অসম চৰকাৰ

GOVERNMENT OF ASSAM

ASOM MALA PROGRAM

Government of Assam

Public Works Roads Department (PWRD)

Project Title: Improvement and Upgradation of A15 Kamargaon to Kamarbandha under Asom Mala [From Ch. 0+000 to Ch. 42+094]

Detailed Project Report

(Environment Impact Assessment and Environmental & Social Management Plan)

(Draft)

(Revision 3)

September, 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

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Executive Summary

A. Introduction

This report summarizes the findings and results of the Environmental Impact Assessment (EIA) study carried out for the **A15 Dhodar Ali (Kamargaon on NH 37 to Kamarbandha)** road under Improvement of SH's and MDR's under Axom 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 Golaghat District and proposed for improvement and upgradation by GoA under AIIB funding. It is an important road connecting NH 37 (at Kamargaon), Golaghat, SH 34 & SH 35 (at Golaghat), Kamarbandha 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 road further from Kamarbandha leads to Jorhat which is one of the major cities of Assam. 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 a 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

Dhodar Ali Road is of historical importance, it starts from Kamargaon in Golaghat. This historical road connects Kamargaon in Golaghat to Joypur in Dibrugarh vis Kamarbandha, Titabor and Mariani. The project road A15 Dhodar Ali lies in the district of Golaghat and the total length of the project road is 42.094 Km. Golaghat district lies between 26° 41" and 27° 17" N latitudes and 93° 18" and 95° 26" E longitudes. The district covers an area of 1,125 km2. This district is surrounded by the river Brahmaputra to the north, the state of Nagaland

to the south, Jorhat district to the east and Karbi Anglong & Nagaon district to the west. The Project work for proposed roads consists of improvement of Kamargaon to Kamarbandha. The mentioned road stretch pass through major junctions and spreads through remote location of the Golaghat District.

The project road originates at Kamargaon and traverses in the south-east direction towards Kamarbandha. The Dhansiri river which is the main river in Golaghat district having a catchment area of 1,220 sq. km, flows alongside the project road from its originating point in Kamargaon till Golaghat city. The road alignment crosses the railway line at many locations and it connects the railway stations at Hautley, Adharsatra, Golaghat and Kamarbandha Ali.

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 cold season starts about the end of November when both day and night temperatures begin to drop rapidly. January is the coldest month of the year with the mean daily minimum temperature at 9.8^0C and the mean daily maximum at 21.6^0C. Temperatures begin to rise from about the beginning of March and by July, it attains the highest point, the mean daily maximum temperature is 31.8^0C. The monsoon season is the year with the highest temperatures. Being also the high moisture in the air, the weather is often unpleasant with the damp heat particularly in between the spells of rain.

Topography: The natural topography of the district Golaghat is a belt of flooded land situated in the north of Dergaon sub-division which is a wide and homogenous plain and low-lying area along the Brahmaputra. It is the populous and important portion where cultivation brings in considerable prosperity and progress. On the lower land, the staple crop is rice, and the higher levels have been planted out with tea. The entire landscape of the district is one of rural plenty and the district is very rich in tea. The tea gardens themselves have enough to appeal to the lover of the picturesque.

Air Quality: The maximum concentration of PM_{10} is 55 µg/m^3 found at Gohain Gaon, whereas the maximum concentration of $PM_{2.5}$ is 20.4 µg/m^3 found at Gohain Gaon. 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 49.2 dB(A) at Gohain Gaon and the night time noise level is 38.4 dB(A) recorded at Gohain Gaon. 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 (6.5–8.5). The level of total dissolved solids is found well within permissible limits, which varies from 156.59 mg/l to 174.19 mg/l at Gohain gaon and Butoli Khowa respectively. Iron content for the analyzed groundwater sample is higher than the permissible standards at all the sampling locations. 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 district consists of alluvial soil. The soil type in the areas is mainly Black soil. Soil is mostly found as sandy clay loam soil in the sampling locations and it is loaded with the sand percentage which varies from 45.89% to 49.45%. Nitrogen content varies from 1870 mg/1000g to 1910 mg/1000g and is poor in organic carbon content.

Land use: The existing land use along the subproject road is mostly residential areas. The land use abutting the project road is majorly residential (71.91%). The commercial and agricultural area is 7.07% and 21.02% respectively.

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. The Dhansiri river which is the main river in Golaghat district flows adjacent to the project road on the right side from its originating point in Kamargaon till Golaghat city. The Kakadonga river crosses the project road at the end of the stretch.

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 **3121** 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 Nambor Doigrung Wildlife Sanctuary which is at a distance of 5.5 km (approx.) from the project road. 4 cultural heritage trees have been identified along the project road. 3 stretches have been identified for elephant crossing where suitable structural mitigation measures have been provided. 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 Kamargaon, Chankala, Khumtai, Hautley, Golaghat, Kanugaon, Kamarbandh. Agriculture is the mainstay of the people. No archaeological and historical monuments are located along the project roads. 30 schools, 7 hospitals, and 10 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 3121 trees existing within the proposed formation width of the subproject road need to be felled.
- The project road runs along the Dhansiri river 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 1987 structures.
- The number of projects affected people are 7750 out of which 3874 are male and 3876 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 **Sonari gaon** on **14th January 2020**, **Maut gaon**, **Salmora Dhansiri**, **Salmora Mukh Adhora, Thengal gaon, Changkala Tiniali** and 1 No. **Butolikhowa** on **10th November 2020**, **Kachopathar**, **Purona Kamargaon**, and **Thengal gaon** on **17th January 2021** along the proposed road alignment. A total of **81 participants** (**63 Male** and **18 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 62,973,777** has been estimated in **Table 88** and **Table 89** 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).

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 Social awareness, 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

The state of Assam is one of the seven North-eastern states of India located at the south of eastern Himalayas along the Brahmaputra and Barak river valleys. Assam has an area of about 78,443 sq. km and a population of about 3.09 crores. The state of Assam has about 2,530 km of State Highways (SH) and 4,379 km of Major District Roads (MDR) which are being maintained and managed by the Public Works Roads Department (PWRD), Government of Assam (GOA). The GOA has embarked upon the ASOM MALA to objectively develop the SH & MDR network of the State and is planned to be an umbrella program that would have several projects under it funded from various sources.

Public Works Roads Department, Assam has undertaken the project for improvement of State Highways and Major District Roads in the next 15 years under Axom Mala. The road network development work will involve reconstruction and widening of roads with long design life, geometric improvement to bring it to proper standards, improved drainage along the roads, improving shoulders and providing paved shoulders wherever necessary, road safety improvement, etc.

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 Public Works Roads Department has started the up-gradation works of State Highways and Major District Roads network for meeting the supply-demand gap of the traffic in the near future. The present sub-project is aimed at widening and improving the **A15** corridor (**42.094 km** length). The stretch is located in the **Golaghat district** connecting **Kamargaon** to **Kamarbandha**. It has been proposed for expansion to two lanes between chainages **0+000** to **42+094**. The project road is major connectivity to NH 37, SH 34, SH 35, Golaghat, Kamarbandha and other nearby villages. The project road is aimed at improving connectivity facilitating safer and more efficient access to livelihood and socio-economic opportunities for the local communities in the region. The rehabilitation and up-gradation of project road will promote equitable growth through sustainable agriculture and rural development. The Existing intermediate lane facility is inadequate to cater to the traffic demand and satisfactory user experience. The road improvement work will promote better access to Tourist locations like Nambor Doigrung Wildlife Sanctuary. The Nambor Doigrung Wildlife Sanctuary is located at a distance of approx. 5.5 km from Golaghat. From Tokani park in Golaghat, the GD road connects to NH 129 which further leads to the Nambor Doigrung Wildlife Sanctuary. The mentioned road stretch passes through major junctions and spreads through the remote location of the Golaghat District. The stretch originates at Kamargaon and further passes through Chankala, Khumtai, Hautley, Golaghat, Kanugaon, Kamarbandha. The improvement works will provide better access to the residents of the nearby villages to market places in Golaghat City and railway stations. The project road corridors proposed

under ASRIP for AIIB financing is given in **Table 1** and the location of these project road corridors is shown in **Figure 1.**

Table 1: Project Road Corridors proposed under ASRIP AIIB Funding

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	Balighat Tiniali to Nakachari	Sivasagar & Jorhat	45.0
Total (km)				**245.7**

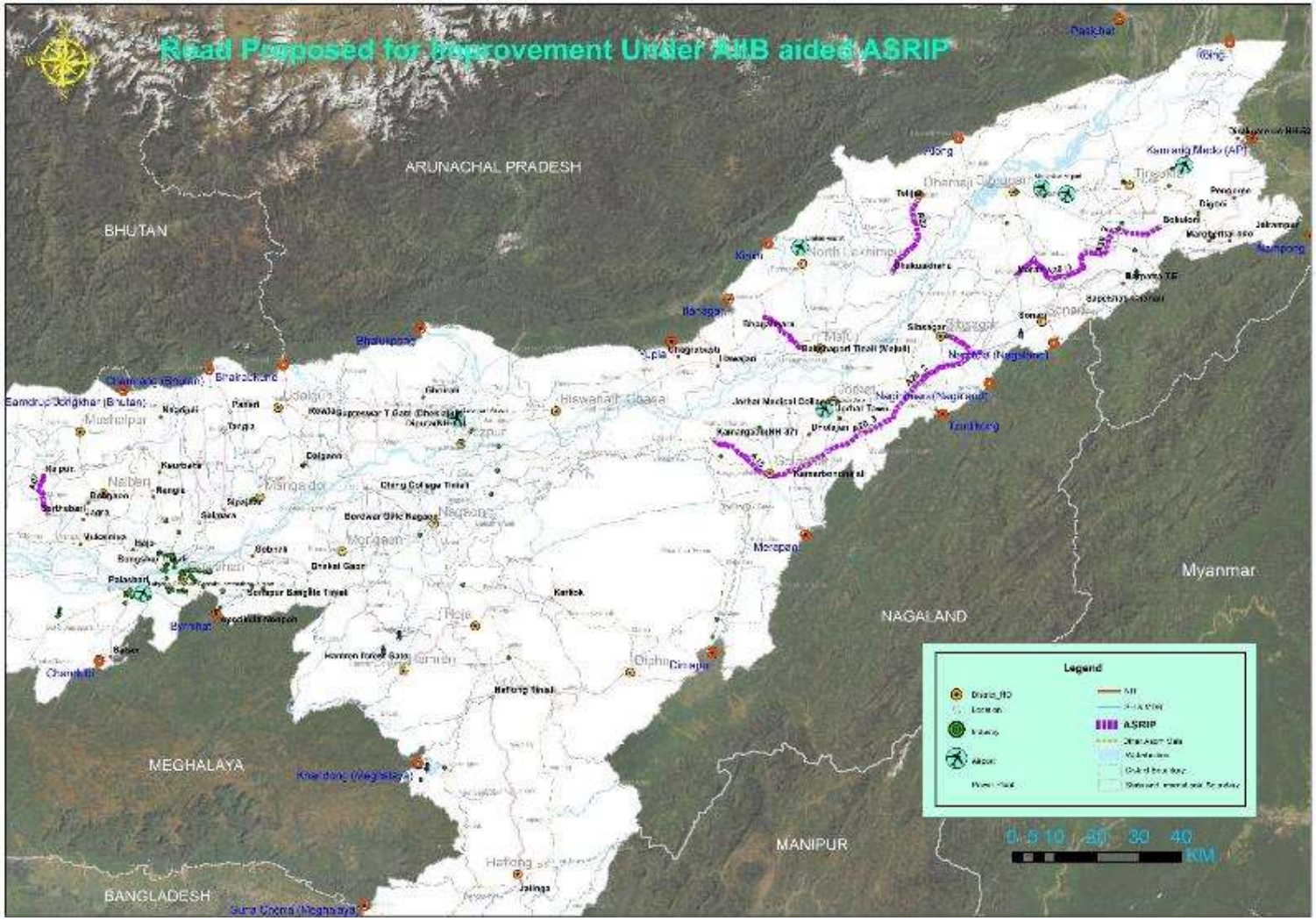


Figure 1: Location of Project Road Corridors proposed under ASRIP for AIIB Financing

1.2 Nature, Size and Location of the Project

The project road Kamargaon to Kamarbandha, begins at Kamargaon, near Kamargaon post office where it connects NH 37. Then the project road moves in south-east direction and turns in east direction after passing through Golaghat city, that is the district headquarter. Roads coming from nearby villages meets the route. 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. Project Road passing through Khumtai Village portion is two lane road and is in good condition. The project road then passes through Kamarbandha Tiniali ends Kakodonga river bridge.

The alignment experiences moderate agricultural activities throughout its stretch. Also, Road stretch passes through many Tea Gardens. Land use pattern of the project road is Built up and Agricultural type.

Golaghat Town is identified as traffic congested portion. The alignment of the project road passing through Golaghat Town is an intermediate lane road with heavy traffic movement. As per the Reconnaissance Survey, street parking along the stretch passing from Golaghat town is observed which create hinderance for the smooth movement of traffic and causes heavy congestion at Tokani park junction. Also, accident Prone Area (Black Spot Location) is located at Kamarbandha Tiniali Junction, where Road coming from Jorhat Town meets the Proposed Road Alignment.

The existing carriageway width is 6.5 meters. The Existing RoW varies between 9.1 meters to 25.3 meters. It is a single lane with paved and earthen shoulders. The proposed RoW varies between 15 to 20 meters with proposed widening 2-lane with Paved shoulder, Earthen Shoulder. In the built-up area footpath and concrete drains have been proposed within the PROW.

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.
- Analyses the alternative options considering alternative locations, designs, management approaches for selection of most feasible and environmentally acceptable options.
- 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 requirements
- Review of the feasibility study
- Reconnaissance survey for identification of key issues data requirement and preliminary consultation

- Primary and secondary data collection
- Consultation with stakeholders
- Identification of impacts and mitigation measures.

1.4.1 Data Collection

Primary and secondary data on the Physical, Ecological, and Socio-economic resources were collected to provide baseline conditions to be used in impact assessment and monitoring plan design. The type and source of information compiled in this EIA are given in the following **Table 2.**

Table 2: Primary and Secondary Information Sources

Information	Sources
Technical information on existing road features and proposed Rehabilitation work. Inventory of road features; viz. water bodies community structures, environmentally sensitive location areas, congested locations, etc.	PWRD, Design Consultant, Ground physical surveys and graphics Consultants
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 Golaghat District
Status of Fishing Activity	District Fisheries Offices at Golaghat 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 Golaghat District 2011 and Official websites maintained by state Govt.

Information	Sources
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 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 section summarizing the national and local legal and institutional frameworks that guided the conduct of the assessment.
- **Chapter 3 - Project Description**: This section presents the key features and components of the proposed project.
- **Chapter 4 - Description of the Environment**: This section discussing the relevant physical, biological, and socioeconomic features that may be affected by the proposed project.
- **Chapter 5 - Anticipated Environmental and Social Impacts and Mitigation Measures**: This section presents the environmental and social assessment of likely positive and adverse impacts attributed to the proposed project and concomitant mitigation measures.
- **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 well defined institutional and legislative framework. 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 Bank has 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,
- 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. The policies and requirements which are most relevant in the context of this project are provided in **Table 3.**

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 (Nambor Doigrung Wildlife Sanctuary) is 5.5 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 notified forests	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	No	No monuments and archaeological sites as listed by Central Government & State Government is reported within 100 meters (restricted Zone) and 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
13	Child labour (Prohibition and Regulation) Act, 1986	To regulate the employment of children including age limits, type	Ministry of Labour and Employment	Yes	This act will be applicable to prohibit employment to children below the

Sr. No.	Act/ Rules	Objectives/Relevance	Authority	Applicable	Reason for Application
		of employment, the timing of work, information disclosure, and health and safety.			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.

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 (Annexure 23) during the initial survey, no diversion of forestland is involved in the A15 Dhodar Ali (Kamargaon on NH 37 to Kamarbandha) road. 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. Wildlife Clearance

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 notified protected area, however 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.

4. 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.

5. Required Clearances/Permissions

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

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	Permission has been granted by DFO Golaghat
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**.

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

Sr. No	Nature Conservation	Relevancy to Project
1	Ramsar Convention on Wetlands	Yes, Protection of significant wetland and prevention of draining or filling during construction
2	CBD (Convention on Biological Diversity)	Yes, Conservation of biological diversity (or biodiversity) and sustainable use of its components.
3	IUCN (International Union for Conservation of Nature)	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

Dhodar Ali Road is of historical importance, it starts from Kamargaon in Golaghat. This Ghistorical road connects Kamargaon in Golaghat to Joypur in Dibrugarh vis Kamarbandha, Titabor and Mariani.

The project road A15 Dhodar Ali lies in the district of Golaghat and the total length of the project road is 42.094 Km. Golaghat district lies between 26° 41" and 27° 17" N latitudes and 93° 18" and 95° 26" E longitudes. The district covers an area of 1,125 km2. This district is surrounded by the river Brahmaputra to the north, the state of Nagaland to the south, Jorhat district to the east and Karbi Anglong & Nagaon district to the west. The Project work for proposed roads consists of improvement of Kamargaon to Kamarbandha. The mentioned road stretch pass through major junctions and spreads through remote location of the Golaghat District.

The project road originates at Kamargaon and traverses in the south-east direction towards Kamarbandha. The Dhansiri river which is the main river in Golaghat district having a catchment area of 1,220 sq. km, flows alongside the project road from its originating point in Kamargaon till Golaghat city. The road alignment crosses the railway line at many locations and it connects the railway stations at Hautley, Adharsatra, Golaghat and Kamarbandha Ali.

3.2 Location and Features of the Sub-Project Road

The project road Kamargaon to Kamarbandha, begins at Kamargaon, near Kamargaon post office where it connects NH 37. Then the project road moves in south-east direction and turns in east direction after passing through Golaghat city, that is the district headquarter. Roads coming from nearby villages meets the route. 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. Project Road passing through Khumtai Village portion is two lane road and is in good condition. The project road then passes through Kamarbandha Tiniali ends Kakodonga river bridge.

Roads coming from nearby villages namely Sonari gaon, Thengal Gaon, Khumtai, Numaligarh, etc meet the project road. At many locations, the proposed road alignment crosses the railway lines. Also, it joins to the railway stations like Hautley, Adharsatra, Golaghat and Kamarbandha ali. Many Common Property Resources like schools, colleges, Hospitals, Religious Places, Community places, and others are observed along the project alignment. **Figure 2** shows the location map and alignment plotted on Google earth.

Figure 2: Map representing Kamargaon to Kamarbandha Road

The salient features of the Road are given in **Table 6**.

Table 6: Summary Road Components and Design Standard

Road Length	42.094 Km.
Alignment	Following the existing road alignment. Except some of the locations where geometric improvements are required.
Flyovers/overpasses/ ROB	2 Underpass for Elephant movement
Bridges	04- Minor Bridges
Other Structures	• Box Culverts: 95 nos.
Embankment Design	Embankment height established is having a 1m freeboard on 20 years frequency HFL Embankment height up to 3.0 m with 2H: 1V slope for embankment height from 3.0 m to 6.0 m with 1.5H: 1V slope. Construction of embankment of height more than 3.0 m, using borrow soil is recommended. However high embankment has been restricted within Row by providing retaining walls
Design Standard	As per IRC Codes and MORTH Guidelines. Vertical Clearance 0.60 m above HFL for bridges up to 30 m length 0.90m above HFL for bridges above 30 m length the discharges for which the bridge has been designed is maximum flood discharge on record for 100 years for major bridges and 50 years for minor bridges.
Speed	65Kmph to 80Kmph.
	Permissible: 80 km/h

Horizontal Curves	As per IRC: 73 -1980
Super Elevations	The maximum value of 7% for superelevation and 15% for side friction factor, the minimum radius for horizontal curves is 230m for design speed 80Km/hr.
Vertical Curves	Grade break of 0.5%, vertical curves will be provided. The length of the vertical curve will be restricted to minimum 50m
Carriageway	7 m wide carriageway with 1.50 m to 2.50 m Earthen Shoulder.
Associated/Linked Facilities	7 - Bus Bay, Bus Shelter with Rest area has been proposed

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)

Sr. No.	Types of Vehicles	Kamargaon to Golaghat Road		Golaghat to Kamarbandha Road	
		Annual Average Daily Traffic (AADT) in Vehicles	AADT in PCUs	Annual Average Daily Traffic (AADT) in Vehicles	AADT in PCUs
1	Two Wheelers	1614	807	2692	1346
2	3 Wheelers	058	058	324	324
3	Car/ Vans/ Jeeps	878	878	1658	1658
4	Mini Buses	008	012	032	048
5	Standard Buses	007	021	010	030
6	Tempo	156	234	185	278
7	LCV's (Goods)	044	066	084	126
8	2-Axle Trucks	068	204	021	063
9	3-Axle Trucks	016	048	006	018
10	Multi-Axle Trucks	004	018	001	005
11	Tractors + Trailer	002	009	001	005
12	Tractors	000	000	001	002
13	Cycle	345	173	505	253
14	Cycle Rickshaw	007	014	007	014
15	Animal Drawn	000	000	002	008
16	Others	017	017	011	011
	Total	**3224**	**2559**	**5540**	**4187**
	Motorized	2855	2355	5015	3901
	Non-motorized	369	204	525	286

Source: Traffic Study

Table 8: Present and Projected Traffic in the road section

Sr. No.	Year	Kamargaon to Golaghat Road		Golaghat to Kamarbandha Road	
		Total Vehicles	Total PCUs	Total Vehicles	Total PCUs
1	2019-2020	3224	2559	5540	4187
2	2020-2021	3421	2717	5887	4453
3	2021-2022	3632	2887	6259	4739
4	2022-2023	3857	3068	6656	5043
5	2023-2024	4098	3261	7081	5369
6	2024-2025	5040	4011	8713	6607
7	2025-2026	5363	4267	9285	7045
8	2026-2027	5710	4540	9899	7513
9	2027-2028	6081	4832	10556	8013
10	2028-2029	6478	5144	11259	8549
11	2029-2030	6903	5478	12012	9123
12	2030-2031	7302	5787	12722	9661
13	2031-2032	7725	6115	13475	10232
14	2032-2033	8175	6462	14275	10838
15	2033-2034	8653	6831	15126	11482
16	2034-2035	9161	7222	16029	12165
17	2035-2036	9651	7595	16904	12825
18	2036-2037	10170	7989	17830	13523
19	2037-2038	10717	8404	18808	14259
20	2038-2039	11296	8844	19841	15037
21	2039-2040	11908	9307	20934	15859
22	2040-2041	12522	9767	22033	16683
23	2041-2042	13169	10251	23191	17551
24	2042-2043	13851	10762	24412	18466
25	2043-2044	14570	11300	25699	19430

Sr. No.	Year	Kamargaon to Golaghat Road		Golaghat to Kamarbandha Road	
		Total Vehicles	Total PCUs	Total Vehicles	Total PCUs
26	2044-2045	15329	11867	27056	20446
27	2045-2046	16128	12465	28487	21516
28	2046-2047	16972	13095	29996	22644
29	2047-2048	17861	13759	31587	23832
30	2048-2049	18798	14458	33264	25085
31	2049-2050	19786	15196	35032	26404
32	2050-2051	20829	15973	36896	27795

Source: Traffic Study

3.5 Proposed Improvement

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 desired geometric 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.

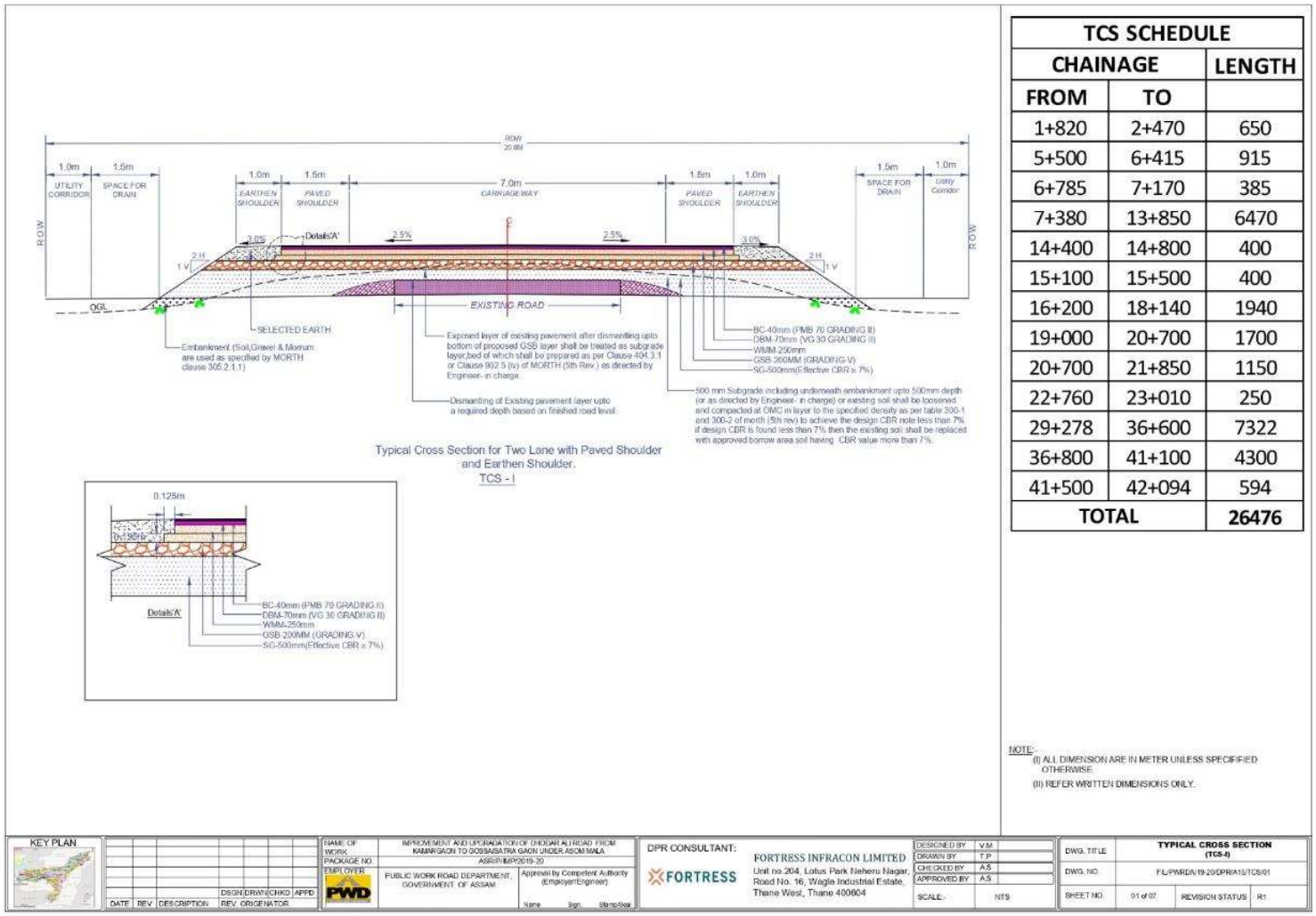
Shoulder: Paved Shoulder and Earthen shoulders are proposed to be 1.5m and 1.0m respectively on both sides of the Carriageway.

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.

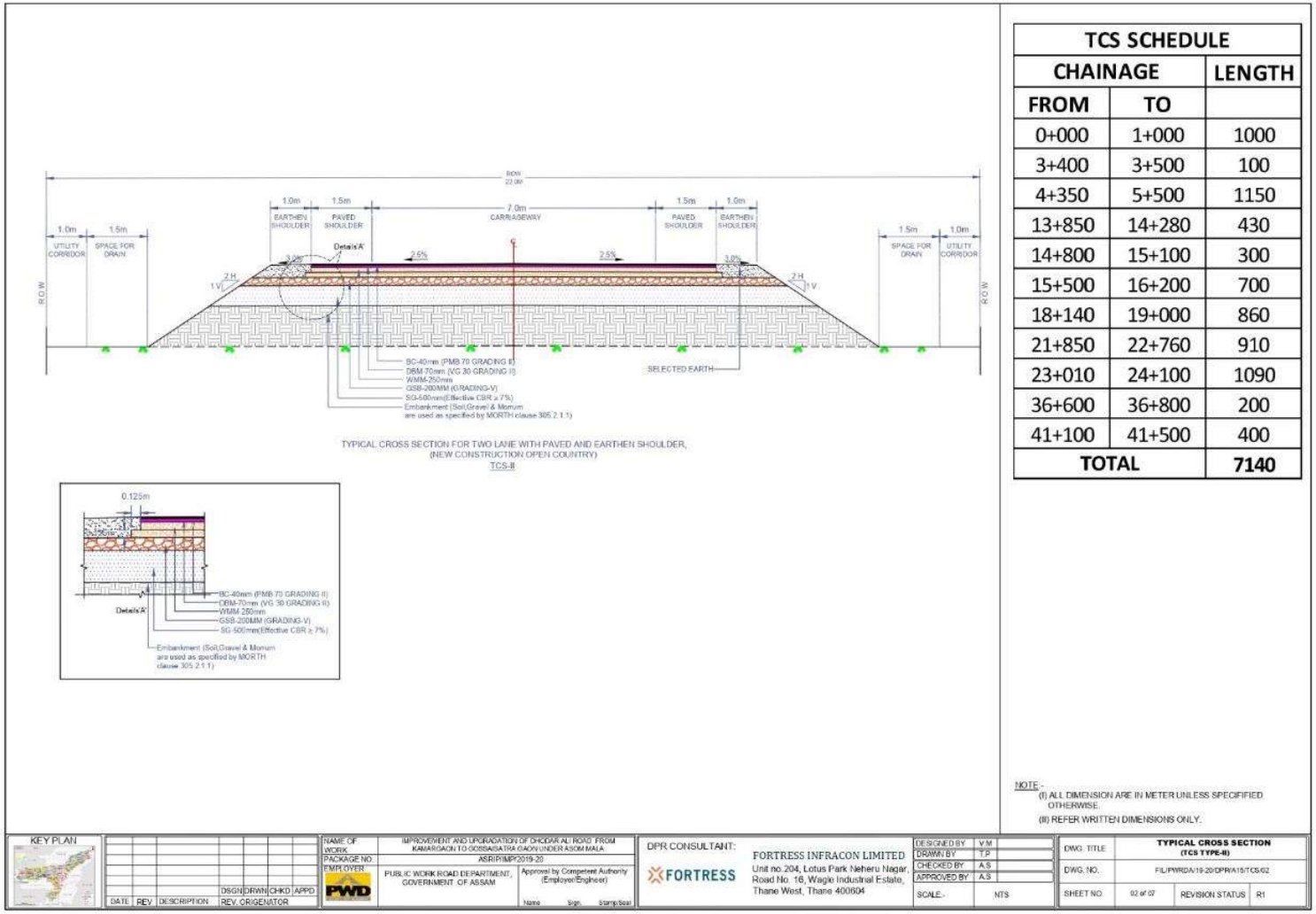
Embankment Slopes: Side slopes shall not be steeper than 2H:1V.

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



TCS SCHEDULE		
CHAINAGE		LENGTH
FROM	TO	
1+820	2+470	650
5+500	6+415	915
6+785	7+170	385
7+380	13+850	6470
14+400	14+800	400
15+100	15+500	400
16+200	18+140	1940
19+000	20+700	1700
20+700	21+850	1150
22+760	23+010	250
29+278	36+600	7322
36+800	41+100	4300
41+500	42+094	594
TOTAL		26476

Figure 3: Typical Cross Section (Type-I)



TCS SCHEDULE		
CHAINAGE		LENGTH
FROM	TO	
0+000	1+000	1000
3+400	3+500	100
4+350	5+500	1150
13+850	14+280	430
14+800	15+100	300
15+500	16+200	700
18+140	19+000	860
21+850	22+760	910
23+010	24+100	1090
36+600	36+800	200
41+100	41+500	400
TOTAL		7140

Figure 4: Typical Cross Section (Type-II)

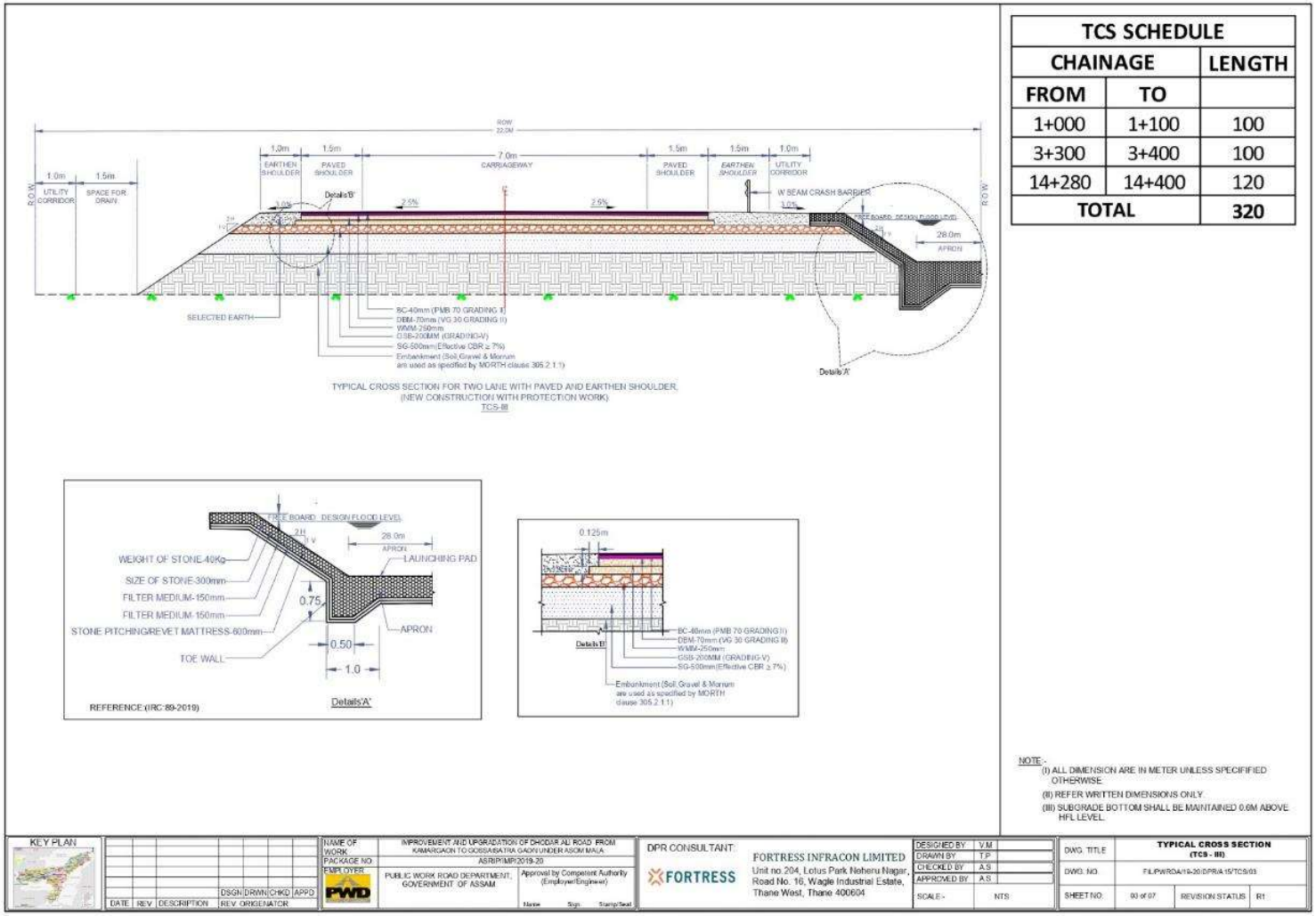


Figure 5: Typical Cross Section (Type-III)

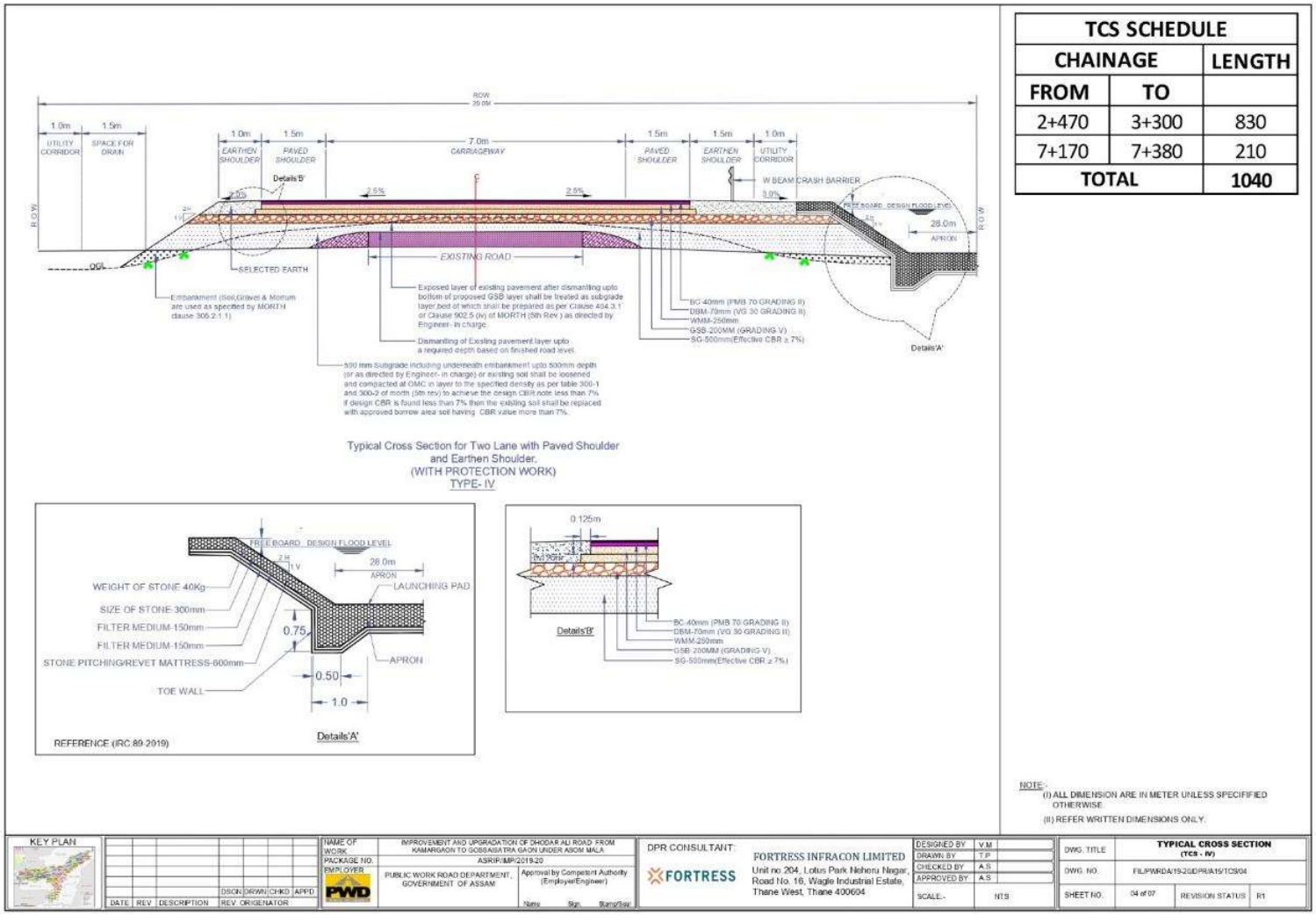


Figure 6: Typical Cross Section (Type-IV)

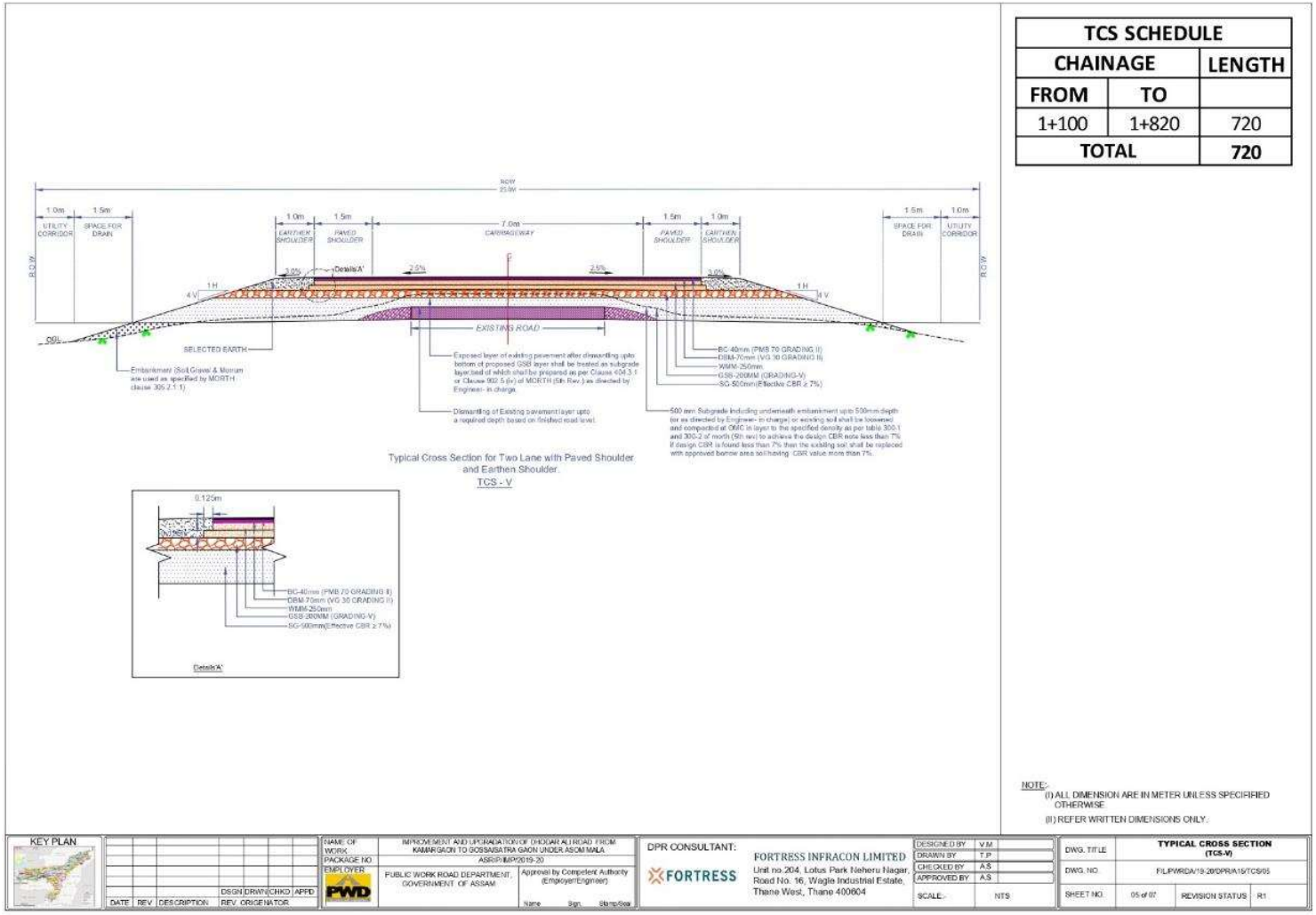
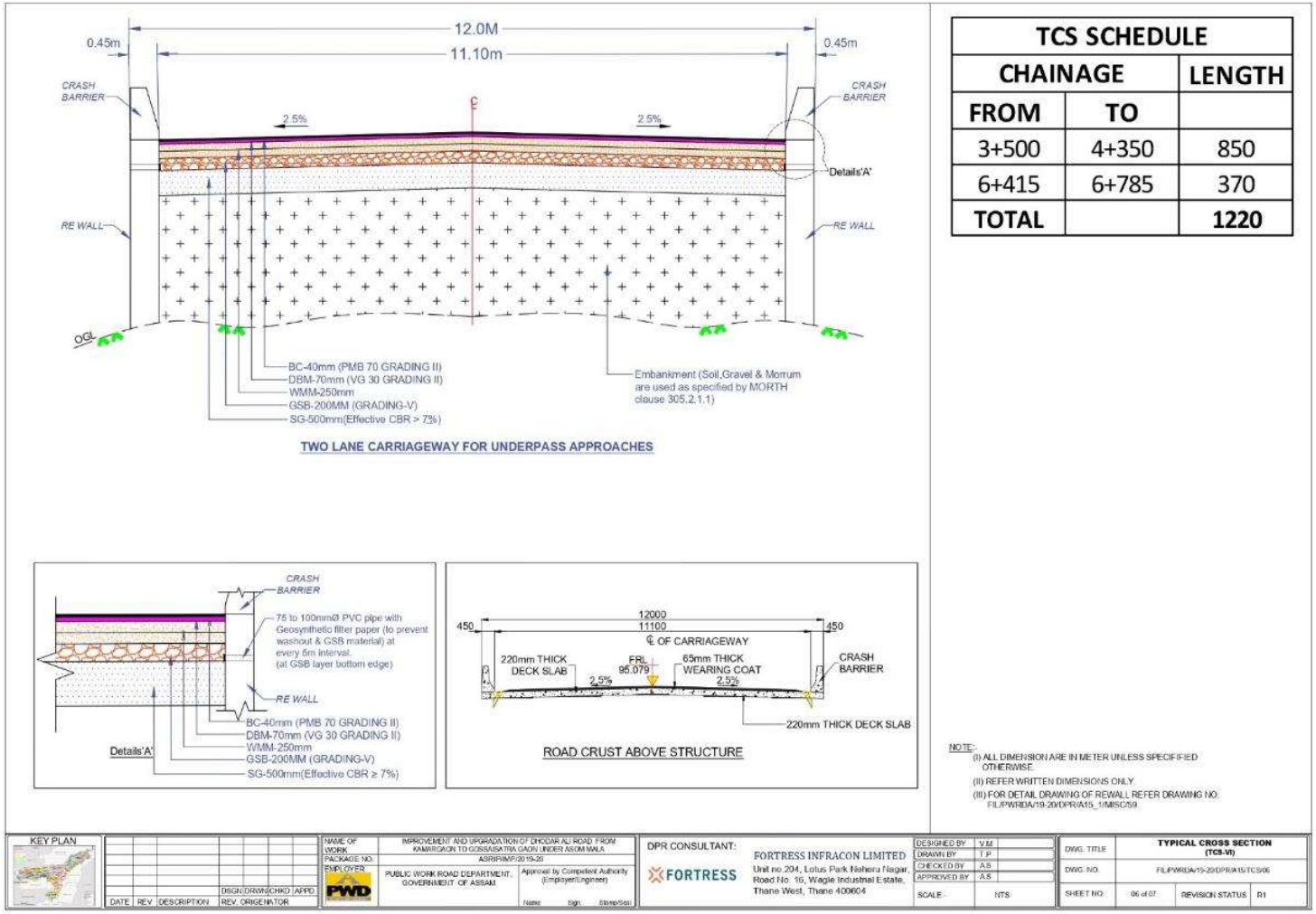


Figure 7: Typical Cross Section (Type-V)



TCS SCHEDULE		
CHAINAGE		LENGTH
FROM	TO	
3+500	4+350	850
6+415	6+785	370
TOTAL		1220

Figure 8: Typical Cross Section (Two lane Carriageway for Underpass Approaches)

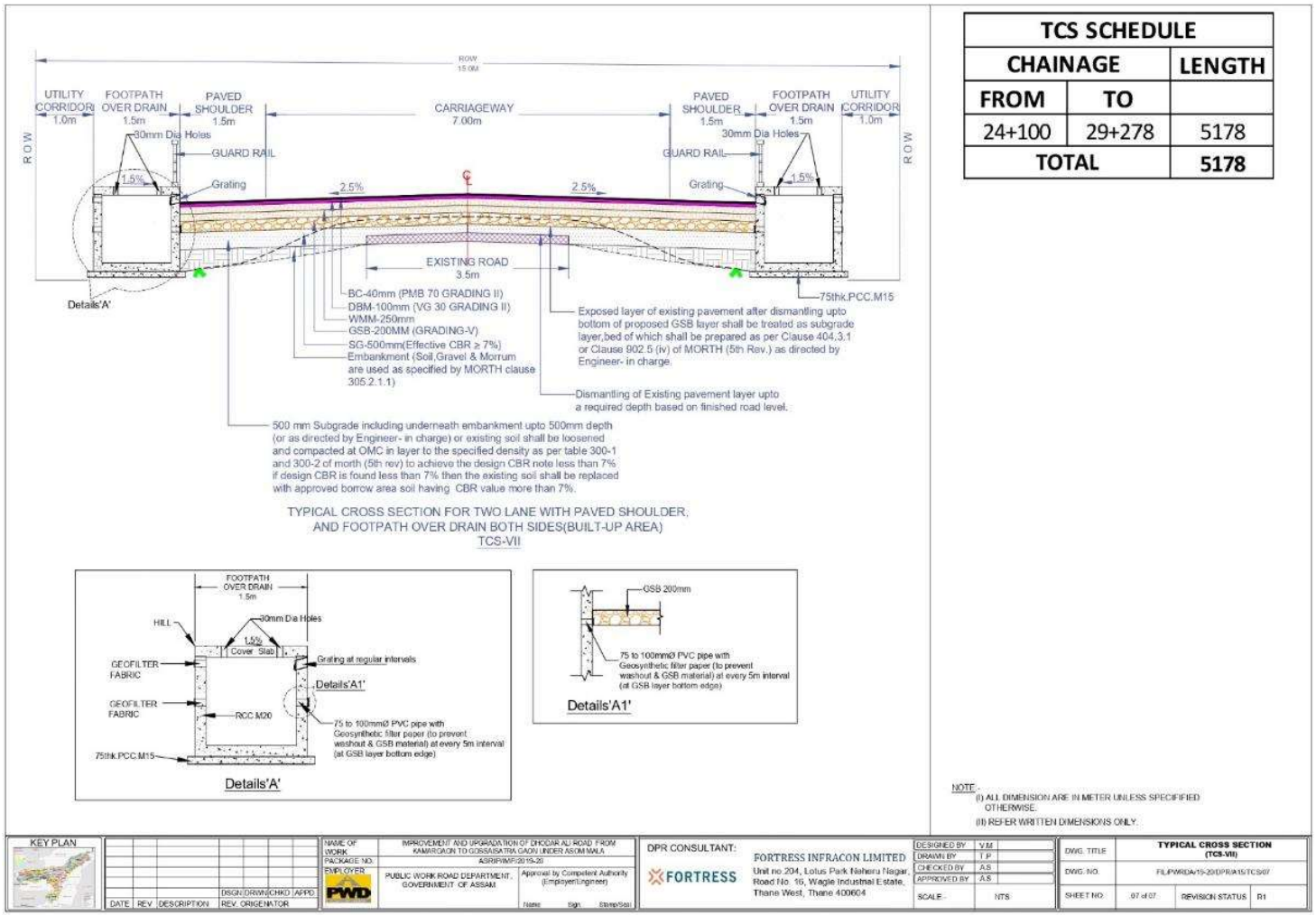


Figure 9: Typical Cross Section (Type VII)

3.5.3 Design of Road Side Drains

In built-up areas, to facilitate proper drainage of surface run-off, road-side covered RCC drains will be constructed as per IRC guidelines.

3.5.4 Pavement Design

The project road envisages two-lane carriageways with hard shoulders and upgrading of the existing pavement to carry the anticipated traffic over the design period. This would involve the construction of new pavement on the widened side and strengthening and rehabilitation of the existing pavements. Flexible asphalt pavement is proposed for the major part of the project road. The applicable IRC Guidelines would be used for this purpose, but using another internationally accepted design method (s) to ensure that the recommended design is the most appropriate.

3.5.5 Traffic Control and Safety Measures

In addition to adequate provisions for roadway width, geometric elements, and junction improvement, the following provisions will enhance the safety of road users. Due consideration has been made for the provisions contained in IRC: SP 44-1996, "Highway Safety Code". Also, other various measures have been proposed to increase traffic control for the High-speed road.

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 Bus Shelters along with Bus Bays are provided as mentioned in **Table 9**, 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 7 bus shelters proposed on this road which is shown in the following **Table 9.**

Table 9: Location of the proposed Bus Shelters

Sr. No.	Bus Bay and Bus Shelter Chainages				Locations
	Left		Right		
	From	To	From	To	
1	1+630	1+825	1+825	1+950	Kamargaon
2	4+740	4+925	4+925	5+065	Chakala Bil Gaon
3	11+100	11+250	11+250	11+410	Khumtai
4	20+360	20+520	20+520	20+660	Adharsantra
5	25+730	25+900	25+900	26+030	Golaghat
6	29+580	29+770	29+770	29+920	Kaboru
7	37+380	37+570	37+570	37+710	Kanugaon

Source: Detailed Project Report

3.5.7 Improvement Proposal for Cross Drainage Structure

Inventory details of existing cross drainage (CD) structures in all the stretches of the project road have been collected during the site visit. A total of 89 numbers of CD structures were observed in project road which needs to be reconstructed or widened. 1 new MNB and 9 new culverts will be constructed.

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 Kamargaon to Kamarbandha 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		End Point		Length of Realignment (m)
	Place	Chainage	Place	Chainage	
1. Realignment No. 1					
Existing Alignment	Kamargaon	0+025	Kamargaon	0+950	925
New Alignment		0+040		1+165	1125
2. Realignment No. 2					
Existing Alignment	Kamargaon	2+975	Kamargaon	3+370	395
New Alignment		3+190		3+540	350
3. Realignment No. 3					
Existing Alignment	Chankala Bil Gaon	4+100	Chankala Bil Gaon	5+500	1400
New Alignment		4+300		5+528	1228

Sr. No.	Start Point		End Point		Length of Realignment (m)
	Place	Chainage	Place	Chainage	
4. Realignment No. 4					
Existing Alignment	No 1 Butolikhowa	13+850	No 1 Butolikhowa	14+450	600
New Alignment		13+860		14+465	605
5. Realignment No. 5					
Existing Alignment	No 1 Butolikhowa	14+650	No 1 Butolikhowa	15+075	425
New Alignment		14+665		15+090	425
6. Realignment No. 6					
Existing Alignment	No 1 Butolikhowa	15+525	Hautley Gaon	16+150	625
New Alignment		15+540		16+150	610
7. Realignment No. 7					
Existing Alignment	Hautley Gaon	18+150	No 2 Sensowagaon	18+950	800
New Alignment		18+147		18+999	852
8. Realignment No. 8					
Existing Alignment	Gosain Santra Gaon	21+775	Gosain Santra Gaon	22+375	600
New Alignment		21+822		22+397	575
9. Realignment No. 9					
Existing Alignment	Gosain Santra Gaon	22+475	Gosain Santra Gaon	22+700	225
New Alignment		22+500		22+725	225
10. Realignment No. 10					
Existing Alignment	Gosain Santra Gaon	23+000	Halmira Gaon	24+100	1100
New Alignment		23+025		24+105	1080
11. Realignment No. 11					
Existing Alignment	Golaghat	27+175	Golaghat	28+300	1125
New Alignment		27+180		28+430	1250
12. Realignment No. 12					
Existing Alignment	Kamarbandha	36+450	Kamarbandha	36+700	250
New Alignment		36+585		36+795	210
13. Realignment No. 13					
Existing Alignment	Chokiting No 2	40+950	Chokiting No 2	41+425	475
New Alignment		41+042		41+510	468

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

3.8.1 Sand

The sand is found at Daigrung River Sand which is at Chainage – 26+500 on the right-hand side with a Lead of 30Km. The sand available at this quarry location is classified to be Zone-II can be used for any construction works.

Figure 10: Location of Sand Quarry Site

Table 11: Laboratory Test Results of Sand

Location and name of quarry if any (correlated with map)	Specimen No.	Location		Side	Natural Sand				
		km	Cut/Fill Existing Road		Sieve Size (mm)	Wt. of materials Retained (g)	Cum. Wt. Of materials Retained (g)	Cum. % materials of Retained	% Passing
1	2	3	4	5	6	7	8	9	10
Village - Doigrung Lead - 20 km	1	26+500		RHS	10 mm	0.0	0.00	0.00	100.00
					4.75 mm	5.0	5.00	0.50	99.50
					2.36 mm	23.5	28.50	2.85	97.15
					1.18 mm	216.5	245.00	24.50	75.50
					600 microns	302.5	547.50	54.75	45.25
					300 microns	270	817.50	81.75	18.25
					150 microns	130	947.50	94.75	5.25
					Pan	52.5	1000.00	100.00	0.00
							Total	259.10	
					Fineness Modulus			2.59	

Source: Material Report

3.8.2 Aggregate

Stone quarries have been primarily identified as stone aggregate source for construction of various components of road, namely, Bituminous Concrete (BC), Dense Bituminous Macadam (DBM), Wet Mix Macadam (WMM) as well as for the cement concrete works. Investigation for the stone quarries is done based on the existing licensed quarries authorized by government agency.

Table 12: Details of Quarry Material Sources along the Project Corridor

Sr. No.	Location	Ref. Chainage	Side of Road (LHS/RHS)	Distance from Existing Road (Km)	Type of Material Available
1	Bihubore	00+000	LHS	122	20mm,10mm

Source: Material Report

3.8.3 Borrow Earth

The borrow earth selected for embankment construction comprises primarily classified as CS according to I.S. classification. The maximum dry unit (Heavy compaction) observed as 1.974 g/cc, satisfying the MoRTH requirements for embankment soil.

Table 13: Details (Source) and Quantity of Borrow earth

Sr. No.	Borrow Area Number	Village Name	Location	Area	Available Quantity	Suitability
1	BA-1	Doigrung	Lat: 26.560455, Long: 93.734451	42,885 sq.m	64327.5	Suitable for subgrade and embankment
2	BA-2	Karbi Hilly trerrain	Lat: 26.538105, Long: 93.833588	1,05,19,262 sq. m	15778893	Suitable for subgrade and embankment

Source: Material Report

3.8.4 Water Requirement

Location of water sources for the use in concrete works and for construction of road works have been identified in the vicinity of project road. Along the project road, streams / Nalas are in close proximity to some points of the alignment and cross the alignment at suitable intervals. However, to facilitate construction works it is always advisable to install deep tube wells at suitable places for obtaining water for construction purposes.

Source: Material Report

3.8.5 Materials Requirement

Total quantity of important materials required for the construction of the project is given in **Table 14**.

Table 14: Estimated Quantities of Materials for Project

Sr. No.	Material Type	Unit	Summary of Quantities
1	Embankment	Cum	282323.16
2	Sub-grade	Cum	216826.60
3	Shoulder	Cum	37874.16
4	WMM	Cum	118278.68
5	Granular Sub-base	Cum	104892.65

Source: Material Report

3.9 Manpower Required

The proposed project will involve 180 – 200 people comprising Skill, Semi-skill, and unskilled labours.

3.10 Land Requirement

The proposed project will envisage 131.07 Acres of land, which comprise of 85.14 Acres Private Land, 35.48 Acres Government Land and 10.48 Acres where ownership could not be ascertained. The details of proposed land acquisition along the project road are given in **Table 15**.

Table 15: Proposed Land Acquisition

Sr. No.	Village Name	Revenue Circle & District	Total Impacted Pvt Land (in acre)	Land Parcels where ownership could not be ascertained (in acre) *	Govt. Land (in acre)	Total Land to be acquired (in acre)
1	Karanihuala	Revenue Circle: Bokakhat & District: Golaghat	4.42	0.91	0	5.33

Sr. No.	Village Name	Revenue Circle & District	Total Impacted Pvt Land (in acre)	Land Parcels where ownership could not be ascertained (in acre) *	Govt. Land (in acre)	Total Land to be acquired (in acre)
2	Sonari Gaon	Revenue Circle: Khumtai & District: Golaghat	1.57	0	1.47	3.04
3	Kamar Gaon		2.15	0.88	0.04	3.06
4	Choukana Bil		2.83	0	0	2.83
5	Thengal Gaon		1.31	0.75	2.27	4.33
6	Soukona Bil 2nd Part		6.45	0.3	0.29	7.04
7	Helochi Gaon		0.59	0	1.56	2.15
8	Kosu Pathar		0.16	0	0.22	0.38
9	Songkola Gaon		0.48	0.31	1.67	2.46
10	Sungi -Hula		0.28	0	0.46	0.74
11	Na-gaon		2.29	0	4.64	6.92
12	Khumtai Gaon 1st Part		1.45	0.2	2.26	3.91
13	Khumtai Gaon 2nd Part		2.22	0.14	4.05	6.4
14	Bogoriani		0.5	0	0	0.5
15	No.2 Butolikhuowa		0	0	1.98	1.98
16	No.1 Butolikhowa		0.5	0	0	0.5
17	27 No Sautoli Grant 2nd Part		1.92	0.09	1.97	3.98
18	24 No Sautoli Grant		5.64	1.96	0.86	8.45
19	Garanga Grant	Revenue Circle & District: Golaghat	2.58	1.58	1.02	5.19
20	Bholaguri Gaon 1st Part		0.07	0	0	0.07
21	Bholaguri Gaon 3rd Part		0.88	0.01	0.47	1.36
22	No. 2 Sensowa Gaon		3.23	0.35	0.54	4.13
23	Na-Pamua Gaon		0.47	0.02	0.38	0.87
24	Gosain Satra Gaon		0.03	0.06	0.25	0.34
25	Na-Pomuwa Gaon	Revenue Circle & District: Golaghat	0.55	0.15	0.43	1.13
26	Gosain Satra Gaon		0.69	0.17	0.02	0.88
27	Salmora Moukhoti Gaon 1st Prt.		2.16	0	0.23	2.39
28	Shalmora Grant		0.57	0	0	0.57
29	Dhansiripar Gaon 1st Part		3.95	0.65	0.69	5.29
30	Moukhuwa Grant 2nd Part		0.7	0	0	0.7
31	Dhansiripar Gaon 2nd Part		0.6	0.17	1.21	1.98
32	Golampati Gaon		0.4	0.19	0.59	1.18
33	Golaghat 16th Part		0.01	0	0	0.01
34	Golaghat 15th Part		0.76	0.11	0.12	0.98
35	Golaghat Town 2nd Part		0.25	0.13	0.3	0.68
36	Golaghat Town 4th Part		0.21	0	0.35	0.56

Sr. No.	Village Name	Revenue Circle & District	Total Impacted Pvt Land (in acre)	Land Parcels where ownership could not be ascertained (in acre) *	Govt. Land (in acre)	Total Land to be acquired (in acre)
37	Golaghat Town 3rd Part		0.55	0.02	0	0.57
38	Golaghat Town 18th Part		0.23	0	0	0.23
39	Golaghat Town 21th Part		0.29	0.05	0	0.34
40	Golaghat Town 7th part		0.11	0	0	0.11
41	Golaghat Town 8th Part		1.18	0	0	1.18
42	Golaghat Town 9th Part		0.49	0	0	0.49
43	Golaghat Town 10th Part		1.12	0.03	0	1.16
44	Bongaon		4.55	0.24	0.17	4.97
45	Kacharihat		1.67	0.01	0.21	1.89
46	Kaboru Gaon		0.91	0.02	0.02	0.94
47	Khiyalekhati Gaon		2.28	0.06	0.19	2.53
48	Raidongia Gaon		1.43	0	0.93	2.36
49	Bamun Gaon 2nd Part		1.66	0	0.01	1.67
50	Bamun Gaon 1st Part		2.04	0.15	0.66	2.85
51	Naamsonia Gaon		0.99	0.11	0.22	1.33
52	Gohain Gaon		4.4	0.48	0.81	5.69
53	Mout Gaon		0.85	0	0	0.85
54	Chutia Gaon		1.94	0.15	0.42	2.5
55	Bokolai Gaon		1.52	0	0.18	1.71
56	Kanu Gaon		1.43	0.03	0.17	1.62
57	Kopohuwating Gaon		0.04	0	0.46	0.51
58	Chokiting Grant 1		2.59	0	0.69	3.28
		Total	**85.14**	**10.48**	**35.48**	**131.09**

Source: Social Impact Assessment Report

3.11 Project Cost

The estimated total project cost is approximately **INR 4,692,203,048**. The per kilometer cost of the project road is **INR 111,469,641.**

Source: Cost Estimate

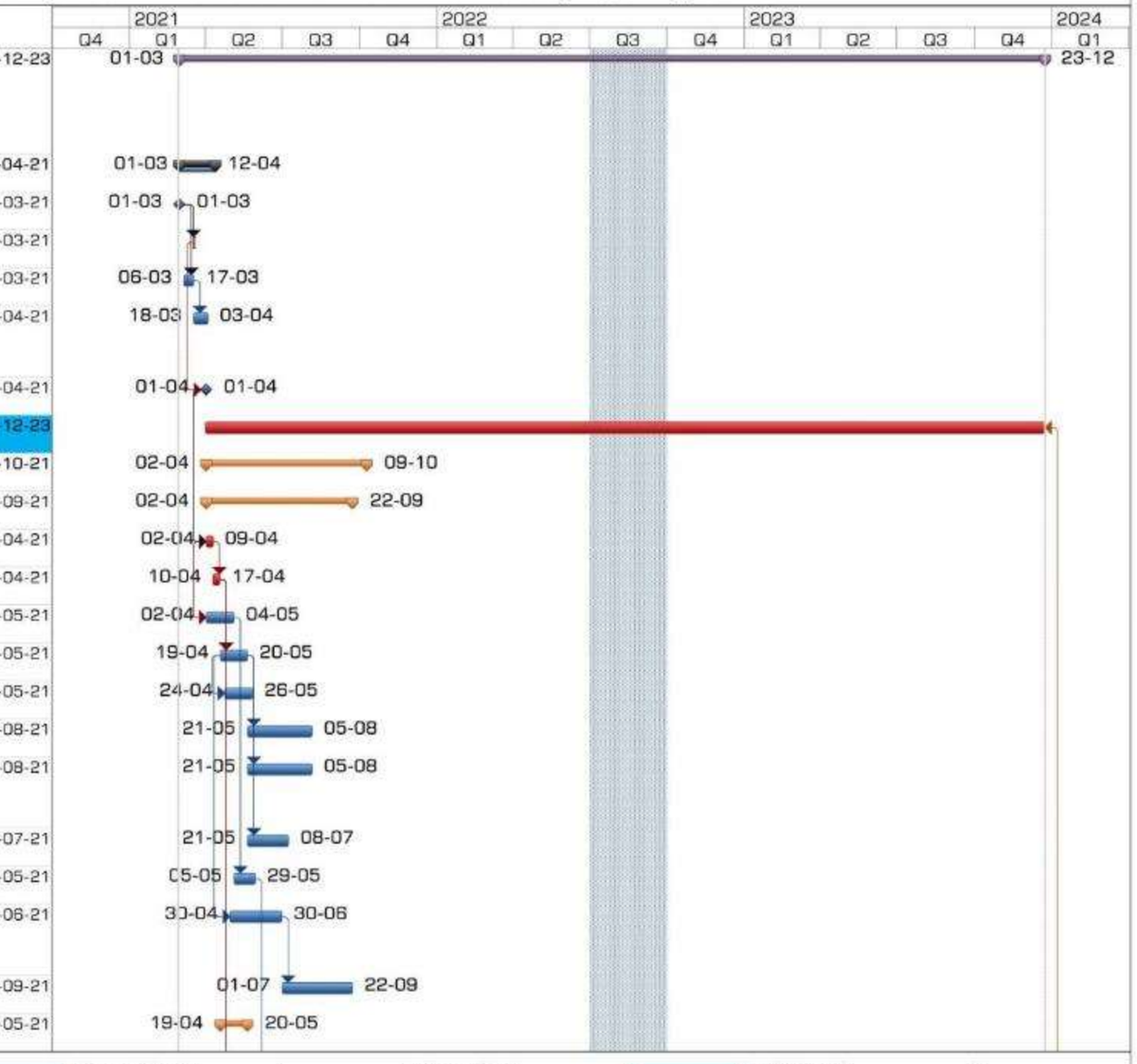
3.12 Implementation Schedule

The project construction period will be **24 months** for the project road. The concessionaire will be recruited for the construction and maintenance-related works.

The Proposed Work Programme & Construction Schedule is given below:

Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
0	Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15	688 days	Mon 01-03-21	Sat 23-12-23
1	1 Project Effective / Appointed Date	37 days	Mon 01-03-21	Mon 12-04-21
2	1.1 Receipt of LOI	0 days	Mon 01-03-21	Mon 01-03-21
3	1.2 Signing of Agreement	1 day	Thu 18-03-21	Thu 18-03-21
4	1.3 Submission of Performance Guarantee	10 days	Sat 06-03-21	Wed 17-03-21
5	1.4 90% of the Total Length of the Project Right of Way by the Employer	15 days	Thu 18-03-21	Sat 03-04-21
6	1.5 Contractual Start Date	0 days	Thu 01-04-21	Thu 01-04-21
7	2 Contract Duration	661 days	Thu 01-04-21	Sat 23-12-23
8	3 Preliminaries (Project Deliverables)	119 days	Fri 02-04-21	Sat 09-10-21
9	3.1 A. Mobilization	108 days	Fri 02-04-21	Wed 22-09-21
10	3.1.1 Preparation of Site Office Layout Plan	7 days	Fri 02-04-21	Fri 09-04-21
11	3.1.2 Approval of Site Office Plan	7 days	Sat 10-04-21	Sat 17-04-21
12	3.1.3 Technical Manpower Mobilization - Initi	28 days	Fri 02-04-21	Tue 04-05-21
13	3.1.4 Establishment of Site Offices - Initial	28 days	Mon 19-04-21	Thu 20-05-21
14	3.1.5 Setting Up Plants / Finalization on Hire	28 days	Sat 24-04-21	Wed 26-05-21
15	3.1.6 Machinery Mobilization	42 days	Fri 21-05-21	Thu 05-08-21
16	3.1.7 Establishment of Labour Camp - Initial Requirements	42 days	Fri 21-05-21	Thu 05-08-21
17	3.1.8 Setting Up Field Laboratory	28 days	Fri 21-05-21	Thu 08-07-21
18	3.1.9 Material Identification & Testing - Prel	22 days	Wed 05-05-21	Sat 29-05-21
19	3.1.10 Construction of Site Offices / Satellite Offices, Stores and Yard	42 days	Fri 30-04-21	Wed 30-06-21
20	3.1.11 Other Miscellaneous Preliminary Item	42 days	Thu 01-07-21	Wed 22-09-21
21	3.2 B. Statutory Requirements & Permissions	28 days	Mon 19-04-21	Thu 20-05-21



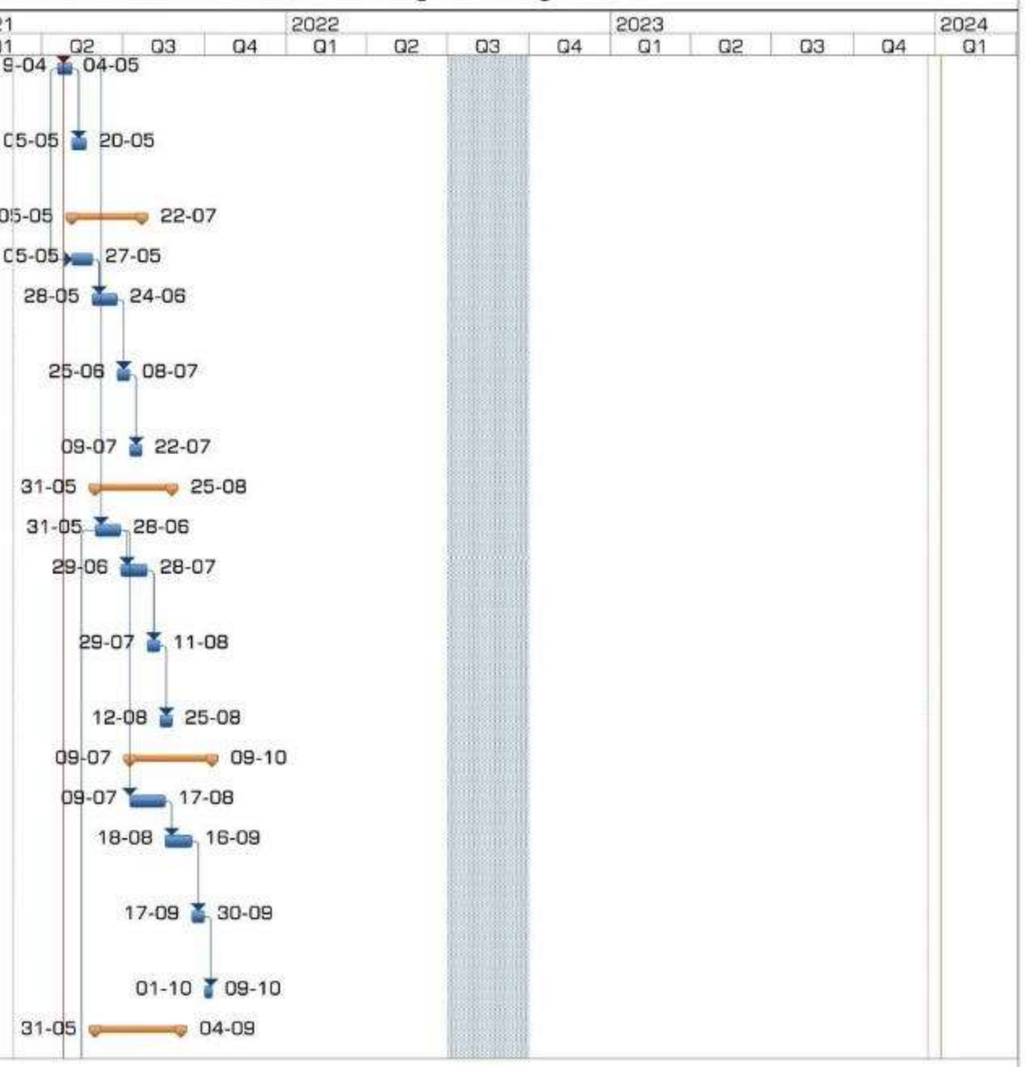
Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) Dist
Project Duration: 688 days
Start Date: Sun 28-02-21, Finish Date: Sat 23-12-23

Task	External Tasks	Manual Task	Finish-only				
Split	External Milestone	Duration-only	Deadline				
Milestone	Inactive Task	Manual Summary Rollup	Critical				
Summary	Inactive Milestone	Manual Summary	Critical Split				
Project Summary	Inactive Summary	Start-only	Progress				

Page 1

Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
22	3.2.1 Client's Letters to the relevant Authorities for clearance of RO Permit	14 days	Mon 19-04-21	Tue 04-05-21
23	3.2.2 All Regulatory Approvals incl. Work Permits, Environmental Clearance	14 days	Wed 05-05-21	Thu 20-05-21
24	3.3 C. Traffic Management Plan	49 days	Wed 05-05-21	Thu 22-07-21
25	3.3.1 Submission of Traffic Management Pla	20 days	Wed 05-05-21	Thu 27-05-21
26	3.3.2 Review of Traffic Management Plan by Consultant/Client	15 days	Fri 28-05-21	Thu 24-06-21
27	3.3.3 Incorporate the Comments and Resubmit Traffic Management Plan	7 days	Fri 25-06-21	Thu 08-07-21
28	3.3.4 Approval of Traffic Management Plan	7 days	Fri 09-07-21	Thu 22-07-21
29	3.4 D. Project Execution Plan	44 days	Mon 31-05-21	Wed 25-08-21
30	3.4.1 Submission of Project Execution Plan I	15 days	Mon 31-05-21	Mon 28-06-21
31	3.4.2 Review of Project Execution Plan (PEP) by Consultant/Client	15 days	Tue 29-06-21	Wed 28-07-21
32	3.4.3 Incorporate the Comments and Resubmit Project Execution Plan (PEP)	7 days	Thu 29-07-21	Wed 11-08-21
33	3.4.4 Approval of Project Execution Plan (PE	7 days	Thu 12-08-21	Wed 25-08-21
34	3.5 E. Quality Assurance Plan (QAP)	49 days	Fri 09-07-21	Sat 09-10-21
35	3.5.1 Submission of Quality Assurance Plan	20 days	Fri 09-07-21	Tue 17-08-21
36	3.5.2 Review of Quality Assurance Plan (QAP) by Consultant/Client	15 days	Wed 18-08-21	Thu 16-09-21
37	3.5.3 Incorporate the Comments and Resubmit Quality Assurance Plan (QAP)	7 days	Fri 17-09-21	Thu 30-09-21
38	3.5.4 Approval of Quality Assurance Plan (Q	7 days	Fri 01-10-21	Sat 09-10-21
39	3.6 F. Health Safety & Environment (HSE) Plan	49 days	Mon 31-05-21	Sat 04-09-21



Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) Dist
Project Duration: 688 days
Start Date: Sun 28-02-21, Finish Date: Sat 23-12-23

Task	External Tasks	Manual Task	Finish-only
Split	External Milestone	Duration-only	Deadline
Milestone	Inactive Task	Manual Summary Rollup	Critical
Summary	Inactive Milestone	Manual Summary	Critical Split
Project Summary	Inactive Summary	Start-only	Progress

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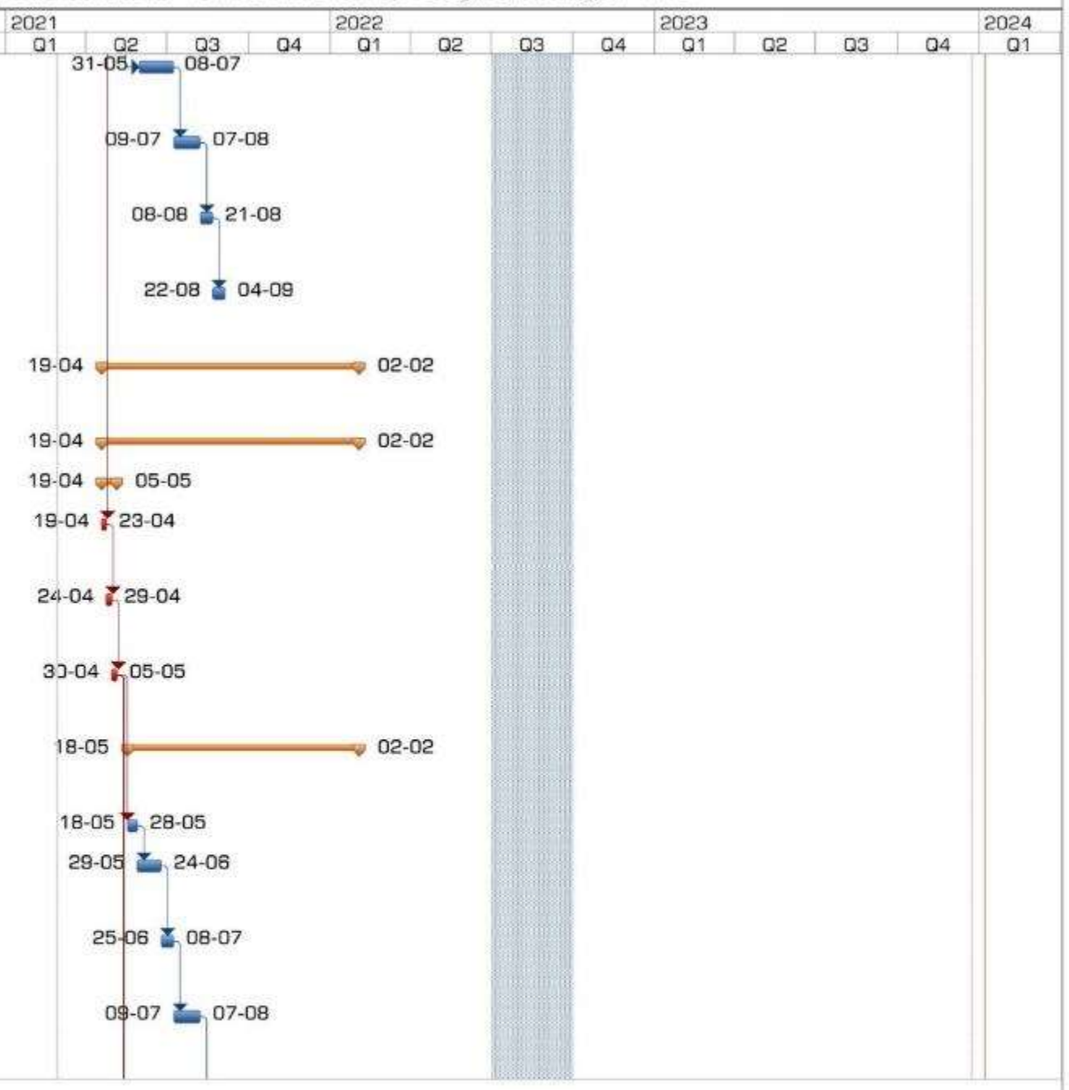
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
40	3.6.1 Submission of Health Safety & Environment (HSE) Plan	20 days	Mon 31-05-21	Thu 08-07-21
41	3.6.2 Review of Health Safety & Environment (HSE) Plan by Consultant/Client	15 days	Fri 09-07-21	Sat 07-08-21
42	3.6.3 Incorporate the Comments and Resubmit Health Safety & Environment (HSE) Plan	7 days	Sun 08-08-21	Sat 21-08-21
43	3.6.4 Approval of Health Safety & Environment (HSE) Plan	7 days	Sun 22-08-21	Sat 04-09-21
44	4 Issuance of GFC Drawings & Re-evaluating Surveying	204 days	Mon 19-04-21	Wed 02-02-22
45	4.1 Road Works	204 days	Mon 19-04-21	Wed 02-02-22
46	4.1.1 A. Issuance of GFC's	15 days	Mon 19-04-21	Wed 05-05-21
47	4.1.1.1 Issuance of Horizontal Alignment, Vertical Profile & Cross Sections	5 days	Mon 19-04-21	Fri 23-04-21
48	4.1.1.2 Issuance of GFC for Major Junction and Minor Junctions	5 days	Sat 24-04-21	Thu 29-04-21
49	4.1.1.3 Issuance of Road Furniture Drgs. Including Traffic Signage & Miscellaneous Items	5 days	Fri 30-04-21	Wed 05-05-21
50	4.1.2 B. Peripheral Transverse Survey & Setting Out of all Roads	179 days	Tue 18-05-21	Wed 02-02-22
51	4.1.2.1 Benchmark Verification by contrac	10 days	Tue 18-05-21	Fri 28-05-21
52	4.1.2.2 Traverse Survey to be performed by contractor	14 days	Sat 29-05-21	Thu 24-06-21
53	4.1.2.3 Confirmation of Traverse & closing error to client/consultant	7 days	Fri 25-06-21	Thu 08-07-21
54	4.1.2.4 Setting Out by contractor for TCS Type-1 ROW	15 days	Fri 09-07-21	Sat 07-08-21



Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) Dist
Project Duration: 688 days
Start Date: Sun 28-02-21, Finish Date: Sat 23-12-23

Task	External Tasks	Manual Task	Finish-only
Split	External Milestone	Duration-only	Deadline
Milestone	Inactive Task	Manual Summary Rollup	Critical
Summary	Inactive Milestone	Manual Summary	Critical Split
Project Summary	Inactive Summary	Start-only	Progress

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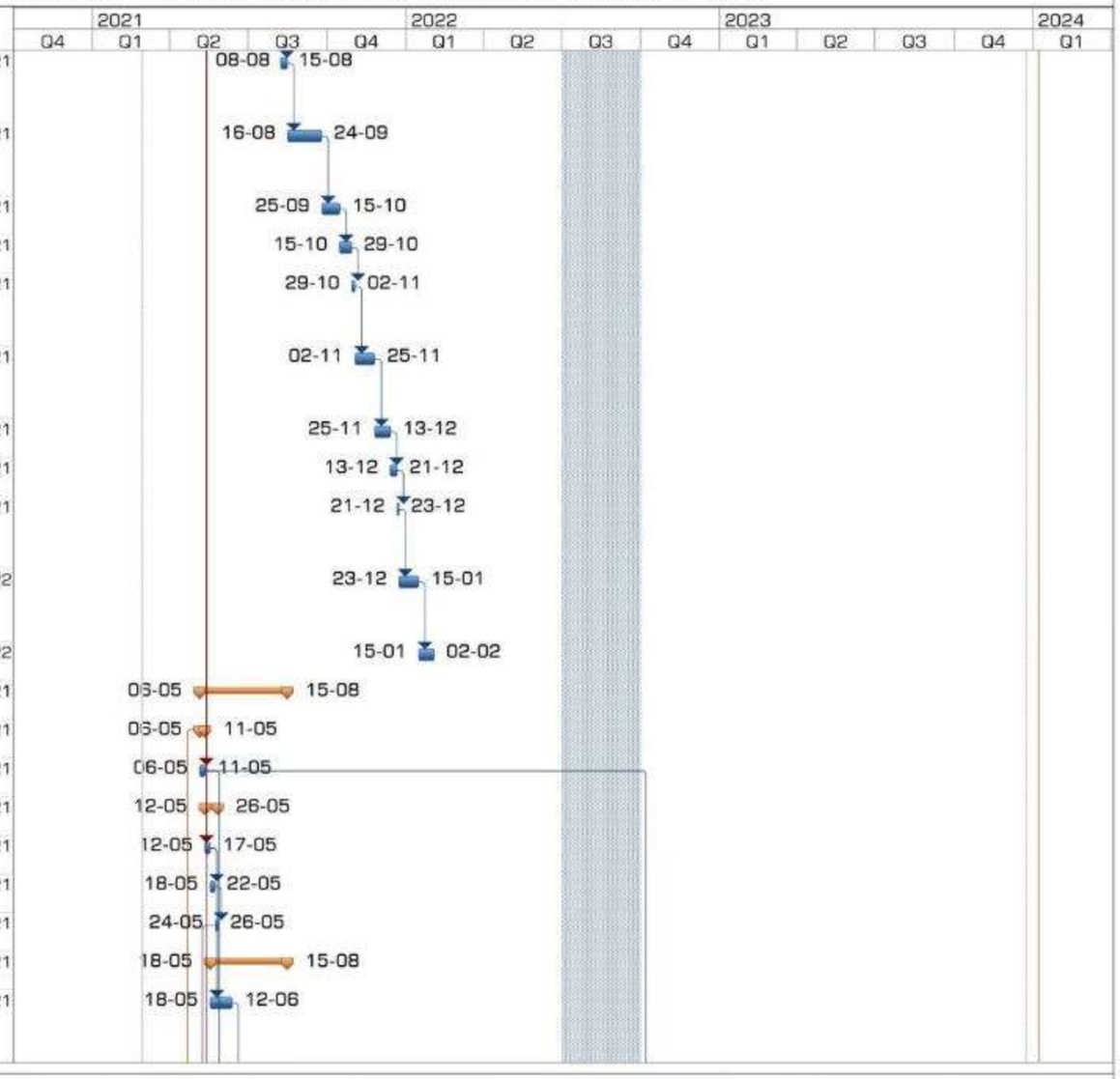
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
55	4.1.2.5 Joint Visit & Certification of TCS Type - 1 ROW	4 days	Sun 08-08-21	Sun 15-08-21
56	4.1.2.6 Continual Survey Works along TCS Type - 1 ROW	20 days	Mon 16-08-21	Fri 24-09-21
57	4.1.2.7 Trail Holing Works along TCS Type	15 days	Sat 25-09-21	Fri 15-10-21
58	4.1.2.8 Setting Out for TCS Type - 2 ROW	12 days	Fri 15-10-21	Fri 29-10-21
59	4.1.2.9 Joint Visit & Certification of TCS Type - 2 ROW	3 days	Fri 29-10-21	Tue 02-11-21
60	4.1.2.10 Continual Survey Works along TCS Type - 2 ROW	20 days	Tue 02-11-21	Thu 25-11-21
61	4.1.2.11 Trail Holing Works along TCS Typ	15 days	Thu 25-11-21	Mon 13-12-21
62	4.1.2.12 Setting Out for TCS Type - 3 RC	7 days	Mon 13-12-21	Tue 21-12-21
63	4.1.2.13 Joint Visit & Certification of TCS Type - 3 ROW	2 days	Tue 21-12-21	Thu 23-12-21
64	4.1.2.14 Continual Survey Works along TCS Type - 3 ROW	20 days	Thu 23-12-21	Sat 15-01-22
65	4.1.2.15 Trail Holing Works along TCS Typ	15 days	Sat 15-01-22	Wed 02-02-22
66	4.2 Structure/Bridges	60 days	Thu 06-05-21	Sun 15-08-21
67	4.2.1 A. Issuance of GFC's	5 days	Thu 06-05-21	Tue 11-05-21
68	4.2.1.1 Issuance of Major/ Minor Bridge D	5 days	Thu 06-05-21	Tue 11-05-21
69	4.2.2 B. Structures	13 days	Wed 12-05-21	Wed 26-05-21
70	4.2.2.1 Issuance of Bridges/RUB/RoB Dra	5 days	Wed 12-05-21	Mon 17-05-21
71	4.2.2.2 Issuance of Culverts Drawings	5 days	Tue 18-05-21	Sat 22-05-21
72	4.2.2.3 Issuance of Drains Drawings	3 days	Mon 24-05-21	Wed 26-05-21
73	4.2.3 C. Survey & Setting Out of all Structu	50 days	Tue 18-05-21	Sun 15-08-21
74	4.2.3.1 Setting Out of all Structure by contractor along the TCS Type-1 ROW	18 days	Tue 18-05-21	Sat 12-06-21



Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) Dist
Project Duration: 688 days
Start Date: Sun 28-02-21, Finish Date: Sat 23-12-23

Task	External Tasks	Manual Task	Finish-only
Split	External Milestone	Duration-only	Deadline
Milestone	Inactive Task	Manual Summary Rollup	Critical
Summary	Inactive Milestone	Manual Summary	Critical Split
Project Summary	Inactive Summary	Start-only	Progress

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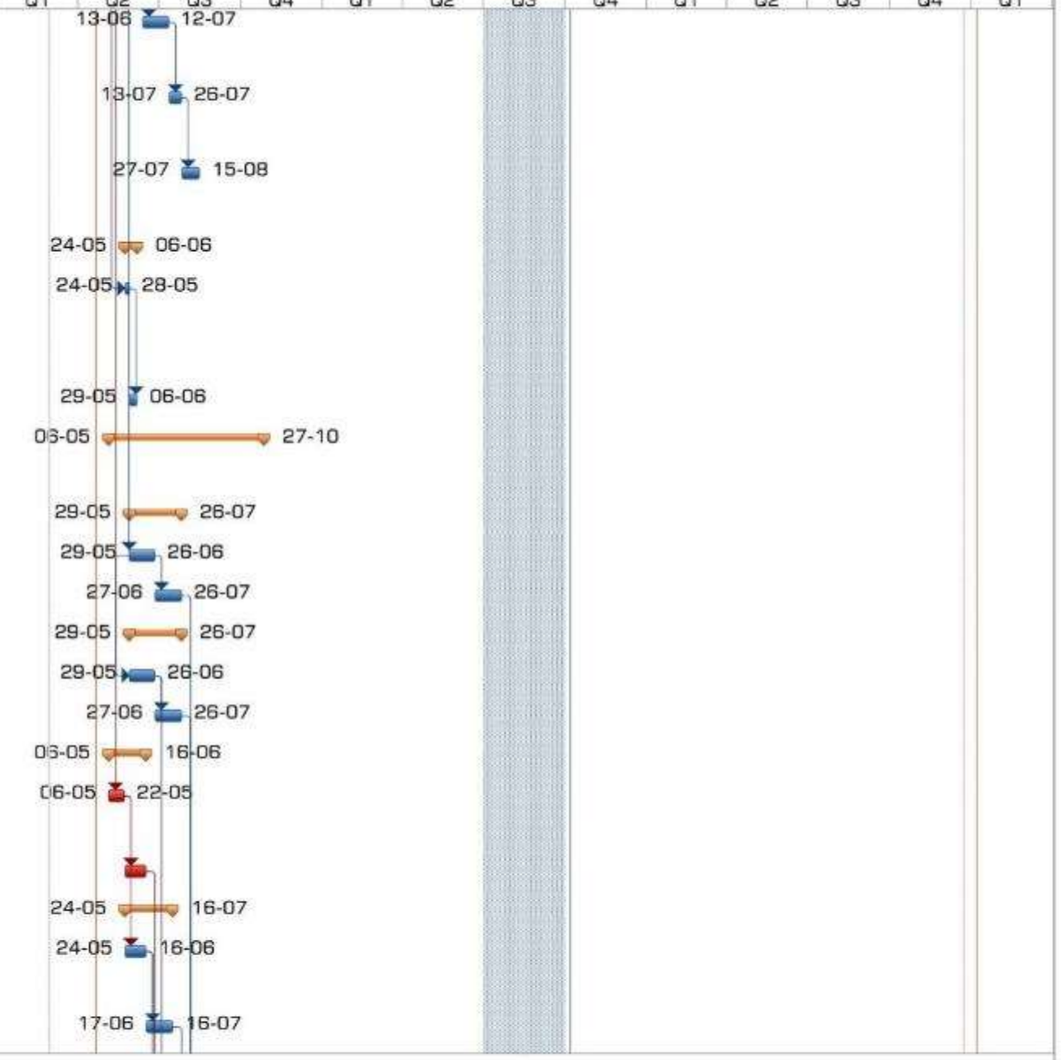
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
75	4.2.3.2 Setting Out of all Structure by contractor along the TCS Type-2 ROW	15 days	Sun 13-06-21	Mon 12-07-21
76	4.2.3.3 Setting Out of all Structure Bridge by contractor along the TCS Type-3 ROW	7 days	Tue 13-07-21	Mon 26-07-21
77	4.2.3.4 Joint Visit & Certification of Setting out Major/Minor Bridge	10 days	Tue 27-07-21	Sun 15-08-21
78	4.3 Other Road Appurtenance/Miscellaneous It	10 days	Mon 24-05-21	Sun 06-06-21
79	4.3.1 Issuance of Traffic Signs, Pavement Marking, Traffic Signals, Crash Barriers, Guard Rails & Electricals Drawings'	5 days	Mon 24-05-21	Fri 28-05-21
80	4.3.2 Miscellaneous Items	5 days	Sat 29-05-21	Sun 06-06-21
81	5 Approval of Material' s Sample, Rates & Agencies	105 days	Thu 06-05-21	Wed 27-10-21
82	5.1 Concrete	30 days	Sat 29-05-21	Mon 26-07-21
83	5.1.1 Prepare & Submit Concrete Mix Desig	15 days	Sat 29-05-21	Sat 26-06-21
84	5.1.2 Review & Approval of Concrete Mix De	15 days	Sun 27-06-21	Mon 26-07-21
85	5.2 Steel Reinforcement	30 days	Sat 29-05-21	Mon 26-07-21
86	5.2.1 Prepare & Submit Certificates/Sample	15 days	Sat 29-05-21	Sat 26-06-21
87	5.2.2 Review & Approval of Steel Reinforcem	15 days	Sun 27-06-21	Mon 26-07-21
88	5.3 Granular Sub Base	30 days	Thu 06-05-21	Wed 16-06-21
89	5.3.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Thu 06-05-21	Sat 22-05-21
90	5.3.2 Review & Approval of Material	15 days	Mon 24-05-21	Wed 16-06-21
91	5.4 Base Course Materials	30 days	Mon 24-05-21	Fri 16-07-21
92	5.4.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Mon 24-05-21	Wed 16-06-21
93	5.4.2 Review & Approval of Material	15 days	Thu 17-06-21	Fri 16-07-21



Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) Dist
Project Duration: 688 days
Start Date: Sun 28-02-21, Finish Date: Sat 23-12-23

Task	External Tasks	Manual Task	Finish-only
Split	External Milestone	Duration-only	Deadline
Milestone	Inactive Task	Manual Summary Rollup	Critical
Summary	Inactive Milestone	Manual Summary	Critical Split
Project Summary	Inactive Summary	Start-only	Progress

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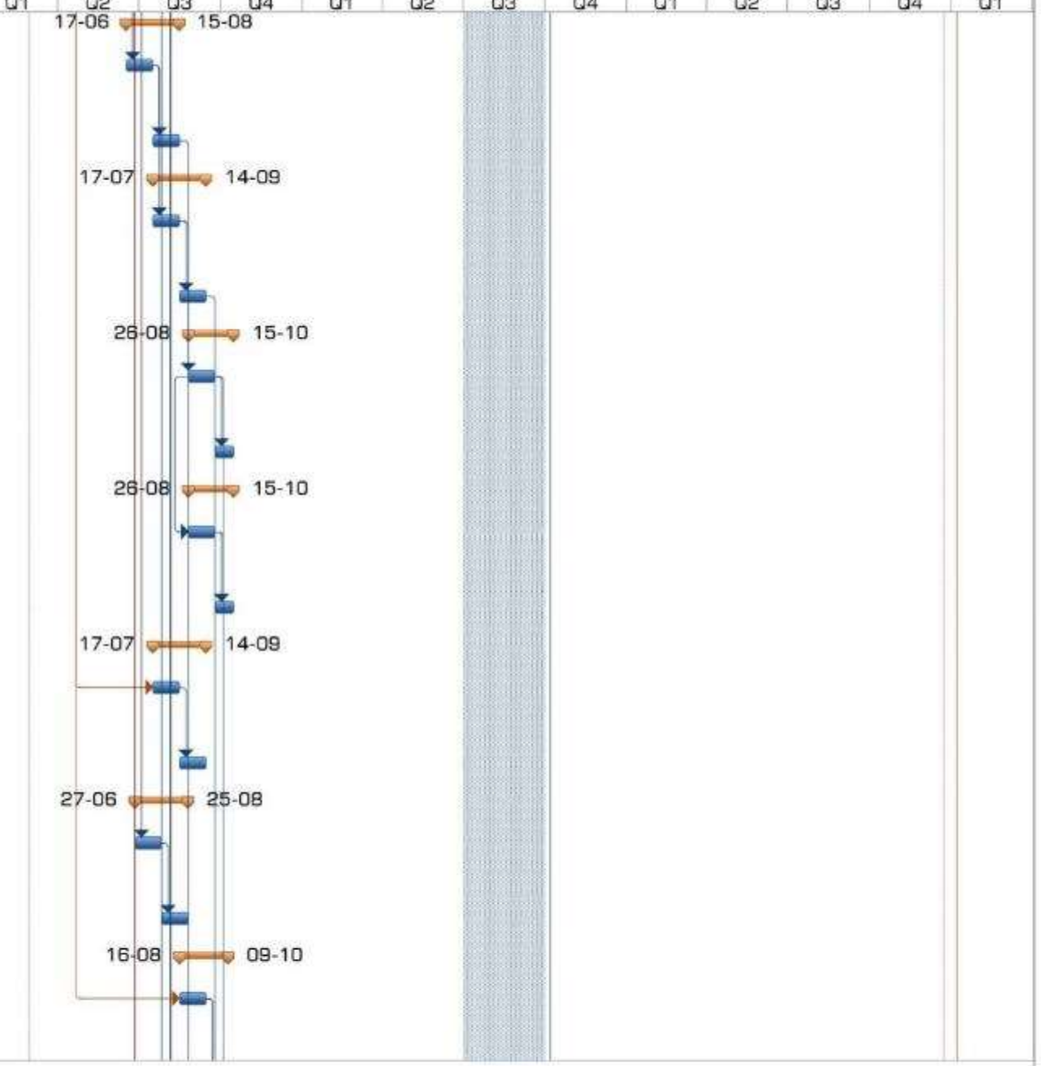
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
94	5.5 Prime Coat & Tack Coat	30 days	Thu 17-06-21	Sun 15-08-21
95	5.5.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Thu 17-06-21	Fri 16-07-21
96	5.5.2 Review & Approval of Material	15 days	Sat 17-07-21	Sun 15-08-21
97	5.6 Wearing Course Materials	30 days	Sat 17-07-21	Tue 14-09-21
98	5.6.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Sat 17-07-21	Sun 15-08-21
99	5.6.2 Review & Approval of Material	15 days	Mon 16-08-21	Tue 14-09-21
100	5.7 Traffic Signs	30 days	Thu 26-08-21	Fri 15-10-21
101	5.7.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Thu 26-08-21	Fri 24-09-21
102	5.7.2 Review & Approval of Material	15 days	Sat 25-09-21	Fri 15-10-21
103	5.8 Road Barriers / Road Furniture	30 days	Thu 26-08-21	Fri 15-10-21
104	5.8.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Thu 26-08-21	Fri 24-09-21
105	5.8.2 Review & Approval of Material	15 days	Sat 25-09-21	Fri 15-10-21
106	5.9 Landscaping Materials	30 days	Sat 17-07-21	Tue 14-09-21
107	5.9.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Sat 17-07-21	Sun 15-08-21
108	5.9.2 Review & Approval of Material	15 days	Mon 16-08-21	Tue 14-09-21
109	5.10 Bricks	30 days	Sun 27-06-21	Wed 25-08-21
110	5.10.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Sun 27-06-21	Mon 26-07-21
111	5.10.2 Review & Approval of Material	15 days	Tue 27-07-21	Wed 25-08-21
112	5.11 Street Lights & Electrical Equipment's	30 days	Mon 16-08-21	Sat 09-10-21
113	5.11.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Mon 16-08-21	Tue 14-09-21



Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) Dist
Project Duration: 688 days
Start Date: Sun 28-02-21, Finish Date: Sat 23-12-23

Task	External Tasks	Manual Task	Finish-only
Split	External Milestone	Duration-only	Deadline
Milestone	Inactive Task	Manual Summary Rollup	Critical
Summary	Inactive Milestone	Manual Summary	Critical Split
Project Summary	Inactive Summary	Start-only	Progress

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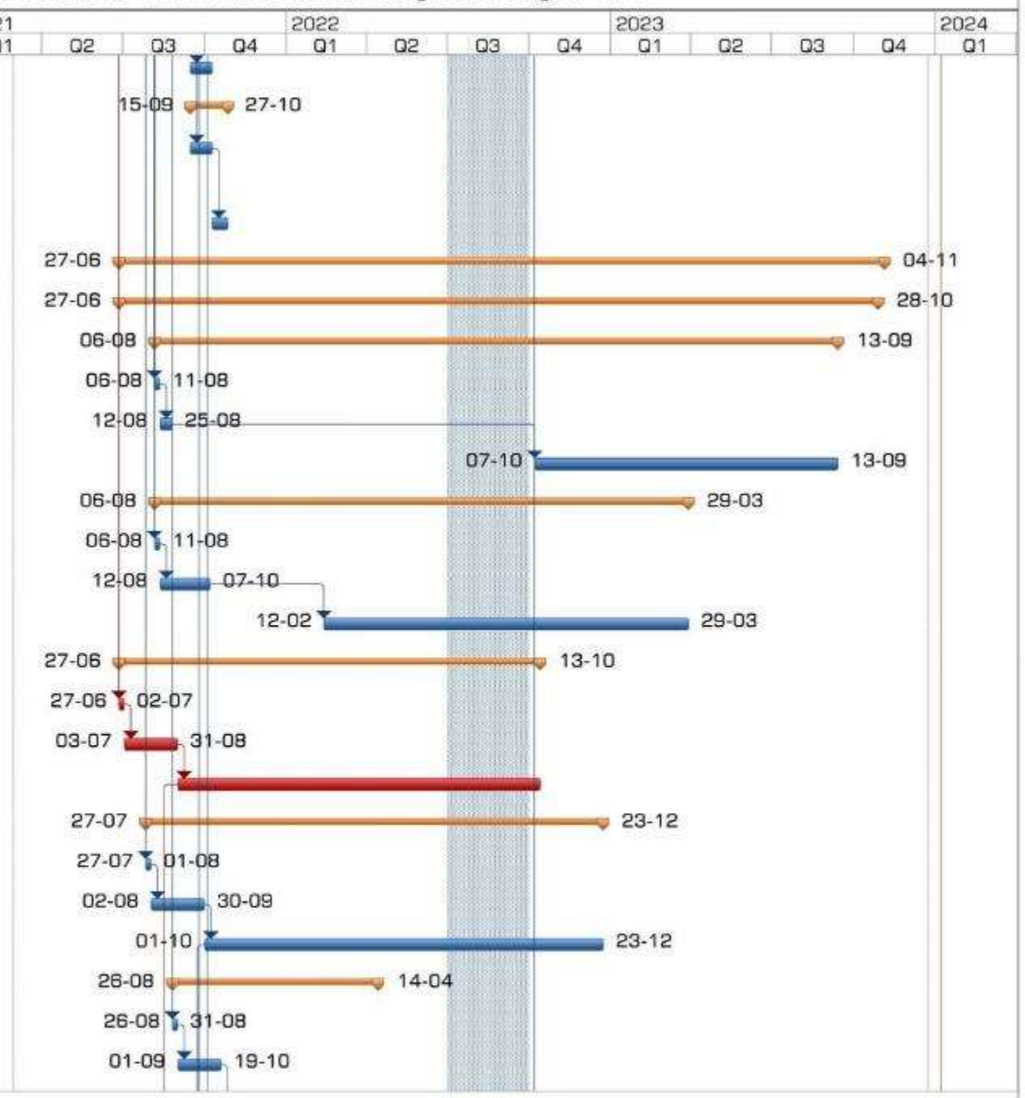
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
114	5.11.2 Review & Approval of Material	15 days	Wed 15-09-21	Sat 09-10-21
115	5.12 Miscellaneous Finishes Materials	30 days	Wed 15-09-21	Wed 27-10-21
116	5.12.1 Prepare & Submit Catalogues / Data Sheets / Samples as applicable	15 days	Wed 15-09-21	Sat 09-10-21
117	5.12.2 Review & Approval of Material	15 days	Sat 09-10-21	Wed 27-10-21
118	6 Project Duration	554 days	Sun 27-06-21	Sat 04-11-23
119	6.1 Procurement Schedule	548 days	Sun 27-06-21	Sat 28-10-23
120	6.1.1 Concrete	495 days	Fri 06-08-21	Wed 13-09-23
121	6.1.1.1 Issue P. O. for Ready Mixed Concr	3 days	Fri 06-08-21	Wed 11-08-21
122	6.1.1.2 Production and First Delivery to S	7 days	Thu 12-08-21	Wed 25-08-21
123	6.1.1.3 Continual Delivery of Concrete Mi	255 days	Fri 07-10-22	Wed 13-09-23
124	6.1.2 Steel Reinforcement	388 days	Fri 06-08-21	Wed 29-03-23
125	6.1.2.1 Issue P. O. for Steel Reinforceme	3 days	Fri 06-08-21	Wed 11-08-21
126	6.1.2.2 Production and First Delivery to S	30 days	Thu 12-08-21	Thu 07-10-21
127	6.1.2.3 Continual Delivery of Steel Reinfor	245 days	Sat 12-02-22	Wed 29-03-23
128	6.1.3 Granular Sub Base	265 days	Sun 27-06-21	Thu 13-10-22
129	6.1.3.1 Issue P. O. for Material	3 days	Sun 27-06-21	Fri 02-07-21
130	6.1.3.2 Production and First Delivery to S	30 days	Sat 03-07-21	Tue 31-08-21
131	6.1.3.3 Continual Delivery of Material	232 days	Wed 01-09-21	Thu 13-10-22
132	6.1.4 Base Course Materials	311 days	Tue 27-07-21	Fri 23-12-22
133	6.1.4.1 Issue P. O. for Material	3 days	Tue 27-07-21	Sun 01-08-21
134	6.1.4.2 Production and First Delivery to S	30 days	Mon 02-08-21	Thu 30-09-21
135	6.1.4.3 Continual Delivery of Material	278 days	Fri 01-10-21	Fri 23-12-22
136	6.1.5 Prime Coat & Tack Coat	185 days	Thu 26-08-21	Thu 14-04-22
137	6.1.5.1 Issue P. O. for Material	3 days	Thu 26-08-21	Tue 31-08-21
138	6.1.5.2 Production and First Delivery to S	30 days	Wed 01-09-21	Tue 19-10-21



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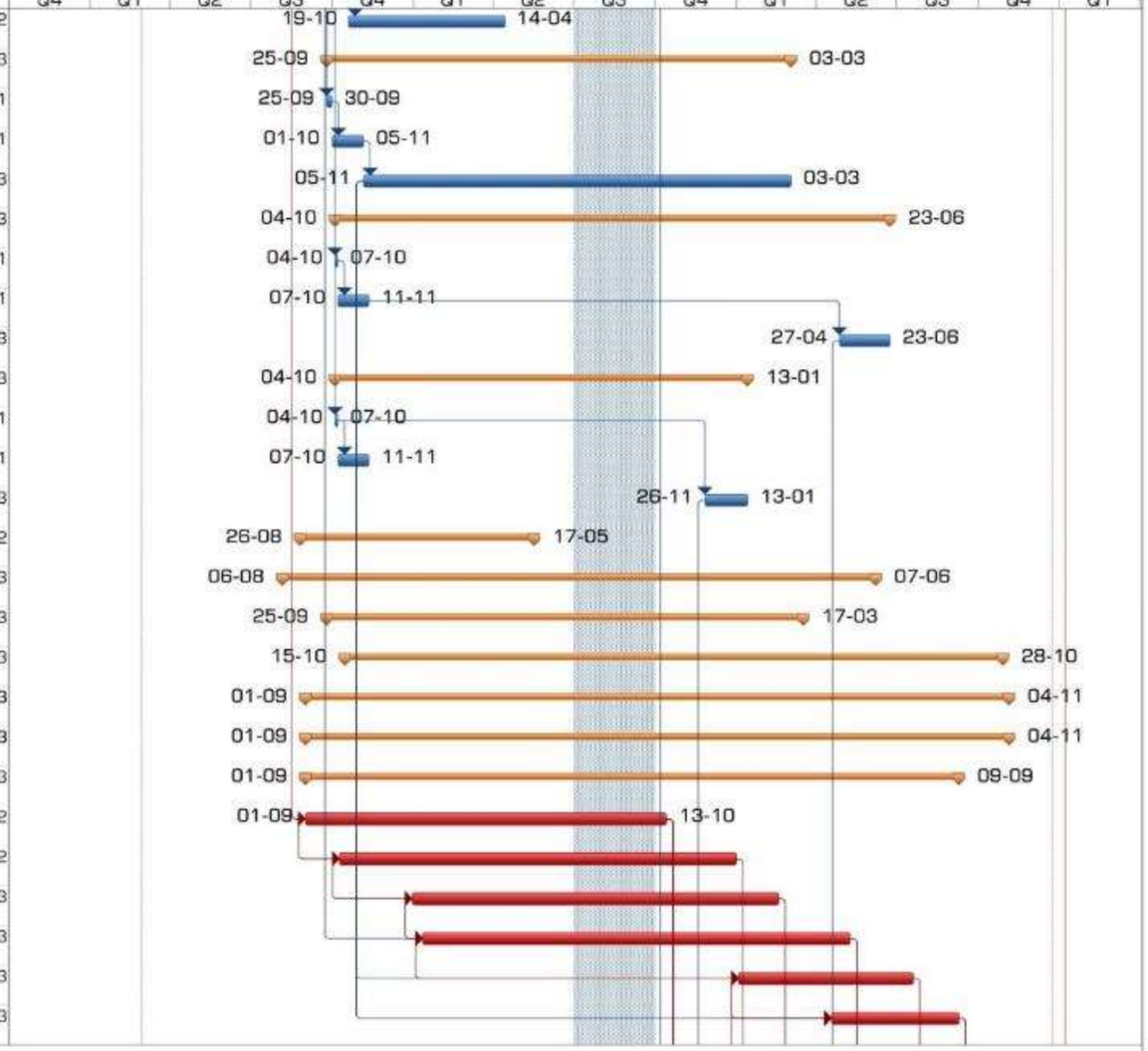
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
139	6.1.5.3 Continual Delivery of Material	152 days	Tue 19-10-21	Thu 14-04-22
140	6.1.6 Wearing Course Materials	341 days	Sat 25-09-21	Fri 03-03-23
141	6.1.6.1 Issue P. O. for Material	3 days	Sat 25-09-21	Thu 30-09-21
142	6.1.6.2 Production and First Delivery to S	30 days	Fri 01-10-21	Fri 05-11-21
143	6.1.6.3 Continual Delivery of Material	308 days	Fri 05-11-21	Fri 03-03-23
144	6.1.7 Traffic Signs	424 days	Mon 04-10-21	Fri 23-06-23
145	6.1.7.1 Issue P. O. for Material	3 days	Mon 04-10-21	Thu 07-10-21
146	6.1.7.2 Production and First Delivery to S	30 days	Thu 07-10-21	Thu 11-11-21
147	6.1.7.3 Continual Delivery of Material	41 days	Thu 27-04-23	Fri 23-06-23
148	6.1.8 Road Barriers / Road Furniture	294 days	Mon 04-10-21	Fri 13-01-23
149	6.1.8.1 Issue P. O. for Material	3 days	Mon 04-10-21	Thu 07-10-21
150	6.1.8.2 Production and First Delivery to S	30 days	Thu 07-10-21	Thu 11-11-21
151	6.1.8.3 Continual Delivery of Material	41 days	Sat 26-11-22	Fri 13-01-23
152	6.1.9 Landscaping Materials	213 days	Thu 26-08-21	Tue 17-05-22
156	6.1.10 Bricks	446 days	Fri 06-08-21	Wed 07-06-23
160	6.1.11 Street Lights & Electrical Equipment	353 days	Sat 25-09-21	Fri 17-03-23
164	6.1.12 Miscellaneous Finishes Materials	488 days	Fri 15-10-21	Sat 28-10-23
168	**6.2 Construction**	**521 days**	**Wed 01-09-21**	**Sat 04-11-23**
169	**6.2.1 Road Works**	**521 days**	**Wed 01-09-21**	**Sat 04-11-23**
170	6.2.1.1 TCS 1	480 days	Wed 01-09-21	Sat 09-09-23
171	6.2.1.1.1 Earthwork	232 days	Wed 01-09-21	Thu 13-10-22
172	6.2.1.1.2 Subgrade Preparation	278 days	Sat 09-10-21	Sat 31-12-22
173	6.2.1.1.3 Granular Sub base	249 days	Thu 30-12-21	Fri 17-02-23
174	6.2.1.1.4 Wet Mix Macadam	308 days	Tue 11-01-22	Tue 09-05-23
175	6.2.1.1.5 Dense Bituminous Macadam	152 days	Tue 03-01-23	Wed 19-07-23
176	6.2.1.1.6 Bituminous Concrete	88 days	Tue 18-04-23	Sat 09-09-23



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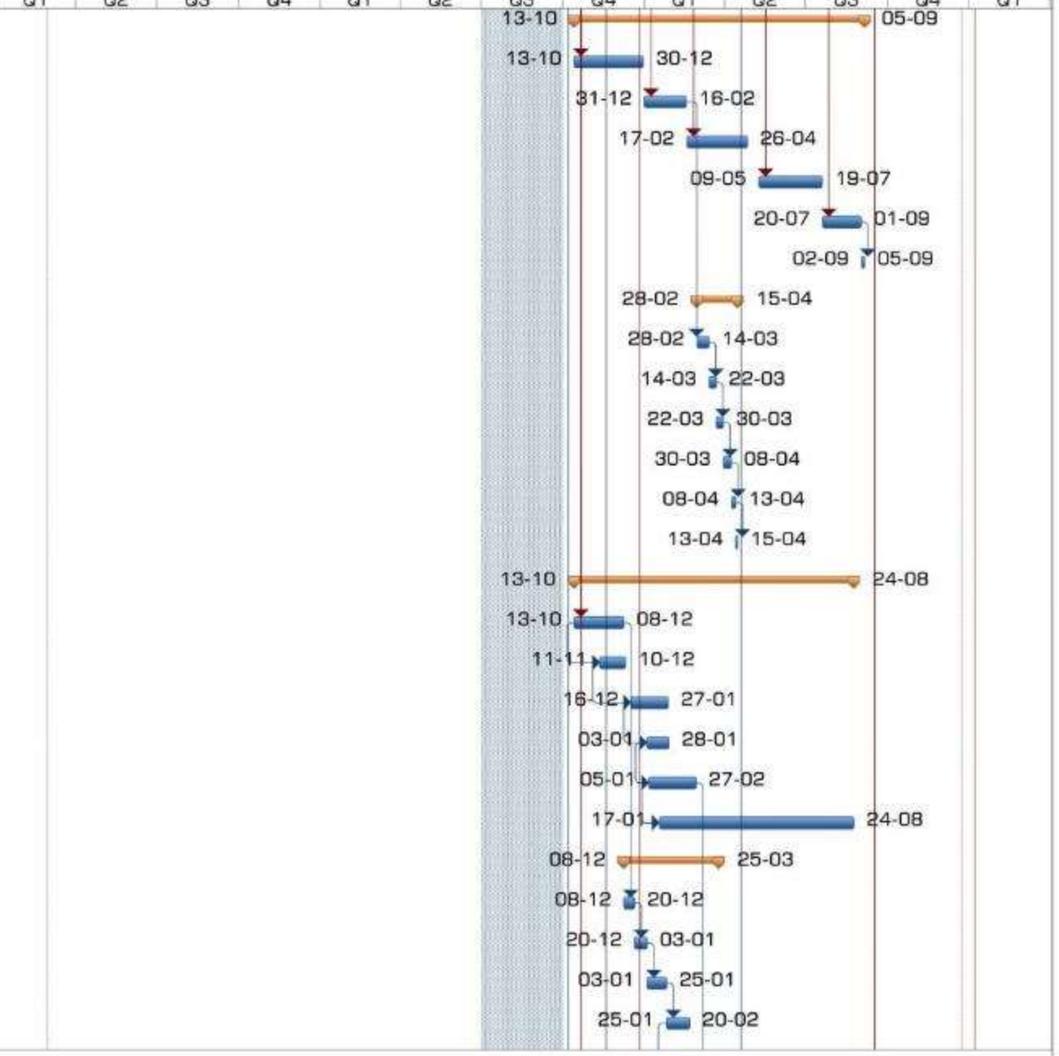
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
177	6.2.1.2 TCS 2	246 days	Thu 13-10-22	Tue 05-09-23
178	6.2.1.2.1 Excavation	67 days	Thu 13-10-22	Fri 30-12-22
179	6.2.1.2.2 Subgrade Preparation	40 days	Sat 31-12-22	Thu 16-02-23
180	6.2.1.2.3 Granular Sub base	58 days	Fri 17-02-23	Wed 26-04-23
181	6.2.1.2.4 Wet Mix Macadam	44 days	Tue 09-05-23	Wed 19-07-23
182	6.2.1.2.5 Dense Bituminous Macadam	22 days	Thu 20-07-23	Fri 01-09-23
183	6.2.1.2.6 Bituminous Concrete	2 days	Sat 02-09-23	Tue 05-09-23
184	6.2.1.3 TCS 3	40 days	Tue 28-02-23	Sat 15-04-23
185	6.2.1.3.1 Excavation	12 days	Tue 28-02-23	Tue 14-03-23
186	6.2.1.3.2 Subgrade Preparation	7 days	Tue 14-03-23	Wed 22-03-23
187	6.2.1.3.3 Granular Sub base	7 days	Wed 22-03-23	Thu 30-03-23
188	6.2.1.3.4 Wet Mix Macadam	8 days	Thu 30-03-23	Sat 08-04-23
189	6.2.1.3.5 Dense Bituminous Macadam	4 days	Sat 08-04-23	Thu 13-04-23
190	6.2.1.3.6 Bituminous Concrete	2 days	Thu 13-04-23	Sat 15-04-23
191	6.2.1.4 Culvert	240 days	Thu 13-10-22	Thu 24-08-23
192	6.2.1.4.1 Site Clearance and Excavatio	48.25 days	Thu 13-10-22	Thu 08-12-22
193	6.2.1.4.2 PCC	24.75 days	Fri 11-11-22	Sat 10-12-22
194	6.2.1.4.3 Reinforcement	36 days	Fri 16-12-22	Fri 27-01-23
195	6.2.1.4.4 Formwork	22 days	Tue 03-01-23	Sat 28-01-23
196	6.2.1.4.5 RCC	45.38 days	Thu 05-01-23	Mon 27-02-23
197	6.2.1.4.6 Protection	158 days	Tue 17-01-23	Thu 24-08-23
198	6.2.1.5 Storm Water Drainage	91.38 days	Thu 08-12-22	Sat 25-03-23
199	6.2.1.5.1 Site Clearance / Excavatiuon	10 days	Thu 08-12-22	Tue 20-12-22
200	6.2.1.5.2 PCC	12 days	Tue 20-12-22	Tue 03-01-23
201	6.2.1.5.3 Reinforcement	19 days	Tue 03-01-23	Wed 25-01-23
202	6.2.1.5.4 Formwork	22 days	Wed 25-01-23	Mon 20-02-23



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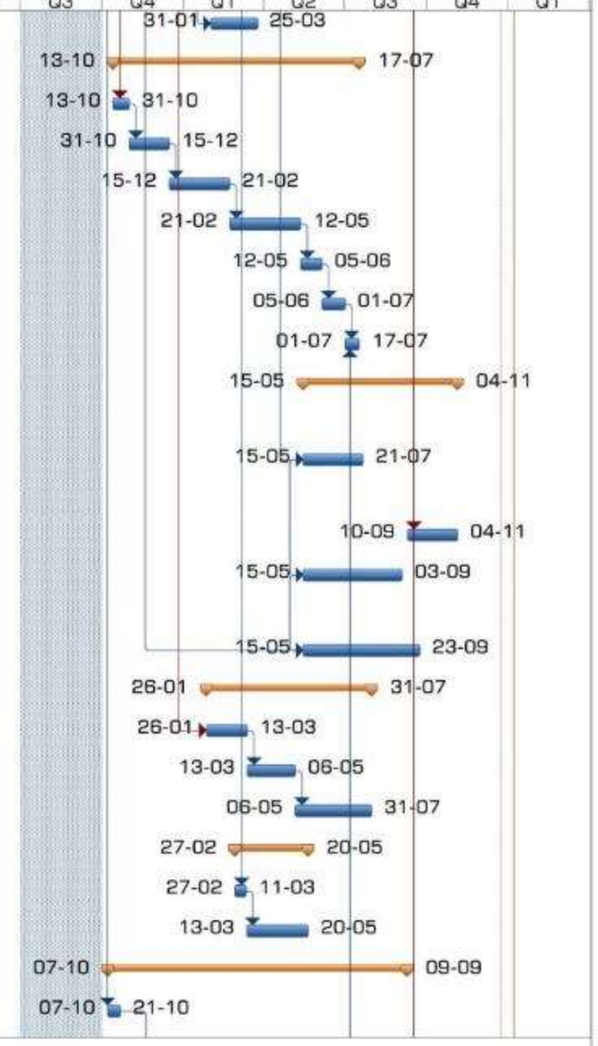
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
203	6.2.1.5.5 RCC	45.38 days	Tue 31-01-23	Sat 25-03-23
204	6.2.1.6 Roundabouts & Junctions	220.51 days	Thu 13-10-22	Mon 17-07-23
205	6.2.1.6.1 Site Clearance	15 days	Thu 13-10-22	Mon 31-10-22
206	6.2.1.6.2 Subgrade Preparation	39 days	Mon 31-10-22	Thu 15-12-22
207	6.2.1.6.3 Granular Sub base	58 days	Thu 15-12-22	Tue 21-02-23
208	6.2.1.6.4 Wet Mix Macadam	69 days	Tue 21-02-23	Fri 12-05-23
209	6.2.1.6.5 Dense Bituminous Macadam	18.88 days	Fri 12-05-23	Mon 05-06-23
210	6.2.1.6.6 Bituminous Concrete	13 days	Mon 05-06-23	Sat 01-07-23
211	6.2.1.6.7 Median/Island	7.63 days	Sat 01-07-23	Mon 17-07-23
212	6.2.1.7 Traffic Signs, Markings and Appurtenances, Traffic Signals	108 days	Mon 15-05-23	Sat 04-11-23
213	6.2.1.7.1 Installation of Traffic Signs including Over head Gantry	40 days	Mon 15-05-23	Fri 21-07-23
214	6.2.1.7.2 Road Marking Works	41 days	Sun 10-09-23	Sat 04-11-23
215	6.2.1.7.3 Installation of Retro reflectorised Traffic sign	62 days	Mon 15-05-23	Sun 03-09-23
216	6.2.1.7.4 Installation of Metal Road St	72 days	Mon 15-05-23	Sat 23-09-23
217	6.2.1.8 Street Lighting	138 days	Thu 26-01-23	Mon 31-07-23
218	6.2.1.8.1 Excavation Works for Founda	39 days	Thu 26-01-23	Mon 13-03-23
219	6.2.1.8.2 Reinforcement	47 days	Mon 13-03-23	Sat 06-05-23
220	6.2.1.8.3 CC/Precast in foundation	52 days	Sat 06-05-23	Mon 31-07-23
221	6.2.1.9 Miscellaneous Structures	71.13 days	Mon 27-02-23	Sat 20-05-23
222	6.2.1.9.1 Crash barriers	11.13 days	Mon 27-02-23	Sat 11-03-23
223	6.2.1.9.2 Painting	60 days	Mon 13-03-23	Sat 20-05-23
224	6.2.2 Construction of Major/Minor Bridge	253 days	Fri 07-10-22	Sat 09-09-23
225	6.2.2.1 Site Clearance & Excavation	12 days	Fri 07-10-22	Fri 21-10-22



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Project Summary		Inactive Summary		Start-only		Progress	

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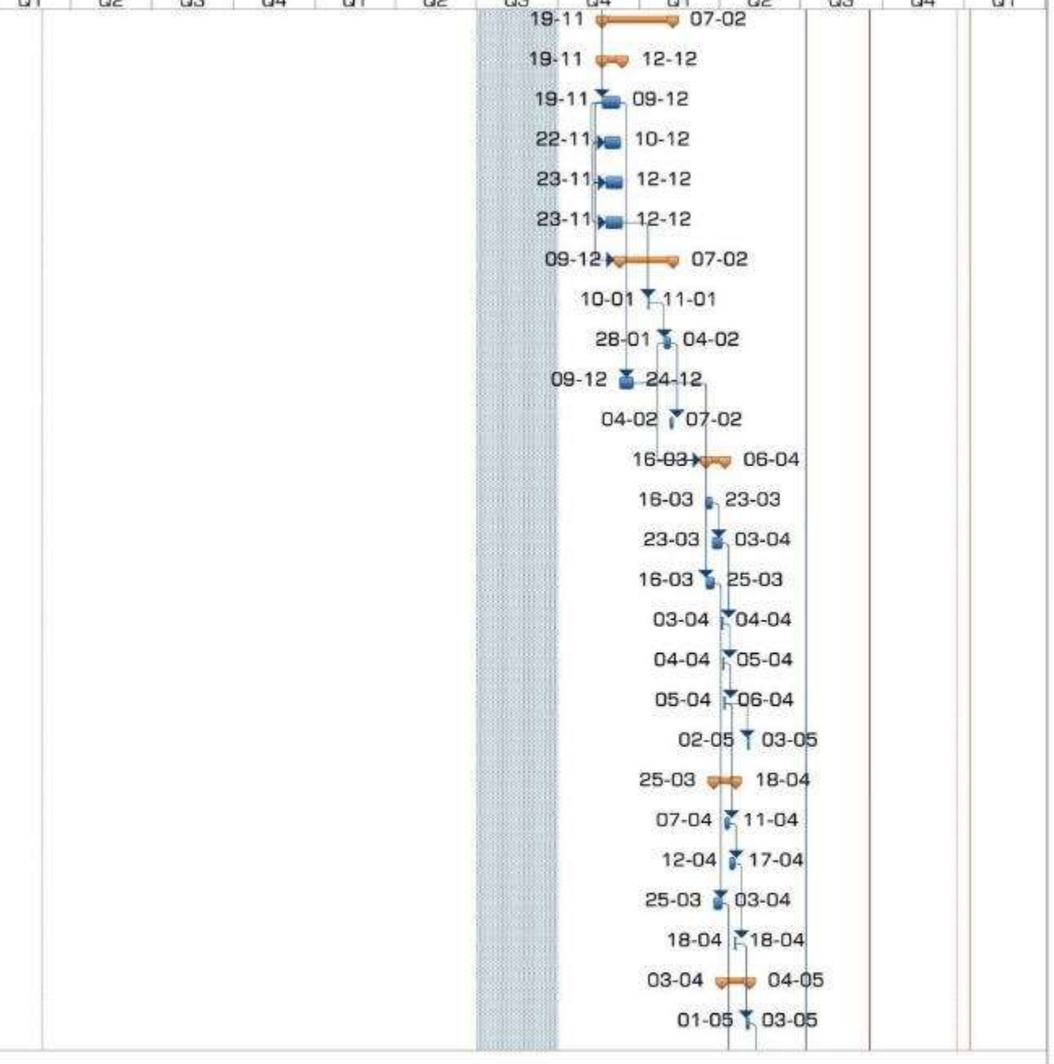
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
226	6.2.2.2 Foundation	67.88 days	Sat 19-11-22	Tue 07-02-23
227	6.2.2.2.1 Pilling	19 days	Sat 19-11-22	Mon 12-12-22
228	6.2.2.2.1.1 Reinforcement	17 days	Sat 19-11-22	Fri 09-12-22
229	6.2.2.2.1.2 Steel Liner	16 days	Tue 22-11-22	Sat 10-12-22
230	6.2.2.2.1.3 Piling	16 days	Wed 23-11-22	Mon 12-12-22
231	6.2.2.2.1.4 Concrete	16 days	Wed 23-11-22	Mon 12-12-22
232	6.2.2.2.2 Pile Cap	50.88 days	Fri 09-12-22	Tue 07-02-23
233	6.2.2.2.2.1 PCC	1 day	Tue 10-01-23	Wed 11-01-23
234	6.2.2.2.2.2 Formwork	6 days	Sat 28-01-23	Sat 04-02-23
235	6.2.2.2.2.3 Reinforcement	13 days	Fri 09-12-22	Sat 24-12-22
236	6.2.2.2.2.4 Concrete	1.88 days	Sat 04-02-23	Tue 07-02-23
237	6.2.2.3 Substructure	18.5 days	Thu 16-03-23	Thu 06-04-23
238	6.2.2.3.1 Stagging	6 days	Thu 16-03-23	Thu 23-03-23
239	6.2.2.3.2 Formwork	9 days	Thu 23-03-23	Mon 03-04-23
240	6.2.2.3.3 Reinforcement	8 days	Thu 16-03-23	Sat 25-03-23
241	6.2.2.3.4 Concrete	1.25 days	Mon 03-04-23	Tue 04-04-23
242	6.2.2.3.5 PSC M35	1 day	Tue 04-04-23	Wed 05-04-23
243	6.2.2.3.6 PSC M50	1.25 days	Wed 05-04-23	Thu 06-04-23
244	6.2.2.4 Elastometric Bearing	2 days	Tue 02-05-23	Wed 03-05-23
245	6.2.2.5 Superstructure	20.5 days	Sat 25-03-23	Tue 18-04-23
246	6.2.2.5.1 Stagging	4 days	Fri 07-04-23	Tue 11-04-23
247	6.2.2.5.2 Formwork	5 days	Wed 12-04-23	Mon 17-04-23
248	6.2.2.5.3 Reinforcement	7 days	Sat 25-03-23	Mon 03-04-23
249	6.2.2.5.4 Concrete	1 day	Tue 18-04-23	Tue 18-04-23
250	6.2.2.6 Wing Walls	27 days	Mon 03-04-23	Thu 04-05-23
251	6.2.2.6.1 Formwork	3 days	Mon 01-05-23	Wed 03-05-23



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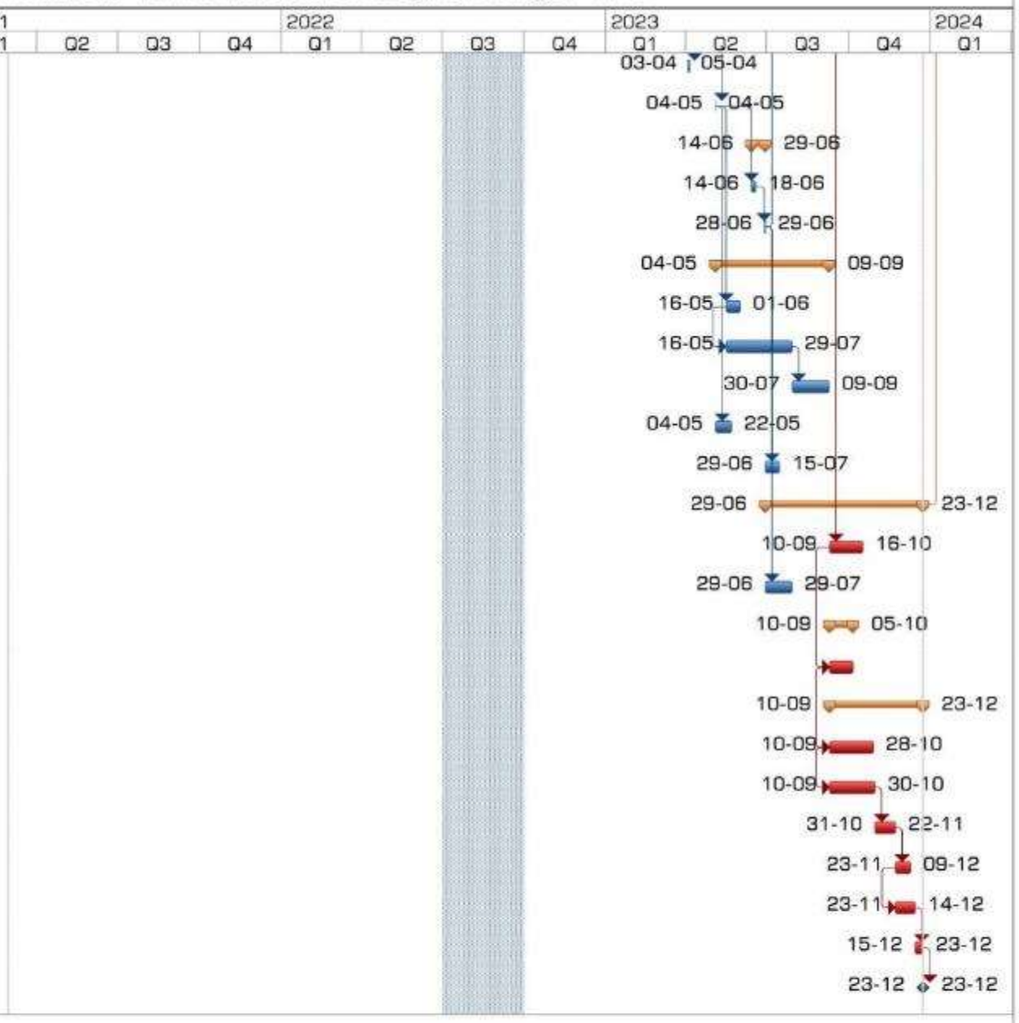
Baseline Schedule: Axom Mala Project – Kamargaon to Kamarbandha (L: 42.172 Km) District: Golaghat, Package I – A 15

ID	Task Name	Duration	Start	Finish
252	6.2.2.6.2 Reinforcement	2 days	Mon 03-04-23	Wed 05-04-23
253	6.2.2.6.3 Concrete	0.5 days	Thu 04-05-23	Thu 04-05-23
254	**6.2.2.7 Laying of Pavement**	**7.88 days**	**Wed 14-06-23**	**Thu 29-06-23**
255	6.2.2.7.1 Mastic	2.38 days	Wed 14-06-23	Sun 18-06-23
256	6.2.2.7.2 Bituminous Concrete	0.5 days	Wed 28-06-23	Thu 29-06-23
257	**6.2.2.8 Protection**	**74 days**	**Thu 04-05-23**	**Sat 09-09-23**
258	6.2.2.8.1 Filter media with granular ma	14 days	Tue 16-05-23	Thu 01-06-23
259	6.2.2.8.2 Back filling	43 days	Tue 16-05-23	Sat 29-07-23
260	6.2.2.8.3 Pitching on slopes	21 days	Sun 30-07-23	Sat 09-09-23
261	6.2.2.8.4 Crash Barrier	15 days	Thu 04-05-23	Mon 22-05-23
262	6.2.2.8.5 Painting on CC	8 days	Thu 29-06-23	Sat 15-07-23
263	**7 Final Testing, Commissioning & Handing Over**	**119.12 days**	**Thu 29-06-23**	**Sat 23-12-23**
264	7.1 Final Testing & Commissioning - Road Work	24 days	Sun 10-09-23	Mon 16-10-23
265	7.2 Final Testing & Commissioning - Bridge	15 days	Thu 29-06-23	Sat 29-07-23
266	**7.3 As-Built Drawings**	**15 days**	**Sun 10-09-23**	**Thu 05-10-23**
267	7.3.1 Preparation & Submission of As-built I	15 days	Sun 10-09-23	Thu 05-10-23
268	**7.4 Demobilization**	**83 days**	**Sun 10-09-23**	**Sat 23-12-23**
269	7.4.1 Remove Fences and Misc. Structures	35 days	Sun 10-09-23	Sat 28-10-23
270	7.4.2 Clear Area of Rubbish / Grade Area	36 days	Sun 10-09-23	Mon 30-10-23
271	7.4.3 Demobilize Equipment	20 days	Tue 31-10-23	Wed 22-11-23
272	7.4.4 Demobilize Satellite Site Set-up	15 days	Thu 23-11-23	Sat 09-12-23
273	7.4.5 Demobilize Main Site Set-up	19 days	Thu 23-11-23	Thu 14-12-23
274	7.4.6 Demobilize Manpower	8 days	Fri 15-12-23	Sat 23-12-23
275	7.4.7 Project Completion	0 days	Sat 23-12-23	Sat 23-12-23



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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 Golaghat city which is a prominent urban area and market place along the project road.
- The project road would facilitate better access to the residents of the nearby villages to the railway stations along the project road.
- The Nambor wildlife sanctuary is close to Golaghat and many tourists halt in Golaghat, hence improvement work will provide better transport facilities to the tourists.
- 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 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 Physical Environment

4.2.1 Terrain, Geology and Soil Type

The Golaghat district falls under the belt of flooded land, which is situated in the north of Dergaon sub-division which is a wide and homogenous plain and low-lying area along the Brahmaputra. It is the populous and important portion where cultivation brings in considerable prosperity and progress. On the lower land, the staple crop is rice, and the higher levels have been planted out with tea. The entire landscape of the district is one of rural plenty and the district is very rich in tea. The Upper Valley of the Dhansiri and Kaziranga are covered with dense forests. A wonderful view of forest can be obtained from one of the outer ranges of the Naga. The Diyong forest area is also covered with dense tree-forest, which makes the place beautiful and abode for many hinds of animals. The entire district lies under the category of plain terrain.

The geology of almost the entire district is concealed by alluvial deposits. Geological surveys, aided by drilling for oil have shown that under the recent deposits there are many thousands of feet Tertiary sediments that lie over on Nagaland basement complex. Oil is another mineral of considerable economic importance which has been discovered in Golaghat also. The oil and natural gas commission undertook exploration in Golaghat. The Numalighar Oil Refinery is now functioning in the district. So far clay is concerned, ordinary clay for pottery and brick making is found almost everywhere in the district. Fire clays have been found in the district. Fine white clay also reported in the district.

The arable soils of Golaghat 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 the soils of the district vary from sandy loams to sands. There are also some clayed loams or clayed soils. Both old alluvial soils and hills soil are acid in reaction and deficient in

'available' phosphate and potash also. As regards to total nitrogen, it varies from high to low in 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.

Source: District Census Handbook, Golaghat District

The details of soil sample collection are given in **Table 16** and **Figure 11.**

Table 16: Soil sampling locations along the project road

Sampling Location	Date of Sampling	Name of place	Distance/ Direction	Coordinates	
				Latitude	Longitude
1	14-Jan-2020	Sonari Gaon	5m/ North	26.625127	93.771991
2	14-Jan-2020	Butolikhowa No.1	5m/ North	26.565138	93.887436
3	15-Jan-2020	Gohain Gaon	5m/ North	26.529088	94.047871

Source: Environmental Baseline Monitoring

Figure 11: Soil sampling locations along the project road

The soil quality along the project road is given in below **Table 17**. The soil map of India showing the project road is shown in **Figure 14**.

Table 17: Soil Quality along the Project road

Sr. No.	Parameters	Test Method	Unit	Butolikhowa No.1	Sonari Gaon	Gohain Gaon	Standards/ Permissible (Limits Hand Book of Agriculture, ICAR, New Delhi)
1.	pH (1:5 suspension)	IS:2720 (Part-26)	-	7.19	7.21	7.17	<4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.00 Moderately acidic 6.01-6.50 Slightly 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.)	IS:2720 (Part-21)	µmhos/cm	143	156	139	Upto 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 Harmful to crops (sensitive to salts)
3.	Porosity	STP/SOIL	% by mass	22.32	24.25	23.34	-
4.	Texture	STP/SOIL	-	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	-
5.	Sand	STP/SOIL	% by mass	45.89	49.45	48.87	-
6.	Clay	STP/SOIL	% by mass	44.48	41.13	41.24	-
7.	Silt	STP/SOIL	% by mass	9.63	9.42	9.89	-
8.	Nitrogen	STP/SOIL	mg/1000g	1870	1890	1910	Upto 50 Very less 51-100 Less 101-150 Good 151-300 Better >300 Sufficient
9.	Potassium (as K)	STP/SOIL	mg/1000g	93.12	92.13	92.38	Upto 15 Very less 16-30 Less

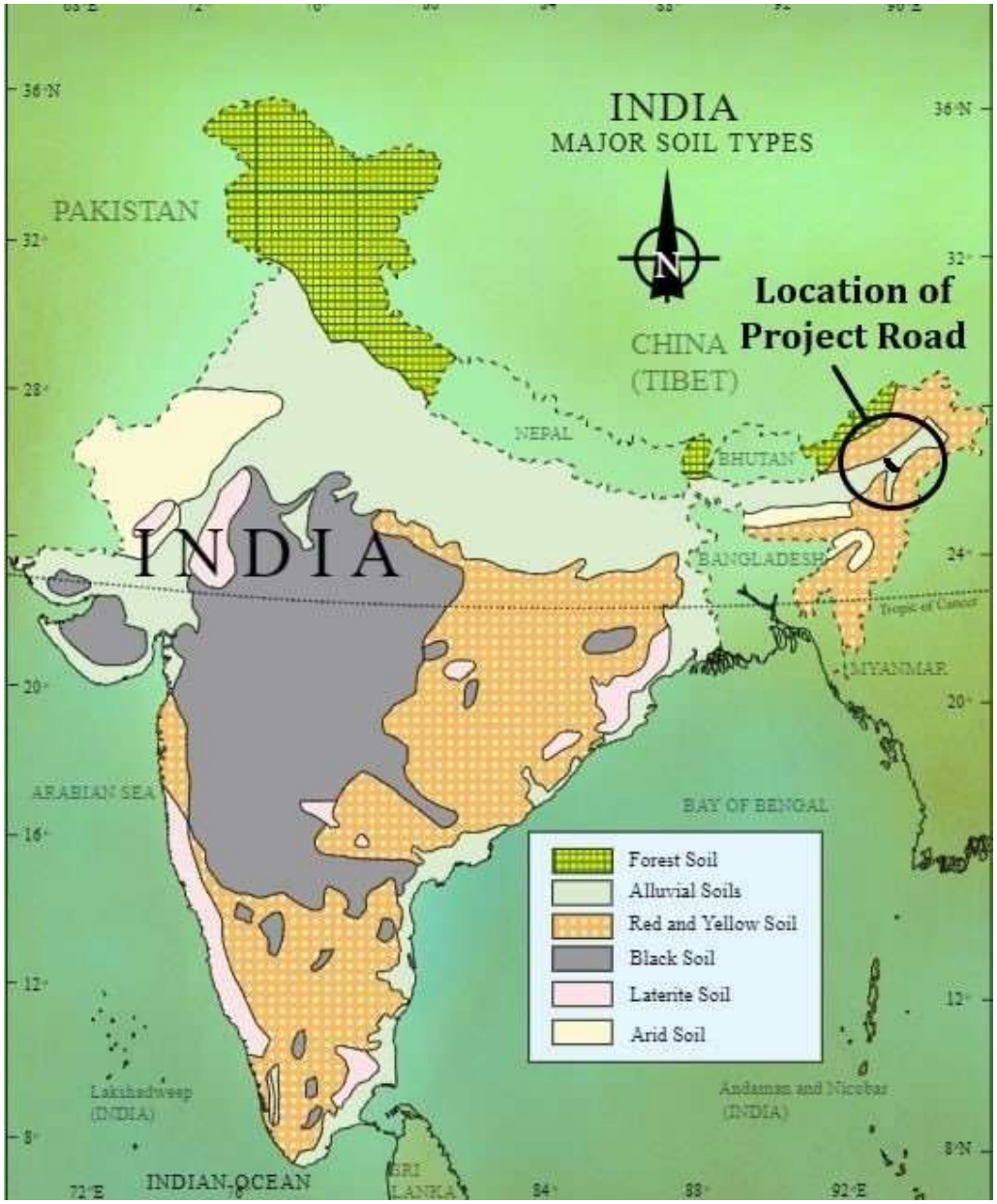
Sr. No.	Parameters	Test Method	Unit	Butolikhowa No.1	Sonari Gaon	Gohain Gaon	Standards/ Permissible (Limits Hand Book of Agriculture, ICAR, New Delhi)
							31-50 Medium, 51-65 On an avg. sufficient 66-80 Sufficient >80 More than sufficient
10.	Phosphorus	STP/SOIL	mg/1000g	<5.0	<5.0	<5.0	0 -120 Very less 120-180 Less 181-240 Medium 241-300 Average 301-360 Better >360 More than sufficient
11.	Organic Matter	IS:2720 (Part-22)	% by mass	0.94	0.82	0.81	Upto 0.20: Very less 0.21-0.40: Less 0.41-0.50: Medium, 0.51-0.80: On an avg. sufficient 0.81-1.00: Sufficient >1.00 : More than sufficient
12.	Moisture Retention capacity	STP/SOIL	% by mass	36.32	34.28	35.87	-
13.	Infiltration Rate	STP/SOIL	mm/hr	242	263	241	-
14.	Sulphates	STP/SOIL	mg/100gm	23.27	24.12	26.58	-
15.	Sodium Sulphates	STP/SOIL	mg/1000g	13.28	14.15	14.12	-
16.	Calcium Sulphates	STP/SOIL	mg/1000g	BDL	BDL	BDL	-
17.	Bulk Density	STP/SOIL	gm/cm3	1.52	1.44	1.40	-

Source: Environmental Baseline Monitoring

Figure 12: Soil Sample Collection at Sonari Gaon

Figure 13: Soil Sample Collection at Butolikhowa No.1

Figure 14: Soil Sample Collection at Gohain Gaon



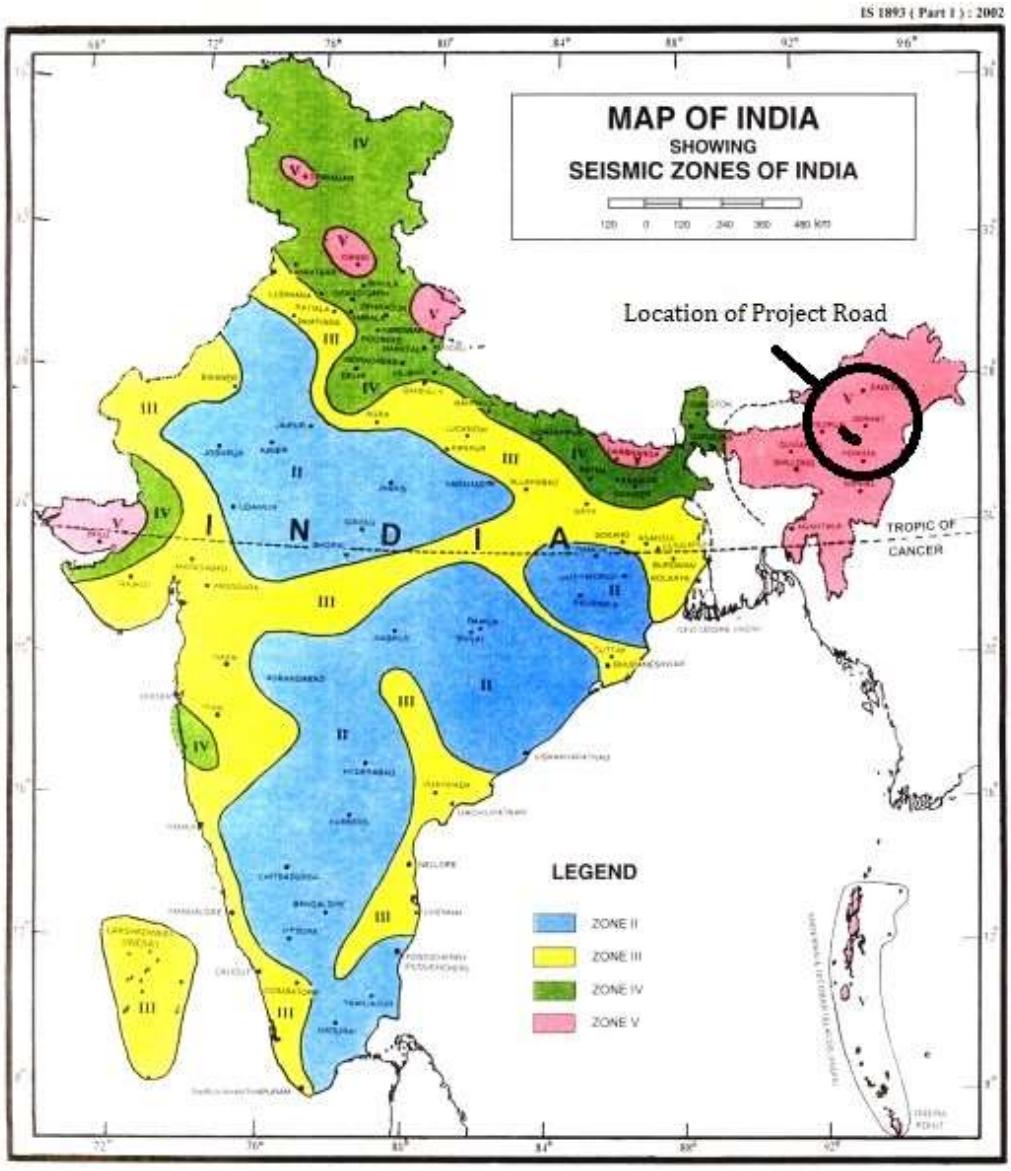
Source: Website of National Repository of Open Educational Resources

Figure 15: Soil Map of India showing the project road

As per the soil map of India, the soil found in the state of Assam is Alluvial soil. Soil is mostly found as sandy clay loam soil in the sampling locations and it is loaded with a sand percentage varying from 45.89% to 49.45% at Butolikhowa No.1 and Sonari Gaon respectively. Nitrogen content varies from 1870 mg/1000g to 1910 mg/1000g at Butolikhowa No.1 and Gohain Gaon respectively. The soil is poor in organic carbon content. Chemically soil along the project road has a neutral pH in the range of 7.17 to 7.21. The soil has less water holding capacity.

4.2.2 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 16**.



Source: IS1893 (Part1) 2002

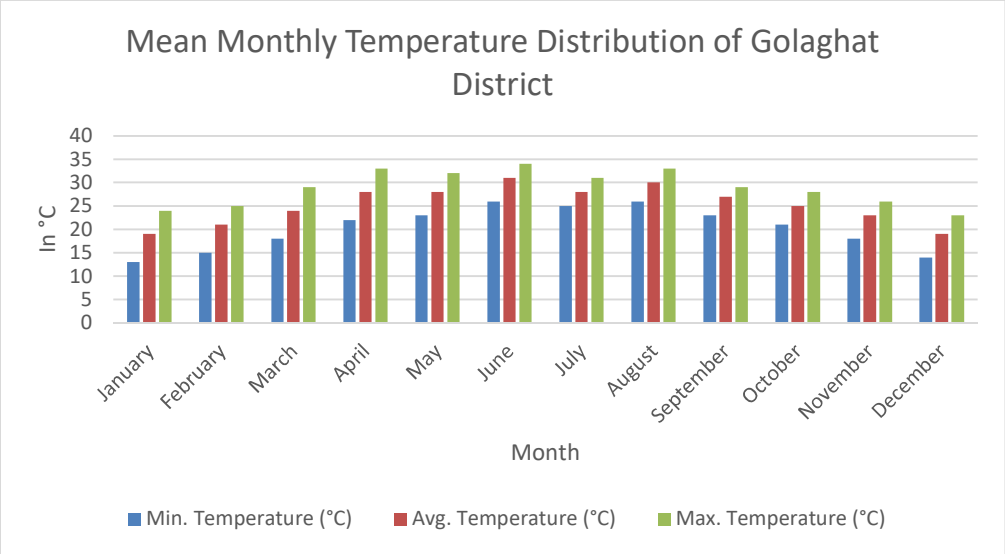
Figure 16: Seismic Zone Map of India showing the project road

4.2.3 Climate

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

4.2.3.1 Annual Temperature

The mean temperature (°C) data for Golaghat district reveals that June is the hottest month with the mean temperature reaching up to 34°C while January is the coldest month of the year when mean temperature dips down to 13°C. The mean maximum annual temperature as recorded in the Golaghat district is 29°C while the mean minimum annual temperature is 20°C. **Figure 17** represents the Mean monthly Temperature Distribution in the Golaghat district.

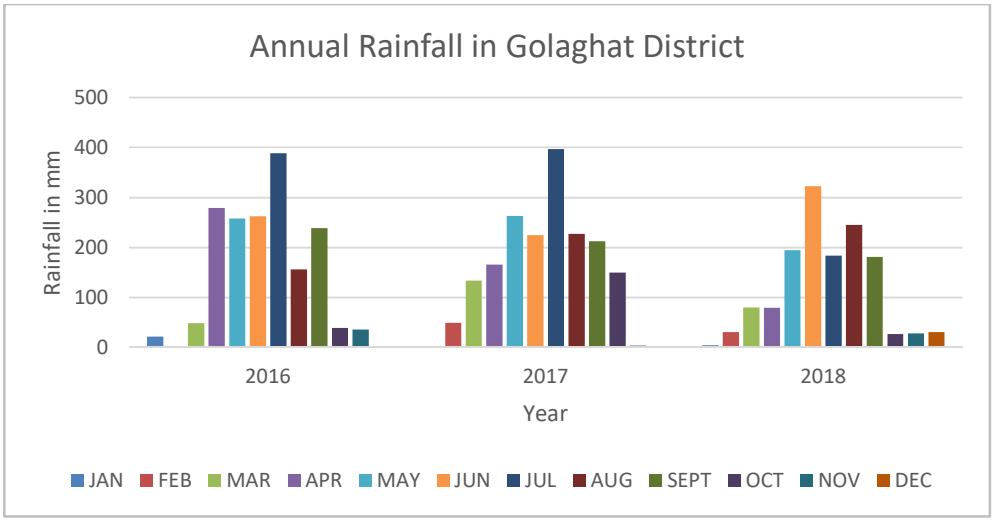


Source: www.worldweatheronline.com

Figure 17: Mean Monthly Temperature Distribution details

4.2.3.2 Annual Rainfall

The Golaghat lies at 103m above sea level. The climate in Golaghat is warm and temperate. When compared with winter, the summers have much more rainfall. Due to its unique geographical location, along with the presence of varied physiography, Golaghat has an array of climatic conditions. The temperature here averages 24.0 °C. The annual rainfall is 1960 mm. The district normally receives 2.51 percent of rainfall in Winter Season (January-February), 25.15 percent in Summer Season (March-May), 66.24 percent in Monsoon Season (June-September) and 6.11 percent in Post-Monsoon Season (October-December). **Figure 18** depicts the details related to the Annual Mean Rainfall received by the Golaghat district for 2018.



*Source: India Meteorological Department website (*www.imd.gov.in*)*

Figure 18: Annual Rainfall details

4.2.4 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 January 2020 is shown in **Figure 19** 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 2.4 m/s. **Table 18** shows the Meteorological Data Parameters at Dibrugarh IMD station, Nearest IMD from the project road (during January 2020).

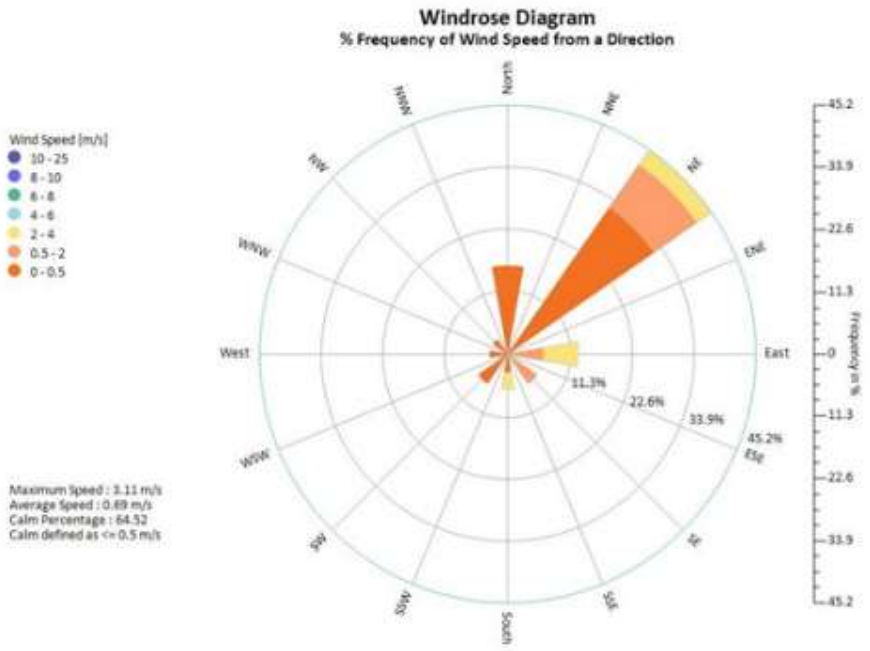


Figure 19: Site-Specific Wind rose diagram of Dibrugarh district

Table 18: Meteorological Data Parameters at Dibrugarh (Nearest IMD from project road)

Month	Temperature, deg C			Humidity, %			Pressure, hPa			Wind Speed, km/Hr	Predominant Wind Direction	Rainfall mm
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg		
January	6.4	26.9	16.2	72	83	77.2	1002.3	1006.5	1004.2	2.4	NE	28.1

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

4.2.5 Hydrogeology

Hydrogeologically the project state can be divided into three units namely consolidated formation, semi consolidated formation, and unconsolidated formation. More than 75% of the project 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 tube wells yield 27 to 59 m^3/hr in this zone. The Tarai zone follows immediately downslope of the Bhabar zone where the yield of the well's ranges between 80-240 m^3/hr. The flood plains follow the Tarai in Brahmaputra valley where the shallow tube wells yield between 20-50 m^3/hr and deep tube wells between 150-240 m^3/hr. In the semi consolidated formations of the Cachar district, the yield of the tube well ranges between 50 to 100 m^3/hr. The details of the hydrogeology have been presented in **Table 19** below.

Table 19: Details of Hydrogeology in project state

Dynamic Ground Water Resources	
Annual Replenishable Groundwater Resource	27.23 BCM
Net Annual Ground-Water Availability	24.89 BCM
Annual Ground Water Draft	5.44 BCM
Stage of Ground Water Development	22%
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

4.2.6 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 January 2020 (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 (NO_3), 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, three surface and three ground water samples were collected for winter season (January 2020). 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 20** and **Table 21** respectively**.** The ground and surface water quality result of the project road is given in the following **Table 22** and

Table 23. The Details of Ground and Surface Water Monitoring Location are depicted in **Figure 20** and **Figure 21** respectively.

Table 20: Groundwater sampling locations along the project road

Sampling Location	Date of Sampling	Name of place	Source	Distance/ direction	Coordinates	
					Latitude	Longitude
1	14-Jan-2020	Sonari Gaon	Hand Pump	Adjacent/ North	26°37'31.89"	93°46'19.36"
2	14-Jan-2020	Butoli Khowa	Hand pump	Adjacent/ North	26°33'53.31"	93°53'12.92"
3	15-Jan-2020	Gohain Gaon	Hand pump	Adjacent/ North	93°53'12.92"	94° 2'50.62"

Source: Environmental Baseline Monitoring

Figure 20: Groundwater sampling locations along the project road

Table 21: Surface water sampling locations along the project road

Sampling Location	Date of Sampling	Name of place	Source	Distance/ direction	Coordinates	
					Latitude	Longitude
1	14-Jan-2020	Borchapari	Ponds	Adjacent/ South	26°37'12.80"	93°47'8.86"
2	14-Jan-2020	Sensowa Gaon	Ponds	Adjacent/ South	26°31'57.44"	93°55'13.27"
3	15-Jan-2020	Dafalating Grant	River	Adjacent/ South	26°32'54.78"	94° 6'35.04"

Source: Environmental Baseline Monitoring

Figure 21: Surface water sampling locations along the project road

Table 22: 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	Sonari Gaon	Butoli Khowa	Gohain Gaon	
1	pH	-	6.5-8.5	No Relaxation	7.28	7.11	7.21	8.2-8.8
2	Colour	Hazen	5	25	<5.0	<5.0	<5.0	Not Exceeding 5 hazen Unit
3	Odour	-	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Unobjectionable
4	Turbidity	NTU	1	5	<1.0	<1.0	<1.0	Not Exceeding 1.5 NTU
5	Total Hardness (as $CaCO_3$)	mg/l	200	600	107.98	133.95	100.65	-
6	Chloride (as Cl)	mg/l	250	1000	18.4	24.28	17.89	-
7	Fluoride (as F)	mg/l	1	1.5	0.92	0.17	0.19	1.5
8	Phenol Content	mg/l	<0.001	-	<0.001	<0.001	<0.001	-
9	Calcium (as $CaCO_3$)	mg/l	75	200	23.2	25.24	31.24	-
10	Magnesium (as $CaCO_3$)	mg/l	30	100	7.9	17.28	5.5	-
11	Sulphate (as SO_4)	mg/l	200	400	8.8	14.23	4.4	-
12	Nitrate (as NO_3)	mg/l	45	No Relaxation	7.8	6.78	8.1	50
13	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	<0.01	<0.01	0.04 (P)
14	Alkalinity as ($CaCO_3$)	mg/l	200	600	132.6	130.14	121.56	-
15	TDS	mg/l	500	2000	168.03	174.19	156.59	-
16	TSS	Mg/l	-	-	<1.0	<1.0	<1.0	-
19	Phosphates	mg/l	-	-	<0.05	<0.05	<0.05	-

Sr. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Result			WHO Drinking Water Standard (Fourth Edition 2011)
			Desirable Limit	Permissible Limit	Sonari Gaon	Butoli Khowa	Gohain Gaon	
20	Ammonia	mg/l	0.5	No Relaxation	<0.1	<0.1	<0.1	-
21	Electrical Conductivity	Micromhos/cm	-	-	258.51	274.14	240.9	-
22	Sodium (as Na)	mg/l	-	-	12.6	8.7	14.12	40
23	Potassium (as K)	mg/l	-	-	6.2	3.6	8.4	-
24	Iron (as Fe)	mg/l	**0.3**	**No Relaxation**	**1.25**	**1.12**	**1.28**	**Not exceeding 0.1 mg/L**
25	TKN	mg/l	-	-	<0.1	<0.1	<0.1	-
26	Total Coliform	mg/l	Nil	Nil	Absent / 100ml	Absent /100 ml	Absent / 100ml	Absent
27	Fecal Coliform	mg/l	Nil	Nil	Absent / 100ml	Absent /100 ml	Absent / 100ml	Absent

Source: Environmental Baseline Monitoring

Figure 22: Groundwater Sample collection at Sonari Gaon

Figure 23: Groundwater Sample collection at Butoli Khowa

Figure 24: Groundwater Sample collection at Gohain Gaon

The samples were collected from bore well at all locations. It can be seen from **Table 22** that; the pH of the drinking water varies from 7.11 to 7.28. The Iron content at all the locations is above the prescribed standards. Total hardness as CaCO3 varies from 100.65 mg/l to 133.95 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 23: Surface Water quality result of the project road

Microbiological Requirement

Sr. No.	Parameter	Test Method	Result			Standards/ Permissible Limits	CPCB Surface Water Standard	
			Borchapari	Sensowa Gaon	Dafalating Grant	WHO	Inland Surface water Tolerance Limits for Class -B	Inland Surface water Tolerance Limits for class - D
1	Total Faecal Coliform Bacteria (MPN/100ML)	IS-1622	541	563	566		500	

Organoleptic & Physical Parameters

Sr. No.	Parameter	Test method	Unit	Result			Standards/ Permissible Limits	CPCB Surface Water Standard	
				Borchapari (Pond)	Sensowa Gaon (Pond)	Dafalating Grant (River)	WHO	Inland Surface water Tolerance Limits for Class -B	Inland Surface water Tolerance Limits for class - D
2	Colour	IS-3025 (P-04)	Hazen Unit	<5.0	<5.0	<5.0	-	-	-
3	Odour	IS-3025 (P-04)	-	Agreeable	Agreeable	Agreeable	-	-	-
4	Turbidity	IS-3025 (P-04)	NTU	1.8	1.7	1.6	-	-	-
5	pH value	IS-3025 (P-04)	-	7.61	7.84	7.57	6-9	6.5 – 8.5	6.5 – 8.5
6	Total Dissolved Solid (TDS)	IS-3025 (P-04)	mg/l	106.26	101.99	114.15	-	-	-
7	Electrical Conductivity	IS-3025 (P-04)	µs/cm	163.48	156.91	175.65	-	-	1000
8	Total Suspended Solid	IS-3025 (P-	mg/l	1.7	1.4	1.6	-	-	-

Sr. No.	Parameter	Test method	Unit	Result			Standards/ Permissible Limits	CPCB Surface Water Standard	
				Borchapari (Pond)	Sensowa Gaon (Pond)	Dafalating Grant (River)	WHO	Inland Surface water Tolerance Limits for Class -B	Inland Surface water Tolerance Limits for class -D
		04)							
9	Total Dissolve Oxygen	IS-3025 (P-04)	mg/l	5.4	5.6	5.5	-	5	4
10	Biological Oxygen Demand	IS-3025 (P-04)	mg/l	4.8	3.4	3.5	30	3	-
11	Phosphate Content	IS-3025 (P-04)	mg/l	0.062	0.045	0.056	-	-	2

Concerning Substances Undesirable in Excessive Amounts

Sr. No.	Parameter	Test method	Unit	Result			Standards/ Permissible Limits	CPCB Surface Water Standard	
				Borchapari (Pond)	Sensowa Gaon (Pond)	Dafalating Grant (River)	WHO	Inland Surface water Tolerance Limits for Class -B	Inland Surface water Tolerance Limits for class -D
12	Total Ammonia	IS: 3025 (P-34)	mg/l	<0.1	<0.1	<0.1	-	-	-
13	TKN	IS: 3025 (P-34)	mg/l	0.56	0.51	0.57	-	-	-
14	Boron (as B)	IS: 3025 (P-57)	mg/l	0.01	BDL	BDL	-	-	-
15	Calcium (as Ca)	IS: 3025 (P-40)	mg/l	10.14	8.21	9.7	-	-	-
16	Chloride (as Cl)	IS: 3025 (P-32)	mg/l	12.14	11.9	14.24	-	-	-
17	Copper (as Cu)	IS: 3025 (P-42)	mg/l	<0.05	<0.04	<0.05	-	-	-

Sr. No.	Parameter	Test method	Unit	Result			Standards/ Permissible Limits	CPCB Surface Water Standard	
				Borchapari (Pond)	Sensowa Gaon (Pond)	Dafalating Grant (River)	WHO	Inland Surface water Tolerance Limits for Class -B	Inland Surface water Tolerance Limits for class -D
18	Fluoride (as F)	IS: 3025 (P-60)	mg/l	0.23	0.17	0.26	1.5	-	-
19	Phenol Content	IS: 3025 (P-43)	mg/l	<0.001	<0.001	<0.001	--	-	-
20	Iron (as Fe)	IS: 3025(P-53)	mg/l	0.07	0.05	0.08	-	-	-
21	Magnesium (as mg)	IS: 3025 (P-46)	mg/l	7.4	8.12	10.34	-	-	-
22	Nitrate (as NO_3)	IS: 3025 (P-34)	mg/l	3.17	4.14	3.18	-	-	-
23	Selenium (as Se)	IS: 3025 (P-56)	mg/l	<0.01	<0.01	<0.01	-	-	-
24	Sulphate (as SO_4)	IS: 3025 (P-24)	mg/l	21.24	20.23	22.98	-	-	-
25	Alkalinity (as Ca CO_3)	IS: 3025 (P-23)	mg/l	61.24	54.25	65.32	-	-	-
26	Total hardness (as $CaCO_3$)	IS: 3025 (P-21)	mg/l	60.07	53.83	66.64	-	-	-
27	Zinc (as Zn)	IS: 3025 (P-49)	mg/l	0.20	0.25	0.16	-	-	-
28	Sodium (as Na)	IS-3025(P-45)	mg/l	12.17	13.14	12.11	-	-	-
29	Potassium (as K)	IS-3025(P-45)	mg/l	3.26	3.7	2.42	-	-	-

Source: Environmental Baseline Monitoring

Figure 25: Surface Water Sample collection at Borchapari

Figure 26: Surface Water Sample collection at Sensowa Gaon

Figure 27: Surface Water Sample collection at Dafalating Grant

As seen from the results, the pH of the drinking water in the region is well within permissible limits (6.5-7.5). The total dissolved solids in the samples collected vary from 101.99 mg/l to 114.15 mg/l which is well within the permissible standards. Total hardness as CaCO3 in the water sample varies from 53.83 mg/l to 66.64 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.

4.2.7 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 January 2020.

4.2.7.1 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.

4.2.7.2 Frequency and Parameters for Sampling

Ambient air quality monitoring was carried out for 24hrs representing winter season. The baseline 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 25** 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 24**.

Table 24: Techniques Used for Ambient Air Quality Monitoring

Sr. No.	Parameter	Technique	Minimum Detectable Limit (µg/m³)
1.	Particulate Matter ($PM_{2.5}$)	Gravimetric Method	120.0
2.	Particulate Matter (PM_{10})	Gravimetric Method	100.0
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/m³)

Table 25: Air Quality Monitoring locations along the project road

Sampling Location	Date of Sampling	Name of place	Distance/ Direction	Coordinates		Land use	Zone
				Latitude	Longitude		
1	14-Jan-2020	Borchapari	Adjacent/ North	26°37'12.16"	93°47'8.56"	Agricultural	Residential
2	14-Jan-2020	Sensowa Gaon	Adjacent/ North	26°31'57.44"	93°55'13.27"	Agricultural	Residential
3	15-Jan-2020	Gohain Gaon	Adjacent/ North	26°31'44.72"	94° 2'52.34"	Agricultural	Residential

Source: Environmental Baseline Monitoring

Figure 28: 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 26** 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. The PM10 level at Gohain gaon is slightly above the WHO Ambient Air Quality Guidelines (IFC EHS).

- $PM_{2.5}$: The mean $PM_{2.5}$ concentration at ambient air quality monitoring locations varies from 17.6 to 20.4 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 45.8 to 55.0 µg/m^3. The values are within the permissible limit at all the stations as per the NAAQS. The PM_{10} concentration is above the limit prescribed by WHO Ambient Air Quality Guidelines (IFC EHS)
- SO_2: The mean concentrations of SO_2 at all ambient air quality monitoring locations vary from 6.7 to 8.2 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 12.2 to 15.5 µg/m^3. The values are within the permissible limit at all the stations.
- CO: The mean concentrations of CO at all AAQM locations range from 0.440 to 0.520 mg/m^3. The values are within the permissible limit at all the Stations.

Table 26: Ambient Air Quality along the Project Road

Sr. No.	Parameter	Method	Unit	National Ambient Air Quality Standard (CPCB) - Permissible limit	WHO ambient Air Quality Guidelines[1]	Results		
						Borchapari	Sensowa Gaon	Gohain Gaon
1	Particulate Matter (PM_{10})	IS:5182 Part-XXIII	µg /m^3	100	50	49.4	45.8	55
2	Particulate Matter ($PM_{2.5}$)	CPCB Volume–Grav	µg /m^3	60	25	18.6	17.6	20.4
3	Sulphur Dioxide	IS:5182 Part-II	µg /m^3	80	20	6.7	7.5	8.2
4	Nitrogen Dioxide	IS:5182 Part-VI	µg /m^3	80	200 – 1 Hourly	13.2	12.2	15.5
5	Carbon Monoxide	IS:5182 Part-X	mg/m^3	4	-	0.48	0.44	0.52

Source: Environmental Baseline Monitoring

[1] The World Bank Group General EHS Guideline Table -1.1.1

Figure 29: Air Quality Monitoring at Borchapari

Figure 30: Air Quality Monitoring at Sensowa Gaon

Figure 31: Air Quality Monitoring at Gohain Gaon

4.2.8 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 from 7 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 27** and in **Figure 31.** Day and night-time Leq have been calculated from hourly Leq values and compared with the stipulated standards. **Table 28** gives the day and night-time Leq noise levels. Measured Leq noise levels are within the prescribed limits.

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.

Table 27: Noise Monitoring locations along the project road

Sampling Location	Date of Sampling	Name of place	Distance/ Direction	Coordinates		Land use	Zone
				Latitude	Longitude		
1	14-Jan-2020	Borchapari	Adjacent/ North	26°37'12.16"	93°47'8.56"	Agricultural	Residential
2	14-Jan-2020	Sensowa Gaon	Adjacent/ North	26°31'57.44"	93°55'13.27"	Agricultural	Residential
3	15-Jan-2020	Gohain Gaon	Adjacent/ North	26°31'44.72"	94° 2'52.34"	Agricultural	Residential

Source: Environmental Baseline Monitoring

Figure 32: Noise Monitoring locations along the project road

Table 28: Day and Night Time Leq in the Project Area

Sr. No.	Name of Location	Units	Results		CPCB Ambient Air Quality Standards in respect of Noise (Residential Area)		Guidelines for Community Noise, World Health Organization (WHO) 1999		Approx. Distance from Road Edge (m)	Land use
			Equivalent Noise Level (7 Am To 10 Pm)	Equivalent Noise Level (10 Pm To 7 Am)	Day	Night	Day	Night		
1	Borchapari	dB (A)	46.2	35.8	55	45	55	45	10	Agricultural
2	Sensowa Gaon	dB (A)	44.9	37.2					10	Agricultural
3	Gohain Gaon	dB (A)	49.2	38.4					10	Agricultural

Source: Environmental Baseline Monitoring

It can be seen from **Table 28** 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 49.2 dB(A) and night time noise level is 38.4 dB(A) at Gohain gaon. Average day time noise level along the subproject roads varies from 44.9 dB(A) to 49.2 dB(A) whereas average night time noise levels vary from 35.8 dB(A) to 38.4 dB(A).

Figure 33: Noise Level Monitoring at Borchapari

Figure 34: Noise Level Monitoring at Sensowa Gaon

Figure 35: Noise Level Monitoring at Gohain Gaon

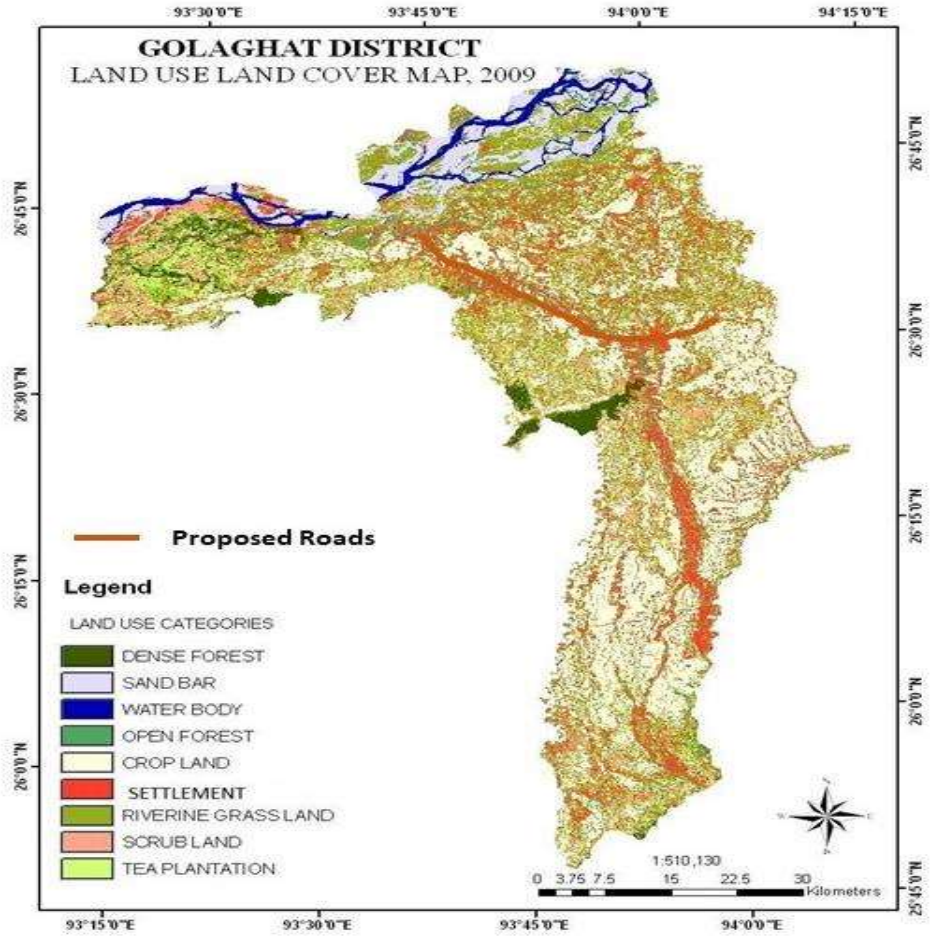
4.2.9 Land Use

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 Abutting Project road is presented in **Table 29**. The land use map of the project district is shown **Figure 36**.

Table 29: Land Use Pattern Abutting Project Road

Land Use	Land Use Pattern	
	Left Side (% Stretch)	Right Side (% Stretch)
Commercial	7.07 %	7.07 %
Agricultural	22.27 %	19.77 %
Residential	70.66 %	73.16 %
Industrial	0.00 %	0.00 %
Reserve Forest	0.00 %	0.00 %
Barren Land	0.00 %	0.00 %
Others (Plantation, Religious, etc.)	0.00 %	0.00 %
Total	**100 %**	**100 %**

Source: Road Inventory Survey



Source: Land use Land Cover Change Detection Using Remote Sensing and GIS Techniques-A Case Study of Golaghat District of Assam, India

Figure 36: Land use map of the project district

4.3 Biodiversity and Biological Environment

4.3.1 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.

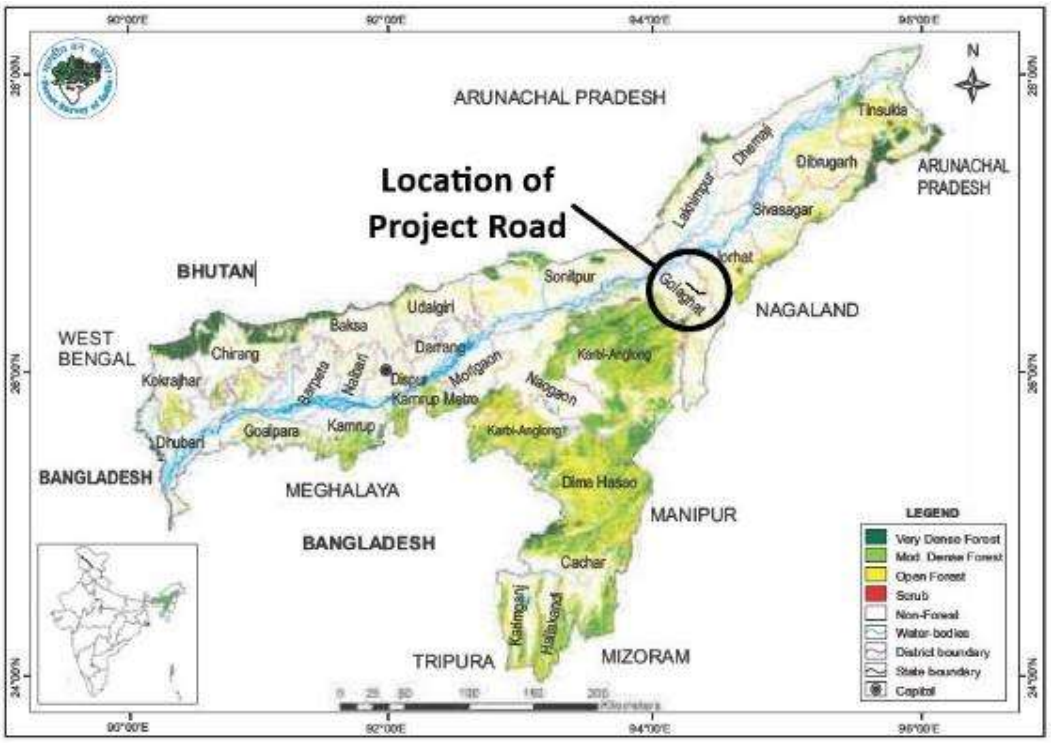


Figure 37: Forest Map of Assam

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.

4.3.2 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 30: 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
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 31: 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 32: 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
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 33: 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 34: 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.
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.

4.3.3 Flora of Golaghat District

Botanically the forest of Golaghat can roughly be divided into two divisions - the tropical and evergreen forests. The first category includes climatic climax vegetation such as Hollong, Nahor, Sam, Amri, Aunseroi, Makoi, Sopa etc. These are the best stocked stand of the district.

In the second category such species are included whose top canopies are deciduous and the middle and lower canopies are evergreen in nature. The evergreen forests are most picturesque to the eyes. The evergreen forests as the name suggests, are evergreen in character and are generally found in all reserve forests. The species of Kaziranga reserve represent Savannah type which contains various kinds of grass such as Ekara, Nal, Khagari (reed) etc. Patches of Koroi also occur here and there. Simalu grows profusely in these areas. A belt of mixed evergreen forest also occurs along the bank of Kaziranga. The belt generally harbours the wild elephants and rhinos of the sanctuary.

4.3.4 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 35**.

Table 35: 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
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

Sr. No	Name	Location	Area	Year
7.	Panidihing Bird Sanctuary	Sibsagar	33.99	
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.	Dehing Patkai Wildlife Sanctuary	Dibrugarh and Tinsukia	111.19	
16.	Borail Wildlife Sanctuary	Cachar and Dima Hasao	326.25	
17.	Amsang Wildlife Sanctuary	Guwahati	78.64	
18.	Dipor Bil Wildlife Sanctuary [4]	Kamrup	4.14	

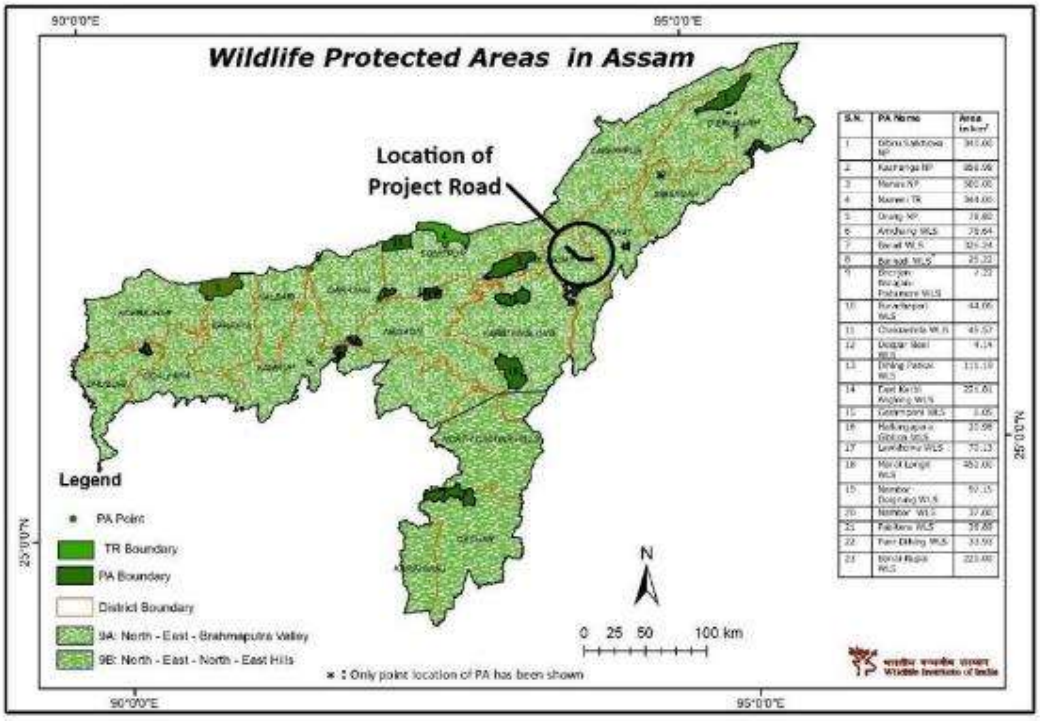


Figure 38: Wildlife Sanctuary and National Park of Assam

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 Nambor Doigrung Wildlife Sanctuary lies at a distance of approx. 5.5 km from the project road.

The Nambor Doigrung Wildlife Sanctuary covers an area of 97.15 km^2. It is located 25 km from Golaghat. The forest type is tropical semi-evergreen with pockets of pure evergreen, interspersed with small forest marshes. The area was declared as a Wildlife sanctuary in 2003. The sanctuary along with Garampani Wildlife Sanctuary (6 km^2) and Nambor Wildlife Sanctuary (37 km^2) are a part of the Kaziranga-Karbi Anglong Elephant Reserve, which was declared on 17 April 2003, with an estimated area of 3,270 km^2.

Figure 39: GIS Based Map showing the Boundary of Nearest Wildlife Sanctuary and Alignment

4.3.5 Fauna of Golaghat District

In Golaghat quite a large number of the denizens of the silvan world is conglomerated in the Kaziranga wild Life Sanctuary. The exhibit par excellence of the Sanctuary is the great Indian onehorned Rhinoceros to be found generally wallowing in the mud of the swamps. Another

magnificent species, getting rare in the rest of India, which can be seen, is the wild buffalos. Another important species is the swamp deer. Countless numbers of the hog deers are also there in the sanctuary and the number of wild pigs is ever greater. Tigers and leopards have been seen in the Sanctuary. The barking deer and sumbhur deer can also been seen. The bear, jungle cats and crab-eating mongoose are some other fauna of the sanctuary. Water birds such as the whistling teel, snipe, adjutant, cormorants, black-billed storks, and white-billed stork are found abundantly. It would be wrong to conclude that species found in Kaziranga are absent in other parts of the district.

Various kinds of colorful land and water birds are available in this district. Birds like fowls, Crow, Parakeets or Bhatau, Horn bills or Dhanesh, Maina Charai, Gray mynas, Pigeons, Doves or Kapon charai, Bulbuls, Wood-peckers, Salika etc are some of the various kinds of other jungle birds and hill birds. The birds who live in the neighbourhood or human habitation are Crows, Sparrow, Ghanchirika, Salika, Balimahi, Owls etc. There are Vultures or Sagun, Chalani, Kuruha in the district. Water birds or both indigenous and migratory nature are seen in the beels, swamps and rivers. Storks or Bartokola, Bagali, PaniKauri, Kam Charai, Ganga Chilani, Manihari (snake bird) are some of the water and marsh birds seen in the district. Ducks are generally found in the beels as winter visitors. Chakai chakua, Saralihanh, and Pintail ducks are some of the winter visitor birds which come to the district in winter season.

Tortoises, crocodiles, lizards and sakes are grouped as reptilian. Tortoises of various kinds are found in the beels and Rivers of the district. Crocodiles are rarely seen in the Brahmaputra. The green lizards are found almost in every part of the district. Among the snakes the most common are king cobras, adders and water snakes of the district. Pythons are normally found in the forest areas of the district. Among the amphibian's frogs and toads are found in all part of the district. Fishes of various kinds are found in the beels and rivers. The bigger fishers are Rau, Barali, Chital, Bahu, Kalijara, Ari, Gagal, Bhakuwa, etc.

4.3.6 Biodiversity in Golaghat

The Golaghat district lies in Upper Assam area and is characterized by Tropical Wet Evergreen Forests. There are numerous Tea gardens, wildlife sanctuaries and game parks in the district. The district is located to the south of Brahmaputra river in the state of Assam. The district also shares its southern border with Nagaland state. Nambor Wldlife Sanctuary, Garampani Willife Sanctuary lies in the district. Deopahar which is a famous tourist attraction for the hills and forests also has several ancient monuments. Neghereting Shiva Temple located in the outskirts of the Golaghat town is surrounded by lush green tea gardens and is also a tourist attraction.

Several Biodiversity hotspots in the district are as follows:

Kaziranga National Park:

This National Park is located over an area of 430 sq km between Brahmaputra River and Karbi Anglong hills. The National Park is also a part of IUCN list of World Natural Heritage Site. The park habitat comprises of large water bodies, swampy ground, patches of elephant grass and scattered trees and bushes. The wildlife in the park consists of one horned

Rhinoceros, tiger, leopard, elephant, wild boar, hog deer, swamp deer, buffalo and other water fowl. Many of the migratory birds also visit the park in the winter season.

Nambor-Doigrung Wildlife Sanctuary:

The wildlife sanctuary covers an area of 97.15 sq km and consists of tropical semi-evergreen forests with pockets of pure evergreen, interspersed with small forest marshes. The flora of the region consists of Bhelu, Gomari, Ajar, Nahor, Udiyam, Poma, Bon Som etc. Various fauna species found in the region consists of Elephant, Hoolock gibbon, stumped tailed macague, pig tailed macague, slow loris, Assamese macaque, Rhesus macaque, Tiger, Leopard, Fishing cat, Barking deer, Sambar, Wild pigs etc. Several bird species like White winged wood duck, Great pied hornbill, Wreathed hornbill, Adjutant stork etc. are also found in these forests. Reptiles like Tortoise, Monitor Lizard and Python are also found in these forests.

River Brahmaputra flows through the northern side of the district. Dhansiri river is one of the major tributaries of the Brahmaputra river flowing through the district. The area under aquatic vegetation is slightly more during pre-monsoon (i.e., 2304 ha) compared to post monsoon (i.e. 1437 ha). Garampani Wildlife Sanctuary, Nambhor Wildlife Sanctuary and Nambor-Doigrung Wildlife Sanctuary in the district is a part of Important Bird Area under criteria A1 (Threatened Species). More than 160 species of birds have been recorded in the area including White-winged Duck (Endangered category), Great Pied Hornbill (Near Threatened) and Lesser Adjutant (Vulnerable).

4.3.7 Biodiversity of the Project Area

The A15 Project road originates at Karaniholla, crossing Kamargaon, Helochi Gaon, Khumtai Nagaon, Butolikhowa, Chinatoli, Napumuwa Gaon, Dhansiri Par, Golghat, Sialekhati, Kamarbandha ending at Chotiking. Golghat, Napumuwa Gaon and Gohain Satra Gaon lies in the buffer zone of the Nambor Doigrung Wildlife Sanctuary. Kaziranga National Park lies 59.26 km from the project road. Dhansiri river which is one of the main tributaries of Brahmaputra River also runs parallel to the project road between chainages 25+200 Km to 00+000 Km before draining into Brahmaputra river, north west of project road. Dhansiri River is an important Ichthyofaunal hot spot of the state of Assam. It is recognized by the presence of varied freshwater fishes. Presently, 34 fishes belonging to fiver orders, thirteen families and twenty-four genera have been identified in the river. Several fishes like Bonale, Bahu, Kuhe, Bha, Chital, Puthe, Shiyana, Chanda, Shigi, Maghun, Goni, Bami and Kanoy are found in the Dhansiri river. The Dhansiri river in the Golaghat district between Moinapara to Selengi has been identified as polluted. Industrial Pollution has been identified as the main reason for the degradation of the river in this region. The project road is within 10 km radius of the Important bird areas of Nambor-Doigrung Wildlife Sanctuary, some migratory birds like Little Cormonant, Irtermediate Egnet, White breasted Waterhen, Asian openbill and Lessen Whistling duck are sighted in the Chankala beel (lake) which is located at Ch. 4+800 Km.

4.3.8 Elephant crossing location

The project area forms a part of the central belt for elephant population in the Northeast India. This central belt has lost its connectivity to the eastern range which comprises of regions of Doma Doma, Digboi Forest Divisions and Arunachal Pradesh due to large scale felling and encroachment in the Nambor Reserve Forest lying in Golaghat district. Large scale destruction of forest cover in the Golaghat district in the past few decades have forced the elephant population to move to NH-37 and nearby agricultural area in search of food. Numaligarh Refinery Limited constructed golf course near Deopahar has also further limited the movement of these Elephants. Also, Doigrung-Nambor Wildlife Sanctuary has an elephant population of 68 as per Elephant Census 2011. These Elephant move to Kaziranga National Park via Kaliani Reserve Forest, Ram Terang and Tokolangso Village. Human settlements, deforestation for firewood and timber wood, agricultural activities i.e., jhum cultivation and road expansion activities are major threats to these elephant population in the region. Based on the studies available and consultation with the Forest Department officials, it can be concluded that the elephant crossing along the project road can mostly be associated with lack of food source in the region along the elephant corridor. 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

As per site survey conducted with the Assistant Conservator of Forest, Golaghat Forest Division three sites were identified as Elephant crossing stretch along the project road. These details of the stretches are provided in **Table 36**. The NOC Obtained for Elephant Underpass is given in **Annexure 24**.

Table 36: Identified Elephant Crossing Stretch

Stretch	From Chainage	To Chainage	Location
Stretch 3	1+100	1+900	Purona Kamargaon
Stretch 2	3+600	4+500	Thengal Gaon
Stretch 1	6+500	6+900	Kochupathar Chankola

Figure 40: Location of Identified Elephant Crossing Stretch 3 at Kamargaon

Figure 41: Photograph of Identified Elephant Crossing Stretch 3 at Kamargaon

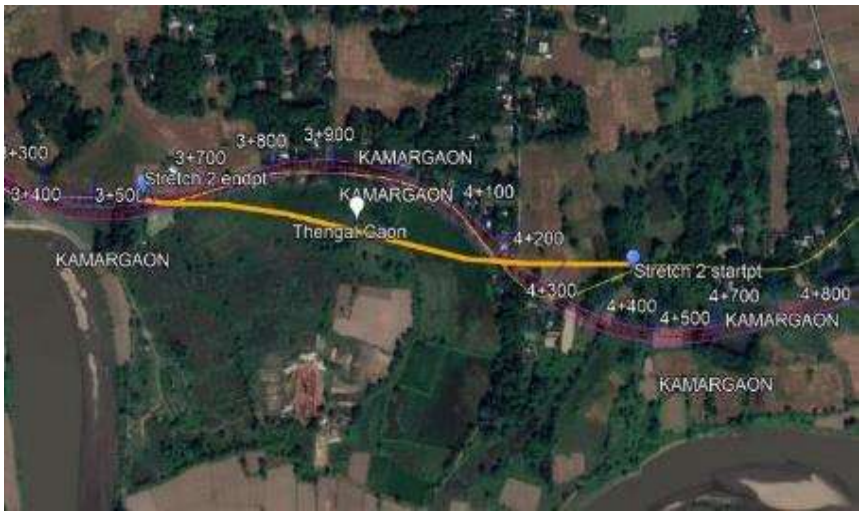


Figure 42: Location of Identified Elephant Crossing Stretch 2 at Thengal gaon

Figure 43: Photographs of Identified Elephant Crossing Stretch 2 at Thengal gaon

Figure 44: Location of Identified Elephant Crossing Stretch 1 at Kochupathar Chankola

Figure 45: Photographs of Identified Elephant Crossing Stretch 1 at Kochupathar Chankola

As per the site consultations conducted at the identified locations the elephants are said to come at Borchapari area which is located on the other side of the Dhansiri river as shown in **Figure 46**. The elephants occasionally come near the project road and cross the road on and off as per the consulatation with the residents of the identified areas and the comment of the ACF, Golaghat division. The elephants come in search of food and they are most commonly seen in the harvest season during the months of November and December. The banana plants and grains are the favorite food of elephants and the residents in the identified stretches have crop cultivations and banana plants in their backyard.

Figure 46: Location of Elephant Sighting as per Public Consultation

Figure 47: Households with Banana Plants in Identified Elephant Crossing Locations

Figure 48: Elephant Watch Tower at Borchapari

Figure 49: Public Consultation at Elephant Crossing Stretch 3 Purona Kamargaon

Figure 50: Public Consultation at Elephant Crossing Stretch 1 Kachupathar

Figure 51: Public Consultation at Elephant Crossing Stretch 2 Thengal gaon

4.3.9 Trees

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 as **Annexure 11.**

The nature of vegetation cover is mixed, moist, evergreen and deciduous type with species like Shorea robusta, Tectona grandis, Artocarpus species, and Bambusa sp, Albizzia sp. *Aegle marmelos, Azadirachta indica, Acacia nilotica, Emblica officinalis, Magnifera indica, Madhuca longifolia and Casia fistula,* Dendrocalamus sp, Bambusa sp., Lagerstroemia parviflora, Artocarpus sp., Aegle marmelos and Dalbergia latifolia Zizyphus glaberrima, Holerrhena pubescens, Woodfordia fructicosa, Cassia fistula, etc.

Coconut trees along proposed alignent

Gulmohar & Deval tree

Banana and Bamboo Culms

Banana Plants within the PROW

Figure 52: Trees along the Project Road

Based on the Joint inception, tree numeration done with ranger and forest officers of Golaghat forest division about 3121 nos. of trees are felling will be involved in widening and realignment work. The Office of division forest officer has given tree felling permission through wide letter No B/Road Side tree/ Glt Divn/2020/2158-55 dated 27/04/2020. The permission letter is attached as **Annexure 12.**

Based on the tree felling permission and in discussion with the DFO during site visit no Tree species identified along the PROW are Critical/ endangered/ protected species list as per IUCN Red list.

4.3.10 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 4 trees of cultural significance have been identified along the road. The locations of such identified heritage trees are given in **Table 37**.

Table 37: Identified Heritage Trees

Sr. No.	Chainage	Location
1	1+050	Kamargaon
2	8+860	Khumtai Nagaon
3	13+800	Khumtai
4	27+600	Golghat

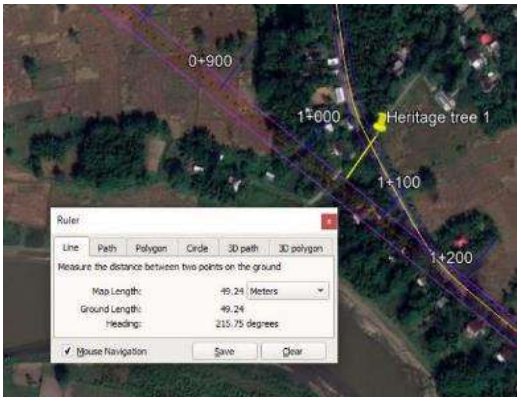


Figure 53: Heritage Tree at Ch. 1+050 Km in Purona Komargaon

Figure 54: Site Photograph of Heritage Tree at Ch. 1+050 Km in Purona Komargaon

Figure 55: Heritage Tree at Ch. 8+950 Km in Khumtai Nagaon

Figure 56: Site Photograph of Heritage Tree at Ch. 8+950 Km in Khumtai Nagaon

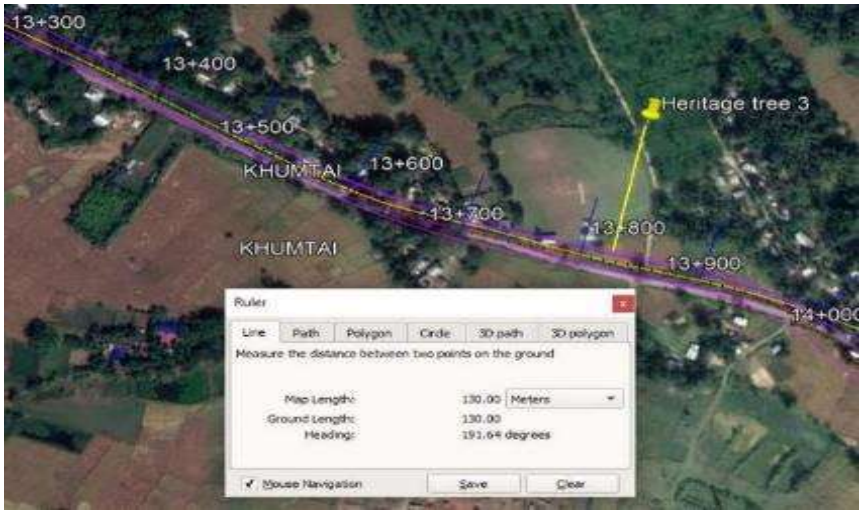


Figure 57: Heritage Tree at Ch. 13+800 Km in Khumtai

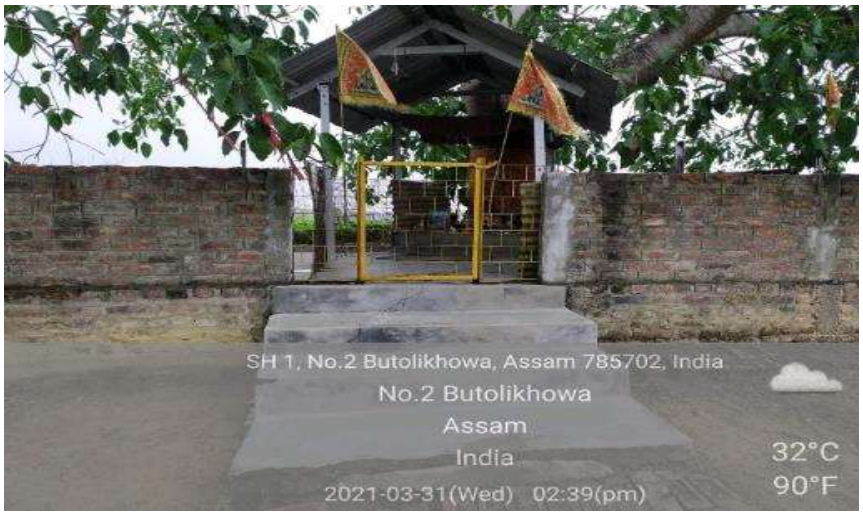


Figure 58: Site Photograph of Heritage Tree at Ch. 13+800 Km in Khumtai

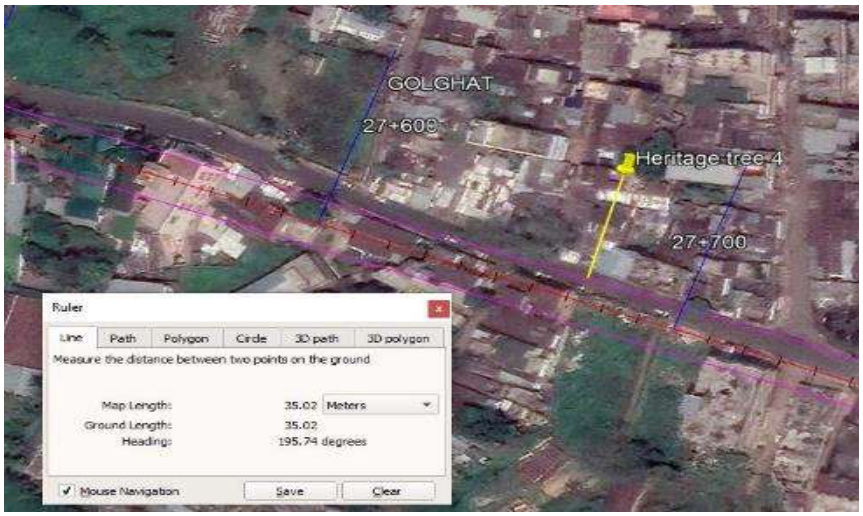


Figure 59: Heritage Tree at Ch. 27+600 Km. Golaghat

Figure 60: Site Photograph of Heritage Tree at Ch. 27+600 Km. Golaghat

4.3.11 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.

4.3.12 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. However, along the project road 1 household was identified involved in cultivation of silkworm. The location of the household is given in **Figure 61**.

Figure 61: Identified Household involved in Silkworm cultivation

Figure 62: Silkworms under cultivation feeding on Som leaves

4.3.13 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. Though farmers in the Golaghat district are slowly adopting these rice varieties for cultivation,

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.

4.3.14 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 38**.

Table 38: Tea Estates Along the project road

Sr. No.	Chainage	Name of the Estate	Distance from alignment
1	09+500	Khumtai Tea Estate	600 m (left)
2	11+700	Butolikhowa Tea Garden	650 m (left)
3	13+350	Hautley Tea Garden	1200 m (left)
4	15+300	Hautley Tea Garden	0 m (left)
5	17+000	Garanga North Tea Garden	0 m (left)
6	22+000	Halmira Tea Garden	0 m (left)

Figure 63: Khumtai Tea Estate

Figure 64: Butolikhow Tea Garden

Figure 65: Hautley Tea Garden

4.3.15 Aquatic Ecology and Fisheries

In Golaghat district, fishes of various kinds are found in the 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.

There are no river crosses along the project road however there are some seasonal streams crosses the alignment where water is available during rainy season only and dry the rest of the year. The Dhansiri river which is the main river in Golaghat district having a catchment area of 1,220 sq. km flows adjacent to the project road on the right side from its originating point in Kamargaon till Golaghat city. At Ch. 3+000, the Dhansiri river is in close proximity at a distance of approx. 40 m on the right side of the road in Kamargaon village. The Kakadonga river crosses the project road at the end of the stretch.

Figure 66: Dhansiri river

Figure 67: Kakadonga river

4.3.16 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. As per the site inspection conducted with forest officials, elephants are observed in Borchapari area across the Dhansiri river and for its prevention 2 Elephant underpass have been proposed at the identified crossing locations.

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 (refer Annexure 25 Biodiversity Assessment Report).

4.3.17 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 elephants which are spotted at Borchapari across Dhansiri river. Animals such as Elephants (Elephas maximus), cow (Bos taurus), goat (Capra aegagrus hircus), pig (Sus), dogs (Canis lupus familiaris) and buffalos (Bubalus bubalis) are observed in study area (refer Annexure 25 Biodiversity Assessment Report).

4.3.18 Avian Fauna

The region near the project location which includes the Nambor Doigrung Wildlife Sanctuary is a critical ecology. The region has been identified as an Important Bird Area as per the IBA programme of Birdlife International and also forms part of the Kaziranga Karbi Anglong Elephant reserve.

The sanctuary is home to a variety of fauna. The sacred groves home to species like Alstonia scholaris. The faunal population includes the elephant and lesser cats and very good birdlife. The sanctuary houses numerous varieties of exotic and variegated migratory as well as domestic birds.

The Chankala beel near the project road on right side at Ch. 4+000 is known for spotting birds. The bird species reported to be found on the Chankala beel are Little Cormorant, Intermediate egnant, White-breasted waterhen, Asian openbill, Lesser whistling duck etc.

4.3.19 Wetlands

Total wetland area in the Golaghat district is 43,635 ha that includes 165 small wetlands (<2.25 ha). River/stream occupies 88.45% of wetlands. The other major wetland types are Lake/pond (5.16%), Waterlogged-natural (3.49%), and Ox-bow lakes (2.52%).

Aquatic vegetation is mainly observed in Lake/pond, waterlogged wetland types. The area under aquatic vegetation is slightly more during pre-monsoon (2304 ha) compared to post monsoon (1437 ha). Seasonal fluctuation of open water spread of wetlands showed slightly more spread during pre-monsoon.

The Chankala beel along the project road located near Ch. 4+000 is one of the prominent lakes in the project region. The Chankala beel is present close to the river Dhansiri and now due to the flow of the river and erosion on the banks the Chankala beel has merged with the Dhansiri river. **Figure 68** show the location of the Chankala beel on Google Earth. The photographs of Chankala beel are shown in **Figure 69**.

Figure 68: Location of Chankala Beel on Google Earth

Figure 69: Photographs of Chankala Beel

The bird species reported to be found on the Chankala beel are Little Cormorant, Intermediate egnant, White-breasted waterhen, Asian openbill, Lesser whistling duck etc.

4.4 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 one district of Assam i.e., Golaghat. 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 39.**

Table 39: Demographic details of Golaghat district

	Assam	Golaghat
Total Population	31,205,576	1,066,888
Rural Population	26,807,034	969,152
Urban Population	4,398,542	97,736
Male	15,939,443	543,161
Female	15,266,133	523,727
Gender Ratio	958	964
SC Population	2,231,321	62,298
% SC	7.15	5.84
ST Population	3,884,371	111,765
% ST	12.45	10.48
Density of Population (per sq. km.)	398	305

4.4.1 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, Arunachal Pradesh, 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 Golaghat district has been shown in the following **Figure 70.**

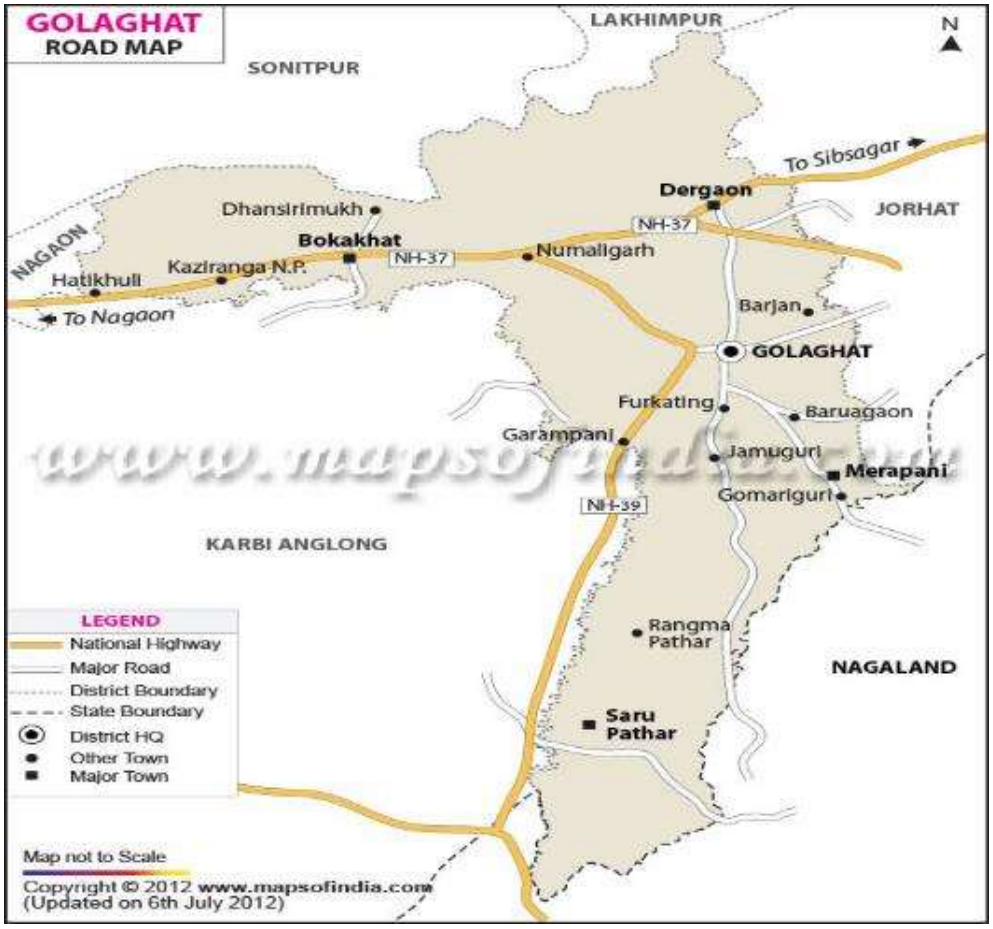


Figure 70: Road Map of Golaghat district

4.4.2 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 40.**

Table 40: Important Settlements Abutting Project Highway

Sr. No.	Existing Chainage (Km)		Length (m)	Name of Settlement
	From	To		
1	0+000	3+000	3000	Kamargaon
2	5+200	5+700	500	Chankala Bil Gaon
3	5+700	6+700	1000	Chankala Bil Gaon
4	6+700	6+900	200	Helochi Gaon
5	6+900	11+850	4950	Kumtai
6	15+800	17+100	1300	Hautley
7	18+730	19+650	920	No 2 Sensowagaon
8	19+650	20+750	1100	Adharsantra
9	23+400	25+100	1700	Halmira Gaon

Sr. No.	Existing Chainage (Km)		Length (m)	Name of Settlement
	From	To		
10	25+100	29+300	4200	Golaghat
11	29+300	31+450	2150	Kaboru
12	34+850	35+300	450	Namsonia
13	35+300	37+200	1900	Kamarbandha

Source: Detailed Project Report

4.4.3 Existing Economy & Employment Base

Agriculture and Tea farming is the mainstay of the people of the region. It plays a significant role with respect to both generations of employment and share in the GDP. Agriculture is closely followed by livestock rearing. Many families in the project region mainly depend on Agriculture, Allied Agriculture & commercial works. There are some small-scale industry units where people are employed to work as laborers.

4.4.4 Cultural/Religious resources

The language spoken by the majority of the people is Assamese and Bengali. English is widely used for official purpose and Assamese and Bengali is used as a regional language. The state has a very opulent cultural heritage, one of the richest in India. The capital city of Assam is Dispur. There is no protected or unprotected ASI monument that exists along the project road. As per field survey, the following **Table 41** are the religious structures observed along the project road.

Table 41: List of religious structures along the project road

Sr. No.	Receptor	Side	Chainage (Km)	Approx distance from the edge of the road (m)
1	Temple	Right	0+745	7
2	Mosque	Right	21+195	5
3	Mosque	Left	25+408	10
4	Temple	Right	26+588	7
5	Mosque	Right	26+685	8
6	Temple	Right	27+420	13
7	Temple	Left	29+880	7
8	Mosque	Right	31+668	12
9	Mosque	Right	31+756	16
10	Mosque	Left	35+070	10

Source: Environmental Baseline Survey

4.4.5 Archaeological and Historical Monuments

No archaeological sites or historical monuments are located along the project road section.

4.4.6 Sensitive Receptors

During the environmental and social screening survey, several sensitive receptors such as religious places, schools, colleges, hospitals, etc. are located within the existing RoW. The list of these structures is presented in **Table 42** below.

Table 42: Sensitive receptors along the project road

Sr. No.	Receptor	Side	Chainage (Km)	Approx distance from the edge of the road (m)
1	Hospital	Right	0+410	25
2	School	Right	0+500	30
3	School	Right	1+450	15
6	School	Right	5+810	20
7	Hospital	Left	6+500	30
8	College	Left	9+310	15
9	School	Left	9+785	35
11	School	Right	11+830	20
12	School	Right	12+150	15
13	School	Left	13+305	45
14	Hospital	Right	19+975	20
15	School	Right	20+490	40
16	School	Left	21+815	100
17	School	Left	23+960	30
18	Hospital	Left	24+635	15
19	College	Right	25+388	20
20	School	Right	25+950	15
21	School	Left	26+020	10
22	School	Left	26+455	20
23	School	Left	26+710	45
24	Hospital	Right	27+663	10
25	School	Right	28+110	10
26	School	Right	28+508	10
27	School	Right	28+865	10
28	School	Left	29+910	15
29	School	Right	31+595	10
30	School	Left	33+835	50
31	School	Right	36+150	10
32	Hospital	Left	36+385	25
33	School	Right	36+838	40
34	School	Left	39+035	20
35	School	Right	39+215	15

Source: Environmental Baseline Survey

4.4.7 Demography of Displaced families

The total number of displaced persons are 7750. The males constitute of 49.98% and females are 50.02%. Most of the displaced person (20.85%) are from the age of 21 to 30. **Table 43** presents the age-wise distribution of the total displaced persons.

Table 43: Total Displaced Persons Age wise

Age Category	Total Males	Total Females	Total Persons	%
0 to 6 Years	256	267	523	6.75%
7 to 14 Years	388	383	771	9.95%
15 to 20 Years	331	327	658	8.49%
21 to 30 Years	731	885	1616	20.85%
31 to 40 Years	715	704	1419	18.31%
41 to 50 Years	570	549	1119	14.44%
51 to 60 Years	466	412	878	11.33%
Above 60 Years	417	349	766	9.88%
Total	3874	3876	7750	**100%**

4.4.8 Religious Stratification

In the proposed project stretch, the most of displaced families are Hindu (73.30%). **Table 44** represent the details of religious stratification of the displaced families on the alignment.

Table 44: Religious Stratification

Religion	No. of Families	Percentage
Hindu	1197	73.30%
Muslim	420	25.72%
Sikh	4	0.24%
Christian	12	0.73%
Jain	0	0.00%
Total	**1633**	**100.00%**

4.4.9 Social Stratification

Social categorization of the displaced families has been presented in **Table 45**. It is observed that 51.32% of the affected families are Other Backward Class (OBC). The General Category constitutes about 42.68%, Schedule Caste 3.74% and Schedule Tribe displaced families are lowest. i.e., 2.27% only.

Table 45: Social Category of the Displaced Families

Social Category	No. of Displaced Families	%
Schedule Tribe	37	2.27%
Schedule Caste	61	3.74%
Other Backward Class	838	51.32%
General	697	42.68%
Total	**1633**	**100%**

4.4.10 Educational Profile

The educational status of the displaced persons is presented in **Table 46**. Out of the total 7227 displaced persons, illiterate constitute only 1.73% only and 2.68% reported that they are literate but never had any formal school education. 60.11% of the displaced persons have taken education up to secondary, 20.17% up to primary school, and 14.67% up to Higher Secondary. 0.58% displaced persons has done degree in technical field and only 4 male displaced people has taken education of vocational studies.

Table 46: Educational Status

Educational Status	Male	Female	No. of Displaced Persons	%
Illiterate	51	74	125	1.73%
Literate (can only sign)	86	108	194	2.68%
Primary	688	770	1458	20.17%
Secondary & Higher Secondary	2207	2137	4344	60.11%
Graduate & Higher	550	510	1060	14.67%
Technical	32	10	42	0.58%
Vocational	4	0	4	0.06%
Total	3618	3609	7227	**100.00%**

4.4.11 Occupational Profile

The occupational status of the displaced person is presented in **Table 47**. It is reported that almost 58.05% of displaced persons are unemployed but in which the percentage share of female is more. Students and housewives are included in this category. The highest 22.38% displaced person are earning money through the business/ Trade. 3.35% of the displaced persons reported to be engaged in agriculture activities, labourers (agricultural and non-agricultural) are about 2.06%. 1.87% displaced persons reported to be working with private services.

Table 47: Employment Status

Employment Status	Male	Female	No. of Displaced Persons	%
Agriculture	180	36	216	3.35%
Agriculture Labourer	102	31	133	2.06%
Non-Agriculture Labourer	104	17	121	1.87%
Business/ Trade	1216	229	1445	22.38%
Govt. Service	159	68	227	3.52%
Private Services	212	42	254	3.93%
Maid Servant	11	4	15	0.23%
Others	240	57	297	4.60%
Unemployed	1006	2742	3748	58.05%
Total	**3230**	**3226**	**6456**	**100%**

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 48.**

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 48: 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:

- The consequences of soil erosions are far wider than the repair and maintenance of the road. Along the project road, the inflow of water into ponds during rains causes erosion of the embankment besides seepage of water into the embankment and sub-grade resulting in softening of the subgrade. This may also increase siltation in water bodies. The project design includes provisions of retaining walls for protection. Regular checks will be made to check its effectiveness.
- Improvements to the road drainage will result in improved stormwater flows and reduce the tendency of blockages to occur in roadside drains. Risks to the public health caused by such stagnant water bodies by acting as disease vector breeding places will be reduced. By designing the drains to withstand appropriate storm events and regular maintenance will further reduce the chances of drainage system failure. Accidental oil spillage, washing of vehicles, used engine oils, paints used in maintenance can contaminate the water bodies. Proper handling of such chemicals under strict supervision will help to minimize the water pollution during the maintenance period. Rejuvenation of the drainage system by removing encroachments/ congestions will be regularly conducted.
- Improved quality of life for the rural population in the projects influence area, 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;
- Interstate connectivity to neighboring districts; and
- Better connectivity to the State Highway and National 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.
- Noise, air and water pollution and disposal of construction waste, during construction, will adversely impact the residents. These latter effects should, however, only be temporary/ reversible.
- Several quarries and other sources will be established which will change the landscape. However, the operation of quarries is an independent and already regulated activity.
- Improvement on the existing road although limited, may increase soil erosion, landslips and reduce the micro-level ecological balance of the area. Construction may also disturb the habitation of fauna living in this area. These should, however, be only temporary/reversible effects.
- Minor impacts of noise and air quality for those now living and workings close to the project road will deteriorate during the construction period and afterward during operation.

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 in the 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 131.07 Acres of land, which comprise of 85.14 Acres Private Land, 35.48 Acres Government Land and 10.48 Acres where ownership could not be ascertained. There is no forest land which is impacted in the proposed project stretch. **Table 49** shows the land to be acquired for the proposed project.

Table 49: Proposed Land Acquisition

Sr. No.	Village Name	Revenue Circle & District	Total Impacted Pvt Land (in acre)	Land Parcels where ownership could not be ascertained (in acre) *	Govt. Land (in acre)	Total Land to be acquired (in acre)
1	Karanihuala	Revenue Circle: Bokakhat & District: Golaghat	4.42	0.91	0	5.33
2	Sonari Gaon	Revenue Circle: Khumtai & District: Golaghat	1.57	0	1.47	3.04
3	Kamar Gaon		2.15	0.88	0.04	3.06
4	Choukana Bil		2.83	0	0	2.83
5	Thengal Gaon		1.31	0.75	2.27	4.33
6	Soukona Bil 2nd Part		6.45	0.3	0.29	7.04
7	Helochi Gaon		0.59	0	1.56	2.15
8	Kosu Pathar		0.16	0	0.22	0.38
9	Songkola Gaon		0.48	0.31	1.67	2.46
10	Sungi -Hula		0.28	0	0.46	0.74
11	Na-gaon		2.29	0	4.64	6.92
12	Khumtai Gaon 1st Part		1.45	0.2	2.26	3.91
13	Khumtai Gaon 2nd Part		2.22	0.14	4.05	6.4
14	Bogoriani		0.5	0	0	0.5
15	No.2 Butolikhuowa		0	0	1.98	1.98
16	No.1 Butolikhowa		0.5	0	0	0.5
17	27 No Sautoli Grant 2nd Part		1.92	0.09	1.97	3.98
18	24 No Sautoli Grant		5.64	1.96	0.86	8.45
19	Garanga Grant	Revenue Circle & District: Golaghat	2.58	1.58	1.02	5.19
20	Bholaguri Gaon 1st Part		0.07	0	0	0.07
21	Bholaguri Gaon 3rd Part		0.88	0.01	0.47	1.36
22	No. 2 Sensowa Gaon		3.23	0.35	0.54	4.13
23	Na-Pamua Gaon		0.47	0.02	0.38	0.87
24	Gosain Satra Gaon		0.03	0.06	0.25	0.34
25	Na-Pomuwa Gaon	Revenue Circle & District: Golaghat	0.55	0.15	0.43	1.13
26	Gosain Satra Gaon		0.69	0.17	0.02	0.88
27	Salmora Moukhoti Gaon 1st Prt.		2.16	0	0.23	2.39

Sr. No.	Village Name	Revenue Circle & District	Total Impacted Pvt Land (in acre)	Land Parcels where ownership could not be ascertained (in acre) *	Govt. Land (in acre)	Total Land to be acquired (in acre)
28	Shalmora Grant		0.57	0	0	0.57
29	Dhansiripar Gaon 1st Part		3.95	0.65	0.69	5.29
30	Moukhuwa Grant 2nd Part		0.7	0	0	0.7
31	Dhansiripar Gaon 2nd Part		0.6	0.17	1.21	1.98
32	Golampati Gaon		0.4	0.19	0.59	1.18
33	Golaghat 16th Part		0.01	0	0	0.01
34	Golaghat 15th Part		0.76	0.11	0.12	0.98
35	Golaghat Town 2nd Part		0.25	0.13	0.3	0.68
36	Golaghat Town 4th Part		0.21	0	0.35	0.56
37	Golaghat Town 3rd Part		0.55	0.02	0	0.57
38	Golaghat Town 18th Part		0.23	0	0	0.23
39	Golaghat Town 21th Part		0.29	0.05	0	0.34
40	Golaghat Town 7th part		0.11	0	0	0.11
41	Golaghat Town 8th Part		1.18	0	0	1.18
42	Golaghat Town 9th Part		0.49	0	0	0.49
43	Golaghat Town 10th Part		1.12	0.03	0	1.16
44	Bongaon		4.55	0.24	0.17	4.97
45	Kacharihat		1.67	0.01	0.21	1.89
46	Kaboru Gaon		0.91	0.02	0.02	0.94
47	Khiyalekhati Gaon		2.28	0.06	0.19	2.53
48	Raidongia Gaon		1.43	0	0.93	2.36
49	Bamun Gaon 2nd Part		1.66	0	0.01	1.67
50	Bamun Gaon 1st Part		2.04	0.15	0.66	2.85
51	Naamsonia Gaon		0.99	0.11	0.22	1.33
52	Gohain Gaon		4.4	0.48	0.81	5.69
53	Mout Gaon		0.85	0	0	0.85
54	Chutia Gaon		1.94	0.15	0.42	2.5
55	Bokolai Gaon		1.52	0	0.18	1.71
56	Kanu Gaon		1.43	0.03	0.17	1.62
57	Kopohuwating Gaon		0.04	0	0.46	0.51
58	Chokiting Grant 1		2.59	0	0.69	3.28
		Total	**85.14**	**10.48**	**35.48**	**131.09**

5.4.4 Impact on Structure

The break-up of the identified impacted structures (1987 numbers) is presented in given in **Table 50.**

Table 50: Impact on Structures

Impact	Residential	Commercial	Resi. & Com	Others	Total	% of Total
Less than 10%	13	30	2	1	46	2.32%
10-20%	16	44	4	1	65	3.27%
20-30%	19	74	6	4	103	5.18%
30-40%	13	60	8	4	85	4.28%
40% & above	161	788	100	639	1688	84.95%
Total	222	996	120	649	1987	**100%**

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 Nambor Doigrung Wildlife Sanctuary which is at a distance of 5.5 km (approx.) from the project road. 3121 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.

5.4.6 Elephant Movement

The project road lies at a distance of approx. 5.5 km from the Nambor Doigrung wildlife sanctuary which is part of the Kazirang Karbi Anglong elephant reserve. In order to identify any wildlife movement in the study area a detailed field study was conducted with the forest and wildlife officials including Assistant Conservator of Forest (Golaghat Forest division). During this study 3 stretches along the road were identified where on & off elephant movement occurs by the Assistant Conservator of Forest (Golaghat Forest Division). To prevent any harm to the elephant 2 underpass have been proposed at the Identified elephant crossing locations and at one location embankment height has been kept low for ease of movement to the elephants.

Based on the data collected from the site and consultation with various wildlife experts, forest officials, and other secondary data various mitigation measures were worked out. The mitigation measures worked out included provision of underpass with 30m horizontal clearance and 7m vertical clearance and a road section with low embankment height & gentle slope. The options worked out were discussed with the ACF, Golaghat Forest Division and Chief Wildlife Warden, Office of Principal Chief Conservator of Forest Assam. As per the

discussion with the forest official's underpass to be provided at stretch 1 & 2 and a road section with low embankment height at stretch 3 was finalized.

The details of the elephant crossing stretch as identified by the Assistant Conservator of Forest (Golaghat Forest Division) and proposed mitigation measures are given in **Table 51**.

Table 51: Mitigation measures for Identified Elephant Crossing Stretches

Stretch	From	To	Location	Mitigation Proposed
Stretch 3	1+100	1+900	Purona Kamargaon	Road Section with low embankment height & Gentle Slope from Ch. 1+100 to 1+820
Stretch 2	3+600	4+500	Thengal Gaon	Underpass at Ch. 3+630
Stretch 1	6+500	6+900	Kochupathar Chankola	Underpass at Ch. 6+450

A pictorial represention of the proposed mitigation measures at the elephant crossing stretches identified by the ACF, Golaghat division is shown in **Figure 71**.

The details of the TCS with low embankment height for Stretch 3 (Ch. 1+100 to 1+820) is given in **Figure 72**. The details of proposed underpass are given in **Annexure 21**. The approach roads for the underpass have been provided in **Figure 73**. The crash barriers have been proposed to make the elephants use the constructed underpass and avoid crossing the road

Figure 71: Mitigation Measures at Identified Elephant crossing stretches

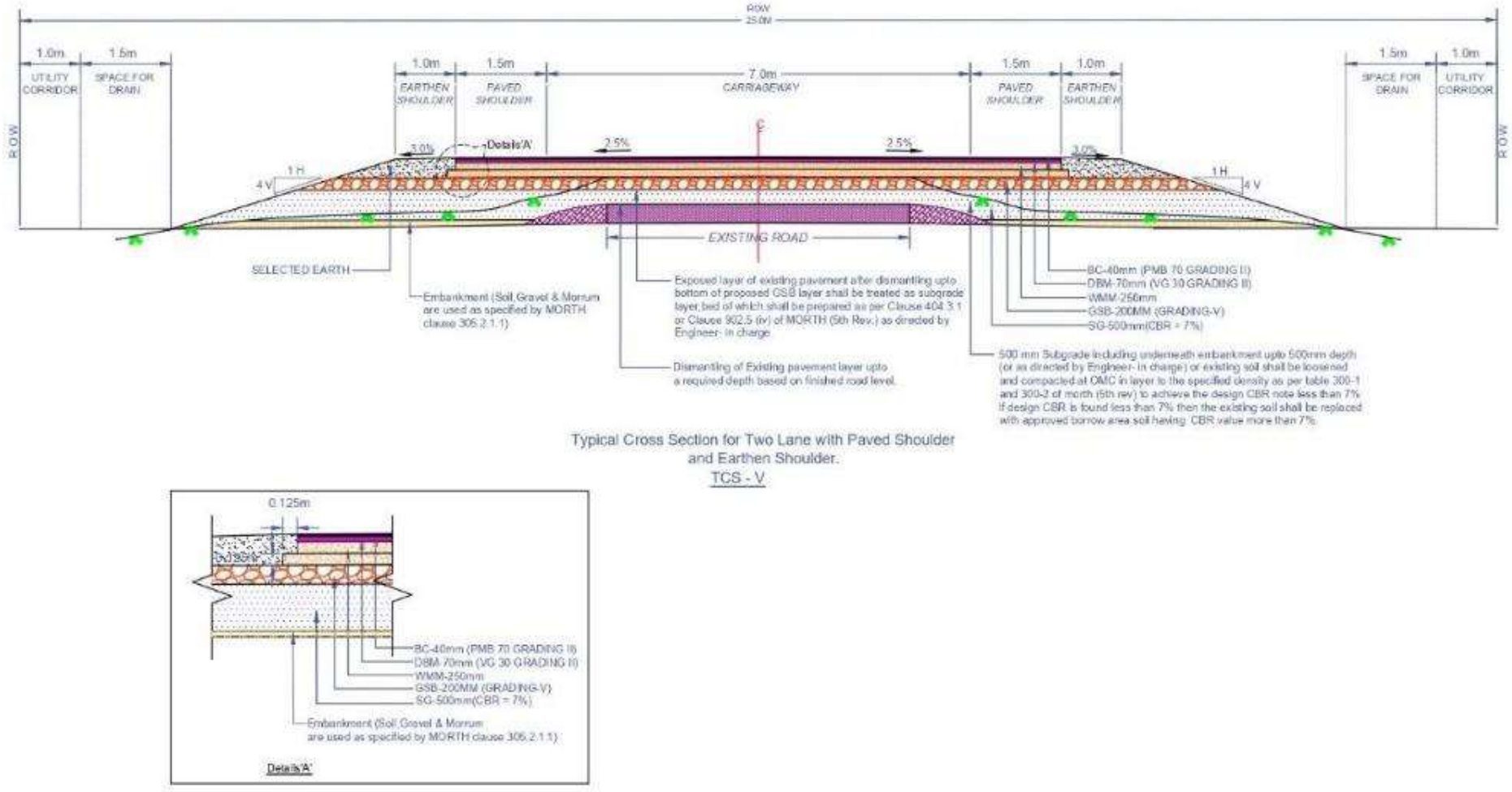


Figure 72: TCS for Identified Elephant Crossing Stretch 3 at Purona Kamargaon

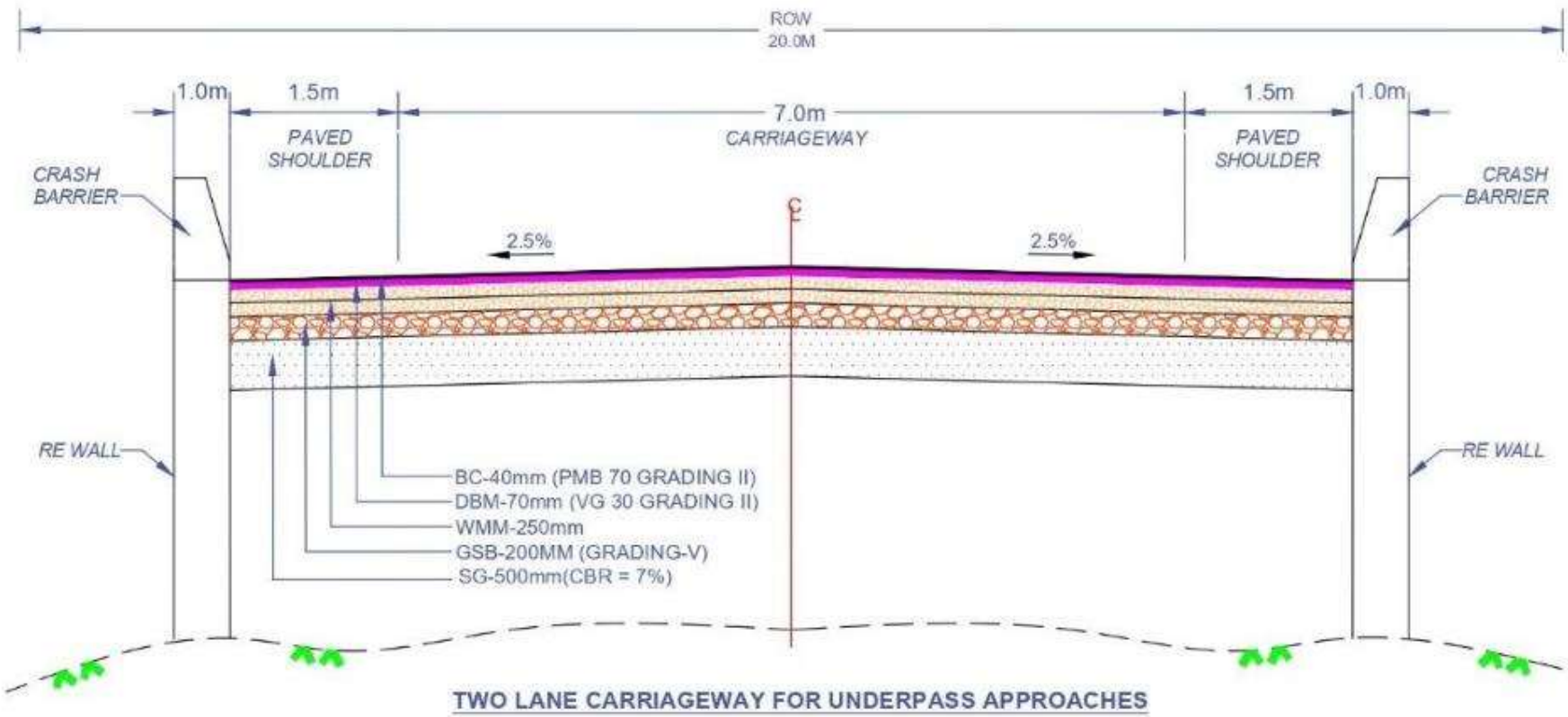


Figure 73: Two Lane Carriageway for Underpass Approaches

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.

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-Objection Certificate (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.

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.

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.

Table 52: Typical noise levels of principal construction equipment (Noise Level in dB (A) at 50 Feet)

Activities/ Operation of Equipment	Noise Level dB(A)	Activities/ Operation of Equipment	Noise Level dB(A)
CLEARING AND GRUBBING		**STRUCTURE CONSTRUCTION**	
Bulldozer	80	Welding generator	71-82
Front end loader	72-84	Concrete mixer	74-88
Jack hammer	81-98	Concrete pump	81-84
		Concrete vibrator	76
EXCAVATION & EARTH MOVING		Air compressor	74-87
Bulldozer	80		
Backhoe	72-93	Bulldozer	80
Front end loader	72-84	Cement and dump trucks	83-94
Dump truck	83-94	Front end loader	72-84
Jack hammer	81-98	Dump truck	83-94
Scraper	80-93	Paver	86-88
GRADING AND COMPACTING		**LANDSCAPING AND CLEAN-UP**	
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
		Truck	83-94
PAVING		Front end loader	72-84
Paver	86-88	Dump truck	83-94
Truck	83-94	Paver	86-88
Tamper	74-77	Dump truck	83-94

Source:

- ***U.S. Environmental Protection Agency. Noise From Construction Equipment and Operations. Building Equipment and Home Appliances. NJID. 300.1. December 31. 1971,***

Based on the standards prescribed by Occupational Safety and Health Administration (OSHA-USA) which in-turn are being enforced by Government of India through Model rules framed under the Factories Act. The acceptable limits for each shift being of 8-hour duration, the equivalent noise level exposure during the shift is 90 dB(A).

Hence noise generated due to various activities in the construction camps may affect workers, if equivalent 8-hour exposure is more than the safety limit. ACGIH (American

Conference of Government Industrial Hygienists) proposed an 8-hour Leq limit of 85 dB(A). Exposure to impulses or impact noise should not exceed 140 dB(A). The workers in general are likely to be exposed to an equivalent noise level of 80-90 dB(A) in an 8-hour shift for which all statutory precautions as per laws should be taken into consideration. Noise[2] limits for different working environment are provided in **Table 53.Error! Reference source not found.**

Table 53: Noise Limits for different working Environment

Location/ Activity	Equivalent Level LAeq,8h	Maximum LA max, fast.
Heavy Industry (no demand for oral communication)	85dB (A)	110dB (A)
Light industry (decreasing demand for oral communication)	50-65dB(A)	110 dB(A)
Open offices, control rooms, service contours of smilar	45-50 dB(A)	
Individual offices (no disturbing noise)	40-45dB(A)	
Classrooms lecture halls	35-40 dB(A)	
Hospital	30-35 dB(A)	40 B (A)

Identification of Pollution Sources

Noise sources identified are:

- Construction activities such as demolition of structures, clearing and grubbing, excavation & earth moving, grading and compacting, structure construction crushing
- Transportation of construction material/debris/spoil through heavy vehicles
- Operation of hydraulic rigs for piles

The construction activities will generate temporary noise impacts in the immediate vicinity of the construction site. These noises generated by construction activities is a temporary phenomenon and is limited to construction phase only. Based on the noise level the OSHA Daily Permissible Occupational Noise Level Exposure time prescribe the exposure time for resident, local and people engaged in construction of road is discussed in **Table 54.**

Table 54: OSHA Daily Permissible Occupational Noise Level Exposure[3]

Sr. No.	Duration per day, hours	Sound level dB(A)
1.	8	90
2.	6	92
3.	4	95
4.	3	97
5.	2	100

2 General EHS Guidelines: Occupation Health and Safety; IFC World Bank group.

3 Occupational Safety and Health Administration (OSHA).

Sr. No.	Duration per day, hours	Sound level dB(A)
6.	1 and ½ or 1.5	102
7.	1	105
8.	½	110
9.	14 or less	115

Mitigation Measures for Construction Phase

The high noise levels may cause discomfort to local residents and workers. Following mitigation measures shall be adopted to keep the noise and vibration levels under control.

- The plants and equipment used for construction will strictly conform to Central Pollution Control Board (CPCB) noise standards. Vehicles, equipment 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, helmets and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than90dB(A); the exposure time for the workers should be as per the reference **Table 54.**
- In construction sites within 150 m of human settlements, noisy construction will be stopped between 10 PM and 6 AM except in case of laying of cement concrete pavement for which lower working temperature is a requirement;
- Hot mix plant, batching or aggregate plants shall not be located within 500 m of sensitive land use as schools and hospitals;
- Near to the sensitive receptors such as hospitals and schools, noise barriers such as concrete, wood, metal or double-glazing of windows for façade insulation shall be used;
- Phase demolition, earthmoving and ground-impacting operations so as not to occur in the same time period. Unlike noise, the total vibration level produced could be significantly less when each vibration source operates separately
- Construction machinery will be located away from the settlements;
- Careful planning of machinery operation and scheduling of operations can reduce the noise levels. Use of equipment, emitting noise not greater than 90 dB(A) for the eight-hour operations shift and locating of construction yards at a distance of at least 500 m from any residential areas can be adhered to;
- Use of noise shields to construction machinery and provision of earplugs to the heavy machine operators are some of the mitigation measures, which should be followed by the contractors during the civil works;
- The noise control measures include limitations on allowable grades. Open-graded asphalt and avoidance of surface dressings to reduce tire noise in sensitive areas. Maintenance of proper road surface repairs also helps in reducing noise levels;
- Use of air horns should be minimized during night time. During daytime use of horns should be restricted at few sensitive locations. This can be achieved through the use of sign boards along the roadside;

- The worker should have job rotation and especially for those workers, exposed to higher noise level.
- During the operational stage, the movement of traffic will be the prime source of the noise. Traffic congestion and pedestrian interferences increase the use of horns. This may result in increased noise levels at nearby schools and religious places.

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 should be 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 of at 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 environmentally acceptable manner. Some of the measures are as follows:

- The existing bitumen surface can be utilized for paving of crossroads, access roads, 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 of at 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 its disposal 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 for accommodation debris generated.
- Public perception and consent from the village Panchayats about the location of 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 3121 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 31210 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

During the construction stage of the project elephants are like to come in the project region. The contractor will raise awareness among the workers to prevent any harm to elephants and no issues of human-elephant conflicts occur.

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 join 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 will be the principal source of pollution during the operation stage. The subproject road is mostly located in vast open agricultural land, which will provide adequate dispersion dynamics of gaseous pollutants. Moreover, the majority of the traffic on the subproject road will be on the existing road.

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 CALINE-4, line source model developed by the California Transport Department. Carbon monoxide (CO) is the main component of vehicular pollution. So, the prediction of CO concentration is representative of the impacts of air pollution due to traffic movement.

CALINE - 4 Model

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 CO2, NOx, 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 CALINE-4, a dispersion model based on Gaussian Equation. The current and projected traffic volume of A15 (Kamargaon to Kamarbandha) road has been used for the prediction. CALINE-4 is a dispersion model developed by the California Department of Transportation for the prediction of concentrations of critical atmospheric pollutants (CO,

NOx and PM2.5) along the highways. This model employs a mixing zone concept to characterize pollutant dispersion over the highway and can be used to predict the pollutant concentrations for receptors up to 500 m of the corridor. The model uses the baseline data on existing concentration of pollutants and estimates the incremental emissions due to the project.

Input Parameters:

- **Traffic Data**: The fleet wise traffic volumes for the present study has been taken from the detailed project report of the project. The annual average daily traffic (AADT) data is available for the proposed road through traffic survey. CALINE 4 model needs hour average traffic volume. The total traffic hour volume is further categorized into two-wheeler, four-wheeler, light commercial vehicles (LCV), bus, high commercial vehicles (HCVs) based on traffic survey at existing road.

Table 55: Predicted Traffic Volume Per Hour

Year	Two-wheeler	Three-wheeler	Car	LCV	Bus	Truck	PCU
2020	187	14	103	7	2	3	**280**
2025	250	19	138	9	3	4	**375**
2030	335	25	184	13	4	5	**501**
2035	448	34	247	17	5	7	**671**
2040	600	45	330	22	6	10	**898**

- **Meteorological data:** The study was conducted to predict pollutant concentration for worst-case meteorological conditions. The meteorological parameters such as wind speed, wind direction, wind direction standard deviation, temperature, mixing height and stability condition are used in model.

Table 56: Meteorological Data for CALINE 4

Sr. No.	Baseline Condition Input Data	Values
1	Altitude above Sea Level	102.54 m
2	Wind speed	1.38 m/s
3	Wind direction	North-East (45^{O})
4	Ambient Temperature	$25^{O}C$

- **Road Geometry:** In the CALINE-4 model the entire length of the selected road section is divided into various road links. The division of sections into links has been done in such a way, so that the link can be fairly considered straight stretch of road having homogenous geometry with uniform road width, height and alignment. The coordinates of end points of links specify the location of the links in the model. The maximum number of links in each road section can be 20. The mixing zone width calculated for selected highway corridor is 7m+ 3m + 3m = 13 m as per guideline provided in CALINE4 model.

- **Emission Factors:** Emission factor is one of the important input parameters in CALINE-4 model. In the present study, the emission factors specified by the Automotive Research Association of India (ARAI) have been used for calculation of weighted emission factors. These emission factors have been expressed in terms of type of vehicles and type of fuel used (for petrol and diesel driven passenger cars). Since, there is only one input requirement for total no. of vehicles in the CALINE 4 model, whereas there are different categories of vehicles (viz. two wheelers, cars, bus and trucks) with different year of manufacture and fuel used, it is essential that a single value representing the equivalent or weighted emission factors for all the vehicles is input into the model. The emission factor used to estimate WEF are given below. The traffic data are not available for fuel types, therefore average emission factor is used in this study.

Table 57: Emission factors for different types of Vehicle (ARAI, 2007)

Pollutants	Unit	Two-wheeler	Three-wheeler	Car	LCV	Bus	Truck
CO	g/km	1.036	1.25	1.281	1.56	8.03	6
NOx	g/km	0.312	0.219	0.04	0.288	0.548	1.24
PM2.5	g/km	0.021	0.01	0.031	0.061	0.133	0.133

These projected vehicles would generate various air pollutants among which CO, NO_2 and Particulate matter ($PM_{2.5}$) would be modelled to predict their quantities for the year 2020, 2025, 2030, 2035 and 2040. PM_{10} and SO_2 concentration need not be modeled as sulfur content in the fuel used in vehicles is quite less to cause a significant SO_2 emission. SO_2 emission factor for vehicles is not included in the report on "Emission Factor development for Indian Vehicles" by The Automotive Research Association of India (ARAI). Similarly, Particulate Matter in the emission factor considers only $PM_{2.5}$ as coarse fraction $PM_{2.5}$ to PM_{10} is negligible in vehicle exhaust.

The predicted results of CALINE4 have been tabulated below. Considering the predicted future traffic according to normal growth rate for the years 2020, 2025, 2030, 2035 and 2040, CO, NO_2, and $PM_{2.5}$ levels are predicted. These levels were within the limiting standards as specified in National Ambient Air Quality Standards.

Table 58: Predicted Concentrations of CO in the study location (ppm)

Year	Distance from Road Edge (m)				
	10	**20**	**50**	**100**	**200**
2020	0.6	0.5	0.5	0.5	0.5
2025	0.6	0.6	0.6	0.5	0.5
2030	0.7	0.6	0.6	0.6	0.5
2035	0.8	0.7	0.7	0.6	0.6
2040	0.9	0.8	0.8	0.7	0.6

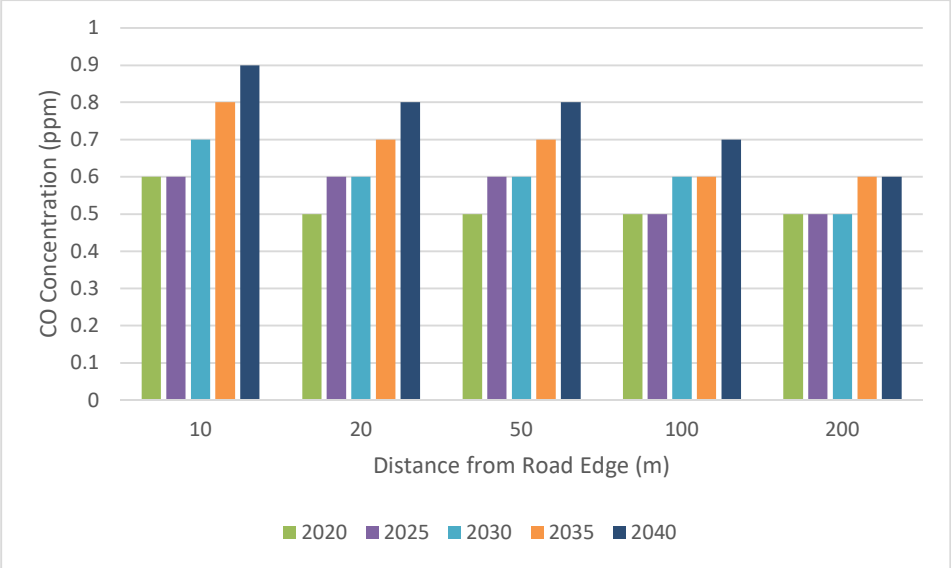


Figure 74: Graph representing Predicted Concentrations of CO in the study location (ppm)

Table 59: Predicted Concentrations of $PM_{2.5}$ in the study location ($\mu g/m^3$)

Year	Distance from Road Edge (m)				
	10	**20**	**50**	**100**	**200**
2020	24.3	23.8	23.3	22.8	22.3
2025	25.6	25	24.3	23.6	23
2030	27.4	26.5	25.6	24.7	23.8
2035	29.7	28.6	27.3	26.2	25
2040	32.9	31.4	29.7	28.1	26.5

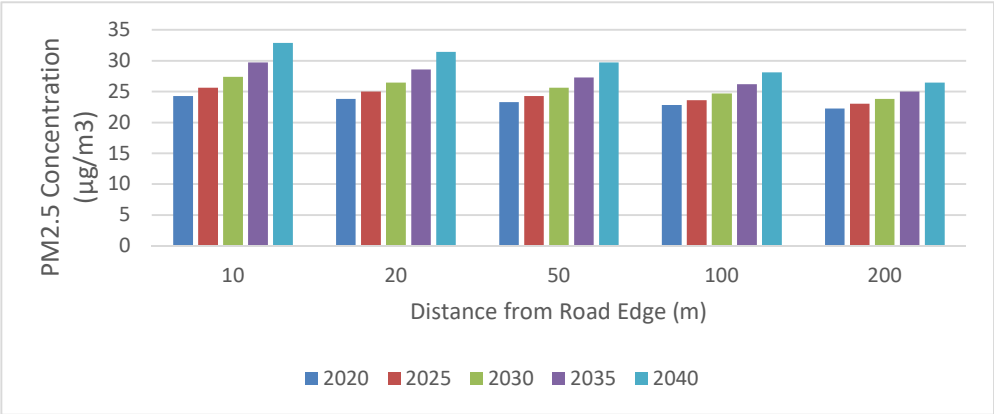


Figure 75: Graph representing Predicted Concentrations of $PM_{2.5}$ in the study location ($\mu g/m^3$)

Table 60: Predicted Concentrations of NO_2 in the study location (ppm)

Year	Distance from Road Edge (m)				
	10	20	50	100	200
2020	0.02	0.02	0.02	0.03	0.03
2025	0.02	0.02	0.03	0.03	0.03
2030	0.02	0.02	0.03	0.03	0.03
2035	0.02	0.03	0.03	0.03	0.04
2040	0.03	0.03	0.04	0.04	0.04

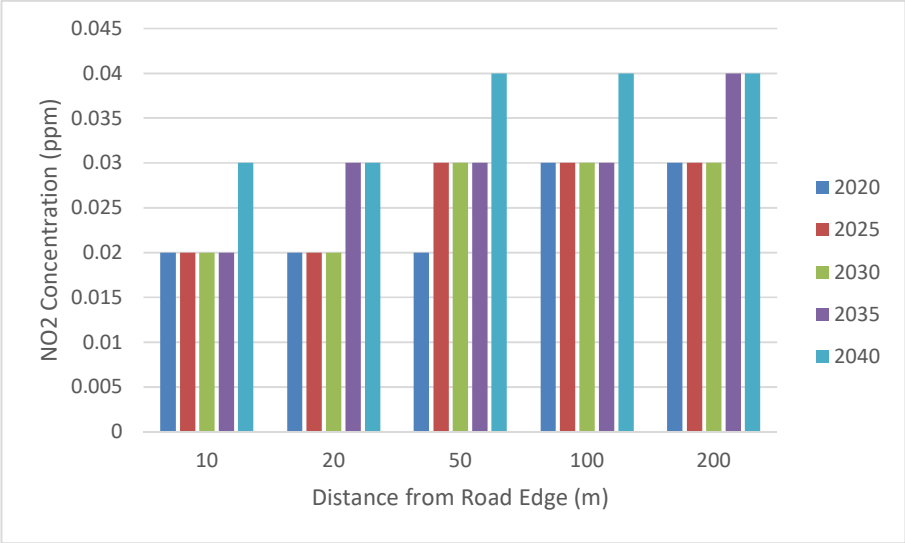


Figure 76: Graph representing Concentrations of NO_2 in the study location (ppm)

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

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).

Noise Modelling Using TNM 2.5

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

Input Parameters

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.

Average Noise Level

All vehicles produce some noise, which is taken as the base and the cumulative noise at the receiver distance due to the whole traffic is estimated. The average noise levels vary depending on the type of vehicle. In order to assess the impact of noise due to the change in traffic density and speed, a small road section of each project road has been selected to develop noise projections for future years 2020, 2025, 2030, 2035, and 2040. In order to assess the impact of traffic on sensitive receptors along the road, receptor locations were set at 50 m, 100 m, 200 m, 300 m, 400 m, 500 m, 600 m, 700 m and 800 m from the center line of the road.

The outputs of the assessment are presented in table below. The **Table 61** shows the noise levels that will be generated by traffic at the respective distance from the centerline of the road. The predicted noise levels are those predicted around built up area considering vehicle speed as 30 kmph. The permissible noise levels in residential area according to Ambient Noise Standards are 55 dB in daytime and 45 dB at nighttime. It can be seen that even without mitigation measures, noise levels in built up area are within the permissible levels except, 50 m from road during night time in the year 2020, 2025, 2030, 2035, and 2040 and

100m for year 2040. The sensitive receptors located within 50m and 100m distance of the road are not operational at night time, hence increased noise will not cause any adverse impact.

Table 61: Anticipated Noise Levels due to projected traffic

Sr. No.	Distance from Centerline (m)	2020		2025		2030		2035		2040	
		Day time	Night time	Day time	Night time	Day time	Night time	Day time	Night time	Day time	Night time
1	50	48.6	45.7	49.8	47	51.1	48.2	52.4	49.4	53.7	50.7
2	100	43.6	41.1	44.8	42.5	46	43.6	47.3	44.9	48.6	46.1
3	200	38.9	36.5	40.1	37.9	41.4	39	42.6	40.3	44	41.5
4	300	36.3	33.6	37.6	35	38.8	36.1	40.1	37.4	41.4	38.6
5	400	34.7	31.8	35.9	33.1	37.2	34.3	38.4	35.6	39.7	36.8
6	500	33.5	30.6	34.7	31.9	36	33.1	37.3	34.3	38.6	35.5
7	600	32.6	29.6	33.8	31	35.1	32.1	36.4	33.4	37.7	34.6
8	700	31.8	28.9	33.1	30.2	34.3	31.4	35.6	32.6	36.9	33.9
9	800	31.2	28.2	32.4	29.6	33.7	30.7	35	32	36.3	33.2

It is evident from the above table that minor increase in noise levels are anticipated due to increase in traffic intensity over the years. However, with mitigation measures like limiting the speed of vehicles around built-up area, the noise levels will be maintained below the permissible limits. The number of sensitive receptors within 50 m distance of the road is very few. Hence, overall noise impacts on sensitive receptors will be insignificant.

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 in Annexure 8.

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

Positive impacts on terrestrial ecology are expected during the project operation stage due to the increase in vegetation and landscaping along the road. The project will coordinate with the local communities to maintain and enhance the trees planted along the state road. “No adverse impact is anticipated during operation stage except accidental damages or absence of proper tree management.

Mitigation Measures: Arrangement shall be made to ensure the survivability of the tree plantation. The tree survivability audit shall also be conducted at least once in a year to assess the effectiveness of the program.

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.

Elephant Movement

During the operation stage the effectiveness of mitigative measures (underpass/ low embankment road section/ rumble strips, informatory /cautionary signage) recommended in design stage shall be monitored. Effectiveness of habitat enhancement measures shall be evaluated. PWRD, Assam should keep record of all accidents. If it is observed after the study that elephants establish a defined movement path and cross the road at specific locations, provision of civil structure shall be made in consultation with forest department. Fresh assessment in case of future widening of the road is recommended.

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.

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 62**.

Table 62: Cumulative Impact Expected Due to Project Development

Sr. No.	Features Affected	Name of Project	Cumulative Impact
1	No of tree Felling Involve	A29_1 (Jorhat to Dholajan)	805
2	Agricultural Land Affected	A29_1 (Jorhat to Dholajan)	The details will be provided after Social Impact Assessment Report is prepared
3	Forest Land Affected	A29_1 (Jorhat to Dholajan)	No forest land will be affected due to the proposed project development
4	Increase in emission rate	A29_1 (Jorhat to Dholajan)	The CO_2 emission rate will increase by 5,584.50 tons/year
5	Influx of labor	A29_1 (Jorhat to Dholajan)	200 labors
6	Structure Affected	A29_1 (Jorhat to Dholajan)	The details will be provided after Social Impact Assessment Report is prepared
7	Incremental load due to NO2, SO2, PM 2.5 and CO	A29_1 (Jorhat to Dholajan)	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

Sr. No.	Features Affected	Name of Project	Cumulative Impact
			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	A29_1 (Jorhat to Dholajan)	The details will be provided after Social Impact Assessment Report is prepared

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.

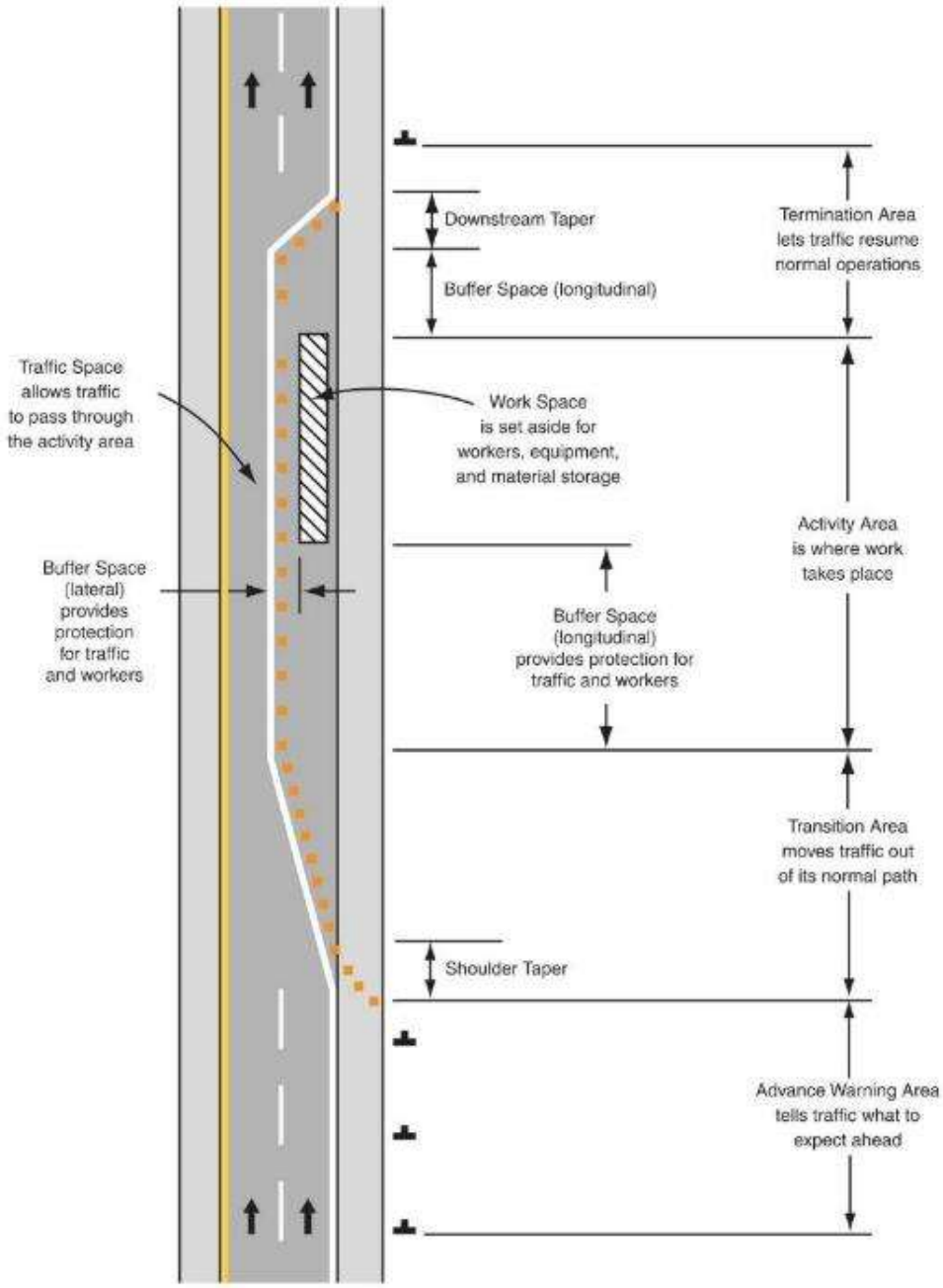


Figure 77: Traffic Management Diagram

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.

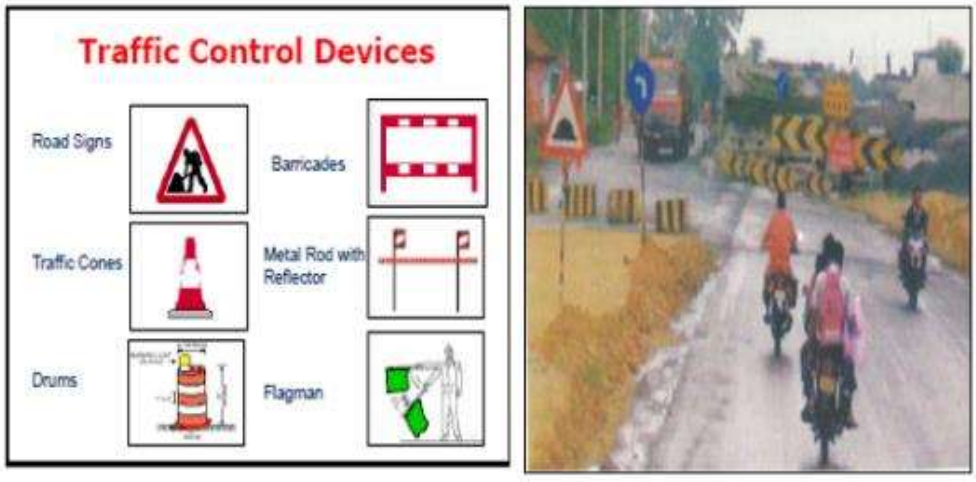


Figure 78: Traffic Control Devices at traffic diversion locations

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 42.094 km of the Major District Road in the State of Assam.
- The road configuration will change from a intermediate 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.
- Construction will take place over 24 months in 2021/2022 and road operation will begin in 2023/2024.
- 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 63: Traffic Composition

Vehicle Type	Traffic Composition (%)
Two Wheelers	50.06
3 Wheelers	1.80
Car/ Vans/ Jeeps	27.23
Mini Buses	0.25
Standard Buses	0.22
Tempo	4.84
LCV's (Goods)	1.36
2-Axle Trucks	2.11
3-Axle Trucks	0.50
Multi-Axle Trucks	0.12
Tractors with Trailer	0.06
Tractors Without Trailer	0.00
Cycle	10.70
Cycle Rickshaw	0.22
Animal Drawn	0.00
Others	0.53

Source: Traffic Study

Traffic forecasts were taken from the detailed project reports prepared for the road section. Maximum PCU of the base year is taken as 4187 consistent with IRC guidelines. The volume/capacity saturation limit was taken at 0.85 for optimum travel speed and fuel consumption. 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 64.**

Table 64: CO_2 Emission Factors

Vehicle Type	Gasoline	Diesel
2-Wheeler	2.28	-
3-Wheeler	2.63	-
Car/Jeeps	2.59	-
LCV	-	3.21
Bus	-	3.61
HCV	-	3.5

It is seen that 2-wheelers, 3-wheelers, and animal-drawn carts have an average trip distance of 22 km of the total road length in each section, whereas all other vehicles do use the entire length as average trip distance. Furthermore, 2-wheelers and 3-wheelers constitute 100% and 90% of the total local traffic.

Estimated carbon emissions: The proposed road upgrading resulting in lower surface roughness and road capacity improvements have implications in CO_2 emissions. Improved roughness results in higher speed and lesser emissions while increase road users result in increased emissions from vehicles. These factors are also affected by traffic congestion i.e. the volume/capacity saturation limit.

Table 65: Emission Standards of Fleet (%)

Vehicle Type	Current Scenario				Year 2051		
	Pre-Euro	Euro I	Euro II	Euro III	Euro I	Euro II	Euro III
2-Wheel	-	50%	50%	-	30%	70%	-
3-Wheel	80%	20%	-	-	40%	60%	-
Cars/ Jeeps	-	40%	40%	20%	-	40%	60%
LCV/Bus/HCV	-	70%	20%	10%	10%	40%	50%

Emissions from road construction were estimated by using the emission factor for rural/ urban roads, by using ADB - Carbon footprint report, which is equivalent to 48,400 kg CO_2/km of road construction

Source: http://www.adb.org/documents/reports/estimating-carbon- footprints-road-projects/default.asp

Estimated Carbon Emissions

The proposed road upgrading resulting in surface roughness and road capacity improvements have implications in CO_2 emissions. Improved roughness results in higher speed and lesser emissions while increase road users increase emissions. These factors are further affected by traffic congestion once the volume/capacity saturation limit.

CO_2 emissions will also result from the processing and manufacturing of raw materials needed to upgrade the project road and in the case of a project, to upgrade and strengthen the road length of 42.094 km, total CO_2 emissions will be of the order of 2037.35 tons.

Table 66: Estimated Total CO2 Emissions during Road Construction

Road	Length (km)	Emission Factor (ton CO_2/km)	CO_2 Emission (tons)
A15	42.094	48.4	2037.35

The design life of roads is 20 years. Total CO_2 emission at the Business-As-Usual scenario was estimated at 8916.64 tons/year, with and without induced traffic is 19533.30 tons/year and 16349.04 tons/year respectively. These values are below the 100,000 tons per year threshold. Therefore, it is not necessary to implement options to reduce or offset CO_2 emissions under the project.

Table 67: CO_2 emissions prediction using TEEMP

Scenario	Length (km)	Emissions (tons CO_2/km/year)	CO_2 Emissions (tons/year)
Business as usual	42.094	211.65	8916.64
Project + Induced	42.094	463.64	19533.30
Project - Induced	42.094	388.06	16349.04

Table 68: Project CO_2 Emissions Intensity Indicators

Particulars	Business-As-Usual	Project (without Induced Traffic)	Project (with Induced Traffic)
tons/km	6,349.37	11,641.85	13,909.30
tons/year	8,916.64	16,349.04	19,533.30
tons/km/year	211.65	388.06	463.64
g/pkm	109.36	76.96	76.85
g/tkm	1,155.53	1,109.06	959.57

The with-project scenarios will be having higher CO_2 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 69: 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 be low.
- **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 Arunachal Pradesh 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 and Arunachal Pradesh 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 (Assam-Arunachal Border), Ranganadi (Assam-Arunachal Border), and the Subansiri (Assam-Arunachal Border). 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 hydro meteorologically homogeneous 22 sub-zones. The project area is falling in subzones 2(a) and 2(b). All structures have been designed for a 50year 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 70.** It must be noted that all these events either simultaneously or in isolation can generate severe disastrous impacts on road infrastructure.

Table 70: 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 soil compaction v. Traffic hindrance and safety	a. Certain critical sections affected by overland flooding of the road raised (vertical alignment, embankment improvement) 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. The highest 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 damage to roads if changes occur in the precipitation pattern	
3	Increased maximum temperature and a higher number of consecutive hot days (heat waves)	i. Concerns regarding pavement integrity, e.g., softening, traffic-related rutting, cracking, fracture, etc. ii. Thermal expansion in bridge expansion joints and paved surfaces Temperature break soil cohesion and increase dust volume which caused health and traffic accidents	a. An adequate binding layer thickness has been proposed to 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	BAU

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 are a) Public Consultations, b) Focus Group Discussions (FGD) c) Key Informants Interviews (KIIs), d) Consultation with Women, e) Consultation with Vulnerable Displaced Persons, f) Consultations with Tribal Population etc.

7.1 Objectives of the Public Consultation

Stakeholder's consultations held with the intent to understand their concerns, apprehensions, overall opinion, and solicit recommendations to improve project design and implementation. Informal meetings, interviews were organized covering the entire project design stage. Consultations provide affected people a platform to ensure incorporation of their concerns in the decision-making process and foster co-operation among officers of PWRD, the community, and the stakeholders to achieve a cordial working relationship for smooth implementation of the project. It inculcates the sense of belongingness in the public about the project.

The discussions held were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the sub-project. They were given a brief outline of the project to which their opinions were required particularly in identifying and mitigating any potential adverse impact.

7.2 Methodology for Consultations

Consultation with the stakeholders, beneficiaries, and community leaders had been carried out using standard structured questionnaires as well as unstructured questionnaires. Questionnaire surveys/ discussions were designed to obtain background information and details of general environmental issues that concern people in the project area. Besides, environmental and social issues were discussed with relevant organizations, government officials, beneficiaries, community leaders, and experts. Besides, personal discussions with officials, on-site discussions with affected stakeholders, and reconnaissance visits have also been made to the project area.

7.3 Stakeholder Consultations

7.3.1 Project Stakeholders

All types of stakeholders were identified to ensure wide coverage as possible.

- Residents, shopkeepers and business people who live and work along the road especially the project affected persons
- All type of road users/commuters
- Executing Agency, Construction Supervision Consultant and Implementing NGOs
- Other government institutions whose remit includes areas or issues affected by the project (state environment and forest department, Pollution Control Board (PCB), Irrigation Department, Public Health Engineering (PHED) Department
- The beneficiary community in general

Table 71: Identified Stakeholders

Level	Type	Key Participants	Response	Influence	Affected
Individual	Local Level Consultations	Persons along the road corridor	Supportive	Medium	Yes, Road users
Individual	Door to Door personal contact	People along the road corridor which are likely to be impacted	Supportive	High	Yes, Due to Land or structure acquisition
Settlement	Focus Group Discussion	Including women, Socially and economically vulnerable	Supportive	High	Yes, due to land or structure acquisition
Common Property Resources	FGD with Community owners/ Leaders/ Caretakers	CPR at the road stretch	Supportive	Low	Yes, by or due to land impacted
Departmental Level Consultations	Focus Group Discussion	Divisional Forest Officer	Supportive	Low	No
	Focus Group Discussion	Assistant Conservator of Forest	Supportive	Low	No
	Focus Group Discussion	GIS Expert	Supportive	Low	No

7.3.2 Consultation with Government Departments

Various Govt. Dept. officials were consulted including PWRD Officials, DFO for forest and wildlife related information, PCCF office for forest and wildlife sanctuary maps, Pollution control board, the statistical officer for Population and demographic profile, Panchayat department for village level information, Survey of India for the topo sheet requirement, Revenue department for the land record information, PHED officers for hand pump relocation and quality assessment, Assam SEB offices for electric pole shifting, etc.

These department officials helped to provide various project-related data and information which helped preparation of reports and data analysis.

Table 72: Consultation with Assistant Conservator of Forest, Golaghat Division

Sr. No.	Respondent	Date	Place	Designation	Department
1	Mr. Rajib Hazarika	22-Jan-2021	Office of Divisional Forest Officer, Golaghat	ACF	Forest
Discussed on:	➢ Suggestions were taken from the ACF for providing protection measures to protect any harm to the Elephants and suggested following latest trends. ➢ Discussed on proposal of low embankment height which will provide ease for the elephants to cross the roads. ➢ The ACF shared that the elephants do not forget the route they take and even after 40-60 years they keep in memory the route taken. ➢ The ACF suggested flyovers or other similar structure may be provided for elephants to cross as they will get used to it later on.				

Figure 79: Tree inventory conducted along with Golaghat Forest Department officials

7.3.3 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 73: Consultation Conducted on Proposed Road

Sr. No.	Village	Date	Participants	Male	Female
1	Sonari Gaon	14/01/20	12	11	1
2	Maut gaon	09/11/20	5	5	0
3	Salmora Dhansiripara	10/11/20	8	4	4
4	Salmora much Adhora	10/11/20	4	3	1
5	1 No. Butolikhowa	10/11/20	6	5	1
6	Changkala Tiniali	10/11/20	6	5	1
7	Thengalgaon	10/11/20	4	4	0
8	Kachupathar	17/01/21	11	8	3
9	Purona Kamargaon	17/01/21	13	10	3
10	Thengal gaon	17/01/21	13	9	4
Total			**81**	**63**	**18**

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 74: Details of Public Consultation at Sonari gaon

Date	Issues Discussed	Response	Participant
14/01/2020	➢ People questioned about embankment design as Assam receive heavy rainfall ➢ People asked about labour requirement ➢ People shared about poor condition of the road and long travel time to Golaghat. ➢ People reported that the air and noise quality at the location is good. ➢ Water quality is also good and used for day-to-day purpose by the residents ➢ Tree cover in the project area is	➢ Suitable embankment design will be done and protection of embankment will be done to prevent it from damage. ➢ During construction phase the contractor will provide employment to the locals as required ➢ The road improvement work will reduce travel time and allow ease in	Total = 12 Male = 11 Female = 1

Date	Issues Discussed	Response	Participant
	moderate and mostly agricultural land are observed along the road ➢ No Wild animals crossing are observed along the project road. Domestic animals can be sighted.	commute.	

Figure 80: Public Consultation at Sonari gaon

Table 75: Details of Public Consultation at Maut gaon

Date	Issues Discussed	Response	Participant
09/11/2020	➢ People questioned about road widening activities ➢ People asked about tree cutting along the road ➢ People asked about bus stop facilities ➢ People reported that the air and noise quality at the location is good. ➢ Water quality is also good and	➢ The existing road will be widened to two lanes with paved and earthen shoulders ➢ The trees within the PRoW will be felled and compensatory plantation will be done as per the direction of the forest department.	Total = 5 Male = 5

Date	Issues Discussed	Response	Participant
	used for day-to-day purpose by the residents ➢ Tree cover in the project area is moderate and mostly agricultural land are observed along the road ➢ No Wild animals crossing are observed along the project road. Domestic animals can be sighted.	➢ Bus stops will be provided at designated locations along the road	

Figure 81: Public Consultation at Maut gaon

Table 76: Details of Public Consultation at Salmora much Adhora

Date	Issues Discussed	Response	Participant
10/11/2020	➢ People questioned about safety provisions along the road ➢ People asked about employment opportunities ➢ People reported that the air and noise quality at the location is good. ➢ Water quality is also good and used for day-to-day purpose by the residents ➢ Tree cover in the project area is moderate and mostly agricultural land are observed along the road ➢ No Wild animals crossing are observed along the project road. Domestic animals can be sighted.	➢ The road design has been done considering safety to the travelers and to prevent accidents. ➢ During the construction stage of the project employment will be provided to the locals as required by the contractor.	Total = 4 Male = 3 Female = 1

Figure 82: Public Consultation at Salmora much Adhora

Table 77: Details of Public Consultation at Salmora Dhansiripara

Date	Issues Discussed	Response	Participant
10/11/2020	➢ People questioned about impact on the adjoining tea estates ➢ People asked about provision of street lights ➢ People shared about poor condition of the road and traffic to Golaghat town. ➢ People reported that the air and noise quality at the location is good. ➢ Water quality is also good and used for day-to-day purpose by the residents ➢ Tree cover in the project area is moderate and mostly agricultural land are observed along the road ➢ No Wild animals crossing are observed along the project road.	➢ The land acquired of the tea estates will be fairly compensated. ➢ Street lights will be provided at suitable junctions ➢ The road improvement work will provide safe and efficient connectivity to Golaghat	Total = 8 Male = 4 Female = 4

Date	Issues Discussed	Response	Participant
	Domestic animals can be sighted.		

Figure 83: Public Consultation at Salmora Dhansiripara

Table 78: Details of Public Consultation at 1 No. Butolikhowa

Date	Issues Discussed	Response	Participant
10/11/2020	➢ People asked about impact of road construction on the adjacent households ➢ People asked about facilities along the road ➢ People asked about road safety features ➢ People reported that the air and noise quality at the location is good. ➢ Water quality is also good and used for day-to-day purpose by the residents ➢ Tree cover in the project area is moderate and mostly agricultural land are observed along the road ➢ No Wild animals crossing are observed along the project road. Domestic animals can be sighted.	➢ The project affected households will be fairly compensated as per the policy. ➢ Bus stop, street lights improved junctions, footpaths etc will be provided along the road ➢ Road safety features such as speed brakers, crash barriers etc will be provided at desired location.	Total = 6 Male = 5 Female = 1

Figure 84: Public Consultation at 1 No. Butolikhowa

Table 79: Details of Public Consultation at Changkala Tiniali

Date	Issues Discussed	Response	Participant
10/11/2020	➢ People reported about the Changkala lake near the road ➢ People asked about impact on the tree along the road ➢ People reported elephants been seen at Borchapari area on other side of the river ➢ People reported that the air and noise quality at the location is good. ➢ Water quality is also good and used for day-to-day purpose by the residents ➢ Tree cover in the project area is moderate and mostly agricultural land are observed along the road ➢ No Wild animals crossing are observed along the project road. Elephants are observed on and off during the harvest season. Domestic animals can be sighted.	➢ The presence of lake will be taken into consideration during the design stage. ➢ Trees within the PRoW will be felled and compensatory plantation will be dones as per the direction of the forest department ➢ Considering elephant movement, provisions in the design will be made	Total = 6 Male = 5 Female = 1

Figure 85: Public Consultation at Changkala Tiniali

Table 80: Details of Public Consultation at Thengal gaon

Date	Issues Discussed	Response	Participant
10/11/2020	➢ People asked about tree plantation activities ➢ People asked about provision considering heavy rainfall of Assam ➢ People reported that the air and noise quality at the location is good. ➢ Water quality is also good and used for day-to-day purpose by the residents ➢ Tree cover in the project area is moderate and mostly agricultural land are observed along the road ➢ No Wild animals crossing are observed along the project road. Domestic animals can be sighted. Elephants are seen during harvest season	➢ Compensatory plantation as per the direction of the forest department will be conducted. ➢ The rainfall and some extra provision will be taken into consideration during the design	Total = 4 Male = 4

Figure 86: Public Consultation at Thengal gaon

Table 81: Details of Public Consultation at Identified Elephant Crossing Location

Date & Place	Issues Discussed	Response	Participant
17/01/2021 Purona Kamargaon, Kachupathar Chankola & Thengal gaon	➢ Elephants are observed during month of November and December ➢ Elephants feed on bananas and harvest crops ➢ No human elephant conflict in the area ➢ Elephants usually come to Borchapari on the other side of the Dhansiri river ➢ No other Wild animals crossing are observed along the project road. Domestic animals can be sighted.	➢ Appropriate low embankment road section will be constructed for ease of movement to the elephants and if feasible an underpass will be provided	Total = 37 Male = 27 Female = 10

Figure 87: Public Consultation at Purona Kamargaon

Figure 88: Public Consultation at Kachupathar

Figure 89: Public Consultation at Thengal gaon

Most of the people interviewed strongly supported 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.

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 90: 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 82** 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 82** shows the result of the public opinion survey carried out in the region.

Table 82: 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,	81	20	61	0

	ponds, wells, and canals				
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 91**. 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 (Figure 4) 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 91**.

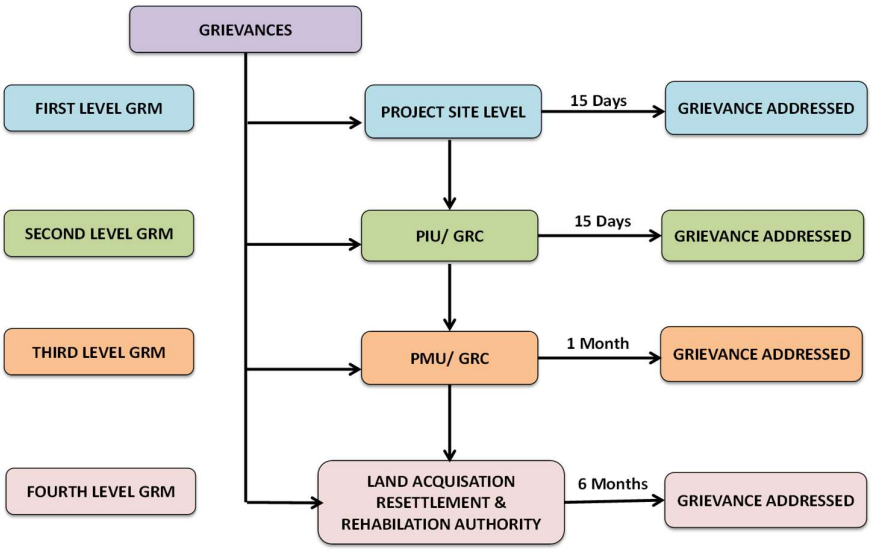


Figure 91: Environmental and Social Grievance Redressal Process

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 that the 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 83.** The Biodiversity Monitoring plan is given in **Table 84**. The Environment Monitoring is given in **Table 85**.

Table 83: Environmental, Social, Health and Safety Management Plan

1. Environment

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
A. Pre-Construction and Design Stage			
1. Tree Cutting			
1.1. 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 (3121) with preference to fast growing species as per the orders of Forest department. • Additional Plantation of 31210 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
2. Joint Field Verification			
2.1.	• 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
B. Construction Stage			
1. Procurement of Machinery - Crushers, Hot-mix Plants & Batching Plants			
1.1. 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	Crushers, Hotmix plants & Batching Plants	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	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.		
2. Procurement of Other Construction Vehicles, Equipment and Machinery			
2.1. 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 metre 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
3. Air Quality			
3.1. 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.	Built-up-Stretches are: Kamargaon, Chankala beel gaon, Heloichi gaon, No. 2 Sensowa gaon, Adharasatra. Gossaisatra	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	• 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	gaon, Halmira gaon, Golaghat, Kaboru, Namsonia, Kamarbandha. Sensitive Receptors in close vicinity are: School (0+500 (R), 1+450 (R), 5+810 (R), 9+310 (L), 9+785 (L), 11+830 (R), 12+150 (R), 13+305 (L), 19+975 (R), 20+490 (R), 21+815 (L), 23+960 (L), 25+388 (R), 25+950 (R), 26+020 (L), 26+455 (L), 26+710 (L), 28+110 (R), 28+508 (R), 28+865 (R), 29+910 (L), 31+595 (R), 33+835 (L), 36+150 (R), 36+838 (R), 39+035 (L), 39+215(R)) Hospitals (0+410 (R), 6+500 (L), 19+975 (R), 24+635 (L), 27+663 (R), 36+385 (L))	
4. Land and Soil			
4.1. 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
4.2. 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 2H:1V. • Earth stockpiles to be provided with gentle slopes to avoid soil erosion.	Throughout the project road	Contractor
4.3. Borrow area management	• Non-productive barren land shall be used for borrowing earth with the necessary permissions/consents.	Borrow site location as identified in DPR or any selected borrow	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	• 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	area	
4.4. 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
4.5. 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. • 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	Fueling station, construction sites, construction camps and disposal location	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	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		
4.6. 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
5. Water Resources			
5.1. 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 • Provision of water harvesting structures to augment groundwater condition in the area	Throughout the project site especially construction sites/camps.	Contractor
5.2. 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	Throughout the Project section	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	the irrigation channels arising due to construction activity • Contractor shall avoid construction works close to the streams or water bodies during monsoon.		
5.3. 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
5.4. 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
5.5. Deterioration in surface water quality due to leakage from vehicles and equipment and wastes from construction camps.	• No vehicles or equipment should be parked or refueled near water bodies to avoid contamination from fuel and lubricants. • 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,	Major ponds along the entire project stretch	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	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.		
6. Flora and Fauna			
6.1. 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 17210 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
7. Construction Camps/ Occupational Health			
7.1. 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 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	Construction camps	Contractor
8. Dismantling of Bridgework / Culverts			
8.1. 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	Bridge and Culvert locations	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	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		
9. Management of Construction Debris			
9.1. 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
9.2. 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. • 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.	Throughout the project corridor	Contractor
10. Site Restoration and rehabilitation			
10.1. 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	Throughout the project corridor, construction camp sites and borrow areas	Contractor

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	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.		
C. Operation Stage			
1. Air Quality			
1.1. 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
2. Noise			
2.1. Noise due to movement of traffic	• Effective traffic management and good riding conditions shall be maintained • The effectiveness of the measures should be monitored and if need be, solid noise barrier shall be placed. • Ambient Noise Quality monitoring.	Sensitive receptors	Operation and Maintenance Agency
3. 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
4. Water resources			
4.1 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
4.2 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	Near water bodies and cross drainage structures and side	Operation and Maintenance Agency

Environmental Issues	Measures to be adopted	Location	Implementation Responsibility
	drains and other channels/streams. • Monitoring of water borne diseases due to stagnant water bodies	drains	
5. 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
A. Pre-Construction and Design Stage			
1. 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 • 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.	Land Acquisition involved along the project road. Details to be provided in Social Assessment report	PWRD, ASSAM
2. Relocation of Cultural Property			
2.1. 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	Throughout project corridor, if any	Civil Construction Contractor

Social Issues	Measures to be adopted	Locations	Implementation Responsibility
	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.		
B. Construction Stage			
1. Labour Codes			
1.1. 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
2. Procurement of Machinery - Crushers, Hot-mix Plants & Batching Plants			
1.2. 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. • 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.	Crushers, Hotmix plants & Batching Plants	Contractor
3. 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
4. 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
C. Operation Stage			
1. Noise			
1.1. 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

Health Issues	Measures to be adopted	Locations	Implementation Responsibility
A. Construction Stage			
1. Air Quality			
1.1. 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. • Provision of PPEs to workers.	Throughout the project corridor	Contractor
2. Noise			
1.2. 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	Kamargaon, Chankala beel gaon, Heloichi gaon, No. 2 Sensowa gaon, Adharasatra. Gossaisatra gaon, Halmira gaon, Golaghat, Kaboru, Namsonia, Kamarbandha. Sensitive Receptors in close vicinity are: School (0+500 (R), 1+450 (R), 5+810 (R), 9+310 (L), 9+785 (L), 11+830 (R), 12+150 (R), 13+305 (L), 19+975 (R), 20+490 (R), 21+815 (L), 23+960 (L), 25+388 (R), 25+950 (R), 26+020 (L), 26+455 (L), 26+710 (L), 28+110 (R), 28+508 (R), 28+865 (R), 29+910 (L), 31+595 (R), 33+835 (L), 36+150 (R), 36+838 (R), 39+035 (L), 39+215(R)) Hospitals (0+410 (R), 6+500 (L),	Contractor

Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	Contractor.	19+975 (R), 24+635 (L), 27+663 (R), 36+385 (L))	
2. Land and Soil			
2.1. 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
3. Construction Camps/ Occupational Health			
3.1. 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
1.3. 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 construction camp	Contractor

Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	• 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".		
1.4. 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),	All construction camp	Contractor

Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	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 • Work schedules are adjusted to provide time for proper cleaning and disinfecting as required.		
1.5. 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	All construction camp	Contractor

Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	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		

Health Issues	Measures to be adopted	Locations	Implementation Responsibility
	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.		

4. Safety

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
A. Pre-Construction and Design Stage			
1. Alignment			
1.1. 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 99 CD structures proposed for improvement Covered drain = 5.178 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. • 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.	Built-up-Stretches are: Kamargaon, Chankala beel gaon, Heloichi gaon, No. 2 Sensowa gaon, Adharasatra. Gossaisatra gaon, Halmira gaon, Golaghat, Kaboru, Namsonia, Kamarbandha. Sensitive Receptors in close vicinity are: School (0+500 (R), 1+450 (R), 5+810 (R),	DPR Consultant during preliminary and detailed design

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	• 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	9+310 (L), 9+785 (L), 11+830 (R), 12+150 (R), 13+305 (L), 19+975 (R), 20+490 (R), 21+815 (L), 23+960 (L), 25+388 (R), 25+950 (R), 26+020 (L), 26+455 (L), 26+710 (L), 28+110 (R), 28+508 (R), 28+865 (R), 29+910 (L), 31+595 (R), 33+835 (L), 36+150 (R), 36+838 (R), 39+035 (L), 39+215(R)) Hospitals (0+410 (R), 6+500 (L), 19+975 (R), 24+635 (L), 27+663 (R), 36+385 (L))	
2. 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 • 99 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 = 5.178 km	DPR Consultant during preliminary and detailed design
3. **Shifting of Utilities and common property resources**			
3.1. 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. • 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	Throughout project corridor	Contractor

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	• 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.		
B. Construction Stage			
1. Noise			
1.1. Noise from construction vehicles, equipment and machinery.	• PPEs to workers	Kamargaon, Chankala beel gaon, Heloichi gaon, No. 2 Sensowa gaon, Adharasatra. Gossaisatra gaon, Halmira gaon, Golaghat, Kaboru, Namsonia, Kamarbandha. Sensitive Receptors in close vicinity are: School (0+500 (R), 1+450 (R), 5+810 (R), 9+310 (L), 9+785 (L), 11+830 (R), 12+150 (R), 13+305 (L), 19+975 (R), 20+490 (R), 21+815 (L), 23+960 (L), 25+388 (R), 25+950 (R), 26+020 (L), 26+455 (L), 26+710 (L), 28+110 (R), 28+508 (R), 28+865 (R), 29+910 (L), 31+595 (R), 33+835 (L), 36+150 (R), 36+838 (R),	Contractor

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
		39+035 (L), 39+215(R)) Hospitals (0+410 (R), 6+500 (L), 19+975 (R), 24+635 (L), 27+663 (R), 36+385 (L))	
2. Land and Soil			
2.1. 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
3. Flora and Fauna			
3.1. 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
4. Traffic Management and Safety			
4.1. 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. • 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	Throughout the project corridor	Contractor

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	and safety. Conduct of regular safety audit on safety measures.		
4.2. 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
4.3. 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. • 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.	Throughout the project corridor, construction sites	Contractor
4.4. Pedestrians, cattle movement	• Temporary access and diversion, with proper drainage	Near habitation on both sides of schools,	Contractor

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	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.	temples, hospitals, graveyards, construction sites, haulage roads, diversion sites.	
C. Operation Stage			
1. Noise			
1.1. Noise due to movement of traffic	• Speed limitation and honking restrictions near sensitive receptors locations.	Sensitive receptors	Operation and Maintenance Agency
2. Maintenance of Right of Way and Safety			
2.1. 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. • Ensure no fuel accumulation and clearances of vegetation by burning near forest areas to avoid forest fires	Throughout the corridor especially near accident prone curves and forest areas	Operation and Maintenance Agency
2.2. 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	Throughout the Project route	Operation and Maintenance Agency

Safety Issues	Measures to be adopted	Locations	Implementation Responsibility
	• 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.		
2.3. 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 84: Biodiversity Management Plan

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	Overall Sensitive Fauna	Throughout the project stretch	Contractor	CSC/ PIU

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
		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, NOC for the same was given by the Department of Forest, Assam, (Annexure 7).				
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. • 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	• 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

Sl. No.	Type of Impact	Mitigation Measure	Applicable Wild Fauna. Avifauna, Fisheries	Specific Location	Responsibility	Supervision
	survey along the corridor)					
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. • 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 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	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
		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 85: 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 (24 Samples)	Contractor through approved monitoring agency
	Operation				24 hr. continuous, for three seasons for a year (once in a season)	Ambient Air Quality Monitoring (At 1 location where environmental monitoring during baseline data generation done) (12 Samples)	
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 (24 Samples)	Contractor through approved monitoring agency
	Operation				24 hr. (once in a	Near Sensitive and	

Attribute	Project Stage	Parameter	Special Guideline	Standards	Frequency & Duration	Location	Implementation
					month) for three seasons in a year for 1 year	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 (24 Samples) Discharge Water Quality (As per suggestion in monitoring plan)	Contractor through approved monitoring agency
	Operation				Once in a Season for three seasons in a year for 1 year	(12 Samples)	
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 (24 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 (12 Samples)	
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	Construction	Rapid audit as per	Hygiene, drainage	IRC guidelines	Construction	Quarterly during construction	Contractor with

Attribute	Project Stage	Parameter	Special Guideline	Standards	Frequency & Duration	Location	Implementation
sites and labour camps		reporting format	Medical Facilities Etc.		Sites and Camp	period	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 approved by Authority Engineer	As approved by Authority Engineer	Throughout the stretch including construction sites, crusher, diversions, Hot Mix Plant, earthwork, demolition site etc.	Occurrence of accidents	Contractor
	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 by PWRD.

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 environmental components 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 construction namely:

- 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 86: 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 CSC to 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 92** shows the implementation arrangement for Asom Mala Program.

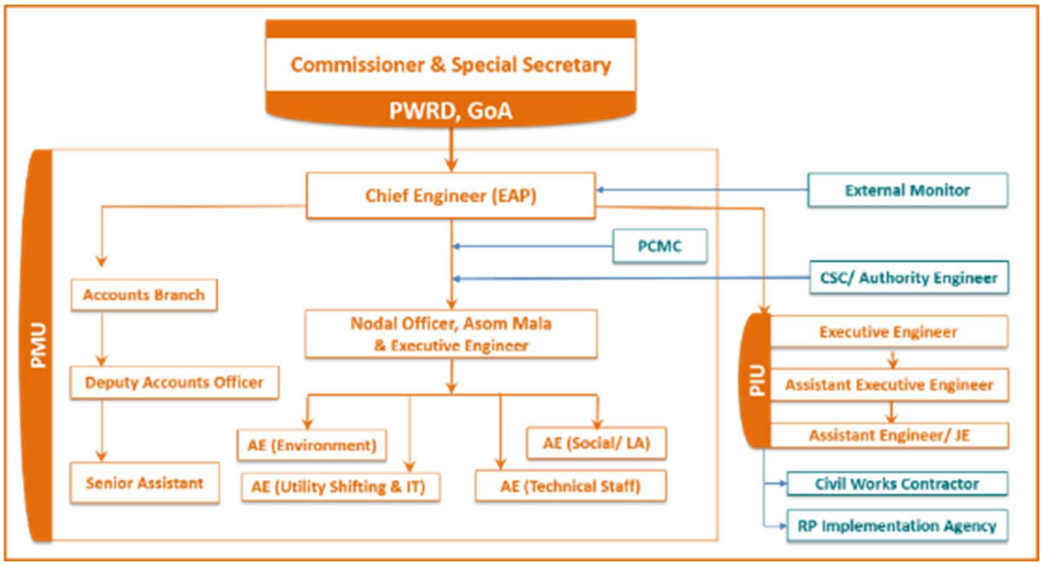


Figure 92: Institutional Arrangement for Implementation of ESMP

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 87**.

Table 87: 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 62,973,777** 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 88** (Civil Cost) and **Table 89** (Non-Civil Cost).

Table 88: 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	12	2500	30,000.00
			Construction sites near sensitive locations	No. of Samples	12	2500	30,000.00
			At 2 location during operation stage where monitoring had been done during construction stage	No. of Samples	12	2500	30,000.00
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	12	1000	12,000.00
			Near known nesting sites - as directed by the Engineer	No. of Samples	12	1000	12,000.00
			During Operation Stage as directed by the Engineer	No. of Samples	12	1000	12,000.00
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	24	4000	96,000.00
			Discharge Water Quality testing during Operation Stage	No. of Samples	12	4000	48,000.00
1.4			Soil Quality Testing along the project road in accordance with CPCB norms				
			During Construction stage at productive agricultural lands abutting	No. of Samples	24	4200	100,800.00

Sr. No.	SOR Item No.	Ref. of MoSRT&H	Description	Unit	Quantity	Rate (INR)	Amount (INR)
			traffic detours and traffic diversions, to be identified by the Engineer				
			During Operation stage At accident/spill locations involving bulk transport carrying hazardous material.	No. of Samples	12	4200	50,400.00
	Total monitoring Cost						**421,200.00**
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 chainage CH. 6+250 (R), 23+500 (L), 36+300 (L)	sqm	5750	31	178,250.00
	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 chainage 6+250 (R), 23+500 (L), 36+300 (L)	Meter	1010	81	81,810.00
2.2			***Oil Interceptors***				
			Oil interceptors at parking/ servicing of construction vehicles	No.	2	60000	120,000.00
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.	Rm	100	4000	400,000.00

Sr. No.	SOR Item No.	Ref. of MoSRT&H	Description	Unit	Quantity	Rate (INR)	Amount (INR)
			School location: 31+595 (R) and 36+150 (R)				
	Total Mitigation / Enhancement Cost during Construction phase						**780,060**
	Total Environmental Management Cost						**1,201,260**
	Total Environmental Management Cost (Including GST @ 12%)						**1,345,411**

Table 89: 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 [Letter No. B/Road Side Tree/Glt Divn/2020/2153-55]	m3			13,086,770
			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.	31210	831	25,935,510
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.	31210	359	11,204,390
			Sub Head No-3 Administrative Charges including logistics				
5			Data processing, administrative support, stationery etc.	LS			292,000
			Digital Camera for the Environment Cell	No.	1	35990	35,990

Sr. No.	SOR Item No.	Ref. of MoSRT&H	Description	Unit	Quantity	Rate (INR)	Amount (INR)
			Sub Head No-4 Biodiversity Management				
6			Budget for Biodiversity Management Plan				4,056,667
			Sub Head No-5 Environmental Awareness and Training				
7			Providing Environmental awareness and training during first 5 years of project implementation	Past Project Experience			414,000
Total Cost							**55,025,327**
Total Cost @ 12% GST							**61,628,366**

10. Conclusions and Recommendations

The proposed project A15 Dhodar Ali (Kamargaon on NH 37 to Kamarbandha) 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 project road lies at a distance of 5.5 km from the Nambor Doigrung Wildlife Sanctuary. 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:

- **3121** trees will need to be cut with the prior permission of forest authorities. Compensatory Tree plantation of **31210** trees 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.
- There are 3 identified trees of cultural importance along the road out of which only 1 is required to be felled due to constraints in geometric improvement of the alignment.

- 3 Elephant crossing locations were identified by the ACF, Golaghat forest division, to prevent any harm to the elephants while crossing underpass for elephant crossing at stretch 1 & 2 is proposed and a road section with low embankment and gentle slide slope has been proposed at stretch 3 to provide ease of movement to the elephants.
- 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's Environmental 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/m^3	Annual* 24 hours**	50 80	20 80	- Improved West and Geake - Ultraviolet Fluorescence
NOx ug/m^3	Annual* 24 hours**	40 80	30 80	- Modified Jacob and Hochheiser - Chemiluminescence
PM10 ug/m^3	Annual* 24 hours**	60 100	60 100	- Gravimetric - TEOM - Beta Attenuation
PM2.5 ug/m^3	Annual* 24 hours**	40 60	40 60	- Gravimetric - TEOM - Beta Attenuation
Ozone (O3) ug/m^3	8 Hours** 1 Hour**	100 180	100 180	- UV Photometric - Chemiluminescence - Chemical Method
Lead ug/m^3	Annual* 24 hours**	0.50 1.0	0.50 1.0	- AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
CO ug/m^3	8 Hours** 1 Hour**	2000 4000	2000 4000	- Non-Dispersive Infra-Red Spectroscopy
NH3 ug/m^3	Annual* 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method
Benzene (C6H6) ug/m^3	Annual*	05	05	- Gas Chromatography based Continuous Analyzer - Adsorption followed by GC Analysis
Benzo Pyrene-Particulate Phase only ug/m^3	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
Arsenic ng/m^3	Annual*	06	06	- AAS/ICP Method after sampling on EPM 2000 or equivalent filter paper
Nickel ng/m^3	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)

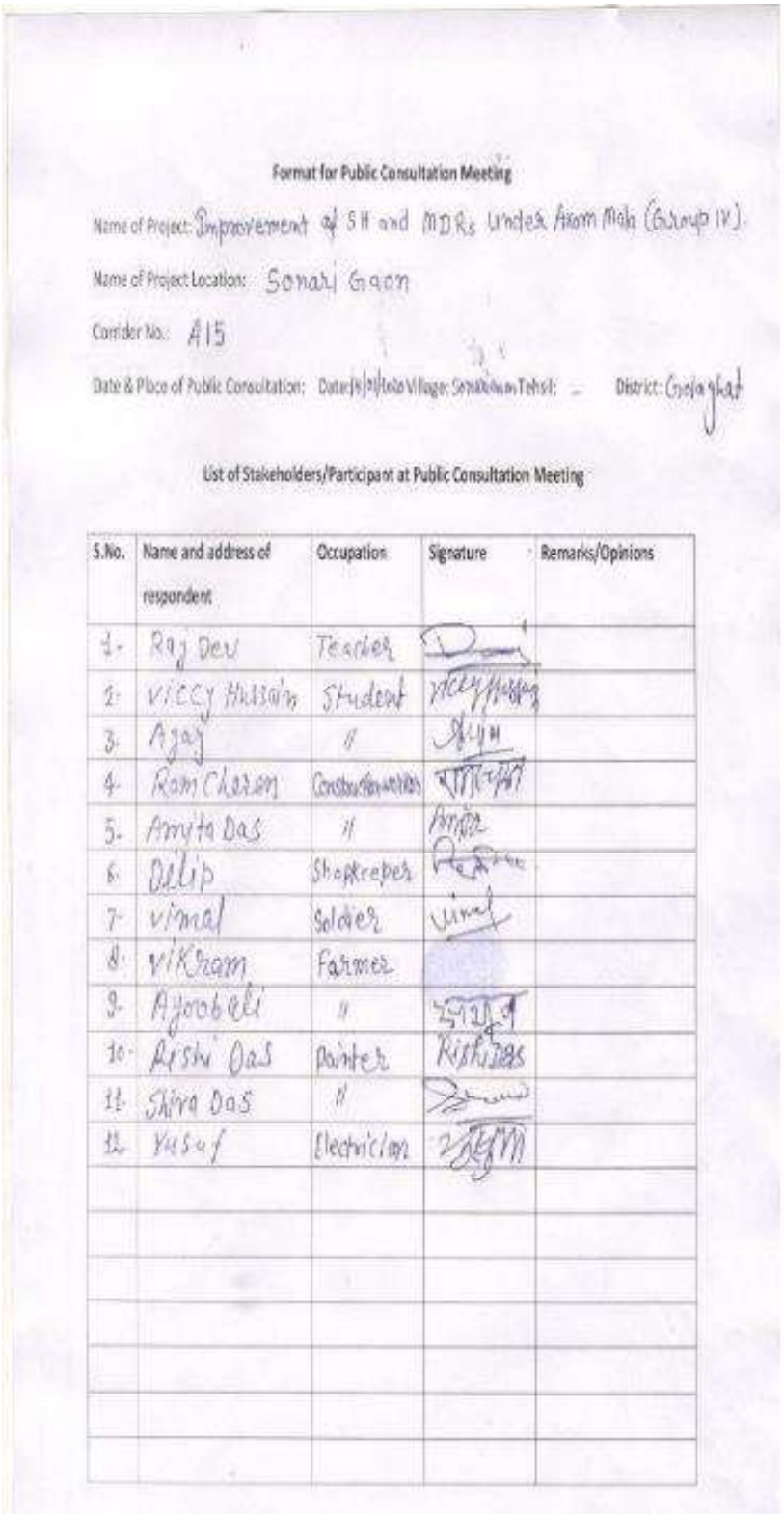
Category	Noise level, Leq dBA	
	Day Time	Night time
Noise sensitive area, low density residential, institutional (School, Hospital), worship areas	50	40
Suburban residential, Medium density areas, public spaces, parks, recreational areas	55	45
Urban residential, high density areas, designated mixed development 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



Format for Public Consultation Meeting

Name of Project: Improvement of SH and MDRs under Asom Mala (Group IV).

Name of Project Location: Sonari Gaon

Corridor No.: A15

Date & Place of Public Consultation: Date[s]/[s]/[s] Village: Sonari Gaon Tehsil: — District: Golaghat

List of Stakeholders/Participant at Public Consultation Meeting

S.No.	Name and address of respondent	Occupation	Signature	Remarks/Opinions
1.	Raj Dev	Teacher		
2.	Vicky Hussain	Student		
3.	Ajay	"		
4.	Ram Charan	Construction worker		
5.	Amita Das	"		
6.	Dilip	Shopkeeper		
7.	Vimal	Soldier		
8.	Vikram	Farmer		
9.	Ajoobali	"		
10.	Rishi Das	Painter		
11.	Shiva Das	"		
12.	Yusuf	Electrician		

(1)

Environmental Assessment Study

Public Consultation Attendance

Name of Project:	Asom Mala		
Name of Project Road:	A15 (Kamargaon to Kamarbandha)		
Project package no.:	Group 4 - A15		
Chainage:		**Date:**	9/11/2020
Location:	Mautgaon 26.535226 94.081115	**District:**	Golaghat
No of Participants			

Sr. No.	Name of Respondent	Village Name	Occupation	Mobile No.	Signature
1.	Debajit Gogoi	Chutiagaon	Business	7086570161	
2.	Bhaba Gogoi	Mautgaon	Shopowner	9476555262	
3.	Jageshwar Gogoi	-11-	-11-	-11-	
4.	Bhaskar Bharali	Chutiagaon	-11-	7002315199	
5.	Diganta Bora	Kamgaon	-11-	6003214909	

(2)

Environmental Assessment Study

Public Consultation Attendance

Name of Project:	Asom Mala		
Name of Project Road:	A15 (Kamargaon to Kamarbandha)		
Project package no.:	Group 4 - (A15)		
Chainage:		**Date:**	10/11/20
Location:	Salmora Dhanshripar	**District:**	Golaghat
No of Participants	Total = 08 (Male = 04 ; Female = 04)		

Sr. No.	Name of Respondent	Village Name	Occupation	Mobile No.	Signature
1	Rajesh Rajbongshi	Salmora Dhanshripar	Shopowner	9864558066	
2	Bija Rajbongshi	Salmora Dhanshripar	"	—	Eliza Rajbongshi
3	Lili Rajbongshi	Salmora Dhanshripar	"	—	
4	Palabi Das	"	Shopowner	9365379920	Palabi Das
5	Bipul Nath	Botolikhua	Business	—	Bipul Nath
6	Susma Nath	Botolikhua	House wife	—	
7	Ranjit Das	Salmora Dhanshripar	Business	9854132756	R. Das
8	Sujit Das	"	"	9707523774	Sujit Das

Environmental Assessment Study

Public Consultation Attendance

Name of Project:	Asom Mala		
Name of Project Road:	A15		
Project package no.:	Group 4 (A15)		
Chainage:		**Date:**	10/11/20
Location:	Salmora Mukh Adhersatra	**District:**	Golaghat
No of Participants	Total = 04 (Male = 03 ; Female = 01		

Sr. No.	Name of Respondent	Village Name	Occupation	Mobile No.	Signature
1	Md. Anfos Ali	Adhersatra	Shopowner	7086308567	Md Anfoos Ali
2	Sanjib Bora	Adhersatra	Busines	6003061878	Sanjib Bora
3	Mabiba Begum	Salmora Mukhsatra	Shopowner	8011076512	Mabiba Begum
4	Putul Ali	"	"	7638071660	Putul Ali

Environmental Assessment Study

Public Consultation Attendance

Name of Project:	Axom Mala		
Name of Project Road:	A15 (Kamargaon to Kamarbandha)		
Project package no.:	Group 4 - A15		
Chainage:		**Date:**	10/11/20
Location:	1. No. Rutolikhua	**District:**	Golaghat
No of Participants	Total = 06 (Male = 05 ; Female = 01)		

Sr. No.	Name of Respondent	Village Name	Occupation	Mobile No.	Signature
1	Shidhartha Tanti	1. No Rutolikhua	Shopowner	8011659394	
2	Ananta Saikia	"	Driver	9365639122	Ananta Saikia
3	Sanjoy Tanti	"	Shopowner	6003671821	Sanjoy
4	Sujit Bora	"	Shopowner	6000766464	Sujit
5	Sunali Ohar Keot	"	Housewife	———	Sunali Ohar (Keot)
6	Prakash Saha	"	Shopowner	7002264001	

Environmental Assessment Study

Public Consultation Attendance

Name of Project:	Asom Mala		
Name of Project Road:	A15		
Project package no.:	Group 4 - A15		
Chainage:		**Date:**	10/11/20
Location:	Changkola Tinali,	**District:**	Golaghat.
No of Participants	Total = 06 (Male = 05, Femal = 01)		

Sr. No.	Name of Respondent	Village Name	Occupation	Mobile No.	Signature
1	Mohan Gogoi	Changkola	Shopowner	6002136832	Mohan Gogoi
2	Punyashwar Bhuyan	"	Driver	8116646192	P Bhuyan
3	Pranab Gogoi	"	—	—	
4	Hemanta Konwar	Khumtai Nagar	Self employed	9577338167	HKonwar
5	Samir Gogoi	"	Shopowner	—	S Gogoi
6	Pinki Gogoi	Khumtai Nagar	Student	—	Pinki Gogoi

Environmental Assessment Study

Public Consultation Attendance

Name of Project:	Asom Mala		
Name of Project Road:	A15		
Project package no.:	Group 4 - A15		
Chainage:		**Date:**	10/11/20
Location:	Thengalgaon	**District:**	Golaghat
No of Participants	Total = 04 (Male = 04)		

Sr. No.	Name of Respondent	Village Name	Occupation	Mobile No.	Signature
1	Moni Tengal	Thengalgaon	Shopowner	9859729621	Moni Tengal
2	Tarun Bora	11	Farmer	9678301990	Tarun Bora
3	Mayan moni Thengal	11	Private	9101129847	Thengal
4	Moni mohan Thengal	11	Farmer	9859300651	

Environmental Assessment Study

Public Consultation Attendance

Name of Project Road:	A 15		
District:		**Date:**	17-01-2021
Place:	Kochu pathen. (64 300)		

Sr. No.	Name of Respondent	Gender	Mobile No.	Signature
1	Sri Abhorik Hatibaruah	M	6003747770	Abhorik Baruah
2	Sri Dipu Gogoi.	M	9365203384	Dipu Gogoi
3	Soi. Amil Gogoi	M	7002699600	
4	Sanjib Bhagabain	M	6001261543	
5	Sri Bikuwa Gogoi	M	9678776734	Bikuwa
6	Sri Surjit Saikia	M	6352906582	
7	Miss Bhanu Bhagabati	F	9954358529	Bhagabati.
8	Miss padmini Gogoi	F	8876168416	P. Gogoi
9	Miss Rupa Gogoi	F		Rupa Gogoi
10	Sri uttam Saikia	M	8471846628	Uttam.
11	Abhijit Saikia	M		Abhijit Saikia
12				

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Environmental Assessment Study

Public Consultation Attendance

Name of Project Road:	A-15		
District:	Golaghat.	Date:	17-01-2021
Place:	Purana Kamargaon. (1+200)		

Sr. No.	Name of Respondent	Gender	Mobile No.	Signature
1.	Bishnu Ranjan Phukan	M	8011011110	
2.	Lachit Gogoi	M	8822698171	Lachit Gogoi
3.	Lalit Goswami	M	8822310452	Lalit Goswami
4.	Ram Phukan	M	9577120160	
5.	Rupeswar Gogoi	M	7086816448	
6.	Anu Gogoi	F	8133918352	Anu Gogoi
7.	Bulu Gogoi	F	7086748862	Bulu Gogoi
8.	Krishna Boruah	M	9435159453	
9.	Alokesh Goswami	M	8822310452	Alokesh Goswami
10.	Rai Saikia	M	9011685742	
11.	Nareshor Phukon	M	6000069596	Nareshor Phukon
12.	[illegible]	F		
13.	Pinku Bora	M	7896343103	

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Environmental Assessment Study

Public Consultation Attendance

Name of Project Road:	A-15		
District:	Golaghat.	Date:	17-01-2021
Place:	Thengal Gaon. (3+800)		

Sr. No.	Name of Respondent	Gender	Mobile No.	Signature
1	Jyotsna Borah	F	8822124319	Jyotsna Borah
2	Paposri Thengal	F	6000621202	Paposri Thengal
3	Porakhsroni Thengal	F	8822013295	Porakhsroni Thengal
4	Mrs Junti Borah	F	6001597543	Junti Borah
5	Dipsikha Borah	F	8638899467	Dipsikha Borah
6	miss Pina Bora.	F	9127161606.	Pina Bora.
7	Rajina Thengal	F	9435882911	Rajina Thengal
8	Nikunja Bora	F	9864377269	Nikunja Bora
9	Mousoma Kuch	F	9864377269	Mousoma Kuch.
10	Prakash Borah.	M	9127161606	Borah.
11	L. Bora.	M		L. Bora.
12	Sri Pradip Thengal	M	9127862160	Pradip Thengal.
13	Sri Dulu Thengal	M	7896965743	D. Thengal

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Public Consultation at Sonari gaon

Public Consultation at Maut gaon

Public Consultation at Salmora much Adhora

Public Consultation at Salmora Dhansiripara

Public Consultation at 1 No. Butolikhowa

Public Consultation at Changkala Tiniali

Public Consultation at Purona Kamargaon

Public Consultation at Kachupathar

Public Consultation at Thengal gaon

Annexure 5: GRM Information Sheet

SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Hindi, 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:

অভিযোগ পঞ্জীয়ন প্ৰ-পত্ৰৰ নমুনা

প্ৰকল্প ৰূপায়ণ সম্পৰ্কত অসম চৰকাৰৰ গড়কাপ্তানী বিভাগে অভিযোগ, পৰামৰ্শ, অনুসন্ধান, মন্তব্য বিচাৰে। স্পষ্টীকৰন আৰু প্ৰতিক্ৰিয়াৰ বাবে অভিযোগকাৰীৰ লগত যোগাযোগ কৰিবলৈ সক্ষম হবলৈ আমি অভিযোগকাৰী সকলক তেওঁলোকৰ নাম আৰু ঠিকনাৰ তথ্য দিবলৈ আহ্বান জনাওঁ।

আপুনি যদি আপোনাৰ ব্যক্তিগত তথ্য দিব বিচাৰে আৰু সেই তথ্য গোপন ৰাখিব বিচাৰে, তেনেহলে আপোনাৰ নামৰ ওপৰত (গোপনীয়/CONFIDENTIAL) লিখি দিব/টাইপ কৰি দিব।

তাৰিখঃ	পঞ্জীয়নৰ স্থানঃ	
যোগাযোগৰ তথ্য/ব্যক্তিগত তথ্যঃ		
নামঃ	লিঙ্গঃ	বয়সঃ
ঠিকনাঃ		
গাওঁ/চহৰঃ		
জিলাঃ		
ফোন নং		
ই-মেইলঃ		
অভিযোগ/পৰামৰ্শ/মন্তব্য/প্ৰশ্ন - আপোনাৰ অভিযোগৰ সবিশেষ (কোন, কি, ক'ত আৰু কেনেকৈ) তলত দিবঃ		
যদি সংযোজন/চিঠি/টোকা আদি গাথি দিয়া হৈছে, তেনেহলে ইয়াত টিক চিন্হ দিবঃ		
প্ৰতিক্ৰিয়া অথবা আপোনাৰ অভিযোগ/মন্তব্য সংক্ৰান্তত নতুন তথ্যৰ বাবে আমাক আপোনাৰ লগত কেনেধৰণে যোগাযোগ কৰাটো বিচাৰে?		

কার্য্যালয়ৰ ব্যৱহাৰৰ বাবে

পঞ্জীয়ন কৰোতাঃ (অভিযোগ পঞ্জীয়নকাৰী বিষয়াৰ নাম)
যদিঃ • টোকা/চিঠি • ই-মেইল • মৌখিক/টেলিফোনযোগে
পর্যবেক্ষণকাৰীঃ (পর্যবেক্ষণকাৰী বিষয়াৰ নাম আৰু পদবি)
ইতিমধ্যে লোৱা ব্যৱস্থাঃ
ইতিমধ্যে লোৱা ব্যৱস্থা প্রকাশ কৰা হৈছে নে নাইঃ ❖ হৈছে ❖ হোৱা নাই
প্রকাশ কৰাৰ ধৰণঃ

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 1:2 (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 1:4 (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 1:2 (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 1:2 (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 1:2 (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 1:2 (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 emergency preparedness 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			

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
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 to typically withstand local weather and climate but now underexposures 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 (°C/yr)	+0.02	0.01	No trend	0.01	0.02
Mean Min Temp (°C/yr)	+0.01	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 on LHS

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2140	Debodaru	0.85	5	Green	Inside
2141	Sewali	0.4	6.1	Green	Inside
2142	Debodaru	0.3	5.9	Green	Inside
2143	Mango	0.5	6.2	Green	Inside
2144	Krishnosura	1.2	6.4	Green	Out Side
2145	Ahat	2.1	7.3	Green	Out Side
2146	Bokul	2.2	7.4	Green	Out Side
2147	Valow	1	7.3	Green	Out Side
2148	Ekesia	1.7	7.9	Green	Out Side
2149	Krishnosura	1.3	5.3	Green	Out Side
2150	Ahat	4.5	7.1	Green	Out Side
2151	Krishnosura	1.8	7.7	Green	Out Side
2152	Moj	0.5	5.9	Green	Out Side
2153	Sasi	0.6	5.6	Green	Inside
2154	Sasi	0.35	7.9	Green	Inside
2155	Neem	0.9	7.2	Green	Inside
2156	Bel	0.7	5.6	Green	Inside
2157	Poma	0.5	77.6	Green	Inside
2158	Krishnosura	1.1	7.9	Green	Inside
2159	Krishnosura	0.9	4.5	Green	Inside
2160	Moj	0.5	4.7	Green	Inside
2161	Sasi	0.5	5.2	Green	Inside
2162	Sasi	0.3	4.5	Green	Inside
2163	Sasi	0.35	4.6	Green	Inside
2164	Sasi	0.3	5.3	Green	Inside
2165	Sasi	0.3	5.3	Green	Inside
2166	Moj	0.4	5.3	Green	Inside
2167	Sasi	0.3	5.3	Green	Inside
2168	Moj	0.4	5.2	Green	Inside
2169	Sasi	0.3	4.4	Green	Inside
2170	Moj	0.5	4.7	Green	Inside
2171	Sasi	0.3	5.3	Green	Inside
2172	Sasi	0.3	4.6	Green	Inside
2173	Sasi	0.3	5	Green	Inside
2174	Sasi	0.4	5.3	Green	Inside
2175	Sasi	0.4	6.2	Green	Inside
2176	Moj	1.1	4.5	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2177	Segun	0.9	4.6	Died	Inside
2178	Moj	0.5	5.1	Died	Inside
2179	Sasi	0.4	4.4	Green	Inside
2180	Khejur	1.1	4.4	Green	Out Side
2181	Sasi	0.3	4.5	Green	Out Side
2182	Sasi	0.45	4.5	Green	Inside
2183	Sasi	0.3	4.7	Green	Inside
2184	Sasi	0.4	4.8	Green	Inside
2185	Tamul	0.5	7.2	Green	Inside
2186	Sasi	0.3	5	Green	Inside
2187	Sasi	0.3	5.3	Green	Inside
2188	Sasi	0.3	4.5	Green	Inside
2189	Modhuri	0.5	4.7	Green	Inside
2190	Sasi	0.5	4.5	Green	Inside
2191	Sasi	0.3	5.8	Green	Inside
2192	Tamul	0.3	7.5	Green	Inside
2193	Tamul	0.3	7.9	Green	Inside
2194	Tamul	0.3	7.9	Green	Inside
2195	Mango	0.3	7	Green	Inside
2196	Poma	0.6	5	Green	Inside
2197	Sasi	0.35	5.1	Green	Inside
2198	Sasi	0.4	5	Green	Inside
2199	Sasi	0.35	4.8	Green	Inside
2200	Sasi	0.4	5.1	Green	Inside
2201	Sasi	0.35	5.2	Green	Inside
2202	Sasi	0.6	4.9	Green	Inside
2203	Sasi	0.35	5	Green	Inside
2204	Sasi	0.4	6.5	Green	Inside
2205	Sasi	0.35	7.4	Green	Inside
2206	Sasi	0.35	7.6	Green	Inside
2207	Sasi	0.5	6.5	Green	Inside
2208	Simolu	2.6	4	Green	Out Side
2209	Sasi	0.35	6	Green	Inside
2210	Kathaluwa	0.3	6	Green	Inside
2211	Sasi	0.3	5.6	Green	Inside
2212	Moj	0.3	5.6	Green	Inside
2213	Sasi	0.35	5.9	Green	Inside
2214	Myfak	0.8	4.5	Green	Inside
2215	Poma	0.4	4.8	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2216	Sasi	0.35	5.3	Green	Inside
2217	Neem	0.3	4.6	Green	Inside
2218	Dimoru	0.3	4.7	Green	Inside
2219	Neem	0.75	6.5	Green	Inside
2220	Neem	0.7	6.5	Green	Inside
2221	Sasi	0.35	5.7	Green	Inside
2222	Neem	0.7	6.7	Green	Inside
2223	Moj	0.5	6.8	Green	Inside
2224	Mango	3.5	4.7	Green	Inside
2225	Sasi	0.3	4	Green	Inside
2226	Sasi	0.3	5.8	Green	Inside
2227	Sasi	0.3	5.8	Green	Inside
2228	Sasi	0.3	5.7	Green	Inside
2229	Sasi	0.3	5.8	Green	Inside
2230	Moj	0.6	4.5	Green	Inside
2231	Sasi	0.3	5.75	Green	Inside
2232	Sasi	0.3	5.5	Green	Inside
2233	Sasi	0.35	5.7	Green	Inside
2234	Sasi	0.8	5.7	Green	Inside
2235	Sasi	0.3	5.7	Green	Inside
2236	Sasi	0.3	4.6	Green	Inside
2237	Sonaru	0.7	4.3	Green	Out Side
2238	Sasi	0.3	4.7	Green	Inside
2239	Sasi	0.3	4.7	Green	Inside
2240	Bilatisonaru	0.3	5.3	Green	Out Side
2241	Moj	0.3	5.4	Green	Out Side
2242	Mango	0.3	6.2	Green	Out Side
2243	Moj	0.3	6.2	Green	Out Side
2244	Moj	0.4	6.2	Green	Out Side
2245	Moj	0.3	5.7	Green	Out Side
2246	Moj	0.3	5.8	Green	Out Side
2247	Krishnosura	0.9	5.3	Green	Out Side
2248	Krishnosura	0.7	5.2	Green	Out Side
2249	Poma	1.35	4.6	Green	Inside
2250	Tamul	0.35	5.3	Green	Inside
2251	Jamu	1	6.6	Green	Inside
2252	Tamul	0.4	7.5	Green	Inside
2253	Poma	0.9	4.9	Green	Inside
2254	Tamul	0.3	5.6	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2255	Poma	0.35	5	Green	Inside
2256	Tamul	0.35	7.5	Green	Inside
2257	Poma	0.9	4.8	Green	Inside
2258	Sasi	0.35	4.9	Green	Inside
2259	Tamul	0.35	5.4	Green	Inside
2260	Tamul	0.4	7.6	Green	Inside
2261	Sasi	0.35	7.1	Green	Inside
2262	Segun	0.95	6	Green	Inside
2263	Sasi	0.35	4.3	Green	Inside
2264	Tamul	0.3	5.7	Green	Inside
2265	Segun	0.4	6.3	Green	Inside
2266	Sasi	0.35	7.9	Green	Inside
2267	Sasi	0.4	5.7	Green	Inside
2268	Tamul	0.3	5.75	Green	Inside
2269	Sasi	0.3	4.5	Green	Inside
2270	Tamul	0.3	5.5	Green	Inside
2271	Sasi	0.3	4.3	Green	Inside
2272	Sasi	0.3	6.55	Green	Inside
2273	Tamul	0.4	5.2	Green	Inside
2274	Segun	1.2	6.1	Green	Inside
2275	Gomari	0.9	5.2	Green	Inside
2276	Shilikhs	1	6.32	Green	Inside
2277	Jolphai	0.6	6.3	Green	Inside
2278	Chandan	0.6	5.3	Green	Inside
2279	Moj	1	4.4	Green	Inside
2280	Mango	0.85	5.5	Green	Inside
2281	Mango	1	5.4	Green	Inside
2282	Kathal	0.9	5.2	Green	Inside
2283	Kathal	1.1	5.9	Green	Inside
2284	Ahat	4.1	4.8	Green	Out Side
2285	Kathal	0.95	5.7	Green	Out Side
2286		0.75	7.6	Green	Out Side
2287	Ajar	0.6	5.1	Green	Inside
2288	Sasi	0.3	5.1	Green	Inside
2289	Sasi	0.3	5.2	Green	Inside
2290	Sasi	0.3	6.4	Green	Inside
2291	Sasi	0.4	7.4	Green	Inside
2292	Sasi	0.3	4.6	Green	Inside
2293	Sasi	0.3	5.3	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2294	Sasi	0.35	6	Green	Inside
2295	Sasi	0.35	4.5	Green	Inside
2296	Sasi	0.3	4.5	Green	Inside
2297	Poma	0.45	7.7	Green	Inside
2298	Sasi	0.3	5.5	Green	Inside
2299	Sewali	0.35	6.9	Green	Inside
2300	Chandan	0.65	5.3	Green	Inside
2301		0.3	7.1	Green	Inside
2302	Krishnosura	0.6	6.9	Green	Inside
2303	Korbe	0.3	4.7	Green	Inside
2304	Sasi	0.3	6	Green	Inside
2305	Cheej	0.9	7.5	Green	Inside
2306	Gomari	0.4	6.3	Green	Inside
2307	Ketkhura	0.65	4.9	Green	Inside
2308	Dimoru	0.4	5.3	Green	Inside
2309	Vatghila	0.65	5.5	Green	Inside
2310	Sasi	0.3	5.8	Green	Out Side
2311	Sasi	0.35	5.9	Green	Out Side
2312	Arjun	0.4	5.4	Green	Inside
2313	Arjun	0.6	5.3	Green	Inside
2314	Modhuri	0.65	5.4	Green	Inside
2315	Mou	0.35	5.4	Green	Inside
2316	Sasi	0.4	7.8	Green	Inside
2317	Jamu	1	7.1	Green	Inside
2318	Sish	0.8	6.8	Green	Inside
2319	Sasi	0.3	4.6	Green	Inside
2320	Simolu	0.5	7.1	Green	Inside
2321	Sasi	0.35	4.4	Green	Inside
2322	Sasi	0.35	5.6	Green	Inside
2323	Kathal	1.3	5.5	Green	Inside
2324	Gomari	0.9	5.6	Green	Inside
2325	Jamu	0.6	5.6	Green	Inside
2326	Sasi	0.3	4.1	Green	Inside
2327	Jamu	0.6	5.7	Green	Inside
2328	Gomari	0.9	5.5	Green	Inside
2329	Gomari	0.7	5.7	Green	Inside
2330	Gomari	0.65	5.5	Green	Inside
2331	Gomari	0.55	5.1	Green	Inside
2332	Jamu	0.5	6.2	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2333	Sasi	0.3	4.9	Green	Inside
2334	Gomari	0.5	5	Green	Inside
2335	Mango	1.1	7.8	Green	Inside
2336		0.7	5.6	Died	Out Side
2337	Sonaru	0.35	7	Green	Out Side
2338	Krishnosura	0.35	7.1	Green	Out Side
2339	Mango	1	7	Green	Out Side
2340	Simolu	1.5	6.6	Green	Out Side
2341	Sonaru	0.7	5.1	Green	Out Side
2342	Ajar	0.4	5.1	Green	Out Side
2343	Ajar	0.6	5.1	Green	Out Side
2344	Arjun	1.8	6.8	Green	Out Side
2345	Mango	1.1	6.9	Green	Out Side
2346	Krishnosura	3.1	7.8	Green	Inside
2347	Evergreenfraytass	2.1	7.9	Green	Inside
2348	Evergreenfraytass	2.4	7.9	Green	Inside
2349	Mango	0.9	6.9	Green	Out Side
2350	Neem	0.3	5.9	Green	Inside
2351	Bilatisonaru	0.35	6.3	Green	Inside
2352	Krishnosura	0.9	6.2	Green	Inside
2353	Mango	0.3	6.4	Green	Inside
2354	Jamu	0.4	5.9	Green	Inside
2355	Krishnosura	0.5	5.6	Green	Inside
2356	Sasi	0.3	5.9	Green	Inside
2357	Bilatisonaru	0.9	5.2	Green	Inside
2358	Sotiana	0.7	5.7	Green	Inside
2359	Krishnosura	0.5	5.4	Green	Inside
2360	Poma	1	5.5	Green	Inside
2361	Poma	0.55	5.4	Green	Inside
2362	Poma	0.55	6.7	Green	Inside
2363	Krishnosura	0.4	5.3	Green	Inside
2364	Poma	0.8	6.7	Green	Inside
2365	Bokul	0.4	5.2	Green	Inside
2366	Krishnosura	0.6	5.9	Green	Inside
2367	Jolphai	0.3	6.3	Green	Inside
2368	Mango	0.8	6.2	Green	Inside
2369	Sonaru	0.5	4.9	Green	Out Side
2370	Sotiana	0.7	5.6	Green	Out Side
2371	Sonaru	0.5	4.3	Green	Out Side

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2372	Bilatisonaru	0.5	4.6	Green	Out Side
2373	Sonaru	0.6	4.7	Green	Out Side
2374	Sonaru	0.8	4.9	Died	Out Side
2375	Valow	0.8	5.2	Green	Out Side
2376	Bogori	0.6	5.2	Green	Out Side
2377	Sasi	0.3	4.6	Green	Inside
2378	Sotiana	0.8	4.1	Green	Inside
2379	Sasi	0.3	4.6	Green	Inside
2380	Krishnosura	0.5	4.3	Green	Inside
2381	Sasi	0.3	4.9	Green	Out Side
2382	Sasi	0.55	5.2	Green	Out Side
2383	Krishnosura	1.1	4.9	Green	Out Side
2384	Krishnosura	1.1	4.8	Green	Out Side
2385	Krishnosura	0.9	4.7	Green	Out Side
2386	Krishnosura	0.6	5	Green	Out Side
2387	Krishnosura	0.5	5.4	Green	Out Side
2388	Neem	1.5	5.3	Green	Out Side
2389	Ahat	2.1	7.3	Green	Out Side
2390	Ahat	2	7.3	Green	Out Side
2391	Sasi	0.3	7.4	Green	Out Side
2392	Sasi	0.3	7.6	Green	Out Side
2393	Sasi	0.35	7.6	Green	Out Side
2394	Vatghila	0.4	4.9	Green	Out Side
2395	Moj	0.3	5.9	Green	Out Side
2396	Sotiana	0.35	4.4	Green	Out Side
2397	Sotiana	0.35	4.4	Green	Out Side
2398	Moj	0.4	4.4	Green	Out Side
2399	Sasi	0.85	8	Green	Inside
2400	Sasi	0.4	7.3	Green	Inside
2401	Sasi	0.4	7.3	Green	Inside
2402	Sasi	0.5	7.3	Green	Inside
2403	Sasi	0.4	7.3	Green	Inside
2404	Sasi	0.45	7.3	Green	Inside
2405	Sasi	0.3	7.3	Green	Inside
2406	Sasi	0.8	7.3	Green	Inside
2407	Sasi	0.3	7.3	Green	Inside
2408	Sasi	0.3	7.9	Green	Inside
2409	Sasi	0.4	7.9	Green	Inside
2410	Sasi	0.7	7.9	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2411	Sasi	0.4	7.9	Green	Inside
2412	Sasi	0.4	7.9	Green	Inside
2413	Sasi	0.6	7.9	Green	Inside
2414	Sasi	0.44	7.3	Green	Inside
2415	Sasi	0.4	7.9	Green	Inside
2416	Krishnosura	0.4	4.7	Green	Inside
2417	Sasi	0.5	7.1	Green	Inside
2418	Sasi	0.3	7.1	Green	Inside
2419	Sasi	0.3	4.1	Green	Inside
2420	Sasi	0.3	4.85	Green	Inside
2421	Sasi	0.3	4.8	Green	Inside
2422	Sasi	0.3	4.9	Green	Inside
2423	Sasi	0.4	4.9	Green	Inside
2424	Sasi	0.3	5.4	Green	Inside
2425	Sasi	0.3	4.8	Green	Inside
2426	Sasi	0.4	4.8	Green	Inside
2427	Sasi	0.3	4.6	Green	Inside
2428	Moj	1.1	5.5	Green	Inside
2429	Sasi	0.35	5	Green	Inside
2430	Sasi	0.3	5.1	Green	Inside
2431	Sasi	0.3	4.6	Green	Inside
2432	Sasi	0.3	4.6	Green	Inside
2433	Sasi	0.4	7.5	Green	Inside
2434	Sasi	0.47	7.8	Green	Inside
2435	Sasi	0.4	7.8	Green	Inside
2436	Mango	1.75	4.1	Green	Out Side
2437	Sasi	0.3	7.5	Green	Out Side
2438	Sasi	0.3	7.6	Green	Out Side
2439	Sasi	0.4	7.1	Green	Out Side
2440	Sasi	0.3	7.1	Green	Out Side
2441	Sasi	0.3	7.1	Green	Out Side
2442	Sasi	0.3	7.6	Green	Out Side
2443	Sasi	0.3	7.65	Green	Out Side
2444	Sasi	0.3	7.5	Green	Out Side
2445	Sasi	0.35	7.5	Green	Out Side
2446	Sasi	0.3	7.4	Green	Out Side
2447	Sasi	0.6	7.8	Green	Inside
2448	Kutkura	0.6	7.1	Green	Inside
2449	Sasi	0.3	6.9	Green	Out Side

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2450	Krishnosura	1.1	5	Green	Out Side
2451	Valow	0.7	5	Green	Out Side
2452	Vatghila	0.65	6.1	Green	Out Side
2453	Jamu	0.9	5.3	Green	Inside
2454	Silikha	1	4.6	Green	Inside
2455	Sasi	0.3	4.8	Green	Inside
2456	Sewali	0.3	5.4	Green	Out Side
2457	Mango	0.7	5.6	Green	Out Side
2458	Moj	0.3	5.8	Green	Out Side
2459	Jolphai	0.9	5.9	Green	Out Side
2460	Krishnosura	1.2	4.7	Green	Out Side
2461	Bokul	0.8	5.8	Green	Out Side
2462	Krishnosura	0.9	5.7	Green	Out Side
2463	Ahat	1.3	4.3	Green	Out Side
2464	Ahat	3.65	4.3	Green	Out Side
2465	Krishnosura	0.9	5.1	Green	Out Side
2466	Sasi	0.3	7.4	Green	Inside
2467	Sasi	0.3	7.7	Green	Inside
2468	Sasi	0.3	7.8	Green	Inside
2469	Sasi	0.3	4.6	Green	Inside
2470	Sasi	0.3	5.4	Green	Inside
2471	Sasi	0.3	6.9	Green	Inside
2472	Korenja	1.3	5.1	Green	Inside
2473	Sotiana	0.3	4.8	Green	Inside
2474	Korenja	0.9	6	Green	Inside
2475	Sasi	0.3	6	Green	Inside
2476	Sasi	0.4	4.3	Green	Inside
2477	Sasi	0.3	4.9	Green	Inside
2478	Sasi	0.3	7.7	Green	Inside
2479	Sasi	0.3	4.3	Green	Inside
2480	Korenja	0.6	4.9	Green	Inside
2481	Sasi	0.35	6.4	Green	Inside
2482	Tamul	0.3	6.6	Green	Inside
2483	Sasi	0.3	4.5	Green	Inside
2484	Korenja	0.4	4.4	Green	Inside
2485	Moj	1	4.6	Green	Inside
2486	Tamul	0.4	5	Green	Inside
2487	Korenja	0.5	5.5	Green	Inside
2488	Sasi	0.3	6.3	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2489	Sasi	0.3	6.3	Green	Inside
2490	Korenja	1	5.9	Green	Inside
2491	Sasi	0.3	6.3	Green	Inside
2492	Sasi	0.4	7.8	Green	Inside
2493	Sasi	0.35	6.3	Green	Inside
2494	Sasi	0.3	6.5	Green	Inside
2495	Sasi	0.3	6.3	Green	Inside
2496	Sasi	0.3	6.6	Green	Inside
2497	Poma	1	6	Green	Inside
2498	Moj	0.55	5	Green	Inside
2499	Sasi	0.3	4.6	Green	Inside
2500	Tamul	0.4	6.8	Green	Inside
2501	Sasi	0.4	4.7	Green	Inside
2502	Sasi	0.3	4.6	Green	Inside
2503	Sasi	0.3	4.7	Green	Inside
2504	Tamul	0.4	6.8	Green	Inside
2505	Tamul	0.5	7.8	Green	Inside
2506	Tamul	0.5	7.8	Green	Inside
2507	Sasi	0.4	7.2	Green	Inside
2508	Sasi	0.3	4.5	Green	Inside
2509	Sasi	0.3	4.5	Green	Inside
2510	Moj	0.7	4.8	Green	Inside
2511	Tamul	0.4	6.3	Green	Inside
2512	Mango	0.7	7.2	Green	Inside
2513	Mango	0.6	7.2	Green	Inside
2514	Simolu	4	5.2	Green	Out Side
2515	Debodaru	0.7	7.7	Green	Out Side
2516	Poma	1.4	5.3	Green	Out Side
2517	Jamu	0.5	6.9	Green	Inside
2518	Tamul	0.4	6	Green	Inside
2519	Sasi	0.3	5.2	Green	Inside
2520	Sasi	0.3	6.2	Green	Inside
2521	Sasi	0.3	6.2	Green	Inside
2522	Sasi	0.3	5.1	Green	Inside
2523	Sasi	0.35	6.2	Green	Inside
2524	Poma	1	5.2	Green	Inside
2525	Silikha	0.9	6.8	Green	Inside
2526	Sasi	0.3	5.4	Green	Inside
2527	Amora	0.5	5.5	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2528	Bogori	1	5.5	Green	Inside
2529	Sasi	0.3	5.3	Green	Inside
2530	Sasi	0.3	5.3	Green	Inside
2531	Tamul	0.3	5.65	Green	Inside
2532	Silikha	0.8	5.6	Green	Inside
2533	Tamul	0.4	6.3	Green	Inside
2534	Tamul	0.3	7.1	Green	Inside
2535	Tamul	0.3	6.3	Green	Inside
2536	Sasi	0.3	6.4	Green	Inside
2537	Tamul	0.3	6.4	Green	Inside
2538	Tamul	0.3	6.3	Green	Inside
2539	Tamul	0.3	5	Green	Inside
2540	Modar	0.8	5.8	Green	Inside
2541	Tamul	0.4	5.8	Green	Inside
2542	Tamul	0.4	5.8	Green	Inside
2543	Tamul	0.3	5.7	Green	Inside
2544	Tamul	0.4	6.5	Green	Inside
2545	Tamul	0.4	5.6	Green	Inside
2546	Moj	1.3	6.2	Green	Inside
2547	Sasi	0.3	7.1	Green	Inside
2548	Moj	1.6	6.2	Green	Inside
2549	Sasi	0.4		Green	Inside
2550	Sasi	0.3		Green	Inside
2551	Sasi	0.3	7	Green	Inside
2552	Sasi	0.3	6.2	Green	Inside
2553	Sasi	0.3	5.7	Green	Inside
2554	Sasi	0.4	4.9	Green	Inside
2555	Segun	1	5.7	Green	Inside
2556	Sasi	0.3	5.7	Green	Inside
2557	Modar	0.5	4.7	Green	Inside
2558	Sasi	0.3	5.3	Green	Inside
2559	Sonaru	0.7	4.6	Green	Inside
2560	Segun	1	5.7	Green	Inside
2561	Segun	0.3	5.5	Green	Inside
2562	Sasi	0.3	5.2	Green	Inside
2563	Sasi	0.3	5.1	Green	Inside
2564	Sasi	0.3	7	Green	Inside
2565	Sasi	0.3	7.6	Green	Inside
2566	Sasi	0.3	7	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2567	Sasi	0.4	6	Green	Inside
2568	Sasi	0.3	7	Green	Inside
2569	Sasi	0.3	5	Green	Inside
2570	Silikha	1	5.2	Green	Inside
2571	Sasi	0.35	5.4	Green	Inside
2572	Debodaru	0.3	6.2	Green	Inside
2573	Kothal	0.7	5.5	Green	Inside
2574	Kothal	0.8	6.1	Green	Inside
2575	Jamu	0.8	6.3	Green	Inside
2576	Sasi	0.4	4.8	Green	Inside
2577	Sasi	0.3	4.8	Green	Inside
2578	Sasi	0.3	4.9	Green	Inside
2579	Sasi	0.4	4.6	Green	Inside
2580	Sasi	0.4	7.4	Green	Inside
2581	Tamul	0.4	7.8	Green	Inside
2582	Sasi	0.3	7.9	Green	Inside
2583	Tamul	0.4	7.8	Green	Inside
2584	Tamul	0.4	7.8	Green	Inside
2585	Tamul	0.4	7.8	Green	Inside
2586	Tamul	0.4	7.9	Green	Inside
2587	Tamul	0.4	7.2	Green	Inside
2588	Tamul	0.4	7.3	Green	Inside
2589	Tamul	0.4	7.4	Green	Inside
2590	Sasi	0.3	4.8	Green	Inside
2591	Sasi	0.4	4.6	Green	Inside
2592	Sasi	0.3	4.6	Green	Inside
2593	Moj	0.6	4.9	Green	Inside
2594	Kadom	1	4.8	Green	Inside
2595	Sasi	0.35	5	Green	Inside
2596	Sasi	0.4	5.4	Green	Inside
2597	Mango	0.4		Green	Inside
2598	Katha	0.6	0.5	Green	Inside
2599	Sasi	0.3	5.2	Green	Inside
2600	Kathal	0.8	5.5	Green	Inside
2601	Neem	0.5	5.2	Green	Inside
2602	Sasi	0.35	5.3	Green	Inside
2603	Sasi	0.3	5.6	Green	Inside
2604	Mango	0.3	6	Green	Inside
2605	Sasi	0.4	5.2	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2606	Sasi	0.3	5.1	Green	Inside
2607	Sasi	0.3	5.4	Green	Inside
2608	Sasi	0.5	5.4	Green	Inside
2609	Semolu	0.4	5.2	Green	Out Side
2610	Vatgila	0.7	6.8	Green	Out Side
2611	Vatgila	0.5	6.8	Green	Out Side
2612	Katkora	1.5	7.4	Green	Out Side
2613	Korobi	0.3	6.1	Green	Inside
2614	Sewali	1.2	5.8	Green	Inside
2615	Tejpat	0.8	6.4	Green	Inside
2616	Segun	1	5.1	Green	Inside
2617	Silikha	0.3	6.2	Green	Inside
2618	Tamul	0.4	6.1	Green	Inside
2619	Tamul	0.4	6.7	Green	Inside
2620	Silikha	1.3	5.6	Green	Inside
2621	Sasi	0.3	5.9	Green	Inside
2622	Tamul	0.4	6.1	Green	Inside
2623	Tamul	0.4	6.1	Green	Inside
2624	Tamul	0.4	6	Green	Inside
2625	Sasi	0.3	6.1	Green	Inside
2626	Sasi	0.35	7	Green	Out Side
2627	Sasi	0.3	7	Green	Out Side
2628	Khejur	1	5.2	Green	Out Side
2629	Segun	1.2	6	Green	Inside
2630	Sasi	0.3	5.8	Green	Inside
2631	Sasi	0.35	5.8	Green	Inside
2632	Tamul	0.4	6.9	Green	Inside
2633	Segun	1.1	6.4	Green	Inside
2634	Segun	1.1	6.3	Green	Inside
2635	Segun	0.7	6.3	Green	Inside
2636	Silikha	1.2	6.7	Green	Inside
2637	Sasi	0.3	4.9	Green	Inside
2638	Gomari	0.4	5.1	Green	Inside
2639	Gomari	1.6	4.9	Green	Inside
2640	Sasi	0.3	4.9	Green	Inside
2641	Gomari	0.9	6.4	Green	Inside
2642	Sasi	0.3	6.9	Green	Inside
2643	Sasi	0.4	7.7	Green	Inside
2644	Coconut	1.1	7.9	Green	Out Side

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2645	Sasi	0.3	6.3	Green	Inside
2646	Sasi	0.3	6.5	Green	Inside
2647	Gomari	1.3	6.9	Green	Inside
2648	Neem	0.5	5.2	Green	Inside
2649	Neem	0.3	5.2	Green	Inside
2650	Coconut	1.2	7.6	Green	Inside
2651	Sasi	0.35	5.3	Green	Out Side
2652	Sasi	0.3	5.2	Green	Out Side
2653	Sasi	0.3	5.1	Green	Out Side
2654	Sasi	0.3	5.5	Green	Out Side
2655	Sasi	0.3	5.1	Green	Out Side
2656	Sasi	0.3	6	Green	Out Side
2657	Sasi	0.3	6.4	Green	Inside
2658	Sasi	0.5	6.4	Green	Inside
2659	Sasi	0.5	6.4	Green	Inside
2660	Mango	0.5	6.7	Green	Inside
2661	Bogori	0.5	7.8	Green	Out Side
2662	Amara	0.4	7.9	Green	Out Side
2663	Khejur	1	7.9	Green	Out Side
2664	Sasi	0.3	5.6	Green	Inside
2665	Sasi	0.3	5.7	Green	Inside
2666	Kodom	1.1	7.6	Green	Inside
2667	Sasi	0.3	6.3	Green	Inside
2668	Sasi	0.35	7	Green	Inside
2669	Flower	0.4	7.8	Green	Inside
2670	Tamul	0.3	7.9	Green	Inside
2671	Moj	0.4	7.8	Green	Inside
2672	Tamul	0.4	7.7	Green	Inside
2673	Tamul	0.4	7.7	Green	Inside
2674	Moj	0.3	7.9	Green	Inside
2675	Poma	0.5	7.5	Green	Inside
2676	Poma	0.5	7.6	Green	Inside
2677	Vatgila	0.6	7.5	Green	Out Side
2678	Kutkura	0.5	5.7	Green	Out Side
2679	Sasi	0.35	5.7	Green	Inside
2680	Akesia	1.9	7.9	Green	Out Side
2681	Cross	2.5	6.2	Green	Out Side
2682	Modar	0.4	6.5	Green	Out Side
2683	Sasi	0.4	6.5	Green	Out Side

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2684	Raintree	1	7.9	Green	Out Side
2685	Sasi	0.3	6.6	Green	Out Side
2686	Raintree	1.1	7.7	Green	Out Side
2687	Bogori	0.45	4.3	Green	Out Side
2688	Kutkura	0.4	6	Green	Out Side
2689	Ahar	0.4	6.8	Green	Out Side
2690	Cross	3	8	Green	Out Side
2691	Krishnosura	0.9	6.1	Green	Inside
2692	Moj	0.8	6	Green	Inside
2693	Poma	0.8	5.6	Green	Inside
2694	Sasi	0.4	6.2	Green	Inside
2695	Moj	0.9	5.9	Green	Inside
2696	Simolu	0.4	6.6	Green	Inside
2697	Raintree	0.4	6.8	Green	Inside
2698	Raintree	0.4	7.5	Green	Inside
2699	Sotiana	0.35	7	Green	Inside
2700	Sotiana	0.55	6.8	Green	Inside
2701	Raintree	0.35	6.4	Green	Inside
2702	Krishnosura	0.9	6.1	Green	Inside
2703	Poma	0.4	7.9	Green	Inside
2704	Sasi	0.35	6.9	Green	Inside
2705	Sonaru	0.35	5.9	Green	Inside
2706	Sasi	0.4	6.7	Green	Inside
2707	Sasi	0.3	7	Green	Inside
2708	Neem	0.35	6.3	Green	Inside
2709	Neem	0.5	6.6	Green	Inside
2710	Sasi	0.3	6.6	Green	Inside
2711	Sasi	0.3	6.6	Green	Inside
2712	Sonaru	0.3	6	Green	Out Side
2713	Krishnosura	0.35	5.8	Green	Out Side
2714	Sonaru	0.55	6.2	Green	Out Side
2715	Dimoru	0.4	6.5	Green	Out Side
2716	Dimoru	0.3	5.9	Green	Out Side
2717	Dimoru	0.9	6.3	Green	Out Side
2718	Dimoru	0.7	6.3	Green	Out Side
2719	Popita	0.4	7.6	Green	Inside
2720	Tamul	0.3	6.3	Green	Inside
2721	Neem	0.7	6.9	Green	Inside
2722	Simolu	0.5	6.9	Green	Out Side

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2723	Dimoru	0.5	6.2	Green	Out Side
2724	Dimoru	0.75	6.55	Green	Out Side
2725	Simolu	1.6	5.5	Green	Out Side
2726	Dimoru	0.8	5.5	Green	Out Side
2727	Dimoru	1	6.2	Green	Out Side
2728	Dimoru	1.3	5.7	Green	Out Side
2729	Sotiana	0.8	7.3	Green	Out Side
2730	Valow		6.4	Green	Inside
2731	Tamul	0.3	6.8	Green	Inside
2732	Tamul	0.4	6.6	Green	Inside
2733	Valow	0.7	7.2	Green	Inside
2734	Mango	0.3	6.8	Green	Inside
2735	Valow	1.1	5.4	Green	Inside
2736	Raintree	0.3	7	Green	Inside
2737	Sotiana	0.6	5.7	Green	Inside
2738	Sotiana	0.5	7.1	Green	Inside
2739	Tamul	0.4	7	Green	Inside
2740	Tamul	0.4	6.7	Green	Inside
2741	Tamul	0.4	6.9	Green	Inside
2742	Valow	0.3	5.2	Green	Inside
2743	Valow	0.6	6.4	Green	Inside
2744	Tamul	0.3	6.9	Green	Inside
2745	Valow	0.9	7.4	Green	Inside
2746	Valow	0.6	5.6	Green	Inside
2747	Valow	0.5	5.9	Green	Out Side
2748	Valow	0.4	6.7	Green	Out Side
2749	Valow	0.6	7.4	Green	Out Side
2750	Valow	0.4	6.1	Green	Out Side
2751	Valow	1.2	7.2	Green	Out Side
2752	Valow	0.7	5.9	Green	Out Side
2753	Valow	0.35	6.8	Green	Out Side
2754	Valow	0.4	5.2	Green	Out Side
2755	Valow	0.4	6.8	Green	Out Side
2756	Valow	0.8	6.7	Green	Out Side
2757	Valow	0.5	7.9	Green	Inside
2758	Valow	0.75	7.8	Green	Inside
2759	Krishnosura	0.7	4.9	Green	Inside
2760	Sonaru	0.6	5.5	Green	Inside
2761	Tamul	0.3	5.5	Green	Inside

Trees no.	Tree Name/ Species	Girth of the Tree (m)	Distance Center of the Road (m)	Tree Condition	Remarks (Privet Inside The Boundry)
2762	Mango	0.4	5.6	Green	Inside
2763	Mango	0.4	6.3	Green	Inside
2764	Mango	0.3	5.6	Green	Inside
2765	Simolu	1.3	7.1	Green	Inside
2766	Modar	0.4	5.1	Green	Inside
2767	Ahar	0.4	7.1	Green	Inside
2768	Mango	0.3	5.7	Green	Inside
2769	Kathal	0.3	5.7	Green	Inside
2770	Kathal	0.3	5.7	Green	Inside
2771	Sonaru	0.3	7.4	Green	Inside
2772	Mango	0.3	6.1	Green	Inside
2773	Mango	0.4	6.1	Green	Inside
2774	Ajar	0.4	7.2	Green	Inside
2775	Sonaru	0.4	5.7	Green	Inside
2776	Mango	0.5	5.7	Green	Inside
2777	Mango	0.35	6	Green	Inside
2778	Kathal	0.6	5.7	Green	Inside
2779	Gomari	1	6	Green	Inside
2780	Sasi	0.3	4.6	Green	Inside
2781	Sasi	0.35	4.9	Green	Inside
2782	Modhuri	0.3	5.2	Green	Inside
2783	Sasi	0.4	4.9	Green	Inside
2784	Sonaru	0.35	5.3	Green	Inside
2785	Sonaru	0.5	5.9	Green	Inside
2786	Jamu	0.3	6.1	Green	Inside
2787	Valow	0.5	5.5	Green	Inside
2788	Valow	0.5	5.2	Green	Inside
2789	Valow	0.6	5.9	Green	Inside
2790	Krishnosura	0.9	7.6	Green	Out Side
2791	Valow	1.3	6.8	Green	Out Side
2792	Valow	0.8	7.5	Green	Out Side
2793	Vatgila	0.3	7.9	Green	Out Side
2794	Valow	0.4	6.7	Green	Out Side
2795	Cross	0.9	5.1	Green	Out Side
2796	Sotiana	0.8	6.2	Green	Out Side

Tree Reported on RHS

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
501	Simolu	0.5	5.9	Green	Out Side
502	Raintree	0.85	5	Green	Out Side
503	Raintree	1	5.15	Green	Out Side
504	Monisal	0.9	4.8	Green	Out Side
505	Kodom	1	6.15	Green	Out Side
506	Simolu	0.6	5.55	Green	Out Side
507	Dimoru	0.45	5.6	Green	Out Side
508	Agar	1.1	7	Green	Out Side
509	Sum	1	7.2	Green	Out Side
510	Poma	0.6	7.5	Green	Out Side
511	Sum	0.85	7.6	Green	Out Side
512	Kathal	2.9	8	Green	Out Side
513	Kathlua	1.75	5.4	Green	Out Side
514	Sum	2.2	6.4	Green	Out Side
515	Poma	1.5	7.4	Green	Out Side
516	Sum	2.3	7.15	Green	Out Side
517	Vatgila	0.68	6	Dead	Out Side
518	Owtanga	0.37	6.6	Green	Out Side
519	Vatgila	0.65	6.4	Green	Inside
520	Cross	1.1	6.8	Green	Inside
521	Owtanga	1.1	5.4	Green	Inside
522	Cross	0.68	5.4	Green	Inside
523	Jori	3	7.4	Green	Inside
524	Sonaru	1.1	6.9	Green	Inside
525	Cross	1	6.7	Green	Inside
526	Jori	0.62	5.7	Green	Inside
527	Cross	1.1	6.95	Green	Out Side
528	Cross	1.4	5.4	Green	Inside
529	Belgos	0.85	5.9	Green	Out Side
530	Akesia	2	6.25	Green	Out Side
531	Simolu	1.5	5.6	Green	Out Side
532	Akesia	1.8	5.3	Green	Out Side
533	Agar	1.1	6.9	Green	Out Side
534	Simolu	1.2	5.7	Green	Out Side
535	Dimoru	0.8	6.6	Green	Inside
536	Mango	0.5	6.3	Green	Inside
537	Bambo		4.3	Green	Inside
538	Poniyal	0.35	5	Green	Inside
539	Poma	0.32	5.2	Green	Inside
540	Imlly	0.86	4.65	Green	Out Side
541	Coconut	0.75	6.7	Green	Inside
542	Moj	0.6	5	Green	Inside
543	Coconut	0.93	6.85	Green	Inside
544	Gomari	0.45	5.8	Green	Inside
545	Gomari	0.65	6.4	Green	Inside
546	Tamul	0.4	6.9	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
547	Cross	0.6	6.3	Green	Out Side
548	Cross	0.65	6.7	Green	Out Side
549	Cross	0.8	5.7	Green	Out Side
550	Cross	1.1	6.3	Green	Out Side
551	Cross	0.55	6	Green	Out Side
552	Cross	0.7	6	Green	Out Side
553	Sasi	0.4	7.8	Green	Inside
554	Sasi	0.4	7.7	Green	Inside
555	Thekera	0.35	7.9	Green	Inside
556	Sasi	0.4	7.7	Green	Inside
557	Amora	1.2	7.8	Green	Inside
558	Sasi	0.43	7.3	Green	Inside
559	Mango	2.65	4.85	Green	Out Side
560	Gomari	1	5.4	Green	Out Side
561	Amlokhi	0.79	7.6	Green	Out Side
562	Agar	1	5.9	Green	Out Side
563	Valow	0.95	7.65	Green	Out Side
564	Sasi	0.4	7.23	Green	Out Side
565	Simolu	1.15	6.9	Green	Out Side
566	Amlokhi	0.86	7.7	Green	Out Side
567	Simolu	0.55	58	Green	Out Side
568	Krishnosura	1.53	5.85	Green	Out Side
569	Agar	1.2	6.5	Green	Out Side
570	Simolu	0.7	5.8	Green	Out Side
571	Valow	0.7	5.95	Green	Out Side
572	Simolu	0.5	5.6	Green	Out Side
573	Valow	0.85	5.3	Green	Out Side
574	Amlokhi	1.53	7.55	Green	Out Side
575	Simolu	0.75	5.55	Green	Out Side
576	Amlokhi	0.6	6.2	Green	Out Side
577	Simolu	0.85	6.6	Green	Out Side
578	Cross	0.6	6	Green	Out Side
579	Cross	0.95	5.7	Green	Out Side
580	Simolu	0.9	6.8	Green	Out Side
581	Dimoru	0.6	6.7	Green	Out Side
582	Cross	0.3	6.4	Green	Out Side
583	Valow	0.85	5.1	Green	Out Side
584	Cross	0.7	6	Green	Out Side
585	Cross	0.85	6.3	Green	Out Side
586	Gomari	1	5.4	Green	Out Side
587	Cross	0.7	6.5	Green	Out Side
588	Cross	0.7	5.1	Green	Out Side
589	Cross	0.75	6.1	Green	Out Side
590	Cross	1	6.3	Green	Out Side
591	Cross	0.4	5.95	Green	Out Side
592	Simolu	1	5.95	Green	Out Side
593	Cross	0.35	6	Green	Out Side
594	Sotiana	1	5.95	Dead	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
595	Sotiana	0.4	6.8	Green	Out Side
596	Sotiana	0.35	7.1	Green	Out Side
597	Sotiana	1	6	Green	Out Side
598	Cross	0.75	6.9	Green	Out Side
599	Cross	0.8	6.5	Green	Out Side
600	Sotiana	1.45	5.6	Green	Out Side
601	Simolu	0.95	6.1	Green	Out Side
602	Cross	1	6	Green	Out Side
603	Sotiana	1.4	5.7	Green	Out Side
604	Agar	1.2	5.7	Green	Out Side
605	Owtanga	2.65	5.8	Green	Out Side
606	Owtanga	1.95	5.8	Green	Out Side
607	Simolu	0.59	5.9	Green	Out Side
608	Sotiana	0.6	5.5	Green	Out Side
609	Simolu	1.65	4	Green	Out Side
610	Simolu	0.9	5.8	Green	Out Side
611	Cross	1	5.9	Green	Out Side
612	Simolu	0.92	6	Green	Out Side
613	Cross	1.05	6.1	Green	Out Side
614	Agar	1.3	5.5	Green	Out Side
615	Agar	0.9	5.3	Green	Out Side
616	Cross	1.6	5.3	Green	Out Side
617	Sotiana	0.63	5.1	Green	Out Side
618	Simolu	0.55	5.8	Green	Out Side
619	Simolu	0.9	5.8	Green	Out Side
620	Agar	0.85	6	Green	Out Side
621	Agar	1.17	5.65	Green	Out Side
622	Agar	1.1	7.1	Green	Out Side
623	Sasi	0.4	7.4	Green	Inside
624	Dimoru	0.5	7.9	Green	Inside
625	Sasi	0.5	7.75	Green	Inside
626	Ara Bongali	0.95	7.73	Green	Out Side
627	Sasi	0.4	7.9	Green	Inside
628	Sasi	0.7	7.2	Green	Inside
629	Sasi	0.55	7.2	Green	Inside
630	Sasi	0.5	6.9	Green	Inside
631	Sojina	1	6.2	Green	Inside
632	Sasi	0.3	6.7	Green	Inside
633	Sasi	0.3	7.35	Dead	Inside
634	Krishnosura	1.1	6.6	Green	Inside
635	Sasi	0.3	7.3	Green	Inside
636	Ahat	4.7	7.7	Green	Inside
637	Sasi	0.4	7.83	Green	Inside
638	Sasi	0.5	7.9	Green	Inside
639	Gomari	0.6	7.2	Green	Out Side
640	Kothalua	0.8	6.7	Green	Out Side
641	Kathal	0.7	7.4	Green	Out Side
642	Kothalua	0.6	7.9	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
643	Poma	1.2	5.3	Green	Out Side
644	Poma	0.9	5.1	Green	Out Side
645	Kothalua	1.2	6.4	Green	Out Side
646	Kothalua	1.3	7.9	Green	Out Side
647	Krishnosura	0.9	7.9	Green	Out Side
648	Krishnosura	1.5	7.6	Green	Out Side
649	Ahat	2.7	6.5	Green	Inside
650	Raintree	0.65	6.55	Green	Out Side
651	Raintree	0.6	5.7	Green	Out Side
652	Cross	1.1	7.9	Green	Out Side
653	Kathal	1.3	5.7	Green	Out Side
654	Sasi	0.3	7.6	Green	Inside
655	Sasi	0.4	7.5	Green	Inside
656	Valow	0.8	7.5	Green	Inside
657	Sasi	0.3	7.5	Green	Inside
658	Sasi	0.3	7.4	Green	Inside
659	Sasi	0.3	7.2	Green	Inside
660	Sasi	0.35	7.9	Green	Inside
661	Kathal	1	7.6	Green	Out Side
662	Moj	2.1	7.3	Green	Out Side
663	Borun	0.3	5.4	Dead	Inside
664	Borun	0.4	6.2	Dead	Inside
665	Gohora	0.5	5.5	Dead	Inside
666	Gohora	0.6	6.5	Dead	Inside
667	Sagun	1.1	7.1	Green	Inside
668	Poma	0.9	7	Green	Inside
669	Mango	1.1	7.4	Green	Inside
670	Owtanga	1.1	5.6	Green	Out Side
671	Moj	0.9	7.1	Green	Out Side
672	Vatgila	0.4	7.2	Green	Out Side
673	Mango	1.3	7.5	Green	Inside
674	Sasi	0.3	7.4	Green	Inside
675	Sasi	0.6	6.8	Green	Inside
676	Tamul	0.3	6.9	Green	Inside
677	Sasi	0.6	5.9	Green	Inside
678	Moj	0.6	5.4	Green	Out Side
679	Sonaru	1	5.7	Green	Out Side
680	Moj	0.4	5.8	Green	Out Side
681	Moj	0.6	5	Green	Out Side
682	Simolu	0.8	5.7	Green	Out Side
683	Simolu	0.4	5.9	Green	Out Side
684	Kathal	0.3	5.1	Dead	Out Side
685	Sonaru	0.5	5	Dead	Out Side
686	Moj	1.4	6.6	Green	Out Side
687	Tamul	0.9	6.8	Green	Out Side
688	Sasi	1	7.5	Green	Inside
689	Tamul	0.4	7.7	Green	Inside
690	Sasi	0.6	7.6	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
691	Sasi	0.3	7.7	Green	Inside
692	Sasi	0.3	6.9	Green	Inside
693	Tamul	0.3	7.6	Green	Inside
694	Tamul	0.6	7.1	Green	Inside
695	Sasi	0.4	7.5	Green	Inside
696	Sasi	0.3	7.6	Green	Inside
697	Sasi	0.3	7.2	Green	Inside
698	Sasi	0.3	7.3	Green	Inside
699	Sasi	0.55	7.5	Green	Inside
700	Sasi	0.3	7.3	Green	Inside
701	Tamul	0.3	7.2	Green	Inside
702	Sasi	0.35	7.7	Green	Inside
703	Tamul	1	7.3	Green	Inside
704	Sasi	0.4	7.7	Green	Inside
705	Sasi	0.4	7.2	Green	Inside
706	Sasi	0.7	7.1	Green	Inside
707	Sasi	0.3	7.8	Green	Inside
708	Sasi	0.4	7.3	Green	Inside
709	Tamul	0.3	7.6	Green	Inside
710	Narji	0.6	6.9	Green	Inside
711	Sasi	0.5	7.1	Green	Inside
712	Sasi	0.3	6.9	Green	Inside
713	Tamul	0.4	7.6	Green	Inside
714	Sasi	1.41	6.8	Green	Inside
715	Sasi	0.4	6.5	Green	Inside
716	Bambo		7.7	Green	Inside
717	Bambo		7.5	Green	Inside
718	Sasi	0.3	6	Green	Inside
719	Sasi	0.3	7	Green	Inside
720	Sasi	0.3	7.3	Green	Inside
721	Sasi	0.3	5.9	Green	Inside
722	Mango	1.1	6.2	Green	Inside
723	Sasi	0.3	7.3	Green	Inside
724	Tamul	0.4	7.5	Green	Inside
725	Sasi	0.55	6.1	Green	Inside
726	Tamul	0.4	7.4	Green	Inside
727	Tamul	0.3	6	Green	Inside
728	Khilikha	1.2	5.8	Green	Inside
729	Tamul	0.3	6.4	Green	Inside
730	Tamul	0.4	7.2	Green	Inside
731	Sasi	0.6	6	Green	Inside
732	Tamul	0.3	6.2	Green	Inside
733	Sasi	0.3	6.4	Green	Inside
734	Sasi	0.4	6	Green	Inside
735	Mango	0.8	5.9	Green	Inside
736	Tamul	0.3	6.5	Green	Inside
737	Sasi	0.3	6.1	Green	Inside
738	Moj	0.3	6.5	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
739	Tamul	0.4	6.4	Green	Inside
740	Sasi	0.8	6.5	Green	Inside
741	Sasi	0.6	6.6	Green	Inside
742	Sasi	0.6	6.3	Green	Inside
743	Khajur	0.8	6.9	Green	Inside
744	Moj	0.3	6.2	Green	Out Side
745	Mango	2.7	6.4	Green	Out Side
746	Bambo		7.4	Green	Out Side
747	Poma	0.5	6.5	Green	Out Side
748	Bambo		7	Green	Out Side
749	Valow	0.5	7.8	Green	Inside
750	Poma	0.8	6.9	Green	Inside
751	Krishnosura	2.4	6.9	Green	Out Side
752	Cross	2.1	5.7	Green	
753	Huwa	0.5	6.6	Green	Out Side
754	Moj	0.3	6.9	Green	Out Side
755	Mango	1.9	4.9	Green	Out Side
756	Cross	0.6	6.6	Green	Out Side
757	Cross	0.3	6.5	Green	Out Side
758	Cross	0.31	6.6	Green	Out Side
759	Cross	0.3	6.5	Green	Out Side
760	Cross	0.3	6.4	Green	Out Side
761	Cross	0.3	6.5	Green	Out Side
762	Cross	0.3	6.6	Green	Out Side
763	Cross	0.3	6.3	Green	Out Side
764	Cross	0.3	6.4	Green	Out Side
765	Cross	0.8	6.7	Green	Out Side
766	Cross	0.5	6.4	Green	Out Side
767	Cross	0.4	7.1	Green	Out Side
768	Valow	0.3	6.8	Green	Out Side
769	Valow	0.3	6.9	Green	Out Side
770	Sotiana	0.3	5.5	Green	Out Side
771	Cross	0.5	6.1	Green	Out Side
772	Chandan	1.1	7.5	Green	Out Side
773	Cross	0.6	5.4	Green	Out Side
774	Cross	0.3	5.3	Green	Out Side
775	Cross	0.6	7.6	Green	Out Side
776	Sonaru	0.8	7.7	Green	Out Side
777	Cross	0.6	7.5	Green	Inside
778	Cross	0.8	7.7	Green	Inside
779	Cross	1.1	7.9	Green	Inside
780	Cross	0.4	7.9	Green	Inside
781	Sonaru	0.3	7.9	Green	Inside
782	Sonaru	0.3	6.2	Green	Inside
783	Sonaru	0.3	6.4	Green	Inside
784	Sonaru	0.4	6.1	Green	Inside
785	Sonaru	0.3	7.1	Died	Inside
786	Moj	0.4	5.6	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
787	Moj	0.5	5.5	Green	Inside
788	Jaba	0.6	5.3	Green	Inside
789	Agar	0.4	5.5	Green	Inside
790	Kanchan	0.3	5.7	Green	Inside
791	Khilikha	0.3	6	Green	Inside
792	Gohora	1.2	7.9	Green	Inside
793	Moj	0.4	7.2	Green	Out Side
794	Moj	0.5	6	Green	Out Side
795	Cross	0.4	7.9	Green	Out Side
796	Cross	0.3	6.3	Green	Out Side
797	Cross	0.5	7.8	Green	Out Side
798	Kutkura	1.2	7.9	Green	Out Side
799	Agar	0.3	5.4	Green	Inside
800	Agar	0.3	6	Green	Inside
801	Moj	0.4	6.6	Green	Inside
802	Tamul	0.4	6.4	Green	Inside
803	Moj	0.5	7.1	Green	Inside
804	Tamul	0.4	6.4	Green	Inside
805	Tamul	0.6	6.2	Green	Inside
806	Tamul	0.5	6.6	Green	Inside
807	Moj	0.8	7.6	Green	Inside
808	Tamul	0.3	6.4	Green	Inside
809	Tamul	0.4	6.5	Green	Inside
810	Tamul	0.4	6.7	Green	Inside
811	Tamul	0.4	7.4	Green	Inside
812	Tamul	0.4	7.2	Green	Inside
813	Jaba	0.3	6.1	Green	Inside
814	Sagun	0.9	7.9	Green	Inside
815	Bambo		7.6	Green	Inside
816	Valow	0.7	5.1	Green	Out Side
817	Valow	0.3	5	Green	Out Side
818	Valow	0.3	4.9	Green	Out Side
819	Poma	2.4	7.3	Green	Inside
820	Simolu	0.3	5.8	Green	Inside
821	Cross	1	6.3	Green	Inside
822	Valow	0.3	5.7	Green	Inside
823	Valow	0.6	5.5	Green	Inside
824	Valow	0.4	5.6	Green	Inside
825	Valow	0.4	5.4	Green	Inside
826	Valow	0.3	5.4	Green	Inside
827	Valow	0.3	6.3	Green	Inside
828	Valow	0.3	5.3	Green	Inside
829	Cross	2.6	7.3	Green	Out Side
830	Valow	0.3	6.9	Green	Out Side
831	Valow	0.3	6.4	Green	Out Side
832	Valow	0.3	6.5	Green	Out Side
833	Valow	0.3	6.6	Green	Out Side
834	Valow	0.6	4.5	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
835	Valow	0.3	4.9	Green	Out Side
836	Valow	0.4	5.1	Green	Out Side
837	Mango	1	6.6	Green	Inside
838	Tamul	0.5	7.2	Green	Inside
839	Mango	0.6	6.8	Green	Out Side
840	Mango	0.6	5.6	Green	Out Side
841	Jaba	0.3	6.2	Green	Inside
842	Fulgos	0.4	6.4	Green	Inside
843	Fulgos	0.3	6.5	Green	Inside
844	Jaba	0.3	5.8	Green	Inside
845	Modhuri	0.6	6.1	Green	Inside
846	Simolu	2.8	5.9	Green	Inside
847	Sonaru	0.9	6.3	Died	Out Side
848	Sasi	0.4	7.2	Green	Inside
849	Tamul	0.4	7.8	Green	Inside
850	Sasi	0.3	6.8	Green	Inside
851	Sasi	0.3	6.8	Green	Inside
852	Arjun	0.6	7.7	Green	Inside
853	Khilikha	0.4	6	Green	Inside
854	Khilikha	0.5	6.1	Green	Inside
855	Mango	0.3	6.5	Green	Inside
856	Sotiana	0.4	5.3	Green	Inside
857	Neem	0.3	5.3	Green	Inside
858	Neem	0.7	5.4	Green	Inside
859	Tamul	0.3	5.6	Green	Inside
860	Var	0.5	5.8	Green	Inside
861	Var	0.5	5.6	Green	Inside
862	Bogori	0.6	5.4	Green	Inside
863	Tamul	0.4	7.7	Green	Inside
864	Moj	0.3	5.6	Green	Inside
865	Cross	0.3	4.9	Green	Inside
866	Cross	0.3	5	Green	Inside
867	Bogori	0.3	4.8	Green	Inside
868	Cross	0.3	4.7	Green	Inside
869	Kodom	0.7	6.7	Green	Out Side
870	Dimoru	0.5	6.4	Green	Out Side
871	Bambo		7.7	Green	Out Side
872	Nogaver	0.9	5.8	Green	Out Side
873	Khilikha	0.4	4.6	Green	Out Side
874	Poma	2.8	4.3	Died	Out Side
875	Moj	0.3	5.1	Green	Out Side
876	Valow	0.3	5.7	Green	Out Side
877	Poma	0.3	5.2	Green	Out Side
878	Neem	1	6.8	Green	Inside
879	Modhuri	0.6	6.4	Green	Out Side
880	Borgos	3.2	7.3	Green	Out Side
881	Raintree	1.1	7.8	Green	Out Side
882	Raintree	1.6	7.9	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
883	Raintree	1	7.4	Green	Out Side
884	Raintree	0.9	7.3	Green	Out Side
885	Raintree	0.7	7.2	Green	Out Side
886	Raintree	1.2	7.1	Green	Out Side
887	Raintree	1.1	7.2	Green	Out Side
888	Raintree	0.9	7.1	Green	Out Side
889	Raintree	0.8	7.2	Green	Out Side
890	Raintree	0.9	6.8	Green	Out Side
891	Raintree	1.2	7.9	Green	Out Side
892	Raintree	2.3	7.9	Green	Out Side
893	Raintree	1.3	7.9	Green	Out Side
894	Raintree	1.6	7.5	Green	Out Side
895	Raintree	1.1	7.8	Green	Out Side
896	Raintree	1.3	7.5	Green	Out Side
897	Raintree	1.1	7.4	Green	Out Side
898	Raintree	1.3	7.1	Green	Out Side
899	Raintree	1.2	7.6	Green	Out Side
900	Raintree	1.8	7.6	Green	Out Side
901	Raintree	1	7.8	Green	Out Side
902	Raintree	1.4	7.7	Green	Out Side
903	Moj	2	7.2	Green	Out Side
904	Raintree	2	7.8	Green	Out Side
905	Raintree	2.1	7.7	Green	Out Side
906	Raintree	1.9	7.9	Green	Out Side
907	Raintree	2.1	7.6	Green	Out Side
908	Raintree	2	7.8	Green	Out Side
909	Raintree	1.1	7.4	Died	Out Side
910	Poma	1.9	6.8	Green	Out Side
911	Raintree	2.2	7.3	Green	Out Side
912	Raintree	2.9	7.4	Green	Out Side
913	Raintree	1.8	7.6	Green	Out Side
914	Raintree	2.2	7.6	Green	Out Side
915	Raintree	2.8	7.4	Green	Out Side
916	Raintree	2.2	7.2	Green	Out Side
917	Raintree	3.9	7.4	Green	Out Side
918	Raintree	2	7.4	Green	Out Side
919	Raintree	1.2	7.5	Green	Out Side
920	Raintree	1.4	7.6	Green	Out Side
921	Raintree	1.2	7.4	Green	Out Side
922	Raintree	2.1	7.5	Green	Out Side
923	Raintree	1.4	7.2	Green	Out Side
924	Raintree	1.2	7.1	Green	Out Side
925	Raintree	3.1	7.3	Green	Out Side
926	Raintree	1.2	7.4	Green	Out Side
927	Raintree	1.4	7.5	Green	Out Side
928	Raintree	2.8	6.9	Green	Out Side
929	Raintree	1.8	6.8	Green	Out Side
930	Raintree	1.7	6.9	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
931	Raintree	0.9	6.2	Green	Out Side
932	Raintree	1.2	6.5	Green	Out Side
933	Raintree	1.8	7.3	Green	Out Side
934	Raintree	1.2	7.1	Green	Out Side
935	Raintree	1.2	7.8	Green	Out Side
936	Raintree	1.7	7.6	Green	Out Side
937	Raintree	1.2	7.4	Green	Out Side
938	Raintree	1.5	7.5	Green	Out Side
939	Raintree	1.9	7.3	Green	Out Side
940	Poma	0.9	7.4	Green	Out Side
941	Raintree	1.4	7.4	Green	Out Side
942	Raintree	2.1	7.7	Green	Out Side
943	Raintree	2	7.6	Green	Out Side
944	Raintree	1.1	7.5	Green	Out Side
945	Raintree	1.2	7.9	Green	Out Side
946	Raintree	1.2	7.7	Green	Out Side
947	Raintree	2	7.6	Green	Out Side
948	Raintree	1.3	7.5	Green	Out Side
949	Raintree	1.3	7.3	Green	Out Side
950	Raintree	1.6	7.4	Green	Out Side
951	Raintree	1.4	7.3	Green	Out Side
952	Raintree	1.9	7.3	Green	Out Side
953	Raintree	2.1	6.8	Green	Out Side
954	Raintree	2.3	6.7	Green	Out Side
955	Raintree	1.2	6.7	Green	Out Side
956	Raintree	1.3	7.4	Green	Out Side
957	Raintree	1.3	6	Green	Out Side
958	Raintree	1.1	5.9	Green	Out Side
959	Raintree	1.9	6.3	Green	Out Side
960	Raintree	0.9	5.9	Green	Out Side
961	Raintree	1.5	6.7	Green	Out Side
962	Raintree	0.8	6.6	Green	Out Side
963	Raintree	0.9	6.7	Green	Out Side
964	Raintree	1.1	6.9	Green	Out Side
965	Raintree	0.7	7.4	Green	Out Side
966	Huwa	1.1	5.9	Green	Out Side
967	Raintree	0.9	7.4	Green	Out Side
968	Raintree	1.7	7.1	Green	Out Side
969	Raintree	1.1	6.5	Green	Out Side
970	Raintree	1.2	6.5	Green	Out Side
971	Raintree	1.1	6.3	Green	Out Side
972	Raintree	1.3	6.2	Green	Out Side
973	Raintree	1.4	6.4	Green	Out Side
974	Raintree	2.1	6.1	Green	Out Side
975	Raintree	1.9	5.9	Green	Out Side
976	Huwa	1.8	6.1	Green	Out Side
977	Poma	2.5	6.2	Green	Out Side
978	Raintree	1.1	5.8	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
979	Raintree	1.9	5.6	Green	Out Side
980	Raintree	1.4	5.3	Green	Out Side
981	Raintree	1.9	6	Green	Out Side
982	Raintree	2	6.1	Green	Out Side
983	Raintree	1.8	6.2	Green	Out Side
984	Raintree	1.6	6.4	Green	Out Side
985	Raintree	1.3	6.9	Green	Out Side
986	Raintree	1.8	7.1	Green	Out Side
987	Raintree	0.4	6.9	Green	Out Side
988	Raintree	0.3	6.8	Green	Out Side
989	Raintree	0.3	6.8	Green	Out Side
990	Raintree	0.3	6.8	Green	Out Side
991	Raintree	0.3	6.8	Green	Out Side
992	Sasi	0.3	7	Green	Out Side
993	Raintree	0.3	6.6	Green	Out Side
994	Sasi	0.9	6.5	Green	Out Side
995	Sasi	0.3	6.6	Green	Out Side
996	Raintree	0.34	6.3	Green	Out Side
997	Sasi	0.5	6.4	Green	Out Side
998	Sasi	0.6	6.04	Green	Out Side
999	Sasi	0.8	5.9	Green	Out Side
1000	Sasi	0.4	6.2	Green	Out Side
1001	Sasi	0.35	6	Green	Out Side
1002	Sasi	0.6	6.1	Green	Out Side
1003	Sasi	0.31	6.3	Green	Out Side
1004	Sasi	0.34	5.7	Green	Out Side
1005	Raintree	0.67	6.6	Green	Out Side
1006	Krishnasura	0.97	6.2	Green	Out Side
1007	Vatgila	0.3	6.7	Green	Out Side
1008	Khilikha	1	6.5	Green	Out Side
1009	Debodaru	0.3	7.7	Green	In Side
1010	Debodaru	0.4	7.6	Green	In Side
1011	Debodaru	0.4	7.4	Green	In Side
1012	Debodaru	0.4	7.5	Green	In Side
1013	Debodaru	0.6	7.3	Green	In Side
1014	Tamul	0.4	7	Green	In Side
1015	Debodaru	0.4	7.4	Green	In Side
1016	Debodaru	0.5	7.5	Green	In Side
1017	Debodaru	0.5	7.25	Green	In Side
1018	Mobil	0.3	6.1	Green	In Side
1019	Mobil	0.6	5.7	Green	In Side
1020	Modar	0.6	6.5	Green	Out Side
1021	Tamul	0.4	7.2	Green	Out Side
1022	Tamul	0.3	7.3	Green	Out Side
1023	Modar	1.3	6	Green	Out Side
1024	Kodom	0.7	7.1	Green	Out Side
1025	Tamul	0.3	7	Green	Out Side
1026	Hura	1.2	6.6	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1027	Hura	1.1	6.5	Green	Out Side
1028	Moj	0.3	6.6	Green	Out Side
1029	Tamul	0.4	6.8	Green	Out Side
1030	Poma	0.4	4.85	Green	Out Side
1031	Velo	0.4	5.7	Green	Out Side
1032	Madhuri	0.6	6.4	Green	Out Side
1033	Madhuri	0.6	7.3	Green	Out Side
1034	Valow	0.7	7	Green	Out Side
1035	Jobaful	0.3	4.75	Green	In Side
1036	Sasi	0.3	6.9	Green	In Side
1037	Mango	0.9	4.68	Green	In Side
1038	Debodaru	0.5	5.8	Green	In Side
1039	Kothal	0.6	4.6	Green	In Side
1040	Modar	0.6	7	Green	In Side
1041	Mango	0.4	5.8	Green	In Side
1042	Jobaful	0.3	5.8	Green	In Side
1043	Litchi	0.6	7.9	Green	In Side
1044	Mango	1.4	6.2	Green	In Side
1045	Kothal	1	6.4	Green	In Side
1046	Mango	0.4	4.64	Green	In Side
1047	Jobaful	0.3	6.3	Green	In Side
1048	Fulgos	0.9	5.4	Dead	In Side
1049	Fulgos	0.5	5.3	Green	Out Side
1050	Hura	0.9	5.5	Green	Out Side
1051	Sasi	0.3	7.15	Green	In Side
1052	Fulgos	0.5	5.5	Green	In Side
1053	Fulgos	0.6	5.5	Green	In Side
1054	Fulgos	0.4	5.8	Green	Out Side
1055	Fulgos	0.5	5.9	Green	Out Side
1056	Fulgos	0.8	5.6	Green	Out Side
1057	Fulgos	0.64	5.5	Green	Out Side
1058	Fulgos	0.5	5.65	Green	Out Side
1059	Bel	0.8	7.2	Green	In Side
1060		0.9	7.5	GREEN	IN SIDE
1061	Tamul	0.4	7.1	Green	In Side
1062	Tamul	0.3	7.2	Green	In Side
1063	Tamul	0.3	7.5	Green	In Side
1064	Sasi	0.3	7.2	Green	In Side
1065	Tamul	0.3	7.6	Green	In Side
1066	Sasi	0.3	7.1	Green	In Side
1067	Tamul	0.3	7.5	Green	In Side
1068	Sasi	0.3	7.1	Green	In Side
1069	Sasi	0.3	7	Green	In Side
1070	Modar	0.4	5.7	Green	In Side
1071	Sasi	0.4	6.9	Green	In Side
1072	Sasi	0.3	7.1	Green	In Side
1073	Sasi	0.4	7.2	Green	In Side
1074	Sasi	0.5	7.3	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1075	Sasi	0.6	7.4	Green	In Side
1076	Sasi	0.3	7.3	Green	In Side
1077	Sasi	0.4	7.2	Green	In Side
1078	Tamul	0.4	6.8	Green	In Side
1079	Modar	0.6	6.6	Green	In Side
1080	Sojina	0.7	6.2	Green	In Side
1081	Bambo		6.8	Green	In Side
1082	Kodom	0.7	7.2	Green	In Side
1083	Krishnasura	1.3	4.7	Green	In Side
1084	Modar	0.3	6.3	Green	In Side
1085	Kodom	0.5	6.7	Green	In Side
1086	Debodaru	0.6	6.1	Green	In Side
1087	Sasi	0.5	7.6	Green	In Side
1088	Mango	0.5	5.6	Green	In Side
1089	Neem	0.8	6.5	Green	In Side
1090	Kothal	1.4	6.4	Green	In Side
1091	Ajar	0.3	6	Green	In Side
1092	Mango	1.3	7.4	Green	In Side
1093	Coconut	1	7.1	Green	In Side
1094	Mango	0.4	5.18	Green	In Side
1095	Korobi	0.3	5.3	Green	In Side
1096	Kothal	1	5.1	Green	In Side
1097	Mango	1	6.8	Green	In Side
1098	Modar	0.5	5	Green	In Side
1099	Kothal	1.1	5.4	Green	In Side
1100	Ahat	4.9	7.6	Green	In Side
1101	Segun	1.1	5.5	Green	In Side
1102	Huwa	1.9	5.7	Green	In Side
1103	Tamul	0.4	7.3	Green	In Side
1104	Tamul	0.5	7.5	Green	In Side
1105	Tamul	0.4	5.2	Green	In Side
1106	Tamul	0.4	5.3	Green	In Side
1107	Kodom	0.9	5.7	Green	In Side
1108	Tamul	0.4	5.2	Green	In Side
1109	Tamul	0.3	5.1	Green	In Side
1110	Tamul	0.3	7.5	Green	In Side
1111	Tamul	0.4	7.4	Green	In Side
1112	Kodom	0.3	6	Green	In Side
1113	Koroi	0.3	5.5	Green	In Side
1114	Cross	0.6	5.5	Green	In Side
1115	Neem	0.7	7.2	Green	In Side
1116	Jabaful	0.4	5	Green	In Side
1117	Cross	0.53	5.3	Green	In Side
1118	Cross	0.5	5.4	Green	In Side
1119	Vatgila	0.4	4.8	Green	In Side
1120	Kobi	0.4	5.4	Green	In Side
1121	Kobi	0.7	5.3	Green	In Side
1122	Hura	1.3	5.4	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1123	Kobi	0.3	6.3	Green	In Side
1124	Kobi	0.7	7.2	Green	In Side
1125	Kobi	0.7	7	Green	In Side
1126	Cross	0.4	7	Green	In Side
1127	Cross	0.3	7.4	Green	In Side
1128	Moj	0.5	6.6	Green	In Side
1129	Cross	0.3	5.7	Green	In Side
1130	Poma	1.5	7.7	Green	In Side
1131	Valow	0.4	7.8	Green	In Side
1132	Bogori	1	6.8	Green	Out Side
1133	Raintree	1.2	7.6	Green	In Side
1134	Cross	0.5	7	Green	In Side
1135	Agar	0.5	7.7	Green	In Side
1136		0.5	7.9	GREEN	IN SIDE
1137	Modar	0.9	6.7	Green	In Side
1138	Bambo		6.1	Green	In Side
1139	Agar	0.4	6.1	Green	In Side
1140	Bambo		7.4	Green	In Side
1141	Kodom	0.4	4.9	Green	In Side
1142	Kodom	0.5	5	Green	In Side
1143	Kodom	0.4	6.4	Green	In Side
1144	Sotiana	0.8	5.7	Green	In Side
1145	Sotiana	0.6	5.6	Green	In Side
1146	Sotiana	0.7	5.7	Green	In Side
1147	Sotiana	0.3	5.3	Green	In Side
1148	Sotiana	0.4	5.4	Green	In Side
1149	Tamul	0.4	7.2	Green	In Side
1150	Tamul	0.3	7	Green	In Side
1151	Tamul	0.4	6.8	Green	In Side
1152	Hura	1.6	5.8	Green	In Side
1153	Moj	0.3	5.6	Green	In Side
1154	Mango	1.2	7.4	Green	In Side
1155	Khiilikha	1	7.1	Green	In Side
1156	Sotiana	0.5	7.2	Green	In Side
1157	Bambo		6.4	Green	In Side
1158	Sotiana	0.5	6.2	Green	In Side
1159	Sotiana	0.3	6.7	Green	In Side
1160	Sotiana	0.6	6.1	Green	In Side
1161	Sotiana	1	5.5	Green	Out Side
1162	Poma	0.4	6.4	Green	Out Side
1163	Simolu	0.3	5.1	Green	Out Side
1164	Agar	0.5	6.9	Green	Out Side
1165	Raintree	1.2	7.2	Green	Out Side
1166	Bambo		7.2	Green	Out Side
1167	Agar	0.4	7.4	Green	In Side
1168	Agar	0.4	7.1	Green	In Side
1169	Agar	0.3	6.5	Green	In Side
1170	Agar	0.3	6.8	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1171	Agar	1.2	6.7	Green	In Side
1172	Goamri	0.4	6.6	Green	In Side
1173	Moj	0.9	7.8	Green	In Side
1174	Agar	0.7	6.1	Green	In Side
1175	Sonaru	0.9	7.1	Green	In Side
1176	Moj	0.3	6	Green	In Side
1177	Samkothal	0.5	6.5	Green	In Side
1178	Moj	0.5	7.2	Green	In Side
1179	Moj	0.4	7.4	Green	In Side
1180	Sewa	0.7	6.8	Green	In Side
1181	Modar	0.5	6.3	Green	In Side
1182	Modar	0.4	6.1	Green	In Side
1183	Valow	0.7	6.5	Green	In Side
1184	Pine	0.5	6.7	Green	In Side
1185	Bambio		6.2	Green	Out Side
1186	Samkothal	1.2	7.5	Green	Out Side
1187	Agar	0.3	6.9	Green	Out Side
1188	Bambo		6.9	Green	Out Side
1189	Bambo		7.4	Green	Out Side
1190	Bambo		7.9	Green	Out Side
1191	Hura	0.4	6	Green	Out Side
1192	Khilikha	0.6	6.3	Green	Out Side
1193	Dimoru	1.2	6.9	Green	Out Side
1194	Huwa	0.4	7.5	Green	Out Side
1195	Pine	0.6	6.5	Green	Out Side
1196	Sonaru	0.6	7.5	Green	In Side
1197	Sonaru	0.5	5.9	Green	Out Side
1198	Sonaru	0.7	5.4	Green	Out Side
1199		2.1	6	GREEN	OUT SIDE
1200	Raintree	1.2	6.8	Green	Out Side
1201	Amlokhi	0.6	7.1	Green	Out Side
1202	Ahat	2.9	7.9	Green	In Side
1203	Sonaru	1.1	7.4	Died	Out Side
1204	Sonaru	1.2	7.5	Green	Out Side
1205	Sonaru	1.9	6.8	Green	Out Side
1206	Sonaru	0.7	6.7	Green	Out Side
1207	Sonaru	0.5	7.1	Died	Out Side
1208	Agar	0.6	6.7	Green	Out Side
1209	Sonaru	0.6	5	Died	Out Side
1210	Sonaru	0.5	4.7	Green	Out Side
1211	Dimoru	0.8	7.4	Green	In Side
1212	Huwa	0.8	6.6	Green	In Side
1213	Simolu	0.6	7.8	Green	In Side
1214	Khrjur	1.6	6.4	Green	In Side
1215	Khejur	1	5.8	Green	Out Side
1216	Khejur	1.2	5.9	Green	Out Side
1217	Khilikha	1.1	7.9	Green	Out Side
1218	Belgos	1	7.3	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1219	Raintree	0.8	6.3	Green	Out Side
1220	Raintree	0.4	6.2	Green	Out Side
1221	Raintree	0.4	5.3	Green	Out Side
1222	Raintree	0.4	5.3	Green	Out Side
1223	Raintree	0.4	6.8	Green	Out Side
1224	Sonaru	1.2	6.8	Green	In Side
1225	Sepon	0.8	7.4	Green	In Side
1226	Sepon	0.5	7.5	Green	In Side
1227	Sepon	0.3	7.7	Green	In Side
1228	Raintree	0.4	7.2	Green	In Side
1229	Sepon	2	7.4	Green	In Side
1230	Krishnasura	0.4	7.7	Green	In Side
1231	Dimoru	1.8	7	Green	Out Side
1232	Owtanga	3.2	6	Green	Out Side
1233	Khejur	1.1	7.3	Green	Out Side
1234	Belgos	0.6	6.1	Green	In Side
1235	Tamul	0.4	7.4	Green	In Side
1236	Tamul	0.4	6.9	Green	In Side
1237	Khejur	1.2	5.4	Green	Out Side
1238	Kodom	0.6	7	Green	Out Side
1239	Sotiana	0.7	4.9	Green	Out Side
1240	Sasi	0.3	6.5	Green	In Side
1241	Tamul	0.3	7.5	Green	In Side
1242	Tamul	0.3	6.9	Green	In Side
1243	Coconut	1	7.5	Green	In Side
1244	Coconut	1	7.1	Green	In Side
1245	Titasopa	1.2	6.3	Green	In Side
1246	Tamul	0.35	7.9	Green	In Side
1247	Khilikha	0.8	6.5	Green	In Side
1248	Sasi	0.4	7.5	Green	In Side
1249	Coconut	1	7.3	Green	In Side
1250	Sasi	0.32	7.5	Green	In Side
1251	Sasi	0.3	7.8	Green	In Side
1252	Tamul	0.3	6.8	Green	In Side
1253	Tamul	0.3	7.4	Green	In Side
1254	Tamul	0.4	7.3	Green	In Side
1255	Debodaru	0.7	7.7	Green	In Side
1256	Japani	1	6.7	Green	In Side
1257	Tamul	0.35	6.3	Green	In Side
1258	Tamul	0.4	7.6	Green	In Side
1259	Raintree	0.9	5.44	Green	In Side
1260	Khilikha	0.8	6.05	Green	In Side
1261	Gohora	0.9	7.2	Green	In Side
1262	Kusat	0.7	7.7	Green	In Side
1263	Agar	1.3	7.7	Green	Out Side
1264	Raintree	0.5	6.5	Green	Out Side
1265	Kutas	0.5	6.9	Green	Out Side
1266	Sotiana	0.65	6.9	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1267	Sonaru	0.5	6.4	Green	Out Side
1268	Ghura	0.5	6.3	Green	Out Side
1269	Ghira	0.7	6.4	Green	Out Side
1270	Ghura	0.7	6.7	Green	Out Side
1271	Sonaru	1.2	7.1	Died	Out Side
1272	Ghura	0.4	7.5	Green	Out Side
1273	Sasi	0.4	5.9	Green	Out Side
1274	Ghura	0.6	6.4	Green	Out Side
1275	Tamul	0.4	5.1	Green	Out Side
1276	Mango	0.7	5.4	Green	Out Side
1277	Poma	1.1	7.8	Green	Out Side
1278	Tamul	0.3	6.8	Green	Out Side
1279	Sasi	0.35	5.9	Green	Out Side
1280	Sasi	0.44	5.85	Green	Out Side
1281	Tamul	0.35	5.5	Green	Out Side
1282	Tamul	0.3	5.4	Green	Out Side
1283	Bambo		6.3	Green	Out Side
1284	Chandan	0.4	7.2	Green	Out Side
1285	Kodom	1	7.4	Green	In Side
1286	Sotiana	0.5	6.1	Green	In Side
1287	Moj	0.9	6.8	Green	In Side
1288	Poma	0.95	6.7	Green	In Side
1289	Moj	1	7.8	Green	In Side
1290	Coconut	0.9	6.6	Green	In Side
1291	Coconut	0.8	7.3	Green	In Side
1292	Coconut	0.8	7.6	Green	In Side
1293	Tamul	0.3	6.85	Green	In Side
1294	Tamul	0.3	6.7	Green	In Side
1295	Tamul	0.4	7.9	Green	In Side
1296	Moj	0.4	6.5	Green	In Side
1297	Tamul	0.3	6.7	Green	In Side
1298	Tamul	0.3	6.8	Green	In Side
1299	Tamul	0.4	7.2	Green	In Side
1300	Tamul	0.4	6.8	Green	In Side
1301	Tamul	0.4	6.7	Green	In Side
1302	Tamul	0.4	7.5	Green	In Side
1303	Tamul	0.4	7.8	Green	In Side
1304	Tamul	0.35	7.1	Green	In Side
1305	Rababtanga	0.3	7.3	Green	In Side
1306	Tamul	0.35	7.1	Green	In Side
1307	Tamul	0.3	7.3	Green	In Side
1308	Tamul	0.35	7.3	Green	In Side
1309	Tamul	0.35	7.4	Green	In Side
1310	Tamul	0.3	7.4	Green	In Side
1311	Tamul	0.3	7.8	Green	In Side
1312	Bambo		6.4	Green	In Side
1313	Moj	0.5	6.1	Green	In Side
1314	Moj	0.3	5.8	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1315	Moj	0.6	5.6	Green	In Side
1316	Jamun	1.6	4.2	Green	Out Side
1317	Tamul	0.35	7.4	Green	Out Side
1318	Tamul	0.3	6.9	Green	Out Side
1319	Tamul	0.3	7.8	Green	Out Side
1320	Tamul	0.3	6.2	Green	Out Side
1321	Tamul	0.35	6.5	Green	Out Side
1322	Tamul	0.3	6.9	Green	Out Side
1323	Tamul	0.4	7.5	Green	Out Side
1324	Tamul	0.3	6.65	Green	Out Side
1325	Tamul	0.35	7.24	Green	Out Side
1326	Tamul	0.3	6.6	Green	In Side
1327	Tamul	0.3	6.6	Green	In Side
1328	Tamul	0.3	7.2	Green	In Side
1329	Tamul	0.4	6.5	Green	In Side
1330	Kodom	1.3	7.1	Green	In Side
1331	Kodom	1	7.8	Green	In Side
1332	Sojina	1.2	7	Green	In Side
1333	Coconut	1	6.6	Green	In Side
1334	Debodaru	0.6	7.5	Green	In Side
1335	Tamul	0.3	6.6	Green	Out Side
1336	Tamul	0.3	7	Green	In Side
1337	Tamul	0.45	7.2	Green	In Side
1338	Mango	1.85	7.1	Green	In Side
1339	Coconut	1	7.1	Green	In Side
1340	Coconut	0.9	6.9	Green	In Side
1341	Coconut	1.1	6.9	Green	In Side
1342	Khilikha	0.6	7.5	Green	In Side
1343	Neem	0.4	6	Green	In Side
1344	Cross	1	6.4	Green	In Side
1345	Kodom	0.3	6.6	Green	In Side
1346	Moj	0.3	5.9	Green	In Side
1347	Khilikha	0.75	6.3	Green	In Side
1348	Coconut	1	7	Green	In Side
1349	Khilikha	0.6	7.5	Green	In Side
1350	Borun	0.5	7	Green	In Side
1351	Tamul	0.3	7.2	Green	In Side
1352	Fulgos	0.7	7.1	Green	In Side
1353	Fulgos	0.3	7.6	Green	In Side
1354	Mango	2.1	6.9	Green	In Side
1355	Khejur	1	7.8	Green	Out Side
1356	Cross	1.9	4.9	Green	Out Side
1357	Cross	1	5.9	Green	Out Side
1358	Cross	0.6	6.7	Green	Out Side
1359	Sasi	0.3	5.4	Green	In Side
1360	Agar	0.6	6.5	Green	In Side
1361	Kodom	0.9	5.1	Green	In Side
1362	Gomari	1.1	4.9	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1363	Gomari	0.9	5	Green	In Side
1364	Moj	0.9	5.9	Green	In Side
1365	Huwa	1.4	6.7	Green	In Side
1366	Huwa	1	5.4	Green	In Side
1367	Huwa	1.14	5.4	Green	Out Side
1368	Huwa	0.8	7.8	Green	In Side
1369	Gomari	0.85	6.9	Green	In Side
1370	Sekon	0.7	5.2	Green	In Side
1371	Tamul	0.3	5.6	Green	In Side
1372	Ahat	8.6	5.2	Green	Out Side
1373	Neem	1.1	4.4	Green	Out Side
1374	Poma	1.7	7.7	Green	Out Side
1375	Tamul	0.35	7.9	Green	In Side
1376	Tamul	0.35	7.9	Green	In Side
1377	Tamul	0.3	7.9	Green	In Side
1378	Tamul	0.35	5.8	Green	In Side
1379	Tamul	0.3	7.9	Green	In Side
1380	Tamul	0.3	6.8	Green	In Side
1381	Ahat	3.1	6.7	Green	In Side
1382	Tamul	0.35	5.2	Green	In Side
1383	Tamul	0.35	5	Green	In Side
1384	Tamul	0.3	6.9	Green	In Side
1385	Tamul	0.45	5	Green	In Side
1386	Khuwalu	0.8	5.2	Green	In Side
1387	Tamul	0.3	6.9	Green	In Side
1388	Tamul	0.4	4.7	Green	In Side
1389	Kothal	0.6	5.8	Green	In Side
1390	Tamul	0.3	4.8	Green	In Side
1391	Kothal	0.7	6.3	Green	In Side
1392	Mango	1.2	7.7	Green	In Side
1393	Mango	1.2	7.8	Green	In Side
1394	Sonaru	1.1	7.5	Green	In Side
1395	Cross	0.5	5.1	Green	Out Side
1396	Cross	0.5	5.5	Green	Out Side
1397	Cross	0.75	5.2	Green	Out Side
1398	Coconut	0.75	7.1	Green	In Side
1399	Tamul	0.35	5.4	Died	In Side
1400	Tamul	0.3	5.5	Green	In Side
1401	Tamul	0.3	6.3	Died	In Side
1402	Tamul	0.35	6	Died	In Side
1403	Coconut	1	7	Green	In Side
1404	Coconut	1	6.9	Green	In Side
1405	Coconut	1	7	Green	In Side
1406	Tamul	0.4	6.34	Green	In Side
1407	Coconut	1	7.4	Green	In Side
1408	Coconut	1	7.7	Green	In Side
1409	Tamul	0.35	6.4	Green	In Side
1410	Tamul	0.3	7.4	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1411	Mango	1.1	7	Green	In Side
1412	Coconut	0.95	6.7	Green	In Side
1413	Tamul	0.35	6.56	Green	In Side
1414	Tamul	0.35	6.4	Green	In Side
1415	Mango	0.5	7.4	Green	In Side
1416	Tamul	0.3	6.45	Green	In Side
1417	Tamul	0.35	6.25	Green	In Side
1418	Khilikha	1.1	6.2	Green	In Side
1419	Tamul	0.35	7.2	Green	In Side
1420	Tamul	0.35	7	Green	In Side
1421	Tamul	0.35	6.2	Green	In Side
1422	Tamul	0.35	6.3	Green	In Side
1423	Coconut	0.8	7.4	Green	In Side
1424	Tamul	0.3	6.7	Green	In Side
1425	Khejur	0.9	4.4	Green	In Side
1426	Debodaru	0.35	4.8	Green	In Side
1427	Debodaru	0.4	4.9	Green	In Side
1428	Debodaru	0.4	4.9	Green	In Side
1429	Debodaru	0.4	5	Green	In Side
1430	Debodaru	0.4	5.4	Green	In Side
1431	Debodaru	0.5	5.7	Green	In Side
1432	Debodaru	0.4	5.8	Green	In Side
1433	Debodaru	0.35	5.8	Green	In Side
1434	Debodaru	0.4	5.8	Green	In Side
1435	Sasi	0.6	5.5	Green	In Side
1436	Sasi	0.3	5.9	Green	In Side
1437	Sasi	0.35	6.2	Green	In Side
1438	Sasi	0.35	5.5	Green	In Side
1439	Sasi	0.3	5.35	Green	In Side
1440	Poma	0.95	6.3	Green	In Side
1441	Tamul	0.3	5.8	Green	In Side
1442	Borun	0.5	5.65	Green	In Side
1443	Tamul	0.4	7.15	Green	In Side
1444	Krishnasura	0.95	5.2	Green	In Side
1445	Poma	0.4	5.8	Green	In Side
1446	Kothal	0.45	6.7	Green	In Side
1447	Sasi	0.3	7.9	Green	Out Side
1448	Mango	1.1	6.3	Green	Out Side
1449	Cross	0.8	4.6	Green	Out Side
1450	Krishnasura	1.3	4.9	Green	Out Side
1451	Krishnasura	0.3	6.8	Green	In Side
1452	Sotiana	0.6	6.55	Green	In Side
1453	Coconut	1	6.1	Green	In Side
1454	Coconut	0.9	6.2	Green	In Side
1455	Tamul	0.4	7.1	Green	Out Side
1456	Coconut	0.8	7.1	Green	In Side
1457	Cross	0.4	5.6	Green	Out Side
1458	Tamul	0.3	5.05	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1459	Kothal	0.55	5.7	Green	In Side
1460	Neem	0.5	5.3	Green	In Side
1461	Kodom	0.5	4.55	Green	In Side
1462	Kodom	0.3	6.1	Green	In Side
1463	Segun	0.5	5.5	Green	In Side
1464	Segun	1.05	4.3	Green	In Side
1465	Coconut	0.8	6.9	Green	In Side
1466	Madhuri	0.5	4.8	Green	In Side
1467	Ahat	2.2	4.4	Green	In Side
1468	Amlokhi	0.9	4.9	Green	In Side
1469	Omra	1.15	4.3	Green	Out Side
1470	Modhuri	0.4	4.5	Died	Out Side
1471	Tamul	0.3	5.15	Green	Out Side
1472	Poma	0.3	6.65	Green	Out Side
1473	Sewali	0.4	5	Green	Out Side
1474	Neem	0.75	7.8	Green	In Side
1475	Tamul	0.3	5.3	Green	In Side
1476	Tamul	0.3	5.4	Green	In Side
1477	Mango	1.25	5.4	Green	In Side
1478	Tamul	0.34	5.4	Green	In Side
1479	Mango	0.4	6.24	Green	In Side
1480	Tamul	0.3	5.4	Green	In Side
1481	Khilikha	0.95	6.8	Green	In Side
1482	Tultha	0.5	5.7	Green	In Side
1483	Sonaru	0.6	7.45	Green	In Side
1484	Himolu	2.3	4.7	Green	Out Side
1485	Krishnasura	0.75	4.9	Green	Out Side
1486	Sotiana	0.45	7.14	Green	Out Side
1487	Krishnasura	0.65	5.25	Green	Out Side
1488	Sotiana	0.52	5.6	Green	Out Side
1489	Sotiana	1.5	5.1	Green	Out Side
1490	Kodom	0.85	6.1	Died	Out Side
1491	Bambo		5.9	Green	In Side
1492	Sotiana	0.3	6.35	Green	In Side
1493	Sotiana	0.6	5.6	Green	In Side
1494	Sotiana	0.7	6	Green	In Side
1495	Agar	1.2	7.4	Green	In Side
1496	Moj	0.35	6.65	Green	Out Side
1497	Moj	0.35	6.6	Green	Out Side
1498	Moj	0.3	6.4	Green	Out Side
1499	Moj	0.4	6.15	Green	Out Side
1500	Tamul	0.3	7.05	Green	Out Side
1501	Mango	1	6.75	Green	Out Side
1502	Krishnasura	0.5	7.4	Green	In Side
1503	Mango	1.35	7.7	Green	In Side
1504	Mango	1	7	Green	In Side
1505	Jamu	1.2	6.6	Green	In Side
1506	Moj	0.4	5.7	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1507	Moj	0.3	6	Green	In Side
1508	Moj	0.4	6.2	Green	In Side
1509	Moj	0.4	7.4	Green	Out Side
1510	Borun	0.7	7	Green	Out Side
1511	Moj	0.35	7.1	Green	In Side
1512	Coconut	0.9	6.6	Green	In Side
1513	Sekon	0.6	6.2	Green	In Side
1514	Mango	0.5	6	Green	In Side
1515	Coconut	1.2	6.2	Green	In Side
1516	Coconut	0.8	6.5	Green	In Side
1517	Coconut	0.8	6.8	Green	In Side
1518	Sekon	1.1	5.1	Green	In Side
1519	Coconut	0.8	5.6	Green	In Side
1520	Coconut	0.85	6.05	Green	In Side
1521	Modhuri	0.8	5.45	Green	In Side
1522	Neem	0.4	6.9	Green	In Side
1523	Segun	0.3	6.3	Green	In Side
1524	Mango	0.3	5.7	Green	In Side
1525	Segun	0.55	6.3	Green	In Side
1526	Debodaru	0.7	6.2	Green	In Side
1527	Tamul	0.5	6.1	Green	In Side
1528	Tamul	0.5	6	Green	In Side
1529	Tamul	0.5	6	Green	In Side
1530	Tamul	0.4	5.8	Green	In Side
1531	Modhuri	0.9	5.8	Green	In Side
1532	Kothaluwa	1.1	7.4	Green	In Side
1533	Sasi	0.4	6.2	Green	In Side
1534	Tamul	0.4	5.8	Green	In Side
1535	Kothaluwa	0.7	6.5	Green	In Side
1536	Tamul	0.4	5.7	Green	In Side
1537	Simolu	0.4	6.2	Green	In Side
1538	Tamul	0.4	7.4	Green	In Side
1539	Simolu	2.2	5.1	Green	In Side
1540	Sotiana	0.34	5.4	Green	In Side
1541	Buwal	1.7	5.1	Green	In Side
1542	Moj	0.5	7.6	Green	In Side
1543	Coconut	1.2	6.3	Green	In Side
1544	Sasi	0.4	5.7	Green	In Side
1545	Sasi	0.4	7.5	Green	In Side
1546	Sasi	0.4	5.7	Green	In Side
1547	Sasi	0.4	6.2	Green	In Side
1548	Moj	0.9	5.1	Green	Out Side
1549	Mango	3.8	4.8	Green	In Side
1550	Simolu	2.8	4.5	Green	In Side
1551	Himolu	3	4.6	Green	Out Side
1552	Himolu	2.1	4.8	Green	Out Side
1553	Himolu	3.1	4.3	Green	Out Side
1554	Buwal	1	4.8	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1555	Buwal	0.5	5.2	Green	Out Side
1556	Sotiana	1.5	5.4	Green	Out Side
1557	Kothaluwa	2.7	5.2	Green	Out Side
1558	Sirish	1.2	6.8	Green	Out Side
1559	Raintree	0.9	5.3	Green	Out Side
3121	Raintree	0.8	6.3	Green	Out Side
1561	Raintree	0.8	7.3	Green	Out Side
1562	Coconut	0.84	6.7	Green	Out Side
1563	Moj	0.3	6.7	Green	Out Side
1564	Moj	0.34	7.3	Green	Out Side
1565	Moj	0.8	6.3	Green	Out Side
1566	Moj	0.4	7.4	Green	Out Side
1567	Poma	0.4	7.3	Green	In Side
1568	Moango	0.4	7.1	Green	Out Side
1569	Amlokhi	0.6	7.5	Green	Out Side
1570	Poma	0.4	7.3	Green	Out Side
1571	Poma	0.5	7.3	Green	Out Side
1572	Koroi	0.9	7.4	Green	Out Side
1573	Bokul	0.4	7.2	Green	Out Side
1574	Amlokhi	0.9	6.9	Green	Out Side
1575	Gohora	1.1	7.2	Green	Out Side
1576	Kodom	0.6	7.3	Died	Out Side
1577	Sasi	0.5	7.55	Green	Out Side
1578	Moj	0.6	7.3	Green	Out Side
1579	Moj	0.5	7.1	Green	Out Side
1580	Sotiana	0.8	6.7	Green	Out Side
1581	Ahat	2.1	7.2	Green	Out Side
1582	Moj	0.5	6.9	Green	Out Side
1583	Moj	0.3	6	Green	Out Side
1584	Moj	37	6	Green	Out Side
1585	Moj	0.43	5.9	Green	Out Side
1586	Moj	0.3	5.9	Green	Out Side
1587	Moj	0.4	6.2	Green	Out Side
1588	Vatgila	0.5	6.3	Green	Out Side
1589	Vatgila	0.4	6.4	Green	Out Side
1590	Vatgila	0.4	6.4	Green	Out Side
1591	Vatgila	0.3	6.5	Green	Out Side
1592	Sirish	2.2	0.72	Green	Out Side
1593	Vatgila	0.4	6.4	Green	Out Side
1594	Sirish	1.8	7.1	Green	Out Side
1595	Vatgila	0.4	5.4	Green	Out Side
1596	Sirish	2.1	7.15	Green	Out Side
1597	Vatgila	0.5	6.4	Green	Out Side
1598	Vatgila	0.6	6.35	Green	Out Side
1599	Vatgila	0.5	6.6	Green	Out Side
1600	Vatgila	0.6	6.5	Green	Out Side
1601	Vatgila	0.5	6.5	Green	Out Side
1602	Vatgila	0.6	6.5	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1603	Sirish	1.5	7.1	Green	Out Side
1604	Sotiana	0.6	6.4	Green	Out Side
1605	Vatgila	0.5	6.3	Green	Out Side
1606	Vatgila	0.5	6.2	Green	Out Side
1607	Vatgila	0.5	6.05	Green	Out Side
1608	Sirish	1.9	7.8	Green	Out Side
1609	Vatgila	0.3	6.2	Green	Out Side
1610	Vatgila	0.3	6.2	Green	Out Side
1611	Vatgila	0.4	6.3	Green	Out Side
1612	Sotiana	2.2	5.9	Green	Out Side
1613	Kothaluwa	1.1	6.3	Green	Out Side
1614	Kothaluwa	1.15	6.1	Green	Out Side
1615	Valow	1.2	6.1	Green	Out Side
1616	Valow	1.2	5.7	Green	Out Side
1617	Valow	1.15	6.1	Green	Out Side
1618	Valow	1.1	5.85	Green	Out Side
1619	Valow	2.7	5.8	Green	Out Side
1620	Sotiana	1.1	6.5	Green	Out Side
1621	Sotiana	2.15	6.35	Green	Out Side
1622	Sotiana	1.1	6.3	Green	Out Side
1623	Sotiana	0.8	6	Green	Out Side
1624	Sotiana	1.09	5.85	Green	Out Side
1625	Kotholuwa	2.1	6.3	Green	Out Side
1626	Kothaluwa	1.9	7.9	Green	Out Side
1627	Moj	0.9	7.9	Green	Out Side
1628	Tamul	0.4	7.8	Green	In Side
1629	Segun	0.6	7.5	Green	Out Side
1630	Poma	1.9	7.9	Green	Out Side
1631	Segun	0.5	7.9	Green	Out Side
1632	Kothaluwa	0.9	7.9	Green	Out Side
1633	Tamul	0.6	7.9	Green	Out Side
1634	Tamul	0.4	6.9	Green	Out Side
1635	Kothaluwa	0.5	7.3	Green	Out Side
1636	Tamul	0.3	6.7	Green	Out Side
1637	Simolu	0.5	6.7	Green	Out Side
1638	Dimoru	0.3	7.3	Green	Out Side
1639	Owtanga	0.4	7.5	Green	Out Side
1640	Bambo		7.6	Green	Out Side
1641	Nagabher	2.11	7.9	Green	Out Side
1642	Valow	0.4	7.3	Green	Out Side
1643	Cross	0.3	7	Green	Out Side
1644	Valow	0.6	6.7	Green	Out Side
1645	Tamul	0.3	7.8	Green	Out Side
1646	Krishnosura	0.7	6.9	Green	Out Side
1647	Coconut	0.7	7.5	Green	In Side
1648	Deboru	0.4	4.9	Green	Out Side
1649	Valow	0.6	4.6	Green	Out Side
1650	Sasi	0.9	5.05	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1651	Simolu	0.4	7.2	Green	Out Side
1652	Ahat	3.7	7.6	Green	Out Side
1653	Bambo		5.2	Green	Out Side
1654	Simolu	0.5	6.6	Green	In Side
1655	Moj	1.3	6.5	Green	In Side
1656	Moj	1.4	6.3	Green	In Side
1657	Valow	0.37	6.45	Green	In Side
1658	Moj	1.25	7.3	Green	Out Side
1659	Valow	0.4	7	Green	Out Side
1660	Valow	0.3	6.4	Green	Out Side
1661	Sotiana	0.6	7.4	Green	Out Side
1662	Valow	1.1	7.15	Green	Out Side
1663	Bambo		7.1	Green	Out Side
1664	Tamul	0.3	6.9	Green	Out Side
1665	Tamul	0.3	6.85	Green	Out Side
1666	Tamul	0.6	6.5	Green	Out Side
1667	Khilikjha	1.3	6.1	Green	Out Side
1668	Khiilikha	1.1	7.7	Green	Out Side
1669	Vatgila	2.3	7.3	Green	Out Side
1670	Tamul	0.3	6.8	Green	Out Side
1671	Moj	0.45	6.3	Green	Out Side
1672	Tamul	0.4	6.7	Green	Out Side
1673	Tamul	0.4	6.9	Green	In Side
1674	Segun	1.1	5.9	Green	Out Side
1675	Modhuri	0.45	6.45	Green	Out Side
1676	Tamul	0.4	6.6	Green	Out Side
1677	Vatgila	0.3	5.75	Green	Out Side
1678	Tamul	0.5	6.9	Green	Out Side
1679	Segun	1.1	6.1	Green	In Side
1680	Tamul	0.4	7	Green	In Side
1681	Dimoru	0.3	6.9	Green	In Side
1682	Papaya	0.5	6.15	Green	In Side
1683	Madhuri	0.5	7.2	Green	In Side
1684	Coconut	1.1	7.8	Green	In Side
1685	Tamul	0.4	6.1	Green	In Side
1686	Tamul	0.4	6.3	Green	In Side
1687	Tamul	0.4	6.2	Green	In Side
1688	Tamul	0.4	7.4	Green	In Side
1689	Gohora	0.4	7.3	Green	In Side
1690	Omora	1.1	4.8	Green	Out Side
1691	Omora	0.65	4.9	Green	Out Side
1692	Sotiana	1.15	7.35	Green	Out Side
1693	Sotiana	1.35	7.35	Green	Out Side
1694	Tamul	0.35	7.35	Green	Out Side
1695	Gomari	1.55	4.8	Green	Out Side
1696	Sotiana	1	5.2	Green	Out Side
1697	Moj	0.35	6.05	Green	In Side
1698	Ghara	0.9	5.7	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1699	Tamul	0.4	7.4	Green	In Side
1700	Cross	1.3	5.15	Green	Out Side
1701	Sasi	0.3	7.8	Green	In Side
1702	Tamul	0.35	7.4	Green	In Side
1703	Debodaru	0.9	6.6	Green	In Side
1704	Tamul	0.4	6.7	Green	In Side
1705	Tamul	0.5	7.1	Green	In Side
1706	Debodaru	0.6	78.1	Green	In Side
1707	Jobaful	0.35	6.65	Green	In Side
1708	Tamul	0.35	6.3	Green	In Side
1709	Tamul	0.3	7.4	Green	In Side
1710	Tamul	0.3	7.3	Green	In Side
1711	Tamul	0.3	7.4	Green	In Side
1712	Tamul	0.45	7.7	Green	In Side
1713	Raintree	0.3	7.7	Green	In Side
1714	Moj	0.35	6.6	Green	Out Side
1715	Tamul	0.4	7.7	Green	In Side
1716	Tamul	0.35	7.8	Green	In Side
1717	Moj	0.3	6.4	Died	Out Side
1718	Tamul	0.5	8	Green	In Side
1719	Monishal	1.1	8	Green	In Side
1720	Tamul	0.4	7.8	Green	In Side
1721	Tamul	0.3	7.8	Green	In Side
1722	Gomari	1.1	6.8	Green	In Side
1723	Coconut	0.85	7	Green	In Side
1724	Tamul	0.45	7.5	Green	In Side
1725	Sasi	0.3	7.9	Green	In Side
1726	Tamul	0.4	6.3	Green	In Side
1727	Tamul	0.5	7	Green	In Side
1728	Nagabher	0.85	6.25	Green	In Side
1729	Kodom	0.55	6.7	Green	In Side
1730	Khilikha	1.1	7.9	Green	In Side
1731	Sasi	0.3	7.4	Green	In Side
1732	Sasi	0.33	6.8	Green	In Side
1733	Dimoru	0.4	6.4	Green	In Side
1734	Sotiana	1.1	5.6	Green	Out Side
1735	Cross	1.3	4.8	Green	Out Side
1736	Cross	0.5	6.4	Green	Out Side
1737	Cross	0.45	6.5	Green	Out Side
1738	Moj	0.4	5.9	Green	Out Side
1739	Simolu	1.3	6.4	Green	Out Side
1740	Tamul	1.1	6.4	Green	Out Side
1741	Mango	0.3	6.4	Green	Out Side
1742	Tamul	0.3	6.1	Green	Out Side
1743	Huwalu	0.4	4.9	Green	In Side
1744	Poma	0.6	4.9	Green	In Side
1745	Tamul	0.4	6.1	Green	In Side
1746	Coconut	0.9	6.8	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1747	Coconut	0.85	7.1	Green	In Side
1748	Mango	1	6.6	Green	In Side
1749	Tamul	0.3	7.8	Green	In Side
1750	Tamul	0.45	6.8	Green	In Side
1751	Raintree	2	8	Green	Out Side
1752	Moj	1.2	6.1	Green	Out Side
1753	Moj	1.05	5.9	Green	Out Side
1754	Gohoa	1.2	6.4	Green	In Side
1755	Gohoa	0.8	7.6	Green	In Side
1756	Dimoru	0.6	6.1	Green	In Side
1757	Segun	1.5	6.9	Green	In Side
1758	Segun	1.35	7.5	Green	Out Side
1759	Raintree	1.35	6.55	Green	Out Side
1760	Segun	1.55	6.6	Green	Out Side
1761	Raintree	2.2	6.8	Green	Out Side
1762	Krishnosura	1.2	6.5	Green	Out Side
1763	Akesia	2.2	6.6	Green	Out Side
1764	Moj	1.9	6.6	Green	Out Side
1765	Gomari	1.6	7	Green	Out Side
1766	Moj	0.3	5.7	Green	In Side
1767	Moj	0.3	6.1	Green	In Side
1768	Coconut	0.9	7.9	Green	In Side
1769	Raintree	1.3	6.9	Green	In Side
1770	Modar	0.6	6.9	Green	In Side
1771	Bokul	0.5	6.8	Green	In Side
1772	Coconut	6.9	6.8	Green	In Side
1773	Tamul	0.5	6.4	Green	In Side
1774	Bel	0.6	7.7	Green	In Side
1775	Mango	1.2	6.6	Green	In Side
1776	Mango	0.9	6.2	Green	In Side
1777	Coconut	0.9	7.7	Green	In Side
1778	Kakatas	0.3	5.8	Green	In Side
1779	Karabi	0.5	5.1	Green	Out Side
1780	Pine	0.5	5.7	Green	In Side
1781	Atlas	0.7	4.7	Green	Out Side
1782	Atlas	0.6	7.3	Green	In Side
1783	Kotahal	0.9	4.9	Green	In Side
1784	Jamu	1	4.8	Green	In Side
1785	Koranja	0.6	5.1	Green	In Side
1786	Gomari	3.1	6.4	Green	In Side
1787	Hura	0.9	5.9	Green	In Side
1788	Gomari	3	6.5	Green	Out Side
1789		0.5	6.2	DEAD	OUT SIDE
1790		0.3	6	GREEN	OUT SIDE
1791	Koranja	0.65	5.6	Green	Out Side
1792	Moj	0.3	6.9	Green	Out Side
1793	Moj	0.5	5.9	Green	Out Side
1794	Sotiona	0.4	5.7	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1795		0.4	6.9	DEAD	OUT SIDE
1796	Sotiona	0.4	6.5	Green	Out Side
1797	Bogori	0.9	6.3	Green	In Side
1798	Bogori	0.3	6.1	Green	In Side
1799	Segun	1.7	7	Green	In Side
1800	Neem	0.4	5.6	Green	In Side
1801	Sonaru	0.4	5.4	Green	In Side
1802	Krishnasura	1.1	5.5	Green	In Side
1803	Gomari	0.3	5.5	Green	Out Side
1804	Moj	0.4	4.7	Green	Out Side
1805	Moj	0.4	4.5	Green	Out Side
1806	Simalu	0.6	8	Green	Out Side
1807	Neem	0.5	6	Green	Out Side
1808	Jori	0.4	5.3	Green	Out Side
1809	Sonaru	2.2	5.1	Green	Out Side
1810	Sewali	0.6	6.7	Green	In Side
1811		1	4.4	GREEN	OUT SIDE
1812	Tamul	0.4	8	Green	In Side
1813	Mango	1.5	7.5	Green	In Side
1814	Bokul	0.7	6.2	Green	In Side
1815	Bher	0.3	6.4	Green	In Side
1816	Bher	0.6	4.9	Green	In Side
1817	Bher	0.6	5	Green	In Side
1818	Sotiona	1.1	5.9	Green	In Side
1819	Sotiona	1	6.1	Green	In Side
1820	Sotiona	0.5	7.8	Green	In Side
1821	Moj	0.7	7.96	Green	In Side
1822	Coconut	1.2	6.3	Green	In Side
1823	Mango	0.7	7.9	Green	In Side
1824	Mango	0.9	7	Green	In Side
1825	Modhuri	0.3	6.7	Green	In Side
1826	Modolia	3	6	Dead	Out Side
1827	Neem	0.8	5.5	Green	In Side
1828	Pine	1.2	6.5	Green	In Side
1829	Pine	0.9	6	Green	In Side
1830	Pine	0.8	7.98	Green	In Side
1831	Modhuri	0.8	7.9	Green	In Side
1832	Dimoru	0.3	5.5	Green	In Side
1833	Fower	0.9	7.99	Green	In Side
1834	Sotiona	0.4	6.8	Green	In Side
1835	Sotiona	2	7.4	Green	In Side
1836	Debodaru	0.5	6.4	Green	In Side
1837	Debodaru	0.5	6.4	Green	In Side
1838	Debodaru	0.4	6.4	Green	In Side
1839	Debodaru	0.5	6.6	Green	In Side
1840	Pine	0.5	7.9	Green	In Side
1841	Neem	0.7	6.9	Dead	In Side
1842	Modhuri	1.2	6.8	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1843	Mango	1.1	7.7	Green	In Side
1844	Neem	1.1	7.2	Green	In Side
1845	Bogori	0.9	7.7	Green	Out Side
1846	Mango	1.1	7.9	Green	Out Side
1847	Ahat	2.5	7.9	Green	Out Side
1848	Sasi	0.3	8	Green	In Side
1849	Segun	1.4	8	Green	In Side
1850	Segun	0.7	8	Green	In Side
1851	Segun	0.5	7.7	Green	In Side
1852	Kodom	1	7.6	Green	In Side
1853	Kodom	1.3	7.3	Green	In Side
1854	Segun	0.5	7.9	Green	In Side
1855	Segun	0.7	7.8	Green	In Side
1856	Segun	0.8	7.3	Green	In Side
1857	Bher	0.5	6.2	Green	In Side
1858	Segun	1	7.3	Green	In Side
1859	Segun	0.8	7.8	Green	In Side
1860	Sasi	0.3	6.7	Green	In Side
1861	Segun	0.9	7.6	Green	In Side
1862	Hura	0.3	6.6	Green	In Side
1863	Sasi	0.5	6.9	Green	In Side
1864	Dimoru	0.4	6.6	Green	In Side
1865	Segun	0.5	7.4	Green	In Side
1866	Segun	0.4	7.6	Green	In Side
1867	Segun	0.4	7.6	Green	In Side
1868	Segun	0.7	7.5	Green	In Side
1869	Segun	0.8	7.7	Green	In Side
1870	Segun	0.9	7.9	Green	In Side
1871	Segun	1.1	8	Green	In Side
1872	Coconut	1.1	6.4	Green	In Side
1873	Neem	0.5	5.7	Green	In Side
1874	Moj	0.8	5.4	Green	In Side
1875	Tamul	0.4	7.5	Green	In Side
1876	Madhuri	0.4	6.4	Green	In Side
1877	Dimoru	0.4	5.3	Green	In Side
1878	Moj	0.7	5.5	Green	Out Side
1879	Moj	0.6	7.2	Green	In Side
1880	Neem	0.5	5.8	Green	Out Side
1881	Mango	0.9	6.2	Green	In Side
1882	Kotahal	0.8	6.4	Green	In Side
1883	Neem	0.4	6	Green	Out Side
1884	Ahat	5.1	6.3	Green	Out Side
1885	Coconut	1	5.9	Green	Out Side
1886	Coconut	1	5.4	Green	Out Side
1887	Khilikha	0.7	6.7	Green	In Side
1888	Debodaru	0.5	7.6	Green	In Side
1889	Modhuri	0.4	7.7	Green	In Side
1890	Moj	1	6.5	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1891	Sonaru	1	6.4	Green	In Side
1892	Korobi	0.4	6.4	Green	In Side
1893	Tamul	0.6	7.5	Green	In Side
1894	Mango	0.5	7.7	Green	In Side
1895	Mango	1.2	5.9	Green	In Side
1896	Dimoru	0.3	6.5	Green	Out Side
1897		1.5	5.1	GREEN	IN SIDE
1898	Sera Tamul	1.6	5.9	Green	In Side
1899	Poniol	1	5	Green	Out Side
1900	Neem	0.4	6.9	Green	In Side
1901	Sojina	1.7	6.8	Green	In Side
1902	Soura	0.7	6.3	Green	In Side
1903	Debodaru	0.9	6.5	Green	Out Side
1904	Debodaru	0.7	7	Green	In Side
1905	Debodaru	0.8	7.2	Green	In Side
1906	Debodaru	1	7.1	Green	In Side
1907	Sotiona	0.4	6.2	Green	In Side
1908	Bogori	0.8	8	Green	In Side
1909	Debodaru	0.5	6.8	Green	In Side
1910	Debodaru	0.7	7.5	Green	In Side
1911	Debodaru	0.3	5.4	Green	In Side
1912	Debodaru	0.4	5.6	Green	In Side
1913	Coconut	1	6.9	Green	In Side
1914	Amala	1.1	7.5	Green	In Side
1915	Coconut	1	6.6	Green	In Side
1916	Debodaru	0.5	5.6	Green	In Side
1917	Debodaru	0.4	5.7	Green	In Side
1918	Debodaru	0.4	5.5	Green	In Side
1919	Debodaru	0.41	5.2	Green	In Side
1920	Bel	0.7	7.2	Green	In Side
1921	Coconut	0.9	7.7	Green	In Side
1922	Bokul	0.4	6.2	Green	In Side
1923	Sasi	0.5	4.9	Green	In Side
1924	Taj Pat	0.3	7	Green	In Side
1925	Sasi	0.3	7.2	Green	In Side
1926	Taj Pat	0.3	7.5	Green	In Side
1927	Taj Pat	0.3	7.4	Green	In Side
1928	Sasi	0.6	5.4	Green	In Side
1929	Coconut	1	6	Green	In Side
1930	Coconut	1	6.4	Green	In Side
1931	Nahor	2	5	Green	In Side
1932	Mango	1.6	6.3	Green	In Side
1933	Korobi	0.7	5.8	Green	In Side
1934	Bel	0.7	5.2	Green	In Side
1935	Sasi	0.3	5.2	Green	In Side
1936		1.2	5.2	GREEN	IN SIDE
1937	Bel	0.9	6.8	Green	In Side
1938	Modhuri	0.3	5.7	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1939	Sasi	0.4	5.6	Green	In Side
1940	Amala	0.6	7	Green	In Side
1941	Mango	0.9	6.7	Green	In Side
1942	Debodaru	0.5	4.7	Green	In Side
1943	Debodaru	0.4	4.8	Green	In Side
1944	Debodaru	0.5	4.8	Green	In Side
1945	Debodaru	0.5	4.7	Green	In Side
1946	Debodaru	0.4	4.9	Green	In Side
1947	Amala	0.5	7.2	Green	In Side
1948	Debodaru	0.4	7.4	Green	In Side
1949	Moj	0.5	6.7	Green	In Side
1950	Tamul	0.4	7.5	Green	In Side
1951	Dimoru	0.3	4.6	Green	In Side
1952	Tamul	0.3	6.2	Green	In Side
1953	Tamul	0.4	5	Green	In Side
1954	Tamul	0.4	5	Green	In Side
1955	Bilati Sonaru	0.5	7.2	Green	In Side
1956	Tamul	0.3	5	Green	In Side
1957	Moj	0.3	4.3	Green	In Side
1958	Sasi	0.5	4.6	Green	In Side
1959	Sojina	0.3	6.7	Green	In Side
1960	Tamul	0.3	5.2	Green	In Side
1961	Moj	0.3	4.3	Green	In Side
1962	Sasi	0.3	4.6	Green	In Side
1963	Tamul	0.4	5.3	Green	In Side
1964	Moj	0.3	4.8	Green	In Side
1965	Mango	1.2	4.3	Green	In Side
1966	Sasi	0.5	4.7	Green	In Side
1967	Coconut	1	5.1	Green	In Side
1968	Moj	0.5		Green	In Side
1969	Tamul	0.3	4.9	Green	In Side
1970	Coconut	0.8	5.5	Green	In Side
1971	Tamul	0.3	4.8	Green	In Side
1972	Coconut	0.8	5.5	Green	In Side
1973	Tamul	0.3	5.3	Green	In Side
1974	Sasi	0.4	4.2	Green	In Side
1975	Tamul	0.4	4.7	Green	In Side
1976	Neem	0.6	4.3	Green	In Side
1977	Tamul	0.4	4.3	Green	In Side
1978	Tamul	0.4	4.1	Green	In Side
1979	Tamul	0.4	4.3	Green	In Side
1980	Tamul	0.4	4	Green	In Side
1981	Coconut	1	5.4	Green	In Side
1982	Tamul	0.4	4.4	Green	In Side
1983	Coconut	1.2	5.9	Green	In Side
1984	Coconut	0.8	5.3	Green	In Side
1985	Tamul	0.4	4.4	Green	In Side
1986	Tamul	0.3	6.5	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
1987	Sasi	0.4	6.5	Green	In Side
1988	Sasi	0.4	4.3	Green	In Side
1989	Kotahal	0.6	4.6	Green	In Side
1990	Kotahal	0.5	4.9	Green	In Side
1991	Sasi	0.4	4.5	Green	In Side
1992	Utoj	1	4.1	Green	In Side
1993	Utoj	0.6	3.8	Green	Out Side
1994	Khilikha	1.5	5	Green	Out Side
1995	Kotahal	2.4	5	Green	In Side
1996	Tamul	0.4	5.8	Green	In Side
1997	Tamul	0.5	7.3	Green	In Side
1998	Velow	0.4	3.8	Green	In Side
1999	Velow	0.4	4	Green	In Side
2000	Tamul	0.4	6.9	Green	In Side
2001	Tamul	0.4	6.7	Green	In Side
2002	Tamul	0.4	7.2	Green	In Side
2003	Tamul	0.3	5.3	Green	In Side
2004	Tamul	0.4	8	Green	In Side
2005	Tamul	0.4	8	Green	In Side
2006	Tamul	0.3	7	Green	In Side
2007	Tamul	0.4	7.2	Green	In Side
2008	Tamul	0.3	7	Green	In Side
2009	Tamul	0.3	5.4	Green	In Side
2010	Tamul	0.4	7.7	Green	In Side
2011	Coconut	1.1	5	Green	In Side
2012	Coconut	1.2	6.3	Green	In Side
2013		5.1	4.3	GREEN	OUT SIDE
2014	Ahat	4.5	6.4	Green	Out Side
2015	Debodaru	0.4	8	Green	In Side
2016	Cross	1.5	7.8	Green	Out Side
2017	Coconut	0.9	6.7	Green	In Side
2018	Mango	0.75	7.7	Green	In Side
2019	Coconut	0.6	6.4	Green	In Side
2020	Debodaru	0.5	6.8	Green	In Side
2021	Tamul	0.4	7.3	Green	In Side
2022	Tamul	0.5	6.7	Green	In Side
2023	Tamul	0.4	6.7	Green	In Side
2024	Tamul	0.4	7	Green	In Side
2025	Tamul	0.5	7.7	Green	In Side
2026	Tamul	0.4	7.5	Green	In Side
2027	Tamul	0.4	7.8	Green	In Side
2028	Krishnasura	0.4	4.3	Green	Out Side
2029	Joba	0.4	7.6	Green	In Side
2030	Sopeta	0.4	7.2	Green	In Side
2031	Krishnasura	0.3	4.6	Green	Out Side
2032	Debodaru	1.2	7.4	Green	In Side
2033	Krishnasura	0.4	4.5	Green	Out Side
2034	Segun	0.9	7.3	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2035	Segun	0.8	7.6	Green	In Side
2036	Tamul	0.5	7.8	Green	In Side
2037	Krishnasura	0.4	7.4	Green	In Side
2038	Coconut	0.9	7.5	Green	In Side
2039	Amala	0.4	6.5	Green	In Side
2040	Coconut	0.9	7.6	Green	In Side
2041	Khilikha	0.4	6.5	Green	In Side
2042	Mango	0.654	6.7	Green	In Side
2043	Mango	1	7	Green	Out Side
2044	Rain Tree	1.8	7.1	Green	In Side
2045	Sonaru	1	7.6	Green	In Side
2046	Tamul	0.4	7.3	Green	In Side
2047	Bogi Jamu	0.7	7.4	Green	In Side
2048	Korenja	1.3	5.5	Green	Out Side
2049	Korenja	1.1	5.5	Green	Out Side
2050	Korenja	1.3	4.9	Green	Out Side
2051	Korenja	0.8	5.1	Green	Out Side
2052	Krishnasura	1.1	7.5	Green	Out Side
2053	Korenja	0.54	5.6	Green	Out Side
2054	Korenja	0.6	6	Green	Out Side
2055	Korenja	1	6.1	Green	Out Side
2056	Mango	2	4.3	Green	Out Side
2057	Korenja	1	6.8	Green	Out Side
2058	Korenja	0.9	6	Green	Out Side
2059	Korenja	0.4	6.5	Green	Out Side
2060	Korenja	0.7	6.5	Green	Out Side
2061	Korenja	0.6	6.3	Green	Out Side
2062	Khilikha	1.6	7.6	Green	Out Side
2063	Sonaru	1.2	5.5	Green	Out Side
2064	Krishnasura	1.2	5.7	Green	Out Side
2065	Sasi	1.4	6.6	Green	Out Side
2066		0.7	5.2	GREEN	OUT SIDE
2067	Sonaru	0.5	7.5	Green	Out Side
2068	Koranja	1.1	6.6	Green	Out Side
2069	Koranja	0.9	6.1	Green	Out Side
2070	Koranja	0.7	5.8	Green	Out Side
2071	Moj	1	6.8	Green	Out Side
2072	Koranja	1	6.7	Green	Out Side
2073	Krishnasura	1	5.6	Green	Out Side
2074	Monishal	1.2	6.4	Green	Out Side
2075	Papaya	0.4	6.7	Green	In Side
2076	Tamul	0.6	5.5	Green	In Side
2077	Sotiona	1.8	5.5	Green	Out Side
2078	Kothal	0.8	5.4	Green	Out Side
2079	Kothal	0.6	5.6	Green	Out Side
2080	Sonaru	0.76	5.4	Green	In Side
2081	Krishnasura	0.55	5.6	Green	In Side
2082	Velow	0.9	5.6	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2083	Sasi	0.3	4.9	Green	Out Side
2084	Sasi	0.3	5	Green	Out Side
2085	Sewali	0.4	7.5	Green	In Side
2086	Sasi	0.3	7.6	Green	In Side
2087	Sasi	1	7.3	Green	In Side
2088	Noga Bher	0.8	7.5	Green	In Side
2089	Joba	1	6.3	Green	In Side
2090		0.7	4.9	GREEN	OUT SIDE
2091	Mango	1.2	5.7	Dead	Out Side
2092	Mango	1.9	5.2	Green	Out Side
2093	Khilikha	0.6	6.5	Green	In Side
2094	Sonaru	1.4	4.3	Green	Out Side
2095	Tamul	0.3	6.2	Green	In Side
2096	Sonaru	1	7.4	Green	In Side
2097	Sonaru	0.6	5.7	Green	In Side
2098	Kodam	0.3	6.1	Green	In Side
2099	Sonaru	0.4	6.2	Green	In Side
2100	Debodaru	0.5	6.2	Green	In Side
2101	Bogori	1.2	5.7	Green	In Side
2102	Bokul	0.4	5.5	Green	In Side
2103	Cross	0.4	5.9	Green	In Side
2104	Sonaru	0.7	5.9	Green	In Side
2105	Tamul	0.5	5	Green	In Side
2106	Valow	0.8	4.5	Green	In Side
2107	Pine	0.6	5.8	Green	In Side
2108	Sasi	0.3	7.4	Green	In Side
2109	Sasi	0.3	5.8	Green	In Side
2110	Sasi	0.3	5.7	Green	In Side
2111	Sasi	0.3	5.6	Green	In Side
2112	Sasi	0.3	5.2	Green	In Side
2113	Sasi	0.3	5.6	Green	In Side
2114	Sasi	0.6	5.7	Green	In Side
2115	Sonaru	0.8	6.3	Green	Out Side
2116	Poma	0.7	7.4	Green	In Side
2117	Bambo		5.8	Green	Out Side
2118	Simalu	4.2	7.7	Green	Out Side
2119	Sonaru	1.7	4.7	Green	In Side
2120	Sasi	0.3	5.7	Green	In Side
2121	Sasi	0.3	5.4	Green	In Side
2122	Sonaru	1	4.9	Green	In Side
2123	Sonaru	1	4.5	Green	In Side
2124	Sonaru	0.8	5.9	Green	In Side
2125	Bokul	0.6	6.9	Green	In Side
2126	Pine	0.5	7.8	Green	In Side
2127	Bambo		5.8	Green	In Side
2128	Moj	1	5.1	Green	In Side
2129	Borgos	7.3	6.8	Green	In Side
2130	Moj	0.8	5.5	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2131	Flower	0.3	6.2	Green	In Side
2132	Flower	0.5	6.4	Green	In Side
2133	Modhuri	0.4	6.2	Green	In Side
2134	Modhuri	0.6	5	Green	In Side
2135	Dimoru	0.64	4.1	Green	Out Side
2136	Moj	0.3	5	Green	In Side
2137	Madelua	0.4	4.5	Green	In Side
2138	Moj	0.9	5.7	Green	In Side
2139	Moj	0.5	6.9	Green	In Side
2140	Sonaru	0.4	5.2	Green	In Side
2141	Jamu	1.3	6.4	Green	In Side
2142	Vatgila	0.7	6.4	Green	In Side
2143	Kothal	0.8	7.6	Green	In Side
2144	Sonaru	0.6	7.9	Green	In Side
2145	Chess	2.4	6.4	Green	Out Side
2146	Debodaru	0.3	7.7	Green	In Side
2147	Debodaru	0.4	7.7	Green	In Side
2148	Debodaru	0.3	7.6	Green	In Side
2149	Debodaru	0.3	7.7	Green	In Side
2150	Sewali	0.3	7.1	Green	Out Side
2151	Moj	0.6	7.4	Green	In Side
2152	Sasi	0.3	6.7	Green	In Side
2153	Sasi	0.4	6	Green	In Side
2154	Tamul	0.4	7.8	Green	In Side
2155	Sasi	0.5	7.4	Green	In Side
2156	Sasi	0.4	7.6	Green	In Side
2157	Sasi	0.45	7.5	Green	In Side
2158	Sasi	0.3	7.9	Green	In Side
2159	Segun	1	6.6	Green	In Side
2160	Segun	1.1	6.5	Green	In Side
2161	Ashok	1.2	6.7	Green	In Side
2162	Bambo		5.1	Green	In Side
2163	Mango	1.6	6.6	Green	In Side
2164	Mango	1.7	6.5	Green	In Side
2165	Mango	1.8	6.1	Green	Out Side
2166	Sonaru	1.2	5.7	Green	Out Side
2167	Debodaru	0.4	6.9	Green	In Side
2168	Debodaru	0.3	7	Green	In Side
2169	Debodaru	0.7	7.1	Green	In Side
2170	Debodaru	0.4	7	Green	In Side
2171	Debodaru	0.6	6.9	Green	In Side
2172	Debodaru	0.6	6.3	Green	In Side
2173	Cross	1.4	5	Green	Out Side
2174	Sasi	0.4	6.5	Green	Out Side
2175	Sasi	0.3	6.6	Green	In Side
2176	Sasi	0.4	6.9	Green	In Side
2177	Amla	0.4	7.1	Green	In Side
2178	Sasi	0.5	5.1	Green	Out Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2179	Sasi	0.3	5.2	Green	Out Side
2180	Cross	0.5	6.9	Green	Out Side
2181	Coconut	0.8	5.3	Green	In Side
2182	Moj	0.8	7.85	Green	In Side
2183	Moj	0.7	7.5	Green	In Side
2184	Tamul	0.35	5	Green	In Side
2185	Tamul	0.35	5.1	Green	In Side
2186	Tamul	0.35	5	Green	In Side
2187	Bel	0.4	6.1	Green	In Side
2188	Debodaru	0.5	6.3	Green	In Side
2189	Debodaru	0.5	6.2	Green	In Side
2190	Debodaru	0.4	7.1	Green	In Side
2191	Debodaru	0.3	7.2	Green	In Side
2192	Debodaru	0.4	7.3	Green	In Side
2193	Debodaru	0.6	6.9	Green	In Side
2194	Sasi	0.4	6.9	Green	In Side
2195	Krishnasura	0.4	7.1	Green	In Side
2196	Segun	1	6.9	Green	In Side
2197	Kothal	0.63	8	Green	In Side
2198	Coconut	0.8	5.75	Green	Out Side
2199	Sasi	0.3	5.5	Green	In Side
2200	Sasi	0.3	5.4	Green	In Side
2201	Modhuri	0.7	6.6	Green	In Side
2202	Krishnasura	0.6	5.7	Green	In Side
2203	Tamul	0.3	7.4	Green	In Side
2204	Gomari	1	6.4	Green	Out Side
2205	Khilikha	1.35	6.6	Green	Out Side
2206	Eukeliptas	1.1	7.8	Green	In Side
2207	Moj	1.2	6.7	Green	In Side
2208	Eukeliptas	1	7.9	Green	In Side
2209	Sasi	0.5	7.5	Green	In Side
2210	Sasi	0.3	6.3	Green	In Side
2211	Sasi	0.35	6.5	Green	In Side
2212	Neem	0.6	7.2	Green	In Side
2213	Moj	0.8	6.1	Green	Out Side
2214	Moj	0.7	5.9	Green	Out Side
2215	Sasi	0.3	6.1	Green	In Side
2216	Monishal	0.7	6.8	Green	In Side
2217	Moj	0.8	6	Green	In Side
2218	Jori Gos	2.35	6	Green	In Side
2219	Kodam	1.4	6.3	Green	In Side
2220	Moj	1	7.6	Green	In Side
2221	Krishnasura	0.7	7.2	Green	In Side
2222	Neem	0.6	7.1	Green	In Side
2223	Coconut	1.2	7.6	Green	In Side
2224	Mango	0.3	6.4	Green	In Side
2225	Mango	0.64	7.8	Green	In Side
2226	Sewali	0.3	6.8	Green	In Side

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2227	Tamul	0.4	6.8	Green	In Side
2228	Mango	0.7	6.4	Green	In Side
2229	Mango	0.8	6.5	Green	In Side
2230	Coconut	0.9	7.9	Green	In Side
2231	Coconut	0.8	7.9	Green	In Side
2232	Tamul	0.4	7.5	Green	In Side
2233	Eukeliptas	0.5	7.6	Green	In Side
2234	Tamul	0.4	6.7	Green	In Side
2235	Amla	0.9	7.4	Green	In Side
2236	Sasi	0.4	7.3	Green	In Side
2237	Coconut	0.9	7.3	Green	In Side
2238	Moj	0.4	6.8	Green	Out Side
2239	Moj	0.8	6.7	Green	Out Side
2240	Moj	0.4	6.5	Green	Out Side
2241	Gomari	0.8	7.6	Green	In Side
2242	Tamul	0.4	8	Green	In Side
2243	Amara	1.2	5.8	Green	Out Side
2244	Flower	1.4	6.9	Green	In Side
2245	Pine	0.6	7.3	Green	In Side
2246	Debodaru	0.6	6.9	Green	In Side
2247	Khejur	1.1	4.3	Green	Out Side
2248	Mango	1.8	7.9	Green	Inside
2249	Sewali	0.5	7.4	Green	Inside
2250	Jori Gos	2.9	3.6	Green	Inside
2251	Bambo		5.4	Green	Inside
2252	Ajar	0.75	7.7	Green	Inside
2253	Bambo		6.5	Green	Inside
2254	Moj	0.4	5.1	Green	Inside
2255	Dimoru	1.8	5.3	Dead	Inside
2256	Cross	1	6.1	Green	Inside
2257	Moj	1.8	6.6	Green	Inside
2258	Moj	0.5	4	Green	Inside
2259	Moj	0.54	3.7	Green	Inside
2260	Moj	0.9	3.6	Green	Inside
2261	Mango	2.1	7.1	Green	Inside
2262	Debodaru	0.42	4.5	Green	Inside
2263	Debodaru	1.1	4.4	Green	Inside
2264	Debodaru	0.4	4.5	Green	Inside
2265	Debodaru	0.6	4.3	Green	Inside
2266	Debodaru	0.5	4.5	Green	Inside
2267	Debodaru	0.4	4.4	Green	Inside
2268	Sasi	0.3	5.8	Green	Inside
2269	Sasi	0.3	7.3	Green	Inside
2270	Moj	1.1	7.2	Dead	Inside
2271	Sasi	0.4	8	Green	Inside
2272	Moj	2	6.4	Dead	Inside
2273	Moj	0.85	5.4	Dead	Inside
2274	Moj	0.65	5.6	Dead	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2275	Moj	1.2	7	Green	Inside
2276	Ahat	2.3	6.7	Green	Inside
2277	Sasi	0.4	6	Green	Inside
2278	Sasi	0.3	6.9	Green	Inside
2279	Kothal	1.55	3.8	Green	Inside
2280	Ajar	1.3	5.3	Green	Inside
2281	Sasi	0.3	5.9	Green	Inside
2282	Sasi	0.4	7.1	Green	Inside
2283	Mango	1	4.4	Green	Inside
2284	Mango	1	6.7	Green	Inside
2285	Mango	0.5	7.7	Green	Inside
2286	Sonaru	0.64	4.6	Green	Inside
2287	Jamu	0.65	7.1	Green	Inside
2288	Bogori	1.4	5.1	Green	Inside
2289	Sasi	0.3	5	Green	Inside
2290	Coconut	0.8	6.9	Green	Inside
2291	Crposs	0.6	6.1	Green	Inside
2292	Krishnasura	0.3	5.1	Green	Inside
2293	Cross	0.35	6.9	Green	Inside
2294	Moj	1.7	7	Green	Inside
2295	Moj	1.2	5.5	Green	Inside
2296	Tamul	0.5	5.8	Green	Inside
2297	Tamul	0.5	5.85	Green	Inside
2298	Mango	2.3	5.5	Green	Inside
2299	Tamul	0.4	5.6	Green	Inside
2300	Tamul	0.4	5.7	Green	Inside
2301	Tamul	0.4	5.6	Green	Inside
2302	Tamul	0.5	5.5	Green	Inside
2303	Sasi	0.3	5.5	Green	Inside
2304	Tamul	0.4	5.4	Green	Inside
2305	Sasi	0.35	5.5	Green	Inside
2306	Sasi	0.3	5.5	Green	Inside
2307	Sasi	0.3	5.3	Green	Inside
2308	Sasi	0.65	5.5	Green	Inside
2309	Tamul	0.5	5.6	Green	Inside
2310	Sasi	0.5	5.6	Green	Inside
2311	Sasi	0.37	5.4	Green	Inside
2312	Tamul	0.5	5.2	Green	Inside
2313	Coconut	0.8	6.4	Green	Inside
2314	Coconut	1	7.4	Green	Inside
2315	Tamul	0.4	5.3	Green	Inside
2316	Tamul	0.5	5.4	Green	Inside
2317	Tamul	0.4	5.1	Green	Inside
2318	Tamul	0.4	5.2	Green	Inside
2319	Sasi	0.34	5.1	Green	Inside
2320	Tamul	0.3	5.2	Green	Inside
2321	Coconut	0.9	6.8	Green	Inside
2322	Coconut	0.8	6.9	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2323	Sasi	0.3	5.1	Green	Inside
2324	Tamul	0.4	6.2	Green	Inside
2325	Tamul	0.4	7.1	Green	Inside
2326	Coconut	0.8	7.2	Green	Inside
2327	Coconut	1	7.3	Green	Inside
2328	Tamul	0.4	5.1	Green	Inside
2329	Coconut	0.7	7.3	Green	Inside
2330	Sasi	0.3	6.4	Green	Inside
2331	Mango	1.1	5.4	Green	Inside
2332	Thekera	0.9	5.2	Green	Inside
2333	Tamul	0.4	4.8	Green	Inside
2334	Tamul	0.3	6	Green	Inside
2335	Tamul	0.4	7	Green	Inside
2336	Bel	0.6	4.9	Green	Inside
2337	Tamul	0.4	5.9	Green	Inside
2338	Sasi	0.3	5.1	Green	Inside
2339	Sasi	0.3	5.3	Green	Inside
2340	Sasi	0.3	5.8	Green	Inside
2341	Mango	2.4	5.1	Green	Inside
2342	Sasi	0.3	6.9	Green	Inside
2343	Buwal	0.8	6.5	Green	Inside
2344	Tamul	0.4	5.6	Green	Inside
2345	Sasi	0.3	5.2	Green	Inside
2346	Simalu	1.5	5.1	Green	Outside
2347	Gohora	0.6	6	Green	Outside
2348	Gohora	0.5	7	Green	Inside
2349	Coconut	0.9	6.4	Green	Inside
2350	Mango	1.5	6	Green	Inside
2351	Khilikha	1.1	5.1	Green	Inside
2352	Tamul	0.35	5.2	Green	Inside
2353	Tamul	0.4	5.5	Green	Inside
2354	Moj	1.9	5.2	Green	Inside
2355	Tamul	0.4	6.4	Green	Inside
2356	Tamul	0.3	7.1	Green	Inside
2357	Coconut	1	7.8	Green	Inside
2358	Khilikha	0.8	5.2	Green	Inside
2359	Sasi	0.35	6.4	Green	Inside
2360	Sasi	0.3	6.4	Green	Inside
2361	Tamul	0.5	5.6	Green	Inside
2362	Tamul	0.5	7.8	Green	Inside
2363	Krishnasura	0.9	7.1	Green	Inside
2364	Nahor	0.6	7.9	Green	Inside
2365	Tamul	0.4	6.8	Green	Inside
2366	Poma	0.8	7.2	Green	Inside
2367	Krishnasura	1.2	6.6	Green	Inside
2368	Ajar	0.7	5.8	Green	Inside
2369	Coconut	0.9	7.5	Green	Inside
2370	Ajar	0.5	4.4	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2371	Coconut	0.9	7.2	Green	Inside
2372	Tamul	0.35	5.4	Green	Inside
2373	Coconut	0.95	6.9	Green	Inside
2374	Dimoru	1.3	6.9	Green	Inside
2375	Tamul	0.4	6.8	Green	Inside
2376	Tamul	0.5	5.6	Green	Inside
2377	Tamul	0.5	6.8	Green	Inside
2378	Tamul	0.3	7.1	Green	Inside
2379	Mango	0.8	4.7	Green	Inside
2380	Mango	0.6	5	Green	Inside
2381	Segun	1.3	5.5	Green	Inside
2382	Eukaliptas	0.65	5.4	Green	Inside
2383	Sasi	0.35	4.7	Green	Inside
2384	Tamul	0.6	5.4	Green	Inside
2385	Moj	1.56	5.3	Green	Inside
2386	Sasi	0.3	4.7	Green	Inside
2387	Modar	1.1	5.4	Green	Inside
2388	Vatgila	0.7	5.7	Green	Inside
2389	Mango	0.3	5.2	Green	Inside
2390	Tamul	0.5	5.4	Green	Inside
2391	Medelua	0.4	5.2	Green	Inside
2392	Tamul	0.6	5.4	Green	Inside
2393	Ajar	0.35	6.9	Green	Inside
2394	Tamul	0.4	5.1	Green	Inside
2395	Simalu	0.4	4.7	Green	Inside
2396	Tamul	0.5	5.1	Green	Inside
2397	Tamul	0.3	5	Green	Inside
2398	Tamul	0.4	5.2	Green	Inside
2399	Tamul	0.3	6.9	Green	Inside
2400	Medelua	1.3	5.1	Green	Inside
2401	Mango	0.6	6.4	Green	Inside
2402	Kothal	0.6	7.3	Green	Inside
2403	Modhuri	0.3	7.5	Green	Inside
2404	Tamul	0.3	7.9	Green	Inside
2405	Sasi	0.3	4.9	Green	Inside
2406	Sasi	0.32	5.4	Green	Inside
2407	Sasi	0.35	6.4	Green	Inside
2408	Mango	0.7	6.6	Green	Inside
2409	Kothal	0.7	7.8	Green	Inside
2410	Sasi	0.4	4.5	Green	Inside
2411	Sasi	0.3	5.7	Green	Inside
2412	Sasi	0.35	8	Green	Inside
2413	Kotholua	0.6	5.1	Green	Inside
2414	Sasi	0.3	6.2	Green	Inside
2415	Moj	0.6	7	Green	Inside
2416	Coconut	0.9	5.6	Green	Inside
2417	Coconut	1	5.5	Green	Inside
2418	Neem	0.8	7.7	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2419	Tamul	0.4	5.6	Green	Inside
2420	Sasi	0.6	6.4	Green	Inside
2421	Tamul	0.5	5.6	Green	Inside
2422	Sasi	0.3	5.7	Green	Inside
2423	Sasi	0.4	4.5	Green	Inside
2424	Mango	0.6	5.3	Green	Inside
2425	Mango	1	5.7	Green	Inside
2426	Mango	0.95	6.9	Green	Inside
2427	Mango	0.65	5.9	Green	Inside
2428	Sotiona	1.1	5.7	Dead	Inside
2429	Valow	0.9	4.7	Dead	Inside
2430	Ajar	1.2	5	Green	Outside
2431	Kath Badam	1.2	6.1	Green	Outside
2432	Kath Badam	1	6.1	Green	Outside
2433	Sasi	0.4	7.2	Green	Inside
2434	Sasi	0.4	8	Green	Inside
2435	Medelua	0.7	7.9	Green	Inside
2436	Medelua	0.3	5	Green	Inside
2437	Sonaru	0.43	4.7	Green	Inside
2438	Medelua	0.3	4.8	Green	Inside
2439	Sasi	0.4	5.2	Green	Inside
2440	Mango	0.87	5.8	Green	Inside
2441	Cross	0.67	6.3	Green	Inside
2442	Modhuri	0.35	7.9	Green	Inside
2443	Mango	1.38	7	Dead	Inside
2444	Sasi	0.3	4.8	Green	Inside
2445	Mango	0.9	7.1	Green	Inside
2446	Kothal	0.9	7.9	Green	Inside
2447	Mango	0.82	5.5	Green	Inside
2448	Mango	1	6.5	Green	Inside
2449	Buwal	0.6	5.1	Green	Inside
2450	Kath Badam	1.24	5.1	Green	Inside
2451	Coconut	0.85	6	Green	Inside
2452	Cross	0.7	7.5	Green	Outside
2453	Cross	0.36	7.4	Green	Outside
2454	Cross	0.6	6.8	Green	Outside
2455	Bel	1.8	6.2	Green	Outside
2456	Sonaru	1.1	7.4	Green	Outside
2457	Cross	1.8	6.4	Green	Outside
2458	Coconut	0.8	6.4	Green	Outside
2459	Bel	0.74	5	Green	Outside
2460	Krishnasura	2.3	4.7	Green	Outside
2461	Coconut	0.8	5.9	Green	Inside
2462	Sasi	0.3	7.4	Green	Inside
2463	Sasi	0.4	6.1	Green	Inside
2464	Sasi	0.3	6.3	Green	Inside
2465	Sasi	0.46	6.2	Green	Inside
2466	Sasi	0.3	6.3	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2467	Flower	0.9	5	Green	Outside
2468	Flower	0.36	5.9	Green	Outside
2469	Sasi	0.3	7.5	Green	Outside
2470	Ahat	1	5.8	Green	Outside
2471	Sasi	0.3	6.7	Green	Outside
2472	Sasi	0.4	6.7	Green	Outside
2473	Kordoi	0.65	6.6	Green	Inside
2474	Dimoru	0.7	6.9	Green	Inside
2475	J.Gulap	0.7	6.8	Green	Inside
2476	Sotiona	0.3	4.7	Green	Inside
2477	Sotiona	0.4	5.1	Green	Inside
2478	Vatgila	0.9	5.5	Green	Inside
2479	Sasi	0.3	6.4	Green	Inside
2480	Sasi	0.3	6.2	Green	Inside
2481	Sasi	0.3	6.2	Green	Inside
2482	Vatgila	1.1	5.2	Green	Inside
2483	Moj	0.7	4.3	Green	Outside
2484	Medelua	1	4.9	Green	Outside
2485	Sotiona	0.32	6.1	Green	Outside
2486	Debodaru	0.35	6.5	Green	Inside
2487	Debodaru	0.4	6.4	Green	Inside
2488	Debodaru	0.3	6.4	Green	Inside
2489	Neem	0.7	6.7	Green	Inside
2490	Amara	1.1	5.6	Green	Inside
2491	Sonaru	1	5.4	Green	Inside
2492	Dimoru	0.4	5.2	Green	Inside
2493	Vatgila	0.4	4.7	Green	Inside
2494	Vatgila	0.3	4.3	Green	Outside
2495	Vatgila	0.7	5.4	Green	Inside
2496	Sasi	0.4	5.7	Green	Inside
2497	Sasi	0.3	5.8	Green	Inside
2498	Sasi	0.4	5.7	Green	Inside
2499	Sasi	0.4	5.9	Green	Inside
2500	Sasi	0.5	6.1	Green	Inside
2501	Ahat	3.5	6.4	Green	Outside
2502	Mango	1	6.1	Green	Outside
2503	Kotholua	0.9	6.3	Green	Outside
2504	Gomari	1.8	4.4	Green	Outside
2505	Sewali	0.43	5	Green	Outside
2506	Tamul	0.6	7.2	Green	Inside
2507	Tamul	0.3	7.3	Green	Inside
2508	Tamul	0.3	7.3	Green	Inside
2509	Tamul	0.3	7.1	Green	Inside
2510	Tamul	0.3	7.2	Green	Inside
2511	Chandan	0.31	6.5	Green	Inside
2512	Khilikha	0.9	6.8	Green	Inside
2513	Mango	1	6.7	Green	Outside
2514	Sasi	0.3	7	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2515	Sojina	0.38	4.9	Green	Inside
2516	Sasi	0.47	6.6	Green	Inside
2517	Sonaru	0.3	4.2	Green	Inside
2518	Moj	0.6	5	Green	Inside
2519	Nahor	0.6	4.6	Green	Outside
2520	Ajar	0.6	7.7	Green	Inside
2521	Nahor	0.4	4.5	Green	Inside
2522	Nahor	0.56	4.4	Green	Inside
2523	Modhuri	0.6	4.2	Green	Inside
2524	Korenja	0.55	4.5	Green	Inside
2525	Sasi	0.4	4.3	Green	Inside
2526	Bambo		7.9	Green	Inside
2527	Modhuri	0.4	7.2	Green	Inside
2528	Mango	0.9	7.65	Green	Inside
2529	Kaktas	0.3	7.9	Green	Inside
2530	Sasi	0.3	6.8	Green	Inside
2531	Sasi	0.3	7.1	Green	Inside
2532	Gomari	1.3	7.2	Green	Inside
2533	Sasi	0.35	7.1	Green	Inside
2534	Moj	0.8	7.4	Green	Inside
2535	Sasi	0.3	7.2	Green	Inside
2536	Sasi	0.36	7.2	Green	Inside
2537	Sasi	0.3	7.3	Green	Inside
2538	Dimoru	0.8	7.3	Green	Outside
2539	Sasi	0.3	7	Green	Outside
2540	Sasi	0.3	7.1	Green	Outside
2541	Sasi	0.4	7.4	Green	Outside
2542	Segun	0.85	7.4	Green	Inside
2543	Tamul	0.4	7.1	Green	Inside
2544	Sewali	0.34	7.4	Green	Inside
2545	Sasi	0.4	7.4	Green	Inside
2546	Tamul	0.3	7.1	Green	Inside
2547	Sasi	0.3	7.6	Green	Inside
2548	Tamul	0.4	7.2	Green	Inside
2549	Sasi	0.5	6.6	Green	Inside
2550	Debodaru	0.5	6.4	Green	Inside
2551	Tamul	0.45	7.3	Green	Inside
2552	Vatgila	0.4	4.9	Green	Outside
2553	Debodaru	0.4	6.5	Green	Inside
2554	Debodaru	0.5	6.5	Green	Inside
2555	Debodaru	0.3	6.4	Green	Inside
2556	Debodaru	0.5	6.5	Green	Inside
2557	Debodaru	0.4	6.5	Green	Inside
2558	Sasi	0.4	6.8	Green	Inside
2559	Simalu	0.8	6.7	Green	Inside
2560	Debodaru	0.4	6.5	Green	Inside
2561	Debodaru	0.7	6.5	Green	Inside
2562	Bogi Jamu	0.4	5.2	Green	Outside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2563	Gomari	0.7	7.7	Green	Outside
2564	Modar	0.35	8	Green	Outside
2565	Sasi	0.3	4	Green	Inside
2566	Sewali	0.5	4.8	Green	Inside
2567	Neem	0.3	4.2	Green	Inside
2568	Neem	0.3	4.1	Green	Inside
2569	Sasi	0.5	4.2	Green	Inside
2570	Neem	0.3	4.1	Dead	Inside
2571	Neem	0.3	4.2	Green	Inside
2572	Sasi	0.3	4.1	Green	Inside
2573	Sasi	0.3	4.1	Green	Inside
2574	Sasi	0.6	4.5	Green	Inside
2575	Neem	0.3	4.1	Green	Inside
2576	Sasi	0.3	4.6	Green	Inside
2577	Sasi	0.3	4.6	Green	Inside
2578	Sasi	0.3	4.8	Green	Inside
2579	Sasi	0.3	4.8	Green	Inside
2580	Sasi	0.3	4.8	Green	Inside
2581	Sasi	0.3	4.7	Green	Inside
2582	Gomari	0.3	4	Dead	Outside
2583	Sasi	0.3	4.7	Green	Inside
2584	Sasi	0.3	4.7	Green	Inside
2585	Sasi	0.4	4.7	Green	Inside
2586	Vatgila	0.3	5.3	Green	Inside
2587	Sotiona	0.7	5.4	Green	Inside
2588	Mango	1.36	7	Green	Inside
2589	Sasi	0.3	7.4	Green	Inside
2590	Tamul	0.3	7.1	Green	Inside
2591	Tamul	0.4	7.4	Green	Inside
2592	Tamul	0.4	7	Green	Inside
2593	Tamul	0.4	7	Green	Inside
2594	Tamul	0.4	7.1	Green	Inside
2595	Tamul	0.4	7	Green	Inside
2596	Tamul	0.4	6.9	Green	Inside
2597	Tamul	0.5	7	Green	Inside
2598	Mango	0.7	7	Green	Inside
2599	Tamul	0.4	7.3	Green	Inside
2600	Tamul	0.3	7.5	Green	Inside
2601	Tamul	0.4	7.2	Green	Inside
2602	Mango	0.9	7.4	Green	Inside
2603	Sasi	0.3	7.3	Green	Inside
2604	Sasi	0.3	6	Green	Outside
2605	Khejur	1	6.6	Green	Outside
2606	Krishnasura	0.76	7.6	Green	Inside
2607	Moj	0.7	7.4	Green	Inside
2608	Moj	0.5	7.6	Green	Inside
2609	Tamul	0.5	7.3	Green	Inside
2610	Sasi	0.3	6.8	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2611	Tamul	0.4	6.9	Green	Inside
2612	Tamul	0.4	7	Green	Inside
2613	Gomari	0.45	6.4	Green	Inside
2614	Sewali	0.69	7.3	Green	Inside
2615	Mango	0.4	6.9	Green	Inside
2616	Joba	0.3	6.9	Green	Inside
2617	Khilikha	0.7	7.7	Green	Inside
2618	Krishnasura	0.6	6.3	Green	Outside
2619	Eukliptas	2.5	7.5	Green	Outside
2620	Moj	0.5	7.3	Green	Inside
2621	Sasi	0.3	7.5	Green	Inside
2622	Poma	0.3	5.9	Green	Inside
2623	Nuni	1	6	Green	Outside
2624	Mango	0.8	7.9	Green	Inside
2625	Mango	0.5	6.7	Green	Inside
2626	Mango	0.3	6.5	Green	Inside
2627	Modhuri	0.4	6.6	Green	Inside
2628	Krishnasura	0.95	5	Green	Inside
2629	Flower	0.84	4.3	Green	Outside
2630	Sasi	0.4	4.6	Green	Outside
2631	Sasi	0.45	4.7	Green	Outside
2632	Sasi	0.3	5.7	Green	Inside
2633	Sasi	0.4	5.7	Green	Inside
2634	Moj	0.4	7	Green	Inside
2635	Moj	0.45	7.9	Green	Inside
2636	Sasi	0.3	5	Green	Outside
2637	Sasi	0.3	5.7	Green	Inside
2638	Krishnasura	0.48	4.8	Green	Outside
2639	Moj	1	5.2	Green	Outside
2640	Gomari	1.2	5.8	Green	Outside
2641	Krishnasura	1.5	5.2	Green	Outside
2642	Bokul	0.65	6.4	Green	Outside
2643	Segun	1.2	5.9	Green	Outside
2644	Segun	0.52	7.8	Green	Outside
2645	Segun	0.96	5.9	Green	Outside
2646	Bel	0.3	7.1	Green	Outside
2647	Segun	0.8	6	Green	Outside
2648	Segun	0.8	6.1	Green	Outside
2649	Segun	1	6.1	Green	Outside
2650	Segun	0.6	8	Green	Outside
2651	Mobil	0.6	5.1	Green	Inside
2652	Moj	0.7	4.8	Green	Inside
2653	Mango	1.2	6.8	Green	Outside
2654	Gomari	0.9	5.5	Green	Inside
2655	Tamul	0.5	7	Green	Inside
2656	Poma	0.9	5.8	Green	Inside
2657	Sasi	0.3	7.2	Green	Inside
2658	Sasi	0.7	5.3	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2659	Sasi	0.38	4.9	Green	Inside
2660	Krishnasura	1.1	4	Green	Outside
2661	Krishnasura	1.25	4.2	Green	Outside
2662	Mango	1.1	4.8	Green	Outside
2663	Krishnasura	1.8	5.1	Green	Outside
2664	Khejur	1.2	5.1	Green	Outside
2665	Ajar	0.9	4.9	Green	Outside
2666	Krishnasura	1.1	3.8	Green	Outside
2667	Krishnasura	1.3	4.3	Green	Outside
2668	Mango	1.4	4.1	Green	Outside
2669	Coconut	1.1	7.9	Green	Inside
2670	Coconut	1	7.6	Green	Inside
2671	Flower	0.64	7.3	Green	Inside
2672	Sewali	0.9	7.6	Green	Inside
2673	Debodaru	1.1	5.3	Green	Outside
2674	Debodaru	0.9	5.3	Green	Outside
2675	Debodaru	0.8	5.3	Green	Outside
2676	Debodaru	0.5	5.3	Green	Outside
2677	Debodaru	1.1	5.2	Green	Outside
2678	Debodaru	1.3	5.3	Green	Outside
2679	Krishnasura	0.95	5	Green	Outside
2680	Segun	1.2	5.4	Green	Outside
2681	Mango	0.3	5.5	Green	Outside
2682	Bokul	0.8	5	Green	Outside
2683	Khilikha	0.8	4.7	Dead	Outside
2684	Krishnasura	0.3	4.8	Green	Outside
2685	Neem	0.7	7	Dead	Outside
2686	Sasi	0.4	7.5	Green	Inside
2687	Neem	1.1	5.8	Green	Inside
2688	Sasi	0.3	7.8	Green	Inside
2689	Segun	0.35	5.5	Green	Outside
2690	Korenja	0.6	5.4	Green	Outside
2691	Tamul	0.3	5.2	Green	Outside
2692	Tamul	0.4	6.4	Green	Inside
2693	Pine	1.16	7.1	Green	Inside
2694	Mango	0.6	7.4	Green	Inside
2695	Sasi	0.3	4.2	Green	Outside
2696	Debodaru	0.87	4.6	Green	Outside
2697	Debodaru	0.7	5	Green	Outside
2698	Bokul	1.17	5	Green	Outside
2699	Tamul	0.3	5.1	Dead	Outside
2700	Korenja	0.6	5	Green	Outside
2701	Korenja	0.7	5.1	Green	Outside
2702	Korenja	0.5	4.9	Green	Outside
2703	Korenja	0.9	4.6	Green	Outside
2704	Korenja	0.5	5.5	Green	Outside
2705	Korenja	1	6.4	Green	Outside
2706	Korenja	0.9	7.2	Green	Outside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2707	Korenja	1.1	5.3	Green	Outside
2708	Korenja	0.7	5.7	Green	Outside
2709	Korenja	1	5.9	Green	Outside
2710	Korenja	1.1	5.9	Green	Outside
2711	Korenja	1.17	5.8	Green	Outside
2712	Krishnasura	1.2	4.3	Green	Outside
2713	Segun	0.3	8	Green	Inside
2714	Mango	2.95	3	Green	Outside
2715	Moj	0.3	4.9	Green	Outside
2716	Moj	0.3	6	Green	Outside
2717	Sotiona	0.46	5.3	Green	Outside
2718	Sojina	0.64	6.4	Green	Outside
2719	Sonaru	0.5	4.8	Green	Outside
2720	Sonaru	1.5	4.4	Dead	Outside
2721		1.6	5.6	GREEN	OUTSIDE
2722	Vatgila	0.4	6.3	Green	Outside
2723	Poma	0.7	7.1	Green	Outside
2724	Sewali	1	6.9	Green	Outside
2725	Sotiona	0.4	6.8	Green	Outside
2726	Bokul	0.65	6.1	Green	Outside
2727	Velow	1.1	5.2	Green	Outside
2728	Velow	1	5.8	Green	Outside
2729	Velow	0.8	5.3	Green	Outside
2730	Simalu	1.1	6.5	Green	Outside
2731	Khejur	1.2	5.7	Green	Outside
2732	Moj	0.33	6.2	Green	Outside
2733	Khejur	0.9	4	Green	Outside
2734	Moj	0.5	6.3	Green	Outside
2735	Moj	0.6	5	Green	Outside
2736	Moj	0.7	7.7	Green	Inside
2737	Ahat	4.6	6.7	Green	Outside
2738	Moj	0.5	5.4	Dead	Inside
2739	Khilikha	1.2	6.4	Green	Inside
2740	Moj	0.9	7.5	Green	Outside
2741	Debodaru	0.5	7.2	Green	Inside
2742	Sasi	0.35	7.2	Green	Inside
2743	Sasi	0.3	7.2	Green	Inside
2744	Segun	1.33	7.2	Green	Inside
2745	Sasi	0.4	7.5	Green	Inside
2746	Coconut	0.8	7.8	Green	Inside
2747	Sotiona	0.3	6.6	Green	Outside
2748	Moj	0.8	5.6	Green	Outside
2749	Khejur	1	6.4	Green	Outside
2750	Krishnasura	1.15	5.7	Green	Outside
2751	Moj	1.1	5.9	Green	Outside
2752	Bokul	1.1	5.5	Green	Outside
2753	Cross	1.7	5.8	Green	Outside
2754	Cross	3.05	5	Green	Outside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2755	Cross	2.1	5.5	Green	Outside
2756	Cross	1.77	5.9	Green	Outside
2757	Sonaru	0.3	7.4	Green	Inside
2758	Sonaru	0.4	7.4	Green	Inside
2759	Sonaru	1.6	4.4	Green	Outside
2760	Moj	0.5	4.6	Green	Inside
2761	Moj	0.8	4.5	Green	Inside
2762	Moj	0.6	4.6	Green	Inside
2763	Sasi	0.3	4.6	Green	Inside
2764	Sotiona	0.3	6.1	Green	Inside
2765	Modhuri	0.35	4.6	Green	Inside
2766	Ajar	0.5	4.7	Green	Inside
2767	Moj	0.85	4.2	Green	Inside
2768	Moj	0.7	4.1	Green	Inside
2769	Moj	0.5	3.9	Green	Inside
2770	Dimoru	0.5	4.3	Green	Inside
2771	Moj	0.35	4.4	Green	Inside
2772	Sasi	0.3	4	Green	Inside
2773	Moj	0.8	4.3	Green	Inside
2774	Amla	0.7	5.65	Green	Inside
2775	Amla	0.6	5.64	Green	Inside
2776	Amla	0.65	5.6	Green	Inside
2777	Tenga	0.5	5	Green	Inside
2778	Chandan	1	5	Green	Inside
2779	Sasi	0.3	5.2	Green	Inside
2780		0.63	5.2	GREEN	INSIDE
2781	Rain Tree	1.1	6.2	Green	Inside
2782	Tamul	0.35	7.9	Green	Inside
2783	Moj	1.1	5.2	Green	Inside
2784	Bilati Sonaru	1.5	5.2	Green	Inside
2785	Ajar	1.6	5.8	Green	Inside
2786	Sasi	0.3	4.8	Green	Inside
2787	Moj	0.6	4.7	Green	Inside
2788	Moj	0.3	4.4	Green	Inside
2789	Debodaru	0.4	7.7	Green	Inside
2790	Debodaru	0.55	7.85	Green	Inside
2791	Sasi	0.3	4.7	Green	Inside
2792	Sasi	0.3	4.7	Green	Inside
2793	Krishnasura	1.3	4.9	Green	Inside
2794	Ahat	2.6	5.1	Green	Outside
2795	Bokul	0.55	5	Green	Outside
2796	Sonaru	0.8	4.5	Green	Outside
2797	Cross	0.4	6.9	Green	Outside
2798	Bogori	1.3	6.1	Green	Outside
2799	Moj	0.45	4.65	Green	Outside
2800	Nilgiri	0.36	5	Green	Outside
2801	Imli	0.7	5.5	Green	Inside
2802	Jolphai	0.7	5.95	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2803		0.3	5.05	GREEN	INSIDE
2804	Jamu	0.4	5.5	Green	Inside
2805	Khilikha	1.06	5.3	Green	Inside
2806	Kodom	0.57	5.5	Green	Inside
2807	Sasi	0.3	5.05	Green	Inside
2808	Khilikha	0.98	5.3	Green	Inside
2809		0.33	4.65	GREEN	INSIDE
2810	Ajar	0.38	5.3	Green	Inside
2811	Sasi	0.3	5.5	Green	Inside
2812	Ajar	0.65	5.75	Green	Inside
2813		0.36	5.2	GREEN	INSIDE
2814	Moj	0.5	4	Green	Inside
2815	Mango	2.1	6.7	Green	Outside
2816	Mango	0.72	6.3	Green	Inside
2817	Sonaru	1.2	4	Green	Inside
2818	Moj	0.8	3.65	Green	Inside
2819	Moj	0.6	3.8	Green	Inside
2820	Moj	1.2	4.5	Green	Inside
2821	Sonaru	0.64	7.5	Green	Inside
2822	Sotiona	1.8	5.6	Green	Inside
2823	Tamul	0.32	6.6	Green	Inside
2824	Cross	0.3	4.2	Green	Inside
2825	Tamul	0.4	7.2	Green	Inside
2826	Moj	0.3	3.7	Green	Inside
2827	Tamul	0.5	7	Dead	Inside
2828	Tamul	0.35	5.9	Green	Inside
2829	Nahor	1	5.75	Green	Inside
2830	Tamul	0.45	5.15	Green	Inside
2831	Nahor	0.75	5.9	Green	Inside
2832	Soifa	0.73	5.9	Green	Inside
2833	Amla	0.9	5.5	Green	Inside
2834	Amora	1.05	6.8	Green	Inside
2835	Moj	0.5	4.5	Green	Inside
2836	Moj	0.4	4.35	Green	Inside
2837	Moj	1.15	4.45	Green	Inside
2838	Moj	0.9	5.3	Green	Inside
2839	Mango	2.6	7.5	Green	Inside
2840	Series	1.4	4.7	Green	Inside
2841	Moj	0.4	4.9	Green	Inside
2842	Moj	0.5	4.5	Green	Inside
2843	Moj	0.3	4.9	Green	Inside
2844	Sasi	0.4	5.57	Green	Inside
2845	Sasi	0.3	8	Green	Inside
2846	Bel	0.5	6	Green	Inside
2847	Moj	0.56	6.4	Green	Inside
2848	Cross	0.8	5.9	Green	Inside
2849	Cross	1.4	6.9	Green	Inside
2850	Mango	1.1	5.4	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2851	Mango	1.25	5.5	Green	Inside
2852	Mango	0.7	5.5	Green	Inside
2853	Kothal	1	5.5	Green	Inside
2854	Sasi	0.35	5.6	Green	Inside
2855	Kotholua	0.35	5.9	Green	Inside
2856	Sasi	0.3	4.9	Green	Inside
2857	Sasi	0.35	5.2	Green	Inside
2858	Moj	0.4	4.6	Green	Inside
2859	Vatgila	0.5	4.8	Green	Inside
2860	Moj	0.8	5.3	Green	Inside
2861	Moj	0.3	5	Green	Inside
2862	Moj	0.3	5.3	Green	Inside
2863	Moj	0.7	5.3	Green	Inside
2864	Moj	0.3	5	Green	Inside
2865	Gohora	1.2	5.3	Green	Inside
2866	Gohora	0.5	6.35	Green	Inside
2867	Sonaru	1.2	4.7	Green	Inside
2868	Sonaru	0.3	5.7	Green	Inside
2869	Sonaru	1	4.9	Green	Inside
2871	Sonaru	0.66	4.1	Green	Outside
2872	Sonaru	0.6	5.45	Green	Inside
2873	Sonaru	0.3	4.5	Green	Inside
2874	Sonaru	0.4	4.95	Green	Inside
2875	Sasi	0.35	7.9	Green	Inside
2876	Kodom	1	6.4	Green	Inside
2877	Kodom	0.36	5.6	Green	Inside
2878	Sasi	0.3	5.2	Green	Inside
2879	Sasi	0.3	5	Green	Inside
2880	Sasi	0.65	5.3	Green	Inside
2881	Sasi	0.4	5.3	Green	Inside
2882	Sasi	0.8	5.3	Green	Inside
2883	Sasi	0.4	5.6	Green	Inside
2884	Sasi	0.66	5.6	Green	Inside
2885	Sasi	0.3	5.7	Green	Inside
2886	Sasi	0.34	6	Green	Inside
2887	Sasi	0.4	6.6	Green	Inside
2888	Sasi	0.3	7.8	Green	Inside
2889	Hura	1	5.6	Green	Inside
2890	Kotholua	0.3	5.4	Green	Inside
2891	Hura	1.1	6.2	Green	Inside
2892	Cross	0.66	6.2	Green	Inside
2893	Tamul	0.3	7.9	Green	Inside
2894	Tamul	0.4	7.56	Green	Inside
2895	Morolia	0.4	5.6	Green	Inside
2896	Sasi	0.3	7.5	Green	Inside
2897	Tamul	0.4	6.5	Green	Inside
2898	Tamul	0.3	7.9	Green	Inside
2899	Morolia	0.3	5.65	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2900	Tamul	0.4	8	Green	Inside
2901	Hura	1.2	6.8	Green	Inside
2902	Mango	2.2	6.7	Green	Inside
2903	Moj	0.8	5.5	Green	Inside
2904	Sasi	0.37	5	Green	Inside
2905	Sasi	0.3	4.4	Green	Inside
2906	Birmona	0.5	5.5	Green	Inside
2907	Amla	0.9	5.6	Green	Inside
2908	Sasi	0.35	7.9	Green	Inside
2909	Sasi	0.3	7.2	Green	Inside
2910	Segun	0.5	5.9	Green	Inside
2911	Segun	0.4	6.9	Green	Inside
2912	Segun	0.3	7.6	Green	Inside
2913	Segun	0.6	5.4	Green	Inside
2914	Segun	0.35	5.5	Green	Inside
2915	Segun	0.5	5.4	Green	Inside
2916	Segun	0.35	5.5	Green	Inside
2917	Segun	0.6	5.4	Green	Inside
2918	Segun	0.5	5.5	Green	Inside
2919	Segun	0.45	5.6	Green	Inside
2920	Segun	0.4	5.6	Green	Inside
2921	Segun	0.45	5.4	Green	Inside
2922	Segun	0.35	5.3	Green	Inside
2923	Segun	0.43	5.4	Green	Inside
2924	Segun	0.4	5.2	Green	Inside
2925	Segun	0.6	5.65	Green	Inside
2926	Segun	0.5	5.6	Green	Inside
2927	Segun	0.5	5.6	Green	Inside
2928	Segun	0.63	5.6	Green	Inside
2929	Segun	0.5	5.6	Green	Inside
2930	Segun	0.6	5.5	Green	Inside
2931	Segun	0.43	6.9	Green	Inside
2932	Segun	0.5	5.9	Green	Inside
2933	Segun	0.7	6.2	Green	Inside
2934	Segun	0.6	6	Green	Inside
2935	Khilikha	0.5	5.6	Green	Inside
2936	Segun	0.55	6.1	Green	Inside
2937	Sasi	0.7	6.3	Green	Inside
2938	Segun	0.3	6.6	Green	Inside
2939	Sasi	0.3	6.3	Green	Inside
2940	Amla	0.4	6.9	Green	Inside
2941	Amla	0.3	6.5	Green	Outside
2942	Amla	0.5	6.8	Green	Outside
2943	Amla	0.5	6.7	Green	Inside
2944	Amla	0.5	6.8	Green	Inside
2945	Sasi	0.5	6.8	Green	Inside
2946	Debadaru	0.35	7.6	Green	Inside
2947	Debadaru	0.45	7.6	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2948	Coconut	0.7	7.5	Green	Inside
2949	Debadaru	0.4	7.3	Green	Inside
2950	Coconut	1.2	5.5	Green	Inside
2951	Sasi	0.4	5.6	Green	Inside
2952	Sasi	0.3	7	Green	Inside
2953	Sasi	0.45	5.9	Green	Inside
2954	Sasi	0.3	6	Green	Inside
2955	Mango	0.7	6	Green	Inside
2956	Poma	0.45	7.8	Green	Inside
2957	Ahat	0.32	5.5	Green	Outside
2958	Mango	1.7	6.25	Green	Outside
2959	Ajar	0.7	6.1	Green	Inside
2960	Ajar	0.46	6	Green	Inside
2961	Ajar	0.44	6	Green	Inside
2962	Khejur	1.4	4.2	Green	Outside
2963	Neem	0.38	5.25	Green	Outside
2964	Neem	0.45	5.3	Green	Outside
2965	Cross	0.55	5.95	Green	Outside
2966	Cross	0.58	5.4	Green	Outside
2967	Krishnasura	0.6	5	Green	Outside
2968	Krishnasura	0.76	5.45	Green	Outside
2969	Krishnasura	1.06	4.9	Green	Outside
2970	Valow	0.9	5.5	Green	Outside
2971	Mango	0.84	5.6	Green	Outside
2972	Krishnasura	1.4	4.7	Green	Outside
2973	Krishnasura	0.77	4.85	Green	Outside
2974	Krishnasura	0.67	4.75	Green	Outside
2975	Krishnasura	0.3	4.5	Green	Outside
2976	Sonaru	0.57	5.1	Green	Outside
2977	Krishnasura	0.37	4.5	Green	Outside
2978	Sonaru	0.35	4.3	Green	Outside
2979	Sonaru	0.4	3.55	Green	Outside
2980	Sonaru	0.7	3.8	Green	Outside
2981	Sonaru	1.3	4.25	Green	Outside
2982	Khua	1.3	6.2	Green	Outside
2983		0.55	6.2	GREEN	OUTSIDE
2984	Jamu	0.74	7.3	Green	Outside
2985	Sonaru	0.3	6.7	Green	Outside
2986	Segun	0.38	6.9	Green	Outside
2987	Sonaru	0.6	7.6	Green	Inside
2988	Sasi	0.4	3.9	Green	Outside
2989	Sasi	0.4	6.4	Green	Inside
2990	Sasi	0.4	7	Green	Inside
2991	Sasi	0.34	6.2	Green	Inside
2992	Sasi	0.32	7.5	Green	Inside
2993	Sasi	0.3	6.8	Green	Inside
2994	Sasi	0.4	6.2	Green	Inside
2995	Tamul	0.4	6.2	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
2996	Sasi	0.5	6.2	Green	Inside
2997	Sasi	0.34	7.8	Green	Inside
2998	Khilikha	0.8	6.15	Green	Inside
2999	Ajar	0.7	5	Green	Inside
3000	Sasi	0.37	4.85	Green	Inside
3001	Sasi	0.4	4.8	Green	Inside
3002	Sasi	0.6	4.9	Green	Inside
3003	Poma	1.7	6.1	Green	Inside
3004	Tamul	1.4	7.5	Green	Inside
3005	Tamul	0.36	5.7	Green	Inside
3006	Sasi	0.4	4.65	Green	Inside
3007	Tamul	0.4	6.97	Green	Inside
3010	Mango	1.12	6.7	Green	Inside
3010	Sasi	0.4	4.45	Green	Inside
3010	Tamul	0.4	5.6	Green	Inside
3011	Tamul	0.3	5.6	Green	Inside
3012	Poma	1.3	7	Green	Inside
3013	Tamul	0.4	7.1	Green	
3013	Tamul	0.4	5.4	Green	Inside
3014	Tamul	0.45	5.4	Green	Inside
3015	Tamul	0.4	6.3	Green	Inside
3016	Tamul	0.4	5.4	Green	Inside
3017	Tamul	0.4	6.2	Green	Inside
3018	Tamul	0.35	7	Green	Inside
3019	Tamul	0.35	6.9	Green	Inside
3020	Tamul	0.3	5.9	Green	Inside
3021	Tamul	0.3	6.8	Green	Inside
3022	Tamul	0.3	5.7	Green	Inside
3023	Tamul	0.3	4.6	Green	Inside
3024	Tamul	0.35	5.5	Green	Inside
3025	Tamul	0.4	6.85	Green	Inside
3026	Tamul	0.3	5.5	Green	Inside
3027	Tamul	0.45	4.9	Green	Inside
3028	Tamul	0.35	7.1	Green	Inside
3029	Tamul	0.3	6.2	Green	Inside
3030	Tamul	0.3	5.2	Green	Inside
3031	Tamul	0.45	5.95	Green	Inside
3032	Tamul	0.38	7.5	Green	Inside
3033	Poma	1.6	4.2	Green	Inside
3034	Tamul	0.35	5.2	Green	Inside
3035	Tamul	0.4	4.85	Green	Inside
3036	Tamul	0.35	4.7	Green	Inside
3037	Sasi	0.3	5.4	Green	Inside
3038	Sasi	0.4	6.5	Green	Inside
3039	Sasi	0.5	6.5	Green	Inside
3040	Sasi	0.3	4.4	Green	Inside
3041	Sasi	0.35	4.55	Green	Inside
3042	Neem	1.85	4.35	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
3043	Sasi	0.3	4.9	Green	Inside
3044	Sasi	0.35	6.1	Green	Inside
3045	Sasi	0.35	7.1	Green	Inside
3046	Krishnasura	0.95	4.7	Green	Outside
3047	Krishnasura	1.2	4.7	Green	Outside
3048	Krishnasura	1.05	5	Green	Outside
3049	Ajar	1.6	4.6	Green	Outside
3050	Ajar	0.75	6.5	Green	Outside
3051	Moj	0.8	3.4	Green	Outside
3052	Vatgila	0.7	3.7	Dead	Outside
3053	Mango	2	4	Green	Inside
3054	Mango	2	4.7	Green	Inside
3055	Neem	0.85	4.3	Green	Outside
3056	Krishnasura	0.8	4.5	Green	Outside
3057	Krishnasura	0.64	3.9	Green	Outside
3058	Krishnasura	0.7	3.8	Green	Outside
3059	Bogori	0.4	5.4	Green	Outside
3060	Sasi	0.3	5.7	Green	Inside
3061	Amita	0.5	5.5	Green	Inside
3062	Sasi	0.4	4.8	Green	Inside
3063	Tamul	0.4	8	Green	Inside
3064	Tamul	0.4	7	Green	Inside
3065	Mango	0.8	7.9	Green	Inside
3066	Korenja	1	6.3	Green	Inside
3067	Sotiona	1.3	6.1	Green	Inside
3068	Cross	0.85	5.3	Green	Outside
3069	Krishnasura	0.65	6.3	Green	Inside
3070	Krishnasura	0.66	5.4	Green	Inside
3071	Rain Tree	0.5	5.4	Green	Inside
3072	Tenga	0.5	5.4	Green	Inside
3073	Borun	0.45	5.8	Green	Inside
3074	Moj	0.45	5.2	Green	Inside
3075	Gomari	0.4	6.4	Green	Inside
3076	Segun	1.05	6.7	Green	Inside
3077	Sasi	0.5	4.65	Green	Inside
3078	Neem	0.57	6.3	Green	Inside
3079	Segun	1	6.8	Green	Inside
3080	Debodaru	0.8	6	Green	Inside
3081	Debodaru	0.5	6.7	Green	Inside
3082	Debodaru	0.75	6	Green	Inside
3083	Rain Tree	1.15	6.2	Green	Inside
3084	Neem	0.3	5.15	Green	Inside
3085	Khilikha	0.9	4.8	Green	Inside
3086	Debodaru	0.55	6.1	Green	Inside
3087	Debodaru	0.65	6.05	Green	Inside
3088	Mango	1.45	5	Green	Inside
3089	Mango	0.8	6.1	Green	Inside
3090	Mango	1	5	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
3091	Sasi	0.4	4.2	Green	Inside
3092	Sasi	0.3	5.3	Green	Inside
3093	Sasi	0.3	5	Green	Inside
3094	Sasi	0.4	4.5	Green	Inside
3095	Sasi	0.3	5.5	Green	Inside
3096	Moj	1	6	Green	Inside
3097	Ahat	1.6	6.9	Green	Inside
3098	Poma	1	4.6	Green	Inside
3099	Dimoru	0.45	6.4	Green	Inside
3100	Ajar	0.75	6.4	Green	Inside
3101	Sotiona	1.6	5.6	Green	Inside
3102	Sasi	0.3	6.2	Green	Inside
3103	Tamul	0.4	7.4	Green	Inside
3104	Sasi	0.4	6	Green	Inside
3105	Krishnasura	0.55	4	Green	Outside
3106	Krishnasura	0.6	4.6	Green	Inside
3107	Sasi	0.37	4.7	Green	Inside
3108	Sasi	0.3	4.7	Green	Inside
3109	Sasi	0.3	4.75	Green	Inside
3110	Debodaru	1	5.3	Green	Inside
3111	Krishnasura	2.35	5.4	Green	Inside
3112	Ahat	3	5.4	Green	Inside
3113	Jamu	0.3	5	Green	Inside
3114	Radhasura	0.85	5	Green	Inside
3115	Khilikha	1.1	4.7	Green	Outside
3116	Bambo		3.85	Green	Inside
3117	Sasi	0.45	7.45	Green	Inside
3118	Sasi	0.35	4.5	Green	Inside
3119	Tamul	0.3	5.4	Green	Inside
3120	Mango	0.72	4.9	Green	Inside
3121	Tamul	0.4	4.75	Green	Inside
3122	Khilikha	0.71	5.4	Green	Inside
3123	Tamul	0.3	6.75	Green	Inside
3124	Tamul	0.3	6.35	Green	Inside
3125	Khilikha	0.5	4.05	Green	Inside
3126	Tamul	0.3	4.44	Green	Inside
3127	Moj	0.85	4.45	Green	Inside
3128	Moj	0.45	4.45	Dead	Inside
3129	Tamul	0.3	5.05	Green	Inside
3130	Tamul	0.4	5.5	Green	Inside
3131	Tamul	0.4	5.65	Green	Inside
3132	Tamul	0.3	7.7	Green	Inside
3133	Sasi	0.3	5.5	Green	Inside
3134	Tamul	0.35	5.5	Green	Inside
3135	Sasi	0.3	4.45	Green	Inside
3136	Tamul	0.3	5.5	Green	Inside
3137	Coconut	0.8	7.9	Green	Inside
3138	Moj	0.6	5.3	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
3139	Modar	0.65	5.1	Green	Inside
3140	Sasi	0.35	5.6	Green	Inside
3141	Jori	3.3	5.4	Green	Outside
3142	Sasi	0.4	6.2	Green	Outside
3143	Tamul	0.4	7.9	Green	Inside
3144	Sasi	0.7	5.9	Green	Outside
3145	Valow	0.8	4.8	Green	Outside
3146	Khilikha	1.1	5.25	Green	Outside
3147	Cross	0.81	6	Green	Inside
3148	Moj	0.35	4.5	Green	Inside
3149	Poma	0.7	5.3	Green	Inside
3150	Moj	0.88	5.6	Green	Inside
3151	Ajar	0.47	7	Green	Inside
3152	Debodaru	1.4	4.3	Green	Outside
3153	Krishnasura	1	5.25	Green	Outside
3154	Sonaru	0.82	4	Green	Inside
3155		0.65	5.65	GREEN	INSIDE
3156	Ahat	3.2	5.3	Green	Outside
3157		0.3	5.85	GREEN	OUTSIDE
3158	Sonaru	0.4	5.7	Green	Outside
3159	Sonaru	1.05	5.4	Green	Outside
3160	Amora	1.1	5.5	Green	Outside
3161	Neem	0.4	6.7	Green	Outside
3162	Cross	0.85	4.8	Green	Outside
3163	Dimoru	0.7	5.8	Green	Outside
3164	Sotiona	0.8	6.4	Green	Outside
3165	Cross	0.65	6.3	Green	Outside
3166	Cross	0.69	7.05	Green	Outside
3167	Cross	0.4	7	Green	Outside
3168	Cross	0.4	6.9	Green	Outside
3169	Poma	0.9	7.2	Green	Outside
3170	Cross	0.5	7.6	Green	Outside
3171	Imli	0.9	5.8	Green	Outside
3172	Vatgila	0.75	5.4	Green	Inside
3173	Vatgila	0.8	6	Green	Inside
3174	Vatgila	0.72	5.5	Green	Inside
3175	Cross	0.55	6.1	Green	Inside
3176	Sonaru	0.5	5.45	Green	Inside
3177	Sasi	0.3	4.95	Green	Inside
3178	Coconut	1	7.55	Green	Inside
3179	Sasi	0.3	5.7	Green	Inside
3180	Debodaru	0.6	6.1	Green	Inside
3181	Moj	0.3	5.2	Green	Inside
3182	Moha Neem	0.95	5.8	Green	Inside
3183	Vatgila	0.4	6.2	Dead	Inside
3184	Soura	0.4	5.8	Green	Inside
3185	Mango	1.6	5.65	Green	Inside
3186	Mango	1.08	6.65	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
3187	Moj	0.3	5	Green	Inside
3188	Ghungru	0.35	5.4	Green	Inside
3189	Tamul	0.35	6.15	Green	Inside
3190	Poma	1.15	7.4	Green	Inside
3191		1	6.9	GREEN	INSIDE
3192	Tamul	0.4	5.65	Dead	Inside
3193	Mango	0.75	6.6	Green	Inside
3194		0.75	6.45	GREEN	INSIDE
3195	Nmango	0.77	5.75	Green	Inside
3196	Tamul	0.35	5.7	Green	Inside
3197	Jamu	1.2	5.9	Green	Inside
3198	Jamu	0.7	6.3	Green	Inside
3199	Kotholua	0.7	7.2	Green	Inside
3200	Tamul	0.3	5.8	Green	Inside
3201	Mango	0.5	5.1	Green	Inside
3202	Kothal	0.7	5.48	Green	Inside
3203	Mango	0.45	5.75	Green	Inside
3204	Coconut	0.95	5.9	Green	Inside
3205	Amla	0.71	7.1	Green	Inside
3206	Coconut	0.7	6.7	Green	Inside
3207	Tamul	0.35	6.5	Green	Inside
3208	Krishnasura	1.15	6.75	Green	Inside
3209	Krishnasura	1.07	5.8	Green	Inside
3210	Coconut	0.77	7.25	Green	Inside
3211	Mango	0.85	6.75	Green	Inside
3212	Coconut	0.97	8	Green	Inside
3213	Sasi	0.4	6.6	Green	Inside
3214	Khilikha	1	5.75	Green	Inside
3215	Sewali	0.7	6.4	Green	Inside
3216	Poma	0.87	7.1	Green	Inside
3217	Poma	0.98	5.3	Green	Inside
3218	Poma	0.47	8	Green	Inside
3219	Khejur	1.1	6.2	Green	Inside
3220	Mango	1.5	6.85	Green	Inside
3221	Rain Tree	1.9	5.9	Green	Inside
3222	Sasi	0.3	5.7	Green	Inside
3223	Jamu	1.7	5.2	Green	Inside
3224	Tamul	0.3	7.5	Green	Inside
3225	Coconut	0.95	7	Green	Inside
3226	Tamul	0.3	7.9	Green	Inside
3227	Coconut	0.75	7.6	Green	Inside
3228	Tamul	0.35	7	Green	Inside
3229	Coconut	0.7	7.75	Green	Inside
3230	Coconut	0.84	7.6	Green	Inside
3231	Tamul	0.3	7.1	Green	Inside
3232	Rain Tree	1.15	7.7	Green	Inside
3233	Sonaru	0.93	6.9	Green	Inside
3234	Rain Tree	0.56	7.3	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
3235	Rain Tree	0.62	6.85	Green	Inside
3236	Khejur	1.3	7.6	Green	Inside
3237	Ajar	0.5	7.9	Green	Inside
3238	Rain Tree	1.1	7	Green	Inside
3239	Rain Tree	1.1	7.9	Green	Inside
3240	Huwalu	1.06	7.1	Green	Inside
3241	Sotiona	1.2	7.8	Green	Inside
3242	Dimoru	0.2	7.8	Green	Inside
3243	Sotiona	2	8	Green	Inside
3244	Nahor	0.67	7.9	Green	Inside
3245	Ahat	1	7.7	Green	Outside
3246	Gomari	1.1	7.75	Green	Outside
3247	Gohora	0.6	6.2	Green	Outside
3248	Modar	0.4	6.5	Green	Outside
3249	Modar	0.35	6.3	Green	Outside
3250	Morolia	0.7	6.5	Green	Outside
3251	Sotiona	0.9	6.7	Green	Outside
3252	Ajar	0.8	6.6	Green	Outside
3253	Jori	1.1	7.4	Green	Outside
3254	Jori	1.4	7.5	Green	Outside
3255	Sonaru	0.7	7.6	Green	Outside
3256	Ahat		7.4	Green	Outside
3257	Ahat	0.6	7.6	Green	Outside
3258	Polash	0.56	7.4	Green	Outside
3259	Polash	0.67	7.3	Green	Outside
3260	Ajar	0.87	7.1	Green	Outside
3261	Eukeliptas	1.84	6.7	Green	Outside
3262	Ajar	1.8	6.4	Green	Outside
3263	Ajar	1.3	6.3	Green	Outside
3264	Valow	0.69	4.4	Green	Outside
3265	Valow	0.6	4.8	Green	Outside
3266	Krishnasura	1.2	4.6	Green	Outside
3267	Krishnasura	1.04	5.3	Green	Outside
3268	Neem	0.35	4.9	Green	Inside
3269	Mango	0.69	5.9	Green	Inside
3270	Akesia	1.5	6.3	Green	Outside
3271	Bogori	0.76	5.7	Green	Outside
3272	Krishnasura	1.4	6.3	Green	Outside
3273	Bhumura	1.2	7.2	Green	Outside
3274	Valow	1.3	7	Green	Outside
3275	Sotiona	1.6	6.1	Green	Inside
3276	Ahat	1.8	6	Green	Inside
3277	Valow	0.4	6.5	Green	Inside
3278	Sotiona	0.3	6.6	Green	Inside
3279	Valow	0.32	4.7	Green	Inside
3280	Valow	0.5	6.7	Green	Inside
3281	Valow	1.3	6.7	Green	Inside
3282	Sotiona	0.48	6.3	Green	Inside

Trees No.	Tree Name/Species	Girth Of the Tree (M)	Distance Center Of the Road (M)	Tree Condition	Remarks (Privet Inside the Boundry)
3283	Simalu	0.35	6.6	Green	Inside
3284	Ajar	1.2	7.7	Green	Inside
3285	Vatgila	0.6	8	Green	Outside
3286		0.8	5.5	GREEN	OUTSIDE
3287	Sotiona	0.8	8	Green	Outside
3288	Gomari	0.43	7.4	Green	Outside

Annexure 12: Divisional Forest Officer Tree Felling Permission Letter

GOVERNMENMT OF ASSAM
OFFICE OF THE DIVISIONAL FOREST OFFICER
GOLAGHAT DIVISION:::::::::::: GOLAGHAT
e-mail: dfo.t.golaghat@gmail.com

Letter No. B/Road Side Tree/Glt Divn/2020/ 2153-55 Dtd. 27/04/2020.

To,

The Chief Engineer (EAP), PWRD, Assam,
Fatasil Ambari, Guwahati-25.

Sub: Regarding tree cutting evaluation on project roads.
Ref: Your office letter No. CE/AXOM MALA/12/2019/9 dtd:- 05/11/2020.

Sir,

With reference to the subject cited above, I have the honour to submit herewith the valuation statement report of standing road side trees of A15 & A29 roads under Axom Mala Project under Golaghat Forest Division as shown below-

Sl No	Name of Road	No. of trees.	Total Volume	Royalty
1	KB Road (Road No. A-29)	415 Nos.	191.9476 m3	Rs. 1,95,935.00
2	Dhodor Ali (Road No. A-15)	2597 Nos.	1714.8528 m3	Rs. 25,43,988.00
3	Kamarbandha Railway line to Kamarbandha Bridge (Road No. A-15)	524 Nos.	255.0585 m3	Rs. 4,30,082.00
	Total:-	3536 Nos.	2161.8589 m3	Rs. 31,70,005.00

The estimate for operation cost of standing roadside trees and estimate for single plantation with goat proof fencing is enclosed herewith.

Therefore, you are requested to sanction the estimated amount at the earliest, so that work could be started very soon.

This is for your kind information and necessary action.

Enclo.- As stated.

Yours faithfully
22/04/2020
Divisional Forest Officer
Golaghat Division
Golaghat

Copy to:-

1. The Executive Engineer, PWD, Golaghat Rural Road Division, Golaghat for information and necessary action.
2. The Team Leader, Rabi Katgiri, M/s Fortrees Infracom Pvt. Limited, Mumbai for information and necessary action.

Divisional Forest Officer
Golaghat Division
Golaghat

Memo No. A/Road Side Tree/Glt Divn/2020/
Dtd. /04/2020

Copy to:

1. The Addl. Principal Chief Conservator of Forests (T), Upper Assam Zone, Kacharighat, Guwahati -1 for favour of his kind information.
2. The Conservator of Forests, Eastern Assam Circle, Jorhat for favour of his kind information.

Divisional Forest Officer
Golaghat Division
Golaghat

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Annexure - I

ESTIMATE FOR DEPARTMENTAL TREE OPERATION OF STANDING ROAD SIDE TREES AT A15 & A29 ROADS UNDER AXOM MALA PROJECT UNDER GOLAGHAT FOREST DIVISION

Sl No	Particulars	Vol. (in cum)	Rate/Cum	Amount	Remarks
1	Cost for felling & Sectioning of trees	2161.5589 m3	Rs. 2150.00	46,47,997.00	
2	Dragging, transportation etc from the site to temporary timber depot including loading, unloading and stacking		Rs. 2625.00	56,74,880.00	
3	Debarking, stacking etc at temporary timber depot		Rs. 275.00	5,94,511.00	
4	Rent for temporary stock depot (3 Nos.)		30,000.00 X 6 months	5,40,000.00	
			Total:-	**1,14,57,388.00**	

(One crore fourteen lakh fifty seven thousand three hundred eighty eight only)

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22/04/2020
Divisional Forest Officer
Golaghat Division
Golaghat

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Range Forest Officer
Golaghat Range
Golaghat

Annexure-II

ESTIMATE FOR SINIGLE PLANTING WITH GOAT PROOF FENCING

Total Length of roads (A-15 & A-29) under Axom Mala Project = 52600 Mtrs.
Spacies: Bhomra, Ajhar, Neem, Sonaru, Jamun, Aam, Kanchan, Amlakhi, Hilikha, Pendulam Debdaru, Radhachura, Krishna Chura, Nahar, Dimaru etc.
No of seedlings required : 3536 Nos x 2 = 7072 Nos. Both side of the Roads.

Sl. No	Particulars	Unit	Quantity	Rate	Amount
	A. Advanced work and creation				
1	Cost of full goat proof fencing of specification 150cm x 150 cm X 1.2 mtr having 14 SWG knot fitted with bamboo or wooden post.	RMT	4	Rs. 612.00	2448.00
2	Bamboo or wooden post of height 2 mtr & Dia 10 cm.	No.	4	Rs. 80	320.00
3	Digging of 4 holes for fencing post & 1 pit for planting (30 cm X 30 cm X 30 Cm) including soil working, manuring, mixing and planting etc.	DL	0.5	283.14	142.00
4	Carriage of fencing materials including seedling		0.5	283.14	142.00
				Sub- total A =	3,052.00
				Contractor margin @ 10% of A =	305.00
				GST 18% of A =	549.00
				Labour cess @ 1% of A =	31.00
				3rd party quality assurance @ 3% of A =	92.00
				Total of A =	4,029.00
	B. 1st year maintenance (upto December)				
Sl no	**Particulars**	**Unit**	**Quantity**	**Rate**	**Amount**
1	Vacancy filling, mulching, watering whenever necessary and repairing of fencing	DL	0.5	311.00	155.50
				Sub- total of B =	155.50
				Contractor margin @ 10% of B =	16.00
				GST 18% of B =	28.00
				Labour cess @ 1% of B =	2.00
				3rd party quality assurance @ 3% of B =	5.00
				Total of B =	207.00
	C. 2nd year maintenance (upto December)				
Sl no	**Particulars**	**Unit**	**Quantity**	**Rate**	**Amount**
1	Vacancy filling, mulching, watering whenever necessary and repairing of fencing	DL	0.5	342.60	171.00
				Sub- total of C =	171.00
				Contractor margin @ 10% of C =	17.00

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				GST 18% of C =	31.00
				Labour cess @ 1% of C =	2.00
				3rd party quality assurance @ 3% of C =	5.00
				Total of C =	226.00
D. 3rd year maintenance (upto December)					
Sl no	**Particulars**	**Unit**	**Quantity**	**Rate**	**Amount**
1	Vacancy filling, mulching, watering whenever necessary and repairing of fencing	DL	0.5	377.00	189.00
				Sub- total of D =	189.00
				Contractor margin @ 10% of D =	19.00
				GST 18% of D =	34.00
				Labour cess @ 1% of D =	2.00
				3rd party quality assurance @ 3% of D =	6.00
				Total of D =	250.00
Abstract for 9000 nos seedlings					
Advanced work and creation			7072 x 4,029.00		2,84,93,088.00
1st year maintenance (upto December)			7072 x 207.00		14,63,904.00
2nd year maintenance (upto December)			7072 x 226.00		15,98,272.00
3rd year maintenance (upto December)			7072 x 250.00		17,68,000.00
				Total	**3,33,23,264.00**
E. Purchase of 7072 N seedlings @ Rs. 15.00 including carriage					**1,06,080.00**
				Grand Total (A to E)	**3,34,29,344.00**

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22/04/2020
Divisional Forest Officer
Golaghat Division
Golaghat

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Range Forest Officer
Golaghat Range
Golaghat

Annexure 13: 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 are 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 you 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 14: 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 15: 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 in Figure-1.
- 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[4]

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.

Awareness and Education of HiV/AIDS and Malaria

[4] 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.

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 standard5.
- 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 16: Generic Guidelines for Environment Friendly Construction Methodology

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 training[6] 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.
- 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.

[6] IFC's EHS Guidelines 2007

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 17: Guidelines for Stripping, Stocking, Preservation of Top Soil[7]

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.

[7] Clauses 301.3.2 and 305.3.3 of MoRTH Specifications for Roads and Bridges Works (Fifth Edition) 2013

Annexure 18: Baseline Monitoring Result

Air Quality Monitoring

NOIDA TESTING LABORATORIES

(An ISO : 9001 : 2008, 14001 : 2004 & OHSAS : 18001 : 2007 Certified & NABL Accredited Laboratory)
MoEF & CC (Ministry of Environment, Forest & Climate Change) Recognized Laboratory.
☎ +91-9313611642, 8510081921, 7503031145, 8527870572, 7503031146, 9999794369

TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Ambient Air Quality Analysis	AAQ-240120-01	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample Drawn On	:	14/01/2020
Sample Drawn By	:	Mr. Kashmir Singh Pal
Sample description	:	Ambient Air
Sampling Location	:	Borchapari
Sampling Plan &Procedure	:	SOP-AAQ/08
Analysis Duration	:	24/01/2020 TO 29/01/2020
Ambient Temperature (°C)	:	24
Average Flow Rate of SPM (m^3/min.)	:	1.10
Average Flow Rate of Gases (lpm)	:	1.0
Sampling Instrument Used	:	Repairable Dust Sampler, Fine Particulate(PM 2.5) Sampler
Weather Condition	:	Clear

TEST RESULT

S.No.	Parameter	Test Method	Results	Units	Limits as per Environment (Protection) Act.
1.	Particulate Matter (PM_{10})	IS:5182 Part-XXIII	49.4	µg /m^3	100.0
2.	Particulate Matter ($PM_{2.5}$)	CPCB Volume – 1 / Grav	18.6	µg /m^3	60.0
3.	Sulphur Dioxide	IS:5182 Part-II	6.7	µg /m^3	80.0
4.	Nitrogen Oxide	IS:5182 Part-VI	13.2	µg /m^3	80.0
5.	Carbon Monoxide	IS:5182 Part-X	0.480	mg/m^3	4.0

Notes:

1. The results given above are related to the tested sample, as received & mentioned parameters. The customer asked for the above tests only.
2. Responsibility of the Laboratory is limited to the invoiced amount only.
3. This test report will not be generated again, either wholly or in part, without prior written permission of the laboratory.
4. This test report will not be used for any publicity/legal purpose.
5. The test samples will be disposed off after two weeks from the date of issue of test report, unless until specified by the customer

NOIDA (G.B. Nagar) (U.P.)

CHECKED BY **AUTHORIZED SIGNATORY**

Laboratory : GT-20, Sector-117, Noida, Gautam Budh Nagar - 201301
E. : noida.laboratory@gmail.com, info@noidalabs.com W.: www. noidalabs.com

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Ambient Air Quality Analysis	AAQ-240120-02	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample Drawn On	:	14/01/2020
Sample Drawn By	:	Mr. Tejas Dwivedi
Sample description	:	Ambient Air
Sampling Location	:	Sensowa Gaon
Sampling Plan &Procedure	:	SOP-AAQ/08
Analysis Duration	:	24/01/2020 TO 29/01/2020
Ambient Temperature (°C)	:	24
Average Flow Rate of SPM (m^3/min.)	:	1.10
Average Flow Rate of Gases (lpm)	:	1.0
Sampling Instrument Used	:	Repairable Dust Sampler, Fine Particulate(PM 2.5) Sampler
Weather Condition	:	Clear

TEST RESULT

S.No.	Parameter	Test Method	Results	Units	Limits as per Environment (Protection) Act.
1.	Particulate Matter (PM_{10})	IS:5182 Part-XXIII	45.8	µg /m^3	100.0
2.	Particulate Matter ($PM_{2.5}$)	CPCB Volume – 1 / Grav	17.6	µg /m^3	60.0
3.	Sulphur Dioxide	IS:5182 Part-II	7.5	µg /m^3	80.0
4.	Nitrogen Oxide	IS:5182 Part-VI	12.2	µg /m^3	80.0
5.	Carbon Monoxide	IS:5182 Part-X	0.440	mg/m^3	4.0

Notes:

1. The results given above are related to the tested sample, as received & mentioned parameters. The customer asked for the above tests only.
2. Responsibility of the Laboratory is limited to the invoiced amount only.
3. This test report will not be generated again, either wholly or in part, without prior written permission of the laboratory.
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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Ambient Air Quality Analysis	AAQ-240120-03	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample Drawn On	:	15/01/2020
Sample Drawn By	:	Mr. Bhuban Chetry
Sample description	:	Ambient Air
Sampling Location	:	Gohain Gaon
Sampling Plan &Procedure	:	SOP-AAQ/08
Analysis Duration	:	24/01/2020 TO 29/01/2020
Ambient Temperature (°C)	:	19
Average Flow Rate of SPM (m^3/min.)	:	1.10
Average Flow Rate of Gases (lpm)	:	1.0
Sampling Instrument Used	:	Repairable Dust Sampler, Fine Particulate(PM 2.5) Sampler
Weather Condition	:	Clear

TEST RESULT

S.No.	Parameter	Test Method	Results		Limits as per Environment (Protection) Act.
1.	Particulate Matter (PM_{10})	IS:5182 Part-XXIII	55.0	µg /m^3	100.0
2.	Particulate Matter ($PM_{2.5}$)	CPCB Volume – 1 / Grav	20.4	µg /m^3	60.0
3.	Sulphur Dioxide	IS:5182 Part-II	8.2	µg /m^3	80.0
4.	Nitrogen Oxide	IS:5182 Part-VI	15.5	µg /m^3	80.0
5.	Carbon Monoxide	IS:5182 Part-X	0.480	mg/m^3	4.0

Notes:

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Noise Monitoring

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Ambient Noise	N-240120-01	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample Drawn On	:	14/01/2020
Sample Drawn By	:	Mr. Tejas Dwivedi
Sample Received On	:	24/01/2020
Sample description	:	Ambient Noise
Sampling Location	:	Borchapari
Sampling Time	:	24 hrs
Analysis Duration	:	24/01/2020 TO 29/01/2020

TEST RESULT

S. No	Test Parameters	* Results	Units	Requirement (as per CPCB Guidelines Limits in dB (A) Leq		
				Category of Area/ Zone	Day Time	Night Time
1.	EQUIVALENT NOISE LEVEL (6.0 AM TO 10.0 PM)	46.2	dB(A)	Industrial Area	75	70
2.	EQUIVALENT NOISE LEVEL (10.0 PM TO 6.0 AM)	35.8	dB(A)	Commercial Area	65	55
				***Residential Area**	**55**	**45**
				Silence Zone	50	40

Notes:

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Ambient Noise	N-240120-02	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample Drawn On	:	14/01/2020
Sample Drawn By	:	Mr. Kashmir Singh Pal
Sample Received On	:	24/01/2020
Sample description	:	Ambient Noise
Sampling Location	:	Sensowa Gaon
Sampling Time	:	24 hrs
Analysis Duration	:	24/01/2020 TO 29/01/2020

TEST RESULT

S. No	Test Parameters	* Results	Units	Requirement (as per CPCB Guidelines Limits in dB (A) Leq		
				Category of Area/ Zone	Day Time	Night Time
1.	EQUIVALENT NOISE LEVEL (6.0 AM TO 10.0 PM)	44.9	dB(A)	Industrial Area	75	70
2.	EQUIVALENT NOISE LEVEL (10.0 PM TO 6.0 AM)	37.2	dB(A)	Commercial Area	65	55
				***Residential Area**	**55**	**45**
				Silence Zone	50	40

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Ambient Noise	N-240120-03	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample Drawn On	:	15/01/2020
Sample Drawn By	:	Mr. Bhuban Chetry
Sample Received On	:	24/01/2020
Sample description	:	Ambient Noise
Sampling Location	:	Gohain Gaon
Sampling Time	:	24 hrs
Analysis Duration	:	24/01/2020 TO 29/01/2020

TEST RESULT

S. No	Test Parameters	* Results	Units	Requirement (as per CPCB Guidelines Limits in dB (A) Leq		
				Category of Area/ Zone	Day Time	Night Time
1.	EQUIVALENT NOISE LEVEL (6.0 AM TO 10.0 PM)	49.2	dB(A)	Industrial Area	75	70
2.	EQUIVALENT NOISE LEVEL (10.0 PM TO 6.0 AM)	38.4	dB(A)	Commercial Area	65	55
				***Residential Area**	**55**	**45**
				Silence Zone	50	40

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Groundwater Monitoring

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
GROUND WATER	W-240120-01	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI

SAMPLING & ANALYSIS DATA

Project Name : Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample received on : 14/01/2020
Sample Drawn By : Mr. Kashmir Singh Pal
Sample Quantity : 2.0 Lt.
Analysis Duration : 24/01/2020 TO 29/01/2020
Sample Description : Ground Water (Hand Pump)
Sample Location : Sonari Gaon

BACTERIOLOGICAL PARAMETERS

S. No.	Parameter	Test Method	Results	Required as per IS-10500:2012
1.	Total Faecal Coliform Bacteria	IS-1622	Absent	Absent/100ml

ORGANOLEPTIC & PHYSICAL PARAMETERS

S. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Result	Test Method
			Desirable Limit	Permissible Limit		
1.	pH	-	6.5-8.5	No Relaxation	7.28	IS:3025(Pt-11) 1983, Reaff. 2002
2.	Colour	Hazen	5	25	<5.0	IS:3025(Pt-4) 1983, Reaff. 2002
3.	Odour	-	Agreeable	Agreeable	Agreeable	IS:3025(Pt-5) 1983, Reaff. 2002
4.	Turbidity	NTU	1	5	<1.0	IS-3025(P-10), 1984
5.	Total Hardness (as $CaCO_3$)	mg/l	200	600	107.98	IS:3025(Pt-21) 1983, Reaff. 2002
6.	Chloride (as Cl)	mg/l	250	1000	18.4	IS:3025(Pt-32) 1988, Reaff. 2002
7.	Fluoride (as F)	mg/l	1	1.5	0.92	APHA 22nd Ed., 4500F(D)
8.	Phenol Content	mg/l	<0.001	-	<0.001	IS: 3025 (P-43)
9.	Calcium (as Ca^{++})	mg/l	75	200	23.2	IS:3025(Pt-40) 1983, Reaff. 2002
10.	Magnesium (as Mg^{++})	mg/l	30	100	7.9	APHA 22nd Ed., 3500-Mg(B)
11.	Sulphate (as SO_4)	mg/l	200	400	8.8	IS:3025(Pt-24) 1986, Reaff.

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						2003
12.	Nitrate (as NO_3)	mg/l	45	No Relaxation	7.8	IS:3025(Pt-34) 1988, Reaff. 2003
13.	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	IS: 3025 (P- 56)
14.	Alkalinity as ($CaCO_3$)	mg/l	200	600	132.6	IS:3025(Pt-23) 1986, Reaff. 2003
15.	TDS	mg/l	500	2000	168.03	IS-3025(P-16), 1984
16.	TSS	Mg/l	-	-	<1.0	APHA
17.	Dissolved Oxygen	% By Mass	-	-	4.9	3025(P-38), 1989
18.	BOD (at 27°C 3-Days)	mg/l	-	-	<2.0	IS-3025(P-44), 1993
19.	Phosphates	mg/l	-	-	<0.05	IS-3025(P-31)
20.	Ammonia	mg/l	0.5	No Relaxation	<0.1	IS: 3025 (P- 34)
21.	Electrical Conductivity	Microm/hos/ cm	-	-	258.51	IS-3025(P-14), 1984
22.	Sodium (as Na)	mg/l	-	-	12.6	IS-3.25(P-45)
23.	Potassium (as K)	mg/l	-	-	6.2	IS-3.25(P-45)
24.	Iron (as Fe)	mg/l	0.3	No Relaxation	1.25	IS:3025 Part 53 2003, RA-2003
25.	TKN	mg/l	-	-	<0.1	IS: 3025 (P- 34)

PARAMETERS CONCERNING TOXIC SUBSTANCES

S. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Result	Test Method
			Desirable Limit	Permissible Limit		
1.	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	IS-3025(P-41)
2.	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	IS-3025(P-27)
3.	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	IS-3025(P-47)
4.	Arsenic (as As)	mg/l	0.01	0.05	<0.01	IS-3025(P-37)
5.	Total Chromium (Cr)	mg/l	0.05	No Relaxation	<0.05	IS-3025 (P-52)
6.	Mercury (as Hg)	mg/l	0.001	-	<0.0001	IS-3025 (P-48)

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
GROUND WATER	W-240120-02	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name : Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample received on : 14/01/2020
Sample Drawn By : Mr. Tejas Dwivedi
Sample Quantity : 2.0 Lt.
Analysis Duration : 24/01/2020 TO 29/01/2020
Sample Description : Ground Water (Hand Pump)
Sample Location : Butoli Khowa

BACTERIOLOGICAL PARAMETERS

S. No.	Parameter	Test Method	Results	Required as per IS-10500:2012
1.	Total Faecal Coliform Bacteria	IS-1622	Absent	Absent/100ml

ORGANOLEPTIC & PHYSICAL PARAMETERS

S. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Result	Test Method
			Desirable Limit	Permissible Limit		
1.	pH	-	6.5-8.5	No Relaxation	7.11	IS:3025(Pt-11) 1983, Reaff. 2002
2.	Colour	Hazen	5	25	<5.0	IS:3025(Pt-4) 1983, Reaff. 2002
3.	Odour	-	Agreeable	Agreeable	Agreeable	IS:3025(Pt-5) 1983, Reaff. 2002
4.	Turbidity	NTU	1	5	<1.0	IS-3025(P-10), 1984
5.	Total Hardness (as $CaCO_3$)	mg/l	200	600	133.95	IS:3025(Pt-21) 1983, Reaff. 2002
6.	Chloride (as Cl)	mg/l	250	1000	24.28	IS:3025(Pt-32) 1988, Reaff. 2002
7.	Fluoride (as F)	mg/l	1	1.5	0.17	APHA 22nd Ed., 4500F(D)
8.	Phenol Content	mg/l	<0.001	-	<0.001	IS: 3025 (P-43)
9.	Calcium (as Ca+)	mg/l	75	200	25.24	IS:3025(Pt-40) 1983, Reaff.

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						2002
10.	Magnesium (as Mg+)	mg/l	30	100	17.28	APHA 22nd Ed., 3500-Mg(B)
11.	Sulphate (as SO_4)	mg/l	200	400	14.23	IS:3025(Pt-24) 1986, Reaff. 2003
12.	Nitrate (as NO_3)	mg/l	45	No Relaxation	6.78	IS:3025(Pt-34) 1988, Reaff. 2003
13.	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	IS: 3025 (P- 56)
14.	Alkalinity as ($CaCO_3$)	mg/l	200	600	130.14	IS:3025(Pt-23) 1986, Reaff. 2003
15.	TDS	mg/l	500	2000	174.19	IS-3025(P-16), 1984
16.	TSS	Mg/l	-	-	<1.0	APHA
17.	Dissolved Oxygen	% By Mass	-	-	4.4	3025(P-38), 1989
18.	BOD (at 27°C 3-Days)	mg/l	-	-	<2.0	IS-3025(P-44), 1993
19.	Phosphates	mg/l	-	-	<0.05	IS-3025(P-31)
20.	Ammonia	mg/l	0.5	No Relaxation	<0.1	IS: 3025 (P- 34)
21.	Electrical Conductivity	Microm/hos/ cm	-	-	274.14	IS-3025(P-14), 1984
22.	Sodium (as Na)	mg/l	-	-	8.7	IS-3.25(P-45)
23.	Potassium (as K)	mg/l	-	-	3.6	IS-3.25(P-45)
24.	Iron (as Fe)	mg/l	0.3	No Relaxation	1.12	IS 3025 Part 53 2003, RA-2003
25.	TKN	mg/l	-	-	<0.1	IS: 3025 (P- 34)

PARAMETERS CONCERNING TOXIC SUBSTANCES

S. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Result	Test Method
			Desirable Limit	Permissible Limit		
1.	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	IS-3025(P-41)
2.	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	IS-3025(P-27)
3.	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	IS-3025(P-47)
4.	Arsenic (as As)	mg/l	0.01	0.05	<0.01	IS-3025(P-37)
5.	Total Chromium (Cr)	mg/l	0.05	No Relaxation	<0.05	IS-3025 (P-52)
6.	Mercury (as Hg)	mg/l	0.001	-	<0.0001	IS-3025 (P-48)

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TEST CERTIFICATE

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
GROUND WATER	W-240120-03	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name : Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample received on : 15/01/2020
Sample Drawn By : Mr. Bhuban Chetry
Sample Quantity : 2.0 Lt.
Analysis Duration : 24/01/2020 TO 29/01/2020
Sample Description : Ground Water (Hand Pump)
Sample Location : Gohain Gaon

BACTERIOLOGICAL PARAMETERS

S. No.	Parameter	Test Method	Results	Required as per IS-10500:2012
1.	Total Faecal Coliform Bacteria	IS-1622	Absent	Absent/100ml

ORGANOLEPTIC & PHYSICAL PARAMETERS

S. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Result	Test Method
			Desirable Limit	Permissible Limit		
1.	pH	-	6.5-8.5	No Relaxation	7.21	IS:3025(Pt-11) 1983, Reaff. 2002
2.	Colour	Hazen	5	25	<5.0	IS:3025(Pt-4) 1983, Reaff. 2002
3.	Odour	-	Agreeable	Agreeable	Agreeable	IS:3025(Pt-5) 1983, Reaff. 2002
4.	Turbidity	NTU	1	5	<1.0	IS-3025(P-10), 1984
5.	Total Hardness (as $CaCO_3$)	mg/l	200	600	100.65	IS:3025(Pt-21) 1983, Reaff. 2002
6.	Chloride (as Cl)	mg/l	250	1000	17.89	IS:3025(Pt-32) 1988, Reaff. 2002
7.	Fluoride (as F)	mg/l	1	1.5	0.19	APHA 22nd Ed., 4500F(D)
8.	Phenol Content	mg/l	<0.001	-	<0.001	IS: 3025 (P-43)
9.	Calcium (as Ca+)	mg/l	75	200	31.24	IS:3025(Pt-40) 1983, Reaff. 2002

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10.	Magnesium (as Mg+)	mg/l	30	100	5.5	APHA 22nd Ed., 3500-Mg(B)
11.	Sulphate (as SO_4)	mg/l	200	400	4.4	IS:3025(Pt-24) 1986, Reaff. 2003
12.	Nitrate (as NO_3)	mg/l	45	No Relaxation	8.1	IS:3025(Pt-34) 1988, Reaff. 2003
13.	Selenium (as Se)	mg/l	0.01	No Relaxation	<0.01	IS: 3025 (P- 56)
14.	Alkalinity as ($CaCO_3$)	mg/l	200	600	121.56	IS:3025(Pt-23) 1986, Reaff. 2003
15.	TDS	mg/l	500	2000	156.59	IS-3025(P-16), 1984
16.	TSS	Mg/l	-	-	<1.0	APHA
17.	Dissolved Oxygen	% By Mass	-	-	4.7	3025(P-38), 1989
18.	BOD (at 27°C 3-Days)	mg/l	-	-	<2.0	IS-3025(P-44), 1993
19.	Phosphates	mg/l	-	-	<0.05	IS-3025(P-31)
20.	Ammonia	mg/l	0.5	No Relaxation	<0.1	IS: 3025 (P- 34)
21.	Electrical Conductivity	Microm/hos/ cm	-	-	240.9	IS-3025(P-14), 1984
22.	Sodium (as Na)	mg/l	-	-	14.12	IS-3.25(P-45)
23.	Potassium (as K)	mg/l	-	-	8.4	IS-3.25(P-45)
24.	Iron (as Fe)	mg/l	0.3	No Relaxation	1.28	IS:3025 Part 53 2003, RA-2003
25.	TKN	mg/l	-	-	<0.1	IS: 3025 (P- 34)

PARAMETERS CONCERNING TOXIC SUBSTANCES

S. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Result	Test Method
			Desirable Limit	Permissible Limit		
1.	Cadmium (as Cd)	mg/l	0.003	No Relaxation	<0.001	IS-3025(P-41)
2.	Cyanide (as CN)	mg/l	0.05	No Relaxation	<0.01	IS-3025(P-27)
3.	Lead (as Pb)	mg/l	0.01	No Relaxation	<0.01	IS-3025(P-47)
4.	Arsenic (as As)	mg/l	0.01	0.05	<0.01	IS-3025(P-37)
5.	Total Chromium (Cr)	mg/l	0.05	No Relaxation	<0.05	IS-3025 (P-52)
6.	Mercury (as Hg)	mg/l	0.001	-	<0.0001	IS-3025 (P-48)

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Surface Water Monitoring

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Test Report of	Report Code	Date of Issue
SURFACE WATER	W-240120-04	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name : Improvement of SH and MDRs under Asom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample received on : 14/01/2020
Sample Drawn By : Mr. Tejas Dwivedi
Sample Quantity : 2.0 Lt.
Analysis Duration : 24/01/2020 TO 29/01/2020
Sample Description : Surface Water (Pond)
Sample Location : Borchapari

MICROBIOLOGICAL REQUIREMENT

RESULTS			
S.No.	Parameter	Test Method	Results
1.	*Total Faecal Coliform Bacteria(MPN/100ML)*	IS-1622	541

ORGANOLEPTIC & PHYSICAL PARAMETERS

S.NO.	Parameter	Test method	Result	Unit
2.	Colour	IS-3025(P-04)	<5.0	Hazen Unit
3.	Odour	IS-3025(P-05)	Agreeable	-
4.	Turbidity	IS-3025(P-10)	1.8	NTU
5.	pH value	IS-3025(P-11)	7.61	-
6.	Total dissolve solid (TDS)	IS-3025(P-16)	106.26	mg/l
7.	Electrical Conductivity	IS-3025(P-14)	163.48	µs/cm
8.	Total Suspended Solid	IS-3025(P-17)	1.7	mg/l
9.	Total Dissolve Oxygen	IS-3025(P-38)	5.4	mg/l
10.	Biological Oxygen Demand	IS-3025(P-44)	4.8	mg/l
11.	Phosphate Content	IS-3025(P-31)	0.062	mg/l

GENERAL PARAMETERS CONCERNING SUBSTANCES UNDESIRABLE IN EXCESSIVE AMOUNTS

S.NO.	Parameter	Test method	Result	Unit
12.	Total Ammonia	IS: 3025 (P- 34)	<0.1	mg/l
13.	TKN	IS: 3025 (P- 34)	0.56	mg/l
14.	Boron (as B)	IS: 3025 (P- 57)	0.01	mg/l
15.	Calcium (as Ca)	IS: 3025 (P- 40)	10.14	mg/l
16.	Chloride (as Cl)	IS: 3025 (P- 32)	12.14	mg/l
17.	Copper (as Cu)	IS : 3025 (P-42)	<0.05	mg/l
18.	Fluoride (as F)	IS: 3025 (P-60)	0.23	mg/l
19.	Phenol Content	IS: 3025 (P-43)	<0.001	mg/l

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20.	Iron (as Fe)	IS: 3025(P-53)	0.07	mg/l
21.	Magnesium (as mg)	IS: 3025 (P-46)	7.4	mg/l
22.	Nitrate (as NO_3)	IS: 3025 (P- 34)	3.17	mg/l
23.	Selenium (as Se)	IS: 3025 (P- 56)	<0.01	mg/l
24.	Sulphate (as SO_4)	IS: 3025 (P- 24)	21.24	mg/l
25.	Alkalinity (as Ca CO_3)	IS: 3025 (P- 23)	61.24	mg/l
26.	Total hardness (as $CaCO_3$)	IS: 3025 (P- 21)	60.07	mg/l
27.	Zinc (as Zn)	IS: 3025 (P- 49)	0.20	mg/l
28.	Sodium (as Na)	IS-3.25(P-45)	12.17	mg/l
29.	Potassium (as K)	IS-3.25(P-45)	3.26	mg/l

Parameters Concerning Toxic Substances:

S.NO.	Parameter	Test method	Result	Unit
30.	Cadmium (as Cd)	IS-3025(P-41)	<0.001	mg/l
31.	Cyanide (as CN)	IS-3025(P-27)	<0.01	mg/l
32.	Lead (as Pb)	IS-3025(P-47)	<0.01	mg/l
33.	Arsenic (as As)	IS-3025(P-37)	<0.01	mg/l
34.	Total Chromium (Cr)	IS-3025 (P-52)	<0.05	mg/l
35.	Mercury (as Hg)	IS-3025 (P-48)	<0.0001	mg/l

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
SURFACE WATER	W-240120-05	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name : Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample received on : 14/01/2020
Sample Drawn By : Mr. Kashmir Singh Pal
Sample Quantity : 2.0 Lt.
Analysis Duration : 24/01/2020 TO 29/01/2020
Sample Description : Surface Water (Pond)
Sample Location : Sensowa Gaon

MICROBIOLOGICAL REQUIREMENT

RESULTS			
S.No.	Parameter	Test Method	Results
1.	*Total Faecal Coliform Bacteria(MPN/100ML)*	IS-1622	563

ORGANOLEPTIC & PHYSICAL PARAMETERS

S.NO.	Parameter	Test method	Result	Unit
2.	Colour	IS-3025(P-04)	<5.0	Hazen Unit
3.	Odour	IS-3025(P-05)	Agreeable	-
4.	Turbidity	IS-3025(P-10)	1.7	NTU
5.	pH value	IS-3025(P-11)	7.84	-
6.	Total dissolve solid (TDS)	IS-3025(P-16)	101.99	mg/l
7.	Electrical Conductivity	IS-3025(P-14)	156.91	µs/cm
8.	Total Suspended Solid	IS-3025(P-17)	1.4	mg/l
9.	Total Dissolve Oxygen	IS-3025(P-38)	5.6	mg/l
10.	Biological Oxygen Demand	IS-3025(P-44)	3.4	mg/l
11.	Phosphate Content	IS-3025(P-31)	0.045	mg/l

GENERAL PARAMETERS CONCERNING SUBSTANCES UNDESIRABLE IN EXCESSIVE AMOUNTS

S.NO.	Parameter	Test method	Result	Unit
12.	Total Ammonia	IS: 3025 (P- 34)	<0.1	mg/l
13.	TKN	IS: 3025 (P- 34)	0.51	mg/l
14.	Boron (as B)	IS: 3025 (P- 57)	BDL	mg/l
15.	Calcium (as Ca)	IS: 3025 (P- 40)	8.21	mg/l

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16.	Chloride (as Cl)	IS: 3025 (P- 32)	11.9	mg/l
17.	Copper (as Cu)	IS : 3025 (P-42)	<0.04	mg/l
18.	Fluoride (as F)	IS: 3025 (P-60)	0.17	mg/l
19.	Phenol Content	IS: 3025 (P-43)	<0.001	mg/l
20.	Iron (as Fe)	IS: 3025(P-53)	0.05	mg/l
21.	Magnesium (as mg)	IS: 3025 (P-46)	8.12	mg/l
22.	Nitrate (as NO_3)	IS: 3025 (P- 34)	4.14	mg/l
23.	Selenium (as Se)	IS: 3025 (P- 56)	<0.01	mg/l
24.	Sulphate (as SO_4)	IS: 3025 (P- 24)	20.23	mg/l
25.	Alkalinity (as Ca CO_3)	IS: 3025 (P- 23)	54.25	mg/l
26.	Total hardness (as $CaCO_3$)	IS: 3025 (P- 21)	53.83	mg/l
27.	Zinc (as Zn)	IS: 3025 (P- 49)	0.25	mg/l
28.	Sodium (as Na)	IS-3.25(P-45)	13.14	mg/l
29.	Potassium (as K)	IS-3.25(P-45)	3.7	mg/l

Parameters Concerning Toxic Substances:

S.NO.	Parameter	Test method	Result	Unit
30.	Cadmium (as Cd)	IS-3025(P-41)	<0.001	mg/l
31.	Cyanide (as CN)	IS-3025(P-27)	<0.01	mg/l
32.	Lead (as Pb)	IS-3025(P-47)	<0.01	mg/l
33.	Arsenic (as As)	IS-3025(P-37)	<0.01	mg/l
34.	Total Chromium (Cr)	IS-3025 (P-52)	<0.05	mg/l
35.	Mercury (as Hg)	IS-3025 (P-48)	<0.0001	mg/l

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
SURFACE WATER	W-240120-06	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name : Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the State of Assam
Sample received on : 15/01/2020
Sample Drawn By : Mr. Bhuban Chetry
Sample Quantity : 2.0 Lt.
Analysis Duration : 24/01/2020 TO 29/01/2020
Sample Description : Surface Water (River)
Sample Location : Dafalating Grant

MICROBIOLOGICAL REQUIREMENT

RESULTS			
S.No.	Parameter	Test Method	Results
1.	*Total Faecal Coliform Bacteria(MPN/100ML)*	IS-1622	566

ORGANOLEPTIC & PHYSICAL PARAMETERS

S.NO.	Parameter	Test method	Result	Unit
2.	Colour	IS-3025(P-04)	<5.0	Hazen Unit
3.	Odour	IS-3025(P-05)	Agreeable	-
4.	Turbidity	IS-3025(P-10)	1.6	NTU
5.	pH value	IS-3025(P-11)	7.57	-
6.	Total dissolve solid (TDS)	IS-3025(P-16)	114.15	mg/l
7.	Electrical Conductivity	IS-3025(P-14)	175.65	µs/cm
8.	Total Suspended Solid	IS-3025(P-17)	1.6	mg/l
9.	Total Dissolve Oxygen	IS-3025(P-38)	5.5	mg/l
10.	Biological Oxygen Demand	IS-3025(P-44)	3.5	mg/l
11.	Phosphate Content	IS-3025(P-31)	0.056	mg/l

GENERAL PARAMETERS CONCERNING SUBSTANCES UNDESIRABLE IN EXCESSIVE AMOUNTS

S.NO.	Parameter	Test method	Result	Unit
12.	Total Ammonia	IS: 3025 (P- 34)	<0.1	mg/l
13.	TKN	IS: 3025 (P- 34)	0.57	mg/l
14.	Boron (as B)	IS: 3025 (P- 57)	BDL	mg/l
15.	Calcium (as Ca+)	IS: 3025 (P- 40)	9.7	mg/l
16.	Chloride (as Cl)	IS: 3025 (P- 32)	14.24	mg/l
17.	Copper (as Cu)	IS : 3025 (P-42)	<0.05	mg/l

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18.	Fluoride (as F)	IS: 3025 (P-60)	0.26	mg/l
19.	Phenol Content	IS: 3025 (P-43)	<0.001	mg/l
20.	Iron (as Fe)	IS: 3025(P-53)	0.08	mg/l
21.	Magnesium (as mg+)	IS: 3025 (P-46)	10.34	mg/l
22.	Nitrate (as NO_3)	IS: 3025 (P- 34)	3.18	mg/l
23.	Selenium (as Se)	IS: 3025 (P- 56)	<0.01	mg/l
24.	Sulphate (as SO_4)	IS: 3025 (P- 24)	22.98	mg/l
25.	Alkalinity (as Ca CO_3)	IS: 3025 (P- 23)	65.32	mg/l
26.	Total hardness (as $CaCO_3$)	IS: 3025 (P- 21)	66.64	mg/l
27.	Zinc (as Zn)	IS: 3025 (P- 49)	0.16	mg/l
28.	Sodium (as Na)	IS-3.25(P-45)	12.11	mg/l
29.	Potassium (as K)	IS-3.25(P-45)	2.42	mg/l

Parameters Concerning Toxic Substances:

S.NO.	Parameter	Test method	Result	Unit
30.	Cadmium (as Cd)	IS-3025(P-41)	<0.001	mg/l
31.	Cyanide (as CN)	IS-3025(P-27)	<0.01	mg/l
32.	Lead (as Pb)	IS-3025(P-47)	<0.01	mg/l
33.	Arsenic (as As)	IS-3025(P-37)	<0.01	mg/l
34.	Total Chromium (Cr)	IS-3025 (P-52)	<0.05	mg/l
35.	Mercury (as Hg)	IS-3025 (P-48)	<0.0001	mg/l

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Soil Monitoring

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Soil Quality Analysis	S-240120-01	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the Stat of Assam
Sampling Location	:	Butolikhowa No.1
Sample Received On	:	24/01/2020
Sample Drawn by	:	Mr. Kashmir Singh Pal
Sample Description	:	Soil
Sample Drawn On	:	14/01/2020
Sample Quantity	:	1.0 Kg
Weather Conditions	:	Normal
Analysis Duration	:	24/01/2020 TO 29/01/2020

S.No.	PARAMETERTS	TEST METHOD	Results	UNIT
1.	pH(1:5 suspension)	IS:2720(Part-26)	7.19	-
2.	Electrical Conductivity at 25°C (1:5suspension.)	IS:2720(Part-21)	143	µmhos/cm
3.	Porosity	STP/SOIL	22.32	% by mass
4.	Texture	STP/SOIL	Sandy Clay Loam	-
5.	Sand	STP/SOIL	45.89	% by mass
6.	Clay	STP/SOIL	44.48	% by mass
7.	Silt	STP/SOIL	9.63	% by mass
8.	Nitrogen	STP/SOIL	1870	mg/1000g
9.	Potassium (as K)	STP/SOIL	93.12	mg/1000g
10.	Phosphorus	STP/SOIL	<5.0	mg/1000g
11.	Organic Matter	IS:2720 (Part-22)	0.94	% by mass
12.	Moisture Retention capacity	STP/SOIL	36.32	% by mass
13.	Infiltration Rate	STP/SOIL	242	mm/hr
14.	Sulphates	STP/SOIL	23.27	mg/100gm
15.	Sodium Sulphates	STP/SOIL	13.28	mg/1000g
16.	Calcium Sulphates	STP/SOIL	BDL	mg/1000g
17.	Bulk Density	STP/SOIL	1.52	gm/cm³

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Soil Quality Analysis	S-240120-02	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAI.

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the Stat of Assam
Sampling Location	:	Sonari Gaon
Sample Received On	:	24/01/2020
Sample Drawn by	:	Mr. Tejas Dwivedi
Sample Description	:	Soil
Sample Drawn On	:	14/01/2020
Sample Quantity	:	1.0 Kg
Weather Conditions	:	Normal
Analysis Duration	:	24/01/2020 TO 29/01/2020

S.No.	PARAMETERTS	TEST METHOD	Results	UNIT
1.	pH(1:5 suspension)	IS:2720(Part-26)	7.21	-
2.	Electrical Conductivity at 25°C (1:5suspension.)	IS:2720(Part-21)	156	µmhos/cm
3.	Porosity	STP/SOIL	24.25	% by mass
4.	Texture	STP/SOIL	Sandy Clay Loam	-
5.	Sand	STP/SOIL	49.45	% by mass
6.	Clay	STP/SOIL	41.13	% by mass
7.	Silt	STP/SOIL	9.42	% by mass
8.	Nitrogen	STP/SOIL	1890	mg/1000g
9.	Potassium (as K)	STP/SOIL	92.13	mg/1000g
10.	Phosphorus	STP/SOIL	<5.0	mg/1000g
11.	Organic Matter	IS:2720 (Part-22)	0.82	% by mass
12.	Moisture Retention capacity	STP/SOIL	34.28	% by mass
13.	Infiltration Rate	STP/SOIL	263	mm/hr
14.	Sulphates	STP/SOIL	24.12	mg/100gm
15.	Sodium Sulphates	STP/SOIL	14.15	mg/1000g
16.	Calcium Sulphates	STP/SOIL	BDL	mg/1000g
17.	Bulk Density	STP/SOIL	1.44	gm/cm^3

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TEST CERTIFICATE

Test Report of	Report Code	Date of Issue
Soil Quality Analysis	S-240120-03	29/01/2020

ISSUED TO: FORTRESS INFRACON LIMITED, MUMBAL

SAMPLING & ANALYSIS DATA

Project Name	:	Improvement of SH and MDRs under Axom Mala for Dhodar Ali Road from Kamargaon on NH-37 to Kamarbandha Road in District Golaghat in the Stat of Assam
Sampling Location	:	Gohain Gaon
Sample Received On	:	24/01/2020
Sample Drawn by	:	Mr. Bhuban Chetry
Sample Description	:	Soil
Sample Drawn On	:	15/01/2020
Sample Quantity	:	1.0 Kg
Weather Conditions	:	Normal
Analysis Duration	:	24/01/2020 TO 29/01/2020

S.No.	PARAMETERTS	TEST METHOD	Results	UNIT
1.	pH(1:5 suspension)	IS:2720(Part-26)	7.17	-
2.	Electrical Conductivity at 25°C (1:5suspension.)	IS:2720(Part-21)	139	µmhos/cm
3.	Porosity	STP/SOIL	23.34	% by mass
4.	Texture	STP/SOIL	Sandy Clay Loam	-
5.	Sand	STP/SOIL	48.87	% by mass
6.	Clay	STP/SOIL	41.24	% by mass
7.	Silt	STP/SOIL	9.89	% by mass
8.	Nitrogen	STP/SOIL	1910	mg/1000g
9.	Potassium (as K)	STP/SOIL	92.38	mg/1000g
10.	Phosphorus	STP/SOIL	<5.0	mg/1000g
11.	Organic Matter	IS:2720 (Part-22)	0.81	% by mass
12.	Moisture Retention capacity	STP/SOIL	35.87	% by mass
13.	Infiltration Rate	STP/SOIL	241	mm/hr
14.	Sulphates	STP/SOIL	26.58	mg/100gm
15.	Sodium Sulphates	STP/SOIL	14.12	mg/1000g
16.	Calcium Sulphates	STP/SOIL	BDL	mg/1000g
17.	Bulk Density	STP/SOIL	1.40	gm/cm³

CHECKED BY

AUTHORIZED SIGNATORY

Laboratory : GT-20, Sector-117, Noida, Gautam Budh Nagar - 201301
E. : noida.laboratory@gmail.com, info@noidalabs.com W.: www. noidalabs.com

Annexure 19: Air Modelling Report

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 CALINE-4, a dispersion model based on Gaussian Equation. The current and projected traffic volume of **A15 (Kamargaon to Kamarbandha)** road has been used for the prediction. CALINE-4 is a dispersion model developed by the California Department of Transportation for the prediction of concentrations of critical atmospheric pollutants (CO, NO_x and $PM_{2.5}$) along the highways. This model employs a mixing zone concept to characterize pollutant dispersion over the highway and can be used to predict the pollutant concentrations for receptors up to 500 m of the corridor. The model uses the baseline data on existing concentration of pollutants and estimates the incremental emissions due to the project.

Modeling using Caline 4

The **Job Parameters** for Modelling are as follows:

Molecular weight: Molecular weight input to the model based on the chosen pollutant ("n/a" for Particulates).

Settling Velocity: The rate at which a particle falls with respect to its immediate surroundings. This parameter is an optional parameter for Particulates only ("n/a" for Carbon Monoxide and Nitrogen Dioxide). Only a value greater than or equal to zero can be used in the model.

Deposition Velocity: The rate at which a pollutant can be adsorbed or assimilated by a surface. This parameter may be specified for all pollutants but it is optional and only a value greater than or equal to zero can be used in the model.

Aerodynamic Roughness Coefficient: Also known as the Davenport-Wieringa roughness-length. These choices determine the amount of local air turbulence that affects plume spreading.

- Rural: Roughness Coefficient = 10 cm
- Suburban: Roughness Coefficient = 100 cm
- Central Business District: Roughness Coefficient = 400 cm
- Other: Use Table A below as guidance to select an appropriate value:

Table A: Aerodynamic Roughness Coefficient defined for various types of landscapes.

Roughness Coefficient (cm)	Landscape Type
0.002	Sea, paved areas, snow-covered flat plain, tide flat, smooth desert
0.5	Beaches, pack ice, morass, snow-covered fields
3	Grass prairie or farm fields, tundra, airports, heather
10	Cultivated areas with low crops and occasional obstacles (such as bushes)
25	High crops, crops with varied height, scattered obstacles (such as trees or hedgerows), vineyards
50	Mixed far fields and forest clumps, orchards, scattered buildings
100	Regular coverage with large obstacles, open spaces roughly equal to obstacle heights, suburban houses, villages, mature forests
≥200	Centers of large towns or cities, irregular forests with scattered clearings

Run Type: Different choices are associated with different hourly average wind angle(s) and averaging times (for CO concentrations only). (Wind angle is the angle between the roadway link and the wind direction. CALINE4 calculates the angles based on data in the Link Geometry and Run Conditions tabs.)

- Standard - Calculates 1-hr average CO, NO_2, or PM concentrations at the receptors. The user must input a wind direction on the Run Conditions tab.
- Worst-Case Wind Angle - Calculates 1-hr average CO or PM concentrations at the receptors. The model selects wind angles that produce the highest concentrations at each of the receptors. This is the most appropriate choice for most users.
- Multi-Run - Calculates 8-hr average CO concentrations at the receptors. The user must input wind angles for each hour.
- Multi-Run/Worst-Case Hybrid - Calculates 8-hr average CO concentrations at the receptors. The model selects wind angles that produce the highest CO concentrations at each of the receptors.

Altitude above sea level: The altitude above mean sea level used in the mass concentration-to volumetric (ppm) conversion. This value must be between zero and 10,000 meters (32,808 feet).

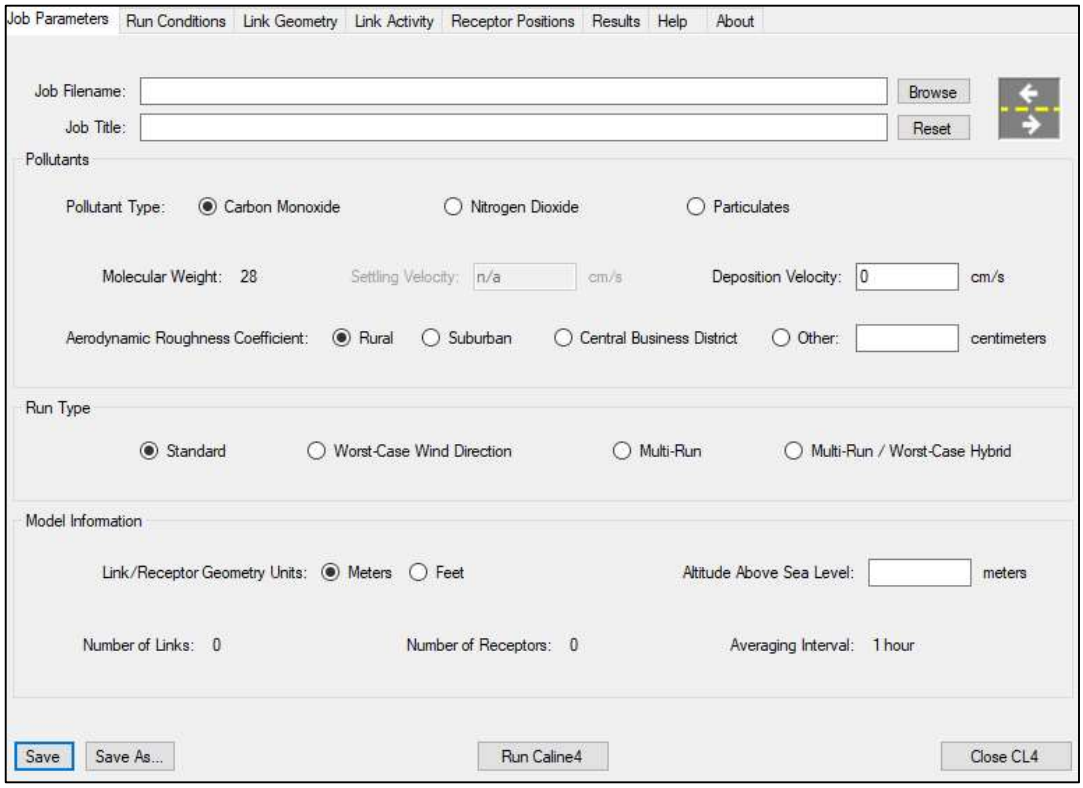


Figure A: Job Parameters Tab

The **Run Conditions** for Modelling are as follows:

Wind Speed: Expressed in meters per second (m/s). It is recommended that users input worst-case wind speeds based on observations, or that represent the minimum choice available for CALINE4 (0.5 m/s). Alternatively, EPA (1992) recommends a value of 1 m/s as the worst-case wind speed.

Wind Direction: The direction from which the wind is blowing, measured clockwise in degrees from the north (0 = north, 90 = east, 180 = south, 270 = west). Most users should opt for the "Worst-Case Wind Direction" choice on the Job Parameters tab. If "Worst-Case" is selected, CALINE4 does not use this input.

Wind Direction Standard Deviation: The statistical standard deviation of the Wind Direction, sometimes termed "sigma theta." **Table B** below provides guidance for specifying this option. CALINE4 requires this value range to be between 5 and 60 degrees.

Table B: Worst-case meteorological inputs for the estimation of 1-hr CO concentrations (Nokes and Benson, 1985).

Time Period	Geographic Location	Wind Speed (m/s)	Standard Deviation (degrees)	Stability Class	Temperature Adjustment
Morning (6-10 a.m.)	Coastal	0.5	10	G (7)	+5°F
	Coastal Valley	0.5	20	G (7)	+5°F
	Central Valley	0.5	5	G (7)	+5°F
	Mountain	0.5	30	G (7)	+5°F
Midday (10 a.m.-5 p.m.)	Coastal	1.0	25	D (4)	+10°F
	Coastal Valley	9.6	30	D (4)	+10°F
	Central Valley	0.5	20	D (4)	+10°F
	Mountain	0.9	30	D (4)	+10°F
Evening (5-9 p.m.)	Coastal	0.5	10	G (7)	+5°F
	Coastal Valley	0.5	10	G (7)	+5°F
	Central Valley	0.5	5	G (7)	+5°F
	Mountain	0.5	30	G (7)	+5°F
Nighttime (9 p.m.-6 a.m.)	Coastal	0.5	5	G (7)	+0°F
	Coastal Valley	0.5	15	G (7)	+0°F
	Central Valley	0.5	10	G (7)	+0°F
	Mountain	0.5	20	G (7)	+0°F

Atmospheric Stability Class: A measure of the turbulence of the atmosphere. Values 1 through 7 correspond to the standard definitions for stability class A through E. **Table B** above guides this choice. Stability class E (or 7) represents the most stable conditions. The stability class entered will affect permissible wind speed. A table of valid wind speeds is presented on the Run Conditions tab for reference.

Mixing Height: The altitude at which thermal turbulence occurs due to solar heating of the ground. This concept is discussed further in elementary meteorological textbooks. Reasonable values for the worst-case mixing height rarely have a significant impact on CALINE4 model results. If an extreme condition could be anticipated at the project location, the local air district should be consulted for guidance. A mixing height of greater than or equal to 5 meters must be entered.

Ambient Temperature: The ambient air temperature is needed to convert mass to volumetric concentration. A temperature that reflects wintertime conditions should be selected, expressed in degrees Celsius.

Ambient CO Concentration (Pollutant Type = Carbon Monoxide): This measure reflects the pre-existing background level of carbon monoxide, expressed in parts per million (ppm). CALINE4 adds the pre-existing and modeled CO concentrations together to determine the total impact at each receptor.

When NO_2 is selected under the pollutant type option, several additional parameters are required in the Run Conditions tab, including ambient concentrations of ozone (O_3), nitrogen

monoxide (NO), and nitrogen dioxide (NO_2), NO_2 photolysis rate constant, and tailpipe NO_2 to nitrogen oxide (NO_x) emissions ratio.

Ambient O_3 Concentration (Pollutant Type = Nitrogen Dioxide): This measure reflects the pre-existing background level of O_3, expressed in parts per million.

Ambient NO Concentration (Pollutant Type = Nitrogen Dioxide): This measure reflects the pre-existing background level of NO, expressed in parts per million.

Ambient NO_2 Concentration (Pollutant Type = Nitrogen Dioxide): This measure reflects the pre-existing background level of NO_2, expressed in parts per million.

NO_2 Photolysis Rate Constant (Pollutant Type = Nitrogen Dioxide): The rate constant for the photodissociation of NO_2, in units of 1/second. The modeled NO_2 concentrations decrease when the photolysis rate constant values increase; therefore, CALINE4 provides the most conservative estimates for NO_2 concentrations when the photolysis rate constant is set to zero through CL4.

NO_2/NO_x Ratio (Pollutant Type = Nitrogen Dioxide): The ratio of tailpipe NO_2 emissions versus NOx emissions. Note that CL4 and CALINE4 require input of g/mi NO_x emissions factors (on the Link Activity tab) when modeling NO_2 concentrations. This ratio is used to convert NOx emissions to NO_2 emissions from on-road vehicles.

Ambient PM Concentration (Pollutant Type = Particulates): This measure reflects the pre-existing background level of particulates, expressed in micrograms per cubic meter. Note that $PM_{2.5}$ and PM_{10} are not directly differentiated in the CL4 user interface or the CALINE4 model functions, but the input parameters, such as ambient concentrations and emission factors, would be different when modeling $PM_{2.5}$ and PM_{10} respectively using CL4 and CALINE4. CALINE4 adds the pre-existing and modeled $PM_{2.5}$ or PM_{10} concentrations together to determine the total impact of $PM_{2.5}$ or PM_{10} at each receptor.

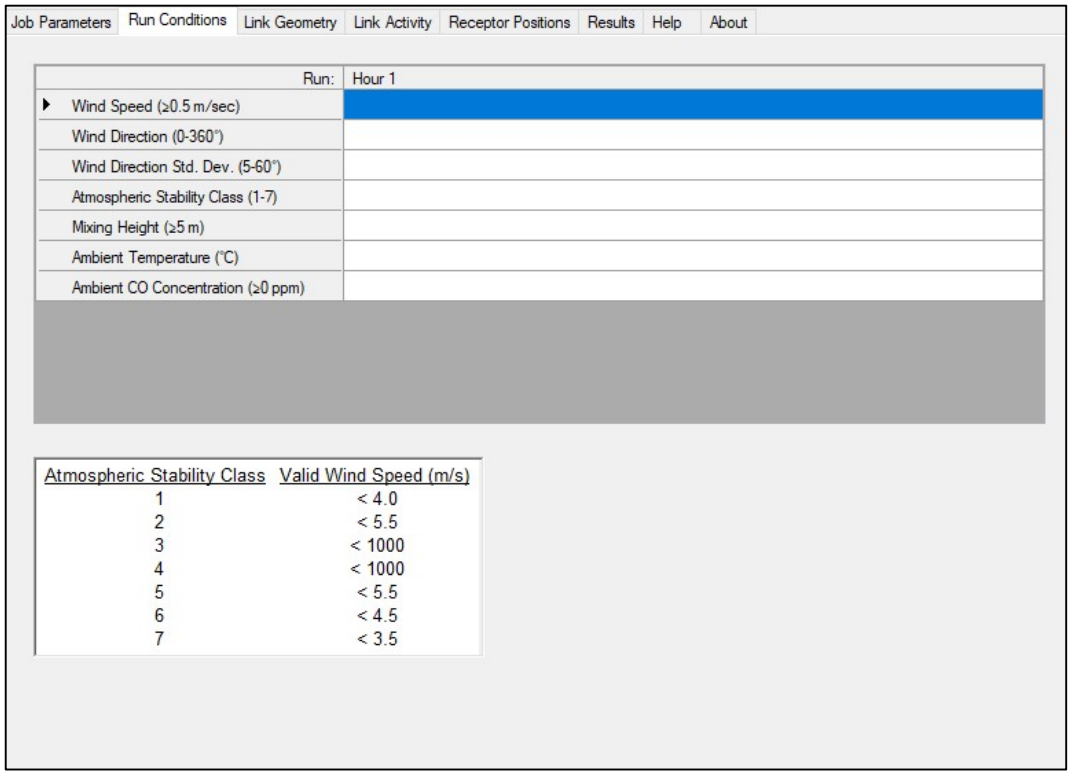


Figure B: Run Conditions Tab

The **Link Geometry** for Modelling are as follows:

The Link Geometry tab contains a matrix to define the roadway network to be modeled. Each row in the matrix defines a single link. Links are defined as straight-line segments. The distance between the centerline of the curved roadway and the straight-line link should be no greater than 3 meters.

Link Description: The user may define a 12-character description for the link. If more than 12 characters are entered, only the first 12 characters will be used.

Link Type: The user must select one of the following five choices to define the type of roadway that each link represents.

- **At-Grade:** For at-grade links, CALINE4 does not permit the plume to mix below ground level, which is assumed to be at a height of zero. The height of the link above ground level, defined in the Link Height cell, must be zero.
- **Fill:** For fill links, CALINE4 assumes that air flow follows the surface terrain, undisturbed. Link Height for fill sections must be between zero and 10 meters (32.81 feet).
- **Depressed:** For depressed links, CALINE4 increases the residence time of an air parcel in the mixing zone. The residence time increases in relation to the depth of the roadway depression. (Mixing zone = width of traffic lane(s) plus 3 meters on each side.) In such a case, estimated concentrations adjacent to the mixing zone are higher than those for an equivalent at-grade or fill section. The modeled concentrations drop more rapidly downwind of a depressed link because vertical

mixing increases with residence time. Link Height for depressed links must be between zero and -10 meters (-32.81 feet).

- **Bridge:** For bridge sections, CALINE4 allows air to flow above and below the link. The plume is permitted to mix downward from the link, until it reaches the distance defined in the Link Height cell. Link Height must be between zero and 10 meters (32.81 feet).
- **Parking Lot:** Parking lot links should coincide with the parking lot access ways. The CALINE4 algorithms adjust to account for the reduced mechanical and thermal turbulence anticipated from slow-moving, cold-start vehicles. Link Height must be zero for parking lot links.

Endpoint Coordinates: Links are defined as straight-line segments. The entire length of each link should deviate no further than 3 meters from the centerline of the actual roadway. The endpoint coordinates, (X1, Y1) and (X2, Y2), define the positions of link endpoints.

- The units (meters or feet) are user-specified on the Job Parameters tab.
- The length of each link must be greater than the mixing zone width (see below).
- The user must define the link geometry and receptor positions with a consistent Cartesian coordinate system. The position of the coordinate system origin is arbitrary and at the user's discretion. The y-axis should be oriented north-south, with values increasing in the northward direction. The x-axis should be oriented east-west, with values increasing in the eastward direction. The choice of magnetic north, true north, or some other approximation is at the user's discretion. However, the wind direction must be defined on the Run Conditions tab according to the same definition of north.
- A map of the link geometry is shown on the Receptor Positions tab.

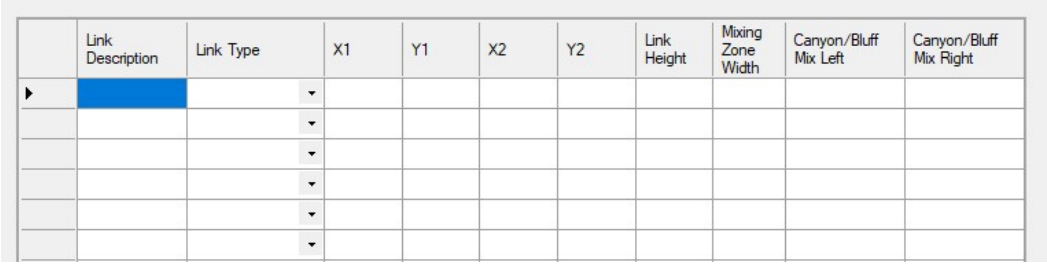
Link Height: For all link types except bridges, Link Height represents the height of the link above the surrounding terrain. Ground level is defined at zero meters or feet. The units of measure (meters or feet) are user-specified on the Job Parameters tab.

For at-grade links, the link height may be defined as zero. For fill links, the link height must be greater than zero. However, CALINE4 always treats the link as though its height is zero; the input does not affect CALINE4 model calculations. Therefore, the positive link height value should be used for documentation purposes. For depressed links, the depth of the depression should be indicated as a negative value. For parking lots, the link height should be defined as zero. For bridges, Link Height defines the height of the bridge above the surface beneath it (a positive value).

Mixing Zone Width: Mixing Zone is defined as the width of the roadway, plus 3 meters on either side. The minimum allowable value is 10 meters, or 32.81 feet. It must also be greater than or equal to the link length.

Canyon/Bluff Mix: The Canyon/Bluff Mix feature has not been validated with field measurements. Only very rare circumstances warrant its use; use extreme caution with this feature. Users of this feature should be thoroughly familiar with dispersion modeling, the key reference (D. B. Turner, Workbook of Atmospheric Dispersion Estimates, Environmental Protection Agency, 1970), and the CALINE4 source code. All other users should leave the

Canyon/Bluff input values set to zero, which disables the feature. If it is entered, Canyon/Bluff Mixing Width must be greater than one-half of the Mixing Zone Width.



	Link Description	Link Type	X1	Y1	X2	Y2	Link Height	Mixing Zone Width	Canyon/Bluff Mix Left	Canyon/Bluff Mix Right
▶										

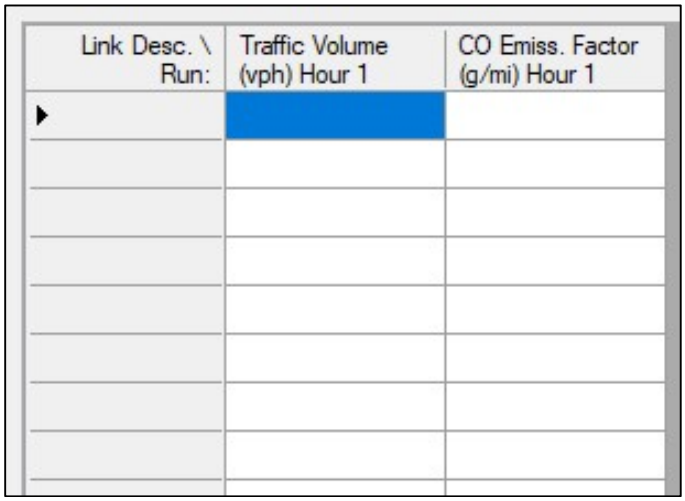
Figure C: Link Geometry Tab

The **Link Activity** for Modelling are as follows:

The Link Activity tab defines the level of traffic and auto emission rate observed at each link.

Traffic Volume: Hourly traffic volume anticipated to travel on each link, in units of vehicles per hour. If a multi-run scenario is selected for modeling CO concentrations, traffic volume must be defined for each of the eight hours.

Emission Factor: The weighted average emission rate of the local vehicle fleet, expressed in terms of grams per mile, per vehicle, for the pollutant selected. When modeling NO2 concentrations, NOx emission factors should be specified for each link. Emission rates vary by time of day. Therefore, if a multi-run scenario is selected (for modeling CO concentrations), emission factors must be defined for each of the eight hours.



Link Desc. \ Run:	Traffic Volume (vph) Hour 1	CO Emiss. Factor (g/mi) Hour 1
▶		

Figure D: Link Activity Tab

The **Receptor Position** for Modelling are as follows:

The Receptor Positions tab contains data inputs for all receptor positions and displays a diagram of the link geometry and receptor positions. Receptors should be defined with the same Cartesian coordinate system and units of measure as the link geometry. For each receptor, space is provided for an 8-character description, the X-coordinate, the Y-coordinate, and the height (Z). The maximum number of receptors is 20.

The links and receptors will appear on the map in their relative positions but the X and Y scales are not necessarily equal. The user may enlarge the map window by dragging the program edges or by clicking the program maximize button. Zooming in to view map details may be performed by using the mouse to drag a box around the area of interest while holding the left button. To un-zoom, click the left mouse button once

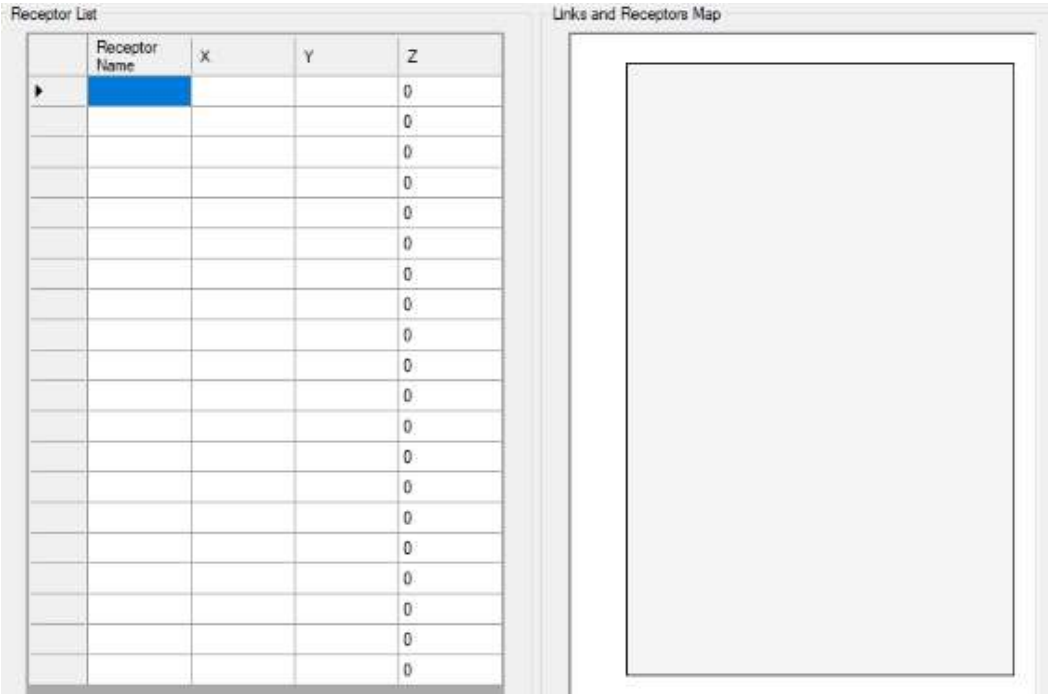


Figure C: Receptor Position Tab

Input Parameters:

- **Traffic Data**: The fleet wise traffic volumes for the present study have been taken from the detailed project report of the project. The annual average daily traffic (AADT) data is available for the proposed road through traffic survey. CALINE 4 model needs hour average traffic volume. The total traffic hour volume is further categorized into two-wheeler, four-wheeler, light commercial vehicles (LCV), bus, high commercial vehicles (HCVs) based on traffic survey at existing road.

Table C: Predicted Traffic Volume Per Hour

Year	Two-wheeler	Three-wheeler	Car	LCV	Bus	Truck	PCU
2020	187	14	103	7	2	3	**280**
2025	250	19	138	9	3	4	**375**
2030	335	25	184	13	4	5	**501**
2035	448	34	247	17	5	7	**671**
2040	600	45	330	22	6	10	**898**

- **Meteorological data:** The study was conducted to predict pollutant concentration for worst-case meteorological conditions. The meteorological parameters such as

wind speed, wind direction, wind direction standard deviation, temperature, mixing height and stability condition are used in model.

Table D: Meteorological Data for CALINE 4

Sr. No.	Baseline Condition Input Data	Values
1	Altitude above Sea Level	102.54 m
2	Wind speed	1.38 m/s
3	Wind direction	North-East (45^O)
4	Ambient Temperature	25^OC

- **Road Geometry:** In the CALINE-4 model the entire length of the selected road section is divided into various road links. The division of sections into links has been done in such a way, so that the link can be fairly considered straight stretch of road having homogenous geometry with uniform road width, height and alignment. The coordinates of end points of links specify the location of the links in the model. The maximum number of links in each road section can be 20. The mixing zone width calculated for selected highway corridor is 7m+ 3m + 3m = 13 m as per guideline provided in CALINE4 model.
- **Emission Factors:** Emission factor is one of the important input parameters in CALINE-4 model. In the present study, the emission factors specified by the Automotive Research Association of India (ARAI) have been used for calculation of weighted emission factors. These emission factors have been expressed in terms of type of vehicles and type of fuel used (for petrol and diesel driven passenger cars). Since, there is only one input requirement for total no. of vehicles in the CALINE 4 model, whereas there are different categories of vehicles (viz. two wheelers, cars, bus and trucks) with different year of manufacture and fuel used, it is essential that a single value representing the equivalent or weighted emission factors for all the vehicles is input into the model. The emission factor used to estimate WEF are given below. The traffic data are not available for fuel types, therefore average emission factor is used in this study.

Table E: Emission factors for different types of Vehicle (ARAI, 2007)

Pollutants	Unit	Two-wheeler	Three-wheeler	Car	LCV	Bus	Truck
CO	g/km	1.036	1.25	1.281	1.56	8.03	6
NOx	g/km	0.312	0.219	0.04	0.288	0.548	1.24
PM2.5	g/km	0.021	0.01	0.031	0.061	0.133	0.133

These projected vehicles would generate various air pollutants among which CO, NO_2 and Particulate matter ($PM_{2.5}$) would be modelled to predict their quantities for the year 2020, 2025, 2030, 2035 and 2040. PM_{10} and SO_2 concentration need not be modeled as sulfur content in the fuel used in vehicles is quite less to cause a significant SO_2 emission. SO_2 emission factor for vehicles is not included in the report on "Emission Factor development for Indian Vehicles" by The Automotive Research Association of India (ARAI). Similarly,

Particulate Matter in the emission factor considers only $PM_{2.5}$ as coarse fraction $PM_{2.5}$ to PM_{10} is negligible in vehicle exhaust.

The predicted results of CALINE4 have been tabulated below. Considering the predicted future traffic according to normal growth rate for the years 2020, 2025, 2030, 2035 and 2040, CO, NO_2, and $PM_{2.5}$ levels are predicted. These levels were within the limiting standards as specified in National Ambient Air Quality Standards.

CO Modeling:

Input:

Sr. No.	Input Parameter	Value
1	Molecular weight	28
2	Aerodynamic Roughness Coefficient	Rural
3	Run Type	Worst-case Wind Direction
4	Altitude Above Sea Level	102.54 m
5	Wind Speed	1.38 m/sec
6	Wind Direction	45^O
7	Wind Direction Standard Deviation	20
8	Atmospheric Stability Class	4
9	Mixing Height	5
10	Ambient Temperature	25^OC
11	Ambient CO Concentration	0.419 ppm

Output:

Table: Predicted Concentrations of CO in the study location (ppm)

Year	Distance from Road Edge (m)				
	10	20	50	100	200
2020	0.6	0.5	0.5	0.5	0.5
2025	0.6	0.6	0.6	0.5	0.5
2030	0.7	0.6	0.6	0.6	0.5
2035	0.8	0.7	0.7	0.6	0.6
2040	0.9	0.8	0.8	0.7	0.6
Limit	3.495	3.495	3.495	3.495	3.495

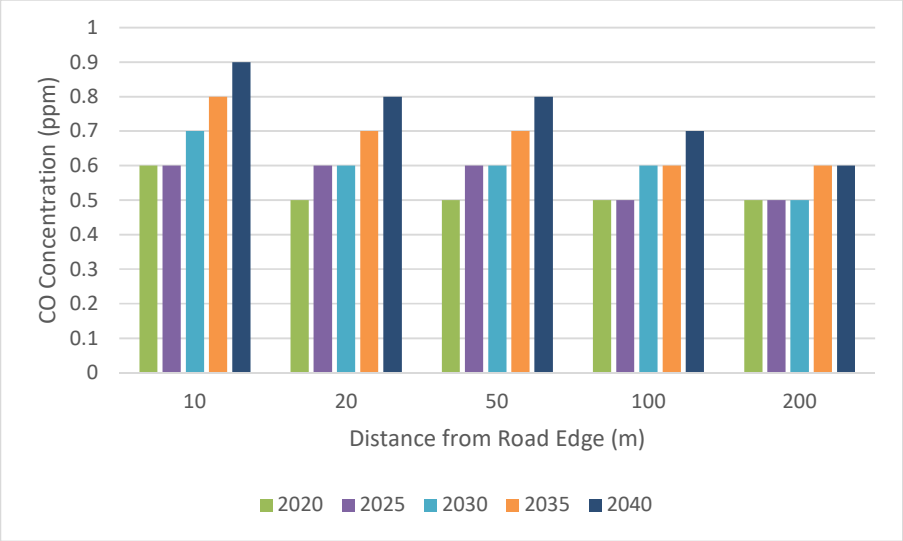


Figure: Graph representing Predicted Concentrations of CO in the study location (ppm)

For Year 2020:

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                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1          (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide


 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
     BRG= WORST CASE           VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M              AMB=  0.4 PPM
   SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)


 II.  LINK VARIABLES

     LINK      *  LINK COORDINATES (M)   *              EF     H     W
  DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
---------------*-------------------------*-------------------------------
A. 1           *    0     0     0 10000 *  AG    280   2.1    0.0  13.0
B. 2           *    0 10000     0 20000 *  AG    280   2.1    0.0  13.0
C. 3           *    0 20000     0 30000 *  AG    280   2.1    0.0  13.0
D. 4           *    0 30000     0 40000 *  AG    280   2.1    0.0  13.0
E. 5           *    0 40000     0 42200 *  AG    280   2.1    0.0  13.0


III.  RECEPTOR LOCATIONS

            *    COORDINATES (M)
  RECEPTOR  *    X      Y      Z
------------*---------------------
1. 1        *     10   8000   0.0
2. 2        *     20   8000   0.0
3. 3        *     50   8000   0.0
4. 4        *    100   8000   0.0
5. 5        *    200   8000   0.0
6. 6        *    -10   8000   0.0
7. 7        *    -20   8000   0.0
8. 8        *    -50   8000   0.0
9. 9        *   -100   8000   0.0
10. 10      *   -200   8000   0.0
```

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODE
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide


 IV.  MODEL RESULTS (WORST CASE WIND ANGLE )

                    *       * PRED  *         CONC/LINK
                    *  BRG  * CONC  *           (PPM)
  RECEPTOR          * (DEG) * (PPM) *   A    B    C    D    E
 -------------------*-------*-------*-------------------------
  1. 1              *  358. *   0.6 *  0.1  0.0  0.0  0.0  0.0
  2. 2              *  357. *   0.5 *  0.1  0.0  0.0  0.0  0.0
  3. 3              *  355. *   0.5 *  0.1  0.0  0.0  0.0  0.0
  4. 4              *  352. *   0.5 *  0.1  0.0  0.0  0.0  0.0
  5. 5              *  351. *   0.5 *  0.0  0.0  0.0  0.0  0.0
  6. 6              *    2. *   0.6 *  0.1  0.0  0.0  0.0  0.0
  7. 7              *    3. *   0.5 *  0.1  0.0  0.0  0.0  0.0
  8. 8              *    5. *   0.5 *  0.1  0.0  0.0  0.0  0.0
  9. 9              *    8. *   0.5 *  0.1  0.0  0.0  0.0  0.0
 10. 10             *    9. *   0.5 *  0.0  0.0  0.0  0.0  0.0
```

For Year 2025:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide


 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM            ALT=   103. (M)
     BRG= WORST CASE           VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M              AMB=  0.4 PPM
   SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)


 II.  LINK VARIABLES

      LINK      *  LINK COORDINATES (M)   *             EF     H     W
   DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
----------------*-------------------------*-----------------------------
A. 1            *    0     0     0 10000 *  AG    375   2.1    0.0  13.0
B. 2            *    0 10000     0 20000 *  AG    375   2.1    0.0  13.0
C. 3            *    0 20000     0 30000 *  AG    375   2.1    0.0  13.0
D. 4            *    0 30000     0 40000 *  AG    375   2.1    0.0  13.0
E. 5            *    0 40000     0 42200 *  AG    375   2.1    0.0  13.0


 III.  RECEPTOR LOCATIONS

             *    COORDINATES (M)
  RECEPTOR   *    X      Y      Z
-------------*--------------------
 1. 1        *   10   8000   0.0
 2. 2        *   20   8000   0.0
 3. 3        *   50   8000   0.0
 4. 4        *  100   8000   0.0
 5. 5        *  200   8000   0.0
 6. 6        *  -10   8000   0.0
 7. 7        *  -20   8000   0.0
 8. 8        *  -50   8000   0.0
 9. 9        *  -100  8000   0.0
10. 10       *  -200  8000   0.0
```

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide
```

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E
1. 1	358.	0.6	0.1	0.0	0.0	0.0	0.0
2. 2	357.	0.6	0.1	0.0	0.0	0.0	0.0
3. 3	355.	0.6	0.1	0.0	0.0	0.0	0.0
4. 4	352.	0.5	0.1	0.0	0.0	0.0	0.0
5. 5	351.	0.5	0.0	0.0	0.0	0.0	0.0
6. 6	2.	0.6	0.1	0.0	0.0	0.0	0.0
7. 7	3.	0.6	0.1	0.0	0.0	0.0	0.0
8. 8	5.	0.6	0.1	0.0	0.0	0.0	0.0
9. 9	8.	0.5	0.1	0.0	0.0	0.0	0.0
10. 10	9.	0.5	0.0	0.0	0.0	0.0	0.0

For Year 2030:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide
```

I. SITE VARIABLES

```
      U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
    BRG= WORST CASE           VD=  0.0 CM/S
   CLAS=     4 (D)            VS=  0.0 CM/S
   MIXH=    5. M              AMB=  0.4 PPM
  SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)
```

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. 1	0	0	0	10000	AG	501	2.1	0.0	13.0
B. 2	0	10000	0	20000	AG	501	2.1	0.0	13.0
C. 3	0	20000	0	30000	AG	501	2.1	0.0	13.0
D. 4	0	30000	0	40000	AG	501	2.1	0.0	13.0
E. 5	0	40000	0	42200	AG	501	2.1	0.0	13.0

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1	10	8000	0.0
2. 2	20	8000	0.0
3. 3	50	8000	0.0
4. 4	100	8000	0.0
5. 5	200	8000	0.0
6. 6	-10	8000	0.0
7. 7	-20	8000	0.0
8. 8	-50	8000	0.0
9. 9	-100	8000	0.0
10. 10	-200	8000	0.0

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide


 IV.  MODEL RESULTS (WORST CASE WIND ANGLE )

                *       * PRED  *         CONC/LINK
                *  BRG  * CONC  *           (PPM)
  RECEPTOR      * (DEG) * (PPM) *   A    B    C    D    E
----------------*-------*-------*-------------------------
 1. 1           *  358. *   0.7 *  0.2  0.1  0.0  0.0  0.0
 2. 2           *  357. *   0.6 *  0.2  0.1  0.0  0.0  0.0
 3. 3           *  355. *   0.6 *  0.1  0.1  0.0  0.0  0.0
 4. 4           *  352. *   0.6 *  0.1  0.1  0.0  0.0  0.0
 5. 5           *  351. *   0.5 *  0.1  0.1  0.0  0.0  0.0
 6. 6           *    2. *   0.7 *  0.2  0.1  0.0  0.0  0.0
 7. 7           *    3. *   0.6 *  0.2  0.1  0.0  0.0  0.0
 8. 8           *    5. *   0.6 *  0.1  0.1  0.0  0.0  0.0
 9. 9           *    8. *   0.6 *  0.1  0.1  0.0  0.0  0.0
10. 10          *    9. *   0.5 *  0.1  0.1  0.0  0.0  0.0
```

For Year 2035:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide


 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
     BRG= WORST CASE           VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M              AMB=  0.4 PPM
   SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)


 II.  LINK VARIABLES

     LINK      *  LINK COORDINATES (M)   *             EF     H     W
  DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
---------------*-------------------------*-----------------------------
A. 1           *    0     0     0 10000 *  AG    671   2.1    0.0  13.0
B. 2           *    0 10000     0 20000 *  AG    671   2.1    0.0  13.0
C. 3           *    0 20000     0 30000 *  AG    671   2.1    0.0  13.0
D. 4           *    0 30000     0 40000 *  AG    671   2.1    0.0  13.0
E. 5           *    0 40000     0 42200 *  AG    671   2.1    0.0  13.0


 III.  RECEPTOR LOCATIONS

           *    COORDINATES (M)
  RECEPTOR *    X      Y      Z
-----------*--------------------
1. 1       *     10   8000   0.0
2. 2       *     20   8000   0.0
3. 3       *     50   8000   0.0
4. 4       *    100   8000   0.0
5. 5       *    200   8000   0.0
6. 6       *    -10   8000   0.0
7. 7       *    -20   8000   0.0
8. 8       *    -50   8000   0.0
9. 9       *   -100   8000   0.0
10. 10     *   -200   8000   0.0
```

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE    2

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide


 IV.  MODEL RESULTS (WORST CASE WIND ANGLE )

                    *       * PRED  *          CONC/LINK
                    *  BRG  * CONC  *            (PPM)
  RECEPTOR          * (DEG) * (PPM) *    A     B     C     D     E
 -------------------*-------*-------*-------------------------------
  1. 1              *  358. *   0.8 *  0.3   0.1   0.0   0.0   0.0
  2. 2              *  357. *   0.7 *  0.2   0.1   0.0   0.0   0.0
  3. 3              *  355. *   0.7 *  0.2   0.1   0.0   0.0   0.0
  4. 4              *  352. *   0.6 *  0.1   0.1   0.0   0.0   0.0
  5. 5              *  351. *   0.6 *  0.1   0.1   0.0   0.0   0.0
  6. 6              *    2. *   0.8 *  0.3   0.1   0.0   0.0   0.0
  7. 7              *    3. *   0.7 *  0.2   0.1   0.0   0.0   0.0
  8. 8              *    5. *   0.7 *  0.2   0.1   0.0   0.0   0.0
  9. 9              *    8. *   0.6 *  0.1   0.1   0.0   0.0   0.0
 10. 10             *    9. *   0.6 *  0.1   0.1   0.0   0.0   0.0
```

For year 2040:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE    1

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Carbon Monoxide


 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
     BRG= WORST CASE           VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M              AMB=  0.4 PPM
   SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)


 II.  LINK VARIABLES

      LINK       *  LINK COORDINATES (M)    *             EF     H     W
   DESCRIPTION   *   X1    Y1    X2    Y2   * TYPE  VPH  (G/MI)  (M)   (M)
-----------------*-------------------------*-----------------------------
A. 1             *    0     0     0 10000 *  AG    898   2.1    0.0  13.0
B. 2             *    0 10000     0 20000 *  AG    898   2.1    0.0  13.0
C. 3             *    0 20000     0 30000 *  AG    898   2.1    0.0  13.0
D. 4             *    0 30000     0 40000 *  AG    898   2.1    0.0  13.0
E. 5             *    0 40000     0 42200 *  AG    898   2.1    0.0  13.0


 III.  RECEPTOR LOCATIONS

              *    COORDINATES (M)
  RECEPTOR    *    X      Y      Z
--------------*--------------------
 1. 1         *     10   8000   0.0
 2. 2         *     20   8000   0.0
 3. 3         *     50   8000   0.0
 4. 4         *    100   8000   0.0
 5. 5         *    200   8000   0.0
 6. 6         *    -10   8000   0.0
 7. 7         *    -20   8000   0.0
 8. 8         *    -50   8000   0.0
 9. 9         *   -100   8000   0.0
10. 10        *   -200   8000   0.0
```

```
CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE   2

      JOB: A15 7-10-2020
      RUN: Hour 1          (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide
```

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E
1. 1	358.	0.9	0.3	0.1	0.0	0.0	0.0
2. 2	357.	0.8	0.3	0.1	0.0	0.0	0.0
3. 3	355.	0.8	0.2	0.1	0.0	0.0	0.0
4. 4	352.	0.7	0.2	0.1	0.0	0.0	0.0
5. 5	351.	0.6	0.1	0.1	0.0	0.0	0.0
6. 6	2.	0.9	0.3	0.1	0.0	0.0	0.0
7. 7	3.	0.8	0.3	0.1	0.0	0.0	0.0
8. 8	5.	0.8	0.2	0.1	0.0	0.0	0.0
9. 9	8.	0.7	0.2	0.1	0.0	0.0	0.0
10. 10	9.	0.6	0.1	0.1	0.0	0.0	0.0

$PM_{2.5}$ Modelling:

Input:

Sr. No.	Input Parameter	Value
1	Aerodynamic Roughness Coefficient	Rural
2	Run Type	Worst-case Wind Direction
3	Altitude Above Sea Level	102.54 m
4	Wind Speed	1.38 m/sec
5	Wind Direction	45^{O}
6	Wind Direction Standard Deviation	20
7	Atmospheric Stability Class	4
8	Mixing Height	5
9	Ambient Temperature	$25^{O}C$
10	Ambient PM Concentration	20.4

Output:

Table: Predicted Concentrations of $PM_{2.5}$ in the study location (ppm)

Year	Distance from Road Edge (m)				
	10	20	50	100	200
2020	24.3	23.8	23.3	22.8	22.3
2025	25.6	25	24.3	23.6	23
2030	27.4	26.5	25.6	24.7	23.8
2035	29.7	28.6	27.3	26.2	25
2040	32.9	31.4	29.7	28.1	26.5
Limit	60	60	60	60	60

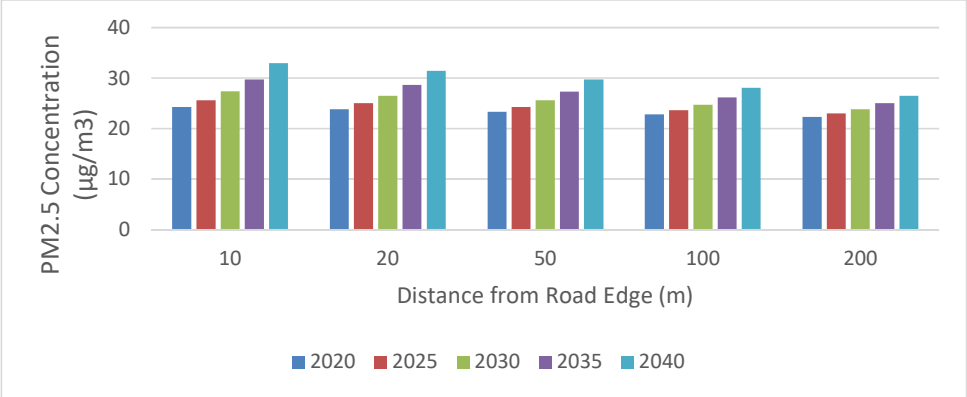


Figure: Graph representing Predicted Concentrations of $PM_{2.5}$ in the study location (ppm)

For year 2020:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE    1

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
              POLLUTANT: Particulates
              (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
     BRG= WORST CASE           VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M             AMB= 20.4 PPM
   SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)


 II.  LINK VARIABLES

      LINK      *  LINK COORDINATES (M)   *              EF     H     W
   DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
----------------*-------------------------*------------------------------
A. 1            *     0     0     0 10000 *  AG    280   0.0    0.0  13.0
B. 2            *     0 10000     0 20000 *  AG    280   0.0    0.0  13.0
C. 3            *     0 20000     0 30000 *  AG    280   0.0    0.0  13.0
D. 4            *     0 30000     0 40000 *  AG    280   0.0    0.0  13.0
E. 5            *     0 40000     0 42200 *  AG    280   0.0    0.0  13.0


 III.  RECEPTOR LOCATIONS

             *    COORDINATES (M)
  RECEPTOR   *    X       Y       Z
-------------*---------------------
 1. 1        *     10    8000    0.0
 2. 2        *     20    8000    0.0
 3. 3        *     50    8000    0.0
 4. 4        *    100    8000    0.0
 5. 5        *    200    8000    0.0
 6. 6        *    -10    8000    0.0
 7. 7        *    -20    8000    0.0
 8. 8        *    -50    8000    0.0
 9. 9        *   -100    8000    0.0
10. 10       *   -200    8000    0.0
```

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
               POLLUTANT: Particulates
               (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

  IV.  MODEL RESULTS (WORST CASE WIND ANGLE )

                *       * PRED  *          CONC/LINK
                *  BRG  * CONC  *            (PPM)
   RECEPTOR     * (DEG) * (PPM) *   A    B    C    D    E
  -------------*-------*-------*------------------------
   1. 1         *  358. *  24.3 *  2.9  1.0  0.0  0.0  0.0
   2. 2         *  357. *  23.8 *  2.5  1.0  0.0  0.0  0.0
   3. 3         *  355. *  23.3 *  1.9  1.0  0.0  0.0  0.0
   4. 4         *  352. *  22.8 *  1.5  0.9  0.0  0.0  0.0
   5. 5         *  351. *  22.3 *  1.0  0.9  0.0  0.0  0.0
   6. 6         *    2. *  24.3 *  2.9  1.0  0.0  0.0  0.0
   7. 7         *    3. *  23.8 *  2.5  1.0  0.0  0.0  0.0
   8. 8         *    5. *  23.3 *  1.9  1.0  0.0  0.0  0.0
   9. 9         *    8. *  22.8 *  1.5  0.9  0.0  0.0  0.0
  10. 10        *    9. *  22.3 *  1.0  0.9  0.0  0.0  0.0
```

For Year 2025:

```
          CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                   JUNE 1989 VERSION
                   PAGE   1

              JOB: A15 7-10-2020
              RUN: Hour 1           (WORST CASE ANGLE)
         POLLUTANT: Particulates
         (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

  I.  SITE VARIABLES

        U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
      BRG= WORST CASE           VD=  0.0 CM/S
     CLAS=     4 (D)            VS=  0.0 CM/S
     MIXH=    5. M             AMB= 20.4 PPM
    SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)


  II.  LINK VARIABLES

       LINK      *  LINK COORDINATES (M)   *              EF     H     W
    DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
----------------*-------------------------*-------------------------------
A. 1            *    0     0     0 10000 *  AG    375   0.0    0.0  13.0
B. 2            *    0 10000     0 20000 *  AG    375   0.0    0.0  13.0
C. 3            *    0 20000     0 30000 *  AG    375   0.0    0.0  13.0
D. 4            *    0 30000     0 40000 *  AG    375   0.0    0.0  13.0
E. 5            *    0 40000     0 42200 *  AG    375   0.0    0.0  13.0


  III.  RECEPTOR LOCATIONS

              *    COORDINATES (M)
    RECEPTOR  *    X      Y      Z
-------------*---------------------
 1. 1        *     10   8000   0.0
 2. 2        *     20   8000   0.0
 3. 3        *     50   8000   0.0
 4. 4        *    100   8000   0.0
 5. 5        *    200   8000   0.0
 6. 6        *    -10   8000   0.0
 7. 7        *    -20   8000   0.0
 8. 8        *    -50   8000   0.0
 9. 9        *   -100   8000   0.0
10. 10       *   -200   8000   0.0
```

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: A15 7-10-2020
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Particulates
(NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E
1. 1	358.	25.6	3.9	1.3	0.0	0.0	0.0
2. 2	357.	25.0	3.3	1.3	0.0	0.0	0.0
3. 3	355.	24.3	2.6	1.3	0.0	0.0	0.0
4. 4	352.	23.6	2.1	1.2	0.0	0.0	0.0
5. 5	351.	23.0	1.4	1.2	0.0	0.0	0.0
6. 6	2.	25.6	3.9	1.3	0.0	0.0	0.0
7. 7	3.	25.0	3.3	1.3	0.0	0.0	0.0
8. 8	5.	24.3	2.6	1.3	0.0	0.0	0.0
9. 9	8.	23.6	2.1	1.2	0.0	0.0	0.0
10. 10	9.	23.0	1.4	1.2	0.0	0.0	0.0

For Year 2030:

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: A15 7-10-2020
RUN: Hour 1 (WORST CASE ANGLE)
POLLUTANT: Particulates
(NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

I. SITE VARIABLES

U= 1.4 M/S Z0= 10. CM ALT= 103. (M)
BRG= WORST CASE VD= 0.0 CM/S
CLAS= 4 (D) VS= 0.0 CM/S
MIXH= 5. M AMB= 20.4 PPM
SIGTH= 20. DEGREES TEMP= 25.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. 1	0	0	0	10000	AG	501	0.0	0.0	13.0
B. 2	0	10000	0	20000	AG	501	0.0	0.0	13.0
C. 3	0	20000	0	30000	AG	501	0.0	0.0	13.0
D. 4	0	30000	0	40000	AG	501	0.0	0.0	13.0
E. 5	0	40000	0	42200	AG	501	0.0	0.0	13.0

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1	10	8000	0.0
2. 2	20	8000	0.0
3. 3	50	8000	0.0
4. 4	100	8000	0.0
5. 5	200	8000	0.0
6. 6	-10	8000	0.0
7. 7	-20	8000	0.0
8. 8	-50	8000	0.0
9. 9	-100	8000	0.0
10. 10	-200	8000	0.0

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
               POLLUTANT: Particulates
               (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

  IV.  MODEL RESULTS (WORST CASE WIND ANGLE )

                *       * PRED  *          CONC/LINK
                *  BRG  * CONC  *            (PPM)
   RECEPTOR     * (DEG) * (PPM) *   A    B    C    D    E
  -------------*-------*-------*-------------------------
   1. 1         *  358. *  27.4 *  5.2  1.8  0.0  0.0  0.0
   2. 2         *  357. *  26.5 *  4.4  1.7  0.0  0.0  0.0
   3. 3         *  355. *  25.6 *  3.5  1.7  0.0  0.0  0.0
   4. 4         *  352. *  24.7 *  2.7  1.6  0.0  0.0  0.0
   5. 5         *  351. *  23.8 *  1.8  1.6  0.0  0.0  0.0
   6. 6         *    2. *  27.4 *  5.2  1.8  0.0  0.0  0.0
   7. 7         *    3. *  26.5 *  4.4  1.7  0.0  0.0  0.0
   8. 8         *    5. *  25.6 *  3.5  1.7  0.0  0.0  0.0
   9. 9         *    8. *  24.7 *  2.7  1.6  0.0  0.0  0.0
  10. 10        *    9. *  23.8 *  1.8  1.6  0.0  0.0  0.0
```

For Year 2035:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
               POLLUTANT: Particulates
               (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

  I.  SITE VARIABLES

        U=   1.4 M/S            Z0=  10. CM            ALT=   103. (M)
      BRG= WORST CASE           VD=  0.0 CM/S
     CLAS=     4 (D)            VS=  0.0 CM/S
     MIXH=    5. M             AMB= 20.4 PPM
    SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)


  II.  LINK VARIABLES

       LINK      *  LINK COORDINATES (M)   *             EF     H     W
    DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
  ---------------*-------------------------*-----------------------------
  A. 1           *     0     0     0 10000 *  AG    671   0.0    0.0  13.0
  B. 2           *     0 10000     0 20000 *  AG    671   0.0    0.0  13.0
  C. 3           *     0 20000     0 30000 *  AG    671   0.0    0.0  13.0
  D. 4           *     0 30000     0 40000 *  AG    671   0.0    0.0  13.0
  E. 5           *     0 40000     0 42200 *  AG    671   0.0    0.0  13.0


  III.  RECEPTOR LOCATIONS

              *    COORDINATES (M)
    RECEPTOR  *    X      Y      Z
  ------------*---------------------
  1. 1        *     10   8000   0.0
  2. 2        *     20   8000   0.0
  3. 3        *     50   8000   0.0
  4. 4        *    100   8000   0.0
  5. 5        *    200   8000   0.0
  6. 6        *    -10   8000   0.0
  7. 7        *    -20   8000   0.0
  8. 8        *    -50   8000   0.0
  9. 9        *   -100   8000   0.0
 10. 10       *   -200   8000   0.0
```

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
               POLLUTANT: Particulates
               (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

 IV.  MODEL RESULTS (WORST CASE WIND ANGLE )

                 *       * PRED  *         CONC/LINK
                 *  BRG  * CONC  *           (PPM)
  RECEPTOR       * (DEG) * (PPM) *   A    B    C    D    E
 ----------------*-------*-------*-------------------------
  1. 1           *  358. *  29.7 *  7.0  2.3  0.0  0.0  0.0
  2. 2           *  357. *  28.6 *  5.9  2.3  0.0  0.0  0.0
  3. 3           *  355. *  27.3 *  4.6  2.3  0.0  0.0  0.0
  4. 4           *  352. *  26.2 *  3.7  2.1  0.0  0.0  0.0
  5. 5           *  351. *  25.0 *  2.4  2.2  0.0  0.0  0.0
  6. 6           *    2. *  29.7 *  7.0  2.3  0.0  0.0  0.0
  7. 7           *    3. *  28.6 *  5.9  2.3  0.0  0.0  0.0
  8. 8           *    5. *  27.3 *  4.6  2.3  0.0  0.0  0.0
  9. 9           *    8. *  26.2 *  3.7  2.1  0.0  0.0  0.0
 10. 10          *    9. *  25.0 *  2.4  2.2  0.0  0.0  0.0
```

For Year 2040:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
               POLLUTANT: Particulates
               (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM            ALT=   103. (M)
     BRG= WORST CASE           VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M              AMB= 20.4 PPM
   SIGTH=   20. DEGREES       TEMP= 25.0 DEGREE (C)


 II.  LINK VARIABLES

      LINK       *  LINK COORDINATES (M)   *              EF     H     W
   DESCRIPTION   *   X1    Y1     X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
-----------------*-------------------------*-------------------------------
A. 1             *    0     0      0 10000 *  AG    898   0.0    0.0  13.0
B. 2             *    0 10000      0 20000 *  AG    898   0.0    0.0  13.0
C. 3             *    0 20000      0 30000 *  AG    898   0.0    0.0  13.0
D. 4             *    0 30000      0 40000 *  AG    898   0.0    0.0  13.0
E. 5             *    0 40000      0 42200 *  AG    898   0.0    0.0  13.0


 III.  RECEPTOR LOCATIONS

              *    COORDINATES (M)
  RECEPTOR    *    X       Y       Z
--------------*---------------------
 1. 1         *     10    8000    0.0
 2. 2         *     20    8000    0.0
 3. 3         *     50    8000    0.0
 4. 4         *    100    8000    0.0
 5. 5         *    200    8000    0.0
 6. 6         *    -10    8000    0.0
 7. 7         *    -20    8000    0.0
 8. 8         *    -50    8000    0.0
 9. 9         *   -100    8000    0.0
10. 10        *   -200    8000    0.0
```

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1           (WORST CASE ANGLE)
               POLLUTANT: Particulates
               (NOTE: OUTPUT IN MICRO-GRAMS/METER**3. IGNORE PPM LABEL)

 IV.  MODEL RESULTS (WORST CASE WIND ANGLE )

                  *       * PRED  *          CONC/LINK
                  *  BRG  * CONC  *            (PPM)
   RECEPTOR       * (DEG) * (PPM) *   A    B    C    D    E
-----------------*-------*-------*------------------------
  1. 1            *  358. *  32.9 *  9.3  3.1  0.0  0.0  0.0
  2. 2            *  357. *  31.4 *  7.9  3.1  0.0  0.0  0.0
  3. 3            *  355. *  29.7 *  6.2  3.0  0.0  0.0  0.0
  4. 4            *  352. *  28.1 *  4.9  2.8  0.0  0.0  0.0
  5. 5            *  351. *  26.5 *  3.3  2.9  0.0  0.0  0.0
  6. 6            *    2. *  32.9 *  9.3  3.1  0.0  0.0  0.0
  7. 7            *    3. *  31.4 *  7.9  3.1  0.0  0.0  0.0
  8. 8            *    5. *  29.7 *  6.2  3.0  0.0  0.0  0.0
  9. 9            *    8. *  28.1 *  4.9  2.8  0.0  0.0  0.0
 10. 10           *    9. *  26.5 *  3.3  2.9  0.0  0.0  0.0
```

NO_X Modelling:

Input:

Sr. No.	Input Parameter	Value
1	Molecular weight	46
2	Aerodynamic Roughness Coefficient	Rural
3	Run Type	Standard
4	Altitude Above Sea Level	102.54 m
5	Wind Speed	1.38 m/sec
6	Wind Direction	45^O
7	Wind Direction Standard Deviation	20
8	Atmospheric Stability Class	4
9	Mixing Height	5
10	Ambient Temperature	25^OC
11	Ambient O_3 Concentration	0.03
12	Ambient NO Concentration	0.02
13	Ambient NO_2 Concentration	0.008
14	NO_2 Photolysis Rate Constant	0.004
15	NO_2/NO_X Ratio	0.4

Output:

Table: Predicted Concentrations of NO_X in the study location (ppm)

Year	Distance from Road Edge (m)				
	10	**20**	**50**	**100**	**200**
2020	0.02	0.02	0.02	0.03	0.03
2025	0.02	0.02	0.03	0.03	0.03
2030	0.02	0.02	0.03	0.03	0.03
2035	0.02	0.03	0.03	0.03	0.04
2040	0.03	0.03	0.04	0.04	0.04

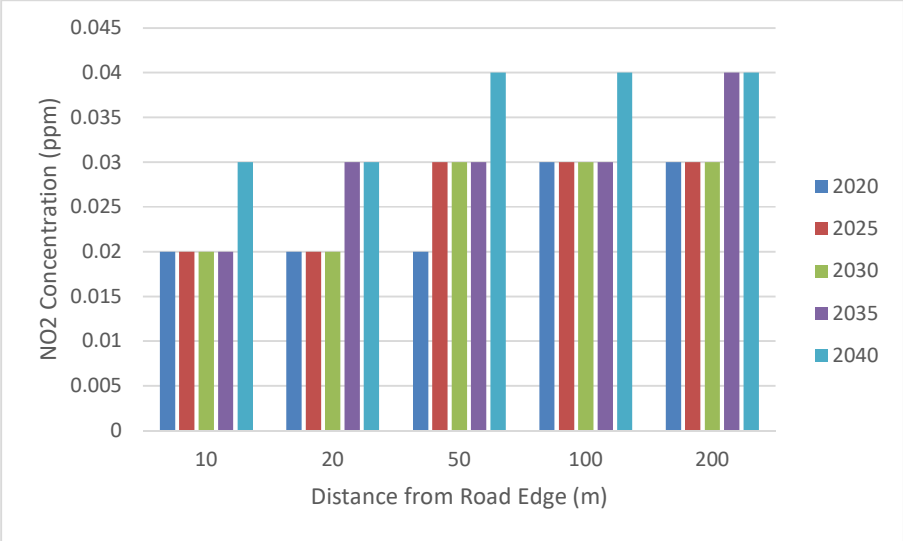


Figure: Graph representing Predicted Concentrations of NO_X in the study location (ppm)

For Year 2020:

```
CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE   1

     JOB: A15 7-10-2020
     RUN: Hour 1
POLLUTANT: Nitrogen Dioxide

 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
     BRG=  45.0 DEGREES        VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M             TEMP= 25.0 DEGREE (C)
   SIGTH=   20. DEGREES

   NOX VARIABLES

     NO2= 0.01 PPM      NO= 0.02 PPM      O3= 0.03 PPM        KR= 0.004 1/SEC

 II.  LINK VARIABLES

     LINK      *  LINK COORDINATES (M)   *              EF     H     W
  DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
---------------*-------------------------*-------------------------------
A. 1           *    0     0     0 10000 *  AG    280  3.43    0.0  13.0
B. 2           *    0 10000     0 20000 *  AG    280  3.43    0.0  13.0
C. 3           *    0 20000     0 30000 *  AG    280  3.43    0.0  13.0
D. 4           *    0 30000     0 40000 *  AG    280  3.43    0.0  13.0
E. 5           *    0 40000     0 42200 *  AG    280  3.43    0.0  13.0

III.  RECEPTOR LOCATIONS

             *    COORDINATES (M)
  RECEPTOR   *    X       Y       Z
-------------*---------------------
1. 1         *     10    8000    0.0
2. 2         *     20    8000    0.0
3. 3         *     50    8000    0.0
4. 4         *    100    8000    0.0
5. 5         *    200    8000    0.0
6. 6         *    -10    8000    0.0
7. 7         *    -20    8000    0.0
8. 8         *    -50    8000    0.0
9. 9         *   -100    8000    0.0
10. 10       *   -200    8000    0.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
         JUNE 1989 VERSION
         PAGE   2

     JOB: A15 7-10-2020
     RUN: Hour 1
POLLUTANT: Nitrogen Dioxide

 IV.  MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

             * PRED  *          CONC/LINK
             * CONC  *            (PPM)
  RECEPTOR   * (PPM) *   A     B     C     D     E
-------------*-------*-------------------------------
 1. 1        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 2. 2        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 3. 3        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 4. 4        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 5. 5        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 6. 6        *  0.02 * 0.01  0.00  0.00  0.00  0.00
 7. 7        *  0.02 * 0.01  0.00  0.00  0.00  0.00
 8. 8        *  0.02 * 0.02  0.00  0.00  0.00  0.00
 9. 9        *  0.03 * 0.02  0.00  0.00  0.00  0.00
10. 10       *  0.03 * 0.02  0.00  0.00  0.00  0.00
```

For Year 2025:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1
               POLLUTANT: Nitrogen Dioxide


 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
     BRG=  45.0 DEGREES        VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M             TEMP= 25.0 DEGREE (C)
   SIGTH=   20. DEGREES

   NOX VARIABLES

     NO2= 0.01 PPM      NO= 0.02 PPM     O3= 0.03 PPM        KR= 0.004 1/SEC


 II.  LINK VARIABLES

      LINK       *  LINK COORDINATES (M)   *              EF     H     W
   DESCRIPTION   *   X1    Y1    X2    Y2   * TYPE  VPH  (G/MI)  (M)   (M)
----------------*-------------------------*-------------------------------
A. 1            *    0     0     0 10000 *  AG    375  3.43    0.0  13.0
B. 2            *    0 10000     0 20000 *  AG    375  3.43    0.0  13.0
C. 3            *    0 20000     0 30000 *  AG    375  3.43    0.0  13.0
D. 4            *    0 30000     0 40000 *  AG    375  3.43    0.0  13.0
E. 5            *    0 40000     0 42200 *  AG    375  3.43    0.0  13.0


III.  RECEPTOR LOCATIONS

             *    COORDINATES (M)
  RECEPTOR   *    X      Y      Z
-------------*---------------------
1. 1         *    10   8000   0.0
2. 2         *    20   8000   0.0
3. 3         *    50   8000   0.0
4. 4         *   100   8000   0.0
5. 5         *   200   8000   0.0
6. 6         *   -10   8000   0.0
7. 7         *   -20   8000   0.0
8. 8         *   -50   8000   0.0
9. 9         *  -100   8000   0.0
10. 10       *  -200   8000   0.0


                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1
               POLLUTANT: Nitrogen Dioxide


 IV.  MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

             * PRED  *          CONC/LINK
             * CONC  *            (PPM)
  RECEPTOR   * (PPM) *   A     B     C     D     E
-------------*-------*-------------------------------
 1. 1        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 2. 2        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 3. 3        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 4. 4        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 5. 5        *  0.01 * 0.00  0.00  0.00  0.00  0.00
 6. 6        *  0.02 * 0.01  0.00  0.00  0.00  0.00
 7. 7        *  0.02 * 0.01  0.00  0.00  0.00  0.00
 8. 8        *  0.03 * 0.02  0.00  0.00  0.00  0.00
 9. 9        *  0.03 * 0.02  0.00  0.00  0.00  0.00
10. 10       *  0.03 * 0.02  0.00  0.00  0.00  0.00
```

For Year 2030:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                     JOB: A15 7-10-2020
                     RUN: Hour 1
                POLLUTANT: Nitrogen Dioxide


 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
     BRG=  45.0 DEGREES        VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M            TEMP= 25.0 DEGREE (C)
   SIGTH=   20. DEGREES

   NOX VARIABLES

     NO2= 0.01 PPM      NO= 0.02 PPM     O3= 0.03 PPM        KR= 0.004 1/SEC


 II.  LINK VARIABLES

     LINK      *  LINK COORDINATES (M)   *              EF     H     W
  DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
---------------*-------------------------*-------------------------------
A. 1           *    0     0     0 10000 *  AG    501  3.43    0.0  13.0
B. 2           *    0 10000     0 20000 *  AG    501  3.43    0.0  13.0
C. 3           *    0 20000     0 30000 *  AG    501  3.43    0.0  13.0
D. 4           *    0 30000     0 40000 *  AG    501  3.43    0.0  13.0
E. 5           *    0 40000     0 42200 *  AG    501  3.43    0.0  13.0


 III.  RECEPTOR LOCATIONS

            *    COORDINATES (M)
  RECEPTOR  *    X      Y      Z
------------*---------------------
 1. 1       *    10   8000   0.0
 2. 2       *    20   8000   0.0
 3. 3       *    50   8000   0.0
 4. 4       *   100   8000   0.0
 5. 5       *   200   8000   0.0
 6. 6       *   -10   8000   0.0
 7. 7       *   -20   8000   0.0
 8. 8       *   -50   8000   0.0
 9. 9       *  -100   8000   0.0
10. 10      *  -200   8000   0.0

                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                     JOB: A15 7-10-2020
                     RUN: Hour 1
                POLLUTANT: Nitrogen Dioxide


  IV.  MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

            * PRED  *         CONC/LINK
            * CONC  *           (PPM)
  RECEPTOR  * (PPM) *   A    B    C    D    E
------------*-------*-------------------------
 1. 1       *  0.01 * 0.00 0.00 0.00 0.00 0.00
 2. 2       *  0.01 * 0.00 0.00 0.00 0.00 0.00
 3. 3       *  0.01 * 0.00 0.00 0.00 0.00 0.00
 4. 4       *  0.01 * 0.00 0.00 0.00 0.00 0.00
 5. 5       *  0.01 * 0.00 0.00 0.00 0.00 0.00
 6. 6       *  0.02 * 0.01 0.00 0.00 0.00 0.00
 7. 7       *  0.02 * 0.02 0.00 0.00 0.00 0.00
 8. 8       *  0.03 * 0.02 0.00 0.00 0.00 0.00
 9. 9       *  0.03 * 0.02 0.00 0.00 0.00 0.00
10. 10      *  0.03 * 0.02 0.00 0.00 0.00 0.00
```

For Year 2035:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1
              POLLUTANT: Nitrogen Dioxide


 I.  SITE VARIABLES

       U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
     BRG=  45.0 DEGREES        VD=  0.0 CM/S
    CLAS=     4 (D)            VS=  0.0 CM/S
    MIXH=    5. M            TEMP= 25.0 DEGREE (C)
   SIGTH=   20. DEGREES

   NOX VARIABLES

     NO2= 0.01 PPM      NO= 0.02 PPM     O3= 0.03 PPM        KR= 0.004 1/SEC


 II.  LINK VARIABLES

      LINK      *  LINK COORDINATES (M)   *             EF     H     W
   DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
----------------*-------------------------*-------------------------------
A. 1            *     0     0     0 10000 *  AG    671  3.43    0.0  13.0
B. 2            *     0 10000     0 20000 *  AG    671  3.43    0.0  13.0
C. 3            *     0 20000     0 30000 *  AG    671  3.43    0.0  13.0
D. 4            *     0 30000     0 40000 *  AG    671  3.43    0.0  13.0
E. 5            *     0 40000     0 42200 *  AG    671  3.43    0.0  13.0


III.  RECEPTOR LOCATIONS

             *    COORDINATES (M)
  RECEPTOR   *    X      Y      Z
-------------*---------------------
1. 1         *     10   8000   0.0
2. 2         *     20   8000   0.0
3. 3         *     50   8000   0.0
4. 4         *    100   8000   0.0
5. 5         *    200   8000   0.0
6. 6         *    -10   8000   0.0
7. 7         *    -20   8000   0.0
8. 8         *    -50   8000   0.0
9. 9         *   -100   8000   0.0
10. 10       *   -200   8000   0.0


                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1
              POLLUTANT: Nitrogen Dioxide


 IV.  MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

              * PRED  *          CONC/LINK
              * CONC  *            (PPM)
  RECEPTOR    * (PPM) *   A    B    C    D    E
--------------*-------*-------------------------
 1. 1         *  0.01 * 0.00 0.00 0.00 0.00 0.00
 2. 2         *  0.01 * 0.00 0.00 0.00 0.00 0.00
 3. 3         *  0.01 * 0.00 0.00 0.00 0.00 0.00
 4. 4         *  0.01 * 0.00 0.00 0.00 0.00 0.00
 5. 5         *  0.01 * 0.00 0.00 0.00 0.00 0.00
 6. 6         *  0.02 * 0.02 0.00 0.00 0.00 0.00
 7. 7         *  0.03 * 0.02 0.00 0.00 0.00 0.00
 8. 8         *  0.03 * 0.02 0.00 0.00 0.00 0.00
 9. 9         *  0.03 * 0.03 0.00 0.00 0.00 0.00
10. 10        *  0.04 * 0.03 0.00 0.00 0.00 0.00
```

For Year 2040:

```
                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   1

                    JOB: A15 7-10-2020
                    RUN: Hour 1
               POLLUTANT: Nitrogen Dioxide


  I.  SITE VARIABLES

        U=   1.4 M/S            Z0=  10. CM           ALT=   103. (M)
      BRG=  45.0 DEGREES        VD=  0.0 CM/S
     CLAS=     4 (D)            VS=  0.0 CM/S
     MIXH=    5. M            TEMP= 25.0 DEGREE (C)
    SIGTH=   20. DEGREES

     NOX VARIABLES

       NO2= 0.01 PPM      NO= 0.02 PPM     O3= 0.03 PPM        KR= 0.004 1/SEC


 II.  LINK VARIABLES

     LINK      *  LINK COORDINATES (M)   *              EF     H     W
  DESCRIPTION  *   X1    Y1    X2    Y2  * TYPE  VPH  (G/MI)  (M)   (M)
---------------*--------------------------*------------------------------
A. 1           *     0     0     0 10000 *  AG    898  3.43    0.0  13.0
B. 2           *     0 10000     0 20000 *  AG    898  3.43    0.0  13.0
C. 3           *     0 20000     0 30000 *  AG    898  3.43    0.0  13.0
D. 4           *     0 30000     0 40000 *  AG    898  3.43    0.0  13.0
E. 5           *     0 40000     0 42200 *  AG    898  3.43    0.0  13.0


III.  RECEPTOR LOCATIONS

           *    COORDINATES (M)
  RECEPTOR *    X      Y      Z
-----------*---------------------
1. 1       *     10   8000   0.0
2. 2       *     20   8000   0.0
3. 3       *     50   8000   0.0
4. 4       *    100   8000   0.0
5. 5       *    200   8000   0.0
6. 6       *    -10   8000   0.0
7. 7       *    -20   8000   0.0
8. 8       *    -50   8000   0.0
9. 9       *   -100   8000   0.0
10. 10     *   -200   8000   0.0

                CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
                         JUNE 1989 VERSION
                         PAGE   2

                    JOB: A15 7-10-2020
                    RUN: Hour 1
               POLLUTANT: Nitrogen Dioxide


  IV.  MODEL RESULTS (PRED. CONC. INCLUDES AMB.)

                * PRED  *         CONC/LINK
                * CONC  *           (PPM)
   RECEPTOR     * (PPM) *   A    B    C    D    E
-------------*-------*-------------------------
 1. 1        *  0.01 * 0.00 0.00 0.00 0.00 0.00
 2. 2        *  0.01 * 0.00 0.00 0.00 0.00 0.00
 3. 3        *  0.01 * 0.00 0.00 0.00 0.00 0.00
 4. 4        *  0.01 * 0.00 0.00 0.00 0.00 0.00
 5. 5        *  0.01 * 0.00 0.00 0.00 0.00 0.00
 6. 6        *  0.03 * 0.02 0.00 0.00 0.00 0.00
 7. 7        *  0.03 * 0.02 0.00 0.00 0.00 0.00
 8. 8        *  0.04 * 0.03 0.00 0.00 0.00 0.00
 9. 9        *  0.04 * 0.03 0.00 0.00 0.00 0.00
10. 10       *  0.04 * 0.03 0.00 0.00 0.00 0.00
```

Annexure 20: 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

Input Parameters

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: Predicted Traffic Volume per hour during Day time

Year	Two-wheeler	Car	LCV	Bus	Truck	PCU
2020	187	103	7	2	3	**280**
2025	250	138	9	3	4	**375**
2030	335	184	13	4	5	**501**
2035	448	247	17	5	7	**671**
2040	600	330	22	6	10	**898**

Table B: Predicted Traffic Volume per hour during Night time

Year	Two-wheeler	Car	LCV	Bus	Truck	PCU
2020	24	21	4	0	5	73
2025	32	28	5	0	7	98
2030	43	38	7	0	9	131
2035	58	50	10	0	12	175
2040	77	67	13	0	16	234

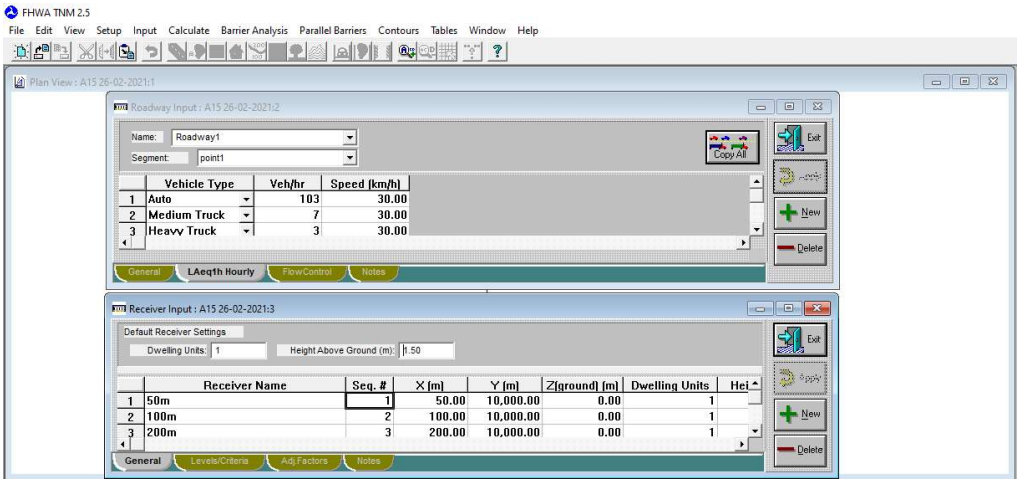


Figure A: Layout of FHWA's Traffic Noise Model

Noise Levels

As per the Baseline survey conducted on **14th January 2020** and **15th January 2020**, the maximum day time noise level is **49.2 dB** and the maximum night time noise level is **38.4 dB**.

Average Noise Level

All vehicles produce some noise, which is taken as the base and the cumulative noise at the receiver distance due to the whole traffic is estimated. The average noise levels vary depending on the type of vehicle. In order to assess the impact of noise due to the change in traffic density and speed, a small road section of each project road has been selected to develop noise projections for future years 2020, 2025, 2030, 2035, and 2040. In order to assess the impact of traffic on sensitive receptors along the road, receptor locations were set at 50 m, 100 m, 200 m, 300 m, 400 m, 500 m, 600 m, 700 m and 800 m from the center line of the road.

The outputs of the assessment are presented in table below. The table shows the noise levels that will be generated by traffic at the respective distance from the centerline of the road. The predicted noise levels are those predicted around built-up area considering vehicle speed as 30 kmph. The permissible noise levels in residential area according to Ambient Noise Standards are 55 dB in daytime and 45 dB at nighttime. It can be seen that even without mitigation measures, noise levels in built up area are within the permissible levels except, 50m from road during night time in the year 2020, 2025, 2030, 2035, and 2040 and

100m from road during night time in the year 2040. The sensitive receptors located within 50m and 100m distance of the road are not operational at night time, hence increased noise will not cause any adverse impact.

Table C: Predicted Noise Level

Sr. No.	Distance from Centerline (m)	2020		2025		2030		2035		2040	
		Day time	Night time	Day time	Night time	Day time	Night time	Day time	Night time	Day time	Night time
1	50	48.6	45.7	49.8	47	51.1	48.2	52.4	49.4	53.7	50.7
2	100	43.6	41.1	44.8	42.5	46	43.6	47.3	44.9	48.6	46.1
3	200	38.9	36.5	40.1	37.9	41.4	39	42.6	40.3	44	41.5
4	300	36.3	33.6	37.6	35	38.8	36.1	40.1	37.4	41.4	38.6
5	400	34.7	31.8	35.9	33.1	37.2	34.3	38.4	35.6	39.7	36.8
6	500	33.5	30.6	34.7	31.9	36	33.1	37.3	34.3	38.6	35.5
7	600	32.6	29.6	33.8	31	35.1	32.1	36.4	33.4	37.7	34.6
8	700	31.8	28.9	33.1	30.2	34.3	31.4	35.6	32.6	36.9	33.9
9	800	31.2	28.2	32.4	29.6	33.7	30.7	35	32	36.3	33.2

Output of Day time Noise Prediction:

For Year 2020:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	49.2	48.6	66	-0.6	10	—
100m	2	1	49.2	43.6	66	-5.6	10	—
200m	3	1	49.2	38.9	66	-10.3	10	—
300m	4	1	49.2	36.3	66	-12.9	10	—
400m	5	1	49.2	34.7	66	-14.5	10	—
500m	6	1	49.2	33.5	66	-15.7	10	—
600m	7	1	49.2	32.6	66	-16.6	10	—
700m	8	1	49.2	31.8	66	-17.4	10	—
800m	9	1	49.2	31.2	66	-18.0	10	—

For Year 2025:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	49.2	49.8	66	0.6	10	—
100m	2	1	49.2	44.8	66	-4.4	10	—
200m	3	1	49.2	40.1	66	-9.1	10	—
300m	4	1	49.2	37.6	66	-11.6	10	—
400m	5	1	49.2	35.9	66	-13.3	10	—
500m	6	1	49.2	34.7	66	-14.5	10	—
600m	7	1	49.2	33.8	66	-15.4	10	—
700m	8	1	49.2	33.1	66	-16.1	10	—
800m	9	1	49.2	32.4	66	-16.8	10	—

For Year 2030:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	49.2	51.1	66	1.9	10	—
100m	2	1	49.2	46.0	66	-3.2	10	—
200m	3	1	49.2	41.4	66	-7.8	10	—
300m	4	1	49.2	38.8	66	-10.4	10	—
400m	5	1	49.2	37.2	66	-12.0	10	—
500m	6	1	49.2	36.0	66	-13.2	10	—
600m	7	1	49.2	35.1	66	-14.1	10	—
700m	8	1	49.2	34.3	66	-14.9	10	—
800m	9	1	49.2	33.7	66	-15.5	10	—

For Year 2035:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	49.2	52.4	66	3.2	10	—
100m	2	1	49.2	47.3	66	-1.9	10	—
200m	3	1	49.2	42.6	66	-6.6	10	—
300m	4	1	49.2	40.1	66	-9.1	10	—
400m	5	1	49.2	38.4	66	-10.8	10	—
500m	6	1	49.2	37.3	66	-11.9	10	—
600m	7	1	49.2	36.4	66	-12.8	10	—
700m	8	1	49.2	35.6	66	-13.6	10	—
800m	9	1	49.2	35.0	66	-14.2	10	—

For Year 2040:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	49.2	53.7	66	4.5	10	—
100m	2	1	49.2	48.6	66	-0.6	10	—
200m	3	1	49.2	44.0	66	-5.2	10	—
300m	4	1	49.2	41.4	66	-7.8	10	—
400m	5	1	49.2	39.7	66	-9.5	10	—
500m	6	1	49.2	38.6	66	-10.6	10	—
600m	7	1	49.2	37.7	66	-11.5	10	—
700m	8	1	49.2	36.9	66	-12.3	10	—
800m	9	1	49.2	36.3	66	-12.9	10	—

Output of Night time Noise Prediction:

For Year 2020:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	38.4	45.7	66	7.3	10	—
100m	2	1	38.4	41.1	66	2.7	10	—
200m	3	1	38.4	36.5	66	-1.9	10	—
300m	4	1	38.4	33.6	66	-4.8	10	—
400m	5	1	38.4	31.8	66	-6.6	10	—
500m	6	1	38.4	30.6	66	-7.8	10	—
600m	7	1	38.4	29.6	66	-8.8	10	—
700m	8	1	38.4	28.9	66	-9.5	10	—
800m	9	1	38.4	28.2	66	-10.2	10	—

For Year 2025:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	38.4	47.0	66	8.6	10	—
100m	2	1	38.4	42.5	66	4.1	10	—
200m	3	1	38.4	37.9	66	-0.5	10	—
300m	4	1	38.4	35.0	66	-3.4	10	—
400m	5	1	38.4	33.1	66	-5.3	10	—
500m	6	1	38.4	31.9	66	-6.5	10	—
600m	7	1	38.4	31.0	66	-7.4	10	—
700m	8	1	38.4	30.2	66	-8.2	10	—
800m	9	1	38.4	29.6	66	-8.8	10	—

For Year 2030:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	38.4	48.2	66	9.8	10	—
100m	2	1	38.4	43.6	66	5.2	10	—
200m	3	1	38.4	39.0	66	0.6	10	—
300m	4	1	38.4	36.1	66	-2.3	10	—
400m	5	1	38.4	34.3	66	-4.1	10	—
500m	6	1	38.4	33.1	66	-5.3	10	—
600m	7	1	38.4	32.1	66	-6.3	10	—
700m	8	1	38.4	31.4	66	-7.0	10	—
800m	9	1	38.4	30.7	66	-7.7	10	—

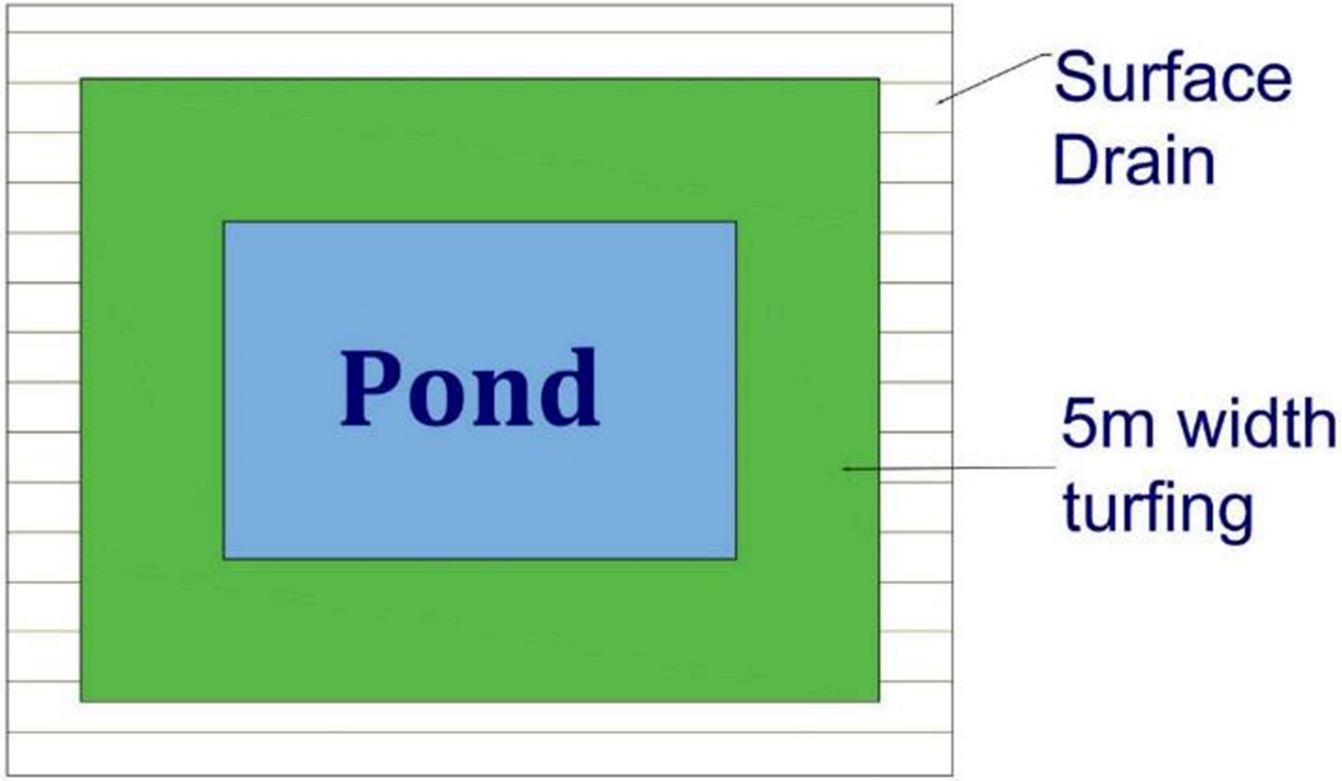
For Year 2035:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	38.4	49.4	66	11.0	10	Sub'l Inc
100m	2	1	38.4	44.9	66	6.5	10	—
200m	3	1	38.4	40.3	66	1.9	10	—
300m	4	1	38.4	37.4	66	-1.0	10	—
400m	5	1	38.4	35.6	66	-2.8	10	—
500m	6	1	38.4	34.3	66	-4.1	10	—
600m	7	1	38.4	33.4	66	-5.0	10	—
700m	8	1	38.4	32.6	66	-5.8	10	—
800m	9	1	38.4	32.0	66	-6.4	10	—

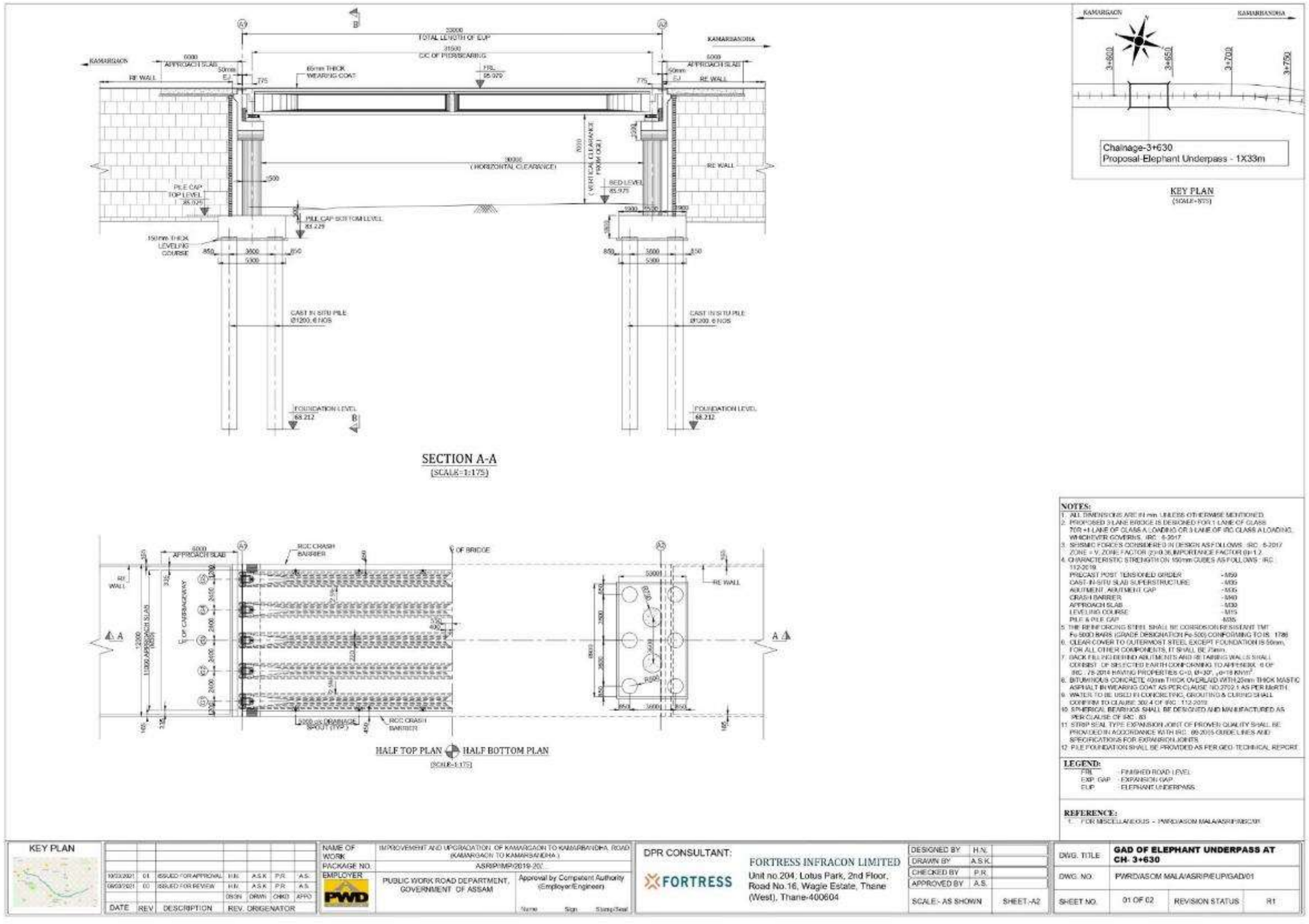
For Year 2040:

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc	
			dBA	dBA	dBA	dB	dB	
50m	1	1	38.4	50.7	66	12.3	10	Sub'l Inc
100m	2	1	38.4	46.1	66	7.7	10	—
200m	3	1	38.4	41.5	66	3.1	10	—
300m	4	1	38.4	38.6	66	0.2	10	—
400m	5	1	38.4	36.8	66	-1.6	10	—
500m	6	1	38.4	35.5	66	-2.9	10	—
600m	7	1	38.4	34.6	66	-3.8	10	—
700m	8	1	38.4	33.9	66	-4.5	10	—
800m	9	1	38.4	33.2	66	-5.2	10	—

Annexure 21: Pond Enhancement Plan



Annexure 22: Elephant Underpass



NOTES:

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE MENTIONED.
2. PROPOSED 3 LANE BRIDGE IS DESIGNED FOR 1 LANE OF CLASS 70R +1 LANE OF CLASS A LOADING OR 3 LANE OF IRC CLASS A LOADING, WHICHEVER GOVERNS. (IRC : 6-2017)
3. SEISMIC FORCES CONSIDERED IN DESIGN AS FOLLOWS : (IRC : 6-2017 ZONE = V, ZONE FACTOR (Z)=0.36,IMPORTANCE FACTOR (I)=1.2
4. CHARACTERISTIC STRENGTH ON 150mm CUBES AS FOLLOWS : IRC : 112-2019

PRECAST POST TENSIONED GIRDER	- M50
CAST-IN-SITU SLAB SUPERSTRUCTURE	- M35
ABUTMENT, ABUTMENT CAP	- M35
CRASH BARRIER	- M40
APPROACH SLAB	- M30
LEVELING COURSE	- M15
PILE & PILE CAP	- M35

5. THE REINFORCING STEEL SHALL BE CORROSION RESISTANT TMT Fe-500D BARS (GRADE DESIGNATION Fe-500) CONFORMING TO IS : 1786
6. CLEAR COVER TO OUTERMOST STEEL EXCEPT FOUNDATION IS 50mm, FOR ALL OTHER COMPONENTS, IT SHALL BE 75mm.
7. BACK FILLING BEHIND ABUTMENTS AND RETAINING WALLS SHALL CONSIST OF SELECTED EARTH CONFORMING TO APPENDIX - 6 OF IRC : 78-2014 HAVING PROPERTIES G=0, Ø=35°, ɣ=18 KN/m³.
8. BITUMINOUS CONCRETE 40mm THICK OVERLAID WITH 25mm THICK MASTIC ASPHALT IN WEARING COAT AS PER CLAUSE NO.2702.1 AS PER MoRTH.
9. WATER TO BE USED IN CONCRETING, GROUTING & CURING SHALL CONFIRM TO CLAUSE 302.4 OF IRC : 112-2019.
10. SPHERICAL BEARINGS SHALL BE DESIGNED AND MANUFACTURED AS PER CLAUSE OF IRC : 83
11. STRIP SEAL TYPE EXPANSION JOINT OF PROVEN QUALITY SHALL BE PROVIDED IN ACCORDANCE WITH IRC : 69-2015 GUIDE LINES AND SPECIFICATIONS FOR EXPANSION JOINTS.
12. PILE FOUNDATION SHALL BE PROVIDED AS PER GEO-TECHNICAL REPORT.

LEGEND:

FRL - FINISHED ROAD LEVEL
EXP. GAP - EXPANSION GAP
EUP - ELEPHANT UNDERPASS

REFERENCE:

1. "FOR MISCELLANEOUS - PWR/ASOM MALA/ASR/PIE/SC/01"

KEY PLAN

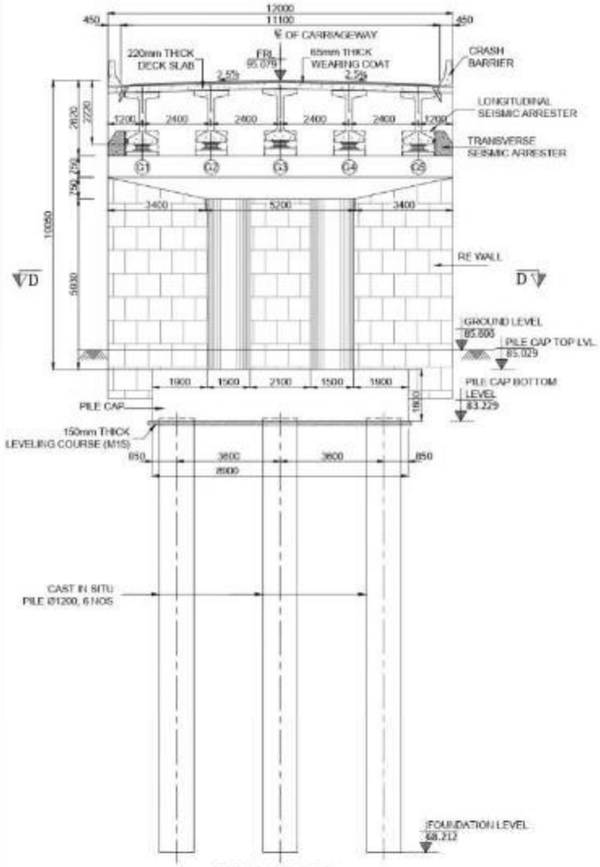
DATE	REV	DESCRIPTION	REV. ORIGENATOR
10/03/2021	01	ISSUED FOR APPROVAL	H.N. A.S.K P.R. A.S.
09/03/2021	00	ISSUED FOR REVIEW	H.N. A.S.K P.R. A.S.
			DSGN DRWN CHKD APPD

NAME OF WORK	IMPROVEMENT AND UPGRADATION OF KAMARGAON TO KAMARBANDHA ROAD (KAMARGAON TO KAMARBANDHA)
PACKAGE NO.	ASR/P/MP/2019-20/
EMPLOYER	PUBLIC WORK ROAD DEPARTMENT, GOVERNMENT OF ASSAM
Approval by Competent Authority (Employer/Engineer)	Name Sign Stamp/Seal

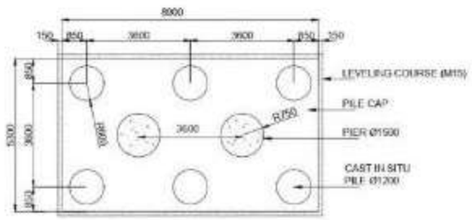
DPR CONSULTANT:
FORTRESS INFRACON LIMITED
Unit no.204, Lotus Park, 2nd Floor, Road No.16, Wagle Estate, Thane (West), Thane-400604

DESIGNED BY	H.N.		
DRAWN BY	A.S.K.		
CHECKED BY	P.R.		
APPROVED BY	A.S.		
SCALE:- AS SHOWN		SHEET:-A2	

DWG. TITLE	GAD OF ELEPHANT UNDERPASS AT CH- 3+630		
DWG. NO.	PWR/ASOM MALA/ASR/PIE/UP/GAD/01		
SHEET NO.	01 OF 02	REVISION STATUS	R1



SECTION B-B
(SCALE-1:125)



SECTION D-D
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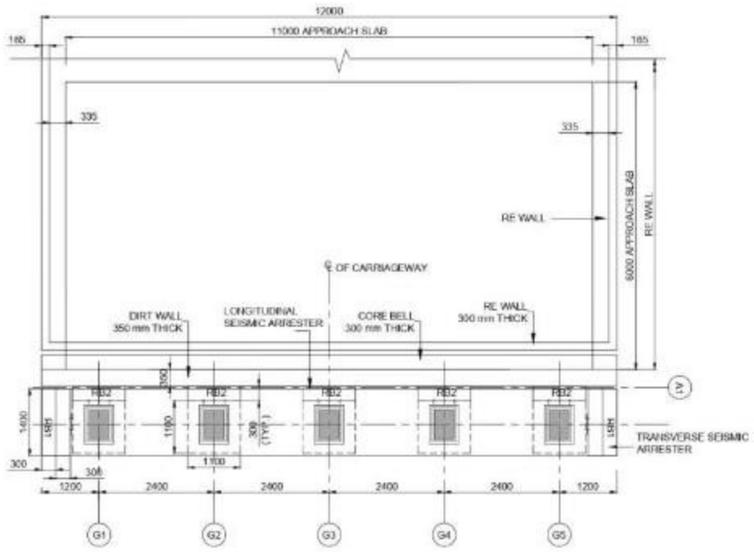
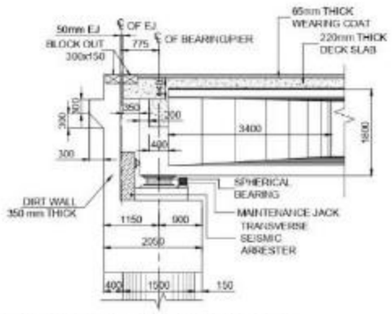
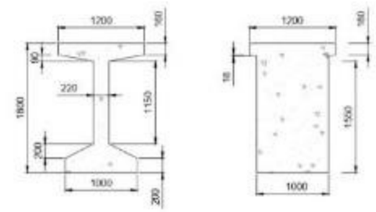


SECTIONAL PLAN OF ABUTMENT CAP SHOWING ARRANGEMENT OF SEISMIC ARRESTER BLOCK
(SCALE-1:75)

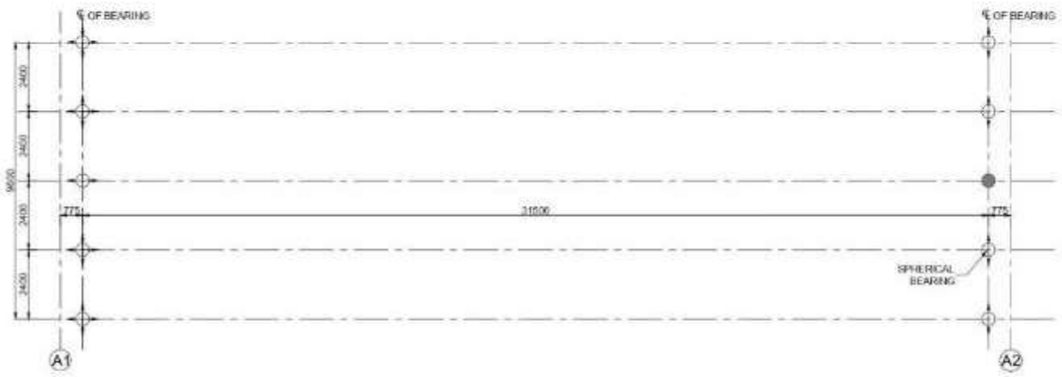
*LONGITUDINAL SEISMIC ARRESTER - RB2
*TRANSVERSE SEISMIC ARRESTER - RB1



DETAIL AT ABUTMENT LOCATION
(SCALE-1:75)



AT MID SPAN AT SUPPORT
GIRDER DETAIL
(SCALE-1:50)



BEARING LAYOUT PLAN
(SCALE-1:125)

LEGEND

MARK	CLASSIFICATION
●	FIXED BEARING
↕	PERPENDICULAR TO AXIS DIRECTION BEARING
↔	AXIS DIRECTION BEARING
✛	ALL DIRECTION BEARING

KEY PLAN

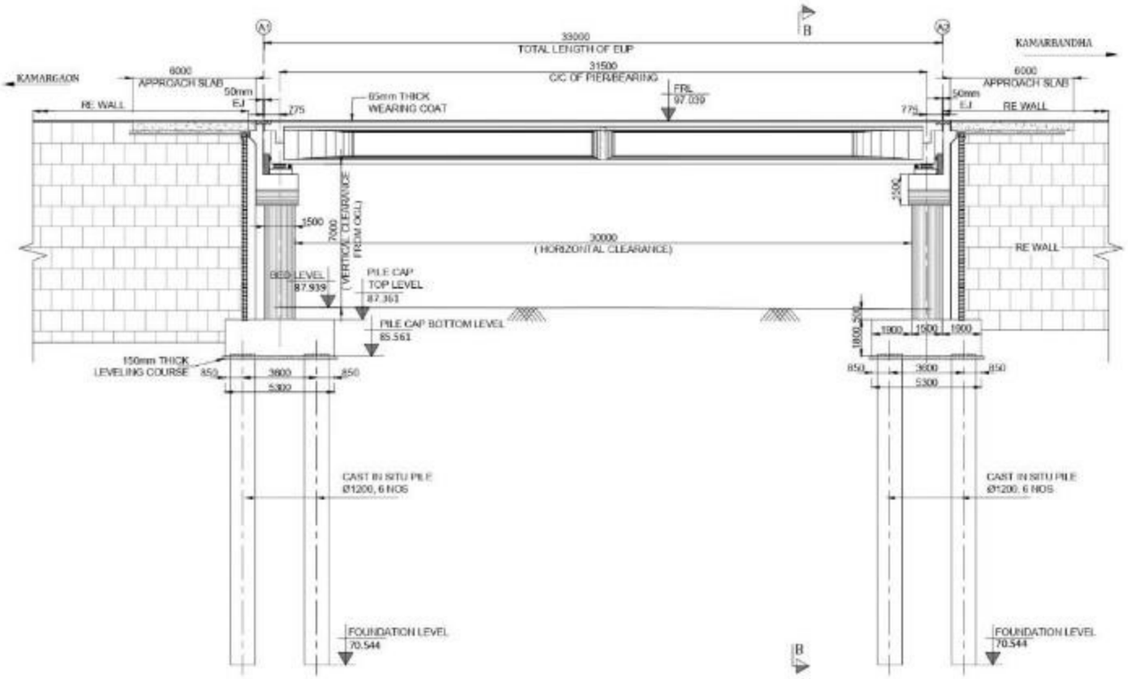
DATE	REV	DESCRIPTION	REV. ORIGENATOR				
			DSGN	DRWN	CHKD	APPD
10/03/2021	01	ISSUED FOR APPROVAL	H.N.	A.S.K.	P.R.	A.S.
09/03/2021	00	ISSUED FOR REVIEW	H.N.	A.S.K.	P.R.	A.S.

NAME OF WORK	IMPROVEMENT AND UPGRADATION OF KAMARGAON TO KAMARBANDHA ROAD (KAMARGAON TO KAMARBANDHA)
PACKAGE NO.	ASRIP/IMP/2019-20/...
EMPLOYER	PUBLIC WORK ROAD DEPARTMENT, GOVERNMENT OF ASSAM
	Approval by Competent Authority (Employer/Engineer) Name Sign Stamp/Seal

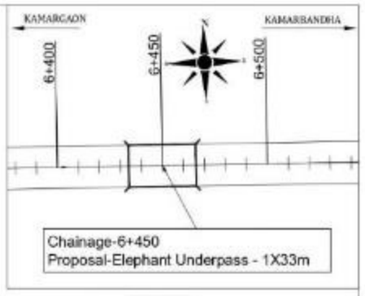
DPR CONSULTANT:
FORTRESS INFRACON LIMITED
Unit no.204, Lotus Park, 2nd Floor, Road No.16, Wagle Estate, Thane (West), Thane-400604

DESIGNED BY	H.N.		
DRAWN BY	A.S.K.		
CHECKED BY	P.R.		
APPROVED BY	A.S.		
SCALE:- AS SHOWN	SHEET:-A2		

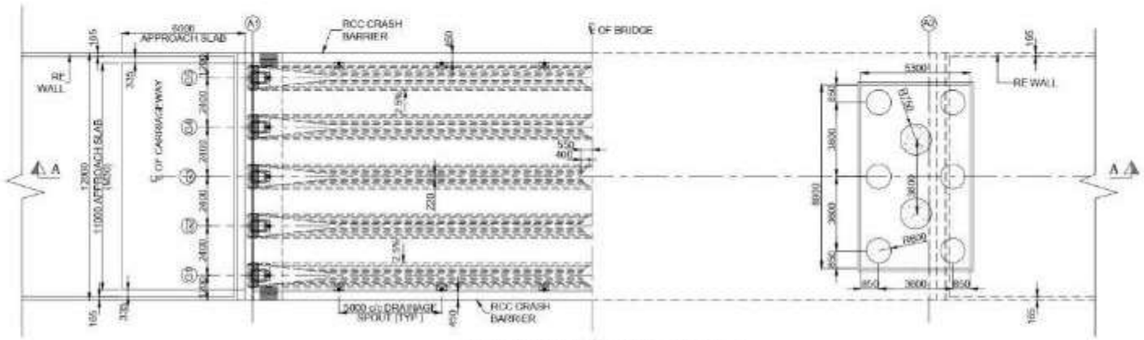
DWG. TITLE	GAD OF ELEPHANT UNDERPASS AT CH- 3+630		
DWG. NO.	PWRD/ASOM MALA/ASRIP/EUP/GAD/01		
SHEET NO.	02 OF 02	REVISION STATUS	R1



SECTION A-A
(SCALE-1:175)



KEY PLAN
(SCALE-NTS)



HALF TOP PLAN ⊕ HALF BOTTOM PLAN
(SCALE- 1:175)

NOTES:
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE MENTIONED.
2. PROPOSED 3-LANE BRIDGE IS DESIGNED FOR 1-LANE OF CLASS 70R +1-LANE OF CLASS A LOADING OR 3-LANE OF IRC CLASS A LOADING, WHICHEVER GOVERNS. IRC : 6-2017
3. SEISMIC FORCES CONSIDERED IN DESIGN AS FOLLOWS : IRC : 6-2017 ZONE – V, ZONE FACTOR (Z)=0.36 IMPORTANCE FACTOR (I)=1.2
4. CHARACTERISTIC STRENGTH ON 150mm CUBES AS FOLLOWS : IRC : 112-2019

PRECAST POST TENSIONED GIRDER	- M50
CAST-IN-SITU SLAB SUPERSTRUCTURE	- M35
ABUTMENT, ABUTMENT CAP	- M35
CRASH BARRIER	- M40
APPROACH SLAB	- M30
LEVELING COURSE	- M15
PILE & PILE CAP	- M35

5. THE REINFORCING STEEL SHALL BE CORROSION RESISTANT TMT Fe-500D BARS (GRADE DESIGNATION Fe-500) CONFORMING TO IS : 1786
6. CLEAR COVER TO OUTERMOST STEEL EXCEPT FOUNDATION IS 50mm, FOR ALL OTHER COMPONENTS, IT SHALL BE 75mm.
7. BACK FILLING BEHIND ABUTMENTS AND RETAINING WALLS SHALL CONSIST OF SELECTED EARTH CONFORMING TO APPENDIX - II OF IRC : 78-2014 HAVING PROPERTIES (ϕ) ϕ=30°, γ=18 KN/m^3
8. BITUMINOUS CONCRETE 40mm THICK OVERLAID WITH 25mm THICK MASTIC ASPHALT IN WEARING COAT AS PER CLAUSE NO 2702.1 AS PER MoRTH
9. WATER TO BE USED IN CONCRETING, GROUTING & CURING SHALL CONFIRM TO CLAUSE 302.4 OF IRC : 112-2019
10. SPHERICAL BEARINGS SHALL BE DESIGNED AND MANUFACTURED AS PER CLAUSE OF IRC : 83
11. STRIP SEAL TYPE EXPANSION JOINT OF PROVEN QUALITY SHALL BE PROVIDED IN ACCORDANCE WITH IRC : 83-2005 GUIDE LINES AND SPECIFICATIONS FOR EXPANSION JOINTS
12. PILE FOUNDATION SHALL BE PROVIDED AS PER GEO-TECHNICAL REPORT

LEGEND:
FTL - FINISHED ROAD LEVEL
EXP. GAP - EXPANSION GAP
EUP - ELEPHANT UNDERPASS

REFERENCE:
1. FOR MISCELLANEOUS - PWRD/ASOM MALA/ASRIP/MISC/01

KEY PLAN

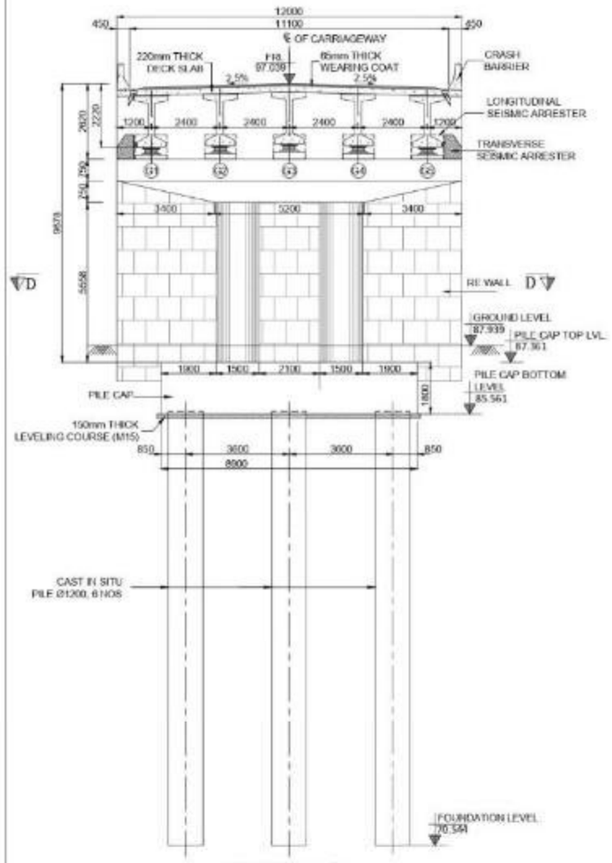
DATE	REV	DESCRIPTION	REV. ORIGENATOR
10/03/2021	01	ISSUED FOR APPROVAL	H.N. A.S.K. P.R. A.S.
09/03/2021	00	ISSUED FOR REVIEW	H.N. A.S.K. P.R. A.S.
			DSGN DRWN CHKD APPD

NAME OF WORK	IMPROVEMENT AND UPGRADATION OF KAMARGAON TO KAMARBANDHA ROAD (KAMARGAON TO KAMARBANDHA)
PACKAGE NO.	ASRIP/IMP/2019-20/...
EMPLOYER	PUBLIC WORK ROAD DEPARTMENT, GOVERNMENT OF ASSAM
	Approval by Competent Authority (Employer/Engineer) Name Sign Stamp(Seal)

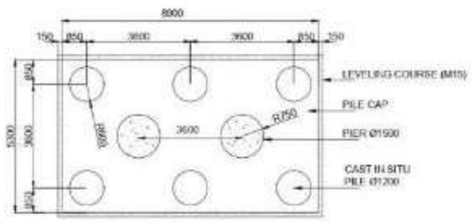
DPR CONSULTANT:
FORTRESS INFRACON LIMITED
Unit no.204, Lotus Park, 2nd Floor, Road No.16, Wagle Estate, Thane (West), Thane-400604

DESIGNED BY	H.N.		
DRAWN BY	A.S.K.		
CHECKED BY	P.R.		
APPROVED BY	A.S.		
SCALE:- AS SHOWN		SHEET:-A2	

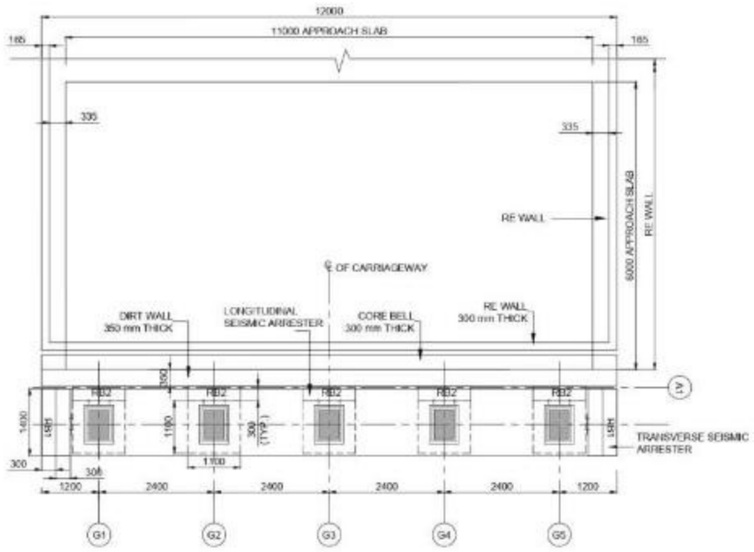
DWG. TITLE	GAD OF ELEPHANT UNDERPASS AT CH- 6+450		
DWG. NO.	PWRD/ASOM MALA/ASRIP/EUP/GAD/02		
SHEET NO.	01 OF 02	REVISION STATUS	R1



SECTION B-B
(SCALE=1:125)

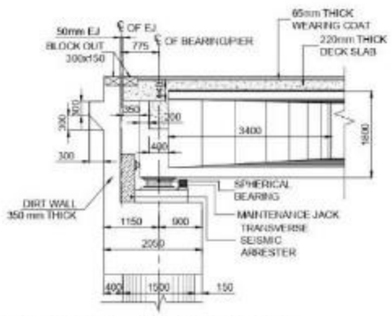


SECTION D-D
(SCALE=1:125)

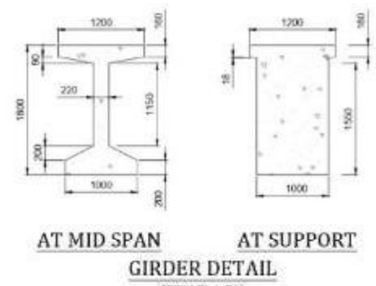


SECTIONAL PLAN OF ABUTMENT CAP SHOWING ARRANGEMENT OF SEISMIC ARRESTER BLOCK
(SCALE=1:75)

*LONGITUDINAL SEISMIC ARRESTER - RB2
*TRANSVERSE SEISMIC ARRESTER - RB1



DETAIL AT ABUTMENT LOCATION
(SCALE=1:75)



AT MID SPAN AT SUPPORT
GIRDER DETAIL
(SCALE=1:50)

BEARING LAYOUT PLAN
(SCALE=1:125)

LEGEND

MARK	CLASSIFICATION
●	FIXED BEARING
⊥	PERPENDICULAR TO AXIS DIRECTION BEARING
↔	AXIS DIRECTION BEARING
✛	ALL DIRECTION BEARING

KEY PLAN

DATE	REV	DESCRIPTION	REV. ORIGENATOR	DSGN	DRWN	CHKD	APPD
10/03/2021	01	ISSUED FOR APPROVAL	H.N.	A.S.K.	P.R.	A.S.	
09/03/2021	00	ISSUED FOR REVIEW	H.N.	A.S.K.	P.R.	A.S.	

NAME OF WORK	IMPROVEMENT AND UPGRADATION OF KAMARGAON TO KAMARBANDHA ROAD (KAMARGAON TO KAMARBANDHA)
PACKAGE NO.	ASRIP/IMP/2019-20/...
EMPLOYER	PUBLIC WORK ROAD DEPARTMENT, GOVERNMENT OF ASSAM
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DPR CONSULTANT:
FORTRESS INFRACON LIMITED
Unit no.204, Lotus Park, 2nd Floor, Road No.16, Wagle Estate, Thane (West), Thane-400604

DESIGNED BY	H.N.	
DRAWN BY	A.S.K.	
CHECKED BY	P.R.	
APPROVED BY	A.S.	
SCALE:- AS SHOWN	SHEET:-A2	

DWG. TITLE	GAD OF ELEPHANT UNDERPASS AT CH- 6+450		
DWG. NO.	PWRD/ASOM MALA/ASRIP/EUP/GAD/02		
SHEET NO.	02 OF 02	REVISION STATUS	R1

Estimate for Underpass at Ch. 3+630

Sr. No.	Item No	Item of Work	Unit	Quantity	Rate	Amount
1	12.1	Excavation for Structures (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.	Cum	279.65	72.00	20134.00
2	12.1	Excavation for Structures (Earth work in excavation of foundation of structures as per drawing and technical specification clause 304, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material) upto required depth for marshy soil	Cum	13.98	160.00	2237.00
2	12.8	Plain/Reinforced cement concrete, in open foundation complete as per drawing and technical specification including steel shuttering formwork.	Cum	383.11	6128.00	2347673.00
3	12.38	Cement concrete for reinforced concrete in pile cap complete as per drawing and Technical Specification.	Cum	169.81	7710.00	1309250.00
	D	RCC Grade M35				
4	12.25	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm)	Meter	181.40	15123.00	2743372.00
	A	Without plasticiser				
5	12.22	Providing steel liner 10 mm thick for curbs and 6mm thick for steining of wells including fabricating and setting out as per detailed drawing	MT	64.71	99335.00	6427967.00
6	13.5 N	Plain/Reinforced cement concrete, in sub structure complete as per drawing and technical specification and steel shuttering formwork	Cum	83.79	9406.00	788137.00
	G	Lift QuantityRCC Grade M-35				
7	12.38	Cement concrete for reinforced concrete in pile cap complete as per drawing and Technical Specification.	Cum	63.35	9406.00	595823.00
	C	RCC Grade M35				
8	14.1	Furnishing and Placing Reinforced/ Prestressed cement concrete in superstructure as per drawing and Technical Specification' including steel shuttering formwork.(without plastisizer)	Cum	7.75	12105.00	93862.00
9	MCGM - SOR (18-19)	Supplying, fitting and fixing in position true to line and level SPHERICAL bearing consisting of bottom plate , saddle plate , top plate , guide plate as per IRC and MORTH Specifications drawing and approved technical specifications complete	MT	2170.00	394.00	854980.00
	R2-BW-8-26					
10	14.1	Furnishing and Placing Reinforced/ Prestressed cement concrete in superstructure as per drawing and Technical Specification' including steel shuttering formwork.(without plastisizer)				
	G	For cast-in-situ box girder, segmental construction and balanced cantilever				
		Height upto 5m	Cum	158.05	13250.00	2094190.00
11	14.1	Furnishing and Placing Reinforced/ Prestressed cement concrete in superstructure as per drawing and Technical Specification' including steel shuttering formwork.(without plastisizer)	Cum			
	D	For solid slab super-structure		87.12	10014.00	872419.00
12	14.1	Provision of reinforced cement concrete crash barrier (New Jersey Type) on structure, constructed with M - 40 grade concrete with HYSD reinforcement conforming to IRC:21, including 50mm dia railing with fixtures and installed as per approved drawings and technical specification clause 809 at locations as directed by the Engineer.				
	E	Crash Barrier (M-40)	meter	90.80	3763.00	341680.00
13	13.5 N	Plain/Reinforced cement concrete, in sub structure complete as per drawing and technical specification and steel shuttering formwork				

Sr. No.	Item No	Item of Work	Unit	Quantity	Rate	Amount
	H	Height upto 5m (Dirt wall)	Cum	23.30	9406.00	219140.00
14	14.10	PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification	Cum	21.06	6001.00	126381.00
15	14.11	Reinforced cement concrete approach slab including reinforcement and formwork complete as per drawing and Technical specification				
	a	Approch Slab RCC (M-30)	Cum	43.20	13449.00	580996.00
16		Supplying, fitting and placing TMT conforming to IS:1786 Fe 500 D reinforcement in foundation/sub structure/super-structure including splicing complete as per drawing and technical specifications				
		TMT-IS 1786 (Fe-500 D) Primary Producer (TATA/ SAIL/ Esser Steel/ Jindal Panther steel/ Shyam steel or equivalent)	MT			
	12.40	Foundation		133.22	78391.00	10443290.00
	13.6	Substructure		19.99	78525.00	1569409.00
	14.2	Superstructure		30.35	80072.00	2430276.00
17	14.9	Drainage Spouts complete as per drawing and Technical specification	Each	16.00	8866.00	141856.00
18	13.8	Providing weep holes in Brick masonry/ Plain/Reinforced concrete abutment, wing wall/return wall with 100 mm dia AC pipe, extending through the full width of the structure with slope of 1V :20H towards drawing foce. Complete as per drawing and Technical specification.	Each	58	199.00	11542.00
19	14.21	Compression Seal Joint (Providing and laying of compression seal joint consisting of steel armoured nosing at two edges of the joint gap suitably anchored to the deck concrete and a preformed chloroprene elastomer or closed cell foam joint sealer compressed and fixed into the gap with special adhesive binder to cater for a horizontal movement up to 40mm and vertical movement of 3mm.)	meter	24.00	13839.00	332136.00
20	5.14	Mastic Asphalt (Providing and laying 25 mm thick mastic asphalt wearing course with paving grade bitumen meeting the requirements given in table 500-29(binder having penetration as (15+/- 5) at 25 deg. centrigrade), prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing anti skid surface with bitumen pre coated fine grained hard stone ships of 13.2mm nominal size at the rate of .005cum per 10 sqm. and at an approximate spacing of 10 cm center tpo center in both direction , pressed into surface when the temperature of surfaces not less than 1000C, protuding 1mm to 4mm over mastic surface , all complete as per clause515.	Sqm	366.30	1366.00	500365.00
21	5.8	Bituminous Concrete (Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 % of mix and fillertransporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the reqd. grade, lavel and alignment,rolling with smooth wheeled,vibratory and tandem rollers to achieve the desired compaction as per MoSRT&H cl. no.509. complete in all respect. (including carriage of mixed materials up to 10.0 Km initial lead from mixing plant)Including cost of testing of materials at site and laboratory as directed by the deptt.)	Cum			
	B	With rock dust as filler (refer table 500-9 of MoSRT&H specification)				
	II	with Polymer modified bitumen 70				
	ii	for Grading-II(13 mm nominal size)		15.84	11684.00	185074.00
22	8.8	Painting Two Coats on New Concrete Surfaces' Painting two coats after filling thesurface with synthetic enamel paint in all shades on new plastered concrete surfaces	Sqm	105.60	93.00	9820.00
23	13.10	Providing and laying of Filter media with granular materials/stone crushed aggregates satisfying the requirements laid down in clause 2504.2.2. of MoRTH specifications to a thickness of not less than 600 mm with smaller size towards the soil and bigger size toeards the wall and provided over the entire surfaces behind the abutement, wing wall and return wall to the full height compacted to firm condition complete as per drawing and technical specification.	Cum	5403.92	3864.00	2,08,80,739.00
24	7.5	Reinforced Earth Retaining Wall (Reinforced earth retaining walls have four main components as under: a) Excavation for foundation, foundation concrete and cement concrete grooved seating in the foundation for facing	Sqm	9774.41	2280.00	22285654.00

Sr. No.	Item No	Item of Work	Unit	Quantity	Rate	Amount
		elements (facia material). b) Facia material and its placement. 'c) Assembling, joining with facing elements and laying of the reinforcing elements.'d) Earth fill with granular material which is to be retained by the wall.				
25	**17.47**	Earth work including excavation, backfilling, grading and compaction with selected backfill soil in layers in Reinforced Earth works as per Technical specification and drawings.	Cum	95172.33	165.90	15789089.00
26	**17.48**	Construction of crash barrier, parapet, coping beam with friction slab in M-30 gradeconcrete complete as per technical specification and drawing.	meter	1634.00	1742.60	2847408.00
27	**13.5**	Plain/Reinforced cement concrete, in sub & structure complete as per drawing and technical specification and steel shuttering formwork	Cum	10.17	9209.00	93688.00
	F	RCC Grade M25				
		With Batching Plant, Transit Mixer and cum Concrete Pump				
28	**12.8**	Plain/Reinforced cement concrete, in open & 2100 foundation complete as per drawing andtechnical specification including steel shuttering formwork.				
		RCC M25	Cum	735.30	7422.00	5457396.00
29		Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor at the rate of 0.20 kg per sqm on the prepared bituminous/granular surface cleaned with mechanical broom.(Including cost of testing of materials at site and laboratory as directed by the deptt	Sqm	396.00	11.00	4356.00
30	**7.5**	With reinforcing elements of synthetic sqm geogrids	Sqm	9774.41	503.00	4916528.00
		Total Amount				**10,73,16,867.00**

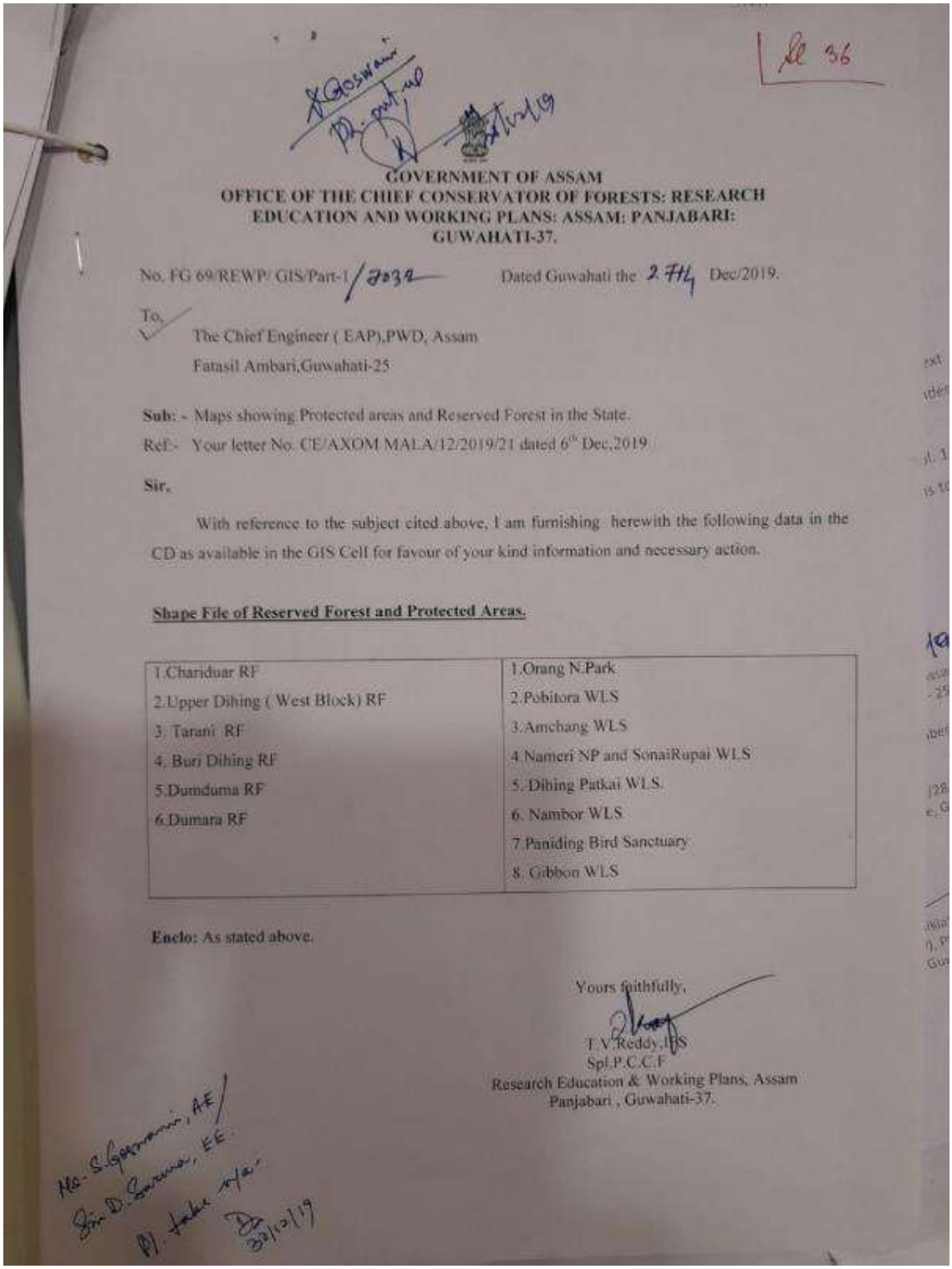
Estimate for Underpass at Ch. 6+450

Sr. No.	Item No	Item of Work	Unit	Quantity	Rate	Amount
1	12.1	Excavation for Structures (Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material.	Cum	265.67	72.00	19128.00
2	12.1	Excavation for Structures (Earth work in excavation of foundation of structures as per drawing and technical specification clause 304, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material) upto required depth for marshy soil	Cum	13.98	160.00	2237.00
3	12.8	Plain/Reinforced cement concrete, in open foundation complete as per drawing and technical specification including steel shuttering formwork.	Cum	167.11	6128.00	1024025.00
3	12.38	Cement concrete for reinforced concrete in pile cap complete as per drawing and Technical Specification.	Cum	169.81	7710.00	1309250.00
	D	RCC Grade M35				
4	12.25	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm)	Meter	180.20	15123.00	2725225.00
	A	Without plasticiser				
5	12.22	Providing steel liner 10 mm thick for curbs and 6mm thick for steining of wells including fabricating and setting out as per detailed drawing	MT	64.28	99335.00	6385253.00
6	13.5 N	Plain/Reinforced cement concrete, in sub structure complete as per drawing and technical specification and steel shuttering formwork	Cum	83.79	9406.00	788137.00
	G	Lift QuantityRCC Grade M-35				
7	12.38	Cement concrete for reinforced concrete in pile cap complete as per drawing and Technical Specification.	Cum	63.35	9406.00	595823.00
	C	RCC Grade M35				
8	14.1	Furnishing and Placing Reinforced/ Prestressed cement concrete in superstructure as per drawing and Technical Specification' including steel shuttering formwork.(without plastisizer)	Cum	7.75	12105.00	93862.00
9	MCGM - SOR (18-19)	Supplying, fitting and fixing in position true to line and level SPHERICAL bearing consisting of bottom plate , saddle plate , top plate , guide plate as per IRC and MORTH Specifications drawing and approved technical specifications complete	MT	2170.00	394.00	854980.00
	R2-BW-8-26	Bearing				
10	14.1	Furnishing and Placing Reinforced/ Prestressed cement concrete in superstructure as per drawing and Technical Specification' including steel shuttering formwork.(without plastisizer)				
	G	For cast-in-situ box girder, segmental construction and balanced cantilever				
		Height upto 5m to 10m	Cum	158.05	13250.00	2094190.00
11	14.1	Furnishing and Placing Reinforced/ Prestressed cement concrete in superstructure as per drawing and Technical Specification' including steel shuttering formwork.(without plastisizer)				
	D	For solid slab super-structure	Cum	87.12	10014.00	872419.00
12	14.1	Provision of reinforced cement concrete crash barrier (New Jersey Type) on structure, constructed with M - 40 grade concrete with HYSD reinforcement conforming to IRC:21, including 50mm dia railing with fixtures and installed as per approved drawings and technical specification clause 809 at locations as directed by the Engineer.				
	E	Crash Barrier (M-40)	Meter	90.80	3763.00	341680.00
13	13.5 N	Plain/Reinforced cement concrete, in sub structure complete as per drawing and technical specification and steel shuttering formwork				

Sr. No.	Item No	Item of Work	Unit	Quantity	Rate	Amount
	H	Height upto 5m (Dirt wall)	Cum	23.30	9406.00	219140.99
14	14.10	PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification	Cum	19.31	6001.00	115849.31
15	14.11	Reinforced cement concrete approach slab including reinforcement and formwork complete as per drawing and Technical specification				
	a	Approch Slab RCC (M-30)	Cum	39.60	13449.00	532580.40
16		Supplying, fitting and placing TMT conforming to IS:1786 Fe 500 D reinforcement in foundation/sub structure/super-structure including splicing complete as per drawing and technical specifications				
		TMT-IS 1786 (Fe-500 D) Primary Producer (TATA/ SAIL/ Esser Steel/ Jindal Panther steel/ Shyam steel or equivalent)	MT			
	12.40	Foundation		81.22	78391.00	6366740.81
	13.6	Substructure		19.99	78525.00	1569409.13
	14.2	Superstructure		30.35	80072.00	2430276.32
17	14.9	Drainage Spouts complete as per drawing and Technical specification	Each	16.00	8866.00	141856.00
18	13.8	Providing weep holes in Brick masonry/ Plain/Reinforced concrete abutment, wing wall/return wall with 100 mm dia AC pipe, extending through the full width of the structure with slope of 1V :20H towards drawing foce. Complete as per drawing and Technical specification.	Each	53	199.00	10547.00
19	14.21	Compression Seal Joint (Providing and laying of compression seal joint consisting of steel armoured nosing at two edges of the joint gap suitably anchored to the deck concrete and a preformed chloroprene elastomer or closed cell foam joint sealer compressed and fixed into the gap with special adhesive binder to cater for a horizontal movement up to 40mm and vertical movement of 3mm.)	meter	24.00	13839.00	332136.00
20	5.14	Mastic Asphalt (Providing and laying 25 mm thick mastic asphalt wearing course with paving grade bitumen meeting the requirements given in table 500-29(binder having penetration as (15+/- 5) at 25 deg. centrigrade), prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing anti skid surface with bitumen pre coated fine grained hard stone ships of 13.2mm nominal size at the rate of .005cum per 10 sqm. and at an approximate spacing of 10 cm center tpo center in both direction , pressed into surface when the temperature of surfaces not less than 1000C, protuding 1mm to 4mm over mastic surface , all complete as per clause515.	Sqm	366.30	1366.00	500365.80
21	5.8	Bituminous Concrete (Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 % of mix and fillertransporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the reqd. grade, lavel and alignment,rolling with smooth wheeled,vibratory and tandem rollers to achieve the desired compaction as per MoSRT&H cl. no.509. complete in all respect. (including carriage of mixed materials up to 10.0 Km initial lead from mixing plant)Including cost of testing of materials at site and laboratory as directed by the deptt.)				
	B	With rock dust as filler (refer table 500-9 of MoSRT&H specification)				
	II	with Polymer modified bitumen 70				
	ii	for Grading-II(13 mm nominal size)	Cum	15.84	11684.00	185074.56
22	8.8	Painting Two Coats on New Concrete Surfaces' Painting two coats after filling thesurface with synthetic enamel paint in all shades on new plastered concrete surfaces	Sqm	105.60	93.00	9820.80
23	13.10	Providing and laying of Filter media with granular materials/stone crushed aggregates satisfying the requirements laid down in clause 2504.2.2. of MoRTH specifications to a thickness of not less than 600 mm with smaller size towards the soil and bigger size toeards the wall and provided over the entire surfaces behind the abutement, wing wall and return wall to the full height compacted to firm condition complete as per drawing and technical specification.	Cum	2325.20	3864.00	8984565.07
24	7.5	Reinforced Earth Retaining Wall (Reinforced earth retaining walls have four main components as under: a) Excavation for foundation, foundation concrete and cement concrete grooved seating in the foundation for facing elements (facia material). b) Facia material and its placement. 'c) Assembling, joining with facing elements and laying of the reinforcing elements.'d) Earth fill with granular material which is to be retained by the wall.	Sqm	4166.58	2280.00	9499802.40

Sr. No.	Item No	Item of Work	Unit	Quantity	Rate	Amount
25	17.47	Earth work including excavation, backfilling, grading and compaction with selected backfill soil in layers in Reinforced Earth works as per Technical specification and drawings.	Cum	36810.51	165.90	6106863.61
26	17.48	Construction of crash barrier, parapet, coping beam with friction slab in M-30 gradeconcrete complete as per technical specification and drawing.	Meter	674.00	1742.6	1174512.40
27	13.5	Plain/Reinforced cement concrete, in sub & structure complete as per drawing and technical specification and steel shuttering formwork	Cum	10.17	9209	93688.68
		RCC Grade M25				
		With Batching Plant, Transit Mixer and cum Concrete Pump				
28		Plain/Reinforced cement concrete, in open & 2100 foundation complete as per drawing andtechnical specification including steel shuttering formwork.	Cum	303.30	7422.00	2251092.60
		RCC M25				
29	5.2	Tack coat Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor at the rate of 0.20 kg per sqm on the prepared bituminous/granular surface cleaned with mechanical broom.(Including cost of testing of materials at site and laboratory as directed by the deptt	Sqm	396.00	11.00	4356.00
30	7.5	With reinforcing elements of synthetic sqm geogrids	Sqm	4166.58	503.00	2095789.74
		Total Amount				**5,97,30,677.00**

Annexure 23: Letter from PCCF, Assam providing GIS Maps of Protected Areas and Reserve Forests



GOVERNMENT OF ASSAM
OFFICE OF THE CHIEF CONSERVATOR OF FORESTS: RESEARCH EDUCATION AND WORKING PLANS: ASSAM: PANJABARI: GUWAHATI-37.

No. FG 69/REWP/ GIS/Part-1/2032 Dated Guwahati the 27th Dec/2019.

To,
The Chief Engineer (EAP),PWD, Assam
Fatasil Ambari,Guwahati-25

Sub: - Maps showing Protected areas and Reserved Forest in the State.
Ref:- Your letter No. CE/AXOM MALA/12/2019/21 dated 6th Dec,2019

Sir,

With reference to the subject cited above, I am furnishing herewith the following data in the CD as available in the GIS Cell for favour of your kind information and necessary action.

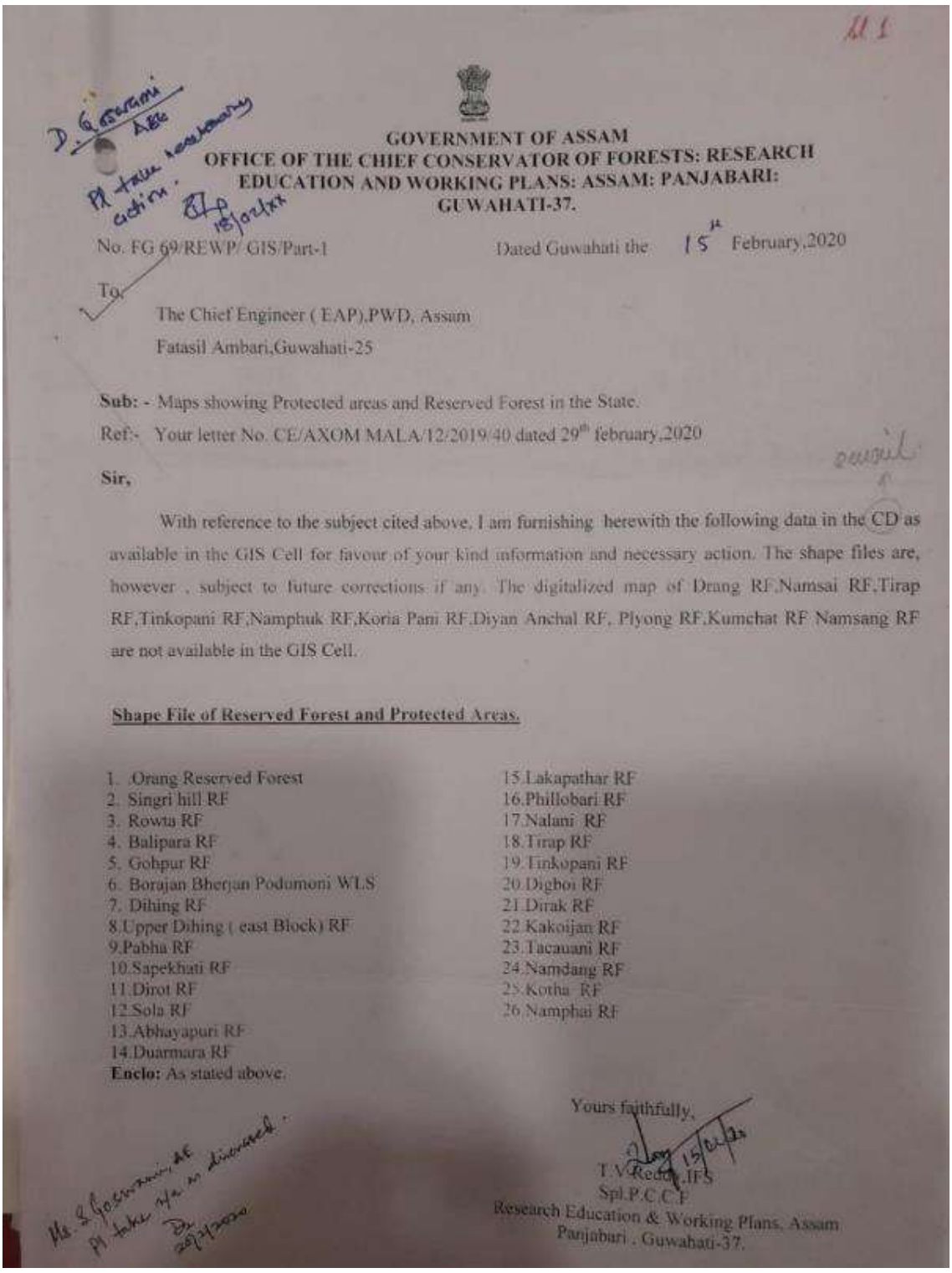
Shape File of Reserved Forest and Protected Areas.

1.Chanduar RF	1.Orang N.Park
2.Upper Dihing (West Block) RF	2.Pobitora WLS
3. Tarani RF	3.Amchang WLS
4. Buri Dihing RF	4.Nameri NP and SonaiRupai WLS
5.Dumduma RF	5. Dihing Patkai WLS.
6.Dumara RF	6. Nambor WLS
	7.Paniding Bird Sanctuary
	8. Gibbon WLS

Enclo: As stated above.

Yours faithfully,

T.V.Reddy,IFS
Spl.P.C.C.F
Research Education & Working Plans, Assam
Panjabari , Guwahati-37.



GOVERNMENT OF ASSAM
OFFICE OF THE CHIEF CONSERVATOR OF FORESTS: RESEARCH EDUCATION AND WORKING PLANS: ASSAM: PANJABARI: GUWAHATI-37.

No. FG 69/REWP/ GIS/Part-1 Dated Guwahati the 15th February,2020

To,
The Chief Engineer (EAP),PWD, Assam
Fatasil Ambari,Guwahati-25

Sub: - Maps showing Protected areas and Reserved Forest in the State.

Ref:- Your letter No. CE/AXOM MALA/12/2019/40 dated 29th february,2020

Sir,

With reference to the subject cited above, I am furnishing herewith the following data in the CD as available in the GIS Cell for favour of your kind information and necessary action. The shape files are, however , subject to future corrections if any. The digitalized map of Drang RF,Namsai RF,Tirap RF,Tinkopani RF,Namphuk RF,Koria Pani RF,Diyan Anchal RF, Plyong RF,Kumchat RF Namsang RF are not available in the GIS Cell.

Shape File of Reserved Forest and Protected Areas.

1. Orang Reserved Forest
2. Singri hill RF
3. Rowta RF
4. Balipara RF
5. Gohpur RF
6. Borajan Bherjan Podumoni WLS
7. Dihing RF
8. Upper Dihing (east Block) RF
9. Pabha RF
10. Sapekhati RF
11. Dirot RF
12. Sola RF
13. Abhayapuri RF
14. Duarmara RF
15. Lakapathar RF
16. Phillobari RF
17. Nalani RF
18. Tirap RF
19. Tinkopani RF
20. Dighoi RF
21. Dirak RF
22. Kakoijan RF
23. Tacauani RF
24. Namdang RF
25. Kotha RF
26. Namphai RF

Enclo: As stated above.

Yours faithfully,

T.V.Reddy,IFS
Spl.P.C.C.F
Research Education & Working Plans, Assam
Panjabari , Guwahati-37.

Annexure 24: 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.

Annexure 25: 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

Author
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.

Data collection and compilation by
Md. Rehman
Ms. Arunima Pandey
Environmental Specialist

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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

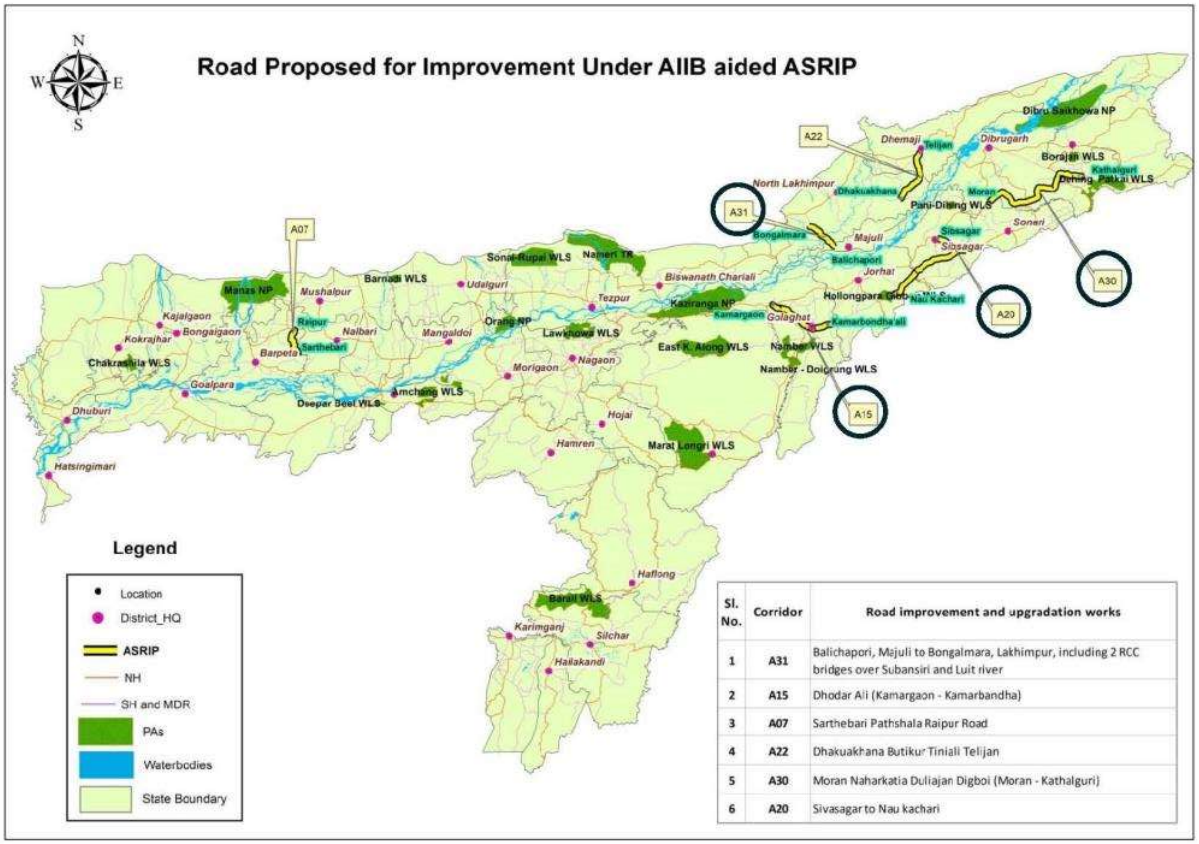
Ecological set-up, favourable geographical location and diversified topographical and climatic conditions were major factors driving the high biodiversity in the state of Assam. Different types of terrestrial and aquatic ecosystem are the ideal conditions for functioning of different types of natural 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					



Sl. No.	Corridor	Road improvement and upgradation works
1	A31	Balichapori, Majuli to Bongalmara, Lakhimpur, including 2 RCC bridges over Subansiri and Luit river
2	A15	Dhodar Ali (Kamargaon - Kamarbandha)
3	A07	Sarthebari Pathshala Raipur Road
4	A22	Dhakuakhana Butikur Tiniali Teli jan
5	A30	Moran Naharkatia Duliajan Digboi (Moran - Kathalguri)
6	A20	Sivasagar to Nau kachari

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.

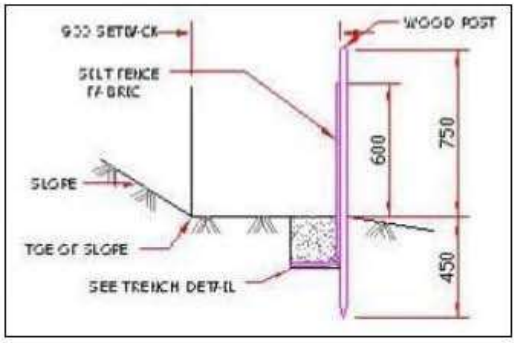


Figure 2: Silt Fencing

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.

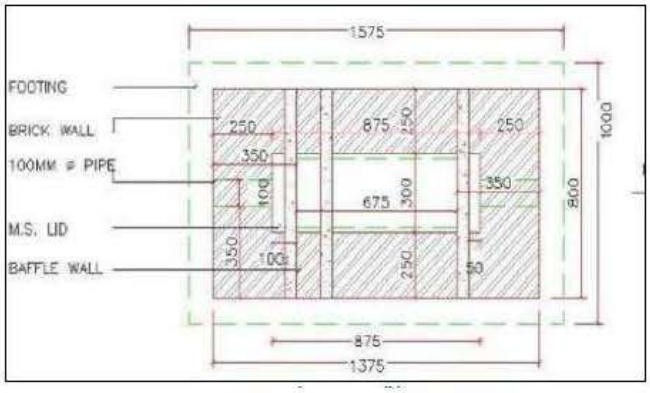


Figure 3: Oil Interceptor

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.

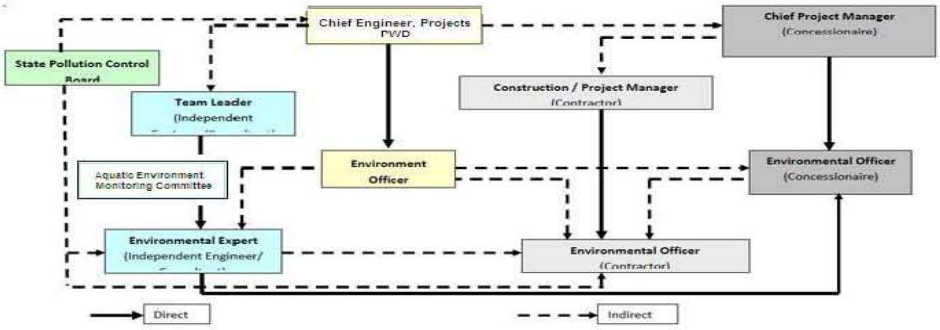


Figure 4: Proposed Organization Chart

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

सत्यमेव जयते

THE ASSAM GAZETTE

অসাধাৰণ

EXTRAORDINARY

প্ৰাপ্ত কৰ্ত্তৃত্বৰ দ্বাৰা প্ৰকাশিত

PUBLISHED BY THE AUTHORITY

নং 224 দিশপুৰ, শুক্ৰবাৰ, 26 মে', 2017, 5 জেঠ,, 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

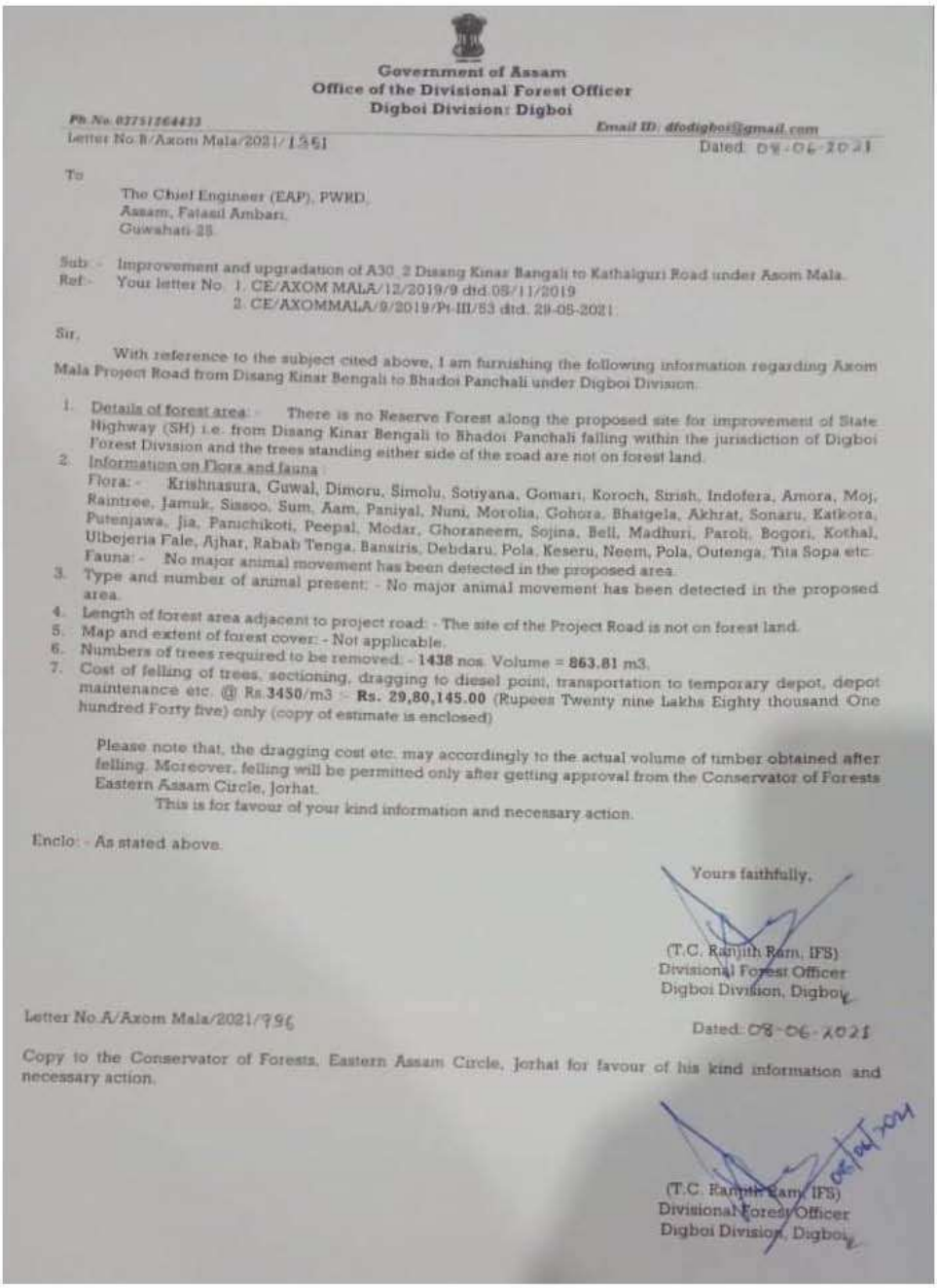
West : Sonitpur District.

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/2021/1561 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.05/11/2019
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, Panchikoti, 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 (*Sapium baccatum*), mahi thekera (*Garcinia morella*), katholua (*Palequium obovatium*), kumbhi (*Careya arborea*), gahori Sopa (*Magnolia Pealiana*), gomari (*Gmelina arborea*), gohora (*Premna bengalensis*), Gondhsoroi (*Cinnamonium grandiliferum*), Salmugra (*Hydrocarpus kurzil*), poreng (*Elaeocarpus robustus*), sotiona (*Alosuonia scholaris*), chom (*Machilus odoratissime*), chewa (*Caryota areus*), jutuli (*Alyingia 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 (*Litssea Sebifera*), bhatghilla (*Oroxylum Indicam*), 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 (*Lantena camera*), Jarmoni (*Eupotorium odoratum*), Jetuli poka (*Rubus malucanus*), Tora (*Alpinea allughus*), Dhopattita (*Phlogarthus 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 (*Menispermum 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 (*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 (*Sus*

scorfa), five-striped palm squirrel (*Funambulus pennanti*), Indian python (*Genus python*), common monitor lizard (*Varanus grisus*), Indian tent turtle (*Kachuga tecta tecta*), geacko (*Calodactyloids aureus*), common cobra (*Naja spp.*), white winged wood duck (*Cairina scutulata*), horn bill (*Pilolaemas tickali austeni*), Indian pied horn bill (*Anthracoceros malabaricus*), osprey (*Pandion haliaetus*), hill myna (*Gracula religiosa indica*), kalij pheasant (*Lophurs leucomala*), babblers (*Timaliinae spp.*), barbets (*Capitonidae spp.*), bitterns (*Ardeidae spp.*), kingfisher (*Alcedinidae*), orioles (*Oriolidae*), bulbuls (*Pycnonotidae spp.*), owls (*Strigidae*), egrets (*Arideidae*), 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).

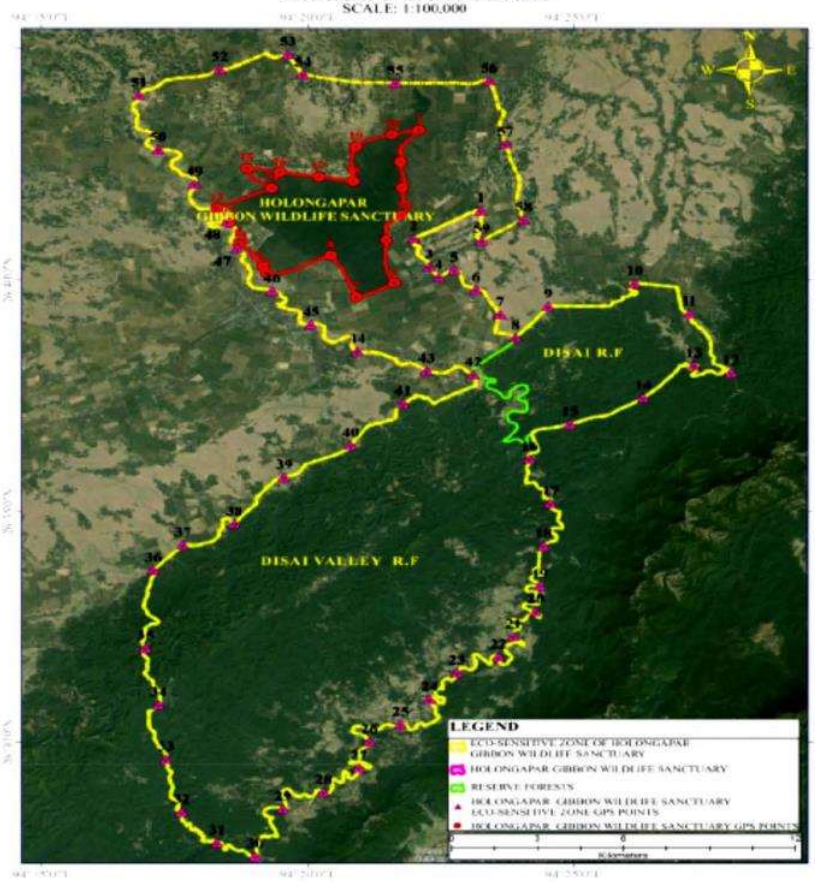
North:-. From GPS Point No. 59 the boundary runs towards north along the road till it meet the GPS Point No. 1 (94° 23' 14.681" E & 26° 41' 29.920" N). The Western boundary of the Sanctuary share inter-state boundary with Nagaland and hence is 0.0 km of Eco-Sensitive Zone is being proposed. The extent 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

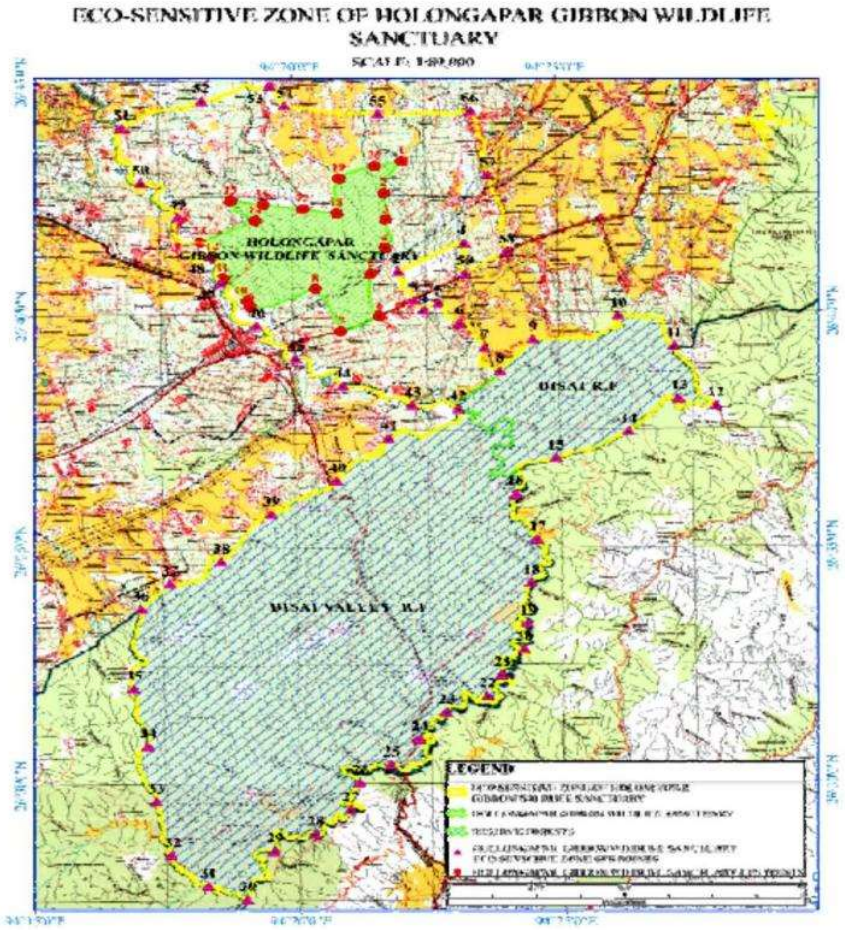
ECO-SENSITIVE ZONE OF HOLONGAPAR GIBBON WILDLIFE SANCTUARY

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



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' 12.239" 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

[भाग II—खण्ड 3(ii)] भारत का राजपत्र : असाधारण 35

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.