Public Works Department

Government of Meghalaya

Environmental and Social Impact Assessment (ESIA)

Report Umsning-Jagi Road

CETEST Engineering Consultants

C. E. TESTING COMPANY PRIVATE LIMITED

Report No PI/CTKI21-19/R1

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1 INTRODUCTION AND PROJECT BACKGROUND

Meghalaya is a hilly state in north eastern India. The state shares its international boundaries with Bangladesh-South & West of Meghalaya are adjacent to Mymensingh, Sylhet and Rangpur division of Bangladesh, respectively and northern part of this hilly state is boarded by another north-eastern state, Assam. Economical growth of this state has been hampered compared to other states of India, due to socio-geographical reasons, poor communication, low agricultural and industrial outputs. The Public Works Department (PWD) of the Government of Meghalaya is the implementing rehabilitation / up-gradation of existing roads and construction of missing links/bypasses/Bridges in the major stretches (Nongstoin-Maweit, Umsning-Jagi Road, Borsora road, Cherragoan road, Bagli and Nongpoh-Umden-Sonapur in State of Meghalaya.

The Government of Meghalaya has stepped up investments in the development of transport infrastructure using financial assistance (loan) from the World Bank (IBRD) under its Meghalaya Integrated Transport Project (MITP) for the enhancement of the transport Infrastructure in the State. The state Government has assigned the work of improvement/rehabilitation of roads and construction of bridges (under the World Bank funded MITP) to Public Works Department (PWD) of the Government of Meghalaya. This department designs plans for rehabilitation / up gradation of existing roads and construction of missing links / bypasses / Bridges in the stretches from Nongstoin-Maweit (35km), Umsning- Jagi Road (40km), Borsora (6.50Km), Cherragoan (6.80 Km), Bagli (4.00 Km), Nongpoh-Umden-Sonapur (25.0km), Shillong town roads (12.591km), Jowai Town roads (34.843km), Nongstoin Town roads (20.752 km) and Williamnagar Town roads (23.451 km).

M/s Consulting Engineers Group Ltd. in JV with M/s C.E. Testing Company Pvt. Ltd. has been chosen by Public Works Department (PWD) of the Government of Meghalaya to perform Consultancy Services for Preparation of Detailed Project Report (DPR) for above discussed stretch.

The PWD of Meghalaya issued Letter of award vide letter No. PW/CE/NH/WB/4/2021/58 dated 13.07.2021. The agreement for the project has been signed on 13.07.2021.

The project involves urban and non-urban roads. Details of the project stretches are elaborated below:

1.1 Non-Urban Roads

1 **Nongstoin-Maweit corridorsection** is having a length of 35km in the West Khasi Hills districts of Meghalaya state. The Project Road will connect the major towns and villages.

2 **Umsning-Jagi Road corridor (SH-8) section** is extended up to 40 km length in the districts Ri-Bhoi of Meghalaya state. The project road starts from the junction with National Highway - 6 /Asian Highway. The NH-6 is a Jorabat to Shillong stretches and it also part of the Asian Highway. It is mainly connected between the cities Guwahati to Shillong. The project scope ends at Km 40.00 of SH-8 near Sonidan town

3 **Up-Gradation/improvement of road to Export point from the main road Borsora corridor sections** is covering a length of 6.50 Km, Cherragoan corridor sections has a length of 6.80 Km, and Bagli corridor sections has a Length of 4.00 Km. These roads are located under the Districts of South West Khasi Hills of Meghalaya state. (**Border road**)

4 **Nongpoh-Umden-Sonapur Road corridor section** has a length of 25 km in the districts Ri-Bhoi of Meghalaya state. The project road starts from Nongpoh connecting with NH-6

/Asian Highway. The NH-6 is mainly connected between the Guwahati to Shillong location. The scope of project road ends at junctions of RDBR road near by Umden town.

1.2 Urban Roads

1 **Shillong Town Roads**:

All the project roads come under East Khasi Hillsdistrict; Meghalaya passes through the Shillong town. Eleven roads are parts of this project road having total length of 12.59 Kms.

2 Jowai Town Roads:

All the project roads come under West Jaintia Hills district and part of Jowai town. Total 54 roads are part of this project road having total length of 34.85 Kms.

3 Nongstoin Roads:

All the project roadscome under WestKhasi Hills district and part of Nongstoin town. Total 24 roads are part of this project having total length of 20.75 Kms.

4 Williamnagar Town:

All the project roads come under East Garo Hills district and part of Williamnagar town. 35 roads are part of this project having total length of 23.45 Kms.

The present Environment and Social Impact Assessment (ESIA)report has been prepared for the **Umsning-Jagi Road corridor (SH-8) section** under Non-urban Roads.

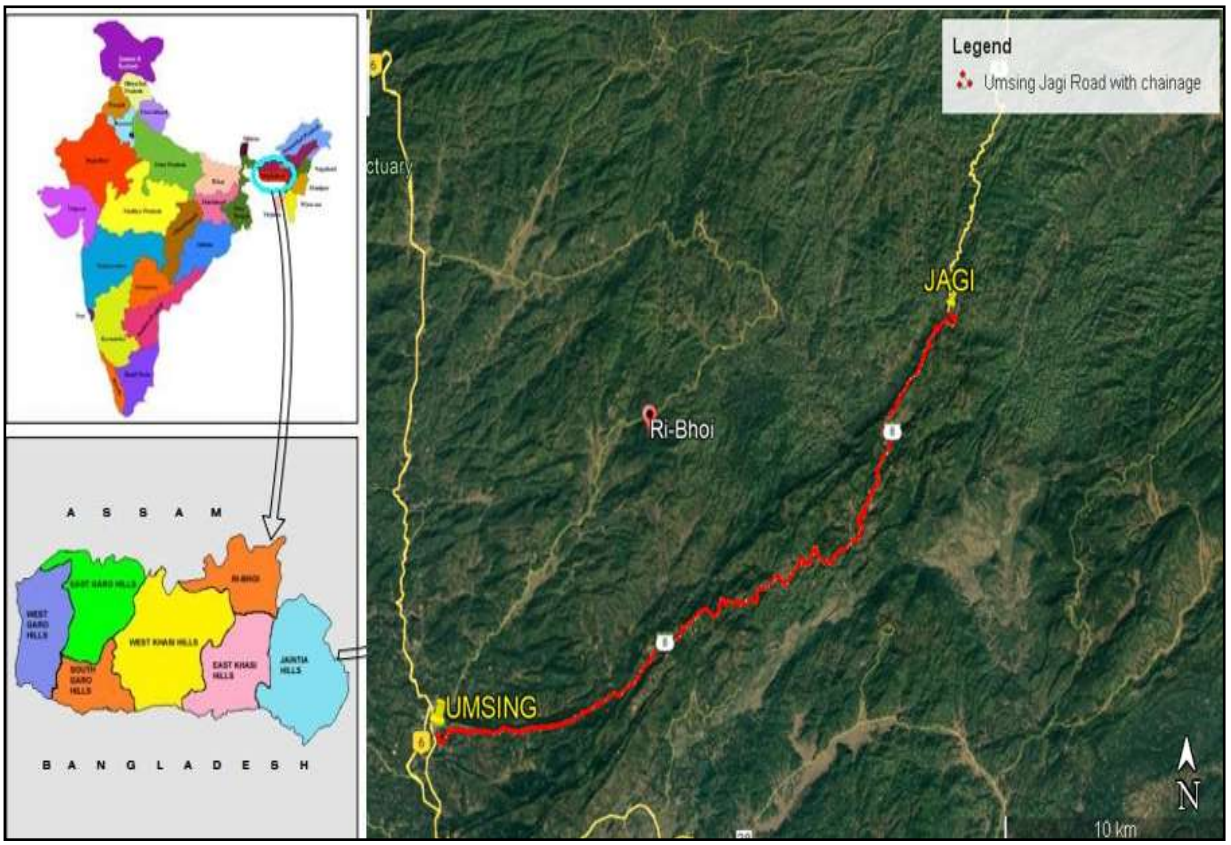
1.2.1 Umsning-Jagi Road (SH-8):

- Umsning-Jagi Road (SH-8) section has a length of 40 km in the district Ri-Bhoi of Meghalaya state.
- The project road starts from the junction with National Highway - 6 /Asian Highway(Jorabat to Shillong stretch).
- The project road ends at Km 40.00 of SH-8 near Sonidan town.
- It connects built up areas like Nongiri, Rilong, Sohpdok, Sohliya, Umtangngi, Mawdiengngan, Umlaiteng, Umlatar, Mawhati, Umsohlait, Sonidan and Mawlaho etc.
- The project road passes through hilly and rolling terrains.

1.3 Project Location

Umsning-Jagi Road corridor (SH-8) section is extended up to 40 km length in the districts Ri-Bhoi of Meghalaya state. The project road starts from the junction with National Highway - 6 /Asian Highway. The NH-6 is a Jorabat to Shillong stretches and it also part of the Asian Highway. It is mainly connected between the cities Guwahati to Shillong. The project scope ends at Km 40.00 of SH-8 near Sonidan town.

Location Map of the Umsning-Jagi Road



1.4 Right of Way (RoW)

The carriageway width of the existing road varies from 3.75 meter to 5.5 meter. Width of earthen shoulder varies from 0.5 meter to 1 meter. The existing ROW width along the project road has been observed to be around 5m to 15m during road inventory. The Proposed Right of Way is within the existing Right of way.

1.5 Proposed Land Acquisition

As the Proposed Right of Way is well within the existing Right of Way, so there is No New Land is required and thus No Land Acquisition.

1.6 Pavement Condition

About 90% the project road passes through hilly terrain. The land use pattern of the road stretch is predominantly agricultural. However, a portion of the road stretch is passing through built-up and semi built-up area. The pavement is broken in most of the stretch.

Project Start Point

Project End Point

1.7 Objective of the Project:

Project aims to improve transport efficiency of the state road network, which will contribute to expansion of economic opportunities and poverty reduction. This will be realized by

1. improving the state highway network,
2. facilitating safe and appropriate road usage,
3. increasing efficiency of transport services and (iv) Enhancing GoM capacity for road asset development

Project immediate outcome will be improved accessibility to social services and markets, increased fuel efficiency, reduced travel time, accidents, vehicle emissions and better employment opportunities outside agriculture, both through improved access to economic centers and increased industrial activities in the project area.

1.8 Scope of the Project:

The proposed subprojects are part of Meghalaya Integrated Transport Program (MITP) for which the Environmental and Social Safeguard Management Framework (ESMF) has been prepared and disclosed at the websites of MIDFC and the World Bank. It is also noted that in

specific to the rural roads the ESMF guidelines delineated under PMGSY RRP II (P165402) and subsequently revised for Additional Finance in 2018 to be followed.

B. Preparation of application and supplementary reports (survey and preparation) as required for obtaining project's clearances like forest /environmental/wildlife clearances, if applicable, and presentation before expert panel committees of MoEF&CC, Govt. of India.

- Undertake the given special and additional assessments as applicable.
- Scientific and expert judgement for adding or skipping any element of assessment was apply
- Preparation of screening report for all the subprojects and Scope of Work (SoW) was define for the detail assessment if required.
- Screening report wasinclude the Environment and Social Management Plans, Health and Safety Plans including COVID 19 management plans, Stakeholder Engagement Plan, Public Disclosure, Grievance Redressal Mechanism and Resettlement Action Plan if required.
- It wasconsider but not be limited to the following:
  - Conduct a comprehensive Environmental and Social Screeningfor all the subprojects.
  - Establishing an environmental baseline for the project area.
  - Conduct detailed Environmental and Social Impact Assessment (ESIA)only for those subprojects against which need for detailed assessment has been recommended as an outcome of Screening Activity.
  - Integration of ESIA findings and ESMP budget in engineering feasibility studies.
  - Preparation of any Environmental and Social Management Plan (ESMP), Health and Safety Plans including COVID 19 management plan, Resettlement Action Plan (RAP), Tribal (Indigenous) Development Plan (TDP), Gender Action Plan; Labour Management Procedure and Stakeholder Engagement Plan (SEP) etc.
  - Preparation of application and supplementary reports (survey and preparation) required per local regulatory requirements for obtaining project's clearances like forest/environmental/wildlife clearances, if applicable, and presentation before expert panel committees of MoEF&CC, Govt. of India.
  - Conduct consultations with identified stakeholders and project-affected parties /communityfrom early project planning and design stages of the assignment.
  - Develop monitoring programme to ensure that the proposed mitigation measures are being implemented effectively.

1.9 Project Summary

After detailed engineering study of the project road such as its importance, socioeconomic profile, geometry, the need for the improvement of the road is very necessary. The improvement of road from existing single lane configuration to intermediate lane configuration will be beneficial for the commuters from safety point of view. Use of innovative technology/material to construct this road as a 'Green Highway' will maintain ecological balance of the project area. Provision for various project facilities will be useful for the

commuters as well as local people. The project has been proposed to be taken up as ITEM RATE project, based on discussion done with PWD, Meghalaya.

Table 1-1Project Salient Features

S. No.	Salient Features	
1	**Design Chainage**	0+000 to 40+130
2	**Overall Length (Km)**	40.130
3	**Large/Small Habitations (Nos.)**	14
4	**Junctions**	
A	Major Junctions (Nos.)	1
B	Minor Junctions (Nos.)	42
5	**Cross Drainage Works**	
A	Major Bridge	Nil
B	Minor Bridge (up to 30m waterway)	7
C	Minor Bridge (more than 30m waterway)	Nil
D	Total Culverts (Nos.)	239
	Pipe Culverts	224
	Slab Culverts	15
6	**Retaining Structure**	
A	Breast Wall (m)	590
B	Gabion Wall (m)	810
C	Retaining wall with gabion facing (m)	Nil
D	Toe wall (m)	700
7	**Slope Protection Measures**	
A	Hydro seeding	At all locations of Gabion wall
B	Shot Crete	To prevent cracks in vertical rocks
8	**Project facilities**	
A	Bus Shelter (Nos.)	27
B	Truck Lay bye (Nos.)	Nil
9	**Others**	
A	W Beam Crash Barrier (Km)	11.230
B	Parapet Wall (Km)	Nil
C	Water Harvesting Structure (Nos.)	Nil
D	Solar Lighting (Nos.)	Nil
E	Road Studs (Nos.)	Nil
F	Rumble Strips (Nos.)	84 Nos.
H	Road Sign (Nos.)	1685
I	Footpath (m)both side	2300

S. No.	Salient Features	
J	Paver Block (m)both	500
K	Roadside Drainage (m)	Covered Drain- 2,300 Hill Side Drain- 35,380
L	Convex Mirror (Nos.)	06
10	**Project Cost**	
A	Total Civil Cost (Cr.) with GST	112.31
B	Civil Cost Per Km (Cr.)	2.799
C	Total Project Cost (Cr.)	139.39
D	Project Cost Per Km (Cr.)	3.47
E	EIRR (%)	14.8%

1.10 Structure of ESIA Report

As per the EIA notification of the MOEF on dated 14 September 2006 & subsequent amendments, the generic structure for the EIA report shall consist of the following chapters:

The EIA report for the project road has been prepared complying country regulations and The World Bank Guidelines for Environmental Assessment. The report has been structured in the following Chapters:

Chapter -I: Introduction and Project Background

Chapter -II: Need of Environment & Social Impact Assessment

Chapter -III: Legal Framework

Chapter -IV: Description of Environment

Chapter -V: Analysis of Potential Environmental & Social Impacts & Mitigation- Measures

Chapter -VI: Environmental Monitoring Program

Chapter -VII: Additional Studies

Chapter -VIII: Resettlement Action Plan

Chapter -IX: Monitoring and Evaluation

Chapter -X: Abbreviated Resettlement Action Plan

Chapter -XI: Project Benefits

Chapter -XII: Environment and Social Management Plan

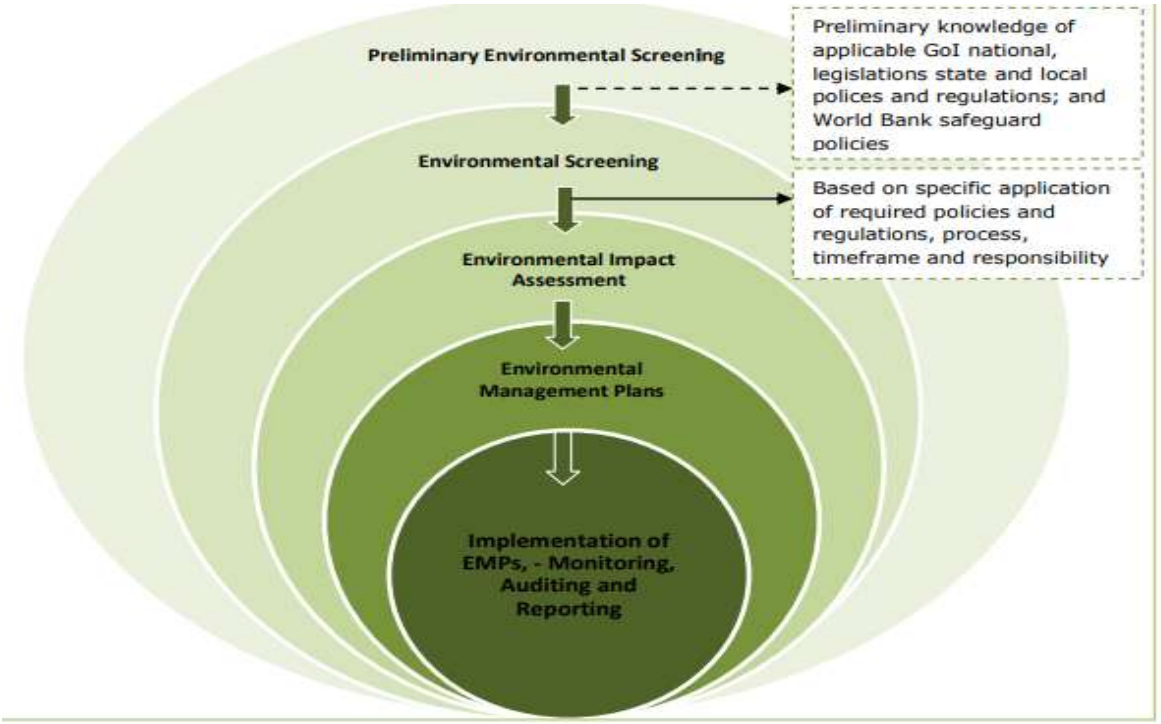
Chapter -XIII: Conclusions & Recommendations

2 NEED OF ENVIRONMENT & SOCIAL IMPACT ASSESSMENT

The project road has been assigned category "B" in accordance with World Bank's Operational Policy OP 4.01 (Environmental Assessment) and mandate the preparation of project-specific Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP). Similarly, in accordance with World Bank's Operational Policy OP 4.12 (Involuntary Resettlement), this project mandates the preparation of the Social Impact Assessment (SIA) and Resettlement Action Plan (RAP). Accordingly, detailed assessments of the environmental and social impacts have been carried out following a suitable methodology.

This ESIA shall cover, the environmental and social impacts due to the project, concerning construction-related environmental impacts, infringements with natural habitats and places of cultural heritage also in the context of 'chance-find', and impacts on local population/ community. The findings of ESIA will guide the effective development of the specific ESMP and facilitate the implementation of safeguard measures appropriately.

The approach followed for conducting ESIA study of the Project. To identify the environmental and social issues arising out of the current practices adopted for planning, design, and construction of the project roads, the environmental and social conditions along the project roads were assessed. During these visits, consultations through group discussions with local communities, road users and panchayat/ village members were contacted to understand their perceptions and needs. A standard methodology was adopted for fulfilling the ESIA requirements; key features/tasks of the methodology are detailed as follows:



Task 1: Field Reconnaissance Survey and Review of Earlier Studies The field reconnaissance survey has been carried out along the project roads to understand salient environmental and social features that are likely to cause adverse impacts, sensitive environmental and social issues via-a-vis proposed project interventions. The salient feature includes The topography of the land, road geometry Environmental features like trees, any forest area, water bodies like ponds, rivers, etc. A social and physical feature like settlement

pattern, its density, typology of buildings, especially the presence of religious buildings, land use, etc.

Experience of EIA, EMP, SIA, RAP study, as well as the implementation of EMP, was also taken into account from earlier TNRSP projects.

Task 2: Review and Assessment of Applicable Environmental and Social Regulations Various rules/regulations and guidelines applicable to the project roads vis-à-vis center (GoI), state (GoM) and World Bank statutory requirements were reviewed and referred to for assessing current environmental and social impacts that are likely to emanate.

Task 3: Delineation of Study Area for Assessment

In road projects, while the influence area may vary via-a-vis size of the road, location of the road, type of road, etc., hence, the study area was fixed based on the proposed interventions including the road sections undergoing widening and strengthening, RoW availability, structural works (culverts and bridges), presence of sensitive areas, etc. In addition to this, the project influence area (10 km buffer from the center line on either sides) for impact assessment is also considered in those areas that are directly or indirectly influenced by the project activities during construction or operation of the proposed road work such as Hot Mix plants, sand quarries, source of raw material and material transport, etc.

Task 4: Assessment of Baseline Environmental and Social Conditions This task comprises a collection of baseline data for the project road locations primarily on physical, biological and socio-economic conditions. The secondary source of information was utilized for giving a generic snapshot of socio environment features. In addition, existing environmental and social quality/features along the project roads were assessed based on a walk through surveys, public consultations, FGD's and discussions with line department officials.

Task 5: Public Consultations/ Focus Group Discussions To cover a wide range of stakeholders in the study area, corner meetings were conducted at selected places with women groups, men and road users to understand the people's perception about the project as well as their issues and concerns. Overall project features, social safeguards, issues related to women's safety and security, environmental safeguards, and enhancement measures would be implemented in the project was also discussed with the public.

Task 6: Prediction of Environmental and Social Impacts The task identified likely impacts that would arise due to the construction of project roads, through changes in the physical, biological or socio-economic environment. The assessment considered both positive and negative impacts at different stages of implementation, i.e. pre-construction, construction and operation stages of the project roads.

Task 7: Preparation of Environment and Social Management Plan (ESMP)A comprehensive Environmental and Social Management Plan (ESMP) was prepared which included mitigation measures for all the negative impacts of sub-projects and enhancement measures for positive impacts.

Task 8: Preparation of Resettlement Action Plan (RAP) Based on the impacts a suitable RAP shall be prepared to specify the procedures it will follow and the actions it will take to properly resettle/compensate affected people and communities. The objective of the RAP is to

assist the affected people in their efforts to improve their living standards or at least regain their living standards to their pre displacement levels.

Task 9: Preparation of Environmental and Social Management Budget

Based on the impact assessment for the environmental and social components a suitable budget has been estimated to compensate for the temporary and permanent impacts that are likely during the project implementation. As part of the project implementation monitoring, budgetary provision has been allotted for RAP implementation and environmental monitoring. The budget also includes compensatory afforestation measures for the loss of avenue trees due to road widening.

Task 10: Environmental Safeguard Clauses in the Bid Document

Suitable safeguard clauses have been prepared based on the ESIA, the prepared clauses shall form part of the bid document either in the General condition or Specific conditions of the contract agreement/ bid document. The prepared ESMP shall also be part of the bid document.

3 REGULATORY FRAMEWORK

The Ministry of Environment, Forest & Climate Change made it mandatory for introducing environment assessment into the planning process of road projects as well as environmental impact appraisal as per Environmental Protection Act, 1986. The MoEFCC have assigned all central and State authorities to develop policies towards protection of environment for any infrastructure development activities as per the act. The Ministry of Environment, Forest & Climate Change (MoEFCC) has overall authority for the administration and implementation of government policies, laws and regulations. In the present project the environment acts, policy guidelines of both State and Central Government will be applicable. As these acts/regulations have varying procedures, requirements depending on type of project, a detailed discussion is required in this report to study the extent of applicability, procedures and requirements to be met by the implementing authorities. The following subsections summarized the legislative framework in which the present project will be addressed with respect to the environment including social issues.

3.1 Institutional Setting

The primary responsibility of administration and implementation of the Government of India's policy with respect to environmental management, conservation, ecologically sustainable development, and pollution control rests with the Ministry of Environment, Forest & Climate Change (MoEF& CC). The MoEF& CC has a number of agencies and institutions to implement the environmental policies. Such as: Central Pollution Control Board (CPCB), MoEF& CC Regional Offices, State Pollution Control Board (SPCB) & State Department of Environment & Forests.

3.2 Acts & Regulation

The Government of India has laid down various policy guidelines, regulations, acts and legislations pertaining to sustenance of environment. The following table shows the relevant environmental legislations and implementing agencies.

Table 3-1: Applicable Acts & Regulations

Sl. No.	Act/Regulations	Main Objective	Implementation Agency
1.	Air (Prevention and Controlof Pollution) Act, 1981	To control and monitor air quality as per prescribed limits	State Pollution Control Board.
2.	The Water (Prevention and Control of Pollution) Act, 1974	To control and monitor water pollution as per prescribed limits	State Pollution Control Board.
3.	Indian Motor Vehicles Act, 1988	To check vehicles for air and noise pollution	Motor Vehicles Department, Govt. of Meghalaya.
4.	The Forest Conservation Act, 1980	To check deforestation	Forest Department GOI and Government of Meghalaya&MoEF& CC
5.	National Forest Policy, 1988	To preserve and restore biological diversity	Forest Department.
6.	Wild Life (Protection) Act, 1972	To protect and improve the overall wild life	Chief Conservator wild life, Forest Department, Meghalaya.

Sl. No.	Act/Regulations	Main Objective	Implementation Agency
7.	Environment Protection Act, 1986	To protect and improve the overall environment	Dept. of Environment and Forest, Meghalaya.
8.	Ancient Monuments and Archaeological Sites and Remains Act, 1958	Preservation of culture and historical remains	Indian Heritage Society, and Indian National Trust for Art and Culture Heritage
9.	EIA Notification, September 14, 2006	For all Development Projects	Ministry of Environment, Forest & Climate Change (MoEF& CC)
10.	National Environmental Appellate Authority Act, 1997	For Grievance Redress	Ministry of Environment, Forest & Climate Change (MoEF& CC)
11.	Integrated Waste Management	Waste management and control.	Ministry of Environment, Forest & Climate Change (MoEF& CC) and State Pollution Control Board

3.3 Clearance Requirement

During the construction stage, some of the key statutory requirements that need to be obtained by the Contractor as part of mobilization have been listed in the table given below:

Table 3-2: Applicable Acts & Regulations (Construction Phase)

S. No.	Clearance Required for	Statute under which clearance is required	Statutory Authority
1	Hot mix plants, Crushers, Batch Mix Plants & DG Sets.	Air (Prevention and Control of Pollution) Act, 1981 and Noise Pollution (Regulation and Control) Rules, 2000	State Pollution Control Board
2	Storage, handling and transport of hazardous materials.	Hazardous Waste (Management and Handling) Rules, 1989 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989.	State Pollution Control Board
3	Location/ layout of workers camp, equipment and storage yards	Environment Protection Act, 1986 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	State Pollution Control Board
4	Quarries (Aggregates, Sand & Earth)	Environment Protection Act, 1986	MoEF&CC
5	Permission for withdrawal of groundwater and for construction purpose.	Environment Protection Act, 1986	CGWB
6	Disposal of bituminous wastes	Hazardous Waste (Management and Handling) Rules, 1989	As per state norm/ Local Civic Body
7	Pollution Under Control Certificate	Central Motor and Vehicle Act 1988	Department of Transport, State Government.
8	Storage of fuel oil, lubricants, explosives, diesel etc. at construction camp.	Manufacture, storage and Import of Hazardous Chemical Rules 1989	State Pollution Control Board & PESO.

3.4 MORTH & IRC Specifications

All road works in India are to be in accordance with the MoRTH specifications for Road and Bridge works and guidelines of Indian Roads Congress (IRC). The MoRTH specifications have

special provisions towards protection of environment under Clause 501, Annexure A and the contractor is to satisfy the provisions. Apart from the Annexure A to clause 501, there are provisions for control of erosion, drainage, dust suppression, borrow area and haul road management under relevant sections. Provisions of clause 501 Annexure A, cover the environmental aspects as:

3.5 Environmental Standards and Code of Practices

All the construction work will be carried out as per the Environment standards and guidelines of MoEFCC, CPCB & code of practices of IRC. Some of the codes used during the construction phase are listed below.

5 Guidelines for use of Fly Ash in Road Embankments (IRC: SP: 58-2001)

6 Guidelines for Environmental Impact Assessment of Highway Projects (IRC: 104-1988)

7 Guidelines on Preparation and Implementation of Environment Management Plan (IRC SP 108-2015)

8 Guidelines on Landscaping and Tree Plantation IRC:SP-21-2009)

9 Report containing recommendations of the IRC regional workshops on Highway Safety IRC: SP: 27-1984

10 Recommended practice for Borrow pits for Road Embankments constructed by Manual operation IRC: 10-1961

11 Road accident Forms IRC: 53-1982

12 Guidelines for Use of Construction and Demolition Waste in Road Sector (IRC 121-2017)

13 Proceedings of International Seminar on sustainable development in 8.10.2001

14 Road Transport Highway Safety Code IRC: SP: 44-1996

15 Guidelines on Safety in Road Construction Zones IRC: SP: 55:2001

16 Guidelines on Skill Development of Workmen in Road Sector (IRC 127-2018)

17 Guidelines of WB& ADB.

3.6 Other Applicable Policies (Social Security & Labor Welfare)

Environmental and labour welfare issues during the construction stage generally involve equity, safety and public health issues. The different applicable policies are:

Table 3-3: Applicable Policies

Applicable Codes	Concerns	Remarks
The Code on Social Security, 2020	It consolidated The Employees' Compensation Act, 1923, The Employees' State Insurance Act, 1948, The Employees' Provident Funds and Miscellaneous Provisions Act, 1952, The Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959, The Maternity Benefit Act, 1961, The Payment of Gratuity Act, 1972, The Cine Workers Welfare Fund Act, 1981, The Building and Other Construction Workers Welfare Cess Act, 1996, Unorganised Workers' Social Security	Ministry of labour and Employment

Applicable Codes	Concerns	Remarks
	Act 2008.	
The Occupational Safety, Health And Working Conditions Code, 2020	It amalgamated The Factories Act, 1948, The Plantations Labour Act, 1951, The Mines Act, 1952, The Working Journalists and other Newspaper Employees (Conditions of Service and Miscellaneous Provisions) Act, 1955, The Working Journalists (Fixation of Rates of Wages) Act, 1958, The Motor Transport Workers Act, 1961, The Beedi and Cigar Workers (Conditions of Employment) Act, 1966, The Contract Labour (Regulation and Abolition) Act, 1970, The Sales Promotion Employees (Condition of Service) Act, 1976, The Inter-State Migrant workmen (Regulation of Employment and Conditions of Service) Act, 1979, The Cine Workers and Cinema Theatre Workers Act, 1981, The Dock Workers (Safety, Health and Welfare) Act, 1986 and The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.	Ministry of labour and Employment
The Code on Wages, 2019	It consolidated the provisions of four labour laws concerning wage and bonus payments and makes universal the provisions for minimum wages and timely payment of wages for all workers in India. The Code repeals and replaces the Payment of Wages Act, 1936, the Minimum Wages Act, 1948, the Payment of Bonus Act, 1965, and the Equal Remuneration Act, 1976.	Ministry of labour and Employment
Corporate Social Responsibility- Companies Act, 2013	Section 135 of the Companies Act introduces mandatory Corporate social responsibility (CSR) contributions for large companies, making it the only mandatory CSR law in the world. According to the bill, all firms with net worth above 5 billion rupees or □ 5billion (approx. $75 million), turnover over 10 billion rupees or □ 10billion (approx. $150 million), or net profit over 50 million rupees or □ 50million (approx. $750,000) are required to spend at least 2% of their annual profits of the preceding year. The law requires that all businesses affected establish a CSR committee to oversee the spending.	Ministry of Corporate Affairs

3.6.1 World Bank safeguard/ Operational policies

The World Bank policies and directives on environmental and social safeguards have adhered to the project roads. The applicability of the relevant policies of the project roads that are undergoing up-gradation (strengthening and widening) are summarized in the following table

Table 3-4: Applicable World Bank Operational policies

OP 4.01 Environmental Assessment	Help to ensure the environmental and social soundness and sustainability of investment projects. Support integration of environmental and social aspects of projects in the decision-making process
OP 4.04 Natural Habitats	Promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions.
OP 4.36 Forestry	Aims to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively for sustainable economic development and protect vital local and global environmental services and values of forests

OP 4.12 Involuntary Resettlement	Avoid or minimize involuntary resettlement and, where this is not feasible, assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing before the beginning of project implementation, whichever is higher.
OP 4.10 Indigenous People	Design and implement projects in a way that fosters full respect for indigenous peoples' dignity, human rights, and cultural uniqueness so that they i. Receive culturally compatible social and economic benefits, and ii. Do not suffer adverse effects during the development process.
Physical Cultural Resources (PCR)	OP 4.11 Assist in preserving PCR and in avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance.

Resettlement Policy Framework (RPF): Resettlement Policy Framework (RPF) consisting of national/state policies and the World Bank's operational policy on involuntary resettlement is being implemented in TNRSP-II. The frameworks provide an overview of screening of the road-projects for social impacts, the process for social impact assessment, preparation of land plan schedules, entitlements for different impact categories, institutional arrangements, information disclosure and consultations and the preparation and implementation of Resettlement Plan (RP). Land will be acquired following provisions of Tamil Nadu Highway Act, 2001 (to be amended to incorporate the provisions of RFCTLARR Act, 2013) and while determining the compensation for land, the competent authority will be guided by the provisions of Sec 26, Sec 27, Sec 28, Sec 29 and Sec 30 of RFCTLARR Act, 2013. The replacement value of houses, buildings and other immovable properties will be determined based on the latest PWD Standard Schedule of Rates (SSR) as on date without depreciation. Compensation for trees will be based on their market value. Disputes relating to ownership rights, apportionment issues, amount of compensation awarded will be referred by the Special DRO to the jurisdictional LARR Authority, to be constituted following Section 51(1) of the RFCTLARR Act, 2013.

3.6.2 Applicable Legal Framework for Social

The legal framework and principles adopted for addressing resettlement issues in the Project have been guided by the proposed legislation and policies of the GOI, the state Government of Meghalaya, PWRD Meghalaya in accordance to World Bank's OP 4.12 for Involuntary Resettlement and OP 4.10 for Indigenous People. Prior to the preparation of the Resettlement Plan, a detailed analysis of the proposed national and state policies is to be undertaken and an entitlement matrix has to be prepared for the entire program. The section below provides details of the various national and state level legislations and their applicability. A summary of applicable acts and policies is presented in the following paragraphs

3.6.3 Objectives of the Policy

The objectives of the Policy are as follows: -

18 To minimize displacement and to identify non-displacing or least-displacing alternatives;

19 To plan the resettlement and rehabilitation of Project Affected Families, (PAFs) including special needs of Tribal and vulnerable sections;

20 To provide better standard of living to Aps.

3.6.4 Policy Framework for this Project

Based on the above analysis of applicable legal and policy frameworks of the country and in consistent with World Bank's policy requirements the broad resettlement principle for this project shall be the following:

Meaningful consultations with affected persons, host communities, and concerned non-government organizations were carried out and all affected persons were informed of their entitlements and resettlement options. DP's participation in planning, implementation, and monitoring and reporting of resettlement programs were ensured.

Particular attention were paid to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, and those without legal title to land, and ensure their participation in consultations.

The livelihoods of all Affected Persons were improved or at least restored through (i) land-based resettlement strategies when affected livelihoods are land based where possible or cash compensation at replacement value for land when the loss of land does not undermine livelihoods, (ii) prompt replacement of assets with access to assets of equal or higher value, (iii) prompt compensation at full replacement cost for assets that cannot be restored, and (iv) additional revenues and services through benefit sharing schemes where possible.

Physically and economically Affected Persons were provided with needed assistance, including (i) if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities, and extension of project benefits to host communities; (ii) Transportation support and development assistance, such as land development, credit facilities, training, or employment opportunities; and (iii) civic infrastructure and community services, as required.

Affected Persons without titles to land or any recognizable legal rights to land are ensured that they are eligible for resettlement assistance and compensation for loss of non-land assets.

A resettlement plan was prepared elaborating on Affected Persons' entitlements, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget and time-bound implementation schedule.

The draft resettlement plan, including documentation of the consultation process were disclosed in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected persons and other stakeholders. The final resettlement plan and its updates was also be disclosed to affected persons and other stakeholders.

Involuntary resettlement is conceived and executed as part of a development project or program. Full costs of resettlement are included in the presentation of project's costs and benefits. For a project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the project as a stand-alone operation.

All compensation to be paid and other resettlement entitlements are to be provided before physical or economic displacement. The resettlement plan is to implemented under close supervision throughout project implementation.

Resettlement outcomes, their impacts on the standards of living of Affected Persons are monitored, it were accessed whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Monitoring reports are disclosed to DPs.

Land acquisitions for the project are done as per both State Highway Safeguard Policies and the RFCTLARR ACT, 2013 and Meghalaya RFCTLARR Rules, 2017. To meet the replacement cost of land payment of compensation in revised market rate.

All Common Property Resources (CPR) lost due to the project are replaced or compensated by the project.

The project recognize three types of Affected Persons like (i) persons with formal legal rights to land lost in its entirety or in part; (ii) persons who lost the land they occupy in its entirety or in part who have no formal legal rights to such land, but who have claims to such lands that are recognized or recognizable under national laws; and (iii) persons who lost the land they occupy in its entirety or in part who have neither formal legal rights nor recognized or recognizable claims to such land. The involuntary resettlement requirements apply to all three types of affected persons.

Cash compensation for properties belonging to the community if opted by the community, were provided to enable construction of the same at new places through the community/ local self-governing bodies / appropriate authority in accordance with the modalities determined by such bodies / authority to ensure correct use of the amount of compensation.

Compensation for trees is based on their market value. Loss of timber trees were compensated at their replacement cost while the compensation for the loss of fruit bearing trees were calculated as annual produce value for at next 15 years depending on the nature of crops/trees.

Table 3-5: Applicable Legal Framework for the entire Project

Sl.	Name of Act/ Rules	Purpose	Applicable/Not Applicable	Description	Responsible Agency
1.	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act -2013.	Fair compensation for (i) acquisition of land and other immovable assets; (ii) economic rehabilitation of all those who are affected due to land acquisition. The Act also covers the Lease Holders, Sharecroppers and Tenant.	Applicable	This Act is Applicable, as land acquisition was carried out and disbursement of compensation was made as per the Act.	Revenue Department under the respective project Districts of Meghalaya
2.	The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act	Grants Legal recognition to the rights of traditional forest dwelling communities.	Applicable	This Act is Applicable as land acquisition has not affected the rights of forest dwelling schedule tribes & other traditional forest dwelling communities.	Ministry of Tribal Affairs, GoI and Department of Tribal Welfare of State Government
3.	The Minimum Wage Act,1948	Payment of minimum rate of wages as fixed and periodically revised by the State Government	Applicable	Construction/daily wageworkers are involved and was involved in the project	District Labour Commissioner.

Sl.	Name of Act/ Rules	Purpose	Applicable/Not Applicable	Description	Responsible Agency
4.	Workmen Compensation Act, 1923	It provides for payment of compensation by Employers to their Employees for injury by accident i.e., personal injury or occupational disease.	Applicable	The Insurance Policy covers the compensation, hospitalization and transportation of workers /employees	District Labour Commissioner
5.	Inter-state Migrant Workers Act, 1979	It protects workers whose services are requisitioned outside their native states in India. Contractor who employs or who employed five or more Inter-State migrant workmen need to obtain registration under this act	Applicable	Construction workers involved in the project may or may not be from the neighboring state. Presently the construction workers are from within the state of Meghalaya.	District Labour Commissioner/ Govt. Of Meghalaya
6.	The Child Labour (Prohibition & Regulation) Amendment Act, 2016	It prohibits employment of children in certain specified hazardous occupations and processes and regulates the working conditions in others.	Applicable	No Child worker should be involved in the project. it may be noted that no child labour is engaged in the project	District Labour Commissioner
7.	Building and Other Construction Workers Welfare Cess Act, 1996	An Act to provide for the levy and collection of a Cess on the cost of construction incurred by employers.	Applicable	Project involves employment of construction workers	District Labour Commissioner
8	The Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013	Vishakha Guidelines are to be followed	Applicable	This act specially protects the rights of the women workers against any kinds of sexual harassment at the project, both at office and sites. The complaint register for sexual harassment is available at the site but no sexual incidence has been reported till date.	
9	The Equal Remuneration Rules, 1976	Equal Remuneration for identical works	Applicable	Project has not discriminated between sex, race, caste or creed in payments to the employees	District Labour Commissioner
10	The Trade Union Act, 1926	Right to form Trade Union at the Workplace	Applicable	No trade union formed within the organization	District Labour Commissioner

Sl.	Name of Act/ Rules	Purpose	Applicable/Not Applicable	Description	Responsible Agency
11	Public Liability Insurance Act 1991	Provides immediate relief to the persons affected by accidents, occurring while handling any hazardous substance	Applicable	Project has been adhering to all the relevant provisions made under the act	District Labour Commissioner
12	World Bank OP/BP 4.12 – Involuntary Resettlement	The project was not involved land acquisition though, at a very low scale widening, realignments, junction improvements, bypasses etc might adversely affect non-titleholders structures used for various purposes, livelihood of people (mainly earning their livelihood by means of petty shops and providing various services).	Applicable	Many of them have been operating from the government land. Thus, both title holders and non-title holders alike would be affected as a consequence of the project	PIU/Implementing Agency
13	Indigenous Peoples OP/BP 4.10	In the context of India Indigenous Peoples may be referred to "scheduled tribes". As per the Census of India, 2011 about 86% of the Meghalaya state belongs the Schedule Tribe. The population is distributed across 11 districts of Meghalaya.	Not Applicable	The policy on Indigenous People was not be triggered as the presence of tribal groups with close attachment to land in the project area is not established. Further, this policy is not triggered in terms of "collective attachment to geographically distinct habitats" and "institutions".	PIU/Implementing Agency
14	Bank Policy – Access to Information	The policy governs the public accessibility of information in the Bank's possession.	Applicable	The Bank allows access to any information in its possession that is not on a list of exceptions. Documents such as RPF, all ESIA and ARAPs was disclosed both by the borrower and Bank.	PIU/Implementing Agency

3.6.5 Environmental Categorization:

The proposed project is classified as Category B as its potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are expected to be less adverse than those of Category A projects. These impacts are site-specific and mostly reversible in nature; and in most cases mitigatory measures can be designed more readily than for Category A projects.

3.6.6 Social Categorization:

There are 8 identified sub-projects 4 are urban and 4 are rural. All activities under these sub-projects are limited to the available RoW, thus no land acquisition and resettlement and rehabilitation are envisioned for these activities. All the activities in the urban or rural projects will not impact the tribal population as it is limited to the existing land area already available. Further, “collective attachment to geographically distinct habitats” and “institutions that are separate from those of the dominant society and culture is not present in the project impact area. Thus, the World Bank OP 4.10 does not trigger for these projects. However, impacts on the livelihood of vendors, petty shopkeepers and likes cannot be fully avoided and thus need to be mitigated in accordance with the policies of the World Bank (OP 4.12).

As per World Bank’s guidelines of Categorization for Involuntary Resettlement, this sub-project is categorized as Category B as the total permanently impacted population is less than 200 PAPs in all the sub-projects. Thus, an Abbreviated Resettlement Action Plan (ARAP)is prepared on the possible impacts identified and measured in SIA and mitigation measures as provisioned in the Entitlement Matrix of the Resettlement Framework and is as per the Guideline and Template of ESMF. The ARAPis disclosed and implemented in the project and the compensation and R&R assistances will be released to the displaced families before the Civil Construction starts.

As per World Bank’s guidelines of Categorization for Indigenous People Impact this sub-project is categorized as Category C. As per the guidelines no specific action is required, still the mitigation methods are reflected in the related plans such as an Abbreviated Resettlement Plan, ESMP and Gender Action Plan.

4 DESCRIPTION OF THE PROJECT

4.1 Project Background

The Public Works Department (PWD) of the Government of Meghalaya is the implementing agency for improvement/rehabilitation of roads and construction of bridges under the World Bank funded MITP. With this background, Public Works Department (PWD) of the Government of Meghalaya has planned to rehabilitation/up-gradation of existing roads and construction of missing links / bypasses / Bridges in the stretches from Nongstoin-Maweit (35km), **Umsning-Jagi Road (40km),**Borsora (6.50 Km), Cherragoan (6.80 Km), Bagli (4.00 Km) and Nongpoh-Umden-Sonapur (25.0km).

The Public Works Department (PWD) of the Government of Meghalaya as employer executing agency has awarded the services to M/s Consulting Engineers Group Ltd. in JV with M/s C.E. Testing Company Pvt. Ltd. for carrying out Consultancy Services for Preparation of Detailed Project Report (DPR) for project road.

4.2 Project Description: Umsning to Jagi Road

Umsning- Jagi Road corridor (SH-8) section has a length of 40 km in the district Ri-Bhoi of Meghalaya state. The project road starts from the junction with National Highway - 6 /Asian Highway. The NH-6 is a Jorabat to Shillong stretches and it also part of the Asian Highway. It is mainly connected between the cities Guwahati to Shillong. The project scope ends at Km 40.00 of SH-8 near Sonidan town.

Traffic is expected to increase on this route, especially passenger vehicles, heading towards Shillong (& nearby areas) that may divert via Umsning-Jagi Road after proposed improvement of Umsning – Sonidan (40 km) and when development of Sonidan-Jagi Road section (40 km) will becompleted.

4.3 Socio-Economic Environment

Umsning- Jagi Road corridor (SH-8) section has a length of 40 km in the district Ri-Bhoi of Meghalaya state. Meghalaya is predominantly a tribal state and a majority of its population resides in villages. The total population of Meghalaya was about 2,966,889 out of which 1,491,832 were males (50.28 %) and 1,475,057 (49.71%) were females. In RiBhoi district, total population 2, 58,840 consisting of 1, 32,531 males and 1, 26,309 females. Sex ratio in the project district RiBhoi is 953 which is less than the overall state sex ratio of 989. Meghalaya is one of the well literate states in India.

The villages and towns situated close to the project alignment will be directly affected by the project. Total population of directly affected towns/villages along the project road, is 1, 45,461 persons. The sex ratio is 942 females per 1000 males. 21.8% is the child population out of the total population. Most of the population (88.5%) belong to ST category. 73.8% persons out of total population are literates. There are 42.4% total workers and 57.6% are non-workers among total population.

Umsning is the major town of the project road and Mawkhap, Rilong, Sohpetbneng, Umlaiteng, Mawhati, Umsohlait and Sonidan are among small habitats along the project road.

4.4 Traffic Studies and Analysis

Traffic Surveys were conducted from 14th to 17th, December 2021, at Sonidan and 13th to 20th December 2021, at NH-27.Entire project road is considered as a single homogenous section. Traffic data in terms of vehicles and PCU for 3-days and 24 hours is given in Figure 4-1. It is assumed that the traffic on an average will grow by 10% by the yeat 2040.

Figure 4-1ADT Umsning-Jagi Road (December 2021)

Categories	ADT (UP)		ADT (DN)		ADT (Both Direction)	
	Vehicles	PCU	Vehicles	PCU	Vehicles	PCU
2 Wheeler	30	15	41	21	71	36
3 Wheeler	11	11	15	15	26	26
Car	94	94	150	150	244	244
Mini LCV	45	45	71	71	116	116
Mini Bus	-	-	1	2	1	2
Standard Bus	2	6	2	6	4	12
LCV - 4 Tyre (Mini Truck)	2	3	2	3	4	6
LCV - 6 Tyre	1	2	2	3	3	5
2-Axle	9	27	6	18	15	45
3-Axle	2	6	2	6	4	12
MAV (4 to 6)	-	-	-	-	-	-
OSV (7++ Axle)	-	-	-	-	-	-
HCM/EME	-	-	-	-	-	-
Tractors With Trailer	-	-	-	-	-	-
Tractors Without Trailer	-	-	-	-	-	-
Bi-Cycle	13	7	18	9	31	16
Cycle-Rickshaw	-	-	-	-	-	-
Animal-Drawn	-	-	-	-	-	-
Hand-Drawn	-	-	-	-	-	-
Exempted Vehicle	-	-	-	-	-	-
Total Slow Moving Vehicles	**13**	**7**	**18**	**9**	**31**	**16**
Total Fast Moving Vehicle	**196**	**209**	**292**	**295**	**488**	**504**
Total Commercial Traffic	**16**	**44**	**15**	**38**	**31**	**82**
Total Traffic	**209**	**216**	**310**	**304**	**519**	**520**

4.5 Engineering Surveys and Investigations

The following survey and Investigation work has been carried out for preparation of Detailed Project report.

4.5.1 Inventory Surveys

The road inventory data collected in August, 2021. Some data on the pavement and land width available has been collected from PWD Meghalaya. The inventory of road includes kilometer wise information's regarding type of terrain, adjacent land use pattern, location of habitations along the road, carriageway and shoulders width and surface type, height of embankment/cutting, road side drains and type, details of road side furniture, right of way, general drainage conditions, etc.

The road inventory data collected are compiled in Road Data Inventory Sheet which is given in Volume-II.

Existing road is single lane type. Existing pavement is Flexible which has suffered severe damage due to non-maintenance of existing road for long time.

4.5.2 Topographic Surveys

Topographic survey is conducted using Aerial Mobile LiDAR (Light Detection and Ranging). Aerial based surveys was used as the primary source of topographical data. In shadow areas such as invert levels below culverts, where LiDAR or better technologies could not survey accurately, traditional methods of Total Station/ Auto Level were used to complete the survey.

4.5.3 Pavement Condition Surveys

The condition of existing pavement has been assessed by visual inspection in August, 2021. Entire bituminous surface has stripped away as a result of water accumulation for a long period. Existing road has loose coarse aggregates from the BT layer and loose aggregates from the underlying granular layer. Existing road is not motorable, represents "Poor" condition.

4.5.4 Pavement Roughness Survey

The Roughness Survey was not necessary due to poor condition of the existing road.

4.5.5 Hydrological Investigations and Studies

There are in all seven (7) nos. of bridges which seems to be structurally fair in condition & hence proposed to be retained with rehabilitation. The terrain where bridges are located have Hill on one side and valley on the other. As per the local enquiry & looking at the stream across the bridge the vent provided at the bridge portion seems sufficient enough to cater the discharge coming across All the bridges are having a width of more than 7m and hence widening of the same is also not required.

4.5.6 Existing Cross Drainage Structures

Bridges

There are 07 Nos. existing minor bridges on the project road. The types of superstructures for the minor bridges are of RCC Slab type

Culverts

There are 239 existing culverts comprising of 224 nos. of pipe culverts and 15 nos. of slab culverts which are generally found structurally safe.

4.5.7 Material Investigation

Soil and Materials testing for the project road were carried out to assess their suitability for the project. Materials investigations were performed to identify potential sources of materials for construction. Field and laboratory investigation of representative samples from quarries/borrow areas for soil and aggregates were carried out to determine their suitability for construction purposes.

4.6 Engineering Designs and Improvement Proposals

The improvement proposals essentially includes road widening, design and strengthening of pavement with all ancillaries such as the improvements of existing geometrics, new pavement design with maximum utilization of available material, provision of roadside drainage and sub-surface drainage, widening and reconstruction of culverts and bridges, improvement of junctions and project facilities, provision of slope protection measures, retaining structures, road marking; signs and other safety devices etc. to ensure safety of all road users (motor vehicles, animal drawn vehicles, cyclists, pedestrians and animals).

During this, maximum care has been taken to fit in the required cross section and project facilities with minimum land acquisition to reduce adverse environmental impacts.

4.6.1 Design Standards

Most part of the project road is proposed for up gradation to Intermediate Lane configuration. For this configuration design standard for improvement of geometrics have been adopted as set out in IRC: 52-2019 ‘Guidelines for the alignment survey and Geometric design of Hill Roads” taken as base document. Other important design standards and specifications which will be taken for the Project Road are given in below:

Table.4-1: Codes for Specification

S. No.	Feature	Terrain	
		Mountainous	**Steep**
1	**Design speed (km / hr)**		
	(i) Ruling	50	**40***
	(ii) Minimum	40	**30***
2	**Carriage way width**		
	Carriage way width for Two Lane (m)	7	7
	Carriage way width for Intermediate Lane (m)	5.5	5.5
3	**Width of shoulder (m)**	Hill side-1.0	Hill side-1.0
		Valley side-1.0	Valley side-1.0
4	**Widening of Pavement at curve for Intermediate Lane (m)**		
	(i) Radius up to 40 m (**Note*)**	1.2	1.2
5	**Camber (%)**		

S. No.	Feature	Terrain	
		Mountainous	**Steep**
	(i) Bituminous	2.5	2.5
	(ii) Cement concrete	2	2
	(iii) Gravel	2.5	2.5
	(iv) Earth	3	3
6	**Minimum radii of horizontal curves (m)**		
	(i) Ruling	80	50
	(ii) Absolute	50	30
7	**Super elevation**		
	(i) Maximum (%)	10	10
	(ii) Minimum	equal to camber	equal to camber
8	**(a) Sight distance (m)**		
	(i) For Minimum design speed (30kmph)	30	
	(b) Intermediate Sight distance		
	(i) For Minimum design speed (30kmph)	60	
9	**Vertical Gradient (%)**		
	(i) Ruling	5	6
	(ii) Limiting	6	7
	(iii) Exceptional	7	8

40*, 30*: Design speed is considered 40kmph and 30kmph for the project road. Design speed of 20 kmph is considered at locations having constrained ROW where scope to improve design speed is limited.

Note*: Extra widening is provided on sharp curves with radius less than 40m. For all curves above 40m radius extra widening is not provided due to constrained ROW. The requirement of extra widening is balanced by hard shoulders provided on either side of paved section. Additionally all required safety measures shall be proposed at such locations.

4.6.2 Widening Scheme, Land Use and Typical Cross Section

A. Widening Scheme

Based on traffic scenario and present road condition, the development proposal for the road project is being proposed to intermediate lane type road with concentric widening considering limited right of way throughout.

B. Land Use

The existing project road has a right of way ranging from 5.5m to 13.0 m. Utmost care has been taken to minimize the corridor of impact during design of alignment.

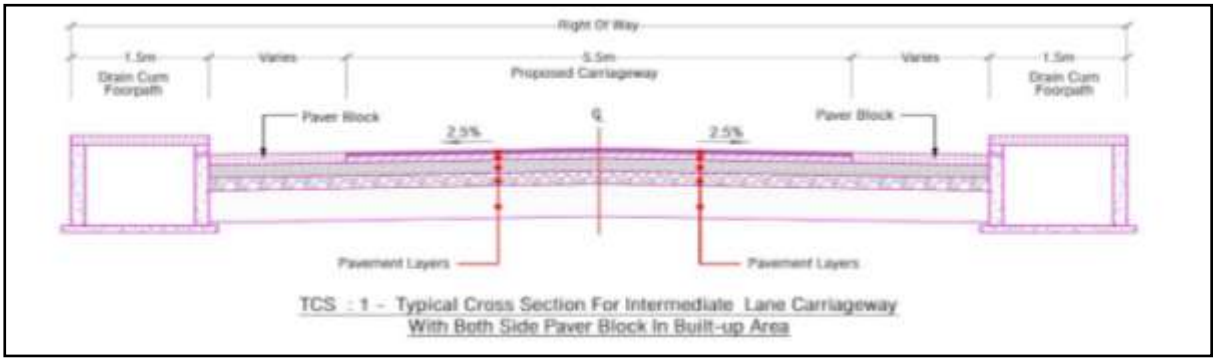
C. Typical Cross Section

The Typical cross section summary for the complete project stretch is shown in the table below:

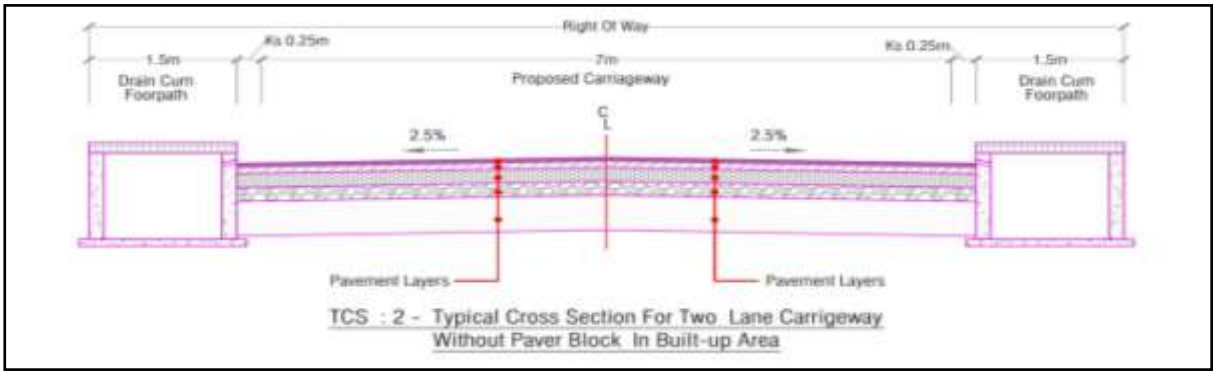
Table 4-2: TCS Summary

S. No	TCS Type	Length (in m)
1	TCS 1	250
2	TCS 2	900
3	TCS 3	5430
4	TCS 4	17630
5	TCS 4A	90
6	TCS4B	100
7	TCS 5	11850
8	TCS 5A	70
9	TCS 5B	200
10	TCS 6	1830
11	TCS 7	1680
12	TCS 7A	100
Total Length		**40.13**

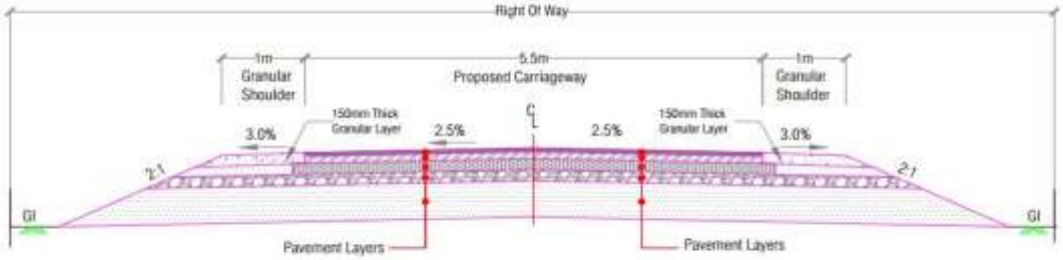
Typical cross sections (TCS) for various configurations proposed in built up area and open country area in rolling/hilly terrain are shown below**.**



TCS : 1 - Typical Cross Section For Intermediate Lane Carriageway With Both Side Paver Block In Built-up Area

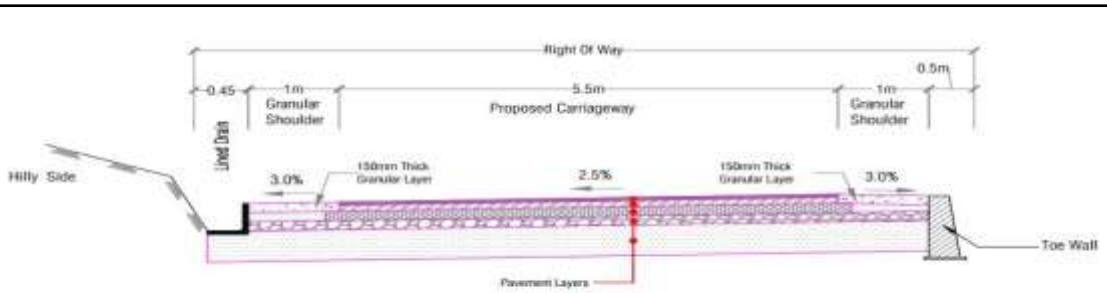


TCS : 2 - Typical Cross Section For Two Lane Carrigeway Without Paver Block In Built-up Area

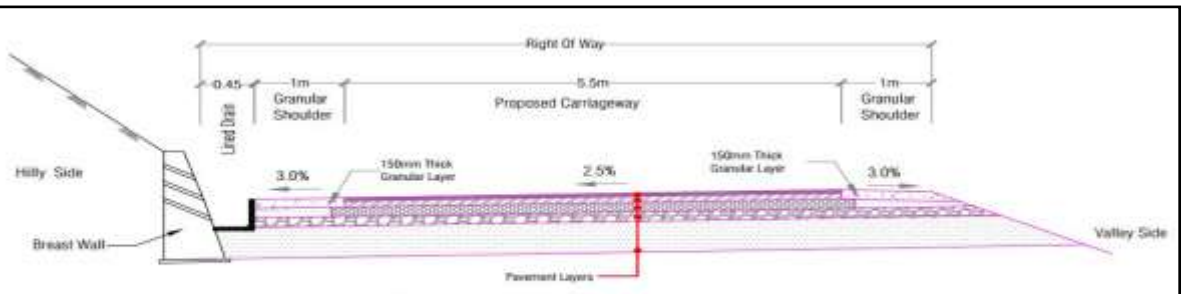


TCS : 3 - Typical Cross Section For Intermediate Lane Carriageway With Both Side Earthen Shoulder In Embankment Section

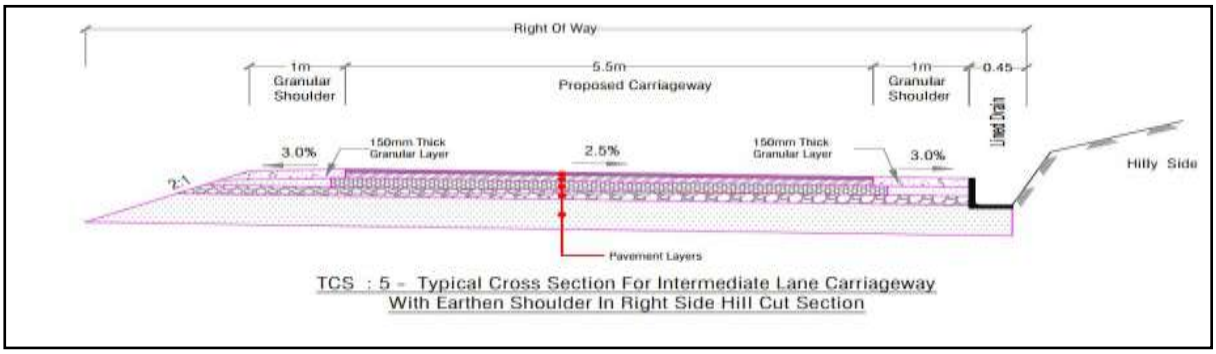
TCS : 4 - Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Left Side Hill Cut Section



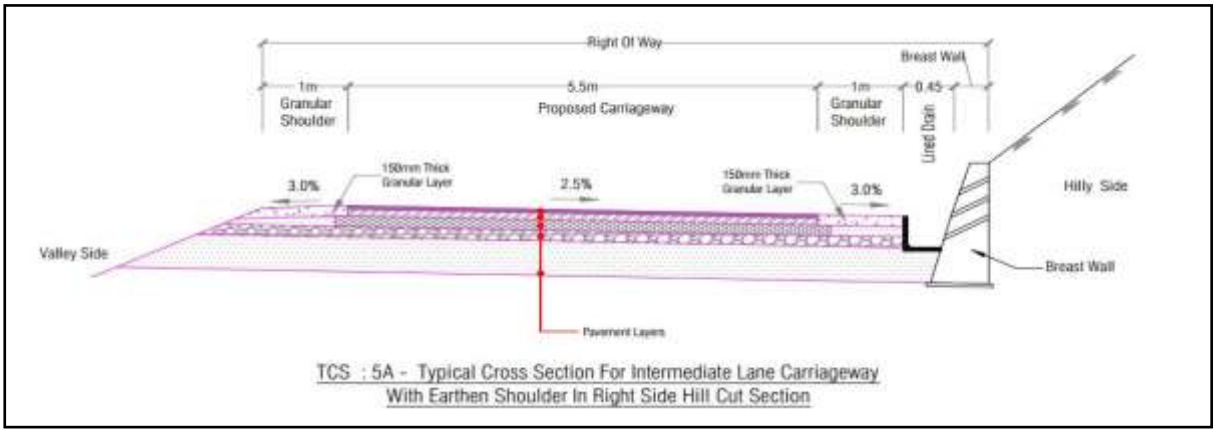
TCS : 4A - Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Left Side Hill Cut Section



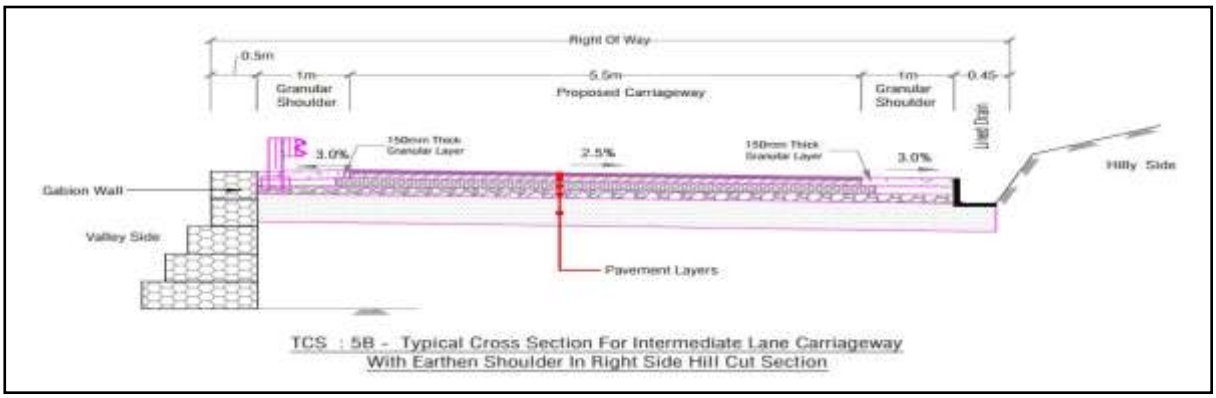
TCS : 4B- Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Left Side Hill Cut Section



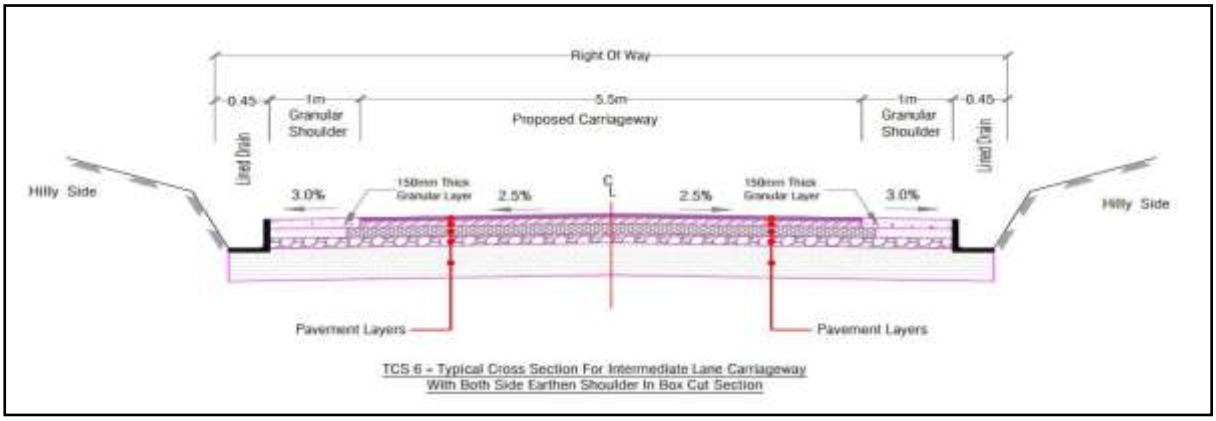
TCS : 5 - Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Right Side Hill Cut Section



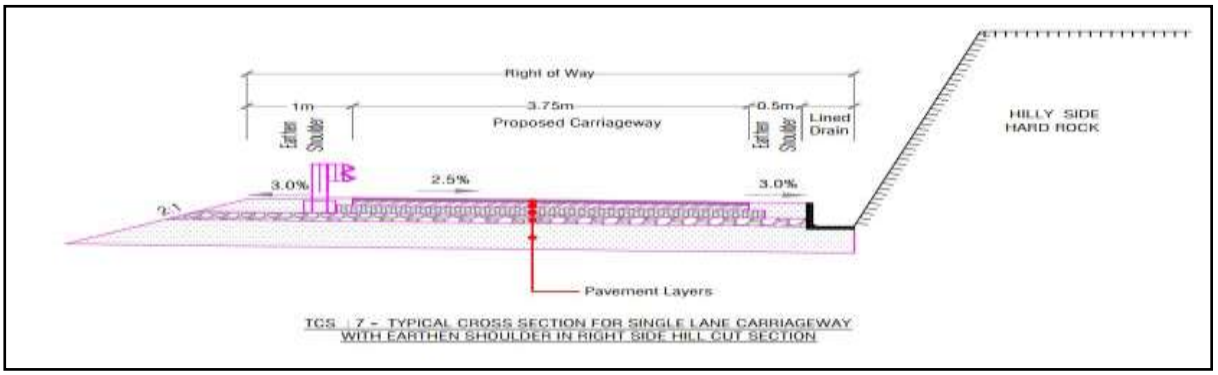
TCS : 5A - Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Right Side Hill Cut Section



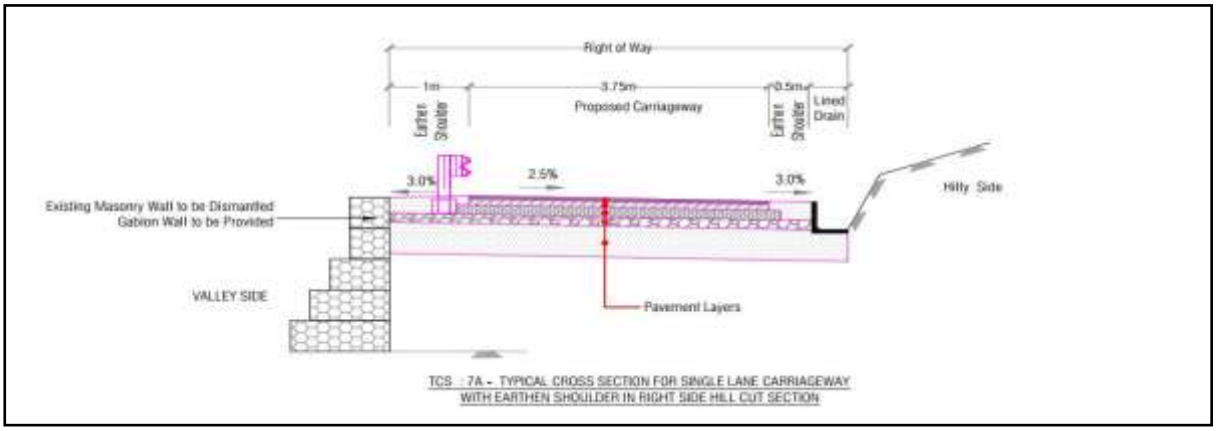
TCS : 5B - Typical Cross Section For Intermediate Lane Carriageway With Earthen Shoulder In Right Side Hill Cut Section



TCS 6 - Typical Cross Section For Intermediate Lane Carriageway With Both Side Earthen Shoulder In Box Cut Section



TCS : 7 - TYPICAL CROSS SECTION FOR SINGLE LANE CARRIAGEWAY WITH EARTHEN SHOULDER IN RIGHT SIDE HILL CUT SECTION



TCS : 7A - TYPICAL CROSS SECTION FOR SINGLE LANE CARRIAGEWAY WITH EARTHEN SHOULDER IN RIGHT SIDE HILL CUT SECTION

4.6.3 Geometric Improvement

Horizontal and vertical profile of the existing road is deficient in many aspects at numerous places. Deficiency in other geometric features such as cross slope, super elevation etc. has also been taken care of while designing or widening of existing road.

In the existing alignment there are about 890 Nos. of horizontal curves on existing road against which total 722 Nos. horizontal curves has been proposed after geometric correction as per specification. Many curves are introduced with transition lengths to improve geometry.

As design speed for rolling terrain (Urban Area) and steep terrain is taken as 40 km/hr and 30 km/hr respectively, At sharp curve locations height of hill cutting is enormous or height of retaining walls is very high which restrain improvement of these curves to 30 m radius. At these curves design speed is also reduced to 20 kmph because of restricted right of way and sharp curves. These curves are improved for maximum possible extent within the available ROW.

The vertical geometry in plain terrain of the project road is proposed as per IRC 73. However, in steep terrain, the maximum ruling gradient of 6%, the limiting gradient 7% in short length up to 100 m has been introduced in compliance IRC code.

4.6.4 Junctions

The existing 01 No. of major junction at start of the project road and 42 Nos. of minor junctions are proposed to be developed and the details of the same is shown in the table below,

4.6.5 Drainage

To ensure effective drainage of water, road side drainage system has been proposed throughout the project stretch. The details of the roadside drainage is shown in typical cross section and drawing volume. Trapezoidal drains made of geo cell with PCC have been proposed at the hill

side and rectangular drains on valley side. The summary of roadside drainage is shown in the table below,

Table4-3:Summary of Proposed Drain

S. No.	Type	Length (m)
1	Cover Drain Both Side	2300
2	Hill side Drain	35380

4.6.6 Pavement Design

The pavement design has been carried out for flexible pavement as per IRC: 37-2018 guidelines. It is recommended to remove the existing bituminous layer and use the treat the existing Granular material as part of new GSB and so that laying of new GSB layer can be avoided. This approach is subject to existing granular thickness being 200 mm and subgrade CBR being 8%.

Reconstruction with new subgrade will have to be done existing subgrade has a CBR less than 8%. Where granular thickness is less than 200 mm, new GSB layer of 100 mm will be provided.

Table 4-4: Recommended Pavement Design

Design Traffic in msa	Design CBR	Bitumen Grade	Case	Pavement Layer Thickness				
				BC (mm)	DBM (mm)	WMM (mm)	GSB (mm)	Total Thickness (mm)
5	8%	VG 40	Widening/ reconstruction[1]	30	50	150	150	**380**
			Granular thickness > =200 mm[2]	30	50	150	-	**230**
			Granular thickness < 200 mm[3]	30	50	150	100	**330**

[1] From km 23.000 to 27.4000, use existing granular layers as Subgrade after Loosening and Recompacting

[2] Applicable from km 4.000 to 19.000, and km 27.400 to 40.000.

[2] Applicable from km 0.000 to 4.000, and km 19.000 to 23.000.

4.6.7 Cross Drainage Structures

A. Bridges

There are 07 nos. of minor bridges on the project road all of which are in sound condition. These bridges are proposed to be retained with minor rehabilitation

B. Culverts

Out of the 239 nos. of existing culverts, 224 are Pipe Culvert & 15 are Slab culvert which are generally found structurally safe and have been proposed for Widening with Rehabilitation.

4.6.8 Erosion Control and Land Slide Correction

Stability of slopes is important for hill road. Disturbance can occur due to erosion caused by rainfall and run-off and consequent slides. Therefore slope stability and erosion control becomes very vital for control and prevention of landslides/slips.

A. Gabion Wall

For land slide correction, the increase of resisting forces of a slide surface is proposed by placing the gabions at the toe of slides to improve the stability of slopes by their dead weight. The provision of gabion acts as an energy dissipation technique in order to help to retard the flow of water and reduce the surface erosion of the slope, to a certain extent. Summary of Gabion walls is given below

Table4-5: Summary of Gabion walls

S. No.	Type of Protection wall	Length (m)
1	Length of Gabion Wall (LHS)	670
2	Length of Gabion Wall (RHS)	140
Total length (m)		810

B. Breast Wall

Other areas where hill slopes are made of soft and highly weathered rocks, earthen boulders etc. and the cut slopes fail by slumping, sliding and toe failures due to erosion. Such spots are identified and toe protection of slopes is proposed by constructing the breast walls. Summary of Breast walls is given below

Table 4-6: Summary of Breast walls

S. No.	Type of Protection wall	Length (m)
1	Length of Breast Wall (LHS)	370
2	Length of Breast Wall (RHS)	220
Total length (m)		590

C. Toe Wall

Toe wall is provided on the earthen shoulder edge of valley side of the project road where the existing slope does not allow construction of embankment and the average depth is less than 1.5 m and the road is to be retained by means of a solid protection work. The details of the Toe wall is given below

Table 4-7: Summary of Toe wall

S. No.	Type of Protection wall	Length (m)
1	Length of Toe Wall (LHS)	220

2	Length of Toe Wall (RHS)	480
Total length (m)		700

In addition to the above retaining structures, slope protection measures are provided in the form of Hydro seeding to protect the hill slope with soft and highly weathered rock.

4.6.9 Road Appurtenances

A. Road Accident Data

Accident Data on the project road has been collected. It is observed that 1 No. of accident was recorded in the year 2020 which was because of over speeding.

To increase road safety, improvement in the existing road geometry and provisions for safety appurtenances such as safety barriers, road sign, road markings, delineators etc. have been taken. The details of such provisions are shown in the section below,

B. Road Side Crash Barrier

W-beam crash barrier is proposed in the project road at locations where sharp curves, road side deep valleys, sections with lower sight distance etc. are observed. The total length of W-beam crash barrier is about 11230 m.

C. Rumble Strip

Rumble strip along with requisite sign boards has been proposed at 84 Nos. of locations which will further warn commuters regarding speed restrictions.

D. Road Sign

Signage plans showing the guide signs, mandatory/regulatory, cautionary/warning, informatory signs at all appropriate locations have been developed. All sign shall have retro-reflecting sheeting. The summary of the road signage is shown in the table below,

Table 4-8: Details of Road Signage

Type of Signage			Total
Cautionary (Including Chevron signs)	**Informatory**	**Mandatory**	
1376	76	233	1685

E. Road Marking

Pavement marking with retro reflective thermoplastic paint is proposed for road center line, carriageway outer edge, bus bays locations and chevron marking, stop marking, zebra crossing marking, chevron sign at junctions. These reflective pavement markings will guide the vehicular traffic in maintaining lane discipline.

F. Road Fencing

Road fencing is provided near ‘St. VianNeys Sec. School’ at 32+000 Km on left side of project road to restrict school children segregate the traffic.

4.7 Project Facilities

The project facilities proposed along the project stretch are shown in the section below,

A. Bus Shelters

Bus-shelters without bus bay have also been proposed at 27 no. of locations near the built up areas:

B. Truck Lay Bye

No Truck Lay Byes is proposed in the project road.

C. Drain cum Footpath

Drain cum footpath facility on both side of project road has been provided in urban areas for the safety of pedestrians in 2300 m length

D. Paver Block

Paver Block on both side of project road has been provided in in 500 m length.

E. Convex Mirrors

06 Nos. of Convex Mirrors areprovided to eliminate blind spots and to provide people with a good overview of their surroundings.

4.8 Safety Measures

The project road is a hill road and mostly Mountainous and steep terrain having sharp curve geometry. Proposals of road geometry has been made to maximum improvement with in minimum land acquisition and minimum losses to environment, social and biological environment.Proposals are made on maximum 40kmph and 30 kmph design speed which avoid vehicles to loss of control on such type of hill roads. Suitable safety measures in the form of safety barriers along valley side has been proposed throughout the hilly terrain of the project stretch. For lane decision making, thermoplastic reflective road markings, traffic signage, has been proposed to ensure night visibility.

4.9 Traffic Management during Construction

Traffic management during construction in rolling, hilly terrain, traffic management for cross drainage structure is prepared as per IRC: SP: 55-2014 and detailed in Chapter No. 10 of the Main DPR Report.

4.10 Construction Management

4.10.1 Construction Material Requirement

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

been carried out to explore the availability of suitable construction material and likely extent of usage in embankment and different pavement courses.

For improvement work as well as for new carriageway / bypass the list of materials includes the following:

- Granular material for lower sub-base works.
- Crushed stone aggregates for upper sub-base, base, surfacing and cement works.
- Sand for filter material and cement, concrete works, sub-base and filling material.
- Borrow material for embankment, sub grade and retaining wall back filling.
- Manufactured materials like cement, steel, bitumen, primer coat, tack coat, fly Ash etc. for other related works.

4.10.2 Aggregate

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

4.10.3 Borrow Earth

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

Table 4-9: Details (Source) and Quantity of Borrow earth

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

Source: Material Report

4.10.4 Water Requirement

There are number of rivers and streams crossing the project road. Sources of water will not be problem for the project. Requirement of water for the project will not be hindrance to the local people around the project road. Total water required for the project road is 2.5x10^5 kl; of this approximately 55,000 kl will be utilised for domestic purpose (assuming 220 persons being engaged for 36 months consuming 70 liters per person per day).

4.10.5 Materials Requirement

Total material requirement for this project is given below.

Table 4-10: Material requirement for the project road

Material	Quantity	Unit
Aggregate	400000	Cum
Sand	25000	Cum
Cement	15000	ton
Steel	3500	ton
Bitumen	5100	ton

4.10.6 Manpower Required

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

4.11 Green Highway Concept

4.11.1 Concept

A green highway is a new concept of road construction with integration of transportation functionality, resource efficiency and ecological sustainability that makes it different from conventional highway. This environmental approach is used throughout the planning, design, and the construction which results into a highway that will benefit transportation, the ecosystem, public health and surrounding communities. The aim of this concept is to develop eco-friendly National Highways with the participation of the community, farmers, NGOs, private sector, institutions, government agencies and the Forest Department for economic growth and development in a sustainable manner. The concept of the green highway and its application to our project road is briefly described below,

4.11.2 Conservation and Ecosystem Management-

The amount of tree within toe line due to widening of highway is 439 trees which needs to be cut. These trees will be compensated through aforesttionalong the project stretch to restore the green cover. No wildlife will be harmed due to construction of this highway. In this way, it will also play a vital role in minimizing the effect on surrounding ecology. Also slope protection measures is proposed along the project stretch. The concept and provision of the same is described below,

4.11.3 Slope Protection Measures

In addition to the retaining structures like gabion wall, breast wall and retaining wall, slope protection measures are provided to ensure stability of hill slope during and after the construction of project road. This measure is particularly used in climate resilient roads/ hill roads.

Such measures are the use of vegetation, either alone or in conjunction with civil engineering structures such as small dams, wall and drains to manage water and debris thereby reducing instability and erosion on slopes.

Slope protection measures are to be provided along the project stretch in the form of erosion blanket with shrub plantation, Hydro seeding, interlink chain mesh with grass strips.

4.11.4 Hydro seeding

Hydro seeding involves adding a mixture of grass seed, fertilizer, mulch and soil additives to a tank, then applying it to the soil via a high-pressure distribution system that combines all the ingredients to form a slurry and sprays it on the soil with a hose. The slurry also includes an organic “tackifier” (glue) that helps the seed stay in contact with the grass.In the project road, Hydro seeding is proposed at locations where gabion walls are proposed.

4.11.5 Shotcrete

Shotcrete is mortar or very fine concrete deposited by jetting it with high velocity on to a prepared surface. The impact created by the application consolidates the concrete. Shotcrete process requires less formwork and can be more economical than conventionally placed concrete. Shotcrete is applied using a wet- or dry-mix process.

In the project road, Shotcrete is provided in order to prevent cracks in Vertical rocks.

4.11.6 Lifecycle Energy and Emission Reduction

With the improvement in existing road, more number of vehicles will prefer to travel to Shillong and south of Meghalaya from north east part of Meghalaya via this route.

By adopting green highway concept the use of construction material like cement, aggregate, bitumen, sand will be minimized which will further reduce the heat and carbon emission.

4.11.7 Recycle, Reuse

Recycle- The existing bituminous material is to be scrapped and reused in the new pavement after proper recycling.

Reuse- This aims at maximum utilization of cutting materials in the new pavement as well as structures. Cutting material is proposed to be used in construction of different layers of pavement, slope protection works and safety barriers etc.

5 DESCRIPTION OF ENVIRONMENT

5.1 Introduction

The present chapter describes the baseline environmental conditions of the project road. It comprises both secondary information as well as primary information collected through baseline studies, data collection and field surveys.

Details of the baseline environmental parameters are required for decision making for the project design, implementation and operation from the environmental point of views. The data has been collected from the primary surveys and secondary sources. It is essential to establish the base line environmental status of the physical, natural and socio-cultural environmental parameters along the project roads and within the project influence area of 10 Kms.

The baseline condition describes the state of the existing environment before the onset of the proposed development work. The collection of baseline information on biophysical, social and economic aspects of the project area is the most important reference for conducting Environmental Screening and Preliminary Environmental and Social Impact Assessment study. The description of existing environment includes the characteristic of area in which the activity of the project road would occur and cover area affected by all impacts. The existing baseline conditions have been analysed based on secondary information/data collection with regard to air quality, water quality, noise, soil, ecology & biodiversity and socio- economic aspects and secondary data/information collection from published authentic sources and various government agencies. Efforts have been made to collect the latest information both at regional as well as local level especially along the project roads alignment. The existing baseline data and analysis around the project road covering both districts are presented in the following sections.

5.2 Scope of the ESIA/ESMP Study

The scopes of the EIA/EMP study are: -

- Baseline status of environmental parameters.
- Identification of the potential impacts during pre-construction, construction and operation phases.
- Developing mitigative measures to sustain and maintain the environmental scenario.
- Providing compensatory developments wherever necessary, including plans for highway side tree plantation.
- Preparation of Environmental Management and Monitoring Plan.
- Screening, scoping and consultations with public, experts in various fields, non-government organization (NGOs) etc.
- Review of policies and legal framework.

The area of direct influence is confined in a linear fashion along the corridor, where the construction activities take place. The area of direct influence of 1 Km on either side of PRoW has been considered. Secondary data have been collected within 10 km aerial distances.

5.3 Data collection and Study area

A study area of 10 km radius (indirect area of impact) from the project road was considered for secondary data collection. Primary data has been collected within 500 meters on both sides of the proposed alignment (direct area of impact). Secondary data were collected from published reports, research papers, working plans, and different websites

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.

Total land required for the project road is 110Ha.

5.3.1 Meteorology:

Three seasons observed in this state are written below:

As per the Kalitaet.al.(2020), the state of Meghalaya has four distrinctseason viz.

Winter season- It includes the months of January and February.

Pre Monsoon season consists of March, April, and May.

Monsoon season is being from June to September

Post-Monsoon includes the rest of the months: October, November, and December

In some places in Meghalaya, annual average rainfall has crossed the 12,000 mm (470 in) and maximum temperature is around 28 °C. Because of high elevation, Shillong area experiences low temperatures and on the other hand, Garo Hills region with lower elevations experienceshigher temperatures.

Ri-Bhoi District:

The climate in this area is per humid subtropical, which is directly influence by the South West Monsoon. Originally from Bay of Bengal and Arabian Sea. The whole year can be divided into four seasons as described above. The summer season(Pre Monsson and Monsoon) extend from the last part of March to Mid-May, is characterized relatively high temperature, occasionally thunder storm and high wind velocity. The rainy season (Monsoon) commence with the onset south west monsoon in April/May and last up to October/November, though it rains intermittently for the whole year but this is the wettest period of the year. The rainy season is followed by Post monsoon seasonwith sharp decline of temperature then the winter season

start which is extend to the start of March. This is the coldest season of the year, but the winter is not that severe. The average rainfall in this area is 1000mm to 2500mm.

- **Rainfall**

UmsningJagi road experiences highest rainfall in the months of June-August. Also, there are certain streams passing through project area.So, during this time span there is a high chance of landslides and flash floods in this area.

The average rainfall of Umsning is shown in Figure 5-1.

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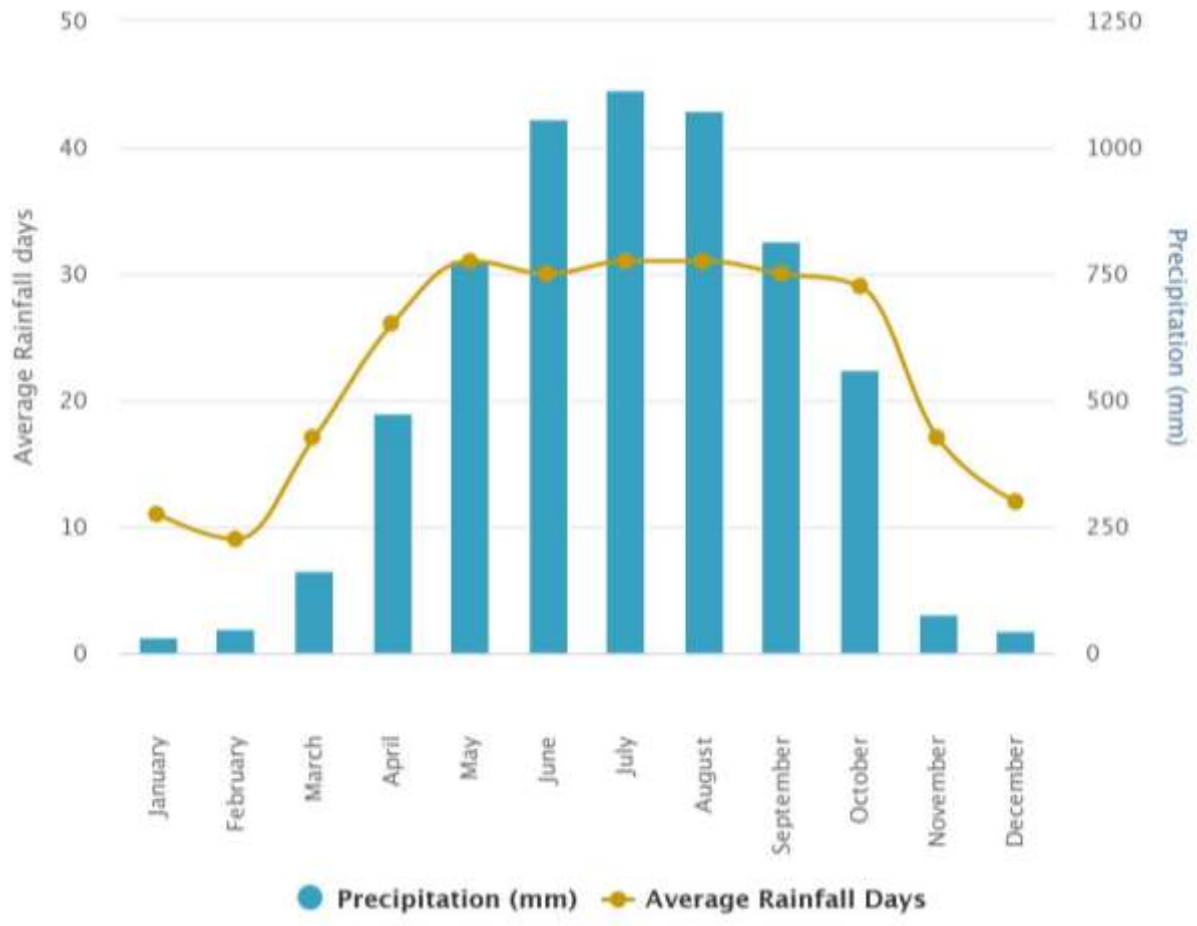

Figure 5-1:- Average rainfall in Umsning.

Source: -: - https://www.worldweatheronline.com/

- **Temperature**

The average annual temperature in Ri-Bhoi District is 21.8° C. August is the warmest month in the district. The temperature in August is 25°C - 26°C. January is the Coldest Month with average temperature is 15°C.

The highest temperature of Umsning is recorded at 24°C in the months of March- August and the lowest temperature is recorded is 18 °C The average temperature for Umsning is shown in Figure 5-2

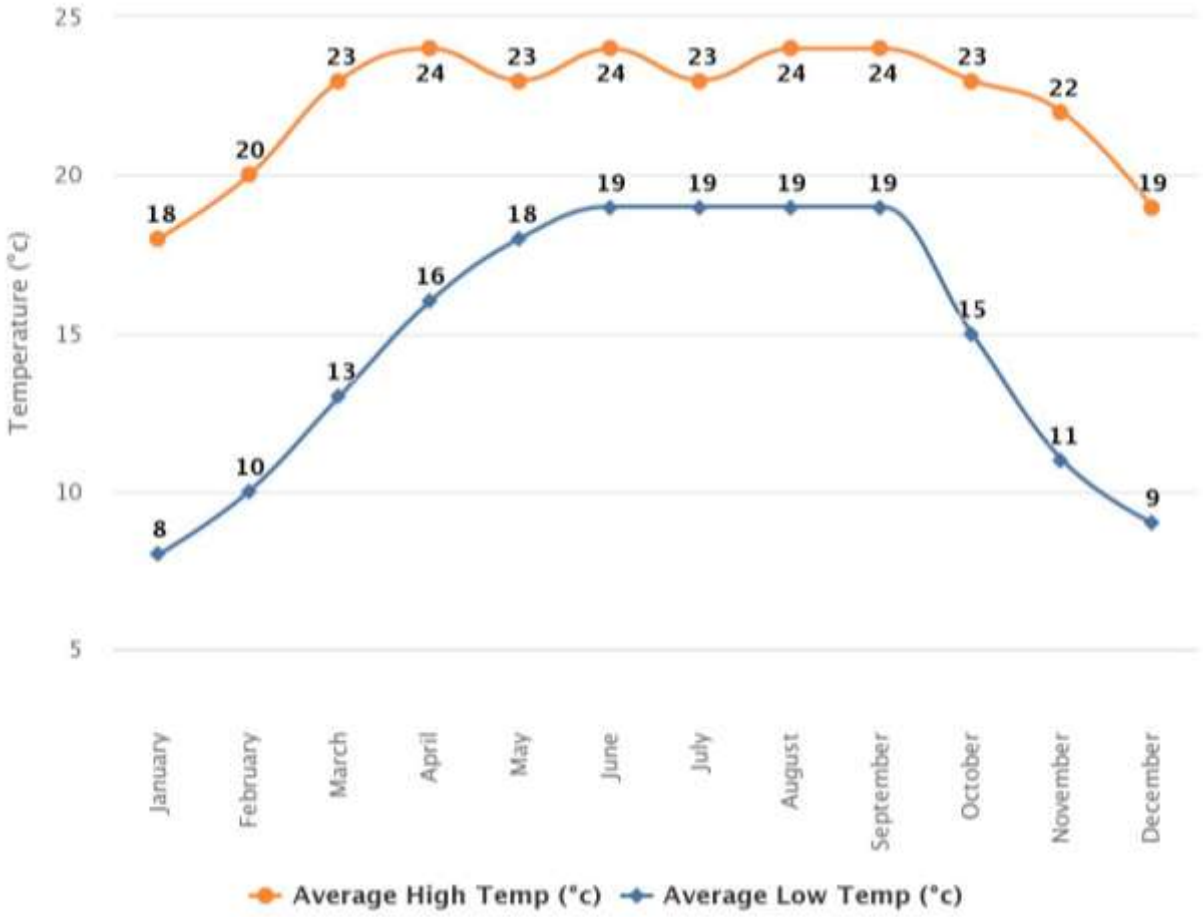

Figure 5-2:- Average temperature

Source: -: - https://www.worldweatheronline.com/

- **Wind Speed/Direction:**

Wind gusts are maximum faced in the months of March, April, May and June and so in these months there is a chance of soil erosion in this area. Potholes can also be created due to continuous soil erosion and water may get logged into the potholes during heavy rainfall which can ultimately led to the destruction of roads.

Average Wind sped/direction data of 10 years of Umsning is shown in Figure 5-3.

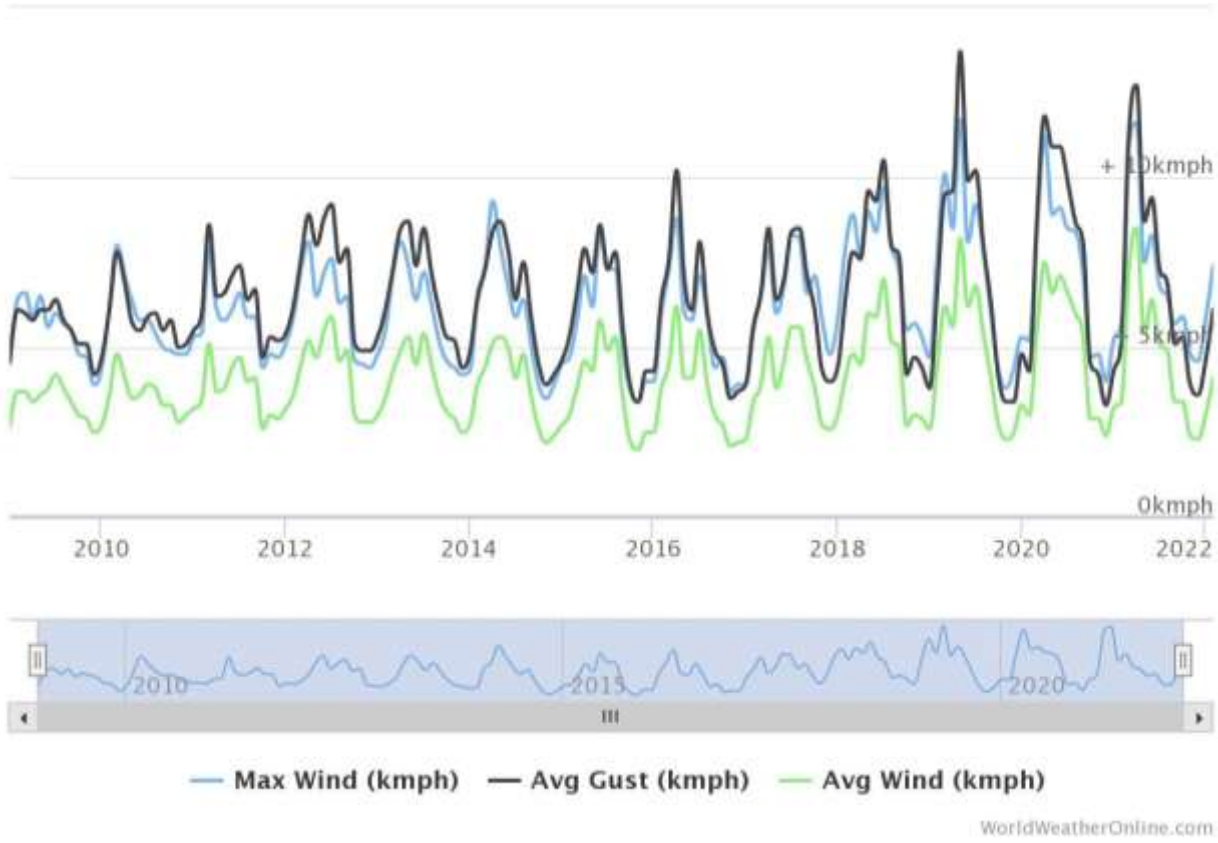

Figure 5-3:- Average wind speed

Source: -: - https://www.worldweatheronline.com/

- **Wind Rose**

Windrose shows that dominant wind blow from the SW much of the time - about 15.85% of all hourly wind directions. Approximately 7.58% (max) of the time the wind blows from the SW at speeds between 1 and 2 m/s. Further, much of the time winds blow at speeds between 1 and 2 m/s - which is 51.52% of the time. Depending on the maximum flow direction of wind the setup of hot mix plant will be decided because the construction of roads should not affect the air quality of residential areas in the down wind direction.

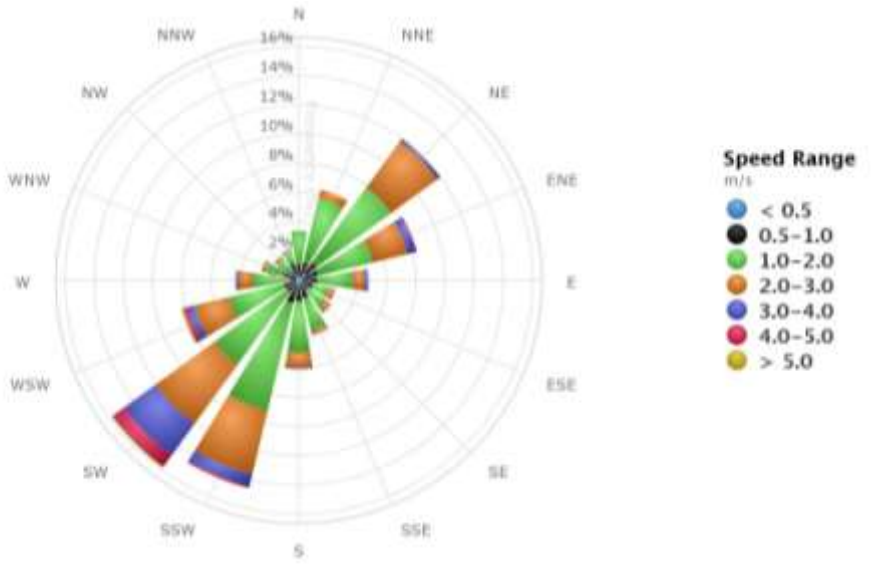

Figure 5-4: Wind rose diagram

Source:- https://www.indianclimate.com/

- **Relative humidity**

The humidity of an area affects the work capability of the work force directly. More the humidity of an area,more is the fatigue experienced by the work force and less is their work output. As the humidity in the project area is moderate, it will not have any such adverse effect on the work force. The average relative humidity is shown in Figure 5-5.

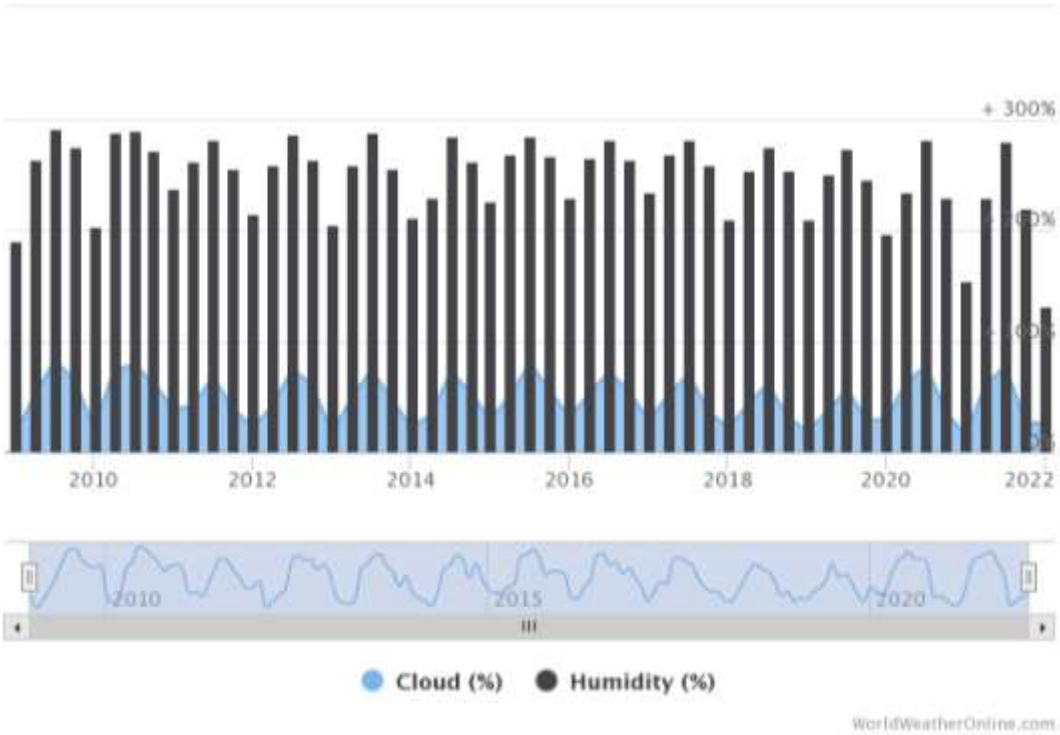

Figure 5-5: Average Humidity

Source: - https://www.worldweatheronline.com/

- **Natural Hazards**

As the State lies in the seismically active zone, special emphasis should be given to reduce the impacts of earthquake. Moreover, it is also affected by hazards such as floods, flash floods, epidemics, fire, hailstorm, lightening, road accidents, etc.

The State of Meghalaya has witnessed seismic events of '8.7 magnitude in 1897'. This region has been identified as a potential site of a future catastrophic earthquake. With the growth of population and infrastructure seismic vulnerability has increased and previous earthquakes have provided a glimpse of the devastating potential of seismic tremors

- **Seismicity**

Earthquake is a natural disaster so necessary safety measures may be adopted considering the vulnerability to avoid enhanced risk. As per the 2002 Bureau of Indian Standards (BIS) map, the state of Meghalaya falls in a region of high to very high seismic hazard. All districts of the state of Meghalaya lie in Zone V. This state also falls in Zone V. Both the project district and project area lie over high damage risk zone V. The seismic map of Meghalaya indicating the location of project stretch is shown in**Figure 5-6**The district being situated in Seismic Zone - V is highly vulnerable to earthquakes. Apart from earthquakes it is prone to thunder squall/thunderstorm, flood, landslides etc and also to human– made hazards like fire i.e., domestic and forest fires, road accident etc. The district experiences thunder squall/thunderstorm mostly during the month of March-May. The district also experiences high rainfalls which often trigger landslides in areas along the National Highway often disrupting communication and causes severe traffic jam in the area.

The project area falls in a moderate earthquake prone zone. Earthquake was recorded in Ribhoi district in and around the project area which is shown in Figure 5-7, but no such earthquake was recorded in UmsningJagi.

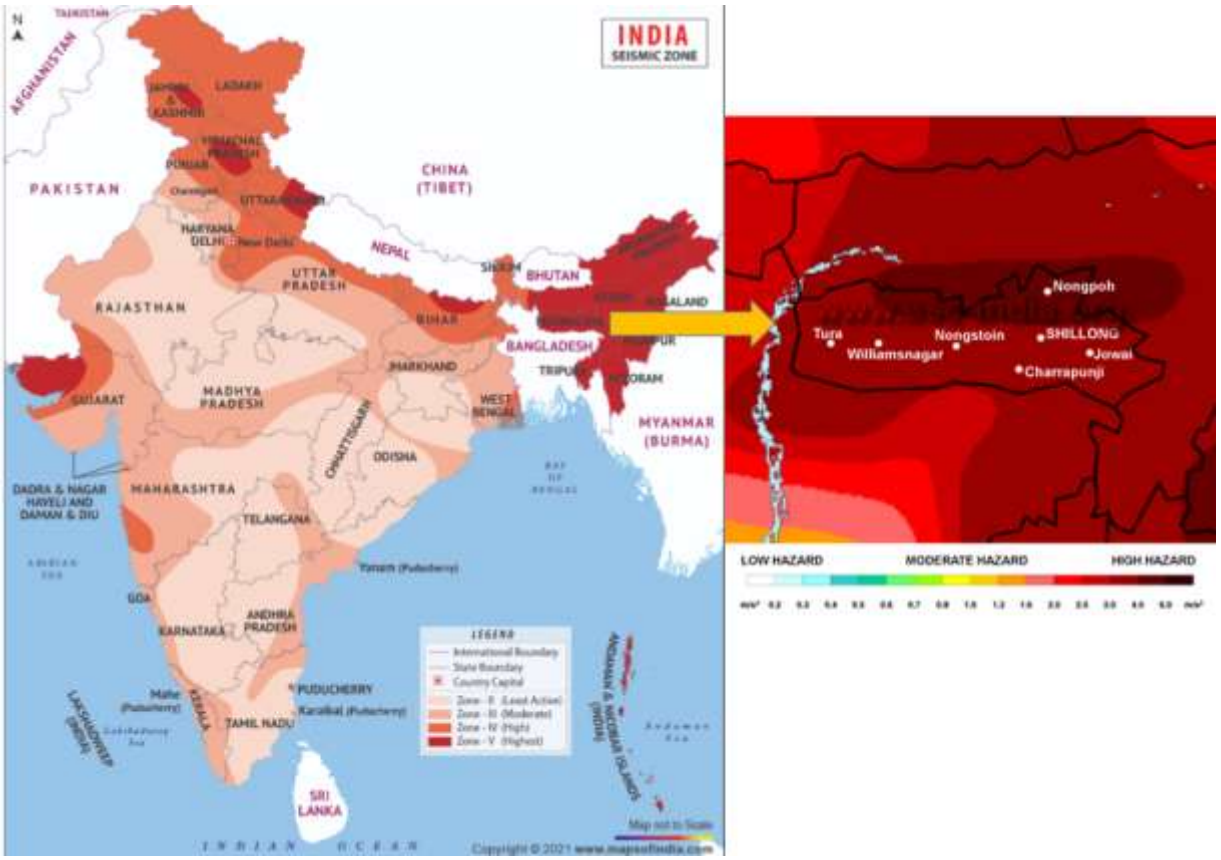

Figure 5-6:- Seismic map of India and Meghalaya

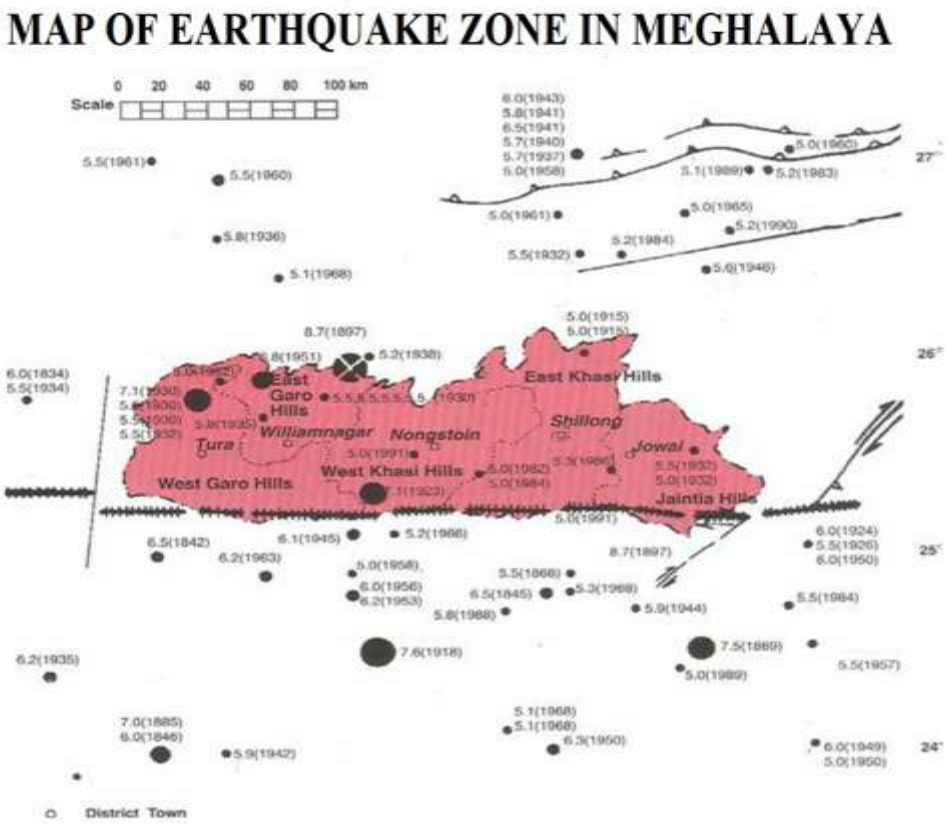

Figure 5-7: Earthquake Zones Map of Meghalaya

- **Flood Hazard**

In Meghalaya, floods occur in river valleys, when flow exceeds the capacity of the river channel, particularly at bends or meanders. The plain areas of Meghalaya adjoining Assam are affected by flood due to the back flow of water from the river Brahmaputra during the flood season between June and October. The tributaries like Krishnai, Jinari, Jingjiram, Rongai, Dudhnoi, Ringgi, Gohai, Dilnietc cause flood in the plain areas of the State.

The Flood Prone Areas of Meghalaya:

- Western part of Meghalaya like Tikrikilla, Phulbari, Rajabala, Garobadha, Hallidaygunj, Bhaitbari, Fersakandi, Magurmari, Silkata, Mahendraganj etc.
- Plain areas near Bangladesh like Baghmara, Balat, Shella, Dawki etc.
- Urban Flooding in localized areas of Shillong, Williamnagar, Tura etc.
- Localised areas of West Khasi Hills, South West Khasi Hills, EastKhasi Hills Jaintia Hills and in Ri-Bhoi Districts.

In this area flooding of river during monsoon and flash floods in hill areas is commonly experienced. Project district also fall under flood prone area. Flood prone area of Meghalaya is showing in Figure 5-8. However, the project road alignment doesnot falls in the flood prone area.

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Figure 5-8: Flood Prone Zones of Meghalaya

Source:http://www.mati.gov.in/docs/Academic%20Module%20-%202/PDF%20(3rd%20November%202021)/vulnerability%20profile%20of%20meghalaya%2018th%20October,2013-SDMA.pdf

- **Landslide Hazard**

Meghalaya being a hilly terrain is prone to landslides. Every year a number of landslides have been reported from various localities. These cause a lot of miseries to public, resulting in loss of lives and properties, disruption of communication network, besides causing economic burden on the society. Landslide is primarily attributed to high slope, immature geology, neo-tectonic activity, heavy rainfall, unplanned and improper land use practice in the State. Landslides generally occur during heavy rains that are during the months of June to October in Meghalaya.

The project area is prone to landslides during months of heavy rainfall. Also, during the site visit Quarrying was observed which could also lead to landslides.

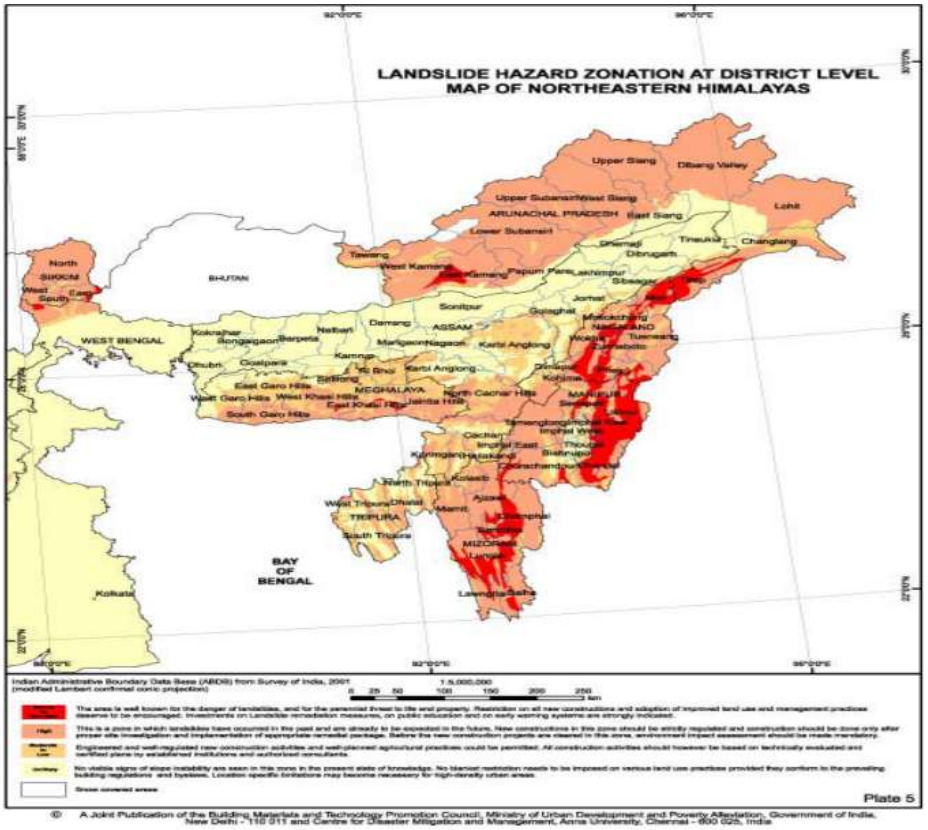


Figure 5-9: Landslide Map of North-Eastern Himalayas

Source:https://megrevenuedm.gov.in/reports/Meghalaya_State_Disaster_Management_Plan_Volume1.pdf

- **Cyclone**

Meghalaya is situated in the north eastern direction of Bangladesh which is highly prone to cyclone. Yearly, approx. 60% percent of the state is affected by cyclone in Bangladesh. The districts close to Bangladesh like South West Garo Hills, South Garo Hills, South West Khasi Hills, West Khasi Hills, fall in very high cyclonic zone due to close proximity to Bay of Bengal (which is a cyclone basin). During April – May, various parts of Meghalaya observe cyclone. It has detrimental impacts on society and environment

5.4 Topography:

Meghalaya: The topography at Meghalaya comprises of landscapes that have a blend of mountain and plateau regionsand this is why it is also known as Meghalaya plateaus. The altitude of these plateaus ranges from 150 meters to 1961 meters.

Based on the site visit, the project road initially passes through plain terrain however, beyond 12+000 the road enters hilly terrain. at 34+500 a rocky outcrop is observed on the RHS.



Figure 5-10: Typical Topography along the Project Road

5.5 Soil & Geology

Geomorphologically, Ri-Bhoi district is a hilly one with intermontane valleys. The western and northern part of the district comprises of the denudational high hills with deep, narrow intermontane valleys covered with or without colluvium. Lithological classification showed that, the hills comprise Archaean Gneissic complex rocks, which are highly deformed, fractured and fissured in nature. These rocks also form highly dissected plateau with steep slopes and deep, narrow valleys exposed in the southwestern part of the district. In the central and eastern parts, denudational high hills with deep valleys are found to exist which comprise intrusive Granites. Further in the southeastern part, denudational low hills are found to occur with valleys and comprise granite with fracture zones. Large number of narrow intermontane valley occurs mostly in the southern part of the district, which are good recharge areas and have highly productive shallow aquifer zone. Deeply dissected plateau comprising the Precambrian Shillong Group of quartzites and phyllites occurs as highly undulating terrain having more than 20 m deep valleys in the area. The quartzites are moderate to steeply dipping rocks having a trend in NE-SW direction. They are intruded by basic and ultramafic rocks, which occur as linear or curvilinear ridges.

The soil map of 57ib hoi district is presented in Figure 5.10 below.

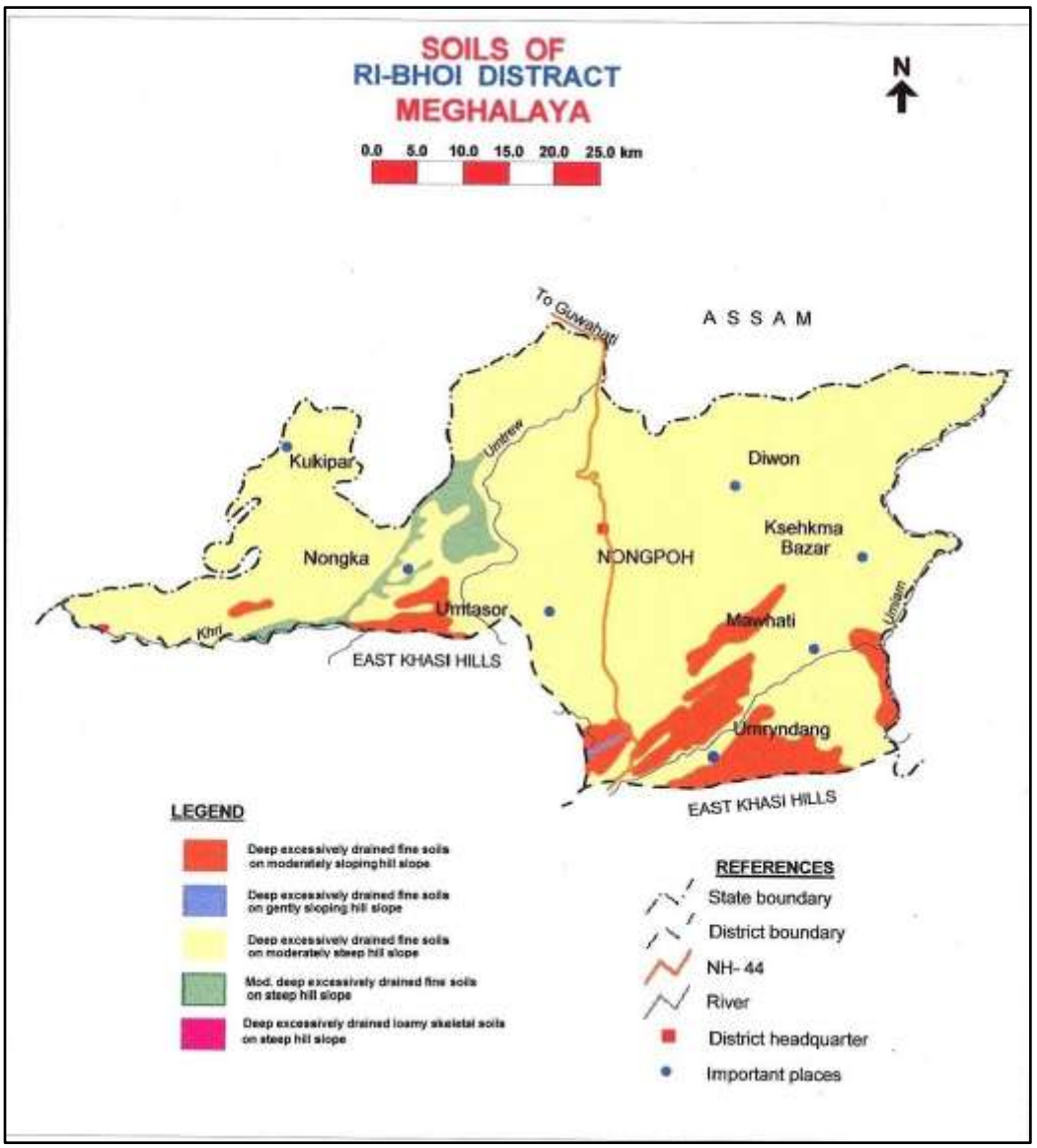


Figure 5-10: Soils of Ribhoi District, Meghalaya

Source: https://agricoop.nic.in

The soil map shows that the Ribhoi district consists mostly of excessively drained fine soil on moderately steep hill slopes. Thus, there is good ground water recharge, though most of it flows out in the form of springs and streams, which is evident from the site visit as a number of such streams were sighted along the project road.

5.6 Ground water Resources

As major part of the district is underlain by consolidated formations, the fractures and joints act as good repository for the development of ground water.

RiBhoi district is basically a hilly one. Steep slopes and rugged terrain offer limited scope for recharge and development of ground water. Moreover, approachability is a big constraint for assured water supply in the hamlets / villages situated on hilltops or steep slopes. Population stress and thereby scarcity of potable water is rising day by day in the district. Irrigation utilizing

ground water, by constructing bore well is negligible in this district. Spring catchment areas need to be protected. It is observed that peoples are destroying the spring catchment by construction of houses or through agricultural practice where by the soil is eroding.

All the irrigation schemes in the district are dependent upon the surface water resources. As per ground water resource estimation by CGWB, the stage of ground water development is only 0.06 % and there is enough scope for future development of ground water resource in the district.As development of ground water is still in nascent stage, there is ample scope for future development of ground water in the district. It is being done through dug wells and bore wells in the intermontane valleys and linear ridges.

As the people in the rural areas are mainly dependent on spring water, there is an urgent need for scientific approach for proper development and management of these springs. It will be appropriate to develop the springs with reasonable discharge, to cater to the domestic water requirements to a large extent. The chemical quality of ground water indicates that groundwater in the area is good for domestic, irrigation and industrial uses. Chemical analysis shows that the spring water is of excellent quality and is suitable for drinking purposes as per BIS standard. However, sporadic occurrences of high concentration of Iron in ground water have been reported in some pockets in the district. So, the water supply agencies should take precautionary measures to provide Iron free water for domestic / industrial purpose.

There are number of rivers and streams crossing the project road. Sources of water will not be problem for the project. Requirement of water for the project will not be hindrance to the local people around the project road.

5.7 Drainage

The drainage system is controlled by topography. The drainage pattern shows annular, trellis, sub-dendritic types, which also indicate the structural control. The important river includes the Umtrew, Umsiang, Umran and Umiam rivers

5.8 Land Environment

Land and soil constitute the basic components of the physical environment. The alignment of a road may cause changes in land, land use, soil and denudation processes in different intensities.

The predominant land uses along the project are agricultural land with patches of barren land &built-up sections.

5.9 Water Environment

The Project area is rich in water sources. There are several major river/streams are there in the vicinity of the project corridor. All of these rivers are perennial. Ground water resources are used for drinking purpose by open wells, bore wells, tube wells or installing hand pumps.

Water Quality: Water is found to be an important source for catering to the local needs of water consumption for various purposes, mainly domestic. Wells and hand pumps are not frequent within the proposed right of way. However, hand pumps are used as a source of drinking water in the settlements along the project road. Few river, stream and water bodies are present in the project periphery. Therefore, any deterioration in the water quality owing to the developmental

activities will pose threat to the concerned population and attention needs to be paid towards maintaining the quality of water using all possible tools such as monitoring during construction with spontaneous remedial suggestions, if required.

A separate Environment Management and Monitoring Plan for the safeguard of water environment have been prepared to mitigate the different impacts that may potentially be caused due to construction activities, which is provided in the subsequent chapters.

The water bodies present in the project area are shown in the Table 5-1.

Table 5-1: List of Water features along the project road

Sr no.	Receptor	Side	Chainage(km)	Approx. distance from the edge of the road (m)	Physically impacted or not
1.	Natural water spring used by local people	LHS	2+100	2.30	Unlikely but may get contaminated during construction
2	Check dam used by local people for domestic purpose	RHS	10+600	4.30	Unlikely but may get contaminated during construction
3	Water body (pond)	RHS	21+400	1.20	Might be Impacted about 50%
4	Check dam used by local people for domestic purpose	RHS	30+500	7.80	Unlikely but may get contaminated during construction
5	Water body (pond)	RHS	31+500	9.10	Unlikely
6	Water Body (pond)	LHS	35+900	4.00	Might be Impacted (however less than 50%)
7	Natural water spring used by local people	LHS	36+000	9.60	Unlikely but may get contaminated during construction
8	Natural water spring used by local people	RHS	36+400	5.60	Unlikely but may get contaminated during construction
9	Water Body (Pond)	RHS	37+500	2320	Not impacted at all

Figure 5-11: Presence of water body on roadside within5m from road

Figure 5-12: Presence of water body at about 10m from road

Figure 5-13: Check dam used by local people on roadside within5m from road

Figure 5-14: Naturalspring used by local people at about 10m from road

5.10 Air Environment

Air pollution is caused due to both natural and manmade processes. The main source of air pollution is human induced/manmade, includes industrialization and its by products, burning of timber, heat and light, rapid urbanization, vehicular pollution, plastics, burning of polymers and processing of various materials emitting obnoxious gasses, generation of smoke, dust and fine respirable particles due to construction activity and rapid burning etc. Vehicular emission is a major source of air pollution now-a-days.

The ambient air quality of the project road was found satisfactory and free from any visible pollution.During site visit, no air polluting source other than domestic combustion of fossil fuel and vehicular emission was observed. However, presently there is very low vehicle count on the project road. Consultation with local residents also confirmed that the air quality of the area is clean throughout the year.

During construction stage of the project however, temporary air pollution is expected due to movement of construction vehicles, operation of plants & machineries, dust emission due to excavation and demolition etc.

Ambient air quality is the most significant parameter that is required to quantify the impact on the natural and biophysical environment. The air quality parameters considered for the construction phase includes Particulate Matter 10 (PM10), Particulate Matter 2.5 (PM2.5), Nitrogen Oxides (NO_x) Sulphur Di-oxide (SO_2), and Carbon monoxide (CO).

Table 5-2: Ambient Air Quality Standard

Parameter	Technique	Technical Protocol	NAAQM Standards (24 hrs basis)
Particulate Matter (Size less than 10µm) or PM10, µg/m3	Respirable Dust Sampler (Gravimetric method)	IS-5182 (Part-IV)	100
Particulate Matter (Size less than 2.5µm) or PM2.5 , µg/m3	PM 2.5 APM 550 Fine Particle Sampler (Gravimetric method)		60
Sulphur Dioxide (SO2), µg/m3	Improved West and Gaeke Method	IS-5182 (Part-II)	80
Nitrogen Dioxide (NO2), µg/m3	Jacob and Hochheiser	IS-5182 (Part-IV)	80
Carbon Monoxide (CO), mg/m3	Non – dispersive Infrared (NDIR) Spectroscopy	IS-5182 (Part-IV)	4

A separate Environment Management and Monitoring Plan for the safeguard of air environment has been prepared to mitigate the different impacts caused due to construction activities, which is provided in the subsequent chapters.

5.11 Noise Environment:

Noise can be defined as any sound that is undesirable because it interferes with speech and hearing, and is intense enough to damage hearing or is otherwise annoying. Noise impacts can be of concern during construction and operational phases of the project.

Noise quality is an issue particularly at congested locations due to heavy traffic jams, horns and slow-moving traffic. The educational institutions, health care facilities, Court etc along the project corridor comprise sensitive receptors with respect to noise pollution.

The Ambient Noise Quality Standards with respect to noise have been stipulated by Govt. of India vide Gazette Notification dt.14.02.2000.

Table 5-3: Ambient Noise Standards

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

* Silence zone is defined as an area up to 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the competent authority;

A separate Environment Management and Monitoring Plan for the safeguard of noise environment has been prepared to mitigate the different impacts caused due to construction activities, which is provided in the subsequent chapters.

5.12 Biological Environment

Ecological resources are among the most important resources impacted by the road/infrastructure projects. The detailed baseline study of the ecological resources is essential to estimate the magnitude of potential impacts and to avoid or mitigate any loss caused by the proposed project. In this section baseline details of the flora and fauna are presented.

Meghalaya is among the few States in the country which can be proud of its abundance of natural forest wealth spanning across large part of its geographical area, much higher than national average. Its location, physiographical features, altitudinal variation, abundant rainfall, salubrious climate and fertile soils favours high species diversity and supports different types of forests. The Vegetation types range from tropical rain forest in foothill to Alpine meadows and cold desert. This rich flora had been the centre of attraction for many botanists starting from Buchanan Hamilton (1820-24) and rightly considered as 'Botanist's Paradise'. This region was described by Hooker as "Cradle of Angiosperms".

True to its name, 'Meghalaya' is an abode of clouds and thus increased moisture conditions prevails. The hills rise abruptly in south, while it is gradual in north. The altitudinal variation ranges from 50 meters to 1950 meters with the Shillong plateau at the crest. The hills are dissected and drained by numerous rivers and rivulets draining to north and south. The climate is monsoonal with distinct warm-wet and cold-dry periods. The towns of Sohra (Cherrapunjee) and Mawsynram, which are located on the southern part of the state, receive very heavy rainfall and are amongst the wettest spots in the world.

The three geographical sub-regions of Meghalaya, viz., Khasi, Garo and Jaintia hills are among the wettest regions of the world, with clouds persisting in various areas nearly throughout the year. Meghalaya falls under the Indo-Myanmar Biodiversity Hotspot zone. Meghalaya, is one of the biodiversity rich states of India in terms of diversity of both flora and fauna due to its unique geographical position, at the meeting point of Indo-Malayan and Eastern Himalayan bio-geographical regions. Thus, it shares biodiversity elements including flora and fauna from both the regions. Meghalaya also shares rich species diversity containing species from Indo-China and rest of India. The diverse landscape of the state also supports a large array of forest types and species. The flora of Meghalaya comprises about 3,128 species of flowering plants of which a large number of species are endemic. Meghalaya harbours a rich diversity of orchids (Family: Orchidaceae), of which nearly 110 genera and 439 taxa are reported from the state. However, many authors believe that Meghalaya may have more species of orchids and many are still to be discovered (Kakati 1986). Meghalaya is also considered as centre of origin for a number of crop plants like rice, and Citrus based on the large number of wild relatives found in the state.

The undulating hilly terrain, where the plateau is dissected by rain-fed rivers, streams and deep ravines, waterfalls and hills covered with rich vegetation present picturesque landscape. The

forests are also home to rare and endemic plants. The undisturbed primary forests are botanically well known and extraordinarily rich. In the project area there are some forests but after primary survey and consultation with the local people it is found that all of these forestsare owned privately.

Figure 5-15 : Private Forest along the project road

Fauna & Flora: This area is neither coming under any type of Protected Forest nor Reserve Forest. There is no Protected Area (National Park, Wildlife Sanctuary and Biosphere Reserve) located within 10 km radius of the project site. Although the following animals are generally found in the Ri-bhoi district,during the public consultation, local villagers informed no sighting of the wild animals and confirmed absence of these in the project area.

Table 5-4 :List of Fauna

MAMMALS	SCIENTIFIC NAME
Rhesus macaque	
Capped Langur	*Trachypithecuspileatus*
Lesser Bandicoot Rat	*Bandicotabengalensis*
Indian Flying Fox	*Pteropusgiganteus*
AVI-FAUNA	
Grey Sibia	*Heterophasiagracilis*
Dark-rumped Swift	*Apusacuticauda*
Tawny-breasted Wren Babbler	*Spelaeornislongicaudatus*
White-napedYuhina	*Yuhinabakeri*
Black-browed Leaf- Warbler	*Phylloscopuscantator*

During the site visit, dense green cover was observed on either side for most of the stretches in the hilly sections (12+000 onwards) of the project road. However, felling of the trees for the

implementation of the project is not envisaged as most of these trees are located beyond the existing ROW and land acquisition has not been proposed in this project. The typical vegetations found along the road are listed below.

Table 5-5 :List of Flora

Common / Local Name	Scientific Name
Shorearobusta	Sal, Sakhu
Mesuaferrea	Diengngai, Nahar
Myricaesculenta	Box myrtle, DiengSohphi
Prunuscerasoides	Wild Himalayan Cherry
Betulaalnoides	Dieng ling
Tectonagrandis	Teak, Segun
Pinuskesiya	Khasi pine
*Lagerstroemia*spp	Ajhow, Jarul, Sida
*Micheli*aspp	Champ, Sopa, Titachap
Bombaxceiba	Semul
Terminaliamyriocarpa	Hollock
Gmelinaarborea	Gamari (State Tree)
Xyliaxylocarpa	NA
Albizialebbeck	Hiraru, Moroi, Mog, Kako, Sundi, Saw, Harish
Toonaciliata	Poma
terminaliabellirica	Bhomda
Schimawallichii	Makrisal, Nagaplu
Cinnamomum spp.	
Castanopsisindica	Hingori
Syzigiumjambosa	jamoon
*Artocarpus*spp	Sam, Champ, Kathal
*Quercus*spp.	Oak
Chukrasiatabularis	Chuma, DiengDkharbti

Figure 5-16 : Vegetation cover along the project road

Protected Areas of Meghalaya:

The protected area network in Meghalaya occupies 1133.9 Sq. Km area which constitute about 5.06 % of the State's Geographical Area. The Protected Area Network includes 2 national Parks, 4 wildlife Sanctuaries and 1 Biosphere Reserve playing an important role in in-situ conservation of Biodiversity.

As per the website of Meghalaya Forest Department, the project district does not have any Protected area within its boundary. The nearest Protected area is Nongkhyliem Wildlife Sanctuary, which is about 25km away from the project site and falls outside of the both Direct and Indirect impact zone.

Table 5-6:- Protected area in Meghalaya

Sl No	Protected Area	Area (sqkms)	District
1	Balpakram National Park	352.00	South Garo Hills
2	Nokrek National Park	47.48	East Garo Hills
3	Nongkhyllem Wildlife Sanctuary	29.00	Ri-Bhoi District
4	Siju Wildlife Sanctuary	5.18	South Garo Hills
5	Baghmara Pitcher Plant Sanctuary	0.02	South Garo Hills
6	Narpuh Wildlife Sanctuary	59.9	East Jainti
7	Nokrek Biosphere Reserve	820	East, West and South Garo Hills

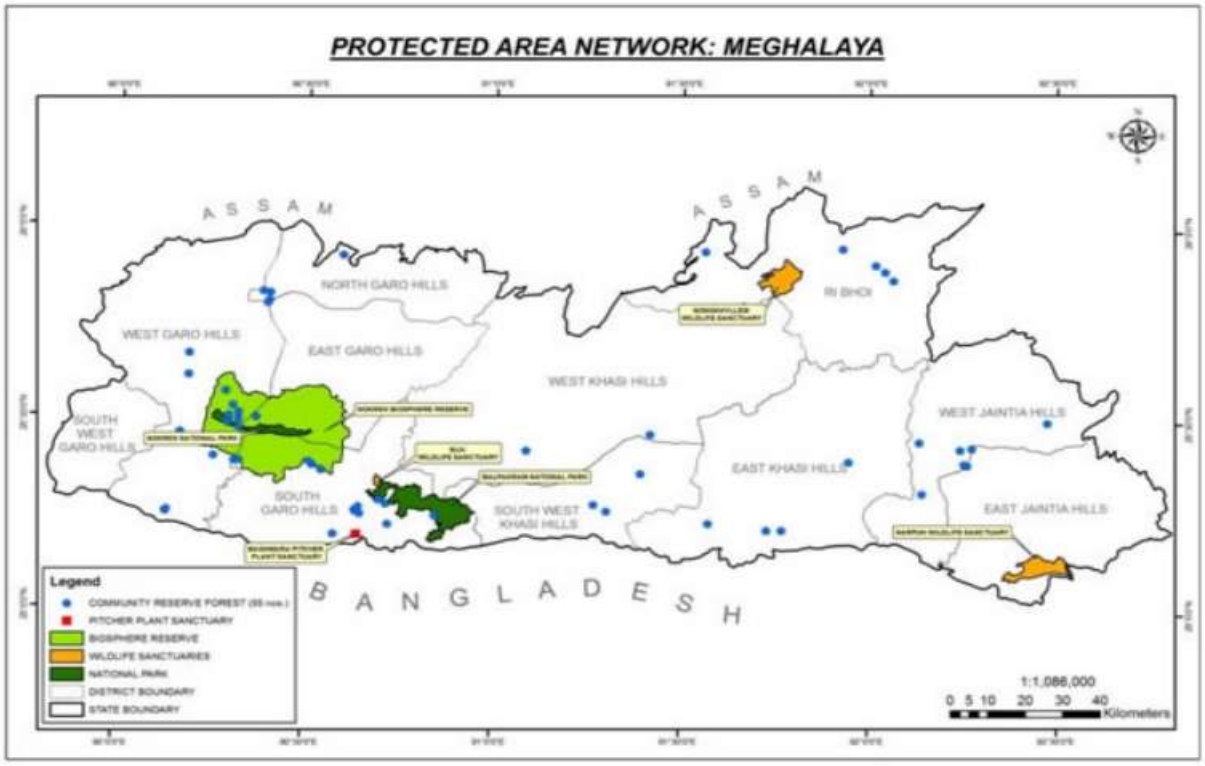


Figure 5-17: Protected Areas of Meghalaya

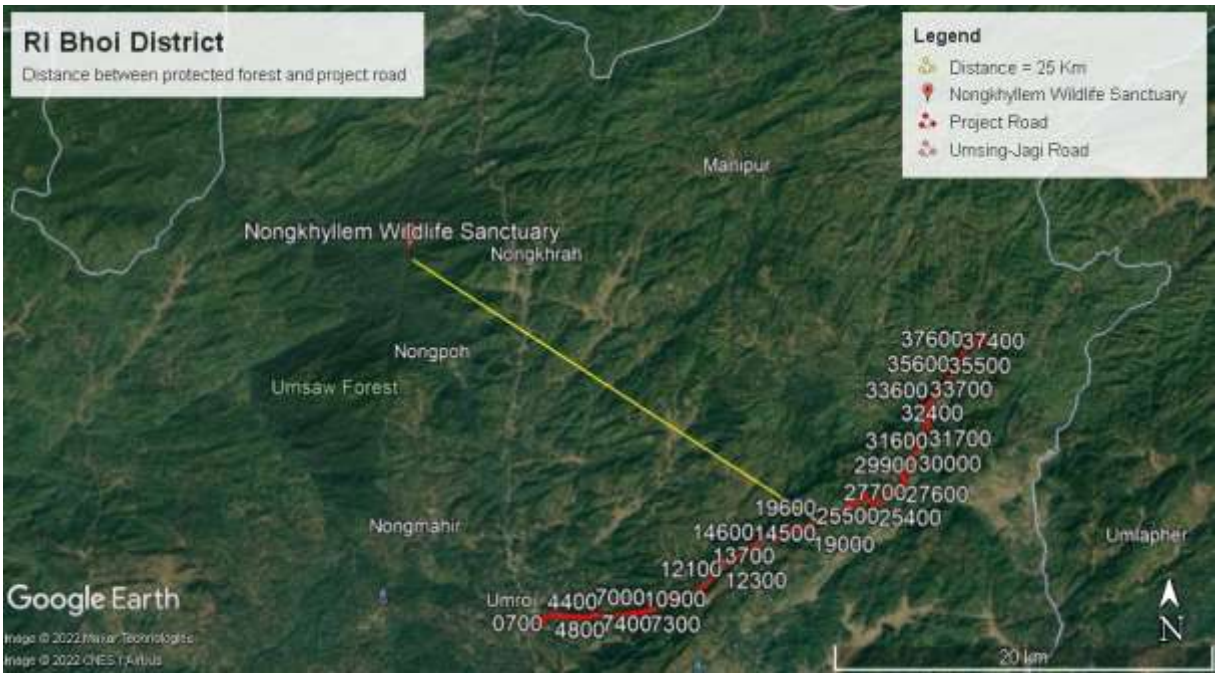


Figure 5-18: Google earth imagery showing distance of project road from nearest protected area

5.13 Social Environment

5.13.1 The State Profile of Meghalaya

The State of Meghalaya was carved out of Assam as an autonomous State in April 1970 and was declared a full-fledged State in January 1972. Meghalaya, situated in the north eastern

region of India is a narrow stretch of land, running between Bangladesh on the South and West and Assam on the North and East, Meghalaya lies between 24° 58' N to 26° 07'N latitudes and 89° 48'E to 92° 51' E longitudes. It covers an area of 22,429 sq. km. The State has most of its land covered by hills interspersed with gorges and small valleys. Endowed with dense forests and rivers cascading down undulating terrain, this region is one of the most scenic of the North Eastern States.

Thus, out of the total forest area of 15,657 sq. km in the State only 1,027.20 sq. km is under the control of State Forest Department, which constitutes only 4.58 % of the total geographical area of the State and 6.56 % of the total forest area of the State. Rest of the area is either private or clan /community owned and is under the indirect control and management of the Autonomous District Councils.

The population of Meghalaya is predominantly tribal, the main tribes are the Khasis, the Jaintias and the Garos besides other plain tribes such as Koch, Rabhas and Bodosetc The Khasis and the Jaintias predominantly inhabiting the districts towards eastern part of Meghalaya, belong to the Proto AustroloidMonkhmer race. The ESIA Study Proposal of Roads lies under West Khasi, RiBhoi, South West Khasi, Jaintia, EastGaro Hills respectively.

5.13.2 District Profile:

RiBhoi District came into existence and assumed the hierarchical status of the district on the 4th June 1992 by upgrading the former Civil Sub-Division. The district was carved out from the erstwhile East Khasi Hills District and lies between North Latitudes 25^0 15' and 26^0 15' and between East Longitudes 91^0 45' and 92^0 15'. It geographically comprises parts of the Khasi kingdoms viz parts of MylliemSyiemship, KhyrimSyiemship, NongspungSyiemship, NongkhlawSyiemship, whole of NongpohSirdarship (erstwhile NongpohSyiemship), MyrdonSirdarship and the erstwhile NongwahSyiemship. Presently, NongwahSyiemship is one of the missing Khasi States that calls for restoration both administratively and territorially. Presently, the District is bounded on the North by the Kamrup, Morigoan and Nagoan Districts of Assam, on the East by the KarbiAnglong District of Assam, on the South by East Khasi Hills & West Khasi Hills Districts and on the West by the West Khasi District. Nongpoh is the district headquarter and as well as that of NongpohSirdarship. RiBhoi District contains an area of 2448.00 sq.km excluding the geographical areas under the erstwhile NongwahSyiemship and other places which fall under the 'Areas of Differences' between Assam and Meghalaya. Nongpoh is near to the two major cities of Shillong and Guwahati and hence is an easy to reach place. It is located at 53 km away from the Shillong and 50 km from Guwahati.

5.13.3 Demographic Profile

Out of total population of Meghalaya, 54.75% people live in urban regions. The district occupies an area of 2378 km² and has a population of 258,840 (as of 2011). As of 2011 it is the second least populous district of Meghalaya.

Table 5-7: Demographic Profile of RiBhoi District

Description	Census 2011	Census 2001
Total Population	258840	192790
Male	132531	99319

Description	Census 2011	Census 2001
Female	126309	93471
Population Growth	0.3426	0.5143
Area Sq.Km	2448	2448
Density /Km2	106	79
Proportion to Meghalaya Population	0.0872	0.0831
Sex Ratio (Per 1000) Males	953	941
Average Literacy	75.67	65.73
Male Literacy	76.79	68.81
Female Literacy	74.49	62.43
No. of Blocks	4	NA
No. of Villages	579	NA

Source: Census 2011

As per 2011 census, 49.18% population of RiBhoi district lives in rural areas of villages. The total RiBhoi district population living in urban areas is 233587 of which males and females are 13826 and 11427 respectively. In rural areas of RiBhoi district, sex ratio is 968 females per 1000 males.

Table 5-8 : Distribution of Rural and Urban Population

Description	Urban	Rural
Population (%)	54.75%	49.18%
Total Population	25253	233587
Male Population	13826	118705
Female Population	11427	114882
Sex Ratio	826	968

Source: Census 2011

5.13.4 Schedule Castes and Schedule Tribes

The social stratification of the project area shows of Schedule Tribe population with 88% households. The second stratum of the social grouping in the area is of Schedule caste population of0.25%.

5.13.5 Literacy Rate

The literacy rate in the district of RiBhoi is 60.21%, whereas the literacy rate in the PIA is around 67.37%. The respective male and female literacy rate are 61.10% and 59.28% in the district of RiBhoi, whereas resembles 50.21% and 51.2% in the PIA.

5.13.6 Employment Pattern

Economic backwardness is the leading problem of the state as majority of the population is below the poverty line. Although the state is rich in mineral resources, the industrial linkages are virtually absent and government is the major source of employment in the organized sector. Activities like animal husbandry, fishery, poultry and horticulture have not been targeted as a major source of employment. Therefore, agriculture forms the only option for the people to seek gainful employment. This too is influenced by impediments such as shifting agriculture, poor productivity, land tenure system and traditional methods of cultivation. All these factors have resulted in poor land and labour productivity.

As unemployment and poverty are correlated, it becomes necessary to understand the occupationalpatternoflabourforceandstatusofemploymenttoanalysethedevelopmentinthe state.

5.13.7 Economic Development

Meghalaya has predominantly an agrarian economywith a significant commercial forestry industry. Meghalaya's gross state domestic product for 2012 was estimated at16,173crore (US$2.5billion) in current prices.The state is geologically rich in minerals.The state has about 1,170km of national highways. It is also a major logistical centre for trade with Bangladesh.Meghalaya has an ideal location advantage for South East Asia Market. The neighbouring countries of India viz Bhutan, Bangladesh, Myanmar has been involved with the state for business and commerce. It has a huge potential to reach other South Asian countries as well. Meghalaya is also geographically rich in minerals and has the potential for industrial setups based on these mineral resources. Above all the Meghalaya Industrial Policy is framed for the ease of doing business and increase trade and commerce. The added advantage being the climate in Meghalaya is good for the development of electronics chips.

Different types of Industry that can be ideally formed in the state are Mineral based Industry, Horticulture and Agro-Based Industry, Electronics and Information Technology, Export Oriented Units, Tourism and besides these the recent development in the state has seen many upcoming service sectors on customer service, real estate’s etc.The State Government also provides various types of Central and State Incentives for the established Industrial Setups which includes Transport Subsidy, Income Tax Exemption, Excise Exemption, Capital Investment Subsidy, Special Incentives for Food Processing,Subsidy on Comprehensive Insurance, Power Subsidy, Subsidy on Power Line (33 K.V. and above),Employment Subsidy, Refund of Central Sales Tax.Meghalaya is coming up with 150 LPM (Litres Per Minute) Oxygen Plant at Nongpoh Civil Hospital in RiBhoi district.

5.13.8 Road Network

Meghalaya has a road network of around 7,633km, out of which 3,691km is black-topped and the remaining 3942km is gravelled. The state has couple of national highways running through it viz NH 40, NH 44, NH 51 and NH 62.

5.13.9 Railway

Meghalaya has a railhead atMendipatharand regular train service connecting Mendipathar in Meghalaya andGuwahati inAssam. Guwahati is the nearest major railway station connecting the north-east region with the rest of the country through a broad-gauge track network.

5.13.10 Aviation

The state has an airport atUmroi which is at a distance of 30 kilometres from Shillong. There is also a helicopter service connecting Shillong to Guwahati and Tura. Baljek Airportnear Turabecame operational in 2008. Other nearby airports are in Assam, Borjhar, Guwahatiairport, about 124 kilometres (77 mi) from Shillong. Newly operational Rupsi Airport is also near to Tura.

5.13.11 Agriculture and Cropping Pattern

Agriculture is the main occupation of the people of the watershed areas. The principal agricultural crops are paddy, ginger, yam, chillies, turmeric etc. However, few horticultural crops like pineapple, arecanut, banana etc. are cultivated in the Watershed area.

Most of the forest species were extinct or not seen in the areas due to repeated jhumming. However, some forest species like Shorearobusta, Artocarpusheterophyllus, Albizzia species, Bahauniavariegetta etc. are seen in the Watershed Area.

5.13.12 Animal Husbandry

Animal husbandry and Agriculture are related with the overall socio – economic conditions of rural tribal people of Meghalaya. Animal husbandry plays a significant role in overall farming system of the state. The total livestock and poultry population of the state are 15.51 lakhs and 28.20 lakhs respectively out of which RiBhoi district possesses 1.12 lakhs and 3.52 lacks respectively (Sample survey 2005- 06). The livestock availability in the district ranges from pig, cattle, buffalo, poultry, goat, rabbit and sheep. Although the district possesses a good number of livestock and poultry, the productivity of livestock and poultry is very poor due to stunted growth and low production of local breeds of livestock and poultry, non-scientific approach of livestock and poultry farming

5.13.13 Fishery

ThePIA has unique topographical condition. Consequently, the PIA is blessed with vast and varied water resources in the forms of rivers, reservoirs, beels, lakes, swamp, pond, mini barrages and low-lying paddy. The district shared maximum 20% in total area of pond/mini barrages of the state followed by 10.2, 9.23 and 2.46% in case of reservoirs, rivers, and beels, lakes etc. respectively, but no contribution in state in terms of paddy cum fish culture in the district, although it is a proven technology scope and potential of ornamental fish (Puntiusbartissp) is not so much satisfactory.

5.13.14 Hospitals

The PIA has 1 hospital, 2 dispensaries, 8 primary health centres, 3 community health centres, 27 sub centres, 1 leprosy control unit, 1 set centre, 1 ayurvedic dispensary and 3 homeopathic dispensaries. Para medical personnel registered during the year for the service of the people of the district.

A number of schools and health services were found during the visit (Ref: Table 5-9) and the photographic evidence of the receptors along with the chainage are shown here in Figure 5-19.

5.13.15 Community Properties and Sensitive Receptors

Besides, Sensitive receptors like educational institutions and healthcare facilities, community properties such as religious properties, Government infrastructure and market places were also observed along the project road. The table below lists those within the project area.

Table 5-9: Community properties and Sensitive receptors along the project road

Sr no.	Receptor	Side	Chainage(km)	Approx. dist. from the edge of the road (m)	Physically impacted or not
1	School	RHS	2+500	5.36	Not impacted at all
2	Market area, Laiphew	RHS	21+300	1.14	Might be impacted (about 50%)
3	Church	LHS	29+000	5.85	Might be impacted (however less than 50%)
4	School, Mawhati	RHS	29+200	4.96	Might be impacted (however less than 50%)
5	Office of the Assistant Executive Engineer, PWD, Mawhati	LHS	29+300	20.87	Not impacted at all
6	Market area, Mawhati	Both Sides	29+300	2.97	Might be impacted (however less than 50%)
7	Post Office, Umsholait	LHS	32+000	62.21	Not impacted at all
8	School, Umsholait	RHS	32+000	3.91	Might be impacted (however less than 50%)
9	Care and support centre, Umsholait	LHS	32+200	16.43	Not impacted at all
10	Market area	LHS	37+500	7179.41	Not impacted at all
11	Market area, Sonidan	Both Sides	39+700	2.46	Might be impacted (however less than 50%)

Schoolbeside Umsning Jagi road

H

Figure 5-19: Few Sensitive receptors along UmsningJagi road

6 ANALYSIS OF POTENTIAL ENVIRONMENTAL& SOCIAL IMPACTS & MITIGATION- MEASURES

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 6-1.

During Planning and Design phase the road alignment, construction details, materials of construction etc. ultimately decide the impacts during later phases are evaluated. Most of the impacts occur during construction and operation phase. While some of the construction phase impacts are temporary, others are permanent. Operation phase impacts are continuous in nature. The important criteria for identification of impact are the identification of the impact zone. For present screening studies, a direct Corridor of Impact (COI) within 500 m road alignment has been considered.

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.

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.

Environmental parameters are broadly classified into three groups.

- **Physical Environment includes:** Water Resources, Water Quality, Air Quality, Noise and Land environment etc.
- **Biological Environment includes:** Terrestrial and aquatic biodiversity and Roadside Plantation etc.
- **Social Environment includes**: Demography, Employment, Agriculture, Housing, Culture etc.

Table 6-1: 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, water supply 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		×	×		×		
Noise	MED		×	×		×		
Soil	MIN		×	×		×		
Flora	MIN		×		×	×		
Social Environment	MAJ	×			×		×	
OPERATION PHASE								
Environmental Attribute								
Air	MIN		×		×	×		
Water	MIN	-	-	-	-	×		
Noise	MIN		×		×	×		
Soil	MIN	-		-		×		
Social Environment								
Increase in property	MED	×			×		×	
Transportation Development	MAJ	×			×		×	
Road User								

Activity	Severity of Impact	Degree of impacts		Duration of Impact		Scope of Impact		
		Positive	Negative	Short term	Long Term	Local	Regional	Limited
Safety and Better Connectivity	MAJ	×			×		×	
Road Users Safety	MAJ	×			×	×		

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

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

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

6.2 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 greencover of the area and also increase soil erosion problems.
- Impacts on physical environment: impacts on air, noise, water and soil during the construction of project road will be noticeable. It may increase soil erosion/ landslide potential due to earthworks during road construction and can change the landscape due to the establishment of newer quarries
- Impacts on Water Environment: It can also cause problem if water streams are polluted since it is used for drinking purpose in the downhill areas.
- Earth cutting and moving will lead to erosion problem

6.3 Environmental & Social Impacts and Mitigation Measures

The assessment of potential environmental impact consists of comparing the expected changes in the environment with or without the project. The analysis predicts the nature and significance of the expected impacts. A summary of potential impacts & mitigation measures is mentioned in the tablebelow.

Table 6-2:Summary of Impacts and Mitigation Measures

Sl. No.	Parameters	Potential Impact	Mitigation Measures Suggested
1	Topography and Soil	Cut and fill operations during road construction	The initial alignment passes through plain terrain however beyond 12+000 the road enters into hilly terrain;at34+500 a rocky outcrop is observed on the RHS. As per discussion with DPR consultant, no substantial cut and fill operations are planned. Minimum cut will be ensured and the cut material will be reused as per the suitability.
		Borrow earth	Borrow earth will be procured from approved area IRC guidelines will be followed during excavation Top soil will be preserved & stockpiled properly. Borrow area Redevelopment plan will be submitted prior to operation of the same. Necessary clearance needs to be obtained prior to operation of the borrow area.
		Quarries	Operational and government licensed quarry have been identified, which will be used for procuring material. Pollution Control Measures will be implemented. Necessary clearance needs to be obtained prior to operation of the borrow area. The topsoil of the quarries needs to be conserved which can used for the agriculture/horticulture purposes
2	Air Environment	Generation of dust during construction phase	Sprinkling of water Earth handling site Borrow area Road construction site Access road route Air pollution control at crusher and Plants PPE for Workers Stone crushing units and Plants should be with environment compliance. Necessary clearance needs to be obtained prior to operation of the borrow area. Regulations of construction timings near sensitive receptors and settlements

Sl. No.	Parameters	Potential Impact	Mitigation Measures Suggested
		Gaseous Pollution	Vehicles and machineries will be regularly maintained to conform to the emission standards. Asphalt mixing sites and Crusher sites should be at least 1 km away from residential area and outside forest area. Asphalt plant will be equipped with pollution control equipment Use of PPE by workers engaged in construction and application of asphalt mix on road surface. Responsibility of contractors and supervising officers that the workers use the PPE.
3	Noise Environment	Noise level may likely to increase during construction phase	Properly maintained equipment to be used Noise levels of machineries used shall confirm to relevant standard prescribed in Environment (Protection) Rules, 2000 Ear plugs and muffs will be used by the workers as per requirement during construction activities Regulation of timing of construction work generating noise pollution near the sensitive areas Provision of noise barrier in front of sensitive receptors.
4	Water Environment	Drainage pattern	Provision of proper drainage through drains/ culverts along the project road, especially at locations where streams are flowing across the project road (Ref: Table 5-1) All the rivers/ water bodies will be crossed by the bridges and other hydrological structures without affecting their original course and flow. Stabilizing and turfing of slopes along the water bodies (If required) will be done. Wherever required gabion walls with hydro seeds and shotcrete.
		Siltation of water bodies	Silt fencing around water bodies during construction to avoid silt laden runoff entering water body (If required) No solid waste will be dumped in or near the water bodies or rivers
		Flooding due to siltation of drainage channel	Excavated earth and other construction materials should be stored away from water bodies

Sl. No.	Parameters	Potential Impact	Mitigation Measures Suggested
		Water for construction	Water sources would be selected so that local availability is not affected. It should be noted that a number of water bodies are located in the vicinity of the project road.
		Contamination from waste	Provision of septic tanks to prevent any untreated sewage discharge from construction worker camps Oil interceptions at construction machine maintenance yards; especially near water bodies (Ref: Table 5-1)
		Contamination from fuel and waste oil	Vehicle maintenance will be carried out in a confined area, away from water sources and it will be ensured that used oil or lubricants are not disposed to water courses
		Sanitation and water use in construction camps	Construction camp will be established in a planned manner Proper sanitation facilities including toilets should be provided Camps will have separate water supply facilities so that local water sources are not affected
5	Land Environment	Loss of topsoil	Topsoil on stripping shall be removed and stockpiled on sides to be used on the side slopes, for top cover of borrow areas and for plantation pits
		Loss of topsoil from borrowing	Arable lands will be avoided for earth borrowing. If needed, topsoil will be separated and refilled after excavation
		Borrowing of fill material	Excavation from pre-selected locations. After excavation the borrow pits will be dressed to match with the surrounding
6	Biodiversity	Loss of Tree and hunting of animals	Minimum tree cutting should be ensured and with due permission by the forest department. It should be ensured that, no animals will be hunted and harmed by the construction workers. The workers will be educated regularly regarding the biodiversity and their conservation importance. C & D waste will not be dumped in any water body.
7	R & R	Land Acquisition Loss of Structures and CPRs	Land acquisition not applicable. Proper compensation will be paid as per norms.

The detailed Environmental Impact assessment and corresponding mitigative measures are described in the following sections for Umsning-Jagiroad.

6.3.1 Air Quality

Adverse impact on ambient air quality is anticipated during construction as well as operation phase due to this project. However, the extent of impact will significantly vary depending on the land use. The probable impacts and recommended mitigation measures are presented below.

6.3.1.1 Impact on Air Quality during Construction Phase

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.

(vi) Particulate matter, comprise the majority pollutants from road construction, Particle size distribution from road construction is predominantly 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.

(vii) Deterioration of air quality due to fugitive dusts emission from construction activities like excavation, backfilling & concreting, and hauling & dumping of earth materials & construction spoils, and vehicular movement along unpaved roads.

(viii) Deterioration of air quality due to gaseous emissions from construction equipment & vehicular traffic.

(ix) Deterioration of air quality due to emission from asphalt and hot mix plants.Emission of Carbon monoxide, sulphur-di-oxide, nitrogen oxides etc. will be generated from the hot mix plant

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

- Vehicles delivering loose and fine materials like sand and aggregates shall be covered.
- Loading and unloading of construction materials in the project area or provisions of water logging around these locations.
- Storage areas should be located downwind of the habitation area.
- Water shall be sprayed on earthworks and unpaved haulage roads regularly.
- Regular maintenance of machinery and equipment. Vehicular pollution check shall be made mandatory.
- Explore the potential for using readymade asphalt and crushed rocks to avoid or minimize the use of hot mix and rock crushing plants.
- Mixing plants and asphalt (hot mix) plants shall be located at least 1.5 km away from the nearest habitation, school, hospital, river, streams, lakes, 500m from ponds and national highways, 250m from state highways downwind direction from the nearest settlement

and after securing a No-Objection Certificate (NOC) from the SPCB, Meghalaya. 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.
- 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.

Impact of/on	Severity	Duration	Extent of Impact (after Mitigation)
Air Environment	Minor-Few Exceedances of Statutory or prescribed limits but assessed to be As Low As Reasonably Practicable (ALARP).	Transient	Low

	No complaint from third parties or governmental body		

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

6.3.1.2 Impact on Air Quality during Operation Phase

Increase of traffic volume post-implementation of the project is anticipated. However, the total volume is not expected to be significant, Further, due to increased awareness about environment and cost of fuel, the introduction of e-vehicles is happening at a much faster rate. Therefore, the overall impact on ambient air quality is not expected to be significant during operation phase.

Impact of/on	Severity	Duration	Extent of Impact (after Mitigation)
Air Environment	Insignificant	Long Term	Low

6.3.2 Noise

Adverse impact on ambient noise quality is anticipated during construction as well as operation phase due to this project. However, the extent of impact will significantly vary depending on the land use. The probable impacts and recommended mitigation measures are presented below.

6.3.2.1 Impact on Noise Quality during Construction Phase

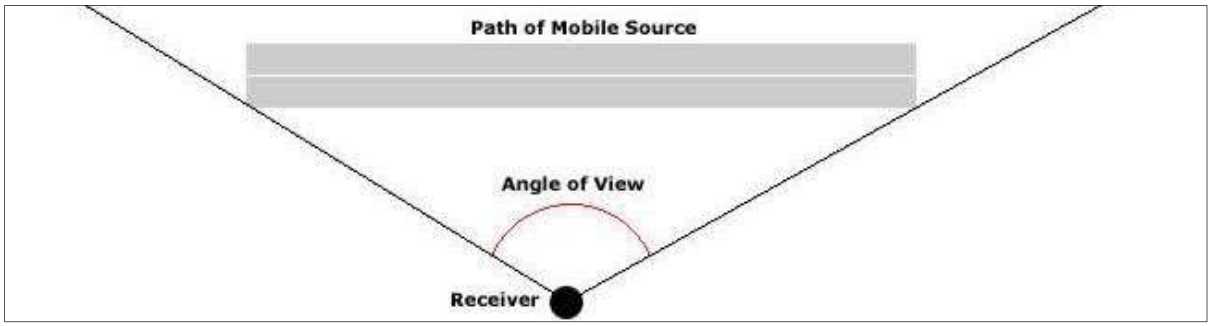
The scale of the construction necessary to upgrade the road and the corresponding slight increase in traffic is not expected to generate adverse impacts. Ambient noise level may increase temporarily in the close vicinity of various construction activities, maintenance workshops, and vehicles and earthmoving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

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

The QUESTOR Construction Noise Tool is a simple application capable of calculating noise levels for construction sites. It is based on the construction site noise calculation model documented in PR70 "How much noise do you make? A guide to assessing and managing

noise on construction sites" by Dr Alan Wills (KVÆRNER) and David Churcher (CIRIA). The tool itself works on a relationship of one receiver to many sources.

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



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

Inference

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

Table 6-3: Typical noise levels of principal construction equipment (Noise Level in dB (A) at 50m

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

ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / hour	Speed (km/hr)	Total (dB(A))
1	Dozer	114	50	None	None	20	90	10	10	44
2	Tracked excavator idling	96				20	90			59
3	Tracked excavator	113				20	90			76
4	Wheeled loader	104				20	90			67
5	Tracked loader	112				20	90			75
									Total noise from site at receiver	79
Tipping Fill										
1	Dump Truck	110	50	None	None	100	90	10	10	57
									Total noise from site at receiver	57
Spreading Fill										
1	Wheeled excavator / loader	104	50	None	None	50	90	10	10	81
2	Dozer	117				50	90	10	10	61
									Total noise from site at receiver	81
Spreading Fill										
1	Wheeled excavator / loader	104	50	None	None	50	90	10	10	81
2	Dozer	117				50	90	10	10	61
									Total noise from site at receiver	81
Ground levelling										
1	Dozer	114	50	None	None	50	90	10	10	58

ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / hour	Speed (km/hr)	Total (dB(A))
2	Grader	111				50	90	10	10	55
									Total noise from site at receiver	60
Unloading										
1	Tipper lorry	113	50	None	None	50	90	10	10	57
2	Tracked loader	112				50	90	10	10	89
									Total noise from site at receiver	89
Rolling gravel / bricks										
1	Road roller	108	50	None	None	100	90	10	10	55
									Total noise from site at receiver	85
Compacting fill										
1	Vibratory roller	106	50	None	None	50	90	20	15	84
2	Compactor rammer	108	50	None	None	50	90	20	15	86
									Total noise from site at receiver	88
Compacting sub-base										
1	Compactor rammer	108	50	None	None	100	90	20	15	89
									Total noise from site at receiver	89
Compacting earth										
1	Compactor rammer	108	50	None	None	100	90	20	15	89
									Total noise from site at receiver	89
Road surfacing										

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

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

Although this level of noise is higher than the permissible limit for ambient noise level for residential/commercial levels but will occur only intermittently and temporarily. This noise level will attenuate with an increase in distance from the noise source, decreasing by 10dB at a distance of about 55m and 20 dB at 180 meters. Impact due to noise during construction activities will be minimal near communities as construction camps are located at least 500 meters away from community areas.

Along the project road, noise-sensitive places have been located which includes schools, hospitals, and religious places (Ref: Table 5-9). Noise impacts during project construction will be significant on these but temporary. Using the Inverse Square Law of noise propagation,

anticipated noise level at some of these sensitive receptors due to construction has been calculated. The result of these calculations is given below.

Table 6-4: Anticipated Noise due to construction at the sensitive receptors

Name of the Component	Description	Distance from the road (m)	Noise Level (dB)
PO	Post Office, Umsholait	6.93	88.16
SCH	School, Mawhati	4.96	91.06
OFC	Office of Assistant Executive Engineer, Mawhati	20.87	78.58
CHC	Church, Mawhati	5.85	89.63
SCH	Serenity School	2.99	95.46
SCH	School, Umsholait	3.91	93.13

From the above study it is evident that the range of noise level of all locations is exceeding the permissible limit. To avoid the impact, following mitigation measures are proposed below.

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

Control Measures adopted during Construction Phase for Noise Environment

- Site Controls: Stationary equipment will be placed along un-inhabited stretches as per distance requirements computed above as far as practicable to minimize objectionable noise impacts. These locations should be away from known bird nesting areas.
- Scheduling of Project Activities: Construction activities will be scheduled to coincide with period when people would least likely to be affected. Construction activities will be strictly prohibited between 10 P.M. and 6 A.M. Near sensitive areas like schools', construction activities should be prohibited at the schooling hours. Near residential areas. Noisy operation near known nesting areas should be avoided during winter, typical breeding period of migratory birds.
- Protection devices (ear plugs or ear muffs) will be provided to the workers operating in the vicinity of high noise generating machines.
- Construction equipment and machinery should be fitted with silencers and maintained properly.
- Noise measurements should be carried out along the road to ensure the effectiveness of mitigation measures
- All construction equipment used for an 8-hour shift shall conform to a standard of less than 90 dB(A). If required, machinery producing high noise as concrete mixers, generators etc., must be provided with noise shields;

- At construction sites within 500m of human settlements, noisy construction activities shall be stopped between 9.00PM and 6.00AM and near sensitive locations such as schools' construction activities should not be done during the schooling hours.
- Vehicles and construction machinery shall be monitored regularly with particular attention to silencers and mufflers to maintain noise levels to minimum;
- Workers in the vicinity of high noise levels must wear ear plugs and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 85 dB(A)per 8-hour shift.

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

6.3.2.2 Impact on Noise Quality during Operation Phase

To assess the noise levels at the various sensitive receptor locations along the corridor during operation phase, the prediction of noise levels has been made for the horizon years 2021 and 2040, using the FHWA Transport Noise Model version 3.0. TNM computes incremental highway traffic noise at nearby receivers. As sources of noise, it includes noise emission levels for the following vehicle types:

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

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

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

Input Data used to run the model are as following:

- Traffic Volume - average hourly traffic volume and type data from traffic survey (Refer Chapter 3, Section 3.4). In noise propagation model vehicles are classified onto 5 categories namely: Automobile, Medium Trucks, Heavy Trucks, Buses, and Motorcycles.
- Background noise such as noise generated due to anthropogenic activities, industrial activities, movement/ operation of other noise generating sources, such as trains, aero planes, etc. was not considered in the model as background noise level at all sensitive receptors was not available.
- During the pre-project scenario (Year 2021), average speed was considered as 55 kmph and 40 kmph for buses and heavy vehicles during day time. Furthermore, for other vehicle categories same is considered as 60 kmph during day time. Though the design speed of the project road is 80 kmph, however as a conservative approach, post project speed for heavy vehicles is considered as 55 kmph during daytime, whereas for other vehicles same is considered as 80 kmph.
- The receptor site condition in terms of existing tree zone, barrier (boundary walls) is also incorporated
- The prediction of noise propagation has considered following three assessment years based on the traffic projections provided in the DPR.
- 1st Prediction- (Year 2021, i.e. current operation)
- 2ndPrediction- (Year 2040 i.e. estimated project life)

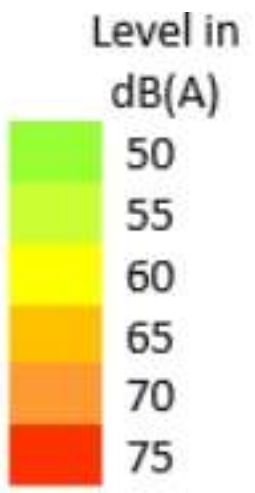
In order to assess the impact on ambient noise during the operation phase comparisons are made between the baseline noise level and predicted noise level for the year 2021 and in year 2040. The outcome of the modelling exercise:

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2021	Predicted Noise Level in 2040	Remarks
		Easting	Northing			
PO 32.400-1	Post Office	409399.00	2858398.00	51.3	51.8	The difference between the 2021 noise level and predicted noise level in 2040 is less than 3dB. The noise level in 2021 and 2040 slightly exceeds the limit i.e. 50dBA.
Sch 29.200-1	School	408280.00	2855881.00	50.2	50.6	The difference between the 2021 noise level and predicted noise level in 2040 is less than 3dB. The noise level in 2021 and 2040 slightly exceeds the limit i.e. 50dBA.
OfC 29.000-1	Office	408079.00	2855692.00	50.5	50.9	The difference between the 2021 noise level and predicted noise level in 2040 is less than 3dB. The noise level in 2021 and 2040 slightly exceeds the limit i.e. 50dBA.
ChC 29.000-1	Church	408088.00	2855680.00	64.7	65.1	The difference between the 2021 noise level and predicted noise level in 2040 is less than 3dB. The noise level in 2021 and 2040 exceeds the limit i.e. 50dBA.
Sch 2.500-2	School	390058.00	2847945.00	73.0	73.4	The difference between the 2021

Receptor Name	Description of Receptor	Coordinates		Base Year Noise Level 2021	Predicted Noise Level in 2040	Remarks
		Easting	Northing			
						noise level and predicted noise level in 2040 is less than 3dB. The noise level in 2021 and 2040 significantly exceeds the limit i.e. 50dBA.
Sch 32.000-3	School	409232.00	2858049.00	50.4	50.9	The difference between the 2021 noise level and predicted noise level in 2040 is less than 3dB. The noise level in 2021 and 2040 slightly exceeds the limit i.e. 50dBA.

Noise levels (Leq) near maximum receivers are found to be lower than the desired levels for the respective categories, noise level exceeds the limit at few locations. The maximum predicted value 73.4dB(A) is recorded at the receiver located at chainage2.500 km. It is evident from the above tables that there will be an increase in the noise levels due to increase in traffic intensity as well as average speed of vehicles over the road's design life.

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

		
Grid Noise Assessment along the Project Roads in 2021 (200 m each side)	**Grid Noise Assessment along the Project Roads in 2040 (200 m each side)**	

Noise level for the base year (2021) is mostly around 50 dB(A) except at two locations, where the noise level is significantly exceeding the limit. Also, during the year 2040, the ambient noise level near the road is predicted to be above 50 dB(A) and hence, likely to exceed the prescribed noise levels. In all these locations, as indicated in the table above, although the noise level is exceeding the statutory limit but IFC definition of significant noise impact i.e. increase in noise level by more than 3dB(A) is not anticipated.

Mitigation Measure

To reduce noise and vibrations, noise barriers in the form of compound wall is proposed. In case of space crunch, the use of concrete screens is also suggested. The noise barrier wall shall be constructed by excavation of foundation, laying of brick masonry wall up to a height of 2m aboveground, plastering and coping as per the direction of the engineer and as laid in the specification. Creepers and paints shall be used in consultation with the affected community to give an aesthetic look. Shade and flowering trees shall be planted within the boundary of the sensitive receptor, between the building line and the compound wall, wherever space shall be available, 5m centre to centre.

Themeasuresadoptedfornoiseattenuation isgivenbelow

- Plantationwithinthepremisesifspaceavailableforplantation
- Raisingof existingboundarywall/constructionof newwallupto2mheight
- Plantingcreeperstoprovideaestheticview
- In urban areas the boundary wall can be painted with posters to provide aesthetic views. The option of posters or creepers shall be agreed by the school / hospital administrator.

Impact of/on	Severity	Duration	Extent of Impact (after Mitigation)
Noise Environment	Minor-Few Exceedances of Statutory or prescribed limits but assessed to be As Low As Reasonably Practicable (ALARP). No complaint from third parties or governmental body	Long Term	Moderate

6.3.3 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 will include the use of gabion wall with hydro seed and shotcrete (Ref: Sec. 4.6.8).
- 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.

Figure 6-1: Landslide and Soil erosion prone area along the project road

6.3.4 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 diseases.

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 levelled 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.

Figure 6-2: Quarries found along the project road

6.3.5 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 refuelled 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-fuelling areas, oil interceptors shall be provided. Oil and grease spill and oil-soaked materials are to be collected and stored in labelled containers (Labelled: 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, 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 reused to the extent possible and remaining, if any, disposed of in secure landfill sites only in an environmentally accepted manner. For removal of debris, wastes and its disposalMoRTH 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 of thedebris 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 as dumping sites.

6.3.6 Groundwater

Contamination of groundwater is not envisaged since construction camps will have toilets connected 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.

6.3.7 Surface Water Quality

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 refuelled 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 labor 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.

Figure 6-3 : Natural Spring water used by local people for domestic 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

6.3.8 Hydrology and Drainage

Construction material and waste may contaminate or clog the small streams/ 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.

Figure 6-4 : Protection of the continuous water flowing structures is required as mitigative measures

6.3.9 Impact on Biological Environment

6.3.9.1 Terrestrial Ecology

As per the approved Protected Areas and reserve forest map of Meghalaya, near the Umsning-Jagi road there are only private forests

One month before the construction starts, clearing and grubbing will be performed by the contractor. In this project no tree felling is envisaged. The cutting of shrubs 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, if any. The heritage trees, if any, identified during the construction period along the project road, should be avoided and not be felled.

Wildlife Corridor

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

6.3.9.2 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 any increase in siltation level of the water. All precautionary measures shall be taken as given under the surface water section (Ref: 6.3.7) to prevent accidental damage of water quality.

6.3.10 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 Meghalaya 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 Meghalaya Government circular.
- No more than 4 people should be Assemble during consultation and that to minimum distance of 6 feet need to be complied.
- During consultation if somebody is seen having cold, cough or unhealthy appearance like from the face reading it appears that he/she is sick, that person should be avoided.

- Do exchange any documents, pens, attendance sheet for signing during consultant. The consultant should enter all the consultation findings and attendance sheet on his/ her own behalf.
- Any document submitted during consultation should be left in one box with all the entries made by the document holder and signed by his/her own pens.
- The social consultant should carry face mask, hand sanitizer, hand gloves, face shield, body cover, etc.
- There should be no exchange or free distribution of face mask during consultation.
- Avoid those people who are not adopting social distancing measures or are not wearing face mask and are not adopting precautionary measures.
- Take photographs of consultation adopting social distancing measures and regular use of hand sanitizer after each consultation.
- Avoid those area, where number of COVID-19 patients are reported in large number by the state authority. The consultation can be repeated after situation improves.

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

- The labour will have to have COVID -19 induction when he joins the work site.
- The EHS officer during the tool box talk should educate the labors about the COVID -19 pandemic, usage of Mask is mandatory, frequent hand washing and provision of hand sanitizer at all the project site
- The labourers 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 labourer's 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 labourers.
- At the labourers' camps poster in local language should be paster at notice board.
- The social distance measures i.e., number of labourers in each room, kitchen strength, bathroom facilities and water point should be multiples.
- Each labourer camp should have isolation room available to quarantine the labourers in case COVID -19 is reported.
- There should be COVID-19 antigen test conducted for each labourer 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.

6.3.11 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/STP 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.

6.3.12 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 centre's, and religious places.

6.3.12.1 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.

6.3.12.2 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.

6.4 Social Impact Assessment

6.4.1 Projects Impacts

The urban infrastructures project is associated with some adverse impacts as well as some benefits. The major impacts of the project include temporary loss of livelihood during the actual construction period due to inaccessibility to the commercial enterprise all along the project corridor and in Parking Areas. Socio Economic survey was done September, 2021. Due to the pandemic situation the Census Survey Started from 10th November to 20th December, 2021 is nearly completed and will be updated in the final DPR. The SES was done in September 2021 and also consultation was done from September to December 2021 which are completed for the present design phase.

6.4.2 Positive Impact

This sub-project aims to reduce traffic congestion within the Umsning-Jagi road. The storm water drain improves the existing system of rain water flow as most of the drain chokes due to silting. The new design will make easy cleaning/desilting of the storm water drain and thus prevent the overflow of water on the black top. The footpath over the drain and utility corridor will reduce accident.

People residing at the Umsning-Jagi road can easily travel within the area. It will give a major fillip to the quest for all weather good roads for the PIA.

Lower accident and provide quick accessibility to services like hospital, market, office etc.

6.4.3 Impact on Land

As discussed earlier also there is no scope of land acquisition and the RoW is free from all encroachments and encumbrances in the project area. The proposed construction of parking areas and bus bays is within the available Government land.

6.4.4 Impact on Structures

During the social survey very, few structures were enumerated along the proposed developments that might be impacted.However, with the updated DPR no structures will be impacted in the proposed developments.

6.4.5 Impact on Community Structures

With the updated DPR, no common Properties and Government structure will be impacted in the proposed development.

6.5 DisplacedFamilies

Displaced family: means a family, who on account of acquisition or purchase of land needs to be relocated and resettled from the affected area to the resettlement area or elsewhere;

Titleholder: A person who has legal rights of the land acquired/purchased by the project;

Encroacher: A person/family, who transgresses into the public land (i.e., extended their building, agricultural lands, business premises or work places into public land), adjacent to his/her own land or other immovable assets and derives his/her additional source of shelter, livelihood, etc.;

Squatter: A person/family who has settled on public/government land, land belonging to institutions, trust, etc. and or someone else's land without permission for residential, business and or other purposes or has been occupying public building without authority prior to the cut-off date and is depending for his or her shelter or livelihood and has no other source of shelter or livelihood;

Tenant: A person who holds/occupies land/structure of another person and (but for a special contract) would be liable to pay rent for that land/structure. This arrangement includes the predecessor and successor-in-interest of the tenant but does not include mortgage of the rights of a landowner or a person to whom holding has been transferred; or an estate/holding has been let in farm for the recovery of an arrear of land revenue; or of a sum recoverable as such an arrear or a person who takes from Government a lease of unoccupied land for subletting it;

Family: Includes a person, his or her spouse, minor children, minor brothers and minor sisters' dependent on him. Widows, divorcees, and women deserted by families shall be considered separate families;

Persons losing their livelihood: Persons losing their livelihood are individual members of the PAFs/households, who are at least 18 years of age and are impacted by loss of primary occupation or source of income;

Business Owner: Persons owning shops or running any commercial activities and/or within any commercial interest and above the age of 18 is considered as business owner.

Employees to Commercial Structures: Persons being employed formal or informal, temporary or permanent to any commercial enterprise or entities in lieu of some remuneration/ salaries/ payments are considered as employees to commercial structures.

Petty shop/Kiosk: It could be cubicle/booth/stall/cabin made of wood or iron or any other building material which could be shifted to another location as a single unit without much damage and is used for carrying out petty business, commercial activities and has been in operation/existence prior to cut off date;

6.5.1 Impacts on Displaced Families

As there is no Land Acquisition and/or any impact to the structures also as the proposed development is free from encumbrances and encroachments there is no displaced family.

6.5.2 Demography of Families

Socioeconomic survey was carried out for 37sample families with 174 number of total populations. The sample was selected at the primary beneficiariessuch that there is proportional representation of the socio-economic parameters of the PIA. The sample survey data reveals that average family size of the sample family is (4.8).

6.5.3 Family Pattern

Socio-economic survey reveals that only 14% of the Surveyed Families are Joint in nature.

Table 6-5 Family Pattern

Sl. No	Family pattern	Numbers	Percentage
1	Joint	5	14%
2	Nuclear	32	86%
Total		37	100%

Source: Census & SES Survey, September 2021

6.5.4 Religious Stratification

Christianity is the predominant religion in the primary PIA followed by Other Religions. The detail presence of religion in the PIA is depicted in the Table 5.6.

Table 6-6 Religious Stratification

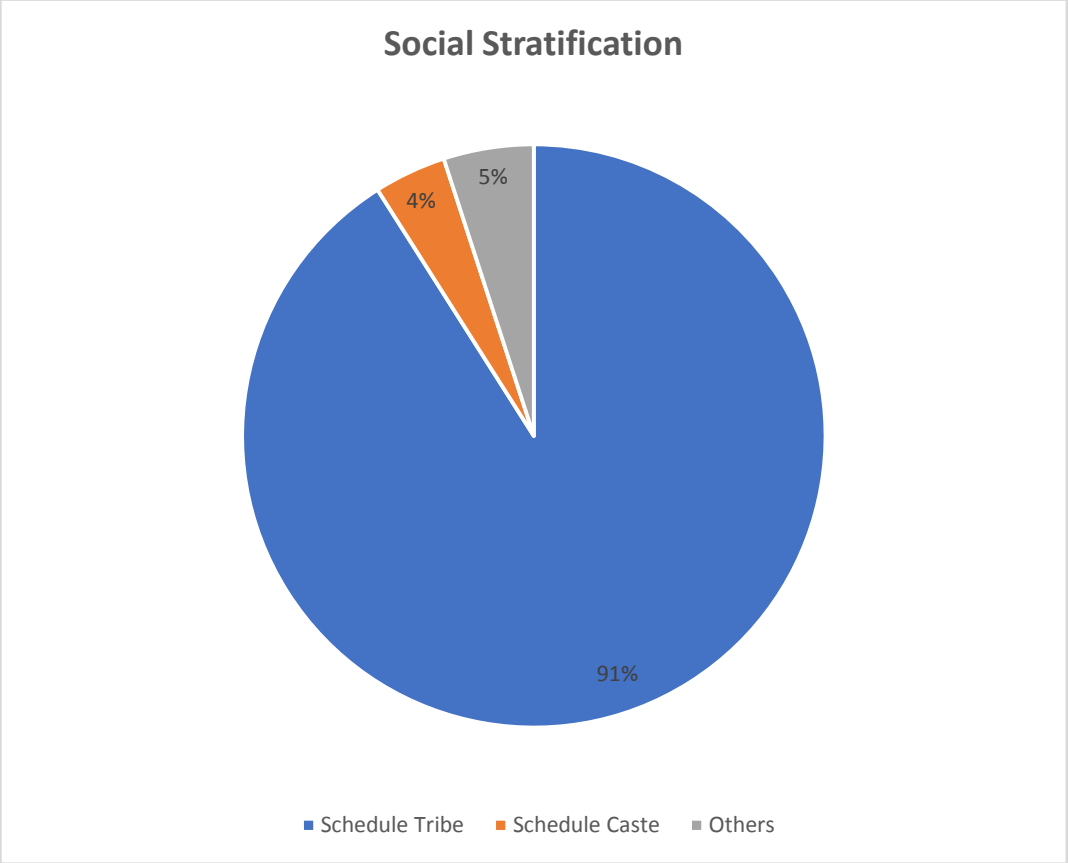
Sl. No.	Category	Percentage
1	Christianity	94%
2	Hindu	3%
3	Muslims	2%
4	Others	1%
Total		**100%**

Source: Census & SES Survey, September 2021

6.5.5 Social Stratification

The social stratification of the project area shows dominance of ST population with 91% families followed by Schedule Caste families at 4%. The third and fourth stratum of the social grouping in the PIA is of Others comprising of 5%. The detail of social grouping in the project area is presented in the Figure 5.1

Figure 6-5Categories of Surveyed Families along the Project Road

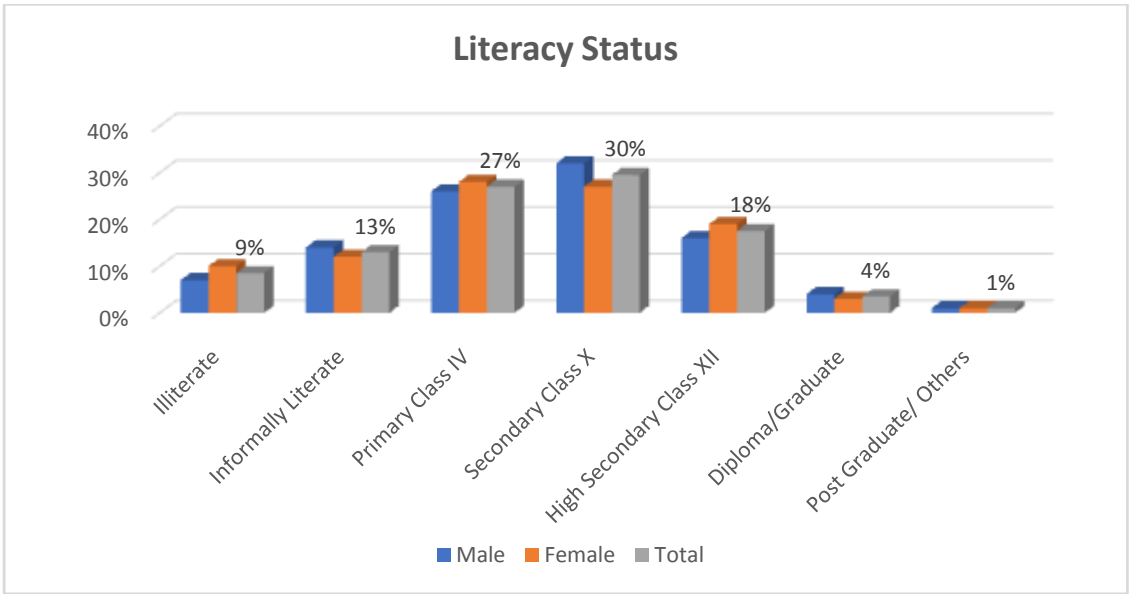


Source: Census & SES Survey, September 2021

6.5.6 Educational Status of PAPs

The educational status of the PAPs, above 6 years of age, reveals that overall scenario of literacy level is not very encouraging in the project area. Out of total 174 sample population the number of child population (0-6 yrs.) is 14 which are kept aside for this category. Only 8% of the population is still illiterate and about 5% PAPs are graduates; while very few (1%) have degree of master and above. The educational status is presented in the Figure 5.2

Figure 6-6Educational Status of PAPs



Source: Census & SES Survey, September 2021

6.5.7 Occupation of PAPs

The occupational status of PAPs reveals that 20% Population are depending on business and this includes the business they are carrying out along the road, mainly shops and kiosks. About 32% Population are having agriculture as their source of income and 4% are engaged in government jobs & private Jobs. The details of occupations by the PAPs are presented in the (Table 5.7).

Table 6-7 : Occupational Status of PAPs (18-60 Years)

Sl. No	Type of Occupation	Percentage
1	Agriculture & Allied Activities	32%
2	Government & Private Services	4%
3	Trade & Business	20%
4	Self Employed	4%
5	Casual Labour	14%
6	Non-Remuneratively Engaged	26%
Total		100%

Source: Census & SES Survey, September 2021

The total number of persons is 174 and the number of persons within the active age group of 15 to 64 years is 116. Thus, the dependency ratio is about 331.

6.5.8 Income and Expenditure Profile of DFs

All the families surveyed have an average annual income more than Rs. 30000/. About 25% Surveyed Families are having average annual income in the range of Rs. 30000-50000, while 53% of the families are earning between Rs. 50000-100000. It has been observed that about 23% Surveyed Families have annual income more than Rs. 1,00,000. The average income level of DF in the project area is summarized in the (Table 5.8).

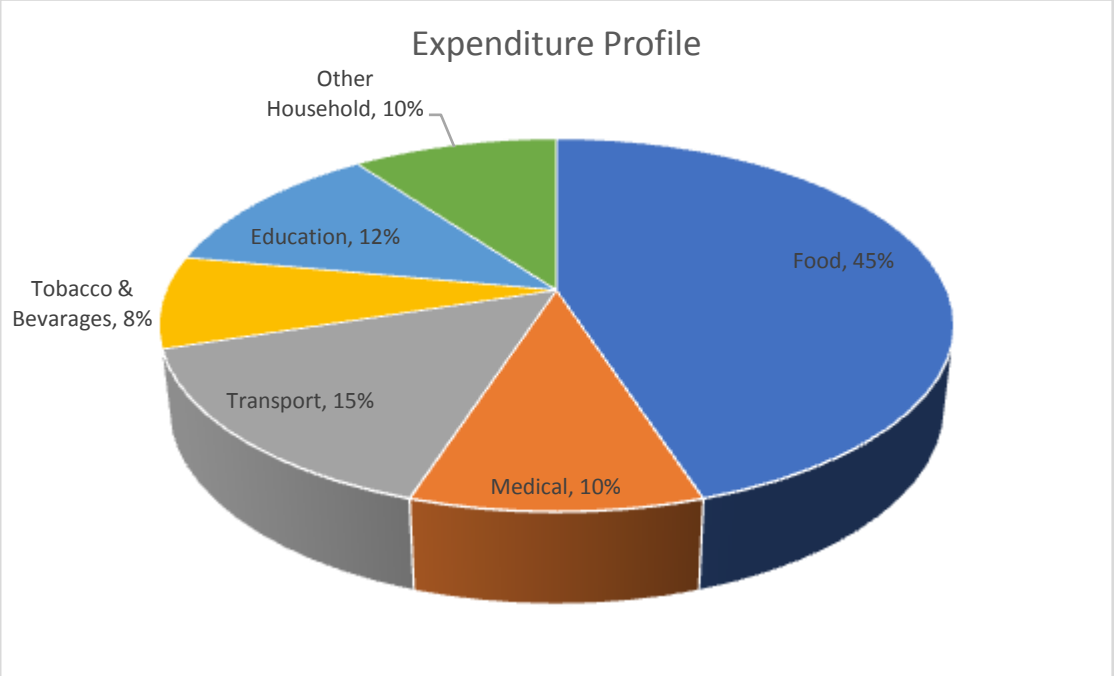
Table 6-8 Annual Income Profile

Sl. No.	Annual Income Categories in (Rs)	% Age
1.	More than 30000 but less than or equal to 50000	25%
2.	More than 50000 but less than or equal to 100000	52%
3.	More than 100000	23%
Total		**100.00%**

Source: Census & SES Survey, September 2021

The expenditure pattern of the families surveyed revealed that about 45% of the average expenditure incurred by the Surveyed Families is on the food items. The detail of the same is presented in graphical format in Figure 5.3. The average annual expenditure is about Rs. 44,514 for the 37 sample families.

Figure 6-7Annual Expenditure Profile



Source:Census&SESSurvey,September 2021

6.5.9 Holding of Agricultural Land (Immovable Assets)

About 21% of the population do not own any land. Only 12% of the population owes more than 0.5 acre of land. The detail of the land holding is depicted in the Table 5.9.

Table 6-9 Agricultural/Homestead Land Holding

Sl. No	Land owned (area in Acres)	Numbers	Percentage
1	Less than 0.25	23	62%
2	0.25-0.5	2	5%
3	More than 0.5	4	12%
4	No land	8	21%
Total		37	100%

Source: Census & SES Survey, September 2021

6.5.10 Possession of Vehicle (Movable Asset)

Majority of the population (37%) have only four wheelers followed by two wheelers (35%) as mode of Family transport. Only 1% of the population do not possess any movable assets. The detail of the movable assets holding is depicted in the Table 5.10.

Table 6-10 Movable Assets Holdings

Sl. No	Family assets	Numbers	Percentage
1	2-wheeler	12	35%
2	3-wheeler	2	5%
3	4-wheeler	14	37%
4	2-wheeler & 4-wheeler	6	15%
5	More than one 2-wheeler & 4-wheeler	3	8%
6	No Assets	0	0%
Total		37	100%

Source: Census & SES Survey, September 2021

6.5.11 Vulnerability

VulnerableFamiliesaredefined as, whoareeither:(i)belowpovertyline(BPL);or(ii)womenheadedhousehold(WHH);or(iii) differently able households(DAH);or(iv)elderly(60yearsandabove) living alone; or (v) scheduled tribes (ST); or (vi) scheduled caste (SC). It shall be noted here that though there are multiple categories of vulnerability groups exist in the project road, we have taken single impact of single vulnerable category for the authentication. For example, the number of BPL/DA/Aged Person/WHH mentioned in the below table does not include those who fall under SC and ST category to avoid the repetition of data and vice-versa. Vulnerability is defined on Census Survey data.

The census survey finding reveals that there is 91% surveyed population along the roadside who belong to the ST community and 4% belong to SC category & 1% families are Women headed household. The total vulnerable families in the PIA are about 99%.

Table 6-11 Vulnerability Status of the Affected Families

Sl. No.	Category	%Age to total population
1	Schedule Tribe	91%
2	Schedule Caste	4%
3	Below Poverty Line (Excluding ST, SC)	3%
4	Women Headed Households	1%
5	Senior Citizen living alone	0%
Total Vulnerable DFs		99%

Source: Census & SES Survey, September 2021

6.5.12 Impact on Gender

In Indian context, irrespective caste, creed, religion and social status, the overall status of women in lower than male and therefore a male child is preferred over a female child. According to 2001 Census in Meghalaya, the sex ratio was 972 females per 1000 male in 2001 but it has increased in 2011 with 989 females per 1000 male which is an indication of social development.

The gender composition of surveyed persons shows that the male accounts for 51% and female accounts for 49%. The gender disparity is not so much visible in among surveyed persons i.e. 986 against state level statistic having 989 but as per census data of India, 2011. The sex ratio of Ri-bhoi district is 976 females per 1000 males in 2011. The illiterate among the female is slightly higher than of the male counterparts. There is 1% of the Surveyed Families are Women Headed Households. From the SES survey the total Population is 174, of which 88 are males &86 are females.

6.5.13 Migration

The Decadal growth rate of the Ri-bhoi district and town clearly indicates influx of migrates from the nearby districts and villages. The SES reveals that about 11% of the population has immigrated in the urban in the last 25 years.

6.5.14 Impact on Tribal People

1 Impact on Land & Structure of ST

No structures or land impacted by the proposed project belong to the STs. Again no ST family will lose their livelihood for the proposed development of the project area.

2 Impact on Socio Economic Profile of ST

The ST population is the majority present in the project affected area does not follow customs that are attach to their land and also not attached to their natural habitat for their living. The proposed sub-project can be viewed as boosting economic growth and poverty reduction, which will bring substantial social and economic development in the region. The ST Surveyed Families have between Rs.50,000 to Rs. 1,00,000 annually. The ST in the project affected area is living in the towns and became the part of the mainstream population. Thus, there will be no negative (culturally or socially) impact on the ST population. Again, the STs are yet to foresee any serious adverse impact for the area in general. Being mostly located at the towns within the developed localities, the people in general are accustomed with the probable risk of development, such as spread of HIV/AIDS and STD, drug abuse that can trap the youth and trafficking of women and children. According to the people these hazards are already faced and conquered by them.

3 Impact on Community

This sub-project has ensured thatthedesignedandimplementationwillbeinsucha waythatitfostersfullrespectfor ST identity,dignity,humanrights,livelihoodsystems,andculturaluniquenessastheydefinethem. There is no impact on the community structure or community land of cultural or religious sentiment of the ST Population in the Primary PIA. Theproposedprojectwillensurethat STsreceiveculturallyappropriatesocialandeconomicbenefits,donotsufferadverseimpactsasaresul tofprojects,andcanparticipateactivelyinprojectsthataffectthem.
Thereisnoculturalheritage siteoftheSTwhichcomesinthewayoftheroadalignment.TheSTpopulationamongthe Surveyed Families inthePIAarelivinginthetownsandintheduecourseoftimebecamethepartofthemainstreampopulation .PresentlytheimpactedSTpopulationdonotfollowanycustomsthatareattachedtotheirlandornaturalh abitatwhichwillbeimpacted.Thus,therewillbenoculturalorsocialimpactontheSTpopulation.

4 ImpactonGender

The tribes of Meghalaya whose societies are organized on matrifocal principles have obtained much greater gender equality than the societies (e.g., Hindu and Muslim) that are organized on the patriarchal principles.

However, it was identified that social and economic benefits for affected which are culturally appropriate and gender and inter-generationally inclusive and develop measures to avoid, minimize, and/or mitigate adverse impacts on STs mainly the Gender. Suggestion of noise barrier, reduction of dust, providing employment of the female members as unskilled labourers during construction were the results of the focus group discussions.

Continuous meaningful focus group discussions with the ST women and affected STs communities and concerned STs organizations were carried out and will be carried on to solicit their participation (i) in designing, implementing, and monitoring measures to avoid adverse impacts or, when avoidance is not possible, to minimize, mitigate, or compensate for such effects; and (ii) in tailoring project benefits for affected ST communities in a culturally appropriate manner. To enhance STs' active participation, projects affecting them will provide appropriate and gender inclusive capacity development. Establish a culturally appropriate and gender inclusive grievance mechanism to receive and facilitate resolution of the ST concerns.

6.5.15 Impact on Access to Services Amenities

A. Transport facility

Transport facility is considered as the most basic of all civic amenities as this is the life line to access any kind of social services. Most of the clusters in the PIA have adequate road transport facility but it fails to cater its benefit due to bad condition of the road during winter and rainy season. Umsning-Jagi road is well connected with the rest of the state. Jagi Road Railway Station is well connected withGuwahati Junction.

B. Solid Waste Dumping Facilities

The PIA is congested with structures and roads and as it is situated on the hill slope, solid waste dumping is a very sensitive issue in the area. As per the SES it is revealed that more than 95% of the people dispose solid waste by the method of 'door to door' collection by local Authority in the urban area.

C. Source of Drinking Water

The main source of drinking water in the PIA is river, streams and ponds (nearly 68%).

Table 6-12 Source of Drinking Water

Sl. No	Types of drinking Water Source	Numbers	Percentage
1	Tap Water by ULB	12	32%
2	Groundwater/surface water	25	68%
Total		37	100%

Source: Census & SES Survey, September 2021

D. Distance of Medical Facilities

Medical facilities like government hospital and urban health centres (UHC) are not easily available within 5km for 30% of the population.

Table 6-13 Distance of Medical Facilities

Sl. No	Distance of Medical Facilities	Numbers	Accessibility Percentage
1	Within 1km	4	11%
2	Within 2km	7	19%
3	Within 5km	25	68%
4	More than 5km	1	3%
Total		37	100%

Source: Census & SES Survey, September 2021

E. Other Services

The proposed project will enhance the standard of living and/or quality of life of the residents of Ri-bhoi. During the construction there might some temporary restrictions in access which have to be taken care in the Resettlement Plan.

There is no permanent impact regarding the limited access to services or amenities are envisaged in the process of development of the proposed project.

6.6 Impacts on Road Safety and Human Health

The planning and designing of the project roadare in accordance with the improved safety measures and better health conditions.

The chances of accidents could be minimized by (1) strengthening the pavements, (2) improving upon the curves in road geometrics, (3) grade separators (4) proposing the service

lanes in market places and near schools, etc (5) providing proper median, (6) improving upon road crossings (7) putting right signals and signboards, (8) new under passes.

6.7 Mitigation Measures:

The project is likely to bring some negative impacts on the environment and socio-economic structure of the region. While deciding the alignment from environment point of view, some negative potential impacts are unavoidable. In such cases, adoption of mitigation measures is the only solution. Mitigation should be focused on achieving goals within clear timeframes. Use of SMART approach is recommended to evaluate the likely effectiveness of alternative mitigation strategies or measures. The SMART refers to measures that are Specific, Measurable, Achievable, Realistic and Timely.

Table 6-14: Potential impact and mitigation measure along the project road

Potential Impacts	Mitigation
Accidental spots can be reduced by providing proper signs and warnings, improvement of junctions, new under pass, fly-over etc.	Proper provision of service roads, junctions, fly-over, under passes to be provided at appropriate places Truck parking places Medical facility to be provided (an ambulance fitted with all medical equipments and a doctor)
Sexually transmission diseases (STDs)	Detected diseased person to be carried to the nearest city hospital Preventive measures should be taken to check the spreading of STDs

6.8 Potential Environmental Enhancement/ Protection Measures

6.8.1 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.

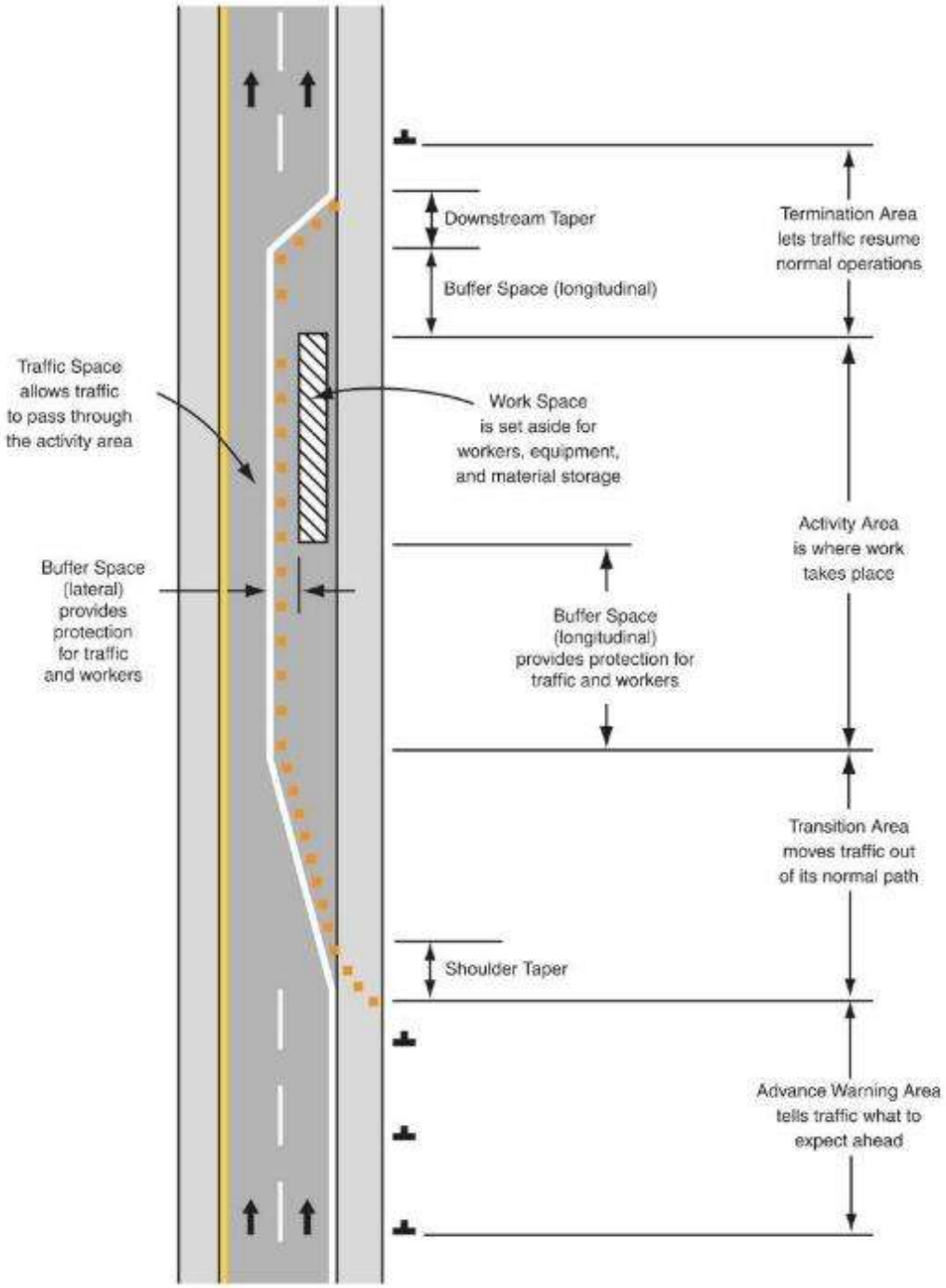


Figure 6-8: Traffic Management Diagram

6.8.2 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.

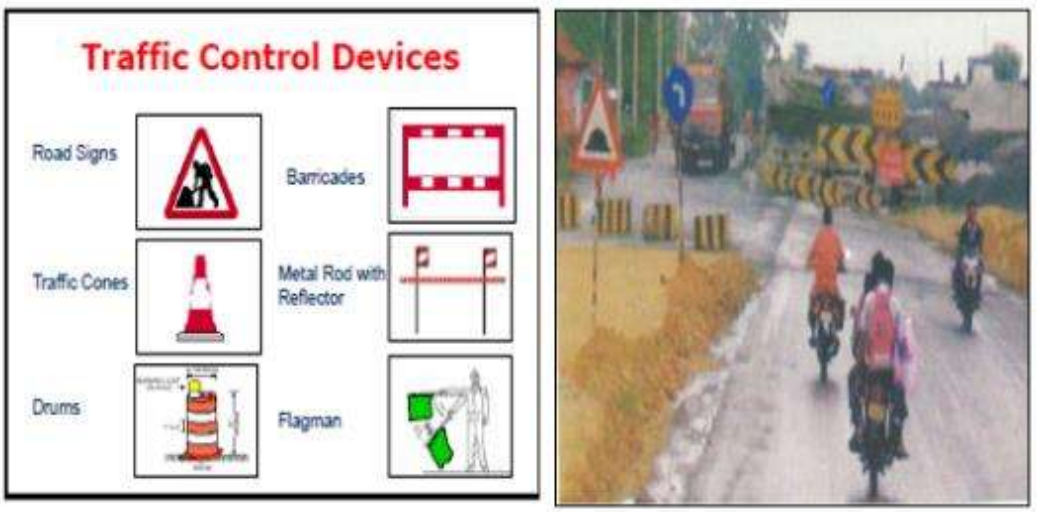


Figure 6-9: Traffic Control Devices at traffic diversion locations

6.8.3 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.

6.8.4 Health and Safety Plan for COVID19 Pandemic

6.8.4.1 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 Meghalaya population.

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

6.8.4.2 Principles of Worker Protection

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

6.8.4.3 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.

6.8.4.4 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).

6.8.4.5 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.**

6.8.4.6 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.

6.8.4.7 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.

6.8.4.8 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 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)

6.8.4.9 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

6.8.4.10 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 meghalaya, 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).

6.8.4.11 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/

6.8.4.12 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

6.8.4.13 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 AarogyaSetu app, recommended by GOI for tracking COVID-19 patients.

7 ENVIRONMENTAL MONITORING PROGRAM

The purpose of the monitoring program is to ensure that the envisaged purpose of the project is achieved and results in desired benefits to the target population. To ensure the effective implementation of the Environmental Management Plan (EMP), it is essential that an effective monitoring program should be designed and carried out. The environmental monitoring program provides such information based on which management decision may be taken during construction and operational phases. It provides basis for evaluating the efficiency of mitigation and enhancement measures and suggest further actions that need to be taken to achieve the desired effect.

Objective of Monitoring Program

The Objectives of environmental monitoring program are-

- Evaluation of the efficiency of mitigation and enhancement measures;
- Updating of the actions and impacts of baseline data;
- Adoption of additional mitigation measures if the present measures are insufficient; and
- Generating the data, which may be incorporated in environmental management plan in future projects.

7.1 Environmental Monitoring

Environmental monitoring describes the processes and activities that need to take place to characterize and monitor the quality of the environment. Environmental monitoring is used in the preparation of environmental impact assessments, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. All monitoring strategies and program have reasons and justifications which are often designed to establish the current status of an environment or to establish trends in environmental parameters. In all cases the results of monitoring will be reviewed, analysedstatistically and published. The design of a monitoring program must therefore have regard to the final use of the data before monitoring starts.

7.2 Monitoring Parameters and Standards

The Environmental monitoring of the parameters involved and the threshold limits specified are discussed below: -

7.2.1 Ambient Air Quality Monitoring

The air quality parameters viz. Sulphur di-oxide (SO2), Oxides of Nitrogen (NOX), Carbon Monoxide (CO) and Particulate Matter (PM 2.5 & PM 10) shall be regularly monitored at identified locations from the start of the construction activity. The air quality parameters shall be monitored in accordance with the National Ambient Air Quality Standards.
The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan (Ref: Table 7-1).

7.2.2 Noise Quality Monitoring

The noise levels shall be monitored at already designated locations in accordance with the Ambient Noise Quality standards. The duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan (Ref: Table 7-1)**.**

7.2.3 Water Quality Monitoring

Water quality parameters such as pH, BOD, COD, DO, Coliform, Total Suspended Solids, Total Dissolved Solids, Iron, etc. shall be monitored at all identified locations during the construction stage as per standards prescribed by Central Pollution Control Board and Indian Standard Drinking water specifications IS:10500 Quality Standards. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan (Ref: Table 7-1)

7.3 Monitoring Plans for Environment Condition

For each of the environmental components, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for the various environmental condition indicators of the project in construction and operation stages is presented in (Ref: Table 7-1)**.**

Monitoring plan does not include the requirement of arising out of Regulation Provision such as obtaining NOC/ consent for plant site operation.

Table 7-1: Environment Monitoring Plan

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
Air	Construction Stage	PM10, PM 2.5, SO_x, NOx, CO	Respirable Dust Sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (P&CP) Act,1981 and its amendment	Hot mix Plant / Batching Plant. Stretch of the road where construction is in progress at the site, especially near locations mentioned in Table 5-9. (Total 03 locations)	Three times in a year for two years (Excluding Rainy season)	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU
	Operational Stage	PM10, PM 2.5, SO_x, NOx, CO	Respirable Dust Sampler to be located 50m from the plant in the downwind direction. Use method specified by	Air (P&CP) Act,1981 and its amendment	As directed by the PIU. Especially near locations mentioned in Table 5-9. (03 Project locations)	Three times in a year for two years (Excluding Rainy season)	P I U through NABL approved monitoring agency	P I U

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
			CPCB for analysis					
Water Quality	Construction Stage	Parameters as per IS: 10500 and standards of surface water	Grab sample collected from source and analyze as per Standard Methods for Examination of Water quality	Water quality standards by CPCB	01 drinking water sample- Labour Camp and 02 surface water samples in project stretch, especially from water features listed in Table 5-1.	Three times in a year for two years (Excluding Rainy season)	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU
Water Quality	Operation Stage	Parameters as per IS: 10500 and standards of surface water	Grab sample collected from source and analyze as per Standard Methods for Examination of Water quality	Water quality standards by CPCB	As directed by the PIU. Especially from water features listed in Table 5-1. (03 Project locations)	Three times in a year for two years (Excluding Rainy season)	P I U through NABL approved monitoring agency	P I U
Noise Levels	Construction Stage	Noise levels on dB (A) scale	As per CPCB	Noise standards by CPCB	Hot mix Plant / Batching Plant. Stretch of the road where construction is in progress at the site, especially near educational institutes/ healthcare facilities mentioned in Table 5-9.. (Total 03 locations)	Three times in a year for two years.	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU
	Operation	Noise levels on dB (A)	As per CPCB	Noise standards by CPCB	As directed by the PIU. Especially near educational	Three times in a year for	PIU through NABL approved	PIU

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
		scale			institutes/ healthcare facilities mentioned in Table 5-9 (Total 03 locations)	two years.	monitoring agency	
Soil Erosion	Construction Stage	Turbidity in Storm Water Silt load in ponds, water courses	----	As per Standard (ICAR)	01 location construction camp and 02 major construction locations, especially from water features listed in Table 5-1. (Total 03 locations)	Three times in a year for two years	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU
	Operational Stage	Turbidity in Storm Water Silt load in ponds, water courses	----	As per Standard (ICAR)	As directed by the PIU. Especially from water features listed in Table 5-1. (Total 03 locations)	Three times in a year for two years.	PIU through NABL approved monitoring agency	PIU

7.4 Environmental Monitoring Budget:

The environmental monitoring cost is estimated on the basis of the length and existing environmental scenario of the proposed project. Environmental monitoring cost of 9, 00,000/- is estimated for the construction and Operation stages. The details have been presented in Table -6.2.

Table 7-2: Environmental Monitoring Cost

Cot of Environment / Migration Plan Description	Unit	Quantity	Unit Rate	Cost (in Rs.)
Air quality monitoring at 3 locations for 3 seasons for 2 consecutive years.	No.	18	9000	162,000

Cot of Environment / Migration Plan Description	Unit	Quantity	Unit Rate	Cost (in Rs.)
(Construction Stage)				
Air quality monitoring at 3 locations for 3 seasons for 2 consecutive years. (Operation Stage)	No.	18	9000	162,000
Water quality monitoring at 3 locations for 3 seasons for 2 consecutive years. (Construction Stage)	No.	18	7000	126,000
Water quality monitoring at 3 locations for 3 seasons for 2 consecutive years. (Operation Stage)	No.	18	7000	126,000
Noise quality monitoring at 3 locations for 3 seasons for 2 consecutive years. (Construction Stage)	No.	18	3000	54,000
Noise quality monitoring at 3 locations for 3 seasons for 2 consecutive years. (Operation Stage)	No.	18	3000	54,000
Soil quality monitoring at 3 locations for 3 seasons for 2 consecutive years. (Construction Stage)	No.	18	6000	108000
Soil quality monitoring at 3 locations for 3 seasons for 2 consecutive years. (Operation Stage)	No.	18	6000	108000
Total				**900000**

8 STAKEHOLDER CONSULTATION AND SOCIAL ASSESSMENT

Additional Studies has been carried out based on local consultation and discussion. The different additional studies carried out for the project comprising of R & R study, Safety study, SIA study etc. The study also covers all other aspects within this project location and makes a plan to reduce the issues based on consultation of local community, department and nodal officer's recommendations.

8.1 Local, Public & Other Stakeholders Consultation

These consultations were held at major settlement areas along the project to inform people about the objectives of the project. Such consultations provided a means to get the opinion of the people and their issues of concern. The focused group discussion and interview survey methods were adopted as tools for community level consultations. In each of the consultation, participants were encouraged to give their observations, suggestions and share experiences on various environmental and road safety issues and suitable mitigation.

Public involvement is one of the most important methods for the success of any project. It is useful for gathering environmental baseline data, understanding likely impacts, determining community and individual preferences, selecting the alternative and for designing sustainable mitigation and compensations plans.

The guiding principles include

- Dissemination of information: - The information regarding the proposed project should be disseminated to the project affected people directly and indirectly.
- Soliciting information: - The basic information regarding various environmental and socio-economic issues is solicited.
- Consultation: - The consultation involves engaging people in dialogue. There has to be a continuous dialogue between the components of the project and the public.

The public consultations are held at all the stages, namely, inception, screening, feasibility, and EIA preparation.

Outcomeof Consultations

Following are the key issues emerged during public consultations during field Study:

- The proposed project should have adequate road safety measures including service roads, traffic signal etc. to minimize increasing road accidents.
- Adequate provision of drainage should be made for catering runoff from surrounding areas as well.
- Tree cutting should be minimized.
- Traffic noise is particularly disturbing for schools, residential complex, hospitals located near to project and appropriate mitigation measures are required.
- Appropriate pollution control measures are required during construction phase.
- Provision of noise barriers for sensitive noise receptors like school and colleges.
- Provision of bus stops with kiosk facilities and landscaping.
- Provision for adequate tree plantation should be made to compensate tree cutting.

8.2 Social Impact Assessment (SIA) And R&R

The Social Impact Assessment study of the project National Highway has been carried out as per terms of reference of NHAI and guidelines given by the Govt. of India. The study methodology employs a simplistic approach in which the important receptors were identified. Based on the identification, secondary baseline data were collected and then analyzed to predict the impacts and quantify them. A detailed Social Assessment has been carried out to identify nature and characteristics of losses to individuals and local communities because of the proposed project interventions. The report prepared which gives detailed impacts of the project. A census survey of Project-Affected Persons (PAPs) was carried out along with the land resource survey of the project area. To establish impacts on people and community a resource mapping on strip map and consultation with individuals, communities and other stakeholders were done. Based on the findings of this survey and consultation with project-affected persons and other stakeholders a social impact assessment report is prepared.

8.3 Introduction

Public consultations or community participation is an integral part and process of any project which involves resettlement or rehabilitation issues. It helps to incorporate valuable indigenous suggestions and perceptions of development. In the process, stakeholders get the opportunity to address issues, which are resolved after making appropriate changes in design and alternative finalization. The stakeholders become aware of the development schemes and at the same time influence and share the control over these initiatives, decisions and resources. Community consultations also help to avoid opposition to the project, which is otherwise likely to occur.

During the course of the social impact assessment, consultation meetings were held to inform the communities and population about the positive as well as negative impacts of the road improvement scheme. Public Consultations were held along the subproject with the displaced households, local persons who will be benefitted from the project and other stakeholders of the sub project. Focus group discussions were held with the youth's group, women's group, farmers, shopkeepers, tenants, interest groups and organisation. Key Informant Interview took place with the village head men, gram panchayat members, head of households and important personalities. There was special consultation with the individual women, vulnerable affected persons and tribal persons. These meetings were used to get wider public input from both the primary and secondary stakeholders

8.4 Stakeholders Identification & Analysis

The stakeholders are all the people getting affected by the project or are responsible for the project, whether directly or indirectly. Primary stakeholders included those affected negatively or positively by the project, like the PAPs, project beneficiaries and project implementing agencies. This includes the affected families of residential structures, Commercial structures, affected shopkeepers, tenants, artisans and local communities. Secondary stakeholders included other individuals and groups, with an interest in the project, viz., the State Highway, National Highway users, Government Stakeholders (BDO, CMOs, ANMs, Teachers etc.) and the line departments

8.5 Focus Group Discussion (FGD)

A focus group discussion is held involving local people to discuss the project. It is a form of qualitative research where questions are asked about their perceptions attitudes, beliefs,

opinion or ideas. In focus group discussion participants are free to talk with other group members; unlike other research methods it encourages discussions with other participants. Keeping the present Covid-19 situation in view, it was advised by the Block Development Officer to organize Public Consultation with less than 15 persons at any point of time. The group's composition and the group discussion should be carefully planned to create a non-intimidating environment, so that participants feel free to talk openly and give honest opinions on that particular project. Since participants are actively encouraged to not only express their own opinions, but also respond to other members and questions posed by the leader, focus groups offer a depth, nuance, and variety to the discussion that would not be available through surveys.

Additionally, as FGDs are structured and directed, but also expressive, they can yield a lot of information in a relatively short time. Therefore, FGDs are a good way to gather in-depth information about a community's thoughts and opinions on that specific project.

8.6 Need and Usefulness of Focus Group Discussion (FGD)

FGDs involve organized discussion with a selected group of individuals to gain information about their views and experiences on the project. It is particularly suited for obtaining several perspectives about the same topic. Therefore, FGDs help in gaining insights into people's shared understanding of everyday life and the ways in which individuals are influenced by others in a group situation. Moreover, the role of the moderator/convenor is very significant, as good levels of group leadership and interpersonal skill are required to moderate/convey a group successfully.

During FGD, free and open discussion among the respondents results in generation of new ideas that can be very useful for decision-making on that specific project. A focus group is not static. The moderator/convenor can bring any changes, remaining within the Scope of Work, in order to better facilitate the discussion during the group discussion. This dynamism allows better results in terms of information derived by a focus group. Expressions other than those in verbal form such as gestures and stimulated activities can provide researcher with useful insights on that particular project.

8.7 Objectives

The community participation programmes in social impact assessment ensured that information is disseminated to all the PAPs and other stakeholders in appropriate ways. The information dissemination has taken place in vernacular, giving details about the main project features and the entitlement framework.

Due consideration has also been given to address the views of the vulnerable groups. The Census/Survey Team carried out preliminary consultations through Focus Group Discussions (FGDs) and meetings with the PAPs as well as the general public in the project area. The local Panchayat leaders were informed through the PIU and the date and venue of the Public Consultation were fixed.

Several informal FGDs were conducted primarily in settlements with problems of traffic congestion, dense informal/squatter settlement, close junctions and road intersections, and concentration of PAPs. During the survey, intensive discussion and consultation meetings were conducted with the individual PAPs in every affected village wherein policy related issues; displacements and other related issues were discussed. Suggestions and comments by PAPs

were incorporated in the project road design as well as the policy measures for resettlement management.

Second round of Public Consultations will be conducted at important points, where people could assemble in large numbers. Panchayat members will be contacted to inform the people beforehand. The PIU will be informed to organize formal consultations and the consultant team will also organize informal meetings with village people and other distinguished persons, leaders of local level organization /association, trucker's association, and village women's groups.

8.8 Level of Discussion

A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. The main point of discussions were minor realignments to save certain structures, compensation and assistance, road safety etc. It has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing Agency to take care of the implementation of the project to bring about promised benefits with proper safety measures.

The information and recommendations gathered from the various stakeholder consultations has been incorporated into the design of the project to ensure that the investments align with local priorities and development plans, and that they will deliver equitable socio-economic benefits to the intended project beneficiaries.

Due to the extreme Pandemic situation in the whole world, the PIA is not an exception. There is lockdown, social distancing and various conditions that are not conducive for Public Consultation. As per the guidelines only five persons could be called for Consultation at Panchayat Office thus those are the Public Representatives and the Public Consultation is rather Key Informant Interview in Nature. Informal FGDs have been done at the villages, market place and other common places to gather and disseminate information about the proposed project.

Still there might be persons who could not be informed or not satisfied with the present information, for them a special system is introduced by the survey team. One email address and one dedicated mobile number which is shared with the leaflets for satisfying mainly the PAPs and the locals regarding any queries or complain.

Consultation in front of School, Locals and Other stakeholders

There was an consultation in front of the school where the following things are discussed: -

Public Consultation in front of Schools and withHeadman of the Villages	
Date of the Consultation	30.08.2021
Place for the Consultation	Umnsing-Jagi road near school area, other local shops
Attendees for the Consultation	E&S Consultant with local peoples from the project road. List with contact details are provided in the following table.
Activities Performed	During the informal consultations following things were discussed: - Availability of Land Parcels for creation of proposed road Air and noise problems due to construction of the road.

	During consultation, Father of St. Vianney's school, Umsholaitrecommended shifting of the road away from the school to improve safety of school children. He also informed that for this purpose, he is willing to provide land available on the other side of the road.Further, he also provided a mail to the Chief Engineer of PWD for some changes that is attached in Figure 8-1 During the local consultation, they advised that least tree cutting shall be done in the project road. It is also noted during meeting that the area is prone to landslide and flooding so, utmost care must be taken during construction.
Photographic Evidence	 Fig: -Public Consultation in front of St. Vianney'sSchool, Umsholait  Fig: -Focused group discussions in local shop Fig: Focused group discussion with Head man in Todh um sing 

Name of the People Consulted	Designation	Contact Details
M Warji	Head Man, Tdoh um sing	983076161
B Marbaimg	Local	6009060249
Robinson	Local Farmer	6009848687
Charai	Headman, MawhatiPdeng	8131972126 / 8131942126
Leki Salam	Headman, Umsholait	9366232440 / 9612240701
Kitbok	Headman, Sonidan	9366305384
Father Leo	In-charge of Umsholait school and other facilities	9366778545

St. Vianney's Higher Secondary School
Umsohlait-Ri Bhoi District.
Estd. 12-02-1972. Meghalaya-India.793105.

PROPOSAL FROM THE SCHOOL

TO

The Chief Engineer of PWD

Subject: High way road construction near the school campus

Respected sir

Here, are some of the proposals proposed by the School Managing committee for the safety of the students and the local area as a whole:-

1. Safety of the students
2. Noise pollution prevention
3. Enlargement of the Assembly ground of the school
4. Building retention wall on both side of the road. (six feet tall)
5. Black topping the Assembly ground
6. Planting trees along the road of the school campus
7. Footpath from road side to the Assembly ground
8. Solar Street light
9. Footpath along the road.

Thank you

Yours sincerely

Rev. Fr. Leo lawbor

Principal & School managing committee

Figure 8-1 :- Letter given to Chief engineer from Father Leo, Principal of school after consultation

Table 8-1: Brief Description of some sample Public Consultation

Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input to technical Design
Place: Umsning, 30/08/2021	Total-3 Male-3 Female-0	The existing alignment passes through the town area. It is one of the major town and many Goods vehicles passes through the town. There are both commercial and residential establishments along the alignment. It has been revealed from the Public consultations that the people on both side of the road, considering future potential in development, but afraid of road accident and menace like trafficking and HIV. Some of them also put the issue of construction of concrete drains for the development of the sewage system of the town.	Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for development.	The local authorities also assured that they would help in development of roads project. Road safety awareness campaign should be made at schools
Place: Ri-Bhoi,30/08/2021 Female FGD	Total-2 Male-0 Female-2	During discussion it has been observed that the benefits of the proposed project area are acknowledged by the local people but they want the Executing Agency, to take care of the implementation of the project to bring about promised benefits and the traffic safety. Simultaneously a focus group discussion with all female participants was held in the same area.	The female participants apprehend about the increase in the number of road accidents and would be dangerous to the children and students who usually not careful using the roads	It has been suggested to make traffic safety awareness campaign at the schools and localities. It is also learnt that a NGO would be recruited for developing the awareness of the people of PIA regarding, trafficking, gender issues and other social stigmas.

Table8-2Pictures of First Stage Consultations

		Focus Group Discussion with the distinguish personalities at the Panchayat Office at Ri-Bhoi District on dated 30/08/2021. The detail alignment of the proposed road was discussed and also the benefits of the proposed road were discussed at a length. The persons attend the meeting have put forward some suggestions which was conveyed to the local PWD. .
Focus group discussion in the market area of Ri-Bhoi District on dated 30/08/2021 was held with the land owners and agricultural labourers (three persons, all male). The PAPs were aware of the project but anxious to know the benefits (compensation and assistance) the project would provide them.Also noted that there won't be any problem to Air and noise quality for this project		
		Focus group discussion maintaining social distance was held with the shop owner and local people (two persons, all male) who would be affected by the project and the alignment were explained in detail. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were developed and the affected peoples' views on the project were recorded. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development at a village in Umsning of Ri-Bhoi district on dated 30/08/2021.
Focus Group Discussion with about four persons (all male) was held maintaining social distancing. The Panchayat Member of the village, in presence of the Survey Coordinator, explains the local people about the detail of the project. All the queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded Place: Local club at Umsning of Ri-Bhoi District Dated 30/08/2021.		

		Interaction with children of the affected area. It was done basically to make them aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. Place: Umsning of Ri-Bhoi District Date: 30/08/2021 About ten children were interacted. Air Quality is very good, no noise is found.
FGD with the female members (three members all female) of the PAHs at Ri-Bhoi on dated 30/08/2021 is being carried on the proposed project road. The Affected persons were also explained in detail about the projects and their entitlements. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. The conception and myths regarding the developmental works were also noted.		

8.9 Outcome of the Consultations

People were aware about the improvements proposed for the project road but were not aware about specific details of the PRoW, shift in centreline and the method of valuation for land and building, payment of compensation and other rehabilitation and resettlement measures. A detailed public consultation was organized with the potential project displaced persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. The main point of discussions were minor realignments to save certain structures, compensation and assistance, road safety etc. It has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing Agency, to take care of the implementation of the project to bring about promised benefits with proper safety measures.

The information and recommendations gathered from the various stakeholder consultations has been incorporated into the design of the project to ensure that the investments align with local priorities and development plans, and that they will deliver equitable socio-economic benefits to the intended project beneficiaries. The salient points of the consultations are summarised in the following Table 7.3

Table 8-3: Summary of Consultation Outcome

Issues Discussed	Outcome
Relocation Options Compensations/Assistance	Displaced Persons whose residential structures are getting affected prefer not to get disturbed and if disturbance is not avoidable then they shall be relocated very nearby. Shop owners and workers raised the issue of loss of their livelihood during the resettlement period due to loss of business. During consultation they were convinced that there will be no permanent

Issues Discussed	Outcome
	impact but temporary impact during the active construction period.
What are all the facilities provided through this project and to whom should we approach?	Facilities like bus shelters, rest rooms, pavements, drains etc would be provided. Officers such as PWRD Engineers, LARR Authority could be approached for grievances.
Safety due to alignment	People expressed their views on the risk if the road is widened at the dense settlement area affecting structures on both sides. During consultation they were convinced that there will be no permanent impact but temporary impact during the active construction period.
Could you inform us the time when our assets be removed?	Would be informed well in advance and compensation will be paid before vacating assets, if required.
Relocation of school buildings Relocation of Bus shelter/CPR	The sites for relocation of schools and CPR were identified in consultation with the villagers and the village Headman was carried out. There were differences in opinions among the villagers in demolishing/ shifting the Bus shelter.
Cross Drainage for alignment	People have shown their concern for the proposed drainage pattern for the alignment of a portion of the project road. In this regard the lined rectangular drains with proper outfall shall be planned as a part of the project design of the main carriageway. Adequate cross drainage structures are planned after study of hydrology of the Survey area.
Utilities and basic infrastructures	People showed their concern about what will happen with the utility lines if the road is widened. Adequate care shall be taken for the shifting of the utilities.
Employment during construction	People were of demand if the local people are given preference for employment during the construction phase of the project. Such options shall be explored to the extent possible and mostly the unskilled worked can be hired from nearby locality.
Why structures at places along the road were not measured?	If and only the structure to be impacted, measurements are required. Otherwise, there is no requirements of measurements of structures.
What about the loss of livelihood during active phase of construction?	The active phase of construction is planned in such a way that there will be minimum (temporary) loss of access and/or livelihood. If there is any loss or damage of structures or any immovable assets the Civil Contractor will compensate the same in discussion with the affected party.

8.10 Minutes of meeting with the DPR consultant

A meeting via video conference was held between ESIA Consultant and the DPR Consultant for discussion on Environmental and Social Impact Assesment on Umsniong to Jagi Road.

Location: Office of CETEST Pvt. Ltd, Kolkata and CEG Tower, Jaipur vide Video Conference Mode

Date: 23.12.2021

Time: 4.30 pm

Attendees: Mr. Sukesh Gupta, Team Leader, CEG Ltd.
My. ShyamSundarKhandelway, Asso. Director, CEG Ltd.
Mr. AnirbanNayak, Road Safety Specialist,CETesting
Mr. Supriya Deb, Highway Expert, CETesting
Mr. SwarnabhaBandyopadhyay, Environmental Specialist, CETesting
Mr. SumanSarkar, Social Specialist, CETesting

The proposals mentioned in Draft Project Report for UmsningJagi Road and their possible Environmental and social effects were discussed along with probable remedies. Following points were discussed in detail.

Table 8-4: Minutes of the meeting of ESIA and DPR consultant

Sl. No.	Topic	Details of Discussion	Decision
1	**Land Acquisition**	The ESIA consultants requested for the details of Land Acquisition being done on the project stretch. DPR Consultant informed that, no land is being acquired for this project stretch and the road is being designed to fit within available ROW as advised by the Client. All proposed structures are well within the existing RoW and thus no LA is required for this project.	DPR Consultant has assured that there is no proposal for Land Acquisition.
2	**Demand for all weather road**	ESIA consultants wanted to know the condition of existing road and improvements planned in the design. DPR Consultant deliberated that the existing pavement condition along the road is poor. In some portions of the stretch, the existing pavement is damaged with cracks, raveling, rutting edge breaking and potholes and in some stretches it is observed that the existing bituminous layer is fully damaged and exposed. The overall pavement condition needs to be improvised.	DPR Consultants clarified that pavement is being designed in compliance with IRC codal provisions along with climate resilient technology.
3	**Road safety**	ESIA Consultants asked about the convex mirror to be installed at turning points, sharp corners of the roads at a suitable height as they allow to see invisible but oncoming vehicles. Hence reducing the probability of road accidents. Proper signage and road	The DPR consultants clarified that all the required safety measures including Rumble strips, Sign boards, Chevron boards, Road studs, Convex mirrors etc are being provided as per codal provisions so as to

Sl. No.	Topic	Details of Discussion	Decision
		furniture are to be integral part of the design.	make the road safe to drive.
4	**Road safety at Night**	ESIA Consultants recommended for street lighting. Provision of street lighting is absolutely necessary as it not only act as a prevention of accidents but also an important source of public security intended to reduce crime. Studies have shown that darkness results in a large number of crashes and fatalities, especially those involving pedestrians; pedestrian fatalities are 3 to 6.75 times more likely in the dark than in daylight. Several decades ago, when automobile crashes were far more common, street lighting was found to reduce pedestrian crashes by approximately 50%. Road Furniture and Road Signage are to be introduced at all proper and suitable places.	DPR Consultants clarified that street lightings are proposed at built – up areas and other safety measures viz. Chevron sign boards, Road studs are proposed as safety measures at night.
5	**Storm Water Drain**	The Local People demanded storm water drain as much as possible throughout the alignment. At congested area it should also have cover and use as footpath.	DPR Consultants clarified that storm water drains are provided at all required locations. Trapazoidal drains are proposed at hill side locations. At built up areas cover drain cum footpath are already proposed considering the requirement of pedestrians.
6	**Bus Shelter and/or Rain Shed**	Bus Shelter and/or Rain Shed should be proposed at regular intervals.	Bus shelters are proposed in the DPR at aallbuiltup locations where people are expected to to use public transport.
7	**Other facilities**	There should be speed breakers in front of school, church and market place	Boundary wall are proposed to completely segregate the school from traffic. Road humps/Rumble strips are proposed at cross roads of all junction . Hence safety is given prime consideration in the proposal.
8	**Utility Corridor**	There should be utility corridor at underground near the congested place	Utility corridor will be provided as per actual requirement.
9	**Public Transport**	There are very few public transports in the total alignment. The frequency of public transport should increase.	The matter belongs to Govt. of Meghalaya and ESAI consultants can recommend to increase public transport for betterment of people.
10	**Bridges**	Are there any new bridges proposed in thealignment for not to disturb the natural flow of water?	Two minor bridges have been proposed for reconstruction. All natural streams have been provided with cross drainage structures viz. minor bridges and culverts. All culverts which are in distressed condition will be replaced
11	**Trees**	Are there any trees proposed in the alignment?	No trees will be cut

9 RESETTLEMENT ACTION PLAN

The Resettlement Policy Framework (RPF) provides a guide the preparation of the Resettlement and Rehabilitation Action Plan (R&R Action Plan) depending upon the scale and severity of impacts that may arise, temporary or permanent land acquisition or resettlement and rehabilitation is inevitable. Thus, the objective of the RPF is to ensure that the Project Affected Persons (PAPs) get compensation for their loss, are offered resettlement measures, and are supported in improving or at least restoring their levels of living and income after the project impact to pre-project levels. The RPF is intended to safeguard the interests of the population impacted by the project, especially the poor and vulnerable. The RPF is based on applicable Policies of GoI, State government (herein Govt. of Meghalaya) and the World Bank.

Both the RFCTLARR Act 2013, followed by State rules (2017) of the act and the World Bank Operation Policy on involuntary resettlement (discussed in detail in Chapter 3) aim to ensure that involuntary resettlement should be avoided or minimized, wherever feasible, exploring all viable alternative project designs. Where displacement is unavoidable, people losing assets, livelihood or other resources shall be assisted in improving or at a minimum regaining their former status of living at no cost to themselves.

Also, World Bank safeguards policy requires stakeholder consultation with PAPs (presented in Chapter 10 and Annex 2) during planning and implementation of resettlement action plan and indigenous/ tribal development plan. Once the draft is prepared it is to be made available at a place accessible to, and in a form, manner and language understandable to the displaced or affected people and local NGOs.

The project is likely to have broadly three type of impacts that require mitigation measures. These are:

- Loss of immovable assets viz., land, house, commercial establishments, wells, pondsetc.
- Loss of livelihood or income opportunities viz, for agriculture labours, helping hands in commercial establishmentsetc.
- Impact on the community in terms of loss of common propertyresources.

The first two categories represent direct impacts on an identified population. The people likely to be affected will be surveyed and registered, and project monitoring and evaluation will compare long term impacts against baseline socio economic data.

The third category represents a group impact, where gains and losses of a group-oriented nature are not quantifiable in terms of impact on the individual. Mitigation and support mechanism will be collectively oriented, and the monitoring will focus on impact on such groups.

This framework provides the following policy notes for preparation of R&R Action Plan:

- All negative impacts including displacement should be avoided or minimized wherever feasible by exploring all viable alternative projectdesigns.
- Where negative impacts are unavoidable, efforts should be made either to improve the standard of living of the affected persons or at least assist them in restoring their previous standard of living at no cost tothem.

- All information related to resettlement and rehabilitation action plan preparation and implementation should be disclosed to all concerned, and community participation should be ensured in planning andimplementation.
- The principles of mutual consent and negotiated settlement may also be applied for land acquisition asrequired.
- The persons affected by the project who does not own land or other properties but who have economic interest or lose their livelihoods will be assisted as per the broad principles brought out in thispolicy.
- Before taking possession of the acquired lands and properties, compensation and R&R assistance will be made to those who are available and willing to receive the entitlements in accordance with this policy (given entitlement matrix presented at the end of thischapter).
- Broad entitlement framework of different categories of PAP/ PAF as envisaged has been assessed and is given in the entitlement matrix. Provision will be kept in the project budget. However, anyone moving into the project area after the cut-off date will not be entitled to assistance.
- Three tier appropriate grievance redress mechanism should be established at project level to ensure speedy resolution of disputes.
- All activities related to resettlement planning, implementation, and monitoring should ensure involvement of women. Efforts should be made to ensure that vulnerable groups are included and people's participation during the course of the projectcycle.
- All consultations with PAPs shall be documented and continuous consultations to be carried out during the implementation of resettlement and rehabilitationworks.
- Supporttobeextendedunderthebroadprinciplesofthispolicytomeetthereplacementvalue of the assets and loss oflivelihood.
- Thepolicyfurtherrecognizesextensionofsupporttonon-titleholdersforthelossoflivelihood and replacement value for assets other thanland.
- Thecommonpropertyresourcesshouldbereplacedasfarasfeasibleandifnot,thenassistance should be provided at replacement value to the group.
- Before taking possession of the acquired lands and properties, all compensation, resettlement and rehabilitation would be made in accordance with this policy. Contractor will ensure that access to residences or business or agricultural land is not blocked during construction or subsequently.Theeasementrightsforthevillagersshallbeensuredwhileplanningthelayouts for the solar parks. The NGO responsible for R&R implementation and M&E consultants will bring it to the notice of project authorities if contractor fails to doso.
- In case of displacement, resettlement sites will be developed as part of the project. In such circumstances care should be taken so that there is no/or minimum adverse social, economic and environmental effects of displacement on the hostcommunities.
- Before taking possession of acquired land, sufficient time would be provided to harvest the crop.
- The implementation of the R&R Action Plan should be synchronized with the execution of works under theproject.

For tribal the following provisions will be adhered to:

- Each PAP/ PAFs of tribal category shall be given preference in allotment ofland.
- Tribal PAFs will be re-settled close to their natural habitat in a compact block so that they can retain their ethnic/linguistic and culturalidentity
- TheTribalLandAlienatedinviolationofthelawsandregulationsinforceonthesubjectwould be treated as null and void and-the R&R benefits would be available only to the original tribal landowner.

9.1 Some Common Definitions

The following definitions are used in the documents:

Cut-offDate: Inthecasesoflandacquisitionaffectinglegaltitleholdersornon-titleholders,thecut-offdatewouldbethedateofissuingthepublicationofpreliminarynotificationu/s11(I)ofRFCTLAR Act, 2013.

Project Affected Person (PAP): Person who is affected in respect of his/her land including homestead land and structure thereon, trade and occupation due to construction of the project.

ProjectDisplacedPerson(PDP): Adisplacedpersonisapersonwhoiscompelledtochangehis/her place of residence and/or work place or place of business, due to theproject.

ProjectedAffectedFamily(PAF): Familyincludesaperson,hisorherspouse,minorchildren,minor brothersandminorsister'sdependentonhim.Providedthatwidows,divorceesandwomen deserted by families shall be considered separate families. Additionally, an adult of either gender with or without spouse or children or dependents shall be considered as a separate family for the purpose of thisAct.

Land Owner: Land owner includes any person - whose name is recorded as the owner of the landorbuildingorpartthereof,intherecordsoftheauthorityconcerned;orAnypersonwhoisgranted forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of ForestRights)Act,2006orunderanyotherlawforthetimebeinginforce;orWhoisentitledtobe granted Patta rights on the land under any law of the State including assigned lands; or any person who has been declared as such by an order of the court orAuthority.

Marginal Farmer: Marginal farmer means a cultivator with an un-irrigated land holding up to one hectare or irrigated land holding up to one half hectare, or as may be defined by the concerned state government.

SmallFarmer:Smallfarmermeansacultivatorwithanun-irrigatedlandholdinguptotwohectares or irrigated land holding up to one hectare, but more than the holding of a marginal farmer, or as may be defined by the concerned state government.

Encroacher: A person who has trespassed Government/ private/community Land, adjacent to his or her land or asset to which he/she is not entitled and who derives his/her livelihood and housing there from prior to the cut-off date.

Squatter: A squatter is a person who has settled on publicly owned land for housing or livelihood without permission or who has been occupying publicly owned building without authority prior to the cut-off date.

Landless/Agriculture Labour: A person who does not hold any agriculture land and has been derivinghismainincomebyworkingonthelandsofothersassub-tenantorasanagriculturelabour prior to the cut-offdate.

Below Poverty Line (BPL): A household, whose annual income from all sources is less than the designedsumasfixedbytheplanningcommissionofIndia,willbeconsideredtobebelowpoverty line (BPL).

Vulnerable Person: Those people falling under BPL line category/ vulnerable community as defined by the central government. The Vulnerable group may include but not be limited to the following:

- Member of Scheduled caste/tribe community/other backwardcommunity.
- Women Headed households.
- Senior citizen-person above the age of 60years.
- Landless
- Village artisan

9.2 Process for RAPPreparation

The project roads include rural roads, major district roads and state highways. Different measures will be followed for different categories of road as explained below:

9.2.1 RPF for the Project Road

For rural roads, the existing PMGSY guidelines will be followed. The rural roads will be built under PMGSY guidelines and will be constructed along the existing tracks used by rural traffic. For a few roads,smallquantitiesofadditionalland ifrequiredtoimprovethegeometryatisolatedlocations, will be transferred by donation or directly purchased. The project will ensure that there is no relocation due to rural roads. The alignment will be finalized in consultation with the community through transect walk. The land will be transferred through a gift-deed on a non-judicial stamp paper and will be executed between the titleholder and StatePWD.

Table8.9-1Entitlement Matrix for PAPs/ PAFs

S. No.	Application	Definitionof EntitledUnit	Entitlement	Details
A. Loss of Residential/ Commercial Structures to Non-Titled Holders				
1	Structures on Government land	Owners of Structures or Occupants of structures identified as per Project CensusSurvey	Resettlement & Rehabilitation Assistance	Non-titleholder shall be given three months' notice to vacate occupied land and provided with cash assistance at replacement cost for loss of structures as described in section 29 of the RFCTLARR Act2013. Allsquatters(otherthankiosks)willbeeligibleforone-timegrantofrupees thirty-six thousand as subsistence allowance as per section 29 of the RFCTLARR Act 2013.
B. Loss of Livelihood				
2	Families living within the project area	Title Holders/ Non-Title holders/ sharecroppers, Agricultural Labourer and employees	Resettlement & Rehabilitation Assistance	Subsistence allowance of rupees thirty-six thousand as one-timegrant. Training Assistance of rupees ten thousand for income generation perfamily. Temporary employment in the project construction work to project affected persons with particular attention to vulnerable groups by theproject contractor during construction, to the extent possible and preference in the employment of semi-skilled and unskilled jobs in the project with adequate training for the job/ or One time payment of five lakhs rupees per affectedfamily
C. Additional Support to Vulnerable Families				
3	Families within projectarea	As per definition of vulnerable	Resettlement & Rehabilitation Assistance	One-time additional financial assistance of rupees fifty thousand.
D. Loss of Community Infrastructure/Common Property Resources				
4	Structures & other resources (e.g. land, water, access to structures etc.) within the	Affected communities and groups	Reconstruction of community structure and common property resources	Reconstruction of community structure and Common property resources in consultation with the community.

S. No.	Application	Definitionof EntitledUnit	Entitlement	Details
	project area			
E. Temporary Impact During Construction				
5	Land & assets temporarily impacted during construction	Owners of land & Assets	Compensation for temporary impact during construction e.g., damage to adjacent parcel of land / assets due to movement of vehicles for transportation of equipment's, machinery and construction activities for infrastructure development.	Compensation to be paid by the contractor for loss of assets, crops and any other damageasperprioragreementbetweenthe'Contractor'and the 'Affected Party'.
F. Resettlement Site				
6	Loss of residential structures	Displaced titleholders and non-titleholders	Provisionofresettlementsite/ vendormarket	Resettlementsiteswillbedevelopedaspartofthe project, if a minimum of 25 project displaced families opt for assisted resettlement. Vulnerable PAPs will be given preference in allotment of plots/flats at the resettlement site. Plot size will be equivalent to size lost subject to a maximum of provision given in RFCTLARR Act2013. Basic facilities shall be provided by the project at resettlement site as per the provisions given in the Third Schedule of RFCTLARR Act2013. Similarly, if at least 25 displaced commercial establishments (small business enterprises) opt for shopping units, the Project Authority will develop the vendor market at suitable location in the nearby area in consultation with displacedpersons. Basic facilities such as approach road, electricity connection, water and sanitation facility, will be provided in the vendor market by theproject. Vulnerable PAPs will be given preference in allotment, of shops in vendor market.Onedisplacedfamilywillbeeligibleforonlyonelandplotatresettlement site or shop in the vendor market.

9.2.2 Tribal People's Development Framework

The Tribal People in India are categorized as indigenous community who often become vulnerableindevelopmentprojectsbecauseoftheirculturalautonomy,economicstatus,andenduring specific disadvantages in terms of social indicators of quality of life, thus usually as subject of social exclusion. Because tribal communities live within varying and changing historical, cultural, political and economic contexts, no precise and coherent term has been found to define them. Under OP 4.10, the determination as to whether a group is to be defined as indigenous peoples is made by reference to the presence (in varying degrees) of four identifyingcharacteristics:

- Self-identification as members of a distinct indigenous cultural group and recognition of this identity byothers;
- Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats andterritories
- Customarycultural,economic,social,orpoliticalinstitutionsthatareseparatefromthoseofthe dominant society and culture;and
- An indigenous language, often different from the official language of the country orregion.

9.2.3 Tribes of Meghalaya

Meghalaya is predominantly a tribal state with approximately 86 per cent of the total population being Scheduled Tribes. The tribes of Meghalaya can be classified into three major groups - Garos,KhasisandJaintias(orPnars).TheotherminortribesincludeRabha,Hajong,KochandBodoKachari. The Khasi are the largest tribal group, followed by the Garo and the Jaintia. The most noteworthy feature of the tribes of Meghalaya is matrilineal lineage, whereby lineage is traced through the mother, and property and inheritance is given to the youngestdaughter.

9.2.4 Khasi and Jaintia Tribes

The term "Khasi" generally is used to describe a group consisting of the Khynriam, Pnar, Bhoi and War. The people who inhabit the Jaintia Hills are called the Synteng or the Pnar or simply Jaintia; the people who dwell in the upland of the central part of the state or the Khasi Hills are called the Khynriam. On the other hand, the people who reside in the deep valleys and hill-sides of the southernpartofthestatearecalledWar,whilethoseoccupyingthelow-lyinghillsonthenorthare called the Bhoi. Over the years the term "Khasi" has come to be synonymous with those occupying the Khasi Hills of Meghalaya. There are not many differences among the tribes and they observe the matrilineal system and are exogamous in their way oflife.

The Khasi and the Jaintia are of common ethnic stock and social and cultural background. The societyismatrilinealandlineageisthroughthemother.Thisishowever,nottosaythatthereisnoroleofthe fatherinthefamily–heistheheadofthefamilyanda'kni'ormaternaluncleinhis sister's house. His earnings before marriage remain part of his mother's or sister's which he cannot take away to his wife's house; while after marriage, his earnings become part of his wife's household. Among the Jaintias, the practice differs to the extent that the son continues to remain apartofhismother'sorsister'sfamily(beforeoraftermarriage)andallearningsaretowardsthem.
Ifawifeweretoretainthepropertyofherhusband,shemustvowto never emarryorthepropertywill revert
backtoherhusband'sfamily.ThematrilinealtraditionwhichtheKhasisfollowisuniquewithprinciplesem

phasizedinmyths,legends,andoriginnarratives.Khasikingsembarkingonwars left the responsibility of running the family to women and thus their role in society became very deep rooted andrespected.

9.2.5 Gender Issues among Tribes

The tribal women in Meghalaya play an important role in the community and family development. Women normally constitute half of the total population. These women mostly work as agricultural labourers and share equal burden with men. Meghalaya being the state with matriarchal society, women are empowered but not necessarily well educated about human and tribal rights.

In TPP, therefore, efforts shoud be made to create an institutional framework to make gender sensitive decisions. Project in consultation with Department of Women and Child Development should identify Women Self-help Groups (WSHGs) within project associated villages and together identifyawarenessprogramson"women'sroleindevelopmentandmaintenanceofpublic assets".

9.2.6 Entitlement

Based on the Operational Policy 4.10 of the World Bank and as one of its significant R&R requirements; special provisions for the Scheduled Tribes (ST) have been made in the project R&R Policy (apart from the general compensation and assistance to be received as Project Affected Persons (PAPs) of proposed project activities for loss of assets. Apart from compensation at replacementvalueandR&Rassistanceforanyadverseimpact,eachTribalfamilywillbeentitledto additional benefits as a one-timegrant.

9.2.7 R & R Benefits for Tribal Project Affected People

The resettlement and rehabilitation (R&R) benefits for tribal families is as under:

- Each Project Affected Family of ST category shall be given preference in allotment ofland.
- Tribal PAFs will be re-settled close to their natural habitat in a compact block so that they can retain their ethnic/linguistic and culturalidentity.
- The Tribal Land alienated in violation of the laws and regulations in force on the subject would be treated as null and void and-the R&R benefits would be available only to the original tribal landowner.

9.2.8 Tribal Peoples Plans (TPP)

On the basis of the SIA and free, prior and informed consultation conducted as part of the process, a Tribal Peoples Plan (TPP) should be prepared covering all project sites (could be regionally segregated – such as East and West Meghalaya). A TPP should include the following elements:

- Thedescriptionoftheprojectobjectiveandactivities,inparticularonprojectactivitiesthat will be conducted for thesite;
- AsummaryoftheSIAincludingtheresultsofthefree,prior,andinformedconsultationwith affected tribal communities and verification of their broad community support for the project;
- Description of potential negative impacts and measures to addressthem;

- Aframeworktoensurethataffectedtribalcommunitiescanmeaningfullyparticipateinthe project activities, and in the process to minimize and mitigate negativeimpacts.
- Mechanisms through which affected tribal communities are able to voice concerns and grievances and have themaddressed;
- Mechanisms and benchmarks for monitoring, evaluating, and reporting on the implementation of TPP;and
- The financing plan for TPPimplementation.

9.2.9 Approval and Disclosure

Once the draft TPP(s) and the associated SA Report(s) are drafted, they will be submitted to PMU forreviewandapproval.PMUwilltranslatethemintorelevantlocallanguages,makethemavailable on its website as well as in locations accessible to affected tribal communities, and consult them withaffectedtribalcommunitiesforcomments.PMUwillalsodisclosethemonSPMU'swebpage, finalize them considering the comment received, and submit them to the Bank for review and clearance. The Bank will disclose the TPP(s) through the Info shop as well as at the country office website.

9.2.10 Monitoring and Evaluation of TPP

Throughout the implementation of the project, the Social Expert will monitor the project compliance with Bank safeguard policies. The expert will visit at least on a monthly basis since the planninguntiltwomonthsafterthecompletionofcivilworkstheprojectsitesandmeettheaffected tribalcommunities.UponthecompletionofaTPP,theexpertwillcarryoutaTPPcompletion assessment to confirm that all measures under this TPP have been fully implemented and that the negative impacts on tribal communities have been adequately addressed.

Monitoring group will be created in each tribal inhabited project area which will ensure that all actions would be undertaken in line with this IPPF and, in case of irregularities, contact the PMU. The participatory social audit will be conducted facilitated by Social Expert, whereby community will be encouraged and facilitated to report outstanding issues and air grievances. The meeting is attended by other PMU members and village authorities. The minutes of the meeting will be prepared, and measures will be taken to address the recorded issues in the subsequent annual cycle.

All implementing agencies will have an IPPF focal point that will regularly supervise and monitor TPP implementation. These focal points will report to Project Director on IPPF related matters and requestthesupportoftheSocialExpertifneeded.S/hewilltraveltothesitesandspotcheckifthe actions are taken and information provided in conformity with theIPPF.

9.3 Gender Equity and Social Inclusion

Mainstreaming gender equity and empowerment is already a focus area in the project. In the sub projects, activities related to livelihood restoration will address women's needs. A Gender Development Framework is being designed under the project as part of this SMF which will help in analysinggenderissuesduringthepreparationstageofsubprojectanddesigninterventions.Atthe subproject level,genderanalysiswillbepartofthesocialassessmentandtheanalysiswillbebased on findings from gender specific queries during the primary data collection process and available secondary data. The quantitative and qualitative analysis will bring out sex disaggregated data and issues related to gender disparity, needs, constraints, and priorities; as well as

understanding whether there is a potential for gender based inequitable risks, benefits and opportunities. Based on the analysis, the specific interventions will be designed and if required gender action plan will be prepared. The overall monitoring framework of the project will include sex disaggregated indicators and gender relevant indicators.

The tribes of Meghalaya whosesocieties are organized on matrifocal principleshave obtained much greater gender equality than the societies (e.g., Hindu and Muslim) that are organized on the patriarchal principles. answered, "Securing equal treatment for men and women in the workplace."

During the social assessment, consultations will be organised with different stakeholders to understand gender issues and possible measures that can help women in ensuring their participationinthe overall process.Theassessmenthelpedtoidentifycertainkeyissuespertaining to women and their involvement in different livelihood activities as well as other activities which will directly or indirectly impact theirlives.

9.3.1 Gender Action Plan

In terms of gender the specific anticipated outcomes for women in the project areas include: (a) access to self-help women group to develop and preserve bioengineering solutions and post construction road maintenance; and (b) employment within SMEs, production clusters, and road-side commercial activities. The project is mainstreaming gender by increasing the participation of women in the workforce and contracting out the preservation of bio-engineering solutions to women self-help groups. The project will carry out the following Gender actions:

- MPWD with the local ULBs will ensure that the women PAPs and women SHGs will be given preferential treatment in allotment of the shops and business space.
- MPWD will engage women-led producer groups to build capacity on operations and maintenance and incentivize private contractors to train and hire women-led groups (CBOs/SHGs) for maintenance tasks supported across the horticulture belt;
- The logistics system and strategy planned to stimulate horticulture growth and other aesthetic infrastructure for landscaping at the roadside and ULBs will take into consideration the specific needs of women and involve them for such actions;
- Ensure that at least a 33% of women are recruited by the ULBs in their workforce;

Three major tools are used to identify and deal with gender issues in the project cycle: gender analysis, project design, and policy dialogue. Gender analysis will be an integral part of the initial social assessment at the screening stage itself. The issues identified can be scaled up during the feasibilityanddetailedanalysiscanbecarriedoutduringtheprojectpreparationstage.Theproject designs will be gender responsive based on gender analysis and will be included in the SIA report. The findings and recommendations from the gender analysis during project planning and feedback from beneficiaries during implementation will be discussed thoroughly to determine the need for further action. Listed below are the key actionpoints:

- Core Requirement for MainstreamingGender
- All data should be disaggregated by gender, caste, ethnicity, location, and age
- Issues of division of labour, access to resources and decision-making power (who is doing what, who has access to what, who makes the ultimate decision) have to be

assessed for their gender differential impact on women and men of different social identity groups.

- Assessment of policies, programs, institutional arrangements, human resources issues, and M&E system has to be done from a gender perspective of the project, project authorities and community groups.

9.4 Monitoring Gender Action Plan

The indicators, frequency, and agency recommended for monitoring are presented in the table below.

Table9-2: Monitoring Indicators for Gender Action Plan

Aspects	Monitoring Indicators (Process and Outcome)	Frequency	Monitoring Responsibility
Economic	No. of women engaged in different activities and their proportion to the total workforce; Days of engagement of women in different wage / non-wage activities and proportional days of engagement in comparison to their malecounterpart; Growth in income of women due to suchengagements; Reduction in no. of days of migration (if migrating earlier); No. of women having additional/new market oriented employable skillsfor self-engagement; No. of women accessed different govt.schemes/provisionsincluding beneficial enrolment in agricultural interventions; Improvement in asset holding of women (productive andhousehold assets).	Planning Stage: for the base linedata Half yearly Monitoring Mid Term Review (MTR) Final Impact Assessment	PMU Third party Monitor along withPMU
Social	Improvement of association of women in local institutional and decision- making process (membership, management position,etc.);	Planning Stage: for the base linedata Half yearly Monitoring Mid Term Review (MTR) Final Impact Assessment	PMU Third party Monitor along withPMU

9.5 Road Side Safety Measures

Indian Road Congress (IRC) codes will be followed in proposing and designing road safety features. Pavement markings will be done for traffic lane line, edge lines and hatching. The marking will be with hot applied thermoplastics materials. The pavement markings will be

reinforced with raised RR pavement markers and will be provided for median and shoulder edge longitudinal lines and hatch markings. Highway lightings including high masts will be provided at intersections in order to improve the night time visibility.

All the urban locations as well grade separated structure locations will be provided lighting arrangements.

9.5.1 Implementation Arrangements

The preparation, implementation, and monitoring of the Gender Action Plan (GAP) is the responsibility of the project implementing entities. The Social Development specialist, at the PMU level, will facilitate and supervise this process of preparation and implementation of the Action Plan. All efforts will be made to coordinate and work with associated line departments and other department, more specifically the Women and Child Development department, State Livelihood Mission, Panchayati Raj, and Rural Development department to help dovetailing with their development programs for the socio-economic development of women.

9.5.2 Implementation of ESMP and RAP

Due to is wide scope, the project activities will be implemented by many agencies: Public Works Department(PWD),UrbanAffairs(UA)Department,DepartmentofTourism,TransportDepartment and Community and Rural Development Department. Each of the mentioned departments, will depute a Project Director (PD) preferably at the level of a Chief Engineer/Superintending Engineer along with the required supporting staff with the overall responsibility for project implementation with the involvement of the various field divisions and other units at the head-quarters (HQ – Shillong).

PDswillworkundertheoverallguidanceandoversightofaProjectAdvisoryCommitteeheadedby the Secretary of the respective departments. In addition, nodal officers will be deputed from the beneficiary departments like Tourism, Agriculture, Police, Health, Education and C&RD. All civil works component will be implemented mainly by PWD, and involvement UA and Transport departments will be mainly for the technical assistance and pilot projects on improving mobility. When functional, the Transport Sector Board will also be constituted to provide high level policy guidance and oversight for projectimplementation.

Meghalaya Infrastructure Finance Development Corporation (MIFDC) set up under the Planning Departmentwillberesponsiblefor overall planning,coordination,implementationandmonitoring of the project along with various departments. It will also be responsible for mobilizing private sector finance for the development works. The State Planning Department will be the nodal department for the Project. MIDFC will be responsible for overall planning and implementation of theentireproject.ItwillensurethatESIAisconductedandESMPsarepreparedandthattheESMF is followed during project implementation. Additionally, a project management unit (PMU) will be mobilized under MIDFC to support the implementing agencies during project preparation and subsequent implementation. The overall institutional arrangement for the implementation of the project is outlined in the followingdiagram.

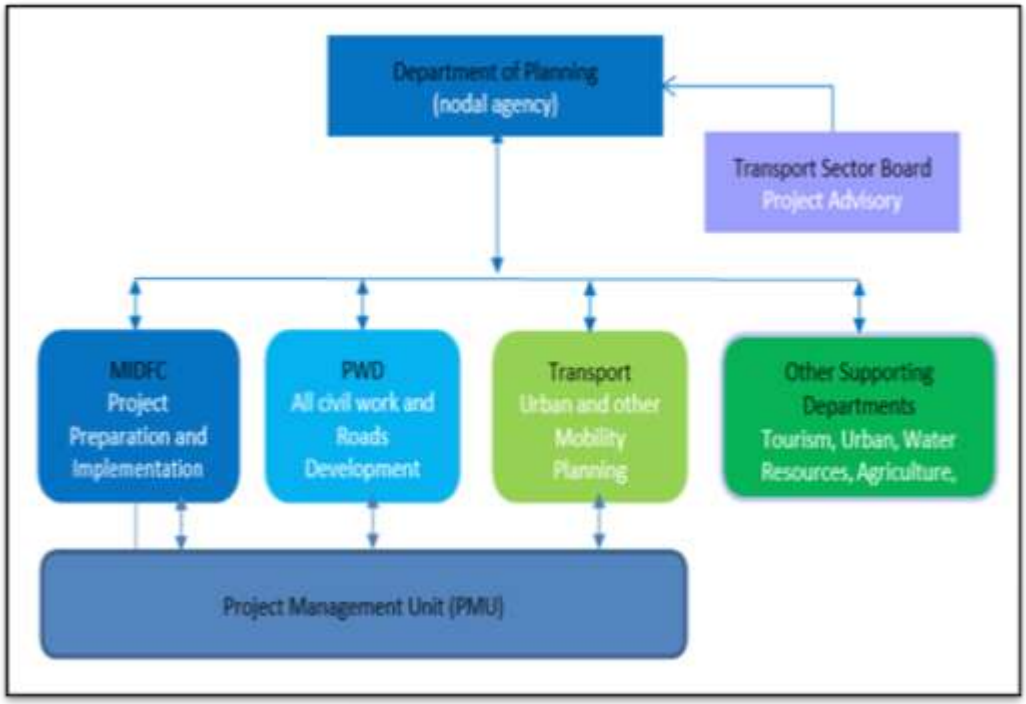


Figure 8.9-1Project Implementation Arrangement

9.5.3 Project Management Unit (PMU)

The Project Management Unit (PMU) will engage a consulting firm, as Project Management Consultant (PMC) for providing technical support to the project and facilitate implementation of project framed activities. The experts of the PMC will assist MIDFC in preparing and updating ESIA (includingE&SMPs).ThePMCwillalsoassistMIDFCinpreparingsemi-annualsafeguardsmonitoring reports. Specific roles of the PMC with regard to ESMF implementation would include the followings.

9.5.3.1 Preparatory Stage:

- Initial field visit to project sites and assessment of environmental and social aspects of projectactivities;
- Discussion with different stakeholders, including implementing agencies on safeguard measures and their expected role;
- Preparing / finalizing assessment framework in line with the Environment and Social indicators;
- Finalizing TOR of the contractors incorporating safeguard measures to betaken;
- Facilitate / organize training / workshops on safeguard measures for thestakeholders;
- Designing study / assessment tools for periodic assessment, its piloting andfinalization.

9.5.3.2 Implementation Stage:

- Conductingperiodicsitevisitsandobservethemeasurestakenasperthesafeguardnorms;
- On the spot guidance to contractor/s / implementing agencies onsafeguards;
- Preparation of site-specific reports and sharing withMIDFC;

- Documentation of learning cases for sharing anddissemination;
- Visual documentation of site-specific safeguardmeasures;
- Tracking activity specific environmental and social monitoringindicators;
- Organizing / facilitating refresher training courses forstakeholders;
- Monthly and quarterly progress report preparation and submission toMIDFC.

9.5.3.3 Post-Implementation Stage:

- Consolidation of periodic monitoringreports;
- Support in conducting environment and socialaudit;
- Consolidation of good practice documents and its submission toMIDFC;
- Final sharing workshop on environment and social safeguard practices and itsoutcome.

9.5.3.4 The PMU shall have following experts for implementation of ESMF and E&SMPs: Social cum Gender Expert

The Social cum Gender Expert at the PMU level will guide the overall process related to social and genderaspects.Thedistrict/sub-districtlevelimplementingagencieswillexecuteandmonitorthe social / gender components in consultation with the said Expert. She / he will be associated in the screening process of such activities that require acquisition of land and/or involvement of women and/or need special focus on tribal involvement. She/he will monitor the social processes followed in execution of the planned activities and realisation of the social / gender inclusion parameters. She / he will be looking after social / gender aspects of the project, including monitoring of social / gender indicators and coordinating with different agencies / institutions. The expert will be guided by the Project Director from MIDFC and reporting to the Project Directordirectly.

9.5.3.5 Environmental Expert

Theenvironmentexpertwilllookafterenvironmentalaspects.She/hewillguidetheprojectteam onenvironmentalaspectsandsupportinbuildingenvironmentalparameterstobebuilt-inthebids. She / he will also guide the contracts and monitor their works from time to time. In case of requirement, she/he will prepare a detail environment management plan for different activities to be executed by the project. The expert will be guided by the MIDFC Project Director and reporting to the Project Director directly.

9.5.4 Capacity Building Strategy

The concerned officials within the project implementation agencies will be oriented on different social and environment aspects by which they will be equipped well to manage the related issues effectively and efficiently. The capacity building would take in to account the current issues that may influence the project activities, measures that are required to be taken to ensure greater involvementofsociallyandeconomicallybackwardfamiliesanddeprivedsectionsofthesociety.A capacity building plan on social and environmental aspects to be prepared by PMU in consultation with all implementingagencies.

9.5.5 Institutional Capacity to Manage Social Development Aspects

9.5.5.1 Autonomous District Councils

As mentioned earlier, ADCs were established under the Sixth Schedule of the Constitution of India (Articles 244(2) and 275(1)) with a view to preserve and protect tribal institutions. It is a

system of local administration to give greater autonomy to tribal societies, to preserve and safeguard tribal groups'traditionalpracticeandtoactasaconduitbetweentheformalstategovernmentandthe informal grassroots tribal institutions. Moreover, the powers for the regulation and management ofnaturalresourceshavebeenconferredontheCouncils.DespitethefactthattheDistrictCouncils manage and control the land, water and forest, the management of these resources is a weak link oftheCouncils.Duetotheirdecisiveroleinlocalgovernance,theprojectaimstobuildtheircapacity insustainablemanagementandsafeguardingofstate'snaturalresources.Theprojectwilloffer technical assistance, skill-development and financial resources to the ADCs, with the aim to empowerthem.

There are, at present, three ADCs in the state of Meghalaya, Khasi, Jaintia and Garo Hills Autonomous District Councils. They are constitutional bodies and all laws, rules and regulations madebythemareenforceable.TheADChastherighttoconstitutevillagecouncilsorcourtsforthe trialofsuitsandcasesbetweenthepartiesallofwhombelongtoScheduledTribeswithintheirown jurisdiction and may appoint suitable persons to be members of such village councils or presiding officers of such courts, and may also appoint such officers as may be necessary for the administration of the laws of the Sixth Schedule. They may also act as courts of appeal from the decisions made by village councils. As per paragraph 8 of the Sixth Schedule, the ADC also has the power to assess and collect revenue in respect of all lands within the district except those lands which are in the areas under the authority of regional councils, if any, in accordance with the standardfollowedbytheStategovernment.Italsohasthepowertolevyandcollecttaxesonlands and buildings, and tolls from persons, falling within their jurisdiction. The ADCs also has the power to make laws on matters such as inheritance of property, marriage and divorce as well as onsocial custom.Notwithstandingthepowerandauthorityextendedtothe ADCsbytheConstitution,inthe mattersasmentionedearlier,theyarehowever,boundedbyparagraph12(A)oftheSchedule.This paragraph gives onus to the State laws over that of the laws made by the ADC. It states that if any lawmadebytheADCisrepugnanttoanyprovisionofalawmadebytheStateLegislature,thenthe formers'willbevoidandtheStatelawwillprevail.

9.5.5.2 Grassroots Institutions

The third centre of authority is the grassroots tribal institutions and practices. In the Khasi and Jaintia Hills, these are powers that rest at the village level's elected members to govern the village. The members mainly belong to the ruling clan called Ki Bakhraw. The elected members organise themselves into a village council or DorbarShnong that is headed by a Chief. The council has significant power and legitimacy rooted in the un-codified customary laws and practices. The primary function of the DorbarShnong is to undertake development works and to manage local assets. It also functions as a court trying petty cases such as land disputes.

9.6 Grievance Redressal Committee (GRC)

9.6.1 Grievance Redress Mechanism

Effective grievance redressal mechanism gives an opportunity to the organization to implement a set of specific measures to ensure good governance accountability and transparency in managing andmitigationofenvironmentalandsocialissueofaparticularproject.Thisconsistsofdefiningthe process for recording/receiving complaints and their redressal in respect of environmental and socialmatters.

An integrated system will be established with Grievance Redressal Cell (GRCs), with necessary officers, officials and systems at MIDFC. Grievances, if any, may be submitted through various mediums, including in person, in written form to a noted address, e-mail, or through direct calls

to concerned official/s. The Social and Environmental Expert within PMU shall be responsible for coordination of grievance/complaints received.

Thegrievanceredressmechanismshouldbeinplaceatthetimeofinitiatingtheimplementationof R&RAPandcivilconstructionactivitiesintheprojectarea.Aplatformforgrievanceredressalshould be organized and its regular meetings may be conducted so as to allow people to put forth their grievances. It will help the appropriate authority to find solutions and amicably address the issues. Theproject,apartfromweb-basedmechanism,willhavethree-tiregrievanceredressalmechanism, i.e., (1) at the project site level, (2) State level (PMU level) and (3) Judiciarylevel.

Web based grievance mechanism[11]: In case of grievances received through toll free number or web-based system, a person should be made in-charge of screening and resolution of the same/communicatingwiththeconcerneddivisionsforresolutionofthesame.Thepersonin-charge based on nature of complaint, should forward the same to the concerned official. A ticket or a unique number will be generated for all such complaints. The complainant should follow up based on that unique number. All calls and messages should be responded within 15 days. If response is not received within 15 days, the complaint should be escalated to the ProjectDirector.

Tier I: Under this project, the local VECs and community level organizations will serve as the first- tiermechanismtohandlecomplaintsandgrievances.ThelocalHeadmanwillbethefocalpointwho will receive, address, and keep record of the complaints and feedbacks. The grievance focal point willfirstreviewthegrievancessubmitted.Ifgrievancesordisputescannotbesolvedattheir level within 30 days of the submission of the grievances, the issue will be brought to PMU level for mediation. PMU is expected to inform aggrieved persons or parties to disputes of the resolution in 30 days.

Tier II: If the aggrieved person is not satisfied with the verdict of site level grievance cell, he or she can escalate the grievance to state level grievance cell. The tier II cell will be under the ChairmanshipofSecretary,DepartmentofPlanning.TheothermemberswillincludeChiefEngineer; Project Director and Social Expert of the Project. The second level of grievance cell will provide its view within 30 days of receiving thegrievance.

TierIII:Theaggrievedpersonifnotsatisfiedwiththeverdictgivenby Statelevelgrievancecell,will have the right to approach the Judiciary. Project will help the aggrieved person in all respect if person wants to approach the judiciary. This would include the District Commissioner and Legal courts. If the issue cannot be addressed or is outside the purview of the GRC, then it may be taken by the Office of the District Commissioner or a Legal Court.

9.6.2 Grievance management through Electronic Mode

A simplified mobile based technology feedback system can be used at community level to capture and feed data into the Management Information System of the PMU. A toll-free Helpline number will also be established to make the mechanism widely accessible and gender friendly.

9.6.3 World Bank Grievance RedressalSystem

Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. ForinformationonhowtosubmitcomplaintstotheWorldBank'scorporateGrievanceRedress Service (GRS), please visit http://www.worldbank.org/GRS. For information on how to submit complaints to the World Bank Inspection Panel, please visitwww.inspectionpanel.org.

9.6.4 Grievance Redressal Mechanism

There Grievance Redressal Committee (GRC) at the PMU level is in process of formation. Consultation for the formation of GRC for this project at city/ward level is currently being undertaken. Before the start of civil contractor appointment, the GRC at project level will be formed with consultation with the PAPs and Beneficiaries so that the grievances are resolved at the project site only. There should be a Women Cell at the PMU. The contractor and the other stakeholder's office will display theVishaka Guidelines at their Notice board. The Women helpline Number should be displayed in the Bus Stand, Ticket Counter, all commercial vehicles and any other place as required.

Table 8.9-3Details of contact for Grievances

Description	Contact details
Company:	PWD, Meghalaya
To:	Chief Engineer-cum-Project Director
Address:	HV9P+GFJ, Lachumiere, Shillong, Meghalaya 793001
E-mail:	cenhpwd@gmail.com
Website:	http://megpwd.gov.in/contacts.html
Telephone:	Tel: 0364-2224561
Fax:	-

9.6.5 Disclosure of Project Information

In order to make the ARAP implementation process transparent, salient features of ARAP shall be translated in Hindi and disclosed on the Project Authority's website. The documents available in the public domain will include ARAP (summary in Hindi) and the list of affected persons eligible for compensation and R&R assistance. Copy of all documents will be kept in PMU for ready reference. As per Access to Information Policy of the World Bank, all safeguard documents will also be disclosed and available at the World Bank's Portal.

10 CLIMATE CHANGE IMPACT & RISK

A rapid increase in the number of motor vehicles on road in Meghalaya 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 behavioural changes of the population whereby they use more and more non- motorized transport at short distances and public transport for long distances.

10.1 Estimated Carbon Emissions

Construction Phase

TheGHGemissionsduringaroadconstructionprojectinvolvethefollowingmajorsources:

- Transportemissionsowingtotransportationofmanandmaterial
- Materialemissionsowingtoextraction/productionofconstructionmaterials
- Machinesemissionsowingto consumptionoffuelbyenginesusedin construction

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

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

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

Therefore, for 40 km of road construction would result in emission of approximately 4120 tonCO2eq.

Operation Phase

The design life of the project road is 20 years. Due very less traffic density and introduce of e-vehicle major CO2 emission increase not anticipated.

10.2 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:

Meghalaya is one of the important states located at north east of India. Usually four seasons are observed in this beautiful hilly state. As per the rainfall data from 1989 to 202182, highest rain fall (31% of south west monsoon rainfall) is observed in month of July. Similarly, state experienced 30% of the south west monsoon rainfall in June month. Also, in August and September, 23% and 17% of south west monsoon rainfall were observed in the State. Highest annual rainfall is 5440.8 mm in the year of 1995. Details rainfall variation table is given below:

Table 10-1 : Mean rainfall (mm) and coefficient of variation (CV) of the state for the monsoon months, southwest monsoon season and annual

	June	July	August	September	June-September (JJAS) rainfall	Annual
Mean	801.5	825.1	612.6	463.2	2702.4	3784.3
C V	33.0	40.2	40.4	46.2	24.9	21.5

Comparing[3] to Eastern part, Western part of this state, especially West Garo Hills and East Garo Hills, small increase of minimum temperature is observed and also, high increase around 1.2 degree centigrade in maximum temperature is noticed in Central part and West khasi hills, South Garo hills and East Kahli hills region. Maximum temperatures during summer and winter seasons are 25°C & 16°C, respectively. [4] Minimum temperatures during summer and winter seasons are 15°C & 4°C.

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,

[2] https://imdpune.gov.in/hydrology/rainfall%20variability%20page/meghalaya_final.pdf
[3] https://meghalaya.pscnotes.com/meghalaya-geography/climate-of-meghalaya/
[4] https://www.mapsofindia.com/meghalaya/geography.html

embrittlement, migration of liquid asphalt. Additionally, thermal expansion in bridge expansion joints and paved surfaces may be experienced.

Earthquake: All districts of the state of Meghalaya lie in Zone V. Centred across the state border in Assam, much of Meghalaya was severely jolted especially Shillong.

Drought: The Average Annual Rainfall in Meghalaya is 2818 MM (source: rainwaterharvesting.org), whereas, Sohra or Cherrapunjee and Mawsynram in Meghalaya receive the highest rainfall in the world i.e. about 11000 mm annually, but this huge rainfall is concentrated only in monsoon months. 11, 667 sq km of the State drains into the Brahmaputra basin and the rest 10,650 sq km into the Barak Basin (Source: Central Water Commission). In less than 12 hours all the rainfall runoff water reaches the plains of Bangladesh and Assam taking along with-it top soil, boulders and logs besides creating flood-havoc in Bangladesh. In contrast during non-monsoon months, most of the rain-fed surface sources and spring sources get dried up, leading to water scarcity, which is a major problem as the people living in these areas with highly variable rainfall, experience droughts like situation and floods and often have insecure livelihoods. In many dire cases people do not even have regular access to water for drinking purposes.

Cyclone Meghalaya is situated in the north eastern direction of Bangladesh which is highly prone to cyclone/ winds. Every year about 60% of the area is affected by cyclone in Bangladesh. The Districts of West Jaintia Hills and East Jaintia Hills may experience a wind speed of up to 55m/s. Occasional cyclones do occur in western Meghalaya their severity being more during monsoon season. The districts close to Bangladesh like South West Garo Hills, South Garo Hills, South West Khasi Hills, West Khasi Hills, fall in very high cyclonic zone due to close proximity to Bay of Bengal (which is a cyclone basin). In this zone wind speed can reach up-to 50 m/s, which can cause large scale damages. The Bay of Bengal accounts for seven percent of the annual tropical cyclone activity worldwide; the recorded frequency of cyclones per year along the Bay of Bengal is four and inevitably one of the four transforms into a severe cyclone causing human and property losses

Flood: The plain areas of Meghalaya adjoining Assam are affected by flood due to the back flow of water from the River Brahmaputra during the flood season between June and October. The tributaries like Krishnai, Jinari, Jingjiram, Rongai, Dudhnoi, Ringgi, Gohai, Dilnietc cause flood in the plain areas of the State.

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.

10.3 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 10-2**.** It must be noted that all these events either simultaneously or in isolation can generate severe disastrous impacts on road infrastructure.

Table 10-2: 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	Business As Usual

11 MONITORING & EVALUATION

The M&E framework of ESMF is designed to assess the progress and achievements against the said management plans – both Environment and Social as well as other plans such as R&R, TPP, and GAP. By providing a feedback loop, the M&E plans enable decision makers to take up mid-course corrections if required. The M&E framework is designed to measure the impacts that have taken place, ensure compliance with the legal obligations, evaluate the performance of the mitigation measures applied, and suggest improvements in management plans, if so required.
The M&E is to be undertaken at two levels:

- Monitoring and Evaluation of the ESMF application: i.e. the application and effectiveness of ESMF elements including screening, assessment, formulation and implementation of the ESMPs, monitoring, capacity building and institutional arrangements;and
- Monitoring and Evaluation of E&S management plans at each project site: i.e. to monitor the effectiveness of implementation of the identified mitigation measures, the environmental quality parameters and social management plans relevant to each projectactivity.

11.1 M&E of the ESMF application

The PMU's Social cum Gender Expert and Environment Expert will undertake ongoing monitoring of the ESMF implementation in order to identify issues, good practices and required actions. Reports based on the monitoring will be prepared by the PMU at least every quarter and submitted to the Project Director. The reports will be shared with the other implementing agencies. The monitoring of the ESMF implementation will cover the following aspects:
Screening of project activities:

- Hasthecategorizationoftheprojectactivitiesbeendoneaccuratelyandorchanged(AtoB)?
- Has the Environmental and Social Screening Checklist been used in all applicableactivities?
- Has the scoping for further assessment been done comprehensively for all applicable activities?

Monitoring of E&S aspects in project activities:

- Arethecontractorsandimplementingagenciesundertakingperiodicandregularmonitoring of the E&S implementation in the projectactivities?

Capacity building arrangements for management of E&S aspects:

- What training programs on E&S aspects have been organized for the staff of implement agencies?
- What training programs on E&S aspects have been organized for thecontractors?

11.2 M&E of E&S Management Plans

Monitoring and evaluation of the project is significant for achieving the project development objective (PDO) within the stipulated time period. The key environmental and social aspects,

those that have been highlighted in each E&SMPs at site level are to be monitored periodically. The approved E&SMPs will give the direction and indicate the milestones achieved as per the national / state benchmarks / norms. The following specific environmental and social parameters should bequantitatively and qualitatively measured and compared over a period of time to understand the impacts.

The PMU through the respective district level offices of PWD will monitor all projects roads to ensure conformity to the requirements of the ESMF. The monitoring will cover all stages of planning and implementation. The monitoring will be carried out through the safeguard compliance reports that will form a part of Quarterly Progress Reports (QPR) for all sub projects and regular visits by the Social cum Gender and Environmental specialists of the PMU.

11.3 Concurrent Monitoring

The PMU's Social cum Gender Expert and Environment Expert will undertake ongoing monitoring of the ESMF implementation in order to identify issues, good practices and required actions. Reports based on the monitoring will be prepared by the PMU at least every quarter and submitted to the Project Director. The reports will be shared with the other implementing agencies.

The PMU will review these reports and identify technical, managerial, policy or regulatory issues with regards to the ESMF compliance. The identified technical issues will be duly incorporated. Policy and regulatory issues will be debated internally by PMU and the need for appropriate interventions will be determined. These interventions could include appropriate revision of ESMF in consultation with the Bank or suitable analytical studies to influence policy or programs of the state, if found necessary / warranted. The table below provides the milestones and process to be followed for monitoring at different stages of project:

Table 11-1 Monitoring Protocol

Milestones	Objectives	Process	Responsibility	Decision/Target/ Deliverable
Environment				
Social				
Sub- Project Screening	To approve categorization of proposed sub-projects	Discussions with implementing agencies to assess eligibility of project based on project's priorities and identify scope of project report Consultants to submit report along with proposed impact categorization	PMU and PIU	Decision to proceed ornot Identification of impactcategory
Sub- Project Appraisal	To ensure satisfactory compliance with SMF	Detailed appraisal (including RAP, GAP and TPP where relevant), including site visits/ investigations, ifnecessary, assess suitability of site, adequacy of safeguard measures, risk analysis and	PMU	Review report and decideto accept accept with modifications - reject and instruct to resubmit

Milestones	Objectives	Process	Responsibility	Decision/Target/ Deliverable
		regulatory clearances). DPR to be submitted for approval		
Approval	Approvals from PMU	PIU to recommend to PMU PMU to review and approve	PIU and PMU	Approval of RAP, GAP and IPDP if required
Implementation of RAP, GAP and IPDP, Monitoring and Review	Ensure Implementation of agreed RAP, GAP and IPDP where applicable)	Prepare quarterly progress reports Schedule field visits as required Midterm and end term evaluation	PIU, PMU, NGO	Quarterly Progress Report

Project monitoring will be the responsibility of the PMU who will submit Quarterly Progress Reports. The reports will compare the progress of the project to targets set up at the commencement of the project. The list of impact performance indicators will be used to monitor project objectives. The socio-economic survey conducted will provide the benchmarks for comparison.

11.4 Periodic Evaluation

An external evaluation of the safegurad implementation prepared for sub projects will also be undertaken twice during the implementation of the project – midterm and at the end of the implementation. During implementation, meetings will be organized by PMU inviting all PIUs for providing information on the progress of the project work.

Mid-term Assessment Study – this would be undertaken mid-way through the project to ascertain the progress achieved and any mid-course corrections which need to be introduced. It would include indicators to measure progress towards log frame goals and objectives.

End-Term Assessment Study – this will be undertaken at the end of the project period (around the time of project completion) and will assess the achievement of the project during the tenure.

11.5 Arrangements for Monitoring

Monitoring is an integral part of successful implementation of the ARAP activities. Internal monitoring will be carried out by the Social Development Expert, PMU and/or the ULB under the supervision of Project Director/Chairman of ULB. Data collected for monitoring activities shall be suitably analysed for project management's learning and experience. Key progress indicators (indicative) for monitoring ARAP implementation are as given below:

- disbursement of compensation and assistance to PAPs, if any
- establishment of grievance redressal mechanism (including processes and timeline for redressal of grievances),

- consultation meetings with PAPs and communities regarding resettlement and rehabilitation issues,
- MIDFC website will include a link where affected person(s) can register their complaints online. A telephone number will also be on the website of MIDFC and the project sites, so that the general public can register their complaint with the PMU office.
- income restoration of affected persons,
- training of the interested PAPs
- grievance handling mechanism

Project monitoring will be the responsibility of the PMU who will submit Quarterly Progress Reports. The reports will compare the progress of the project to targets set up at the commencement of the project. The list of impact performance indicators will be used to monitor project objectives. The socio-economic survey conducted will provide the benchmarks for comparison.

11.6 PeriodicEvaluation

An external evaluation of the safeguard implementation prepared for sub projects will also be undertaken twice during the implementation of the project – midterm and at the end of the implementation. During implementation, meetings will be organized by PMU inviting all PIUs for providing information on the progress of the project work.

Mid-term Assessment Study – this would be undertaken mid-way through the project to ascertain the progress achieved and any mid-course corrections which need to be introduced. It would include indicators to measure progress towards log frame goals and objectives.

End-Term Assessment Study – this will be undertaken at the end of the project period (around the time of project completion) and will assess the achievement of the project during thetenure

12 ABBREVIATED RESETTLEMENT ACTION PLAN

12.1 Introduction

The Government of Meghalaya has entrusted the implementation of improvement of road infrastructure for all District Head Quarters of Meghalaya to PWD as executing agency. The proposed development is for improvements/enhancements to the urban infrastructure in identified District Head Quarters of Meghalaya. The developments are to be carried out within urban areas and are not likely to result in adverse social affects. Contrary, the proposed developments will aim to enhance the social conditions in the area. Each district head quarter will have its own development proposals and may or may not be same with the others.

The ESIA was carried out atUmsning-Jagi road, district in accordance with Environment and Social Framework (ESF 2016). Based on the ESIA findings on the final design and in accordance with the Resettlement Policy Framework of this project, this Abbreviated Resettlement Action Plan has been prepared.

12.2 Objective of ARAP

The specific objectives of this ARAP are:

- To describe project impacts andmitigation measures resulting from project activities
- Identification and confirmation of project affected persons at sub-project sites;
- Document the extent of economic and physical displacement and establish entitlement criteria;
- Record consultations held with the affected persons and other project beneficiaries and stakeholders;
- Describe and specify compensation options, resettlement-assistance and livelihood-improvement options to be provided in compliance with the legal framework and World Bank guidelines;
- Detail the ARAP grievance mechanism and outline the roles and responsibilities of the project stakeholders while implementing the ARAP;
- Establish monitoring and evaluation and follow up activities and;
- Ensure compliance with the national legal framework and World Bank's ESF 2016.

12.3 Approach and Methodology

The activities to be carried out under sub-component "Enhancing Urban Facilities" in the District Headquarters have been largely planned to avoid involuntary resettlement, however, impacts on the livelihood of vendors, petty shopkeepers and similar people cannot be fully avoided and thus need to be mitigated in accordance with the policies of the World Bank and State and Central Governments. The Social Impact Assessment of the Umsning-Jagi road was based on the social screening survey, socio-economic survey, Census survey and Stakeholder's consultations of the project areas for identifying the probable impacts on land, structures, livelihood and CPRs.

12.4 Project Resettlement Policy Framework

Based on the National and state legal framework and World Bank's Guidelines the Project Resettlement Framework (RPF) with an Entitlement Matrix is proposedfor MPWD projects. The entitlements of different categories of eligible persons are presented in a matrix form indicating the type of loss, category of entitled person, unit of entitlements, etc. As per the Social Screening survey the probable impacts are depicted in tabular format.

Table 10.12-1Impacts of the Projects

Sl. No.	Impacts	Number
1a	Total Rural land acquisition requirements (in ha)	NilHa
1b	Total Rural land acquisition requirements (in ha)	Nil Ha
2	Total number of Private Structures	37
3	Total number CPRs	7
4	Total of number of Structures	44
5	Total Affected Title Holder Affected Families	-
6	Total Affected Non-Title Holder Affected Families	37
7	Total Number of AFs	37
8	Vulnerable AFs	35
9	Total Number of APs	174

Livelihood of Title and Non-Title Holder: A minimum wage of Rs.404[5]/- per day to each affected commercial structure for the number of days it loses its livelihood will be provided. The Vendors/Kiosk/petty shops should be relocated in such a manner that he/she can provide uninterrupted service to the same number of customers and /or accessibility to their structures should be provided by the contractor such that there is no loss of business. If relocation in that manner is not possible, assistance as per the minimum wage should be paid to each affected Vendors/Kiosk/petty shops for the number of days it loses its livelihood, given that they should obtain a vending license from the ULB. Persons affected by the proposed project may belong to either of the above-mentioned categories and will be eligible for compensation, resettlement and rehabilitation assistance in accordance with the principles of this Resettlement Policy Framework.

12.5 Magnitude of impacts

The impact on the population would be the followings.

- There will be minimum loss of private land.
- There might be loss of private structures and livelihood.

- There may be temporary loss of livelihood which will be compensated otherwise or as per the Resettlement Policy Framework (RPF).
- There is loss of Community Structure which will replaced/reconstructed.
- With the implementation of the project, the safety and efficiency of the transport operation will increase manifold.
- There will be decrease in water logging in the street mainly in the congested areas and increase of the aesthetic view of the towns.
- The safety and security of the residents, mainly the women and children will increase manifolds with the enhance lighting facilities and with the introduction of 24X7 surveillance by CCTV at the important junctions and other places.
- Loss of Livelihoods due to loss of primary source of income will be compensated through rehabilitation assistances of Rs. 364/- per day as per RPF. The entitled persons under these categories are the commercial entities mostly vendors having temporary loss during the actual phase of construction.

12.6 Other Mitigating measures

The project in principle agrees to provide the following facilities:

- Skill development Training to the members of the PAF.
- Provision of Place for the affected Vendors/Kiosk/petty during construction phase who lose their livelihood temporarily.
- Employment opportunity in the project on priority basis.
- Special drive for employing local women in the project.
- Accessibility to the structures should be provided by the contractor such that there is no loss of business or any extra expenditure on part of the Residents.

12.7 Resettlement Budget

The cost related to resettlement cost will be borne by the EA. EA will ensure allocation of funds and availability of resources for smooth implementation of the project R&R activities. In the case of assistance and other rehabilitation measures, the EA will directly pay the money or any other assistance as stated in the RP to PAPs. The implementing NGO will be involved in facilitating the disbursement process and rehabilitation program.

Table 10.12-2Resettlement Budget

I. Compensation for loss of Private Property (NTH)			
Loss of Structure (house, shop, building or immovable property or assets attached to land)			
Type of Structure	**Rs. Per Sqm**	**Area Sqm**	
Pucca	16660	0	0.00
Semi Pucca	13390	15.34	205,402.60
Kutcha	6700	36.64	245,488.00
		Subtotal (A)	**450,890.60**
II. Impact to Squatters/ Encroachers/TH			

Loss of Shop/trade/commercial structure			
Subsistence Allowance for 3 months	36,000.00	37	1,332,000.00
		Subtotal (B)	**1,332,000.00**
III. Impact to Vulnerable Household			
One time Resettlement Allowance	50,000.00	37	1,850,000.00
		Subtotal (C)	**1,850,000.00**
			VI. Common Property Resource
Govt./ Panchayat Buildings	100,000.00	7	700,000.00
		Subtotal (D)	**700,000.00**
IV. Unforeseen Impacts			
Contingency of 5%	Total of (A to D)	5%	216,644.53
		Subtotal (E)	**216,644.53**
V. Implementation of RAP			
Support for implementation of RAP (lumpsum)	1,200,000	1	1,200,000.00
M & E consultant (lumpsum)	80,000	1	80,000.00
		Subtotal (F)	**1,280,000.00**
		Total = (A to F)	**5,829,535.13**

Say Rs. 5,829,535 or INR 5.83 million

13 PROJECT BENEFIT

Transportation/Highway projects are generally intended to improve the economic and social welfare of the people and the locality. The broad objective of the present project is providing four lanes facility to accommodate the rapid growth of traffic.

The proposed project would act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety and provide better transportation facilities and other facilities such as way side amenities. Vehicle operating cost will also be reduced due to improved road quality.

Overall improvement will be expected in project area in terms of:

- Improvements in the physical infrastructure and road access.
- Improvement in social services due to quicker and safe mode of transport
- Enhanced connectivity between rural & urban population which will benefit the all sections of the society like general population, small-medium-large scale industries, farmers, businessmen etc.
- Reduction in pollution, vehicle maintenance costs, fuel usage due to free flow of traffic
- Employment potential for skilled, semi-skilled and unskilled labour, during construction and operational phases of the project, with specific attention to employment potential of local population as well as necessity for imparting any specialized skills to them to be eligible for such employment in the project
- Over-all development in economy in terms of industry and improved lifestyle
- Minimize road accidents by increasing road widths.
- Minimize the travel time.
- Better connectivity to economic, social and political hubs of Meghalaya.
- Better approach to medical, educational and essential services.
- Faster transportation of perishable goods like fruits, vegetables, and dairy products.
- Better opportunities for transporting, processing and marketing of agricultural products.
- Development of tourism and pilgrimage.
- Opening up of opportunities for new occupations and trade on the route.
- Improved road connectivity helps in better implementation and management of government schemes.
- National highways connect capitals, important places, ports and places of strategic importance of various areas.
- The construction of the project road in the state of Meghalaya will ensure smooth flow of the traffic. Installation of proper road safety system through signage, barricades, and crash barriers will add to be safety to the traffic.

- Vehicle Operating Cost (VOC) will be reduced when the National Highway is constructed. Fuel consumption, wear and tear of tyres, suspension will be benefited when a geometric of the road is improved. VOC consist of the following components.
- Fuel consumption
- Lubricating oil consumption
- Spare part consumption
- Tyre consumption
- Vehicle depreciation

14 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

The environmental and social management measures shall be implemented during the various stages of the project viz: Pre-construction Stage, Construction Stage and Operational Stage. The environmental and social management plan for the project is described below.

14.1 Objectives of EMP

The Environmental Management Plan (EMP) consists of a set of mitigation, monitoring and institutional measures to be taken during the design, construction and operational phases of the project to eliminate adverse environmental impacts, to offset them, or to reduce them to acceptable levels. The main aim of the Environmental Management Plan is to ensure that the various adverse impacts are mitigated and the positive impacts are enhanced. A description of the various management measures against each activity suggested for construction stage is provided in this chapter.

14.2 Pre-Construction Stage

14.2.1 Pre-construction activities by PIU/Independent Consultant

Prior to the contractor mobilization, the PIU will ensure that a hindrance free corridor is handed over to enable the start of construction work. Clearance involves for the following activities:

- Felling and removal of trees, which should be minimal with due permission.
- Relocation of common property resources and community assets like temples, telephone poles, electric poles and hand pumps etc;
- Modification (if any), of the contract documents by the Engineer of the Independent Engineer.

14.2.2 Pre-construction activities by Contractor

Pre-construction stage involves mobilisation of the contractor and the activities undertaken by the contractor pertaining to the planning of logistics and site preparation necessary for commencing construction activities. The activities include:

Joint field verification of EMP by the Environment Expert of the Independent Engineer/Authority Engineer and Contractor.

Identification and selection of material sources (quarry and borrow material, water, sand etc).

Procurement of construction equipment / machinery such as crushers, hot mix plants, batching plants and other construction equipment and machinery.

Selection, design and layout of construction areas, hot mix and batching plants, labour camps etc.

Apply for and obtain all the necessary clearances/ NOC's/ consents from the agencies concerned.

Planning traffic diversions and detours including arrangements for temporary land acquisition (if required).

Must obtain ground water extraction permission before starting any construction works and setting up of construction camps. If not huge fine may be levied on the contractors by the concerned authority.

14.3 Construction Stage

14.3.1 Construction activities by the Contractor

Construction stage is the most crucial stage in terms of activities that require careful management to avoid environmental impacts. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted for in the Engineering Costs.

14.3.2 Construction activities by the PIU/ Authority Engineer / Independent Consultants

The Project Implementing Unit(PIU)/Independent Engineer shall be involved in the smooth execution of the project and assisting the contractor during this phase. Their work shall include but not limited to:

Monitoring and guiding the contractor on adopting good environmental and engineering practices;

Arrangement of plantation through the Forest Department;

Arranging training to the contractor and other stakeholders according to the needs arising; and

Implementation of Environment Management and Monitoring Plan.

Making changes in the design if need so arises.

14.4 Operation Stage

The operational stage involves the following activities by PIU:

Monitoring of environmental conditions through approved monitoring agency; and
Monitoring of operational performance of the various mitigation/enhancement measures carried out.

Table 12.14-1: Environment Management Plan (EMP)

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
PRE-CONSTRUCTION STAGE					
P1	Alignment,	The alignment as finalized by shifting / adjusting the centerline of the road, adopting of suitable cross-sections and adjustment of the median width to minimize land acquisition, loss of settlements and to avoid environmentally sensitive features compatible with project activities. AtUmsholait, the alignment in front of school is recommended for re-alignment as requested by Principal of school since the proposed alignment is in the school's boundarywater.	Throughout Corridor	PIU, Revenue Dept. NGOs Collaborating Agencies	-
P2	Land Acquisition	No land acquisition is envisaged. However, if required, such acquisition of	Throughout Corridor	PIU, Revenue	

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		land and private properties will be carried out in accordance with the RAP and entitlement framework for the project. It will be ensured that all R & R activities including implementation of Environment Management Plan are completed before the start of work. PIU has to ascertain that any additional environmental impacts resulting from acquisition of land are addressed and integrated into the EMP and other relevant documents.		Dept. NGOs Collaborating Agencies	
P3	Preservation of Trees	All efforts will be made to preserve trees including evaluation of minor design adjustments/ alternatives to save trees. Specific attention will be given for protecting giant trees, and locally important trees (religiously important etc.). Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and formal Clearances from the Forest Dept./MoEF& CC are completed and subsequently a written order is issued to the Contractor. In the event of design changes, additional assessments including the possibility to save trees shall be made. Stacking, transport and storage of the wood will be done as per the relevant norms.	Throughout Corridor	PIU Forest Department Contractor	
P4	Relocation of Utilities and Common Property Resources (CPR)	All utilities and CPRs i.e., water supply lines, religious structures, hand pumps will be relocated before the construction starts. The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community. Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all utilities and CPRs. The CPRs which may be impacted are listed in Table 5-9. Efforts should be made to modify the alignment in these	Throughout Corridor	PIU Concerned Agencies Contractor	

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		locations to avoid any impact to these properties. Besides CPRs, few water bodies may also get physicallyimpacted (ref: Table 5-1) during the construction phase. If such impact could not be avoided, compensatory measures in terms of equivalent water body should be created in a nearby location to ensure ecological and social services provided by these water bodies.			
P5	Orientation of Implementing Agency and Contractors	The PIU shall organize orientation sessions and regular training sessions during all stages of the project. This shall include on-site training (general as well as in the specific context of the sub-project). These sessions shall involve all staff of Authority Engineer, field level implementation staff of PIU and Contractor. The contractor will ensure that his staff including engineers, supervisors and operators attend the training sessions.	Throughout Corridor	PIU Concerned Agencies Contractor	
P6	Joint Field Verification	The Environmental Expert of AE and the Contractor will carry out joint field verification to ascertain any additional possibility to saving trees, environmental and community resources. The verification exercise should assess the need for additional protection measures or changes in design/ scale/ nature of protection measures including the efficacy of enhancement measures suggested in the EMP. Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed.	Throughout out Corridor	Contractor and Environmental Expert of AE	PIU
P7	Assessment of Impacts due to Changes/Revisions/Additions in the Project Work	The Environmental Expert of AE will assess impacts and revise/ modify the EMP and other required sections of the project documents in the event of	Throughout out Corridor	Contractor Environmental Expert of AE	PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		changes/ revisions (including addition or deletion) in the project's scope of work.			
P8	Crushers, Hot-mix plants and Batching Plants Location	Hot mix plants and batching plants will be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants will be located at least 1 Km away from the nearest village/ settlement preferably in the downwind direction. The Contractor shall submit a detailed layout plan for all such sites and approval of Environmental Expert of AE/PMC shall be necessary prior to their establishment. Arrangements to control dust pollution through provision of windscreens, sprinklers, and dust encapsulation will have to be provided at all such sites. Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be submitted to the "PIU through Environmental Expert of AE/PMC. The Contractor shall not initiate plant/s operation till the required legal clearances are obtained and submitted (CTE and CTO). The engineer will ensure that the regulatory and legal requirements are being complied with.	Throughout out Corridor	Contractor	Environmental Expert of AE and PIU
P9	Other Construction Vehicles, Equipment and Machinery	All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Indian Standard (IS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to. Noise limits for construction equipments to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in	Throughout out Corridor	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		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 for NH verification whenever required. Mobile equipment shall be placed at least 100 m away from the nearest dwelling.			
P10	Borrow Areas	Finalizing borrow areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor. The Contractor will not start borrowing earth from selected borrow areas until the formal agreement is signed between landowner and contractor and a copy is submitted to the PIU/Environmental Expert of AE through the Engineer. Locations finalized by the contractor shall be reported to the Environmental Expert of AE and who will in turn report to PIU. Planning of haul roads for accessing borrow materials will be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as far as possible (in case such a land is disturbed, the Contractor will rehabilitate it as per Borrow Area Rehabilitation Guidelines) and will use the existing village roads wherever available. In addition to testing for the quality of borrow materials by the AE, the environmental personnel of the AE will be required to inspect every borrow area location prior to approval The AE will make sure that each such site is in line with IRC and other project guidelines. Necessary clearances need to be obtained prior to operation of Borrow areas.	Along the Project Influence Area	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
P11	Quarry	Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials, quality and other logistic arrangements. In case the contractor decides to use quarries other than recommended by DPR consultants, then it will be selected based on the suitability of the materials and as per established law. The contractor will procure necessary permission for procurement of materials from Mining Department, District Administration and State Pollution Control Board and shall submit a copy of the approval and the rehabilitation plan to the PIU through Engineer. Contractor will also work out haul road network and report to Environmental Expert of AE and will inspect and in turn report to PIU before approval.	Along the Project Influence Area	Contractor	Environmental Expert of AE and PIU
P12	Arrangement for Construction Water	To avoid disruption/disturbance to other water users, the contractor will extract water from fixed locations and consult the Environmental Expert of AE before finalizing the locations. The contractor will not be allowed to pump from any irrigation canal and surface water bodies used by community. The contractor will need to comply with the requirements of the State Ground Water Department and seek their approval for use of ground water for construction and submit copies of the permission to AE and PIU prior to initiation of any construction work.	Along the Project Road	Contractor	Environmental Expert of AE and PIU
P13	Labor Requirements	The contractor preferably will use unskilled labor from local communities to give the maximum benefit to the local community.	Along the Project Area	Contractor	Environmental Expert of AE and PIU
P14	Construction Camp Locations – Selection, Design and	Sitting of the construction camps will be selected by the contractor as per the guidelines.	Along the Project Road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
	Lay-out	Construction camps will not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. Location for stockyards for construction materials will be identified at least 1000 m from watercourses (ref: Table 5-1). The waste disposal and sewage system for the camp will be designed, built and operated such that no odor is generated.			
P15	Arrangements for Temporary Land Requirement	The contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/hot mix plants/traffic detours/borrow areas etc. The Contractor will submit a copy of agreement to the Environmental Expert of AE. The Environmental Expert will be required to ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is included in the contract.	Along the Project Road	Contractor	Environmental Expert of AE and PIU
P16	Implementation - Information Meetings	The contractor will organize at least 2 implementation information meetings in the vicinity of Project Site (minimum one in each section) for general public to consult and inform people about his plans covering overall construction schedule, safety, use of local resources (such as earth, water), traffic safety and management plans of debris disposal, drainage protection during construction, pollution abetment and other plans, measures to minimize disruption, damage and in convenience to roadside users and people along the road. The first Implementation information meeting be conducted within four weeks of mobilization. The people should be informed about the date, time and venue at least 7 days prior to meetings. Public shall be informed about the meeting through display of posters at prominent public places (panchayat offices, offices of Market committees, Notice board of	Along the Project Road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		religious places etc.) and distribution of pamphlets along roadside communities or in any manner deemed fit. The contractor will maintain a channel of communication with the communities through his designated Environment and Safety Officer to address any concern or grievances. Periodic meetings will also be conducted during the construction period to take feedback from communities or their representatives to ensure minimum disturbance. The mechanism and contents for disclosure shall be approved by PIU prior to the meetings.			
CONSTRUCTION STAGE					
C1	Clearing and Grubbing	Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert of AE. The Contractor under any circumstances will not cut trees other than those identified for cutting and for which he has written instructions from the PIU. The PIU will issue these instructions only after receiving all stages of clearances from the Forest Department/ MoEF& CC. Vegetation only with girth of over 30 cm will be considered as trees and shall be compensated, in the event of PIU's instruction to undertake tree cutting. The sub grade of the existing pavement shall be used as embankment fill material. The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads. The existing bitumen surface may be	Along the work in progress	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.			
C2	Disposal of debris from dismantling structures and road surface	The contractor shall identify disposal sites. The identified locations will be reported to the Environmental Expert of AE. These locations will be checked on site and accordingly approved by Environmental Expert of AE prior to any disposal of waste materials. All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, will be considered incidental to the work and will be planned and implemented by the contractor as approved and directed by the Environmental Expert of AE. The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Environmental Expert of AE. Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area.	Along the work in progress	Contractor	Environmental Expert of AE and PIU
C3	Other Construction Waste Disposal	The pre-identified disposal locations will be a part of Comprehensive Waste Disposal Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of AE. Location of disposal sites will be finalized prior to initiation of works on any particular section of the road. The Environmental Expert of AE will approve these disposal sites after conducting a joint inspection on the site with the Contractor. Contractor will ensure that any spoils of material unsuitable for embankment fill will not be disposed off near any water	Along the Road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and low-lying areas located in barren lands along the project corridors (if so desired by the owner/community and approved by the Environmental Expert of AE). All waste materials will be completely disposed and the site will be fully cleaned and certified by Environmental Expert of AE before handing over. The contractor at its cost shall resolve any claim, arising out of waste disposal or any non-compliance that may arise on account of lack of action on his part.			
C4	Stripping, stocking and preservation of top soil	The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert of AE. The following precautionary measures will be taken to preserve them till they are used: Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, silt fencing will protect the edges of the pile. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be utilized for -	Along the Road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		covering all disturbed areas including borrow areas only in case where these are to be rehabilitated as farm lands (not those in barren areas) top dressing of the road embankment and fill slopes, filling up of tree pits, in the median and in the agricultural fields of farmers, acquired temporarily.			
C5	Accessibility	The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road, providing temporary connecting road. The contractor will take care that schools and religious places are accessible to Public. The contractor will also ensure that the work on / at existing accesses will not be undertaken without providing adequate provisions and to the prior satisfaction of Environmental Expert of AE. The contractor will take care that the cross roads are constructed in such a sequence that construction work over the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.	Along the Road	Contractor	Environmental Expert of AE and PIU
C6	Planning for Traffic Diversions and Detours	Temporary diversions will be constructed with the approval of the Resident Engineer and Environmental Expert of AE for which contractor will seek prior approval for such plans. Detailed Traffic Control Plans will be prepared and submitted to the Resident Engineer for approval, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details diversions; traffic safety arrangement during construction; safety measures for night – time traffic and precautions for transportation of hazardous materials. Traffic control plans shall be prepared in line with requirements of IRC's SP- 55 document	Along the Road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		and The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. The contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from AE and PIU. The temporary traffic detours will be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).			
C7	Earth from Borrow Areas for Construction	No borrow area will be opened without permission of the Environmental Expert of AE. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of AE and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961). The borrowing operations will be carried out as specified in the guidelines for sitting and operation of borrow areas. The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out twice a day to control dust along such roads during their period of use. During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Expert of AE will decide the numbers of sprinkling depending on the local requirements. Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the guidelines for Redevelopment of Borrow Areas or as suggested by Environmental Expert of AE.	Borrow Areas	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		The final rehabilitation plans will be approved by the Environmental Expert of AE.			
C8	Quarry Operations	The contractor shall obtain materials from quarries only after the consent of the Department of Mining / SPCB (both the states) / District Administration or will use existing approved sources of such materials. Copies of consent/ approval/ rehabilitation plan for opening a new quarry or use of an existing quarry source will be submitted to Environmental Expert of AE and the Resident Engineer. The contractor will develop a Comprehensive Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy to PIU and AE prior to opening of the quarry site. The quarry operations will be undertaken within the rules and regulations in force in the state.	Quarry Areas	Contractor	Environmental Expert of AE and PIU
C9	Transporting Construction Materials and Haul Road Management	Contractor will maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machineries as précised. All vehicles delivering fine materials to the site will be covered to avoid spillage of materials. All existing highways and roads used by vehicles of the contractor or any of his sub-contractor or suppliers of materials and similarly roads, which are part of the works, will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. Contractor will arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces with specific attention to the settlement areas. The unloading of materials at construction sites/close to settlements will be restricted to daytime only.	All Roads Used	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
C10	Construction Water	Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to 'PIU' through the Engineer. The contractor will source the requirement of water preferentially from ground water but with prior permission from the Central Ground Water Board. A copy of the permission will be submitted to 'PIU' through the Engineer prior to initiation of construction. The contractor will take all precaution to minimize the wastage of water in the construction process/ operation.	Along the Project	Contractor	Environmental Expert of AE and PIU
C11	Disruption to Other Users of Water	While working across or close to any perennial water bodies, contractor will not obstruct/ prevent the flow of water. Construction over and close to the perennial streams shall not be undertaken in any season. The contractor will take prior approval of the River Authority or Irrigation Department for any such activity. The PIU and the Engineer will ensure that contractor has served the notice to the downstream users of water well in advance.	All Water Bodies Used	Contractor	Environmental Expert of AE and PIU
C12	Drainage	Contractor will ensure that no construction materials like earth, stone, ash or appendage is disposed off in a manner that blocks the flow of water of any water course and cross drainage channels (ref: Table 5-1 for potential streams which could be impacted.). Contractor will take all-necessary measures to prevent any blockage to water flow. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert of AE and the 'Resident Engineer' to prevent temporary or permanent flooding of the site or any	Drainage line along the road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		adjacent area. To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like: Drainage line will be constructed all along the project road. Good engineering and construction practice should be followed Use of sediment traps, silt fencing, oil and grease turfing etc. to minimize of the soil movement.			
C13	Siltation of Water Bodies and Degradation of Water Quality	The Contractor will not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction. Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of water bodies (including wells) adjacent to the ROW and around the stockpiles at the construction sites close to water bodies. Appropriate mitigation measures should be implemented to prevent impact to water bodies listed in Table 5-1. The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. The contractor will also put-up sedimentation cum grease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m. in present case three Sedimentation Cum Grease Trap are proposed, However the item has been kept in case need arises during construction. Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse.	All Surface Water Bodies Along the Road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
C14	Slope Protection and Control of Soil Erosion	The contractor will take slope protection measures as per design, or as directed by the Environmental Expert of AE to control soil erosion and sedimentation. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such as no separate payment will be made for them. Contractor will ensure the following aspects: 1. During construction activities on road embankment, the side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. 2. Turfing works will be taken up as soon as possible provided the season is favorable for the establishment of grass sods. Other measures of slope stabilization will include mulching netting and seeding of batters and drains immediately on completion of earthworks. 3. In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank. 4. Along sections abutting water bodies, stone pitching as per design specification will protect slopes.	Along the Roads	Contractor	Environmental Expert of AE and PIU
C15	Water Pollution from Construction Wastes	The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. Contractor will avoid construction works close to the streams or water bodies. All waste arising from the project is to be disposed off in the manner that is acceptable and as per norms of the State Pollution Control Board.	Along the road	Contractor	Environmental Expert of AE and PIU
C16	Water Pollution	The contractor will ensure that all	Along the	Contractor	Environmental

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
	from Fuel and Lubricants	construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refueling sites will be located at least 500 m from rivers and irrigation canal/ponds. All location and layout plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by the Environmental Expert of AE and PIU. Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refueling areas as per the design provided. Oil and grease traps will be provided at fuelling locations, to prevent contamination of water. 'Oil interceptors' shall be provided in wash down areas and re-fuelling areas In all, fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such storage. Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to AE and PIU) and approved by the Environmental Expert of AE. All spills and collected petroleum products will be disposed off in accordance with MoEF&CC and state PCB guidelines. Environmental Expert of AE and Resident Engineer' will certify that all arrangements comply with the guidelines of PCB/ MoEF&CC or any other relevant laws.	Roads		Expert of AE and PIU
C17	Dust Pollution	The contractor will take every precaution to reduce the level of dust from	Along the Roads, Construction	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		crushers/hot mix plants, construction sites involving earthwork by sprinkling of water, encapsulation of dust source and by erection of screen/barriers. All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement. The contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation. The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less than 500 g/m3. The pollution monitoring is to be conducted as per the monitoring plan. Alternatively, only crushers licensed by the SPCB shall be used. Required certificates and consents shall be submitted by the Contractor in such a case to the Environmental Expert of AE through the 'Engineer'. Dust screening vegetation will be planted on the edge of the ROW for all existing roadside crushers. Hot mix plant will be fitted with dust extraction units.	Site/ Camps		
C18	Emission from Construction Vehicles, Equipment and Machineries	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 SPCB. The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to 'PIU' through the 'Engineer'.	Along the Roads , all vehicles used/ Camps	Contractor	Environmental Expert of AE and PIU
C19	Noise Pollution: Noise from Vehicles, Plants and Equipments	The Contractor will confirm the following: All plants and equipment used in construction shall strictly conform to the MoEF& CC/CPCB noise standards. All vehicles and equipment used in construction will be fitted with exhaust silencers.	Along the Roads , all vehicles used/Camps	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. Maintenance of vehicles, equipment and machinery shall be regular to keep noise levels at the minimum. At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching will be stopped during the night time between 10.00 pm to 6.00 am. No construction activities will be permitted around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centers and hospitals between 10.00 pm to 6.00 am. Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to Environmental Expert of AE through the 'Engineer'.			
C20	Personal Safety Measures for Labour	Contractor will provide: Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc. Welder's protective eye-shields to workers who are engaged in welding works Protective goggles and clothing to workers engaged in stone breaking activities and workers will be seated at	Along the Roads, all vehicles used/Camps	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		sufficiently safe intervals Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. Adequate safety measures for workers during handling of materials. The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 as far as those are applicable to this contract. The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. The contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form. The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. Contractor will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint dry is rubbed and scrapped. The Contractor will mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and will be approved by AE and PIU.			

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
C21	Traffic and Safety	The contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Environmental Expert of AE and 'Resident Engineer' for the information and protection of traffic approaching or passing through the section of any existing cross roads. The contractor will ensure that all signs, barricades, pavement markings are provided as per the MOSRT&H specifications. Before taking up of construction on any section of the existing lanes of the highway, a Traffic Control Plan will be devised and implemented to the satisfaction of Environmental Expert of AE and ' Resident Engineer'	Along the Roads, all vehicles used/Camps	Contractor	Environmental Expert of AE and PIU
C22	Risk from Electrical Equipment(s)	The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that: No material will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights will be provided to protect the public in construction zones. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the 'Resident Engineer'.	Along the Roads	Contractor	Environmental Expert of AE and PIU
C23	Risk Force Measure	The contractor will take all reasonable precautions to prevent danger to the workers and public from fire, flood etc. resulting due to construction activities. The contractor will make required arrangements so that in case of any mishap all necessary steps can be taken	Along the Roads, construction Camps	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		for prompt first aid treatment. Construction Safety Plan prepared by the Contractor will identify necessary actions in the event of an emergency.			
C24	First Aid	The contractor will arrange for - a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital Equipment and trained nursing staff at construction camp.	Along the Roads, construction Camps	Contractor	Environmental Expert of AE and PIU
C25	Informatory Signs and Hoardings	The contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required as per IRC and MoRT&H specifications.	Along the Roads, construction Camps	Contractor	Environmental Expert of AE and PIU
C26	Road side Plantation Strategy	The contractor will do the plantation at median and/or turfing at embankment slopes as per the tree plantation strategy prepared for the project. Minimum 90 percent survival rate of the saplings will be acceptable otherwise the contractor will replace dead plants at his own cost. The contractor will maintain the plantation till they handover the project site to NHAI. Environmental Expert of AE will inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.	Along the Roads	Contractor	Environmental Expert of AE and PIU
C27	Flora and Fauna	The contractor will take every possibleprecaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. If any wild animal is found near the construction site at any point of time, the contractor will immediately upon discovery thereof acquaint the	Along the Roads	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		Environmental Expert of AE and carry out the AE instructions for dealing with the same. Environmental Expert of AE will report to the nearby forest office (range office or divisional office) and will take appropriate steps/ measures, with leading role from forest officials. All efforts during the design stage should be made to minimize the tree felling requirement Compensatory plantation should be started during construction phase parallel to the construction activities. The workers will be made aware during regular moring toolbox meeting about the poisonous snakes and insects and to keeping themselves away from such animals. Awareness needs to be done among the workers regarding the first aid for snake bite/insect bite.			
C28	Chance Found Archaeological Property	All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Environmental Expert of AE of such discovery and carry out the AE instructions for dealing with the same, waiting which all work shall be stopped. The AE will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.	Along the Roads, construction sites/Camps	Contractor	Environmental Expert of AE and PIU
C29	Labour Accommodation	Contractor will follow all relevant provisions of the Factories Act, 1948 and the building and the other Construction Workers (Regulation of Employment and	Along the Roads, construction Camps/site	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		Conditions of Service) Act, 1996 for construction and maintenance of labor camp. The location, layout and basic facility provision of each labor camp will be submitted to AE and 'PIU' prior to their construction. The construction will commence only upon the written approval of the Environmental Expert of AE. The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the AE. The sewage system for such camps will be properly designed and built so that no water pollution takes place in adjacent canals. The cooking area needs to be separated from living rooms/sleeping areas.			
C30	Potable Water	The Contractor will construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing. The Contractor will also provide potable water facilities within the precincts of every workplace in an accessible place, as per standards set by the building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. Testing of water will be done as per parameters prescribed in IS 10500:1991.	Along the Roads, construction Camps/construction site	Contractor	Environmental Expert of AE and PIU
C31	Sanitation and Sewage System	The contractor will ensure that - the sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women	Along the Roads, construction Camps/Construction Sites	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		Adequate water supply is to be provided in all toilets and urinals			
C32	Waste Disposal	The contractor will provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of AE. Unless otherwise arranged by local sanitary authority, arrangements for disposal of night soils (human excreta) suitably approved by the local medical health or municipal authorities or as directed by Environmental Expert of AE will have to be provided by the contractor.	Along the Roads, construction Camps	Contractor	Environmental Expert of AE and PIU
C33	Consultation	The Environmental Expert of AE will contact the responsible people with the enhancement drawing of the site for which enhancement has been proposed and take their consent before the start of work. Accesses to Different Schools along the road will be developed to the satisfaction of 'PIU'.	Along the Roads	Contractor	Environmental Expert of AE and PIU
C34	Clean-up Operations, Restoration and Rehabilitation	Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of AE. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. The contractor will clear all temporary structures; dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by AE. All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed in pre identified approved areas or in places suggested by the Environmental Expert of AE areas in a layer of thickness of 75 mm-l50 mm. All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites,	Along the Roads, construction Camps	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's expense, to the entire satisfaction to the Environmental Expert of AE and PIU will certify in this regard.			
OPERATION STAGE					
Activities to be carried Out by PIU					
O1	Monitoring Operation Performance	The PIU will monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project. The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision, status of rehabilitation of borrow areas and disposal sites,	Along the Road	PIU	PIU
O2	Maintenance of Drainage	PIU will ensure that all drains (side drains, median drain and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding. PIU will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every three months.	Along the Road	PIU	PIU
O3	Pollution Monitoring	The periodic monitoring of the ambient air quality, noise level, water quality, soil pollution/contamination in the selected locations as suggested in pollution monitoring plan. PIU will either appoint PCB or its approved pollution-monitoring agency for the purpose	Along the Road	PIU through Pollution Monitoring Agency	PIU
O4	Air Pollution	Ambient air concentrations of various pollutants shall be monitored as envisaged in the pollution-monitoring plan. Bottlenecks should be avoided for smooth flow of traffic.	Along the Road	PIU through Pollution Monitoring Agency	PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		Plantation of pollutant adsorbing trees, such as Spider Plant, Bamboo Palm, etc. Regular maintenance of the road will be done to ensure good surface condition			
O5	Noise Pollution	Noise pollution will be monitored as per monitoring plan at sensitive locations. Noise control programs are to be enforced strictly. According to monitoring results, use of sound barriers / trees will be considered where warranted Signs for sensitive zones (health centers / educational institutions etc.) will be put up where horn should not be blown or traffic speed need to be regulated Pressure Horn must be banned in the project road	Along the Road	PIU through Pollution Monitoring Agency	PIU
O6	Water Pollution	Water Quality will be monitored as per monitoring plan	Along the Road	PIU through Pollution Monitoring Agency	PIU
O7	Plantaton (Flora and Fauna)	Monitoring of survival of trees should be done at regular interval and suitable mitigation measures should be taken to protect the trees. Efforts will be made for proper maintenance of planted trees, shrubs and grasses to maintain greenery and aesthetics Planted tree should be covered with fence or net	Along the Road	PIU through Pollution Monitoring Agency	PIU
O8	Soil Erosion and Monitoring of Borrow Areas	Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankment> 2m. and other places expected to be affected, will be carried out once in every three months as suggested in monitoring plan.In case soils erosion is found, suitable measures should be taken to control the soil erosion.	Along the Road	PIU	PIU
O9	Road Safety and Traffic	Road Safety will be monitored during operation especially at location where traffic-calming measures have been proposed.	Along the Road	PIU	PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/Monitoring
		The spills at the accident sites will be cleared immediately and disposed off properly in accordance with Emergency Response Plan Traffic management plan will be developed, especially along congested locations and near sensitive locations Traffic control measures including speed limits will be enforced strictly. Engagement with local community / Awareness Training			

14.5 Reporting System

The Monitoring and Evaluation of the management measures envisaged are critical activities in implementation of the Project. The rationale for a reporting system is based on accountability to ensure that the measures proposed as part of the Environmental Management Plan get implemented in the Project.

Project Monitoring Cell will be set up in the PIU, which will act as the Contract Management Unit (CMU) and will be responsible for execution of the Project. Project Execution Units will be set up under the supervision of the Contract Management Unit for the Contract Package.

14.6 Technical set up

It is proposed that an Environmental Management Implementation Unit (EMIU) will be set up within PIU. The EMIU will have an Environmental Expert who will be responsible for monitoring the implementation of the EMP with the assistance of the Environmental Expert/Specialist of the AE/IE and the Contractor. The Environmental Expert will be assisted by two Environmental Engineers. The EMIU of PIU will assist the CMU and the Project Director and will interact with State Pollution Control Board (SPCB), State Forest Dept., NGO & various Committees for addressable of environmental issues. In the PIU, there will be an Environmental Officer within the Project Management Information System Unit who will assist the Project Director on the environmental matters and also interact with the CMU, PIUs and its EMIUs.

14.7 Nonconformity To Environmental Management Plan (EMP)

The Contractor will implement necessary mitigation measures for which responsibility is assigned to him as stipulated in the EMP. Any lapse in implementing the same will attract the damage clause as detailed below:

- Any complaints of public, within the scope of the Contractor, formally registered with the PIU and communicated to the Contractor, which is not properly addressed within the time period intimated by the PIU shall be treated as a major lapse.
- Non-conformity to any of the mitigation measures like unsafe conditions, non-collection of excavated material (during laying of drainage pipes) regularly and other unattended

Environment, Health & Safety (EHS) issues, as stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.

- On observing any lapses, PIU shall issue a notice to the Contractor, to rectify the same.
- Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.
- If a major lapse is not rectified upon receiving the notice PIU shall invoke reduction, in the subsequent interim payment certificate.
- For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum limit of about 0.5% of the contract value.
- If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited immediately.

Table14-2Environment Management Plan Implementation Budget

Sl. No	Cot of Environment / Migration Plan Description	Unit	Quantity	Unit Rate (Rs.)	Amount (Rs.)
1	Obtaining necessary clearances, permission, consent from the concerned departments.	Contractors' responsibility			
2	Water Sprinkling for dust suppression at site (3 trips/ day)				
3	Labour welfare as per norms.				
4	Environmental Monitoring (Air, Water, Noise & Soil).	--	--	--	900000/-
5	Provision for Installation/ upgrade of one noise barrier at 2+500 in front of Serenity School, if the alignment remains same	Number	1	150000	150000/-
6	Conducting SwachhataPakhwada, EHS awareness program and Training etc	Lump sum	--	200000	200000/-
7	Traffic Safety (Sign Boards, Delineators, Barricades, Cautionary tape etc.)	Lump sum	--	500000	500000/-
8	Fire Safety, Workers Safety (PPEs), Electrical Safety, Health Safety (First Aid Facility) etc	Lump sum	--	500000	500000/-
9	Miscellaneous/CER	Lump Sum		200000	200000/-
				Total cost	**2450000/-**

15 CONCLUSION AND RECOMMENDATIONS

The environmental and the social impact assessment have been conducted as per the approach/ methodology for conducting ESIA study for all the seven project corridors. All the potential impacts were identified in relation to pre-construction, construction, and operation phases. Social impact assessment study has done within the proposed corridor. The proposed project interventions shall not attract Environmental Clearance (EC) from the SEIAA.

Focus Group Discussions (FGD's) were conducted to assess the perception of the people about the proposed project. The stakeholders selected included shop keepers, residents along the road, owners/ workers of local commercial establishments etc. The outcome of the consultations depicts the requirement for the road safety measures; road furniture's (including street lights, additional bus bays, signage's, speed breaker etc,).

In view of the environmental Impact assessment, there will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on the project corridors (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects, disturbance to the residents, businesses, safety risk to workers, public and nearby buildings due to road excavation works, access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts that are likely to arise during the road construction works in the settlement areas, and there are well developed methods of mitigation that are suggested in the ESMP. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported by the contractor to the CSC/PIU.

The prepared ESMP will assist the Contractor, CSC, and the PIU in mitigating the environmental and social impacts, and guide them in the environmentally sound execution of the proposed project. A copy of the updated ESMP shall be kept on-site during the construction period at all times. The ESMP shall be included in the bidding document along with appropriate contractual clauses for safeguarding the environment during the project construction and operation (maintenance period). As per the World Bank policy requirements, the prepared safeguard documents shall be disclosed in the World Bank website.

Annexure 1: Environmental Screening Checklist

Screening Checklist

Name of the sub-project	Umsning- Jagi Road
Size of the project (approx. area in sq. mt/hac or length in mt/km, as relevant)	40 km- Project Length
Location of the proposed sub-project	Maghalaya, India
Name of the of the district, block	Ri-Bhoi
Name of the settlement/ area, where the bridge is located	This road passes through towns/ Villages viz. Rilong, Sohpdok, Tdohumsiang, Sohliya, Umtangngi, Mawdiengngan, Umlaiteng, Umlatar, Mowhati, Umsohlait, Sonidan and Mawlaho.
Latitude and longitude	
New construction/ repair/ rehabilitation/ expansion (if there is an existing bridge, please share picture of old bridge. Also, the approach roads.)	Expansion of the project road
If expansion, then is there any need of new land	No
If yes, please share detail: • Total requirement • Private land • Govt. land • Forest land	
What is the High Flood Level in the sub-project area?	The sub-project is in the zone of high flood zone as these towns receive an enormous amount of rain and flooding happens in the road. Since it is hilly terrain there is flow of water continuous.

S. No.	Environmental & Social Features	Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High (H), Medium (M), Low (L))	Likelihood of Impact (Likely, Unlikely)	Description of Impact
Physical Environment						
	Springs	Yes	_	Low	Likely	
	Standing water bodies (ponds, lakes, etc.)	Yes	_	Low (L)	Likely	
	Flowing water bodies (rivers, rivulets, streams, canals, etc.)	Yes	_	Low (L)	Likely	Increase in turbidity
	Ground water sources (open wells, bore wells, etc.)	Yes	_	Low (L)	Likely	
	Meandering River	Yes	_	Low (L)	Likely	Increase in turbidity
	Erosion prone stretches	Yes	_	Medium (M)	Likely	Problem of soil erosion is expected in some locations. particularly soil erosion due to a lack of drainage facilities.
	Areas with high slope (higher than 15 percent)	Yes	_	Medium (M)	Likely	high slope in almost entire project area which will face problem of soil erosion.
	Landforms (hills, valleys)	Yes	_	Medium (M)	Likely	Project road mostly passing

S. No.	Environmental & Social Features	Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High (H), Medium (M), Low (L))	Likelihood of Impact (Likely, Unlikely)	Description of Impact
						through the hill area will require new hill cutting and steep slopes.
	Coal Mine	No				
Biological Environment						
	National Park / Wildlife Sanctuary	Consider both end of the bridges and within 10km radius as per law				No National Park / Wildlife Sanctuary are locating along the project road
	Reserved Forests	Consider both end of the bridges and within 10km radius as per law				No reserved forest is locating along the project road
	Community Forest/ Fisheries	Local consultation Fish breeding Around the area – unique amphibian species (relevant dept.)		Low (L)	Unlikely	Yes, local community forest based on private ownership is there. Tree cutting not envisaged

S. No.	Environmental & Social Features	Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High (H), Medium (M), Low (L))	Likelihood of Impact (Likely, Unlikely)	Description of Impact
	Large Trees / Woodland	Visual checks – if found, please click photograph	_	Medium (M)	Likely	Tree cutting cause soil erosion
	Sacred Groves	Discuss with community if found, please click photograph				No sacred groves are founding along the project road
	Presence of endangered species / habitat areas	Consider both end of the bridges and within 10km radius as per law				No
	Migratory routes	Please refer to ESMF and check if any intercepts with the project area				No
	Ecologically sensitive areas	Consider both end of the bridges and within 10km radius as per law				No
Human Environment						

S. No.	Environmental & Social Features	Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High (H), Medium (M), Low (L))	Likelihood of Impact (Likely, Unlikely)	Description of Impact
	Settlements/Habitations	Yes	+	Medium (M)	Likely	10 settlements, improve the connectivity
	Sensitive Receptors (schools, hospitals, markets etc.)	Yes	_	Low	Likely	Increase of noise and air pollution.
	Drinking water sources	Yes	_	Low	Likely	Drinking water may contaminated during the construction works.
	Underground utility lines like electricity lines, pipelines for gas, etc	No				
	Physical cultural resources – Protected monuments, historical/ heritage sites etc.	No				
	Physical cultural resources – Religious structures, other sites significant to community	No				
	Agricultural land/ Other activities					
	Defence Installations / Airports	No				
	Heavy polluting Industry	No				

S. No.	Environmental & Social Features	Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High (H), Medium (M), Low (L))	Likelihood of Impact (Likely, Unlikely)	Description of Impact
	Water or Waste water Treatment Plant	No				
Social Safeguard Issues						
	Any loss / reduction of access to traditional dependent communities (to areas where they earn for their primary or substantial livelihood).					
	Adverse impacts to women, gender issues including economic and safety concerns	Community consultation				
	Presence of Indigenous / vulnerable communities	Community consultation				
	Land acquisition of private land leading to loss of shelter and livelihood					
	Whether land acquired / donated is more than 10% of the total holding					
	Land acquisition resulting to loss of income; livelihood; sources of livelihood; loss of access to common property resources and / or private residential and/or property					

S. No.	Environmental & Social Features	Presence within 500 mts from activity sites (Yes/No) If yes, mention distance in km)	Type of Impact (+ or -)	Significance of Impact (High (H), Medium (M), Low (L))	Likelihood of Impact (Likely, Unlikely)	Description of Impact
	resources.					
	Possible conflicts with and/or disruption to local community					
	Significant issues raised by the stakeholders during consultation	MoM of the community consultation				

Annexure 2: Social Screening Checklist

Urban Roads (Town roads) and Non-urban roads under MITP (World Bank) initiative. Public Works Department (Roads), Government of Meghalaya

Social Screening Format

General Information:

Name of Project: **Umsning- Jagi Road** Urban/ Rural Area: **Rural**

Tehsil: **Ribhoi** District: **Ribhoi**

1. Does the project activity require additional land area? **No**

2. If response in above question is yes, then fill information against sl. no. 3, 4 & 5 (as applicable), otherwise skip to sl. no. 6

Details	Unit	Quantity	Classification/ Category of land	Present Usage of land
3. Private land required	Acres			
a. No. of land owners affected	Number			
b. Persons whose livelihood is primarily dependent on land likely to be acquired/required	Number			
c. BPL Families (among a+b)	Number			
d. Total Vulnerable Families (including BPL) (among a+b)	Number			
4. Government Land	Acres			
a. Non-Titleholders – Encroachers Families	Number			
b. Non-Titleholders – Squatters Families	Number			
c. Various other users of this Govt. Land; Families	Number			
d. People losing livelihoods/ access due to loss of Govt. Lands project; Families	Number			
5. Tribal Families affected	Number			

6. Residential structures/buildings (permanently) affected due to project activities:

Details	Unit	Quantity

Details	Unit	Quantity
a. Total Affected Families	Number	Nil
b. Title Holders	Number	Not Applicable
c. Non-Titleholders – Encroachers	Number	Not Applicable
d. Non-Titleholders – Squatters	Number	Not Applicable
e. BPL Families losing Dwellings	Number	Not Applicable
f. Total vulnerable families (including BPL)	Number	Not Applicable
g. Total Tribal Families	Number	Not Applicable

7. Commercial units (permanently) affected due to project activities:

Details	Unit	Quantity
a. Total Affected Families	Number	Nil
b. Title Holders	Number	
c. Non-Titleholders – Encroachers	Number	
d. Non-Titleholders – Squatters	Number	
f. BPL Families losing Commercial Properties	Number	
g. Total vulnerable families (including BPL)	Number	
h. Total Tribal Families	Number	
i. Vendors affected	Number	
j. Petty shop keepers & Kiosk affected	Number	

8. Common Property Resources (permanently) Affected: (Please give each type by number)

Description	Unit	Quantity
Religious structure (specify)	Number	Nil
Well	Number	Nil
Waiting Shed/Rain Shelter	Number	Nil
Schools/Educational/ Cultural Structures	Number	Nil
Government/ Community Structures	Number	Nil

9. Residential and/or Commercial units (temporarily) affected during construction activities:

Details	Unit	Quantity
a. Total Affected Residential/Commercial Families	Number	121
b. Title Holders	Number	84
c. Non-Titleholders – Encroachers	Number	25
d. Non-Titleholders – Squatters	Number	12
e. Vendors affected	Number	17
f. Petty shop keepers & Kiosk affected	Number	30

10. Summary:

S No	Items	Results
1	Total no of Families (permanently) affected due to proposed project activity (Single or multiple impacts)	Nil
2	Total no of BPL Families (permanently) affected due to proposed project activity (Single or multiple impacts)	Nil
3	Total no of vulnerable Families (permanently) affected (including BPL) due to proposed project activity (Single or multiple impacts)	Nil
4	Total no of Tribal Families (permanently) affected (including BPL) due to proposed project activity (Single or multiple impacts)	Nil
5	Total number of Community Property Resources affected	**Nil**
6.	Total Number of Families temporarily affected during construction	121

11. Result/ Outcome of Social Screening Exercise

Output	Outcome	Triggered for the Project
If the number of affected due to scheme/ sub-project implementation is **less than equal to** 200 persons (all impacts combined together – land, structure, other assets, livelihood, etc) or there is only temporary impact during construction	Abbreviated Resettlement Action Plan (ARAP) required	Not Applicable
If the number of affected due to scheme/ sub-project implementation is **more than 200 persons** (all impacts combined together – land, structure, other assets, livelihood, etc)	Resettlement Action Plan (RAP) required	Not Applicable

Output	Outcome	Triggered for the Project
If only govt. land, forest land, other department land is impacted and the number of affected persons is nil (all impacts combined together – land, structure, other assets, livelihood, etc)	ARAP/RAP not required	ESIA

12. Additional information to be collected about the site:

Sl. No.	Previous usage of site	Response
1	Whether the present site or part of present site ever used for any of the following purposes? Response column whichever is applicable	
	Worshipping sacred trees/ sacred grooves	No
	Burial place	No
	Grazing cattle/ goats	No
	Other small shrines	No
	Other prayers, rituals, annual or seasonal festivals/ rituals	No
	Habitation place of community Gods/ ancestors/ or any other good or bad supernatural forces	No
	Place of offering (animal sacrifice)	No
	Other purposes (e.g. sports, cattle racing, etc)	No
	Sensitive social/ cultural/ historical folk tales or oral history of the site (which may later on influence the project)	No
	Open defecation	No
2	No specific usage/ plain ground/ agricultural	No

Annexure 3: Minutes of meeting with the DPR consultant

Location: Office of CETEST Pvt. Ltd, Kolkata vide Video Conference Mode

Date: 23.12.2021

Time: 4.30 pm

Attendees: Team Leader, DPR with Mr. SwarnavaBandhopadhyay, Environmental Specialist, Mr. SumanSarkar, Social Specialist and team members of DPR and ESIA Consultant.

Agenda items

1. Land Acquisition

The ESIA consultants requested for the details of Land Acquisition being done on the project stretch. DPR Consultant informed that, no land is being acquired for this project stretch and the road is being designed to fit within available ROW as advised by the Client. All proposed structures are well within the existing RoW and thus no LA is required for this project.

DPR Consultant has assured that there is no proposal for Land Acquisition

2. Demand for all weather road

ESIA consultants wanted to know the condition of existing road and improvements planned in the design. DPR Consultant deliberated that the existing pavement condition along the road is poor. In some portions of the stretch, the existing pavement is damaged with cracks, raveling, rutting edge breaking and potholes and in some stretches it is observed that the existing bituminous layer is fully damaged and exposed. The overall pavement condition needs to be improvised.

DPR Consultants clarified that pavement is being designed in compliance with IRC codal provisions along with climate resilient technology

3. Road safety

ESIA Consultants asked about the convex mirror to be installed at turning points, sharp corners of the roads at a suitable height as they allow to see invisible but oncoming vehicles. Hence reducing the probability of road accidents. Proper signage and road furniture are to be integral part of the design.

The DPR consultants clarified that all the required safety measures including Rumble strips, Sign boards, Chevron boards, Road studs, Convex mirrors etc are being provided as per codal provisions so as to make the road safe to drive.

4. Road safety at Night

ESIA Consultants recommended for street lighting. Provision of street lighting is absolutely necessary as it not only act as a prevention of accidents but also an important source of public security intended to reduce crime. Studies have shown that darkness results in a large number of crashes and fatalities, especially those involving pedestrians; pedestrian fatalities are 3 to 6.75 times more likely in the dark than in daylight. Several decades ago, when automobile

crashes were far more common, street lighting was found to reduce pedestrian crashes by approximately 50%. Road Furniture and Road Signage are to be introduced at all proper and suitable places.

DPR Consultants clarified that street lightings are proposed at built – up areas and other safety measures viz. Chevron sign boards, Road studs are proposed as safety measures at night.

5. Storm Water Drain

The Local People demanded storm water drain as much as possible throughout the alignment. At congested area it should also have cover and use as footpath.

DPR Consultants clarified that storm water drains are provided at all required locations. Trapazoidal drains are proposed at hill side locations. At built up areas cover drain cum footpath are already proposed considering the requirement of pedestrians.

6. Bus Shelter and/or Rain Shed

Bus Shelter and/or Rain Shed should be proposed at regular intervals.
Bus shelters are proposed in the DPR at aallbuiltup locations where people are expected to to use public transport.

7. Other facilities

There should be speed breakers in front of school, church and market place
Boundary wall are proposed to completely segregate the school from traffic. Road humps/Rumble strips are proposed at cross roads of all junction . Hence safety is given prime consideration in the proposal.

8. Utility Corridor

There should be utility corridor at underground near the congested place
Utility corridor will be provided as per actual requirement.

9. Public Transport

There are very few public transports in the total alignment. The frequency of public transport should increase.
The matter belongs to Govt. of Meghalaya and ESAI consultants can recommend to increase public transport for betterment of people.

10. Bridges

Are there any new bridges proposed in the alignment for not to disturb the natural flow of water?
Two minor bridges have been proposed for reconstruction. All natural streams have been provided with cross drainage structures viz. minor bridges and culverts. All culverts which are in distressed condition will be replaced

11. Trees

Are there any trees proposed in the alignment?
No trees will be cut.

Annexure 4: Select Picture Plate