Consultancy Services for conducting an Environmental and Social Impact Assessment (ESIA) of Urban Roads (Town roads) and non- urban roads and Major/Minor bridges and preparation of Environmental and Social Management instruments under MITP (World Bank) initiative.

ESIA Report of Nongstoin Town Roads

CETEST Engineering Consultants

C. E. TESTING COMPANY PRIVATE LIMITED

Report No PI/CETKI21-19/R2 Revision No. A

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1 CHAPTER-I: 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. Economic growth of this state has been hampered compared to other states of India, due to socio-geographical reasons, poor communication, and low agricultural and industrial outputs. The Public Works Department (PWD) of the Government of Meghalaya is the implementing the 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** (21.372 km) and Williamnagar Town roads (23.451 km). This Environmental and Social Impact Assessment (ESIA) report covers only **Nongstoin Town roads**.

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/4/2021/58dated 13.07.2021. The agreement for the project has been signed on 13.07.2021.

1.1 The Project Road

Nongstoin Town Roads are 21.372 km total in length situated in the West Khasi Hills district of Meghalaya state. The road project involves improvement of 24 road stretches. The Project Roads for the Nongstoin Town Roads are shown in the Figure 1.

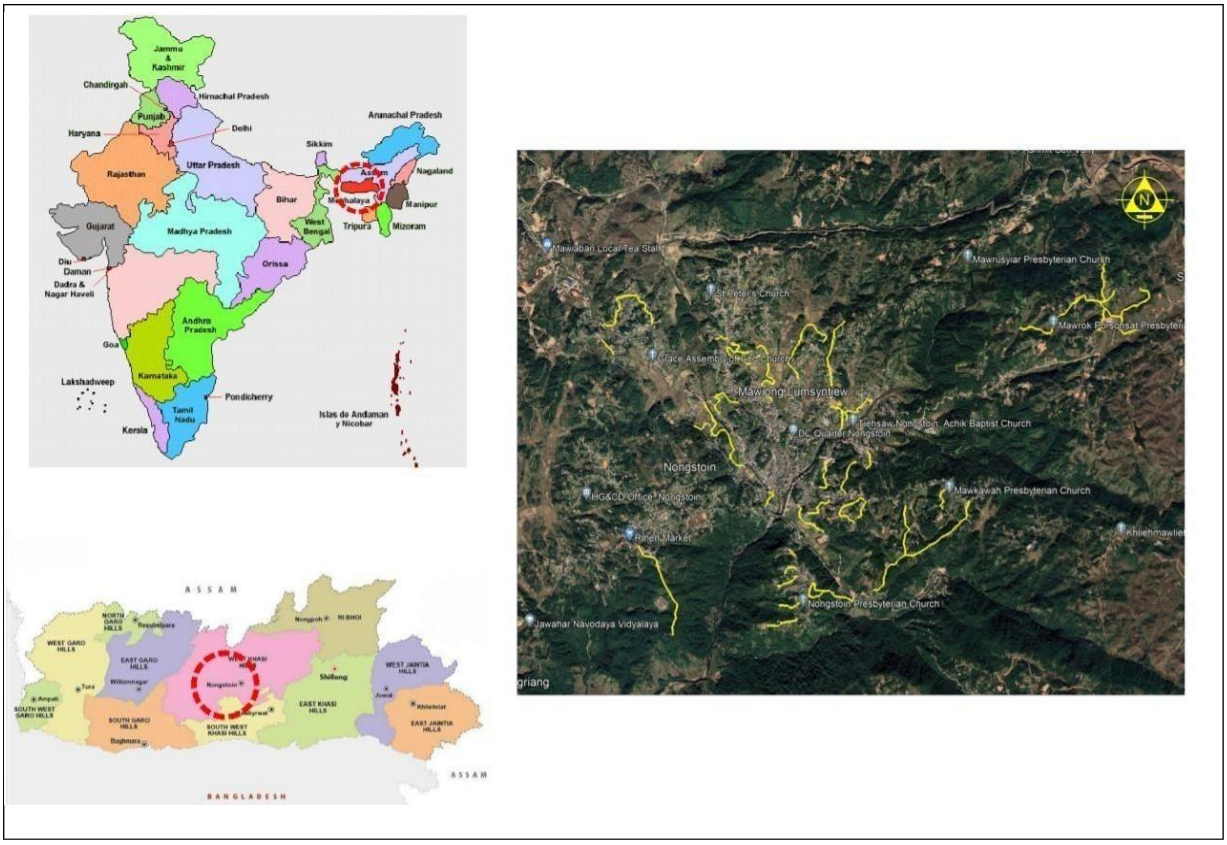


Figure 1: Location Map of the Nongstoin Town Roads

The urban roads of Nongstoin town are around 21.372 kms total in length. The project roadstretches of Nongstoin Town Roads are listed table below:

Table 1: The project road stretches of Nongstoin Town Roads

Sl. No.	Name Of Road		Length(m)
1	Improvement i/c MBT of road from Lulong (Nongstoin-Mawkawah road) to Dong Lynti Nongstoin connecting to Nongstoin-Mawthawpdah Road		1195
2	Improvement i/c MBT of approach road from Nongstoin- Mawkawah road to Umsaitmluh		500
3	Improvement i/c MBT of road from Nongstoin- Mawkawah road to Petjyllan (Near Anderson H/S School) to connect NH-44 E		410
4	Improvement i/c MBT of approach road from NH-44 E (Near Petrol Pump) to Lulong, Mawkawah village		258
5	Improvement i/c MBT of road from TB Hospital Road upto Nongstoin Playground	Link1	650
		Link 2	364
		Link3	170
6	Improvement i/c widening, MBT of road from Nongstoin College to Permanent campus of Rev. S. Wollington Children Home of the KJP Synod Sepngi		1118

Sl. No.	Name Of Road		Length(m)
7	Rehabilitation of PWD road from Nongstoin- Sonapahar road near AH & Vety.Office to Nongstoin-Pyndengrei road		597
8	Rehabilitation of Extension of Ladweitang-Mawiong Lumsyntiew to connect Nongstoin-Rambrai road at 3rd km		1070
9	Improvement/c MBT of Ladweitang-Mawiong Pyndengrei		985
10	Improvement, Rehabilitation & MBT of road from 2nd Km of Nongstoin-Rambrai road to KJP Sepngi Higher Secondary School	Link1	440
		Link2	433
		Link3	92
		Link4	100
		Link5	688
		Link6	251
11	Improvement i/c MBT of road from Nongstoin-Mawkawah road to Diangjri upto Domkharu Upper New-Nongstoin Road	Link1	460
		Link2	300
12	Improvement i/c MBT of a village road from Nongstoin-Mawkawah road to Peace nola Memorial Playground Mawkawah	Link1	400
		Link2	958
13	Improvement i/c MBT of PWD road from 5th km of Nongstoin-Markasa Road to Mawrok Porsohsat Village	Link1	250
		Link2	235
		Link3	310
		Link4	530
		Link5	1165
14	Improvement i/c MBT of road from Nongstoin-Old Nongstoin Roadto Domthangpitat Nongstoin	Link1	175
		Link2	375
15	Improvement i/c MBT of road from Nongstoin-Old Nongstoin roadto Domthangksing at Nonstoin	Link1	266
		Link2	183
		Link3	102
16	Rehabilitation of PWD road to Mawbyrshem	243	
17	Improvement i/c MBT from Nongstoin-Pyndengrei to Mawiangdong	158	
18	Improvement i/c MBT from Nongstoin-Pyndengrei Road to Umshaitshait	Link1	200
		Link2	154
19	Improvement i/c MBT from Nongstoin-Mawkawah Road to Dong Lynti Nongstoin upto Hubert Memorial English School	1033	
20	Improvement i/c MBT from Nongstoin-Mawkawah Road (Near Durbar Hall BlockNo. -6, Upper New Nongstoin) to Church of the Living God, Upper New Nongstoin	353	
21	MBT of different Link Road sat Nondein, New Nongstoin	Link1	1162
		Link2	150

Sl. No.	Name Of Road		Length(m)
22	Resurfacing of road from Nongstoin-Mawkawah road to Madan Shyiap	448	
23	Improvement i/c MBT from Nongstoin-Sonapahar Road to Mawsiangphet upto St. Francis D' Assisi College	Link1	1144
		Link2	220
24	Improvement i/c MBT from Nongstoin-Pyndengrei road to ThomasJones Secondary School	Link1	350
		Link2	280
Total			**21.372**

All of the project road stretches lies in hilly terrain. Carriageway width varies from 1 m to 3.5m.

1.2 Objective of the Project:

The objective of the project is to improve the existing town roads with respect to geometry,safety, drainage and other techno-economic feasible solutions. This will be realized by

(i) upgradation/ reconstruction/ widening as well rehabilitation selected roads:

(ii) facilitating safe and appropriate road usage,

(iii) Improve public and external stakeholder support and awareness.

(iv) increasing efficiency of transport services and

(v) Enhancing GoM capacity for road asset development

(vi) Widening of all the project roads to the maximum possible extent withoutoverruling the existing Right-of- Way (ROW).

(vii) Most of the project roads undergo overlay scheme whereas few roads areproposed for pavement reconstruction.

(viii) Pedestrian safety barricades, collapsible barricades etc. related to traffic safetyare proposed where pedestrians are vulnerable to conflicts.

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.

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

- 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 applied.
- Preparation of screening report for all the subprojects and Scope of Work (SoW) wasdefine for the detail assessment if required.
- Screening report included 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 was considered but not be limited to the following:
  a) Conduct a comprehensive Environmental and Social Screening for all the subprojects.
  b) Establishing an environmental and social baseline for the project area.
  c) 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.
  d) Integration of ESIA findings and ESMP budget in engineering feasibility studies.
  e) Preparation of any Environmental and Social Management Plan (ESMP), Health and Safety Plans including COVID 19 management plan Tribal (Indigenous) Development Plan (TDP), Gender Action Plan; Labor Management Procedure and Stakeholder Engagement Plan (SEP) etc.
  f) 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 beforeexpert panel committees of MoEF & CC, Govt. of India.
  g) Conduct consultations with identified stakeholders and project-affected parties / Community from early project planning and design stages of the assignment.
  h) Develop monitoring programme to ensure that the proposed mitigation measuresare being implemented effectively.

Table 2: Project Salient Features

Sl.	Salient Features	Details
1	Design Chainage	-
2	Total Length (Km)	21.372
3	Proposed Carriageway width	The carriageway (BT) width varies from 1 to 3.5 m either side of design center line.
4	Major Junctions (Nos.)	23

Sl.	Salient Features	Details
	Minor Junction (Nos.)	50
	Total Junction	73
6	Major Bridge	Nil
7	Minor Bridge	Nil
8	Total Culverts (Nos)	72
9	Bus Shelters (Nos.)	-
10	Slope Protection	Retaining Walls, Breast Walls, Parapet Walls
11	Project Cost	15.43 Cr.

1.4 Structure of ESIA Report

As per the EIA notification of the MOEF on dated 14 September 2006 & subsequentamendments, 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: Project Description
Chapter -III: Need of Environment & Social Impact Assessment
Chapter -IV: Legal Framework
Chapter -V: Description of Environment
Chapter -VI: Analysis of Potential Environmental and Social Impacts and MitigationMeasures

Chapter -VII: Environmental Monitoring Plan
Chapter -VIII: Climate Change Impact and Risk
Chapter -IX: Additional Studies
Chapter -X: Resettlement Action PlanChapter -
XI: Monitoring & Evaluation
Chapter -XII: Abbreviated Resettlement Action Plan

Chapter -XIII: Environment and Social Management Plan
Chapter -XIV: Conclusions and Recommendations

2 CHAPTER-II: Project Description

The urban roads of Nongstoin town are around 21.375 km in length which situated in the West Khasi Hills district of Meghalaya state. The project road starts from the ABDK Mission Compound of RSN Road and it's interconnected to 24 road junctions within Nongstoin Town.

2.1 Need for the Project

The project stretch has bitumen surface throughout. 99% of the road stretches are poor in condition. The safety provision of road is also inadequate. Therefore, it is imperative to upgrade this road section to standard configuration with adequate safety measures in order to enhance traffic operational efficiency and to ensure safety to road users, so that the objective of improving the connectivity of the roads to the others parts of the district andstate is realized.

Many settlements are located close to project road, which make road narrow and congested.Poor road conditions and geometry of the project road result in slow economic growth and poor infrastructure facilities in the area. Therefore, rehabilitation and upgrading project roadis needed with proper traffic engineering and enforcement of the rules and regulations of the road, so that there should also be a marked reduction in road traffic accidents and smooth flow of traffic is ensured.

2.2 Project Location

Nongstoin Town Roads involves 24 road stretches, total length of 20.925. The Project Highway corridor is situated in West Khasi Hills district of Meghalaya. The project is located in the Universe Transverse Meter (UTM) zone 46. The height of the dissected Meghalaya Plateau is 150 meters - 1961 meters above sea level. Location map of the project roads is given in Figure 1.

2.3 Existing Features of the Project

The existing project features are given below.

Sl.	Project Component	Details
1	Location of Project	Nongstoin Town (20.925km). Project road is situated inWest Khasi Hills in the state of Meghalaya.
2	Administrative locations	West Khasi Hills
3	State	Meghalaya
4	Length of the project section	21.372 km
5	Terrain	All of the road stretches of Nongstoin passes throughhilly terrain
7	Land use	The project area covers mostly forest area and agricultural area and 30% area is covered by built-up area.
8	Forest area	40% area of the project road is under forest area
9	Bridge	There is no major and minor Bridges along the projectroad
10	Road Configuration	Most of the roads are of single lane configuration with a

Sl.	Project Component	Details
		few numbers of roads have intermediate/two lane configuration.
11	Pavement condition	Existing road is not motorable, thus 99% of the roadsare 'poor' in condition.
12	High embank road stretches	Nil

2.4 Right of Way (RoW)

The carriageway width of the existing road varies from 1m to 3.5 meter. Width of earthen shoulder varies from 0 to 1.5 meter. The Proposed Right of Way is within the existing Right of way.

2.5 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.

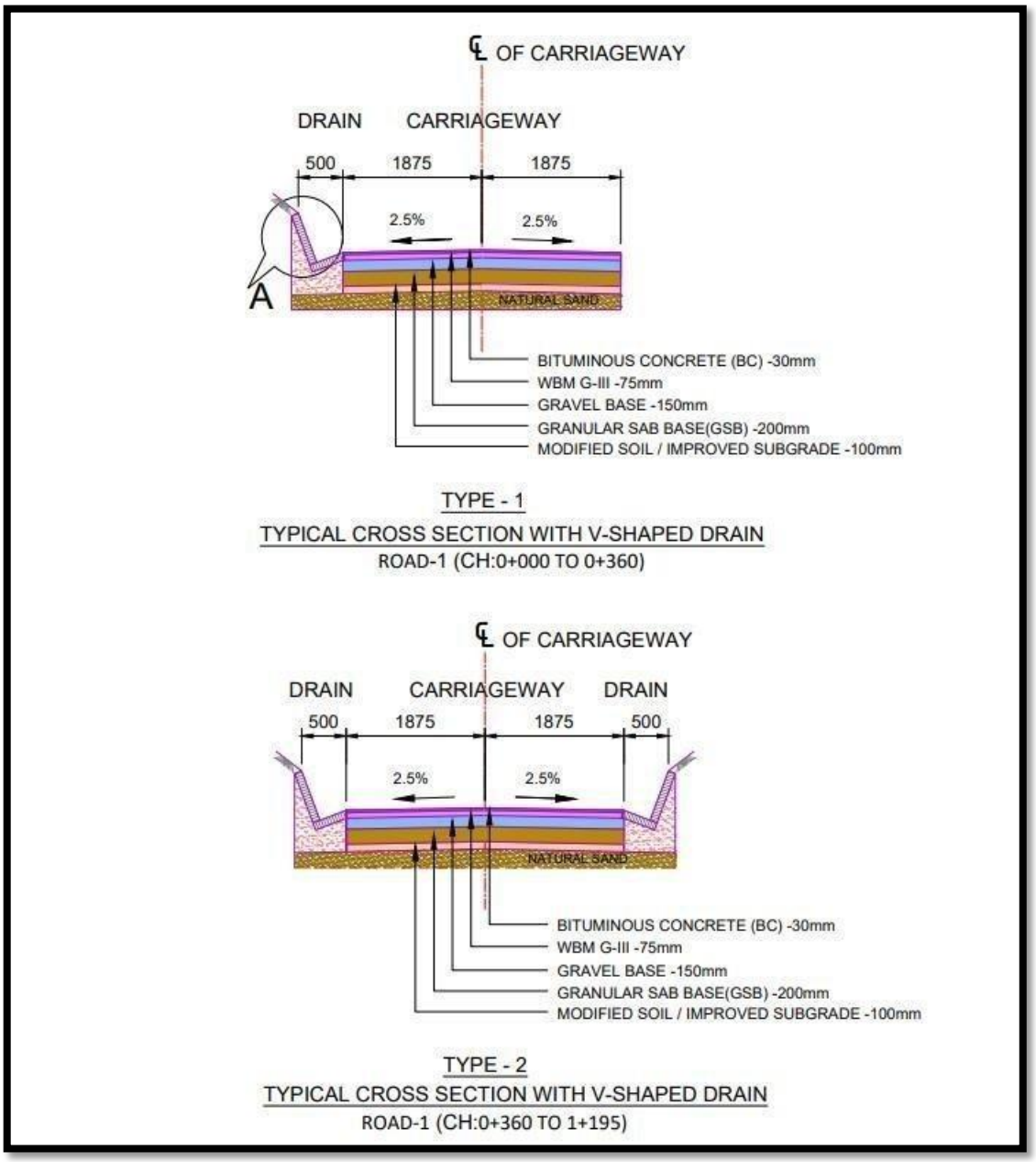
2.6 Proposed Cross Section Details

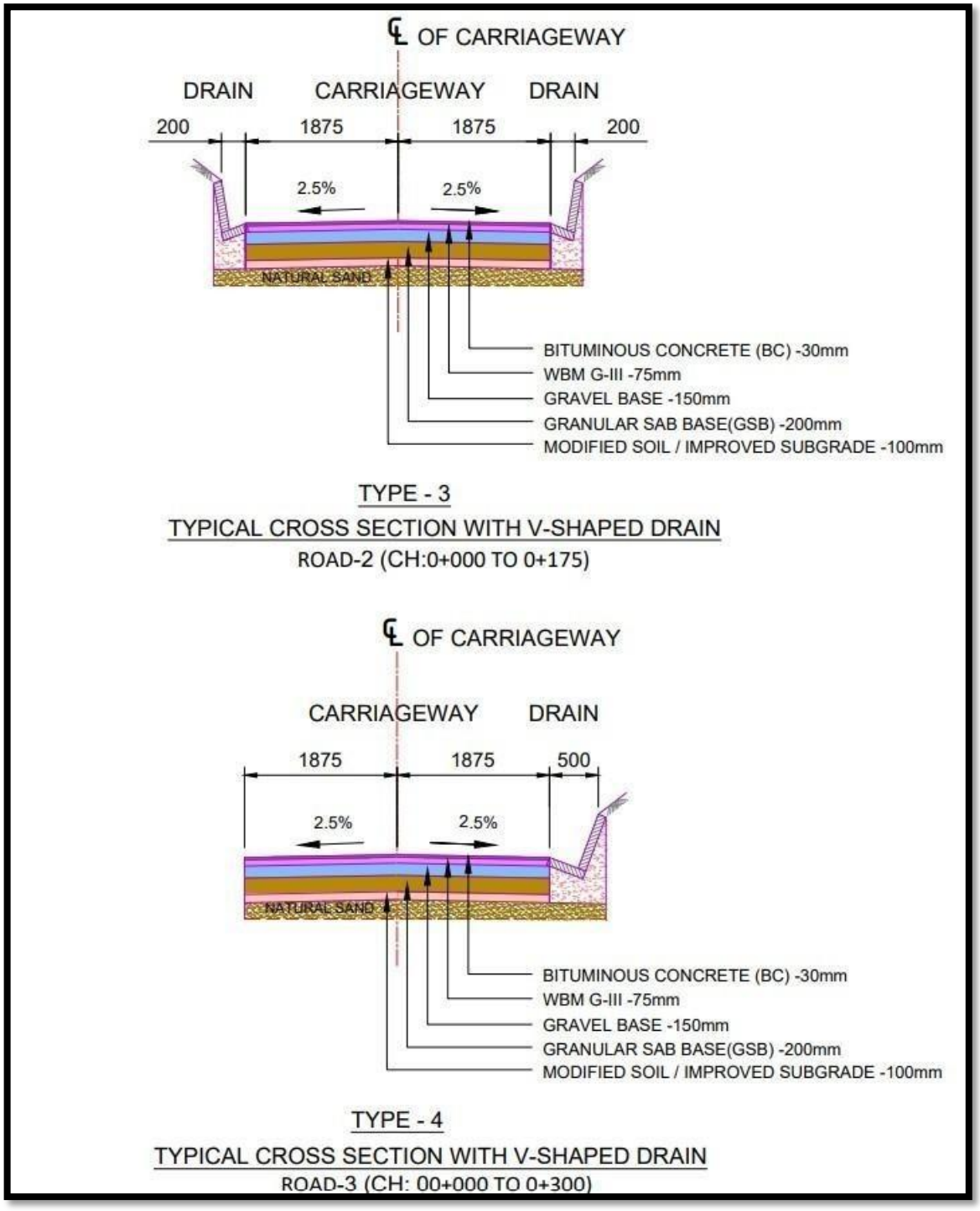
Carriageway Width: The carriageway configuration of two lanes with a paved and hard shoulder is proposed for the project road having 1 to 3.5m carriageway width.

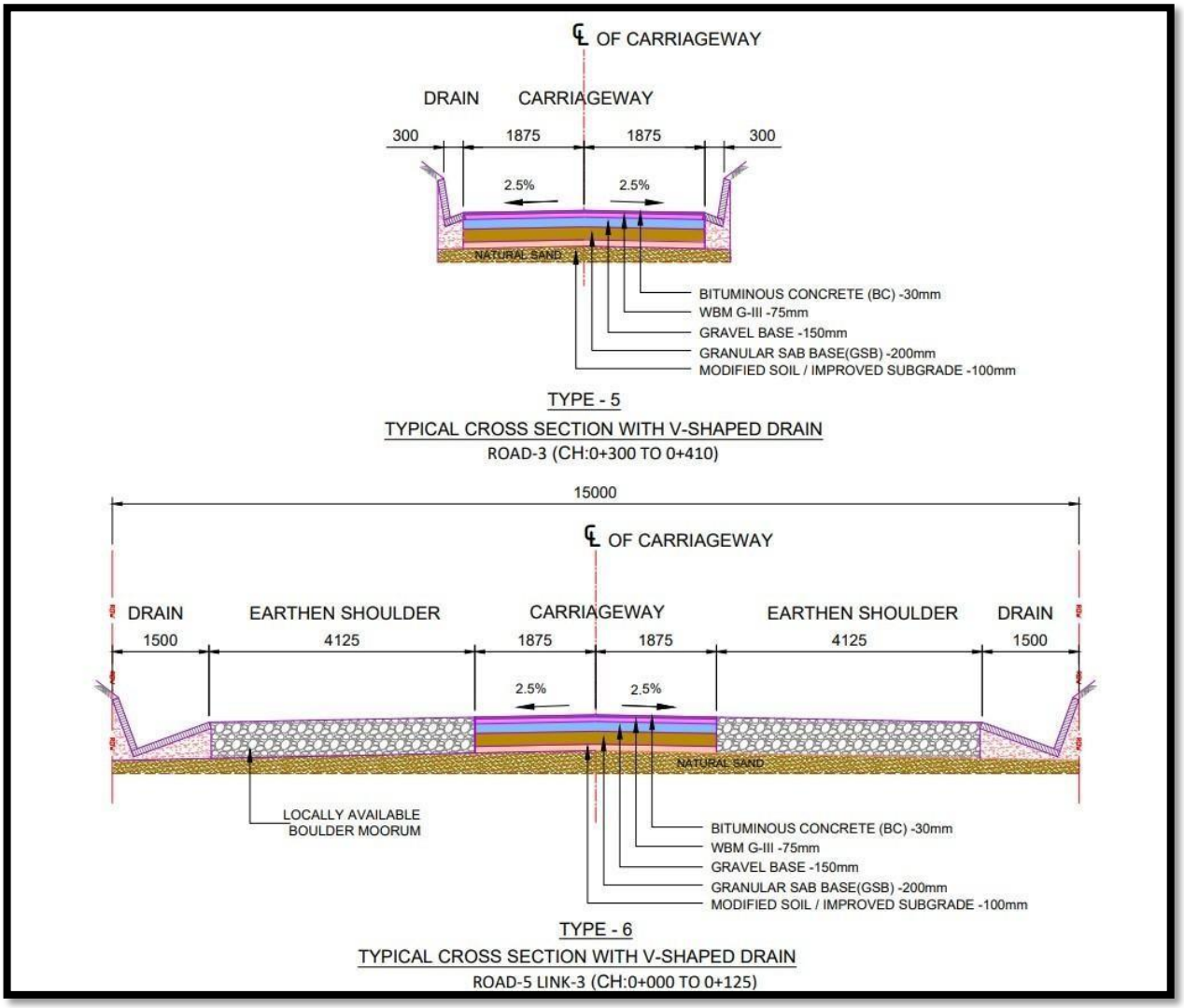
Shoulder: Earthen shoulders are proposed to be 1 to 1.5 m on both sides afterCarriageway if sufficient RoW is available.

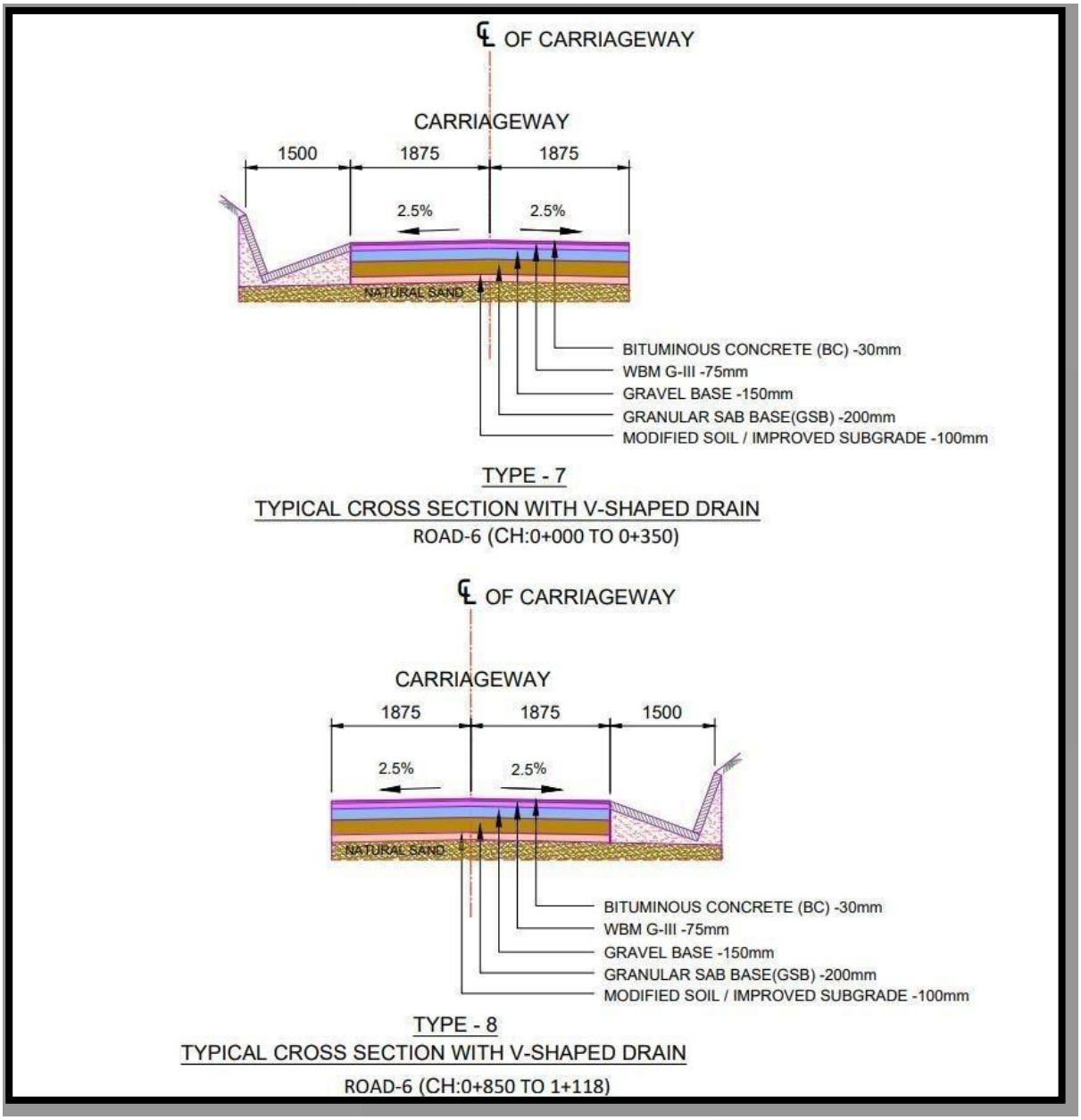
Typical Cross Section:

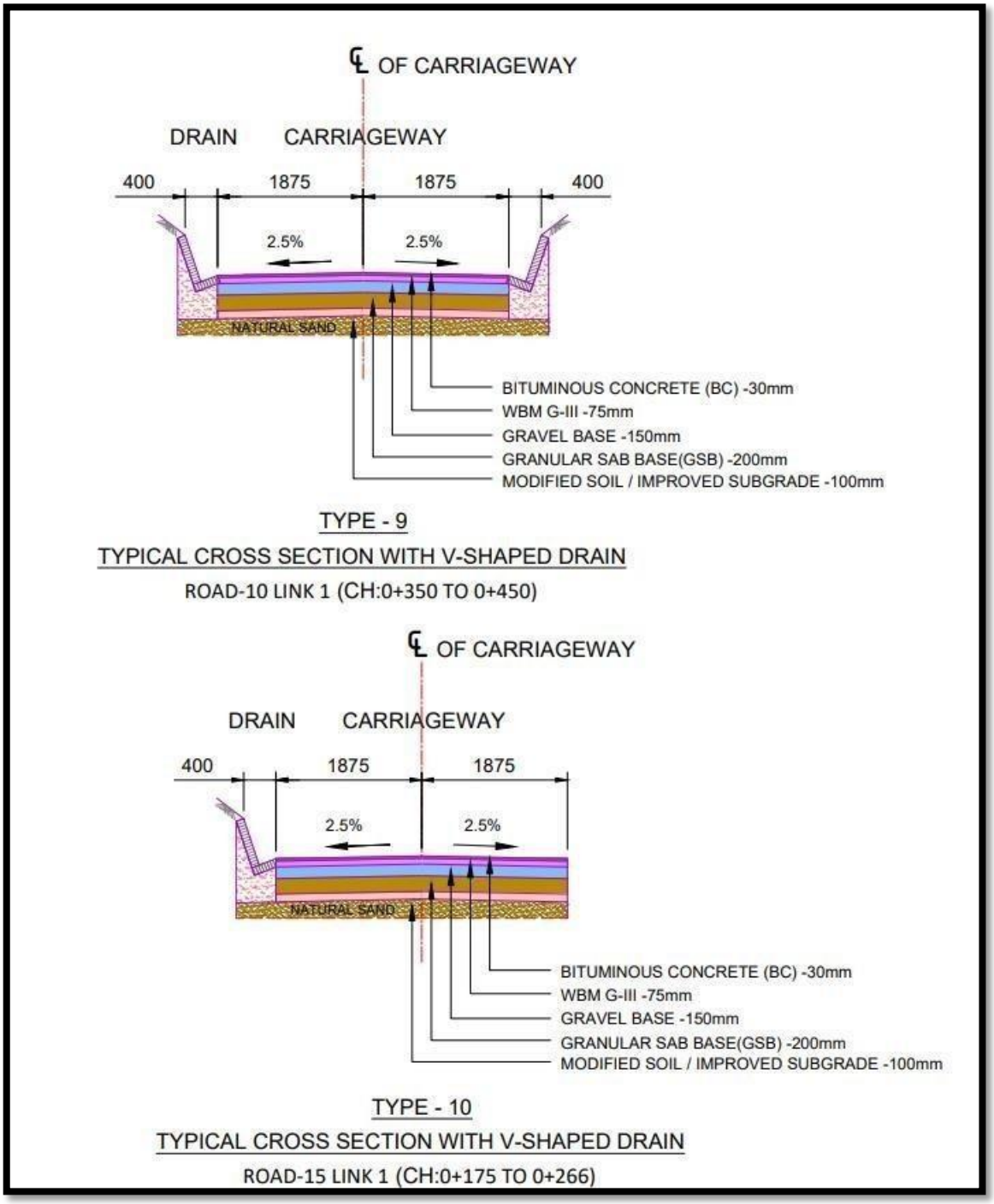
Typical cross sections (TCS) for various configurations proposed in built up area and open country area in hilly terrain are shown below:


℄ OF CARRIAGEWAY
DRAIN
CARRIAGEWAY
500
1875
1875
2.5%
2.5%
A
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 1
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-1 (CH:0+000 TO 0+360)
℄ OF CARRIAGEWAY
DRAIN
CARRIAGEWAY
DRAIN
500
1875
1875
500
2.5%
2.5%
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 2
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-1 (CH:0+360 TO 1+195)


℄ OF CARRIAGEWAY
DRAIN
CARRIAGEWAY
DRAIN
200
1875
1875
200
2.5%
2.5%
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 3
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-2 (CH:0+000 TO 0+175)
℄ OF CARRIAGEWAY
CARRIAGEWAY
DRAIN
1875
1875
500
2.5%
2.5%
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 4
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-3 (CH: 00+000 TO 0+300)


℄ OF CARRIAGEWAY
DRAIN
CARRIAGEWAY
300
1875
1875
300
2.5%
2.5%
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 5
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-3 (CH:0+300 TO 0+410)
15000
℄ OF CARRIAGEWAY
DRAIN
EARTHEN SHOULDER
CARRIAGEWAY
EARTHEN SHOULDER
DRAIN
1500
4125
1875
1875
4125
1500
2.5%
2.5%
NATURAL SAND
LOCALLY AVAILABLE
BOULDER MOORUM
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 6
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-5 LINK-3 (CH:0+000 TO 0+125)


℄ OF CARRIAGEWAY
CARRIAGEWAY
1500
1875
1875
2.5%
2.5%
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 7
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-6 (CH:0+000 TO 0+350)
℄ OF CARRIAGEWAY
CARRIAGEWAY
1875
1875
1500
2.5%
2.5%
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 8
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-6 (CH:0+850 TO 1+118)



TYPE - 9

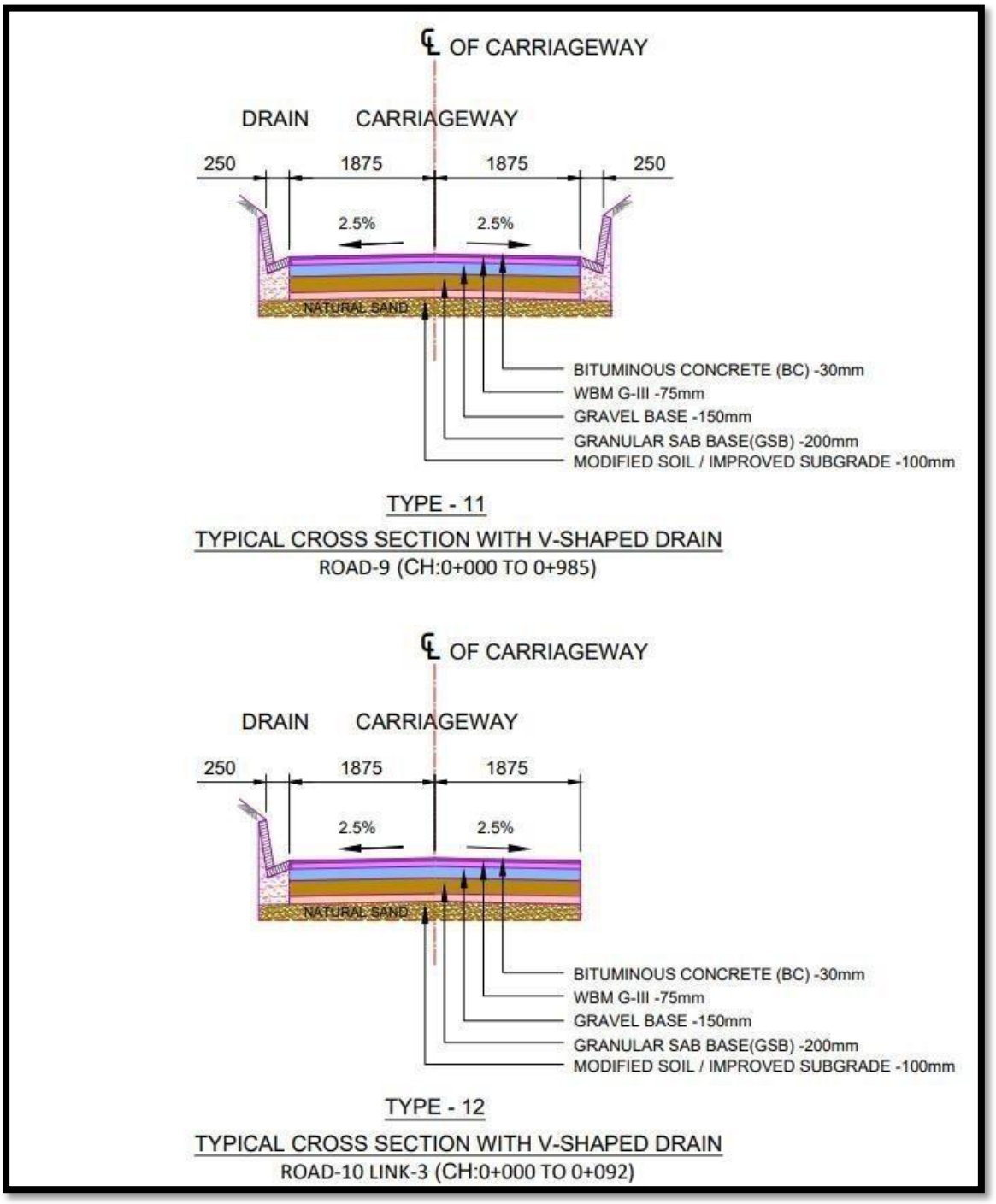
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN

ROAD-10 LINK 1 (CH:0+350 TO 0+450)

TYPE - 10

TYPICAL CROSS SECTION WITH V-SHAPED DRAIN

ROAD-15 LINK 1 (CH:0+175 TO 0+266)



TYPE - 11

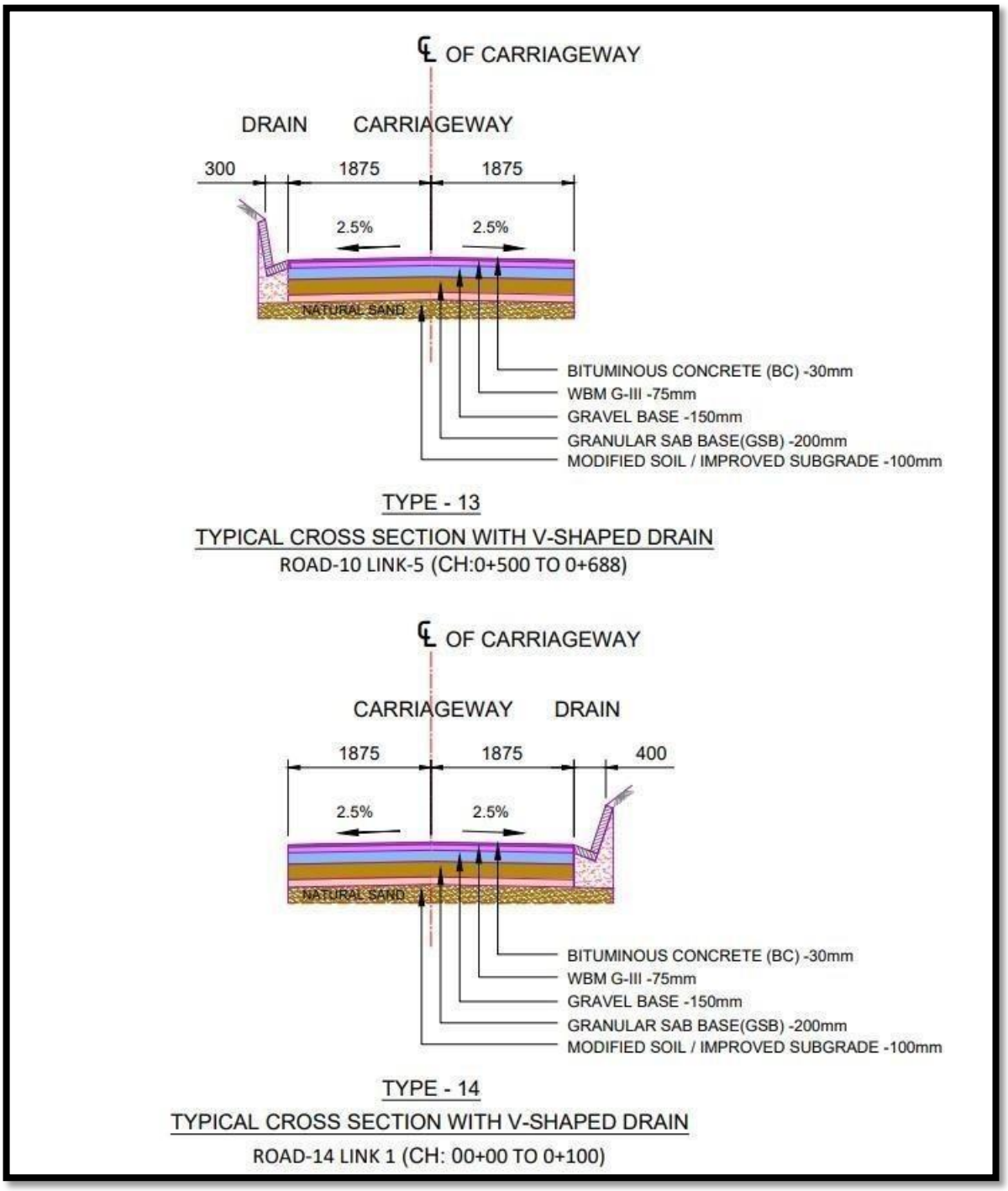
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN

ROAD-9 (CH:0+000 TO 0+985)

TYPE - 12

TYPICAL CROSS SECTION WITH V-SHAPED DRAIN

ROAD-10 LINK-3 (CH:0+000 TO 0+092)


℄ OF CARRIAGEWAY
DRAIN
CARRIAGEWAY
300
1875
1875
2.5%
2.5%
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 13
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-10 LINK-5 (CH:0+500 TO 0+688)
℄ OF CARRIAGEWAY
CARRIAGEWAY
DRAIN
1875
1875
400
2.5%
2.5%
NATURAL SAND
BITUMINOUS CONCRETE (BC) -30mm
WBM G-III -75mm
GRAVEL BASE -150mm
GRANULAR SAB BASE(GSB) -200mm
MODIFIED SOIL / IMPROVED SUBGRADE -100mm
TYPE - 14
TYPICAL CROSS SECTION WITH V-SHAPED DRAIN
ROAD-14 LINK 1 (CH: 00+00 TO 0+100)

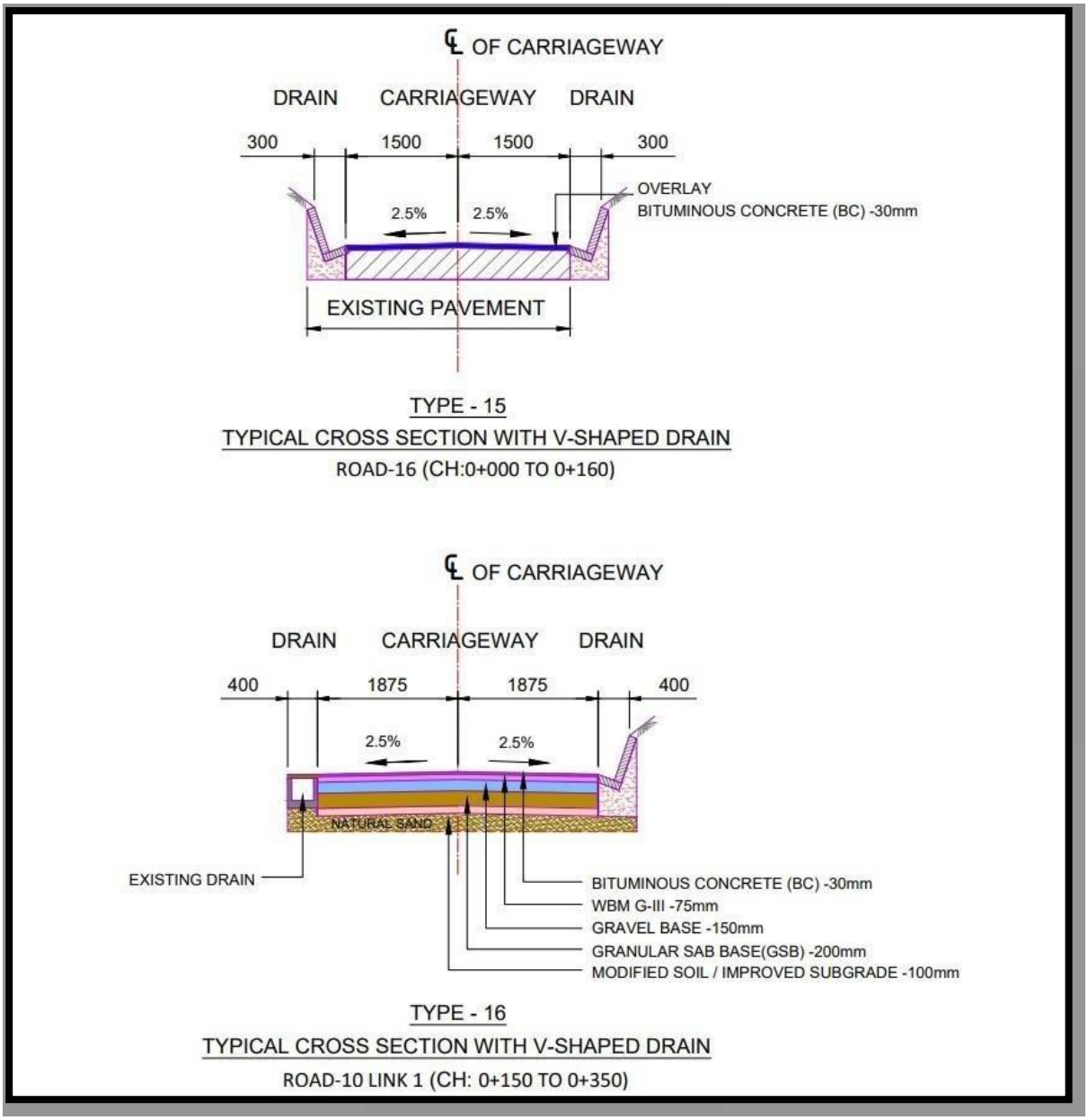


Figure 2: Structures of Typical Cross Section

2.7 Current and Projected Daily Traffic

Meghalaya government had restricted traffic movement in the state due to unprecedented increase in Covid-19 cases. Due to these restrictions, traffic surveys were not carried out earlier during field surveys. Preliminary site reconnaissance indicates that substantial number of private cars commute along the project road stretches.

2.8 Proposed Roadside Drainage

To ensure effective drainage of water from road side drainage system has been provided throughout the project stretch. The details of the roadside drainage are shown in typical cross section and drawing volume. Roadside drains should generally be of uniform section throughout Irrespective of the location of road on

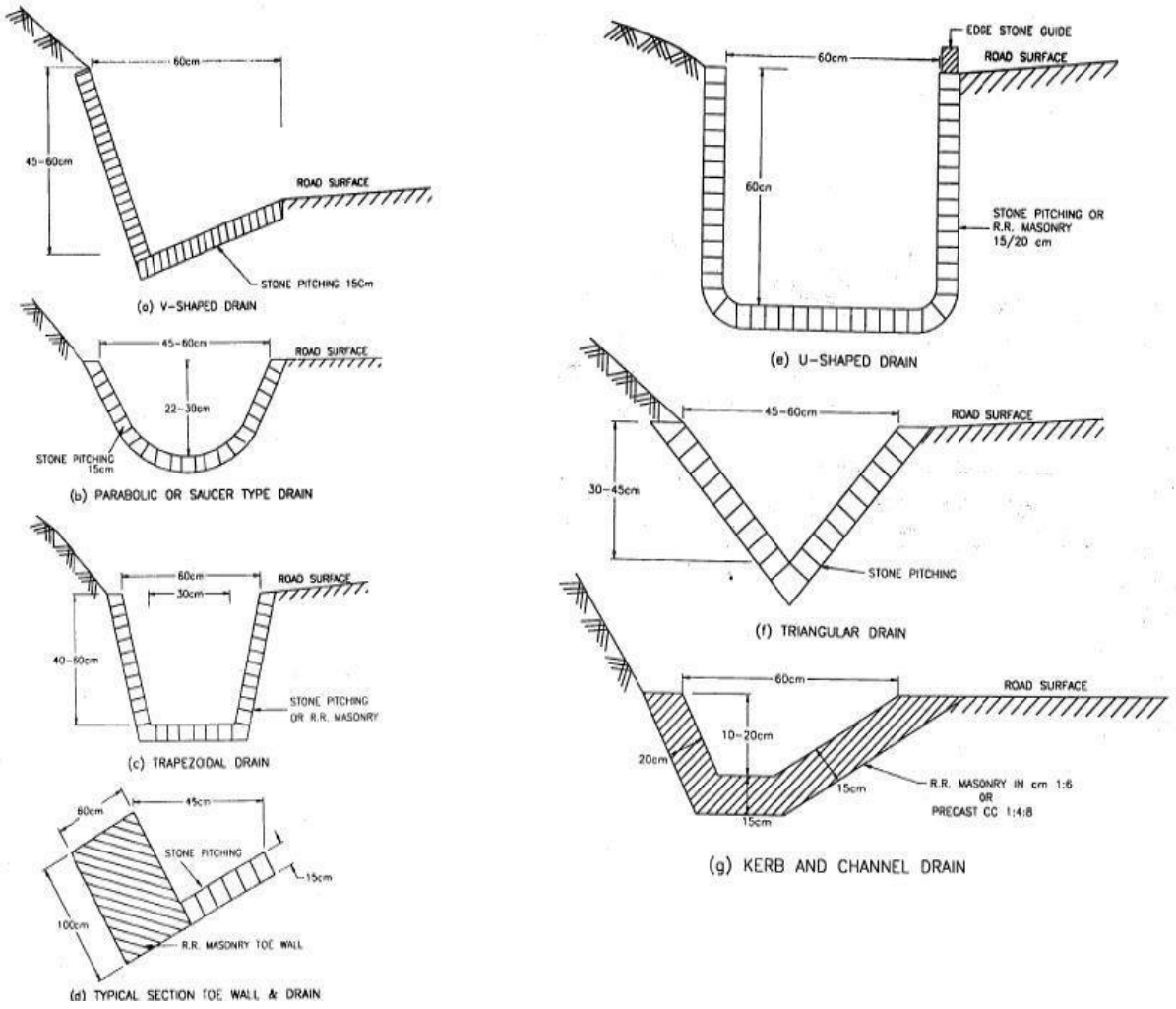


Figure 3: Structure of Road Side Drains

the hill slope. Road on ridge alignment may not require the same section of drains due to lesser quantity of flow of water. For convenience of construction, it may be necessary to have uniform section of a drain but the frequency of culverts could be regulated to the catchment area that it has to cater to. Roadside drains are constructed to parabolic (Saucer shape), trapezoidal, triangular, V-Shape, kerb and channel or U-Shaped cross-sections. The parabolic section is hydraulically the best and most erosion resistant. The trapezoidal sections easier to construct and is more generally used. Kerb and channel drain gives extra width in case of emergencies for vehicles to use. U-Shaped drains are generally deep drains and are provided where higher discharge has to be catered and adequate road width is available. Drawings of Structures of different shapes of roadside drains are given below in Figure 3.

2.9 Proposed Pedestrian and Animal Crossing

On the basis of interfering site visit data and traffic data, no pedestrian underpass is proposed. There is no animal movement corridor along or across the project road. Therefore, no animal underpass is needed.

2.10 Wayside Amenities

- **Bus Shelters**
  No bus shelter has come for proposal till now.

- **Truck Lay Bye**
  No Truck Lay Bye has been proposed.
- **Footpath**
  This project only develops the Road within the available RoW. No new footpath hasbeen proposed.

2.11 Pavement Condition

The project stretch has bitumen surface throughout. Most of the existing road stretches (99% of the road stretches) are 'poor' in condition.The summary of the visual pavement condition (survey carried out in October, 2021) of the project roads are given below:

Table 3: Summary of Pavement Condition

Sl.	Name of Road with Link no.	GPS Coordinates (UTM) Zone 46R (Starting Point)			GPS Coordinates (UTM) Zone 46R (Ending Point)			Types of Pavements	Overall, Road Width (m)	Overall Visual Conditions in terms of Good, Fair, Poor	Distress of the Road	Recommended Overlay/ Reconstruction
		Easting	Northing	Altitude (m)	Easting	Northing	Altitude (m)					
1	Improvement i/c MBT of road from Lulong (Nongstoin-Mawkawah road) to Dong Lynti Nongstoin connecting to Nongstoin-Mawthawpdah Road	327156	2823351	1408	326779	2822416	1357	Gravel / Earthen Road	3.50	Poor	Very Poor Condition gravel and required reconstruction from WBM	Reconstruction
2	Improvement i/c MBT of approach road from Nongstoin-Mawkawah road to Umsaitmluh	325904	2823385	1318	326198	2823084	1343	Gravel / Earthen Road	3.50	Poor	Very Poor Condition gravel and required reconstruction from WBM	Reconstruction
3	Improvement i/c MBT of road from Nongstoin- Mawkawah road to Petjyllan (Near Anderson H/S School) to connect NH- 44E	326169	2823571	1362	326229	2823874	1323	Gravel / Earthen Road	3.50	Poor	Gravel-Earthen very Poor Condition gravel-and required reconstruction from sub grade	Reconstruction
4	Improvement i/c MBT Of approach road from NH- 44E (Near Petrol Pump) to Lulong, Mawkawah village	327231	2822814	1420	327033	2822714	1392	Gravel / Earthen Road	3.50	Poor	Gravel-Earthen very Poor Condition gravel- and required reconstruction from sub grade	
5/1	Improvement i/c MBT ofroad from TB Hospital Road upto Nongstoin Playground (Link-1)	326493	2822318	1362	326029	2822374	1404	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
5/2	Improvement i/c MBT of	325887	2822099	1393	325545	2822042	1401	Gravel	3.50	Poor	Very Poor Condition	Reconstruction

Sl.	Name of Road with Link no.	GPS Coordinates(UTM) Zone 46R (Starting Point)			GPS Coordinates(UTM) Zone 46R (Ending Point)			Types of Pavements	Overall, Road Width (m)	Overall, Visual Conditions in terms of Good, Fair, Poor	Distress of the Road	Recommended Overlay/ Reconstruction
		Easting	Northing	Altitude (m)	Easting	Northing	Altitude (m)					
	Road from TB Hospital road upto Nongstoin Playground (Link-2)										gravel and required reconstruction sub grade	
5/3	Improvement i/c MBT ofroad from TB Hospital road upto Nongstoin Playground (Link-3)	326195	2822417	1401	326082	2822530	1402	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
6	Improvement i/c widening, MBT of road from Nongstoin College to permanent campus of Rev. S. Wollington Children Home of the KJP Synod Sepngi	324077	2822955	1383	324474	2821944	1356	Gravel/ Earthen Road	3.50	Poor	Gravel-Earthen very Poor condition gravel-andrequired reconstruction from sub grade	Reconstruction
7	Rehabilitation of PWD road from Nongstoin-Sonapahar road near AH & Vety. Office to Nongstoin – Pyndengrei road	325021	2824417	1322	325247	2824541	1345	Gravel	3.50	Poor	BT but very worst condition and reconstruction required from WBM layer	Reconstruction
8	Rehabilitation of Extension of Ladweitang- Mawiong Lumsyntiew to connect Nongstoin Rambrai road at 3rd km	325932	2824809	1351	326220	2825220	1369	Gravel	3.50	Poor	BT – gravel - earthen But very poor condition so require construction from top of the subgrad and some places GSB/WBM	Reconstruction
9	Improvement i/c MBT OF Ladweitang- Mawiong Pyndengrei	325461	2825169	1345	325632	2824570	1335	Bituminous	3.50	Poor	Very Poor Condition gravel and required	Reconstruction

Sl.	Name of Road with Link no.	GPS Coordinates (UTM) Zone 46R (Starting Point)			GPS Coordinates(UTM) Zone 46R (Ending Point)			Types of Pavements	Overall, Road Width (m)	Overall Visual Conditions in terms of Good, Fair, Poor	Distress of the Road	Recommended Overlay/ Reconstruction
		Easting	Northing	Altitude (m)	Easting	Northing	Altitude (m)					
											reconstruction from sub grade	
10/1	Improvement, Rehabilitation & MBT of road from 2ndKm of Nongstoin-Rambrai road To KJP Sepngi Higher Secondary School(Link-1)	326310	2824484	1338	326392	2824154	1326	Bituminous	3.50	Poor	BT Road Very Poor Conditions due toLots of potholes, cracking, rutting, raveling and undulating type surface so required reconstruction from WBM layer	Reconstruction
10/2	Improvement, Rehabilitation &MB T of road from 2ndKm of Nongstoin-Rambrai road To KJP Sepngi Higher Secondary Sc hool (Link-2)	326450	2824429	1331	326799	2824554	1332	Bituminous	3.50	Poor		Reconstruction
10/3	Improvement, Rehabilitation &MB To road from 2 Km of Nongstoin-Rambrai road to KJP Sepngi Higher Secondary School (Link-3)	326476	2824420	1331	326495	2824347	1325	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from WBM	Reconstruction
10/4	Improvement, Rehabilitation & MBT of road from 2nd Km of Nongstoin-Rambrai road to KJP Sepngi HigherSecondary School (Link-4)	326385	2824474	1337	326427	2824504	1342	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
10/5	Improvement, Rehabilitation & MBT of road from 2nd Km of Nongstoin-Rambrai road to KJP Sepngi Higher Secondary School (Link-5)	326323	2824618	1348	326363	2825259	1383	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from WBM	Reconstruction
10/6	Improvement, Rehabilitation & MBT of road from 2nd Km of Nongstoin-	326362	2825266	1383	326491	2825449	1407	Gravel	3.50	Poor	Very Poor Condition gravel and required	Reconstruction

Sl.	Name of Road with Link no.	GPS Coordinates (UTM) Zone 46R (Starting Point)			GPS Coordinates(UTM) Zone 46R (Ending Point)			Types of Pavements	Overall, Road Width (m)	Overall Visual Conditions in terms of Good, Fair, Poor	Distress of the Road	Recommended Overlay/ Reconstruction
		Easting	Northing	Altitude (m)	Easting	Northing	Altitude (m)					
	Rambrai road to KJP Sepngi Higher Secondary School (Link-6)										from WBM	
11/1	Improvement i/c MBT of road from Nongstoin- Mawkawah road to Diangjriupto Domkharu Upper New-Nongstoinroad (Link-1)	326631	2823466	1408	326568	2823177	1406	Gravel/ Earthen Road	3.50	Poor	Very Poor Condition Gravel and required reconstruction from WBM	Reconstruction
11/2	Improvement i/c MBT of road from Nongstoin - Mawkawahroad to Diangjriupto Domkharu Upper New-Nongstoin road (Link-2)	326633	2823459	1411	326598	2823238	1417	Gravel	3.50	Poor	Very Poor Condition Gravel and required reconstruction from WBM	Reconstruction
12/1	Improvement i/c MBT of a village road from Nongstoin -Mawkawah road to Peacenola Memorial Playground Mawkawah(Link-1)	327645	2823572	1446	327565	2823293	1446	Gravel	3.20	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
12/2	Improvement i/c MBT of a village road from Nongstoin - Mawkawah road to Peacenola Memorial Playground Mawkawah (Link-2)	327644	2823585	1444	327679	2823650	1449	Gravel	3.50	Poor		Reconstruction
13/1	Improvement i/c MBT of PWD road from 5th km of Nongstoin-Markasa Roadto Mawrok Porsohsat Village(Link- 1)	329791	2825289	1496	329823	2825745	1550	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
13/2	Improvement i/c MBT ofPWD road from 5th km of Nongstoin-Markasa Road to Mawrok Porsohsat Village (Link- 2)	329609	2825430	1535	329335	2825281	1552	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
13/3	Improvement i/c MBT of PWD road from 5th km of Nongstoin-Markasa Road to Mawrok Porsohsat Village (Link-3)	329422	2825533	1543	329536	2825720	1551	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction

Sl.	Name of Road with Link no.	GPS Coordinates (UTM) Zone 46R (Starting Point)			GPS Coordinates(UTM) Zone 46R (Ending Point)			Types of Pavements	Overall, Road Width (m)	Overall Visual Conditions in terms of Good, Fair, Poor	Distress of the Road	Recommended Overlay/ Reconstruction
		Easting	Northing	Altitude (m)	Easting	Northing	Altitude (m)					
13/4	Improvement i/c MBT of PWD road from 5th km of Nongstoin-Markasa Road to Mawrok Porsohsat Village(Link-4)	329427	2825611	1556	329386	2826094	1568	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
13/5	Improvement i/c MBT ofPWD road from 5th km of Nongstoin-Markasa Road to Mawrok Porsohsat Village (Link- 5)	329378	2825591	1550	328431	2825289	1492	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
14/1	Improvement i/c MBT of road from Nongstoin - Old Nongstoin Road to Domthangpitat Nongstoin (Link-1)	326080	2822532	1408	326026	2822373	1403	Gravel	3.50	Poor	Very Poor Conditiongravel and required reconstruction from sub grade (Not marked on kml)	Reconstruction
14/2	Improvement i/c MBT ofroad from Nongstoin - Old Nongstoin Road to Domthangpitat Nongstoin (Link-2)	326035	2822318	1412	325688	2822274	1394	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade (Not marked on kml)	Reconstruction
15/1	Improvement i/c MBT ofroad from Nongstoin-Old Nongstoin road to Domthangksing at Nonstoin(Link-1)	325545	2822042	1401	325903	2822594	1408	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
15/2	Improvement i/c MBT ofroad from Nongstoin – Old Nongstoin road to Domthangksing at Nonstoin (Link-2)	325897	2822678	1402	325774	2822613	1409	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
15/3	Improvement i/c MBT of road from Nongstoin - Old Nongstoin road to Domthangksing at Nonstoin (Link-3)	325887	2822810	1397	325793	2822893	1411	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction

Sl.	Name of Road with Link no.	GPS Coordinates (UTM) Zone 46R (Starting Point)			GPS Coordinates(UTM) Zone 46R (Ending Point)			Types of Pavements	Overall, Road Width (m)	Overall Visual Conditions in terms of Good, Fair, Poor	Distress of the Road	Recommended Overlay/ Reconstruction
		Easting	Northing	Altitude (m)	Easting	Northing	Altitude (m)					
16	Rehabilitation of PWD road to Mawbyrshem	325537	2823366	1326	325578	2823532	1317	Bituminous	3.50	Good	This road recently done carpeting (20mm)	Overlay
17	Improvement i/c MBT from Nongstoin-Pyndengrei To Mawiangdong	325134	2825271	1370	324994	2825257	1373	Gravel Road	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
18/1	Improvement i/c MBT from Nongstoin - Pyndengrei Road to Umshaitshait (Link-1)	325228	2825122	1385	325180	2825220	1372	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
18/2	Improvement i/c MBT from Nongstoin- Pyndengrei Road to Umshaitshait (Link-2)	325242	2825122	1377	325385	2825123	1388	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
19	Improvement i/c MBT from Nongstoin-Mawkawah Road to Dong Lynti Nongstoin upto Hubert Memorial English School	327884	2823407	1428	327811	2823197	1429	Gravel	4.00	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
20	Improvement i/c MBT from Nongstoin – Mawkawah Road (Near Durbar Hall Block No.-6, Upper New Nongstoin) to Church of the Living God, Upper New Nongstoin	326281	2823429	1380	326032	2823306	1352	Gravel	3.50	Poor	Gravel-Earthen very Poor Condition gravel - and required reconstruction from sub grade	Reconstruction

Sl.	Name of Road with Link no.	GPS Coordinates (UTM) Zone 46R (Starting Point)			GPS Coordinates(UTM) Zone 46R (Ending Point)			Types of Pavements	Overall, Road Width (m)	Overall Visual Conditions in terms of Good, Fair, Poor	Distress of the Road	Recommended Overlay/ Reconstruction
		Easting	Northing	Altitude (m)	Easting	Northing	Altitude (m)					
21/1	MBT of different Link Roadsat Nondein, New Nongstoin (Link-1)	324855	2824549	1324	325321	2823821	1320	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
21/2	MBT of different Link Roadsat Nondein, New Nongstoin (Link-2)	324740	2824284	1339	324900	2824292	1327	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade (Under Construction)	Reconstruction
22	Resurfacing of road from Nongstoin -Mawkawah road to Madan Shyiap	326479	2823502	1415	326601	2823865	1356	Gravel	3.50	Poor	Gravel-Earthen very Poor Condition gravel-and required reconstruction from sub grade	Reconstruction
23/1	Improvement i/c MBT from Nongstoin - Sonapahar Road to Mawsiangphet upto St. Francis D' Assisi College (Link-1)	323691	2825444	1322	324264	2825444	1374	Gravel	3.50		Poor	Very Poor Conditiongravel and required reconstruction fromsub grade
23/2	Improvement i/c MBT from Nongstoin- Sonapahar Road to Mawsiangphet upto St. Francis D' Assisi College (Link-2)	323812	2825108	1347	323680	2825270	1345	Gravel	3.50	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction	Reconstruction
24/1	Improvement i/c MBT from Nongstoin-Pyndengrei road to Thomas Jones Secondary School (Link-1)	325123	2825151	1380	325407	2824991	1337	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction
24/2	Improvement i/c MBT from Nongstoin-Pyndengrei road to Thomas Jones S econdarySchool(Link-2)	325317	2825033	1367	325591	2825067	1356	Gravel	3.50	Poor	Very Poor Condition gravel and required reconstruction from sub grade	Reconstruction

2.12 Construction Material Requirement

Data is awaited from the concern department.

2.13 Minor Bridge

There is no Minor bridge along the project road.

2.14 Culvert

A total no. of 74 culverts are there along the project stretches. The details of culverts observed along the project stretch are as follows:

Table 4: Culverts along the Project stretches

Sl. No.	GPS Coordinate		Type of Structure	Span arrangement		Condition	Remark
	Latitude	Longitude		No. of pipe/ Span	Diameter/ Span	Culvert	
1. Lulong to Dong Lynti Nongstoin Connecting to Nongstoin-Mawthawpdah Road							
A	25.511677	91.278857	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
B	25.513741	91.279868	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
C	25.515142	91.28046	Pipe Culvert	2	x1.00	good	Over all condition of the culvert is good.
2. Nongstoin -Mawkawah Road to Umisatmluh							
A	25.517256	91.26791	Slab Culvert	1	x5.00	good	Over all condition of the culvert is good.
B	25.516583	91.67974	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
C	25.516497	91.267865	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
D	25.515917	91.267995	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
e	25.515968	91.268017	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
F	25.515861	91.268057	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
G	25.515715	91.268203	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
H	25.515589	91.268604	Slab Culvert	1	x2.00	good	Over all condition of the culvert is good.
I	25.514758	91.270609	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good.
3. Nongstoin-Mawkawah Road to pet jyllan to connect NH-44 E							
A	25.523238	91.267892	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
B	25.519812	91.270916	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
C	25.521	91.270854	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
D	25.521078	91.270888	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.

Sl. No.	GPS Coordinate		Type of Structure	Span arrangement		Condition	Remark
	Latitude	Longitude		No. of pipe/ Span	Diameter/Span	Culvert	
4. ApproachRoadfromNH-44EtoLulongMawkawahVillage							
A	25.521589	91.275967	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
B	25.521522	91.276058	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good.
C	25.521599	91.27603	Slab Culvert	1	x1.50	good	Over all condition of the culvert is good.
5.TB Hospital road upto Nongstoin Playground							
i. Link 1 (No Culvert)							
ii. Link 2 (No Culvert)							
iii. Link 3							
A	25.50944	91.269252	Slab Culvert	1	x1.50	good	Over all condition of the culvert is good.
6. Nongstoin College to permanent campus of Rev. S. Wollington Children Home of the KJP synod Sepngi (No Culvert)							
7. Nongstoin-Sonapahar Road near AH & Vety. Office to Nongstoin -Pyndengrei Road(No Culvert)							
8. Ladweitang Mawiong Lumsyntiew to connect Nongstotin-Rambrai Road at 3rd km							
A	25.531268	91.266936	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
B	25.5314	91.267025	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
C	25.532668	91.267123	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
D	25.532795	91.267146	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
E	25.535618	91.268558	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
F	25.535978	91.269589	Slab Culvert	1	x1.50	good	Over all condition of the culvert is good.
G	25.534592	91.271166	Slab Culvert	1	x1.50	Satisfactory	Overall condition of the culvert is Satisfactory
H	25.534297	91.270869	Slab Culvert	1	x1.50	good	Over all condition of the culvert is good.

Sl. No.	GPS Coordinate		Type of Structure	Span arrangement		Condition	Remark
	Latitude	Longitude		No. of pipe/ Span	Diameter/Span	Culvert	
i. Link 1							
A	25.516528	91.27308	Slab Culvert	1	x1.00	Satisfactory	Overall condition of the culvert is Satisfactory
B	25.51619	91.273647	Slab Culvert	1	x1.00	Satisfactory	Overall condition of the culvert is Satisfactory
ii. Link 2							
A	25.517284	91.275138	Pipe Culvert	1	x1.00	Satisfactory	Overall condition of the culvert is Satisfactory
12.Nongstotin-MawkawahRoadtoPeacenolaMemorialPlaygroundMawkawah							
i. Link1							
A	25.518696	91.283998	Pipe Culvert	1	x1.00	Partially choked	Cleaning of the culvert is required
ii. Link 2 (No Culvert)							
13. Nongstoin Markasa Road to Mawrok Porsohat Village							
i. Link 1							
A	25.535124	91.305835	Pipe Culvert	1	x1.00	Satisfactory	Overall condition of the culvert is Satisfactory
B	25.537111	91.304772	Pipe Culvert	1	x1.00	Choked	Replacement required.
C	25.536421	91.304177	Slab Culvert	1	x1.00	Satisfactory	Overall condition of the culvert is Satisfactory
ii. Link 2 (No Culvert)							
iii.Link 3 (No Culvert)							
iv.Link 4 (No Culvert)							
v.Link 5 (No Culvert)							
14. Nongstoin-Old Nongstoin Road to Domthangpitat Nongstoin							
i. Link 1 (No Culvert)							
ii. Link 2							
A	25.507653	91.268176	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good.

Sl. No.	GPS Coordinate		Type of Structure	Span arrangement		Condition	Remark
	Latitude	Longitude		No. of pipe/ Span	Diameter/Span	Culvert	
15. Nongstoin-Old Nongstoin Road to Domthangksingat Nongstoin							
i. Link 1 (No Culvert)							
ii. Link 2 (No Culvert)							
iii. Link 3 (No Culvert)							
16. PWD road to Mawbyrshem							
A	25.518447	91.264878	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
17. Nongstoin-Pyndengrei to Mawiangdong (No Culvert)							
18.Nongstoin -Pyndengrei Road to Umshaitshait							
i. Link 1 (No Culvert)							
ii. Link 2 (No Culvert)							
19.Nongstotin-Mawkawah Road to Dong Lynti Nogstoin upto Hubert Memorial English School (No Culvert)							
20.Nongstoin -Mawkawah road to church of the Living god, Upper new Nongstoin							
A	25.517659	91.270755	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good.
B	25.51784	91.270512	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
C	25.51784	91.270512	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
D	25.517056	91.270036	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good.
21. Different Link roads at Nondein, New Nongstoin							
i. Link 1							
A	25.521397	91.261657	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
B	25.521542	91.262208	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
C	25.524853	91.25864	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
D	25.524561	91.258005	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
E	25.526493	91.257973	Slab Culvert	1	x2.00	good	Over all condition of the culvert is good.

Sl. No.	GPS Coordinate		Type of Structure	Span arrangement		Condition	Remark
	Latitude	Longitude		No. of pipe/ Span	Diameter/Span	Culvert	
F	25.526964	91.257422	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
G	25.527376	91.257009	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
ii. Link 2 (No Culvert)							
22. Nongstoin -Mawkawah road to Madan Shyiap							
A	25.519141	91.2709	Slab Culvert	1	x2.00	good	Over all condition of the culvert is good.
B	25.518691	91.273173	Slab Culvert	1	x1.20	good	Over all condition of the culvert is good.
C	25.519266	91.272633	Pipe Culvert	1	x1.00	good	Over all condition of the culvert is good.
D	25.520517	91.273501	Pipe Culvert	1	x1.00	good	O Over all condition of the culvert is good.
							Over all condition of the culvert is good.
23. Nongstoin Sonapahar Road to Mawsiangphet up to St. Francis D' Assisi College							
i. Link 1							
a.	25.535956	91.245367	Pipe Culvert	2	x1.00	good	Over all condition of the culvert is good.
b.	25.536312	91.246786	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good.
C	25.537013	91.246796	Slab Culvert	1	x1.20	Satisfactory	Over all condition of the culvert is good.
D	25.5384	91.247753	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good.
E	25.538715	91.249024	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good.
F	25.538775	91.249044	Slab Culvert	1	x0.50	good	Over all condition of the culvert is good..
G	25.534507	91.248345	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good..
H	25.53722	91.250279	Slab Culvert	1	x1.00	good	Over all condition of the culvert is good.

Sl. No.	GPS Coordinate		Type of Structure	Span arrangement		Condition	Remark
	Latitude	Longitude		No. of pipe/ Span	Diameter/Span	Culvert	
I	25.536388	91.251233	Slab Culvert	1	x0.50	Good	Over all condition of the culvert is good.
ii.Link2 (No Culvert)							
24. Nongstoin-Pyndengrei Road to Thomas Jones Secondary School							
i.Link1(No Culvert)							
ii.Link2							
A	25.53246	91.263163	Slab Culvert	1	x1.00	Good	Over all condition of the culvert is good.
9.Ladweitang Mawiangdong Pyndengrei Road							
A	25.5336	91.263199	Stone Culvert	1	x0.50	Good	Over all condition of the culvert is good.
B	25.531166	91.264384	Stone Culvert	1	x0.50	Good	Over all condition of the culvert is good.
C	25.530769	91.264102	Slab Culvert	1	x0.50	Good	Over all condition of the culvert is good.
D	25.53039	91.264707	Stone Culvert	1	x0.50	Good	Over all condition of the culvert is good
10. Nongstotin-Rambrai Road to KJP Sepngi Higher Secondary School							
i. Link 1							
A	25.527339	91.272346	Pipe Culvert	1	x1.00	Good	Overall condition of the culvert is good.
ii. Link 2							
A	25.526972	91.273649	Pipe Culvert	2	x1.00	Good	Over all condition of the culvert is good.
B	25.526903	91.273969	Pipe Culvert	1	x1.00	Fully Choked	The culvert is totally choked, cleaning required.
iii. Link3 (No Culvert)							
iv. Link4 (No Culvert)							
v. Link 5							
A	25.53168	91.271254	Pipe Culvert	1	x1.00	Good	Overall condition of the culvert is good.
vi. Link6							
A	25.53546	91.272337	Pipe Culvert	1	x1.00	Fully choked	Overall condition of the culvert is Poor, Replacement required

2.15 Estimated Project Cost

The amount of each item is evaluated on the basis of relevant unit rates analyzed from Standard Data Book of Ministry of Road Transport and Highways- MORT&H. Summary of Preliminary Cost Estimate for all the improvement works is presented table below

Table 5 :Summary of Project Cost

Abstract of Cost, Road Wise				
Sl.	**Details of Road**	**Length of Road(m)**	**Cost (INR)**	**Cost (Cr.)**
1	Improvement i/c MBT of road from Lulong (NongstoinMawkawahroad) to Dong Lynti Nongstoin connecting to Nongstoin-Mawthawpdah Road	1195.000	9,110,779.95	0.91
2	Improvement i/c MBT of approach road from Nongstoin -MawkawahroadtoUmsaitmluh	500.000	3,823,758.52	0.38
3	Improvement i/c MBT of road from Nongstoin-Mawkawahroad to Petjyllan (Near Anderson H/S School) to connect NH-44 E	410.000	2,919,171.00	0.29
4	Improvement i/c MBT of approach road from NH-44 E (Near Petrol Pump) to Lulong Mawkawah village	258.000	1,789,391.09	0.18
5	Improvement i/c MBT of road from TB Hospital Road upto Nongstoin Playground	1184.000	10,096,721.99	1.01
6	Improvement i/c widening, MBT of roadfrom Nongstoin College to permanent campus of Rev. S. Wollington Children Home of the KJP Synod Sepngi	1118.000	9,787,679.59	0.98
7	Rehabilitation of PWD road from Nongstoin-Sonapahar road near AH & Vety. Office to Nongstoin-Pyndengrei road	597.000	4,720,466.15	0.47
8	Rehabilitation of Extension of Ladweitang-Mawiong Lumsyntiew to connect Nongstoin- Rambrai road at 3rd km	1070.000	8,658,247.94	0.87
9	Improvement i/c MBT of Ladweitang Mawiong Pyndengrei	985.000	7,282,344.96	0.73
10	Improvement,Rehabilitation & MBT of road from 2nd Km of Nongstoin- Rambairoad to KJP Sepngi Higher Secondary School	2004.000	15,069,332.17	1.51
11	Improvement i/c MBT of road from Nongstoin-Mawkawahroad to Diangjriup to Domkharu Upper New – Nongstoin road	760.000	5,375,473.98	0.54
12	Improvement i/c MBT of a village road from Nongstoin-Mawkawah road to Peacenola Memorial Playground Mawkawah	1358.000	9,282,937.06	0.93
13	Improvement i/c MBT of PWD road from5th km of Nongstoin-Markasa Road to Mawrok Porsohsat Village	2490.000	17,555,358.34	1.76
14	Improvement i/c MBT of road from Nongstoin-Old Nongstoin Road to Domthangpitat Nongstoin	550.000	3,782,869.05	0.38
15	Improvement i/c MBT of road from Nongstoin- Old Nongstoin road to Domthangksing at Nonstoin	551.000	4,191,812.71	0.42
16	Rehabilitation of PWD road to Mawbyrshem	243.000	495,713.52	0.05
17	Improvement i/c MBT from Nongstoin- Pyndengrei to Mawiangdong	158.000	1,126,111.65	0.11
18	Improvement i/c MBT from Nongstoin- Pyndengrei Road toUmshaitshait	354.000	2,474,323.01	0.25
19	Improvement i/c MBT from Nongstoin-Mawkawah Road to Dong Lynti Nongstoin uptoHubert Memorial English School	1033.000	7,505,530.71	0.75
20	Improvement i/c MBT from Nongstoin-Mawkawah Road (Near Durbar Hall Block No. 6, Upper New Nongstoin) to Church of the Living God, Upper New Nongstoin	353.000	2,414,380.34	0.24

21	MBT of different Link Roads at Nondein,New Nongstoin	1312.000	9,276,417.97	0.93
22	Resurfacing of road from Nongstoin Mawkawah road to Madan Shyiap	448.000	3,519,123.44	0.35
23	Improvement i/c MBT from Nongstoin- Sonapahar Road to Mawsiangphet upto St. Francis D' Assisi College	1364.000	9,678,937.26	0.97
24	Improvement i/c MBT from Nongstoin- Pyndengrei road to Thomas Jones Secondary School	630.000	4,386,343.36	0.44
	Total Cost	**20925**	**154,323,225.74**	**15.43**

2.16 Implementation Schedule:

Since as a widening proposal intermediate lane has been proposed a construction period of730 days (2022-23, 2023-24) has been envisaged with a phasing of 60% & 40%respectively.

2.17 Sub-project Benefits

The Project Benefits comprise the cost saving in operation of vehicles and maintenance of the road between Without Project and With Project options. The Project Benefits results in the formof-:

- Savings in Vehicle Operating Costs (VOC) - Vehicle Operating Cost (VOC) will be reduced when riding quality of road is improved.
- Savings in travel time costs due to reduction in congestion and higher travel speeds asa result of improved roads - both in terms of capacity as well as riding quality.
- Savings in maintenance costs- Maintenance and Operation cost such as fuel consumption, wear and tear of tyres, will be sufficiently reduced. The vehicle operating cost shall be further reduced by improving the geometrics and design. The benefits perceived by the road user are in the form of lower expenditure.
- The proposed project will also contribute to economic development by encouraging attraction of businesses to sites equipped with good access and by improving the travel efficiencies of existing businesses and to start a new avenue.
- Reductions in adverse environmental impacts of transportations i.e. reduced trafficemissions, decrease in respirable suspended particulate matter and suspended particulate matter, reduced Noise and other impacts are also the direct benefits of proposed upgradation of the project road.

3 CHAPTER: IV- LEGAL FRAMEWORK

The following chapter summarizes the legislative framework in which the present project will be addressed with respect to the environmental and social issues.

3.1 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 the implementing agencies.

Table 6: Applicable Acts & Regulations

Sl. No.	Act/Regulations	Main Objective	Applicability to this Project	Implementation Agency
1.	Air (Prevention and Control of Pollution) Act, 1981	To control and monitor air quality as per prescribed limits	Yes, For establishment and operation of Hot Mix/ Stone crusher/ WMM/ Batching Plants during construction, etc. (Construction Stage)	State Pollution Control Board.
2.	The Water (Prevention and Control of Pollution) Act, 1974	To control and monitor water pollution as per prescribed limits	Yes, For establishment and operation of Hot Mix/ Stone crusher/ WMM/ Batching Plants during construction, etc. (Construction Stage)	State Pollution Control Board.
3.	Indian Motor Vehicles Act, 1988	To check vehicles for air and noise pollution	Yes, For construction vehicles (ConstructionStage) Pollution Under Control Certificate	Motor Vehicles Department, Govt. of Meghalaya.
4.	The Forest Conservation Act, 1980	To check deforestation	No. No forest land isrequired	Forest Department GOIand Governmentof Meghalaya & MoEF & CC
5.	Wild Life (Protection) Act, 1972	To protect and improvethe overall wild life	No. No Wildlife Sanctuary or National Park/Tiger reserves lies within 10 kms of project boundary	Chief Conservator wildlife, Forest Department, Meghalaya.
6.	Environment Protection Act, 1986	To protect and improve the overall environment	Yes, discharge Standards, Hazardous material managementand handling Rules & Regulations (Construction Stage)	Dept. of Environment and Forest, Meghalaya.

Sl. No.	Act/Regulations	Main Objective	Applicability to this Project	Implementation Agency
7.	Ancient Monuments and Archaeological Sites and Remains Act, 1958	Preservation of culture and historical remains	No. There is no culture and historical place along the project road.	Indian Heritage Society, and Indian National Trust for Art and Culture Heritage
8.	EIA Notification, September 14, 2006	For all Development Projects	The Project does not require Environmenta lClearance.	Ministry of Environment, Forest & Climate Change (MoEF & CC)
9.	National Environmental Appellate Authority Act, 1997	For Grievance Redress	No.	Ministry of Environment, Forest & Climate Change (MoEF & CC)
10.	Integrated Waste Management	Waste management and control.	Yes, it is applicable as domestic solid waste is generated from the canteens, residenceslocated within the Construction camp.	Ministry of Environment, Forest & Climate Change (MoEF & CC) and State Pollution Control Board
11	Fly Ash Notification, 2011 and 2016	Mandate use of fly ash inroad construction within a radius of 300km	Yes. Because as per the notification every construction agency engaged in construction of roads within a radius of 300 kilometers from a coal or lignite based thermal power plantwould be bound to use fly ash in accordance with the guidelines or specifications issued by the Indian Road Congress. The NTPC Thermal Power Project in Dolaigaon, Assam and Bongaigaon Thermal Power Project lie within 300km radius of the project road.	MoEF & CC
12	Noise Pollution (Regulation and	To regulate and control noise producing	Yes	State Pollution Control Board

Sl. No.	Act/Regulations	Main Objective	Applicability to this Project	Implementation Agency
	Control) Rules. The Noise Pollution (Regulation and Control) Amendment Rules 2006	and generating sources with the objective ofmaintaining the ambient air quality standards in respect of noise		
13	The Explosives Act (&Rules) Explosives Rules, 2008	An Act to regulate the manufacture, possession, use, sale, transport, import and export of Explosives (Fortransporting and storing diesel, bitumen etc.)	Yes, if the storage quantity of Diesel and Bitumen exceeds the allowable limit.	Petroleum & Explosives Safety Organization (PESO)
14	Ground Water (Management & Regulation) Act, 2019	For regulating groundwater abstraction and maintaining ground watertable.	Yes, NOC for establishing bore wells for abstraction of groundwater for use of construction as well as domestic use.	State Ground Water Board
15	The Petroleum Rules, 2002	Delivery, dispatch or storage of petroleum products by authorized persons/ organization	Yes	A person Recognized by the Chief Controller

3.2 Clearance Requirement

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

Table 7: Applicable Acts & Regulations (Construction Phase)

Sl.	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

Sl.	Clearance Required for	Statute under which clearance is required	Statutory Authority
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 Rules1989	State Pollution Control Board &PESO.

3.3 MORTH & IRC Specifications

All road works in India are to be in accordance with the Ministry of Road Transport and HighwayMoRTH 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.

3.4 Environmental Standards and Code of Practices

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

- Guidelines for use of Fly Ash in Road Embankments (IRC: SP: 58-2001)
- Guidelines for Environmental Impact Assessment of Highway Projects (IRC: 104-1988)
- Guidelines on Preparation and Implementation of Environment Management Plan (IRC SP108-2015)
- Guidelines on Landscaping and Tree Plantation (IRC: SP-21-2009)
- Report containing recommendations of the IRC regional workshops on Highway Safety(IRC: SP: 27-1984)
- Recommended practice for Borrow pits for Road Embankments constructed by Manual operation (IRC: 10-1961)
- Road accident Forms (IRC: 53-1982)
- Guidelines for Use of Construction and Demolition Waste in Road Sector (IRC 121-2017)
- Proceedings of International Seminar on sustainable development in 8.10.2001
- Road Transport Highway Safety Code (IRC: SP: 44-1996)
- Guidelines on Safety in Road Construction Zones IRC: SP: 55:2001
- Guidelines on Skill Development of Workmen in Road Sector (IRC 127-2018)

- Guidelines of WB& ADB.

3.5 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 8: 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 Act 2008.	Ministry of labour and Employment
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 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

3.5.1 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 detailsof the various national and state level legislations and their applicability. A summary of applicable acts and policies is presented in the following paragraphs.

3.5.2 Objectives of the Policy

The objectives of the Policy are as follows: -

- To minimize displacement and to identify non-displacing or least displacing alternatives;
- To plan the resettlement and rehabilitation of Project Affected Families, (PAFs) includingspecial needs of Tribal and vulnerable sections;
- To provide better standard of living to Aps.

3.5.3 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 projectshall 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 was 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.

Table 9: Applicable Legal Framework for the entire Project

Sl.	Name of Act/ Rules	Purpose	Applicable/ Not Applicable	Description	Responsible Agency
1.	The Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act	Grants Legal recognition to the rightsof traditional forest dwelling communities.	Not Applicable	This Act is not applicable	Tribal Affairs, Department of Tribal Welfare of State Government
2.	The Minimum Wage Act,1948	Payment of minimumrate of wages as fixed and periodically revisedby the State Government	Applicable	Construction/ daily wage workers are involved and was involved in the project	District Labour Commissioner.

3.	Workmen Compensation n 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
4.	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 migrantworkmen 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
5.	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 childlabour is engaged in the project	District Labour Commissioner
6.	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
7.	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.	

Sl.	Name of Act/ Rules	Purpose	Applicable/ Not Applicable	Description	Responsible Agency
8.	The Equal Remuneration Rules, 1976	Equal Remuneration for identical works	Applicable	Project will not discriminate between sex, race, caste or creed in payments to the employees	District Labour Commissioner
9.	The Trade Union Act, 1926	Right to form Trade Union at the Workplace	Applicable	No trade union formed within the organization	District Labour Commissioner
10.	Public Liability Insurance Act 1991	Provides immediate relief to the personsaffected by accidents, occurring while handling any hazardous substance	Applicable	Project has been adheringto all the relevant provisions made under theact	District Labour Commissioner
11.	World Bank OP/BP 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	Applicable	The project does notenvisage land acquisitionand the RoW is free from any encroachments or encumbrances as there is a very low scale widening, realignments, junction improvements etc.	PIU/ Implementing Agency
12.	Indigenous Peoples OP/BP 4.10	In the context of India Indigenous Peoplesmay be referred to "scheduled tribes". As per the Census ofIndia, 2011 about 86% of the Meghalaya state belongs the Schedule	Applicable	The majority of the population of the state is tribal however, largely impacted ST population mostly live in the urban areas and become the mainstream population. Thus, the policy on	PIU/Implementing Agency

Sl.	Name of Act/ Rules	Purpose	Applicable/ Not Applicable	Description	Responsible Agency
		Tribe. The population is distributed across 11 districts of Meghalaya.		Indigenous People is not 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".	
13.	Bank Policy – Access to Information	The policy governs the public accessibility of information in the Bank's possession.	Applicable	Documents such as RPF, all ESIAs was disclosed both by the borrower and Bank and uploaded in the website.	PIU/Implementing Agency

3.5.4 Social Categorization:

All activities under the sub-projects are limited to the available RoW, thus no land acquisition and resettlement and rehabilitation are envisioned for these activities. The activities in this project will impact the tribal population as Meghalaya is largely tribal state with over 86% of the population belonging to the Schedule Tribes (ST) communities. The project will have positive impact on the tribal population Further the tribal community in Meghalaya have collectiveattachment to the land and if project have any impact on them would have trigger the Operational Policy OP 4.10 of the World Bank. Anticipated impact on livelihood of vendors is notthere; however, there would be minor impacts on some structures which will be reconstructedby the Contractor upon completion of work. Thus, a separate Abbreviated Resettlement Action Plan (ARAP) will not be required for this sub-project. Apart from this, there would be some access restrictions to the structures along the road for 2-5 days and mitigation measures to address the access restriction issues has been suggested in ESMP.

4 CHAPTER: V- DESCRIPTION OF ENVIRONMENT

The present chapter describes the baseline environmental and social conditions within the project influence area of 10 Kms of the project road. The baseline information on biophysical (air quality, water quality, noise, soil, ecology & biodiversity), social and economic aspects along theproject roads has been collected applying primary surveys and referring to secondary sources.

4.1 Topography:

Most of the project road passes through hilly terrain. The existing road stretches level varies from 1254 meter above sea level to 1594 meter above sea level. Digital elevation map of projectroad is attached in Figure 4.

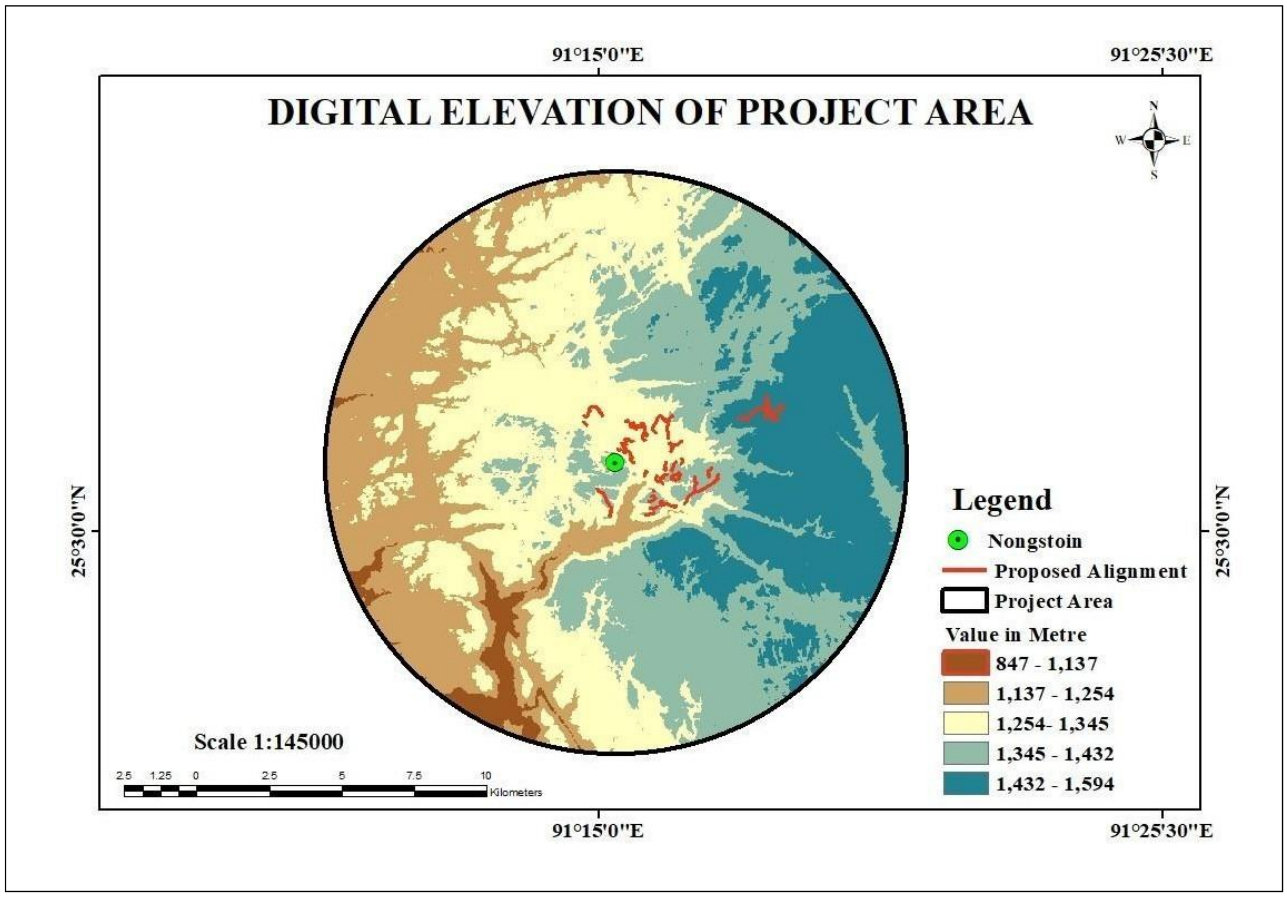


Figure 4: Digital Elevation Map of Proposed Project Road

4.2 Soil & Geology:

The climate, vegetation, relief and parent material constituting the ecosystem influence significantly the paedogenesis resulting in the development of different kinds of soils. The State is covered by the warm per-humid agro-ecoregion. However, it can be divided into two distinct sub eco-region (Zone) with thermic and

hyper thermic temperature regimes.

The area forms a part of Meghalaya plateau comprising Archaean Basement Complex and younger sediments. The Archaean Basement Complex and the overlying Proterozoic metasediments of Shillong Group form NE-SW trending strike ridges with prominent Valleys. Quartzite and conglomerate form high hills whereas phyllites, slate and quaternary valley fills form the low-lying valleys. The Shillong Group of rocks were deposited in a shallow marine environment. Gneisses and schistose rocks of the Archaean age are the oldest rock of the area forming the basement complex of Assam Meghalaya Gneissic Complex. The other rocks present in the area are quartz-biotite-sillimanite schist and migmatites. The regional strike of thefoliation is more or less NE-SW with southerly dips. Veins of quartz and pegmatites mostly follow the foliation trend. The Shillong Group of rock includes conglomerate, quartzite, phyllites and quartz mica schist. The above group of rocks is intruded by grey/pink Alluvium comprising dark brown to brown oxidized sand, silt clay of Chapar and sorbhog formation is found towards northern part of the district. A NESW trending shear zone traverses through the eastern part of the district.[1]

The district shows different types of soil as the provenance differs widely. Red Gravelly and RedLoamy Soil are the common soil types. The soils are acidic in nature and comparatively rich in organic matter and nitrogen but poor in phosphorous.

Soil profile of the project location is drawn below:

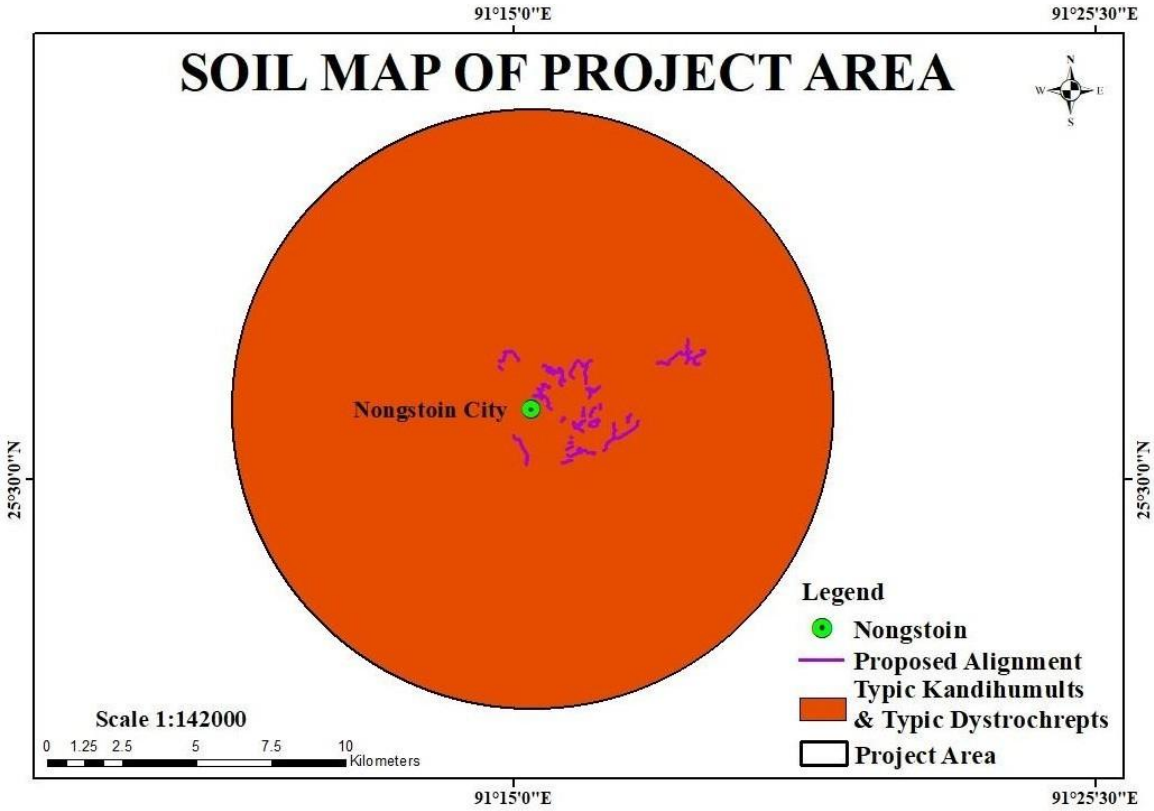


Figure 5: Soil Map of Project Area

[1]Final District Survey Report, Govt. Of Meghalaya

4.2.1 Soil Quality Monitoring

Soil is an important non-renewable resource to human life and terrestrial ecosystems. The key aim of soil monitoring is to understand the condition of soil in the project districts. The sampling was taken place by NABL Accredited Laboratory in the month of January. The concerned parameters are Nitrogen, Phosphorus, Potassium, pH, Nitrate etc. The sample collection, preservation, storage, transportation, and analysis were carried out as per the standard methods. Soil sampling locations are given in Table 19.

Table 10: Soil sampling locations along the project road

Sampling Location	Date of Sampling	Name of place	Distance	Coordinates	
				Latitude	Longitude
1	07/01/2022	Nongstoin	1.50 Km	25°31'16.71"N	91°15'19.47"E
2	07/01/2022	Miangkain	16.84 Km	25°28'13.55"N	91° 6'16.69"E

Source: Environmental Baseline Monitoring

Figure 6: Soil sampling locations

The soil quality along the project road is given in below Table 11.

Table 11: Soil Quality along the Project Road

Sl.	Parameters	Test Method	Unit	Nongstoin	Miangkain	Standards/ Permissible (Limits Hand Book of Agriculture, ICAR, New Delhi)
1.	pH Value at 25°C	ITL/SOP/ENV/Soil/01	-	8.15	7.88	<4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.00 Moderately acidic

Sl.	Parameters	Test Method	Unit	Nongstoin	Miangkain	Standards/ Permissible (Limits Hand Book of Agriculture, ICAR, New Delhi)
						6.01-6.50 Slightly acidic 6.51-7.30 Neutral 7.31-7.80 Slightly alkaline 7.81-8.50 Moderately alkaline 8.51-9.00 Strongly alkaline >9.00 Very strongly alkaline
2.	Conductivity at 25°C	ITL/SOP/ENV/Soil/02	µmhos/cm	677	714	Upto 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 Harmful to crops (sensitive to salts)
4.	Soil Texture	ITL/SOP/ENV/Soil/07	-	Silty Clay Soil	Silty Clay Soil	-
5.	Sand	ITL/SOP/ENV/Soil/06	% by mass	23.4	18.2	-
6.	Clay	ITL/SOP/ENV/Soil/06	% by mass	42.5	42.6	-
7.	Silt	ITL/SOP/ENV/Soil/06	% by mass	34.1	39.2	-
8.	Nitrogen	ITL/SOP/ENV/Soil/09	mg/kg	25.1	22.8	Upto 50 Very less 51-100 Less 101-150 Good 151-300 Better >300 Sufficient
9.	Potassium (as K)	ITL/SOP/ENV/Soil/11	mg/kg	73.1	68.4	Upto 15 Very less 16-30 Less 31-50 Medium, 51-65 On an avg. sufficient 66-80 Sufficient >80 More than sufficient
10.	Phosphorus	ITL/SOP/ENV/Soil/10	mg/kg	4.21	3.99	0 -120 Very less 120-180 Less 181-240 Medium 241-300 Average 301-360 Better >360 More than sufficient
11.	Organic Matter	ITL/SOP/ENV/Soil/17	% by mass	6.5	6.2	Upto 0.20: Very less 0.21-0.40: Less 0.41-0.50: Medium, 0.51-0.80: On an avg. sufficient 0.81-1.00: Sufficient >1.00: More than sufficient

Sl.	Parameters	Test Method	Unit	Nongstoin	Miangkain	Standards/ Permissible (Limits Hand Book of Agriculture, ICAR, New Delhi)
12.	Moisture Retention capacity	ITL/SOP/ENV/Soil/05	Inches/foot	1.22	1.17	-
14.	Sulphates	ITL/SOP/ENV/Soil/14	mg/kg	13.4	14.2	-
17.	Bulk Density	ITL/SOP/ENV/Soil/04	gm/cc	1.30	1.29	-

The important physical characteristics of soil are bulk density, porosity and texture. Ph of soil in the proposed study area were found in the range of 7.88 to 8.15 the soil samples are, therefore,moderately alkaline. Conductivity of soils sample is found in the range of 677 to 714 Mhos/cm. Available phosphorous of soil samples along the proposed study area ranges from 3.99 to 4.21 mg/kg which is very less. Potassium content as K in soil samples along the proposed study area is found in the range of 68.4 to 73.1 mg/kg. Total organic matter in soil samples along the proposed study area is found in the range of 6.2– 6.5 %, therefore the soil is fertile in terms of productivity.

4.3 Climate:

Meteorology:

Three seasons observed in this state are written below:

- May to early October → Rainy Season
- October to November & December to February → Cool Season
- March to April → Warm Season

In some places in Meghalaya, annual average rainfall has crossed the 12 000 mm (470 in) and maximum temperature is around 28 °C.

Rainfall:

In terms of precipitation received, in Nongstoin August receives the most amount of rainfall, with an average of 27.6 days with at least 706 mm of precipitation. Driest month of Nongstoin district is January an average of *5.9 days* with at least 23mm of precipitation. The study area is surrounded by hills and is subjected to a wet weather. The area experiences a lot of rainfall every year. In the month of August there will be chances of water logging, flash floods, landslides in the area.

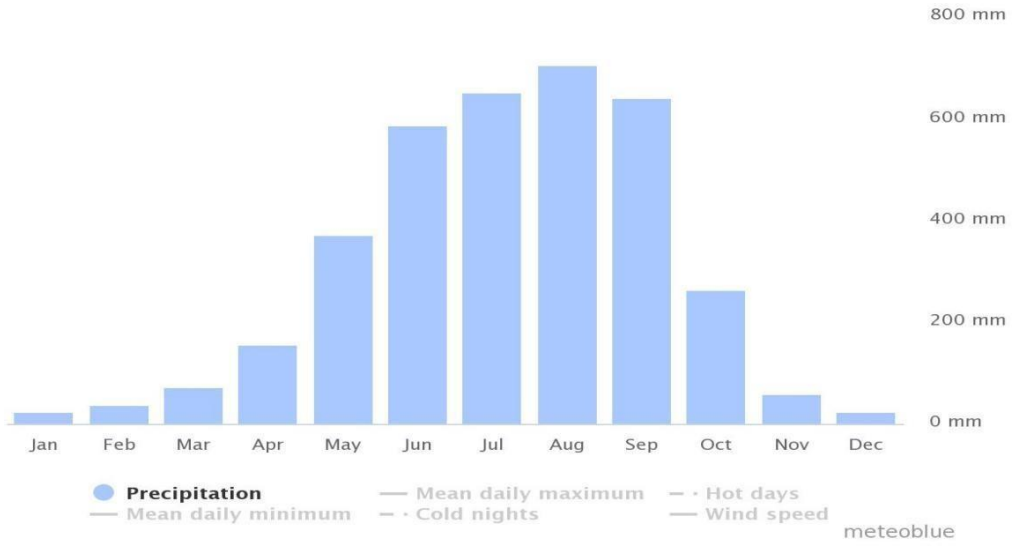


Figure 7: Precipitation in Nongstoin (Source-meteoblue)

Temperature:

The warm season lasts for 5.3 months, from May 20 to October 30, with an average temperature above 70°F. The hottest month of the year in Nongstoin is August, with anaverage of 23°C. The cool season lasts for 1.7 months, from December 17 to February 8, with an average temperature below 19°C. The coldest month of the year in Nongstoinis January, with an average of 17°F.

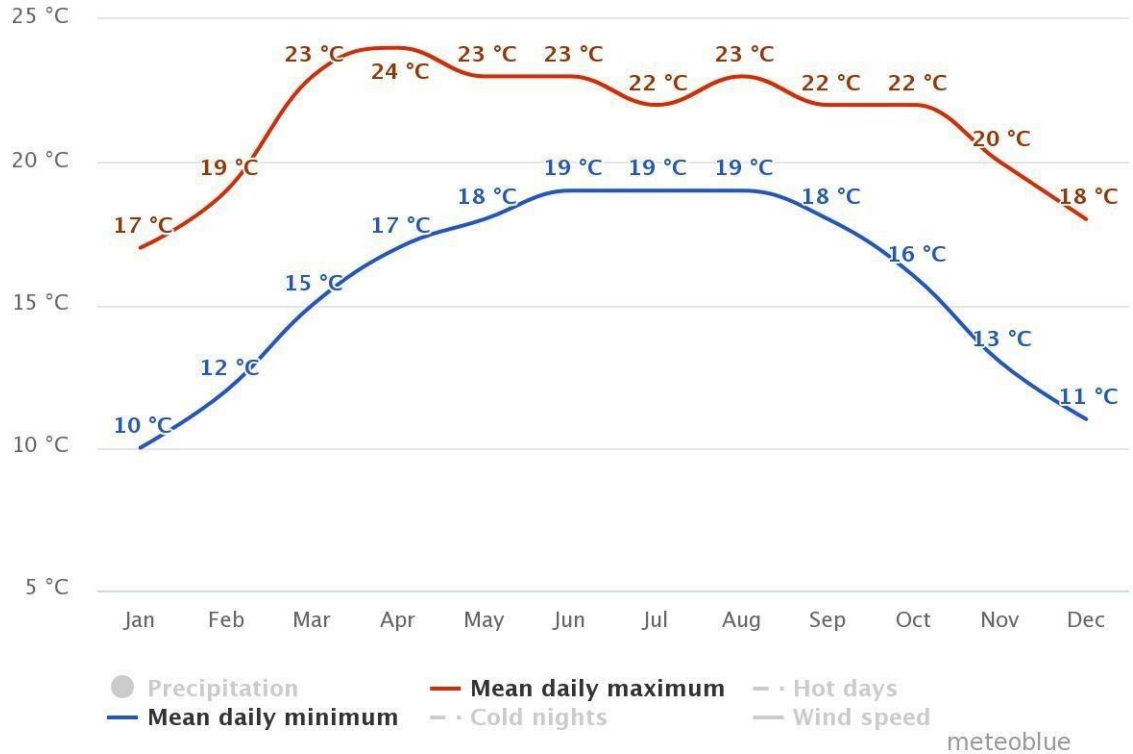


Figure 8: Average Temperature in Nongstoin

Wind Speed/Direction:

The average hourly wind speed in Nongstoin experiences significant seasonal variation over the course of the year. The windier part of the year lasts for 5.3 months, from March 25 to September 3, with average wind speeds of more than 6.4 miles per hour. The windiest month of the year in Nongstoin is July, with an average hourly wind speedof 8.4 miles per hour and so in this month 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. While the calmer time of year lasts for 6.7 months, from September 3 to March 25. The calmest month of the year in Nongstoin is December, with an average hourly wind speedof 4.0 miles per hour. The calmer time of year is suitable for construction. Depending on the maximum flow direction of wind the setup of hot mix plant will be decidedbecause the construction of roads should not affect the air quality of residential areas in the down wind direction.

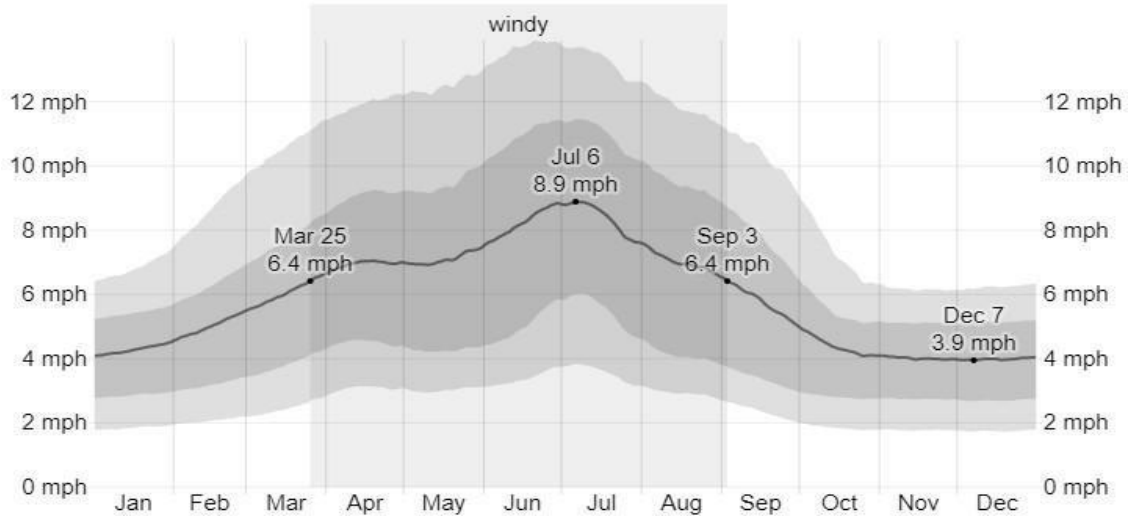


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Figure 9: Average Wind Speed in Nongstoin

Source: https://weatherspark.com/y/111986/Average-Weather-in-Nongstoin-India-Year-Round

The wind is most often from the west for 2.5 months, from January 7 to March 23, with apeak percentage of 52% on March 2. The wind is most often from the south for 6.6 months, from March 23 to October 10, with a peak percentage of 87% on July 8. The wind is most often from the east for 2.9 months, from October 10 to January 7, with a peak percentageof 37% on January 1. 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 10: Wind Rose Diagram For Nongstoin (Source:https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/nongstoin_india_1261205)

- **Relative Humidity:**

The air is generally humid in this region during the monsoon reason when the maximum relativehumidity was observed to be 95%. Similarly, the minimum relative humidity was observed to be 68%. Generally, the weather during other seasons was observed to be dry. The Relative Humidity is often associated with the working capacity of the labour force and shares an inversely proportional relationship. The higher the humidity, the less is the working capacity as the body gets tired and fatigued easily. Hence, construction work will be done more comfortably during the months when the humidity is lower.

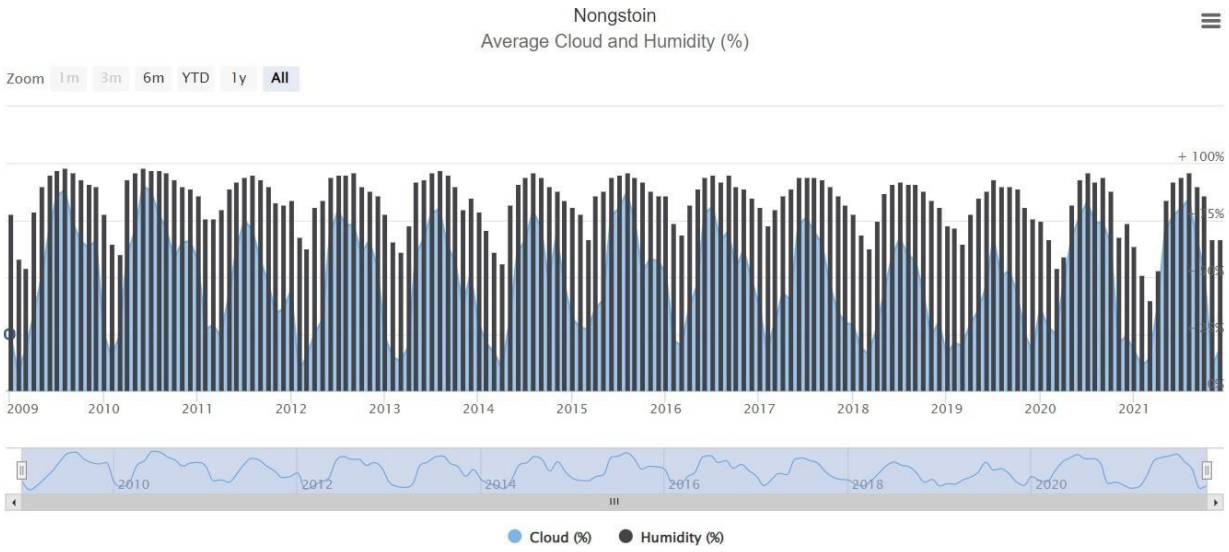

Figure 11: Average Humidity of previous 10 years

(Source: https://www.worldweatheronline.com/nongstoin-weather-averages/meghalaya/in.aspx)

4.4 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 IndianStandards (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 fallsin Zone V. Considering high hazard seismic zone of the project road section area, design standards for structures stipulated in the clause under IRC: 6-2014 has been taken into account. Both the project district and project area lie over high damage risk zone V. The project area falls in a high earthquake prone zone but no such earthquake was recorded in Nongstoin Town roads. The seismic map of Meghalaya indicating the location of project stretch is shown in Figure 12. Seismically, West Khasi Hills district lies in Zone V. Nearly all of the state of Meghalaya, lies on the "Shillong Massif". This is a block-like structure that has not undergone much folding or faulting as compared to the surrounding areas. The main threats to the state come from faults bounding the massif with the surrounding areas. The northern part of the massif has several faults, among the newly identified Oldham Fault that is believed responsible for the 1897 earthquake. The southern boundary is marked by the east-westtrending Dawki Fault, along the Bangladesh border. Moderate earthquakes have occurred in this state but the most significant of all was the Great Assam earthquake of 1897. Centred across the state border in Assam, much of Meghalaya was severely jolted.

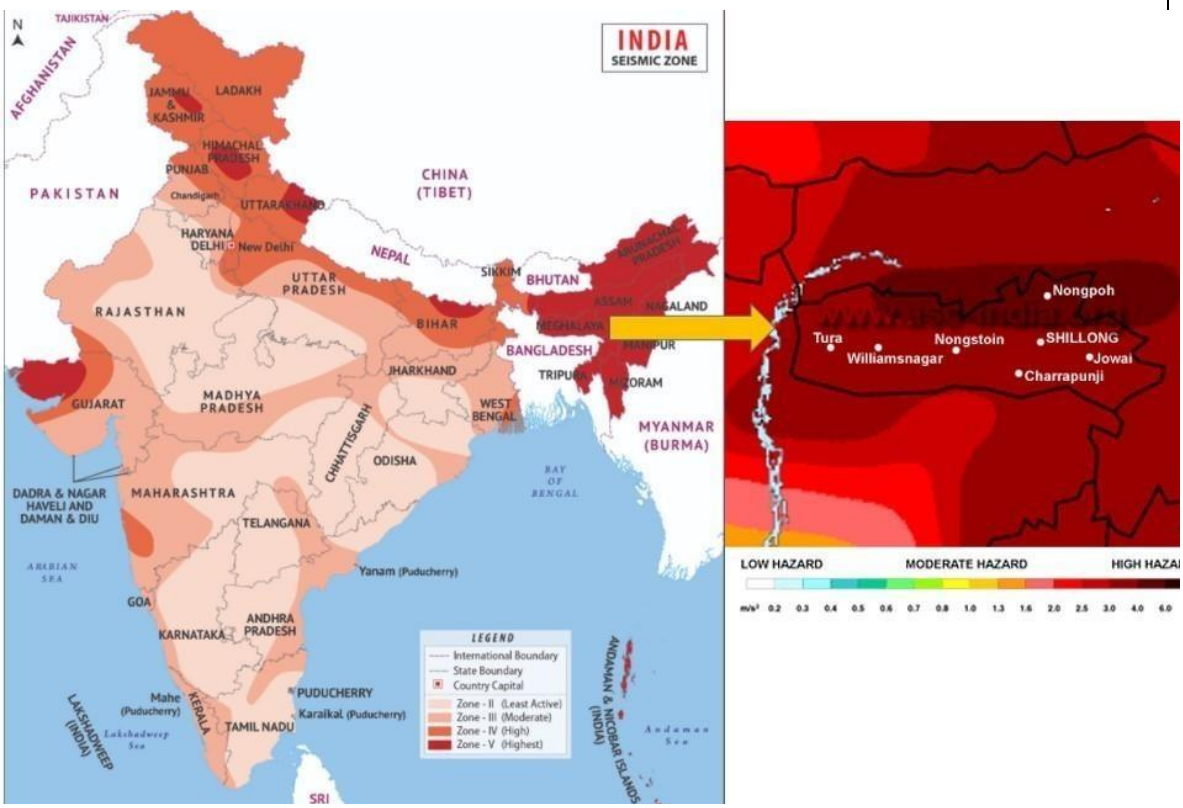

Figure 12: Seismic zone map of India & Meghalaya

Source:http://asc-india.org/seismi/seis-meghalaya.htm

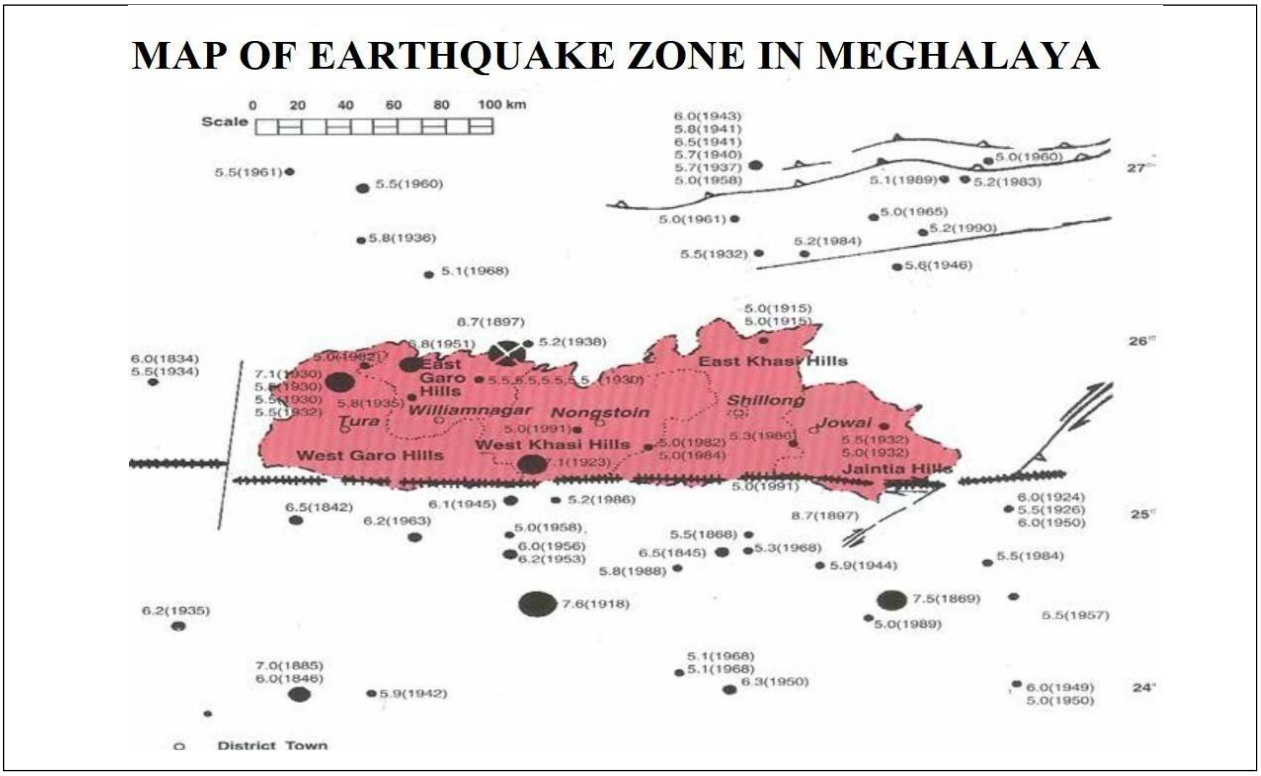

Figure 13: Earthquake Zones Map of Meghalaya

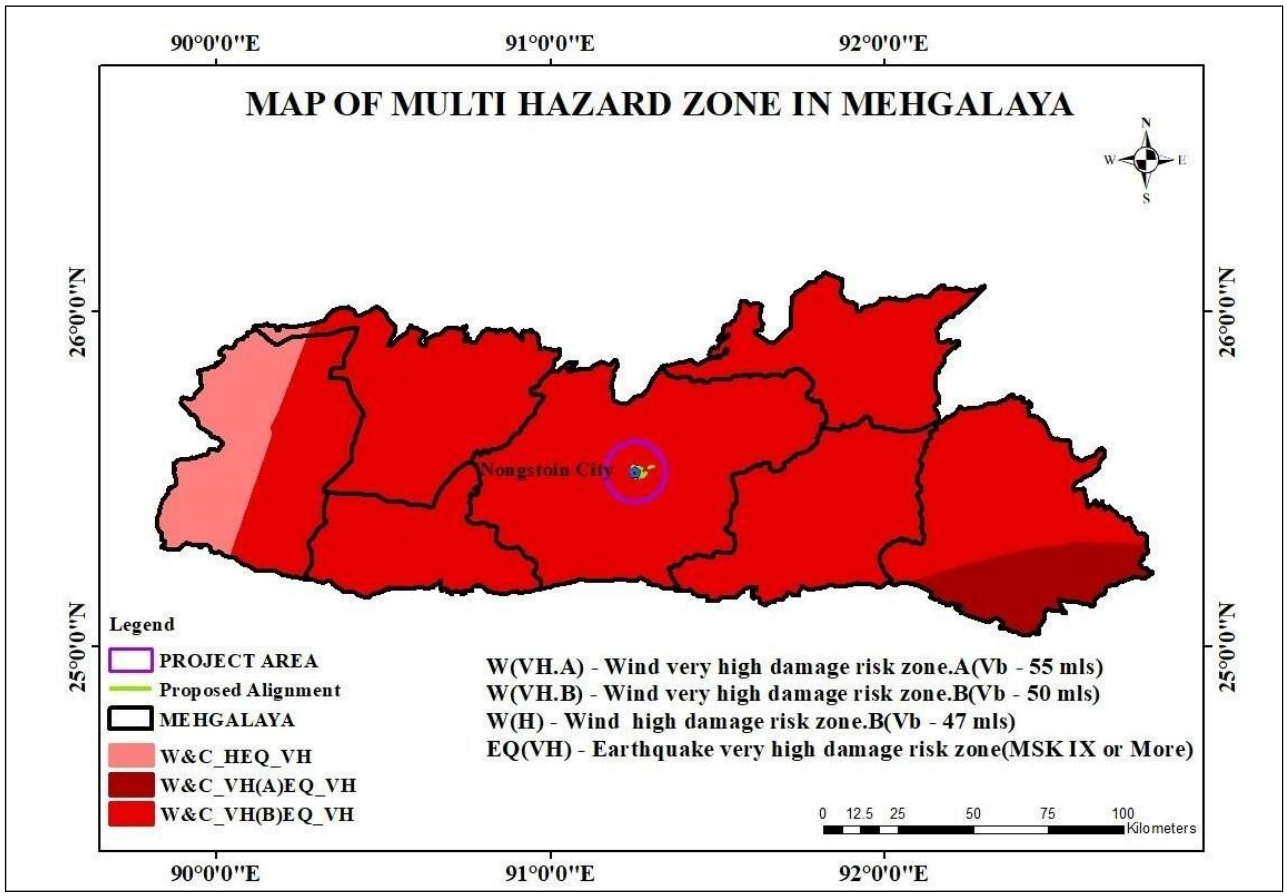

Figure 14: Multi Hazard Zone Map of Meghalaya showing the project road

- **Flood Hazard:**

In Meghalaya, floods occur in river valleys when the flow exceeds the capacity of the river channel, particularly at bends or meanders. The plain areas of Meghalaya adjoiningAssam are affected by flood due to the back flow of water from the River Brahmaputra during the flood season between June and October. Project district also fall under flood prone area. Flood prone area of Meghalaya is shown in the Figure below. The project area is not known to face significant impacts from monsoon floods. However, it does witness flash floods in certain low-lying areas. The patterns of floods cannot be forecasted.

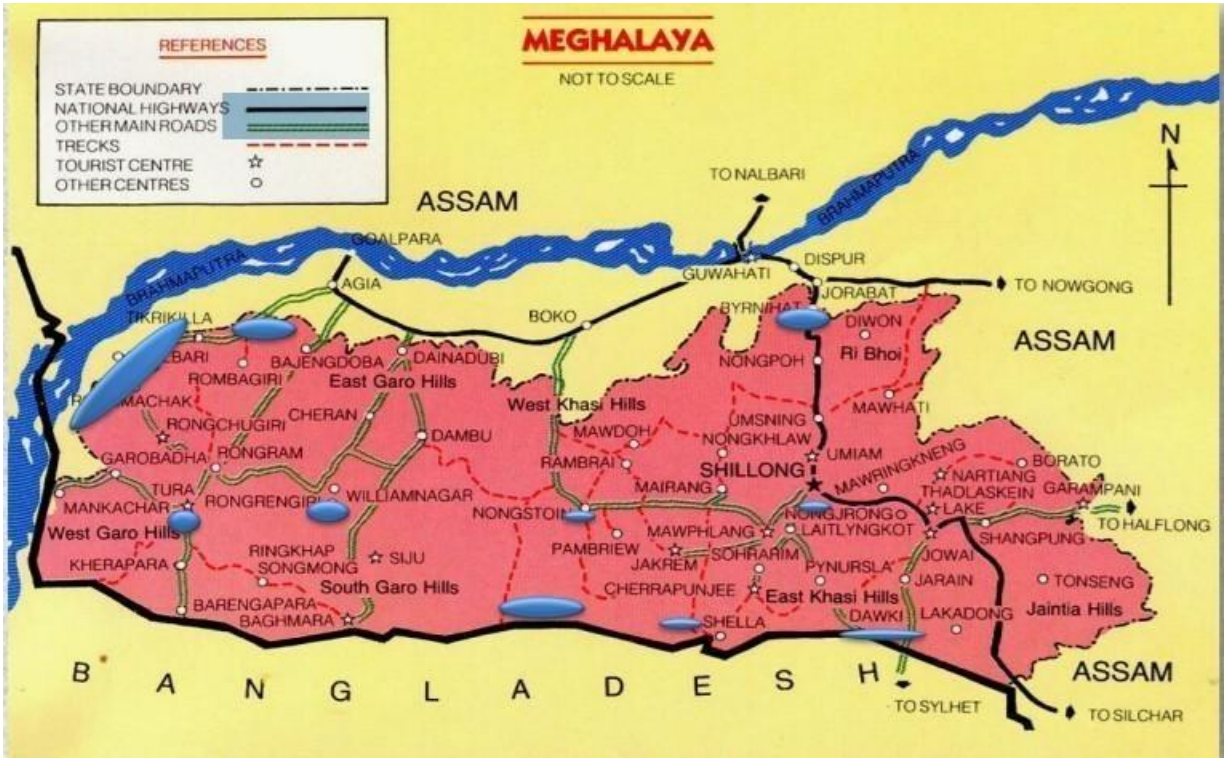

Figure 15: Flood Prone Zones of Meghalaya

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 is during the months of June to October in Meghalaya.

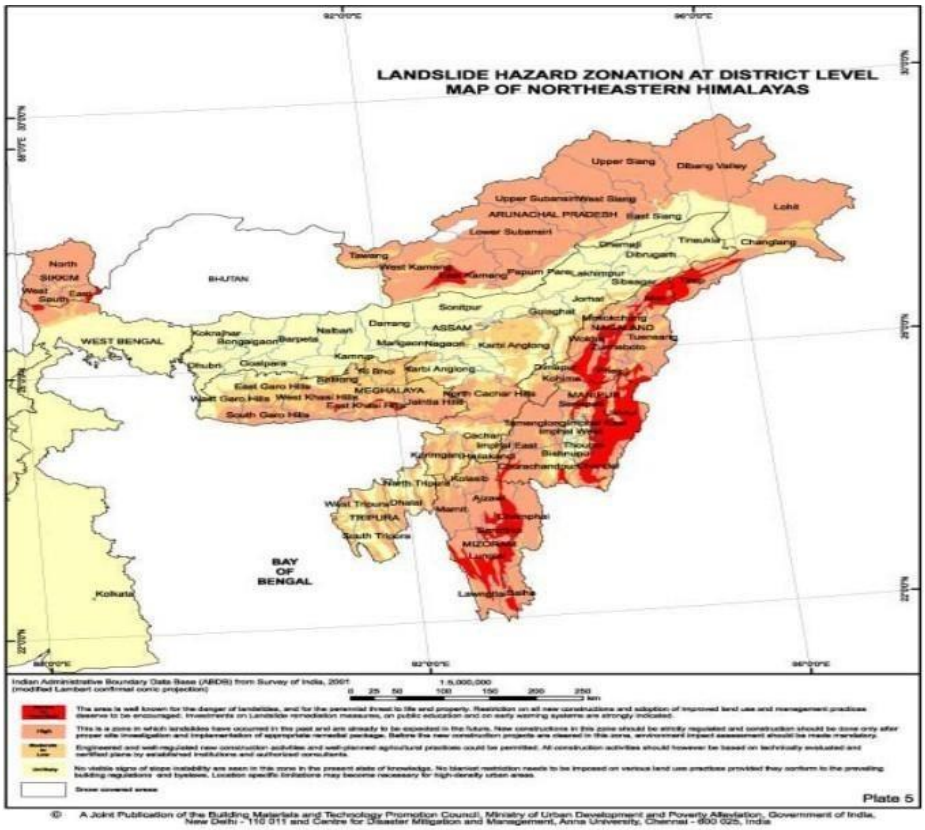

Figure 16: Landslide Map of North-Eastern Himalayas

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.[3]

West Khasi Hill district and project area also comes under high cyclonic zone. The proposed project area comes under very high damage risk zone B. The Cyclone Zone map of Meghalaya indicating the location of project stretch is shown in Figure 17.

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[3] Meghalaya State Disaster Management Plan

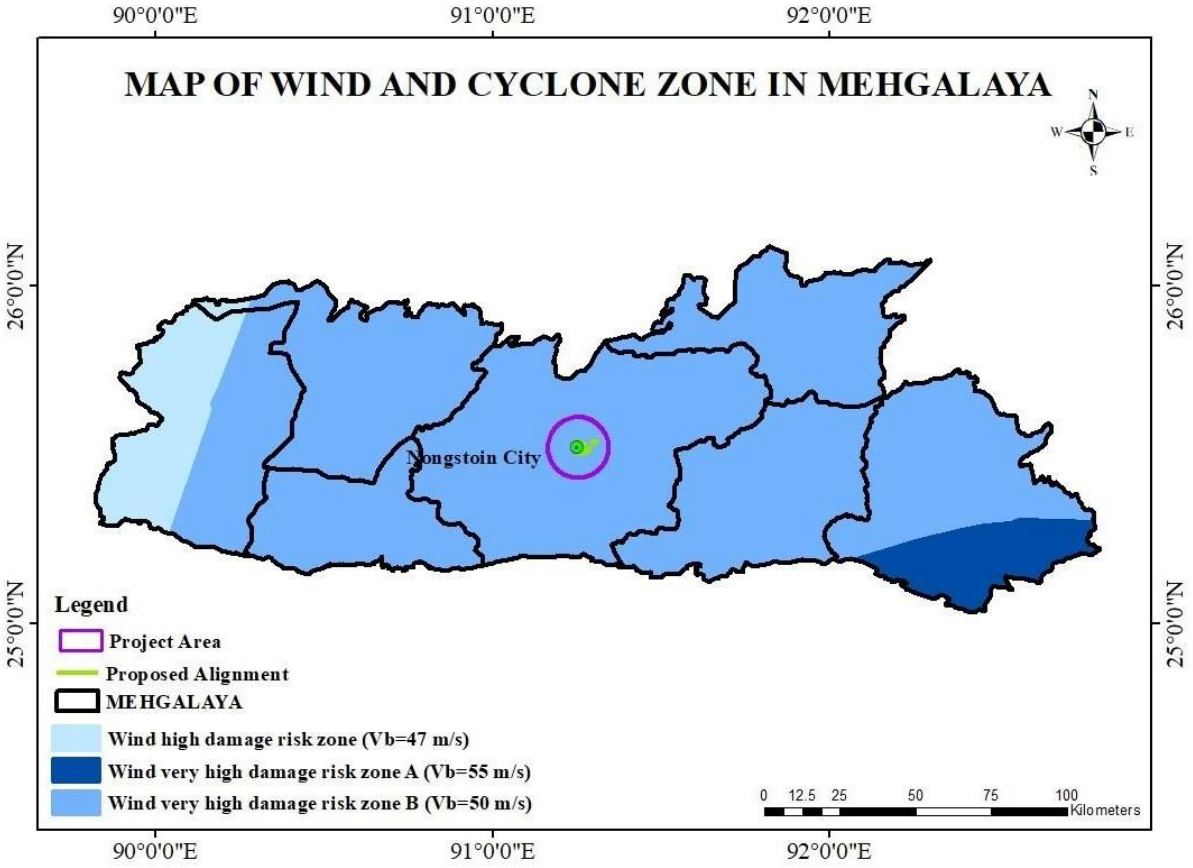


Figure 17: Map of Wind and Cyclone Zone in Meghalaya showing the project road

4.5 Land Environment:

The project road passes mostly through hilly terrain and few stretches pass through rolling Terrain. The adjoining land is generally hilly with vegetation. A combination of conversion of land use to agriculture and plantations, deforestation and periods of intense rainfall render several tracts of land abutting the road to be erosion prone. The project corridor has scattered built up area named as Nongpyndeng, Mawlait, Nongthraw, Miangshiang, Nongsba, Nongpathar, Maweit etc.

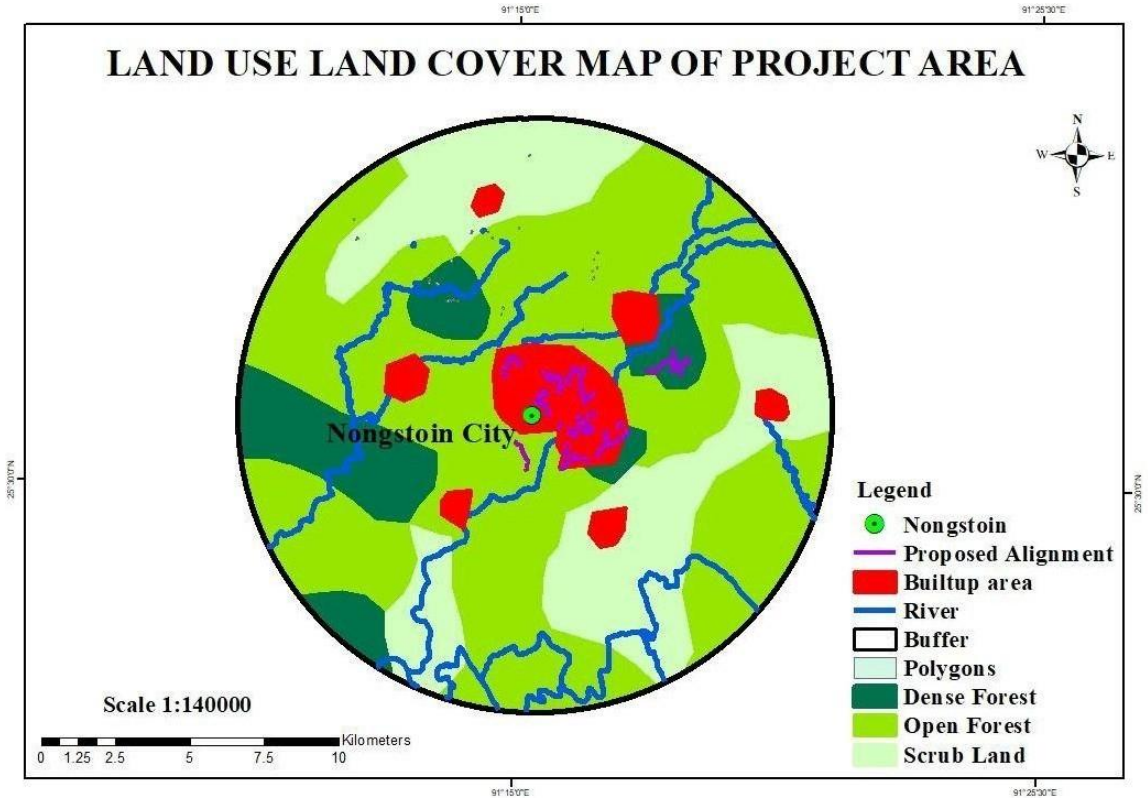


Figure 18: Land Use Map of the Project Area

4.6 Water Environment:

The Project area is not so rich in water sources. No major river/streams are there in the vicinity of the project corridor. Ground water resources are used for drinking purpose by open wells, bore wells, tube wells or installing hand pumps.

4.7 Air Environment:

Air pollution is caused due to both natural and manmade processes. The main source of air pollution is human induced/manmade, which 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 major source of air pollution now-a-day. Presently some patches of study area are inthe locality of heavy traffic movement particularly at congested places i.e. at major market areas,which may impact the ambient air quality of the area. During construction stage of the project, temporary air pollution arises due to movement of construction vehicles, operation of plants & machineries, dust emission due to excavation and demolition etc.

4.8 Monitoring Parameters and Standards

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

4.8.1 Ambient Air Quality Monitoring

The air quality parameters viz. Sulphur di-oxide (SO_2), 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 ambient air quality with respect to the study area forms the baseline information. The prime objective of the baseline air quality study was to assess the existing air quality of the area. This will also be useful for assessing the conformity to standards of the ambient air quality during the construction and operation phase.

This section describes the selection of sampling locations, methodology adopted for sampling, analytical techniques and frequency of sampling. The ambient air quality monitoring data is taken from an environmental assessment report of Rongram-Rongrenggre-Darugre Road.

4.8.1.1 Methodology Adopted for Air Quality Survey

Selection of Sampling Locations:

The baseline status of the ambient air quality has been assessed through a scientifically designed ambient air quality monitoring network. Selection of Air quality monitoring station was done as per MoEF guidelines for conducting EIA study. The design of monitoring network in the air quality surveillance program has been based on thefollowing considerations:

- Meteorological conditions on synoptic scale;
- Topography of the study area;
- Representatives of regional background air quality for obtaining baseline status;
- Representatives of likely impact areas.

4.8.1.2 Frequency and Parameters for Sampling

High volume samplers were used to collect/measure the air pollutant concentration data at 24 hours averaging periods for all stations. The baseline data of air environment was monitored for parameters mentioned below:

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

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

The baseline status of the ambient air quality has been checked through ambient air quality monitoring at selected points along the project area. The ambient air quality has been monitored at 2 locations as shown in Table 11 along the project road for particulatematter ($PM_{2.5}$ and PM_{10}), sulphur dioxide (SO_2), oxides of nitrogen (NO_X); and carbon monoxides (CO) using standard analysis technique is shown in Table 12

Table 12: Techniques Used for Ambient Air Quality Monitoring

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

To study the baseline ambient air quality scenario within the project corridor the ambient air quality, air sampling was carried out in the month of January 2022. To generate post-monsoon air quality of the project area, samples of ambient air was collected from two (2) locations for twice a week for two weeks.

Table 13: Air Quality Monitoring locations along the project road

SL. no	Date of Sampling	Name of place	Distance (m)	Coordinates	
				Latitude	Longitude
1	i. 03/01/2022 to 04/01/2022 ii. 07/01/2022 to 08/01/2022	**Nongstoin**	1.50 Km	25°31'16.71"N	91°15'19.47"E
2	iii. 03/01/2022 to 04/01/2022 iv. 07/01/2022 to08/01/2022	**Miangkain**	16.84 Km	25°28'13.55"N	91° 6'16.69"E

Source: environmental assessment report of Rongram-Rongrenggre-Darugre Road.

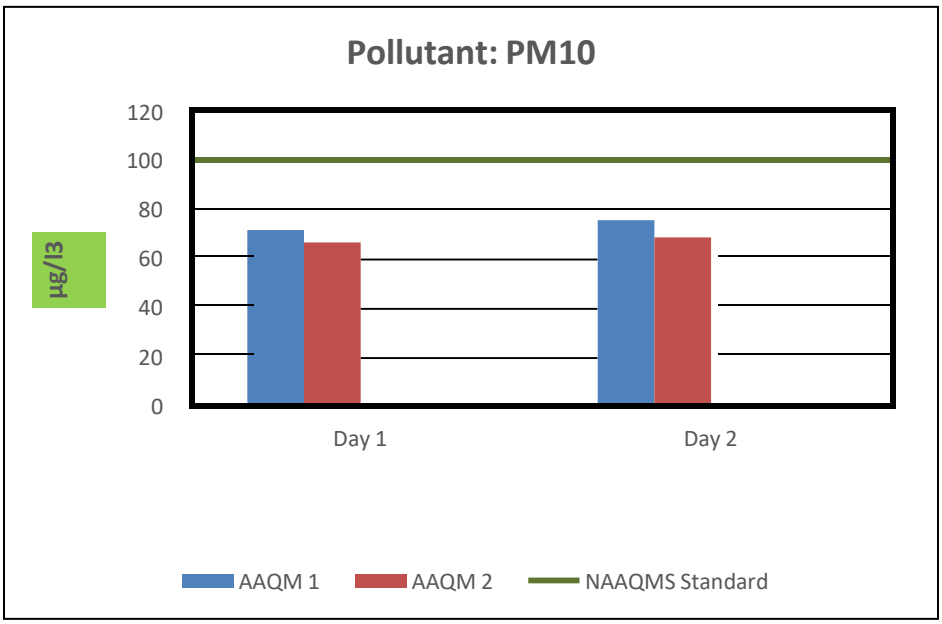
Figure 19: Air Quality Monitoring locations along the project road

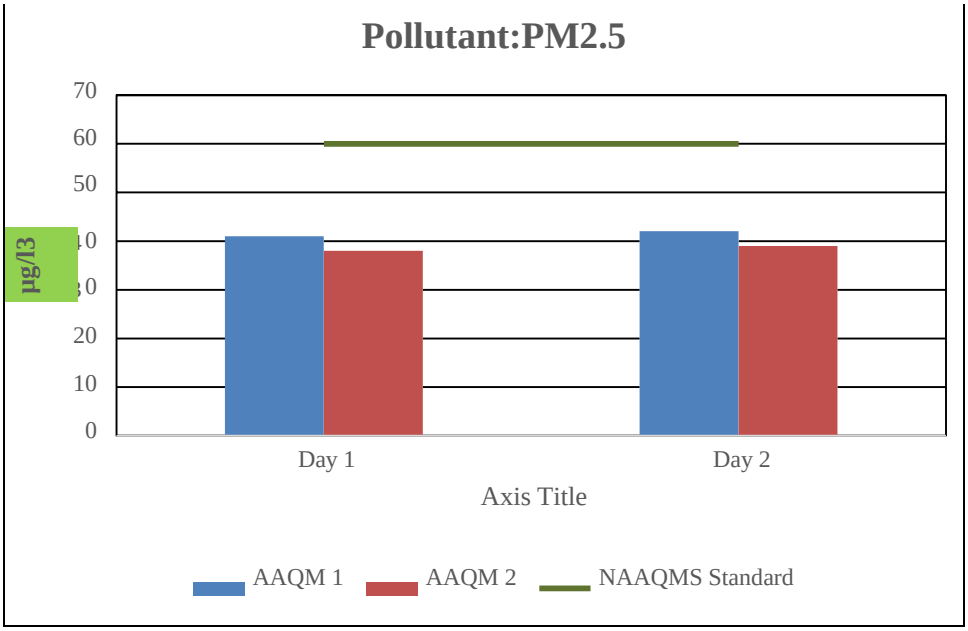
Ambient air quality monitoring results for $PM_{2.5}$, PM_{10}, SO_2, NO_X, and CO concentrations are given in Table 14 and summarized below. The monitored values are compared with National Ambient Air Quality Standards prescribed by Central Pollution Control Board (CPCB) and WHO Ambient Air Quality Guidelines (IFC EHS) for residential, rural, and other areas.

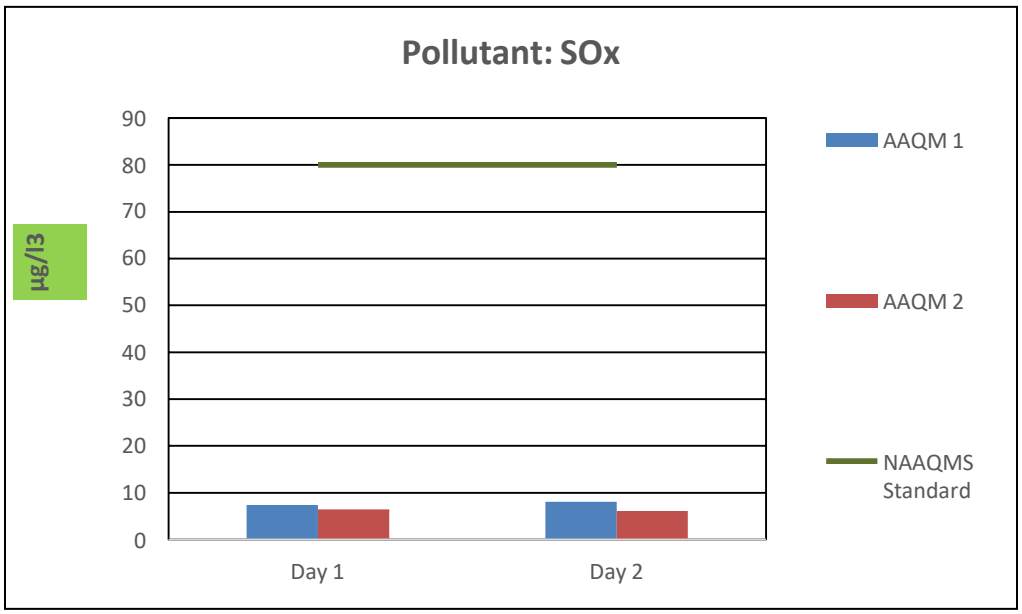
Table 14: Ambient Air Quality along the Project Road

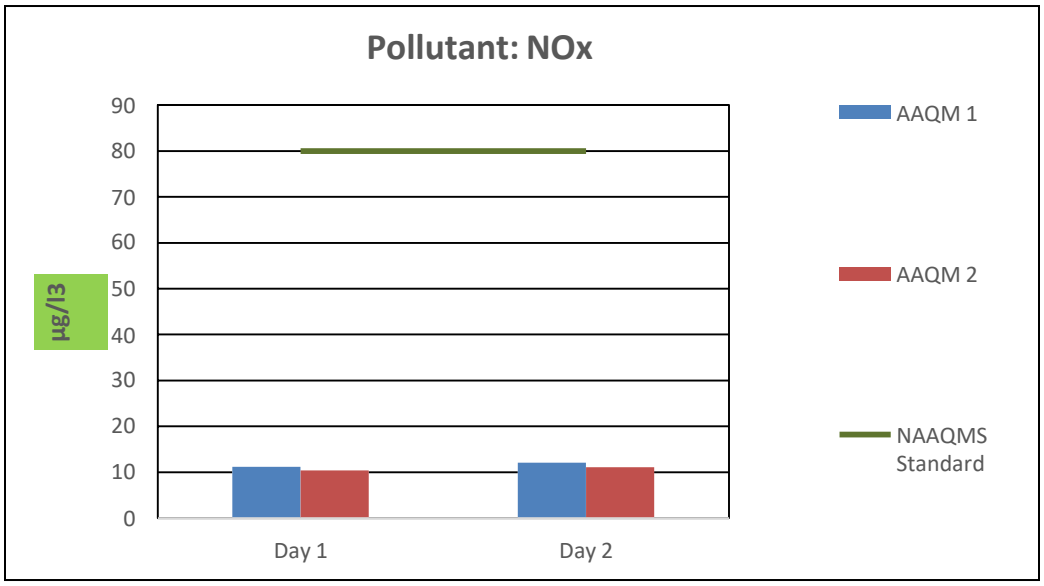
	S. N.	Particulate Matter (PM_{10})	Particulate Matter ($PM_{2.5}$)	Sulphur Dioxide	Nitrogen Dioxide	Carbon Monoxide	Hydrocarbon (HC), µg/m³	Lead (Pb), µg/m³
National Ambient Air Quality Standard (CPCB) - Permissible limit		100	60	80	80	2	-	1
AAQM 1: Nongstoin								
Week 1	1	72	41	7.4	11.2	BDL	BDL	BDL
Week 2	2	76	42	8.1	12.1	BDL	BDL	BDL
AAQM 2: Miangkain								
Week 1	5	67	38	6.4	10.4	BDL	BDL	BDL
Week 2	6	69	39	6.1	11.1	BDL	BDL	BDL

Figure 20: Pollutant


Pollutant: PM10
120
100
80
60
40
20
0
µg/l3
Day 1
Day 2
AAQM 1
AAQM 2
NAAQMS Standard


Pollutant:PM2.5
70
60
50
µg/l3
20
10
0
Day 1
Day 2
Axis Title
AAQM 1
AAQM 2
NAAQMS Standard





The Ambient air quality levels meet the National air quality standards for the rural, residential area all along the project road. Concentrations of all the parameters at three locations are withinthe National Ambient Air Quality Standard (CPCB) - Permissible limit.

- $PM_{2.5}$: The mean $PM_{2.5}$ concentration at ambient air quality monitoring locations varies from 38 µg/m^3 to 42 µg/m^3. The values are within the permissible limit atall the stations.
- PM_{10}: The mean PM_{10} concentration at ambient air quality monitoring locations varies from 67 to 76 µg/m^3. The values are within the permissible limit at all the stations as per the NAAQS.

- SO_2: The mean concentrations of SO_2 at all ambient air quality monitoring locations vary from 6.1 µg/m^3 to 8.1 µg/m^3. The values are within the permissible limit at all the stations.
- NO_X: The mean concentrations of NO_X at all AAQM locations range from 10.4 to 12.1 µg/m^3. The values are within the permissible limit at all the stations.
- CO: The CO level was measured below detection limit at all the locations.

4.9 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 15: 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 have been prepared to mitigate the different impacts caused due to construction activities, which is provided in the subsequent chapters.

4.9.1 Noise Quality Monitoring

A preliminary reconnaissance survey was done to identify the major noise generating sources along the proposed alignment. The noise at different noise generating sources has been identified based on industrial, commercial, and residential activities, traffic, and noise at sensitive areas. Sound Pressure Level (SPL) measurements were undertaken at all locations, with an interval of about 5 seconds over 10 minutes per hour for 24 hr. The day noise level has been monitored from 7 AM to 10 PM and night levels from 10 P.M. to 7 AM at 2 locations. The Details of the monitoring locations are given in Table

Day and night-time Leq have been calculated from hourly Leq values and compared with the stipulated standards.

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

Table 16: Noise Monitoring locations along the project road

Sampling Location	Date of Sampling	Name of place	Distance (m)	Coordinates		Land Use
				Latitude	Longitude	
1	03.01.2022-07.01.2022	**Nongstoin**	1.50 Km	25°31'16.71"N	91°15'19.47"E	Residential cum residential
2	03.01.2022-07.01.2022	**Miangkain**	16.84 Km	25°28'13.55"N	91° 6'16.69"E	Residential

Source: environmental assessment report of Rongram Rongrenggre Darugre Road and CPCB Manual Monitoring Data

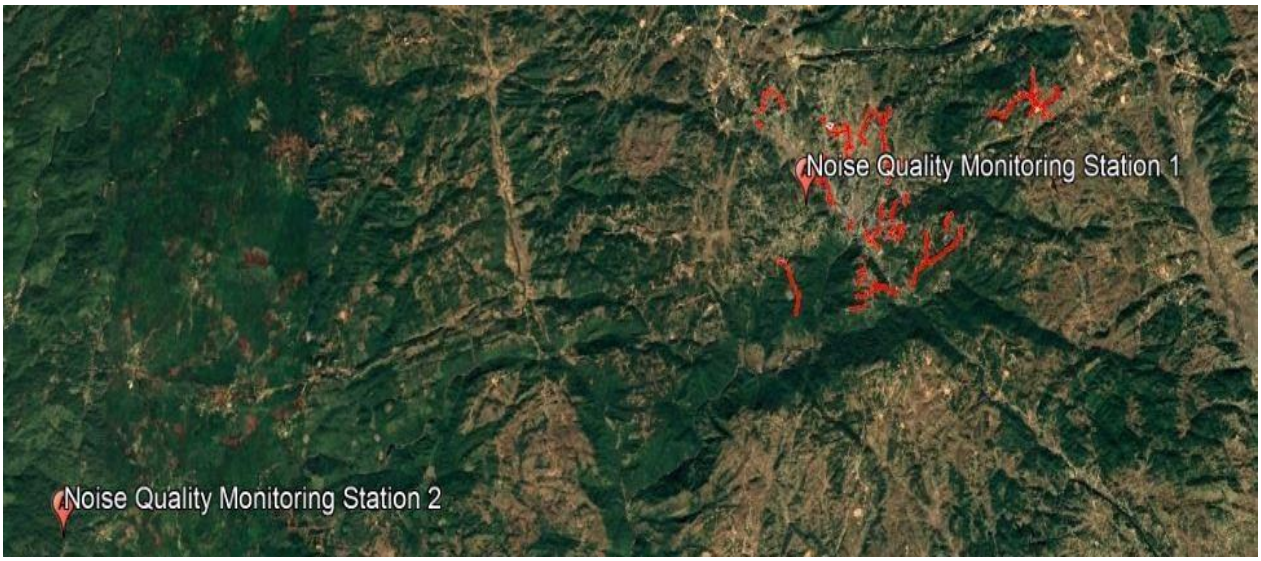


Figure 21: Noise Monitoring locations along the project road

Table 17: Day and Night Time noise monitoring

	Noise location1: Nongstoin		Noise location 2Miangkain	
Date	**03.01.2022**	**07.01.202**	**03.01.2022**	**07.01.2022**
Maximum	52.3	52.1	52.1	51.2
Minimum	35.2	36.4	37.9	38.2
Leqday	48.6	47.7	48.2	47.7

Figure 22: Location wise noise monitoring

	Noise location1: Nongstoin		**Noise location 2Miangkain**	
Leqnight	36.4	36.5	39.4	38.3
Leq	48	47.4	48.6	47.9
STANDARD	**Day–65**	**Night-55**	**Day–55**	**Night - 45**

It can be seen from Table 15 that at all the monitoring locations, the ambient noise levels are well within the permissible limits for residential areas prescribed by CPCB and also by World Bank EHS standards of 55 dB(A) and 45 dB(A) for day time and night time respectively. The maximum recorded day time noise level is 48.6 dB(A) and night time noise level is 36.4 dB(A) atNongstoin and Miangkain. Average day time noise level along the subproject roads varies from
47.7 dB(A) to 48.6 dB(A) whereas average night time noise levels vary from 36.4 dB(A) to 39.4dB(A).

4.10 Biological Environment:

Meghalaya falls under the Indo-Myanmar Biodiversity Hotspot zone.

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 Balpakram National Park, which is about 22km away from the project site and fall outside of the both Direct and Indirect impact zone.

Table 18: Protected area in Meghalaya

Sl	**Protected Area**	**Area (sq kms)**	**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

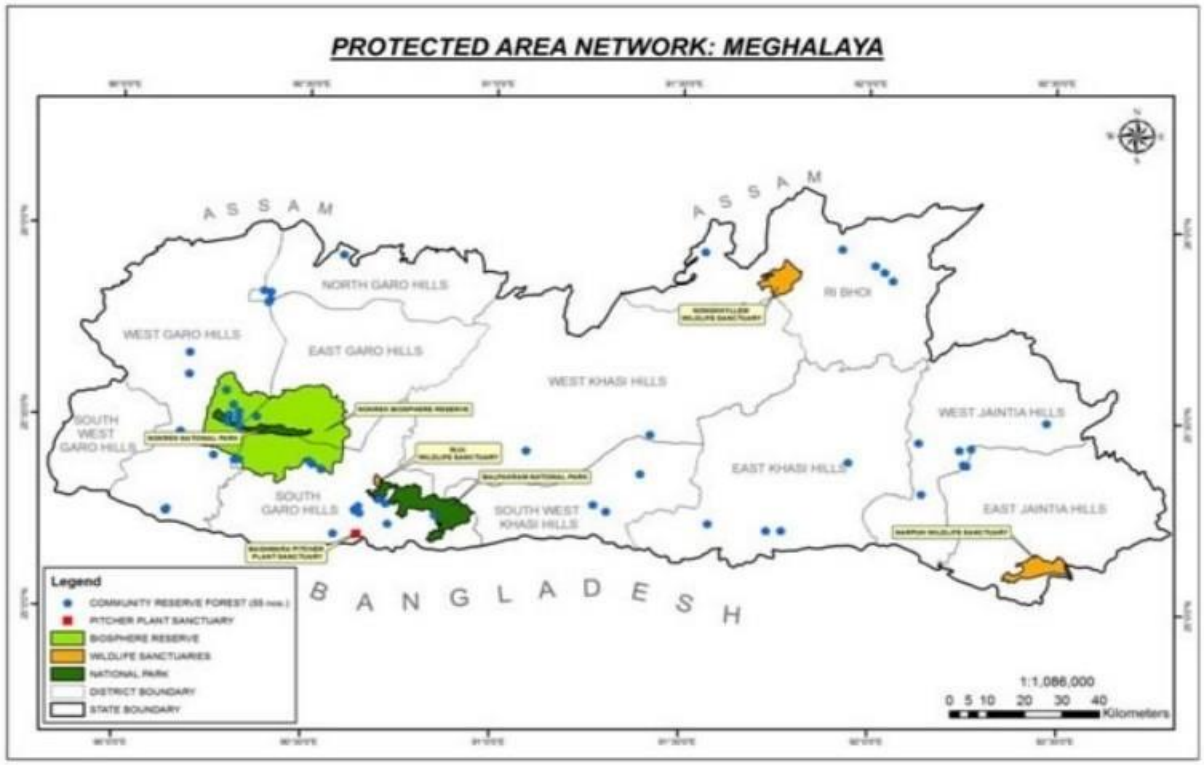


Figure 23: Protected Areas of Meghalaya

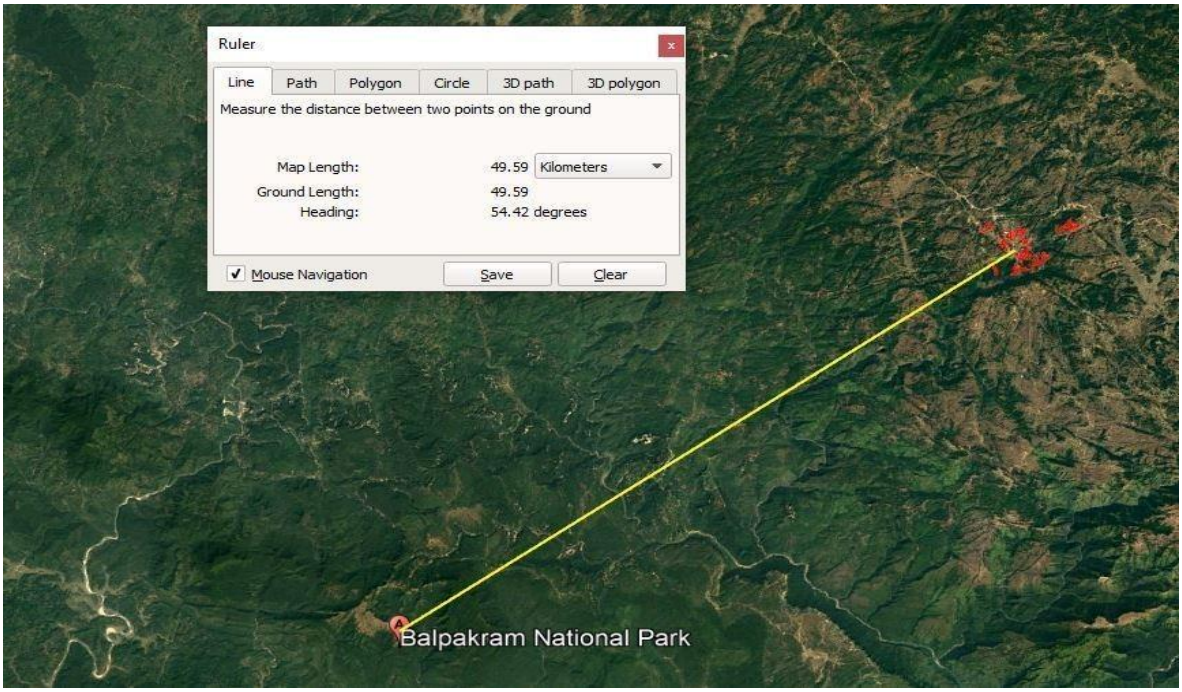


Figure 24: distance between Balpakram National Park and project area

Elephant Reserves:

The state has a substantial population of Asian elephant and due to this high density ofelephants in the state, for their conservation, state has developed various policies. For protection and conservation of elephants in Garo Hills area, Meghalaya government has notified(vide- No.132/2000/97 dated 31st October 2001) a 3500 km2 area as Garo Hills Elephant Reserve under Project Elephant, MoEFCC, Govt of India. Nokrek and Balpakram National Park forms the core area (400 Km^2) of the Elephant Reserve and majority of the part of the Elephant Reserve is situated in East Garo and South Garo Hill Districts. West Khasi Hills district is not part of any Elephant Reserve.

Reserved Forests of Meghalaya State:

There are 24 Reserved Forests (RFs) in the state with area varying from 0.44 km2 to 150 km^2 covering a total of 712.74 km^2 area. There is no Reserve Forest in the West Khasi Hills district.

Table 19: Reserve Forest list in Meghalaya State

District	Name of Reserved Forests	Area (in sq. km.)
Jaintia Hills District	Saipung R.F.	150.35
	Narpuh Bl. I	62.42
	Narpuh Bl. II	98.68
East Khasi Hills District	Riatkhwan R.F.	3.91
	Shyrwat R.F.	0.44
	Riat Laban R.F.	2.05
Ri – Bhoi District	Nongkhyllem R.F.	125.91
	Umsaw R.F.	0.44
East Garo Hills District	Chimabongshi R.F.	23.28
	Dhima R.F.	20.72
	Dilma R.F.	2.59
	Rajasimla R.F.	18.13
	Ildek R.F.	2.59
	Darugiri R.F.	10.36
	Rongrenggiri R.F.	36.26
	Dambu R.F.	18.13
	Songsak R.F.	23.31
West Garo Hills District	Dibru Hills R.F.	15.02
	Tura peak R.F.	4.19
South Garo Hills District	Baghmara R.F.	43.91
	Angratoli R.F.	30.11
	Rewak R.F.	6.47
	Emangiri R.F.	8.29
	Siju R.F.	5.18

Community Reserves:

Community Reserves or Conservation Reserves are special category of protected and it recognizes that local communities can participate in protection of threatened species and naturalresources. Meghalaya has a large number of Community Reserves, the largest for any Indian state. The Govt. of Meghalaya has declared 73 private and community lands/forests into Community Reserves, to increase the area under protected networks for protecting flora, fauna and traditional or cultural conservation values and practices. There are two community Reserve in West Khasi Hills. These two-community reserve is not within the radiusof 5 KM from the proposed road alignment.

Table 20: Community Reserves

Sl.	District	Name of Community Reserve	Area (Ha)
1	West Khasi Hills	Kpoh Eijah	17
2		Miewsyiar	87
Grand Total			**6293.382**

Sensitive Ecological and cultural attributes:

The table below gives the ecological profile of the project area indicating the critical ecological, Historical and cultural features –

Table 21: Availability of Ecological/Cultural Site within Project Area

Ecologically/Culturally significant feature	Availability within project area
Wildlife Sanctuary	No
National Park	No (The nearest is Balpakram National Park,which is outside of direct influence zone of the ROW, No impact)
Ramsar Site	No (As on Dec 2020, there is no declared Ramsar site in Meghalaya)
Biodiversity Heritage Site	No
Biosphere Reserve	No
Important Bird Area	No (The nearest is Balpakram National Park,which is outside of direct influence zone of the ROW, No impact)
Key Biodiversity Area	No (The nearest is Balpakram National Park,which is outside of direct influence zone of the ROW, No impact)
Wildlife Corridor	No
Elephant Corridor	No (The nearest is Bagmara – Balpakram , which is outside of direct influence zone of the ROW, No impact)
Tiger Reserve	No

Ecologically/Culturally significant feature	Availability within project area
Reserve Forest	No
Elephant Reserve	No
Community Forests	No
Sacred Groove	No
Archeological Sites	No
Unprotected / Non-Classified Forest	Yes
Major River	No
Fish Sanctuary	No
Surface water bodies	Yes. Small ponds mostly used for fishery.

Forest Status in Project District:

As per the latest State of Forest Report 2019 published by Forest Survey of India (FSI), It is evident from below mentioned table that the project area district has a high forest cover, i.e., 76.32 % of the geographical area of the district, which mostly comprises of moderately dense oropen forest and majority of the forests are either private or owned by the community.

Table 22: West Khasi Hill- Forest Cover (Area in Sq. km)

District	Geographic Area	As per 2017 Assessment				% Forest cover
		Very Dense Forest	Mod Dense Forest	Open Forest	Total	
West Khasi Hills	5247	91	2551	1366	4008	76.39
Source: Indian State of Forest Report, 2019						

Animal crossings & Migratory Routes

The project corridor is devoid of any reserved forest within the study area and there is no wildlife habitat around the project. So, there is no designated migratory route or animal crossing in the project area.

Community Reserves:

Community Reserves or Conservation Reserves are special category of protected areas and it recognizes the fact that local communities can participate in protection of threatened species and natural resources. Meghalaya has a large number of Community Reserves, the largest for any Indian state. The Govt. of Meghalaya has declared 73 private and community lands/forests into Community Reserves, to increase the area under protected networks for protecting flora, fauna and traditional or cultural conservation values and practices. There are four Community Reserves in West Khasi Hills. All Community Reserves situated in West Khasi Hills District are away from the project sites.

Table 23: Community Reserves in West Khasi Hills

District	Name of Community Reserve	Area (Ha)
West Khasi Hills	Dibru Hills R.F.	15.02

District	Name of Community Reserve	Area (Ha)
	Tura peak R.F.	4.19

Important Bird Areas:

The Important Bird Area (IBA) programme was initiated by Bird Life International to document and advocate the protection and management of a network of sites that are important for the long-term viability of naturally occurring bird populations across the geographic range of those bird species for which a site-based approach is appropriate. Following this concept, a total of 9 IBA sites have been identified in the State. There is No IBA within close vicinity of the project site.

Tawny-breasted Wren babbler (Spelaeornis longicaudatus) and The Khasi Hills Swift or Dark rumped swift (Apus acuticauda) is another Globally Vulnerable bird recorded from Meghalaya but no sightings of these birds has been reported from the Project site.

Table 24: IBA Sites

Sl	IBA Sites Name	IBA Criteria
1	Balpakram complex	A1, A2, A4i
2	Mawphlang Sacred Grove	A1, A2
3	Nokrek National Park	A1, A2, A3
4	Nongkhyllem Wildlife Sanctuary	A1
5	Narpuh Reserve Forests	A1, A2
6	Riat Khwan Umiam	A1, A2
7	Saipung	Data deficient
8	Upper Shillong	A1, A2
9	Cherrapunjii: Cliffs, Gorges and Sacred Groves	A1, A2

Elephant Corridor:

According to 'Right of Passage: Elephant Corridors of India (2017), five active elephant corridors have been identified in the State of Meghalaya. No elephant Corridor is present in the close vicinity of the ROW. During public consultation and discussion with Forest Official, no presence of wild elephants from the close vicinity of the ROW has been reported.

The Elephant Corridors in Meghalaya is shown in Table below.

Table 25: Elephant Corridors in Meghalaya

Corridor name	Connectivity	Corridor Use
Ranggira – Nokrek	West Garo Hills with Nokrek National Park	Rare
Nokrek – Imangre	Imangre Reserve Forest and Nokrek National Park	Regular
Rewak – Imangre	Imangre Reserve Forest with Rewak Reserve Forest	Regular
Siju – Rewak	Siju Wildlife Sanctuary with Rewak Reserve Forest	Regular
Baghmara – Balpakram	Balpakram National Park with Baghmara Reserve Forest	Regular

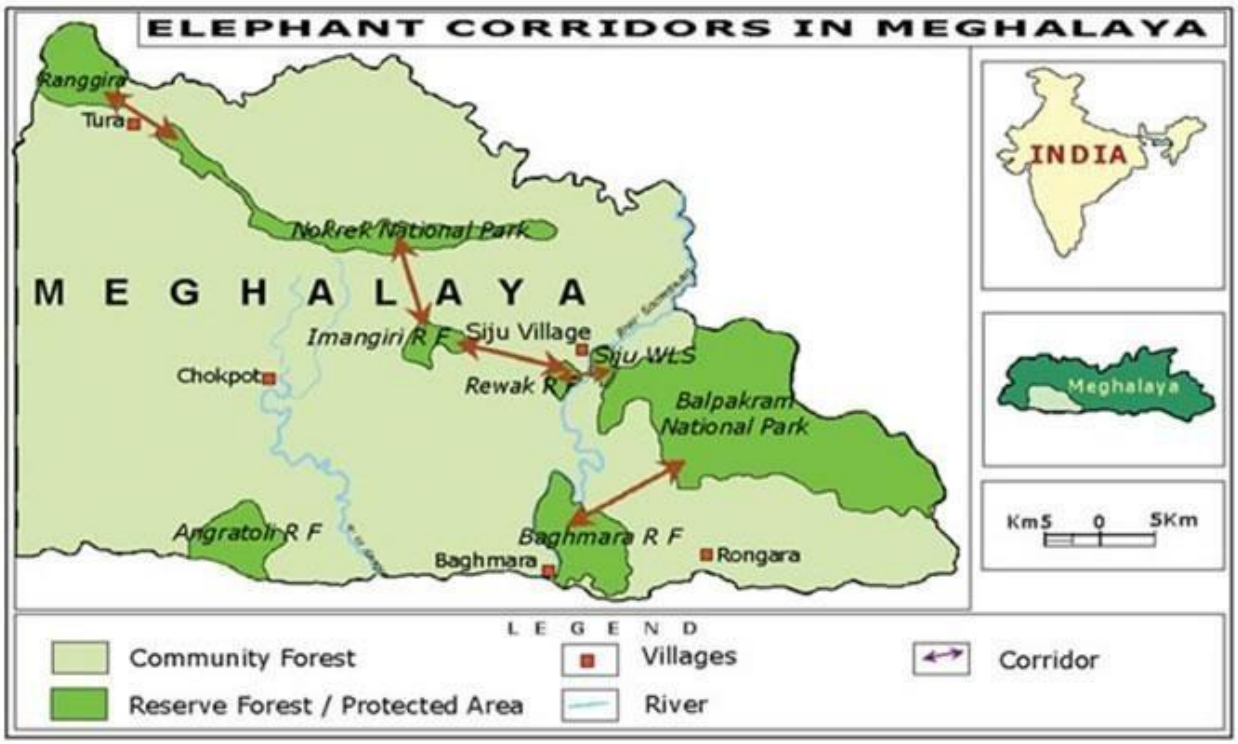


Figure 25: the Elephant Corridors in Meghalay

Sacred groves:

Sacred groves are forest patches, which are protected by communities based on religious beliefs, and have a significant religious connotation for the protecting community. These groves are considered as one of the most species-rich areas for plants, birds and mammals. Most ofthe groves are in the catchment areas of major rivers. The information on floristic richness of thesacred groves of Meghalaya revealed that at least 514 species representing 340 genera and
131 families are present in these sacred forests. Many endemics, rare, endangered and threatened species of the state are found in the sacred groves. The sacred grove biodiversity compares favourably with that of the core area of some of the biosphere reserves in this region, which are being managed by the state forest department.

Even though Meghalaya has as many as 105 recorded sacred groves, the more famous ones are the Mawphlang and Mawsmai sacred groves. No sacred grove is located within the Project site i.e., Nongstoin Town Roads.

Table 26: Sacred Grove in West Khasi Hills District

Sl.	Sacred Grove Name	Sacred Grov eLocation	Area (Hectares)
District –West Khasi Hills			
1	U Law Lyngdoh	Nongkyngkin	190
2	U Lum Sanglia	-DO-	-DO-
3	U Law Blei	-DO-	-DO-
4	Law Lyngdoh	Nonglang	200
5	Law Kyntang	Mawlangwir	Not Known
6	Law Kyntang	Mawten	-DO-
7	Law Lyngdoh	Rangmaw	-DO-
8	Law Kyntang	Mawthawiaw	-DO-
9	Nongsynrih sacred grove	Nongsynrih	-DO-
10	Law Adong Lyngdoh Mawlong (clan protected grove)	Mawlong	200
11	Kyllai Lyngngun	Mariam	80
12	Lyngdoh Mawnai sacred grove	Mawnai	80
13	Law Lyngdoh	Nonglait	Not Known

Biodiversity Profile of the Study area:

The whole of Garo Hills region forms a sort of undulating plateau with plenty of flat lands and valleys with altitudes varying from 100-1400 m above sea level, highest point being Lum Shyllong which is 1,968 metres. The district has a rich and unique flora and it is supposed to be the original home of the Citrus. Based on altitude, the vegetation of Garo Hills can be broadly classified into the flora of tropical and sub-tropical zones. During the survey, the team has also given emphasis about presence of different species within the 10 km and 15 km Buffer area of the project site through interview, field visit and literature review.

Vegetation:

Vegetation around 10 km and 15 km buffer of the study area mostly comprises of large/ medium/ small trees bushy shrubs and annuals perennial or biennials herbs. No scheduled species as per Wildlife Protection Act ,1972 had been described from the project site nor any species listed under Endangered or Vulnerable as per IUCN status had been described from theproject site. It embraces evergreen, semi-evergreen and deciduous forests, bamboo thicketsand grasslands including riparian forests and swamps. These forests mainly consist of Shorea robusta and in certain area Tectona grandis has also been introduced.

Table 27: Agro-biodiversity in the Study Area

Scientific Name	Family	Crop Type	Local/English Name
Allium cepa	Amaryllidaceae	Vegetable	Piyaj
Allium sativum	Amaryllidaceae	Spice	Lahsun
Amaranthus sp.	Amaranthaceae	Vegetable	Lalsag
Anacardium occidentalis	Anacardiaceae	Plantation Crop	Kaju
Ananas comosus	Bromeliaceae	Fruit	Pineapple
Areca catechu	Arecaceae	Plantation Crop	Tambul
Artocarpus hetrophyllus	Moraceae	Vegetable	Kathal
Brassica spp.	Brassicaceae	Oilseed	Sarson
Capsicum annuum	Solanaceae	Vegetable	Mirch
Carica papaya	Caricaceae	Fruit	Papita
Cier aeriatinum	Fabaceae	Pulse	Chana
Citrus media	Rutaceae	Fruit	Nimbu
Cocos nucifera	Arecaceae	Fruit	Narikol
Colocasia antiquoram	Aracea	Vegetable	Kachchu
Corchorus capsularis	Malvaceae	Fibre	Jute
Coriandrum sativum	Apiaceae	Condiment & Spice	Dhania
Cucumis sativa	Cucurbitaceae	Fruit	Kheera

ScientificName	Family	Crop Type	Local/English Name
Cucurbita pepo	Cucurbitaceae	Vegetable	Kaddu
Daucus carrota	Apiaceae	Vegetable	Gajar
Hevia brasiliensis	Euphorbiaceae	Plantation Crop	Ruber
Lens esculenta	Fabaceae	Pulse	Masur
Luffa spp.	Cucurbitaceae	Vegetable	Lauki
Lycopersicon esculentum	Solanaceae	Vegetable	Tamatar
Momordica charantia	Cucurbitaceae	Vegetable	Karela
Musa indica	Musaceae	Fruit	Kela
Oryza sativa	Poaceae	Cereal	Dhan
Phaseolus mungo	Fabaceae	Pulse	Urd
Psidum guajava	Myrtaceae	Fruit	Amrud
Raphanus sativa	Brassicaceae	Vegetable	Muli
Sesamum indicum	Pedaliaceae	Oilseed	Til
Solanum melongena	Solanaceae	Vegetable	Began
Solanum tuberosum	Solanaceae	Vegetable	Aalu
Spinach oleracea	Amaranthaceae	Vegetable	Palak
Trigonella foenium graecum	Fabaceae	Vegetable	Methi
Triticum aestivum	Poaceae	Cereal	Gehu
Zea mays	Poaceae	Cereal	Makka
Zingiber officinalis	Zingiberaceae	Rhizome	Adrakh

Table 28: Plant Biodiversity in the Study Area

Scientific Name	Family	Habit	Local Availability	IUCN * Status
(A) ANGIOSPERMS				
Acacia pennata	Mimosaceae	Herb	Common	LC
Ageratum conyzoides	Asteraceae	Herb	Very Common	NA
Albizzia procera	Mimosaceae	Tree	Rare	NA
Anthocephalus chinensis	Rubiaceae	Tree	Common	NA
Artocarpus integrifolia	Moraceae	Small Tree	Common	NA
Arundinella nepalensis	Poaceae	Herb	Common	NA
Arundo donax	Poaceae	Herb	Common	LC
Asparagus racemosus	Liliaceae	Herb	Rare	NA
Bauhinia acuminata	Caesalpiniaceae	Small Tree	Common	LC
Bombax ceiba	Bambacaceae	Tree	Very Common	NA
Cardamine impatiens	Brassicaceae	Herb	Common	NA
Cassia fistula	Caesalpiniaceae	Small Tree	Common	NA
Cassia tora	Caesalpiniaceae	Shrub	Common	NA
Chrysopogon fulvus	Poaceae	Herb	Common	NA
Cissampelos pariera	Manispermaceae	Herb	Rare	NANIC

Scientific Name	Family	Crop Type	Local/English Name	IUCN * Status
Commelina bengalensis	Commelinaceae	Herb	Very Common	NANIC
Cyperus rotundus	Cyperaceae	Herb	Abundant	NANIC
Dendrocalamushamiltonii	Poaceae	Herb	Common	NA
Dioscorea bulbifera	Dioscoreaceae	Climber	Common	NA
Erythrina variegata	Papilionaceae	Small Tree	Rare	NA
Eucalyptus tereticornis**	Myrtaceae	Tree	Rare	NA
Euphorbia emodi	Euphorbiaceae	Herb	Common	LC
E. hirta	Euphorbiaceae	Herb	Common	NA
Ficus hispida	Moraceae	Tree	Common	NA
Galium sp.	Rubiaceae	Herb	Common	NA
Gmelina arborea	Verbenaceae	Tree	Common	NA
Imperata cylindrica	Poaceae	Herb	Common	LC
Ipomoea aquatica	Convolvulaceae	Herb	Common	NA
I. cairica	Convolvulaceae	Creeper	Very Common	NA
Justicia adhatoda	Acanthaceae	Shrub	Common	NA
Lagerstroemia sp	Lytharaceae	Tree	Rare	NA
Lathyrus aphaca	Fabaceae	Herb	Common	NA
Lemna minor	Lemnaceae	Herb	Common	LC
Lepidium virginicum	Brassicaceae	Herb	Common	NA

Scientific Name	Family	Habit	Local Availability	IUCN * Status
Litsea glutinosa	Lauraceae	Tree	Rare	NA
Mallotus philippensis	Euphorbiaceae	Small Tree	Common	NA
Mimosa pudica	Mimosaceae	Herb	Rare	NA
Phragmites karka	Poaceae	Herb	Common	LC
Phyllanthus emblica	Euphorbiaceae	Tree	Common	NA
Poa annua	Poaceae	Herb	Common	LC
Potamogeton pectinatus	Potomogetonaceae	Herb	Common	LC
Pycrius spp.	Cyperaceae	Herb	Abundant	NA
Ranunculus arvensis	Ranunculaceae	Herb	Common	NA
Saccharum spontaneum	Poaceae	Herb	Abundant	LC
Sapium baccatum	Euphorbiaceae	Tree	Common	NA
Scripus spp.	Cyperaceae	Herb	Common	NA
Shorea robusta	Dipterocarpaceae	tree	Rare	NA
Smilex zylanica	Smilaceae	Climber	Rare	LR
Solanum erianthum	Solanaceae	Herb	Common	NANIC
Sonchus spp.	Asteraceae	Herb	Common	NA
Stellaria media	Caryophylaceae	Herb	Common	NA
Syzygium cumini	Myrtaceae	Tree	Common	NA
Tectona grandis**	Verbenaceae	Tree	Common	NA
Thysanolaena maxima	Poaceae	Herb	Common	NA
Tinospora cordifolia	Manispermaceae	Climber	Rare	NA
Toona ciliata	Meliaceae	Tree	Common	NA
Trewia nudiflora	Euphorbiaceae	Tree	Rare	LR

Scientific Name	Family	Habit	Local Availability	IUCN * Status
Vitex peduncularis	Verbenaceae	Tree	Rare	NA
Zizyphus mauritiana	Rhamnaceae	Tall Shrub	Abundant	NANIC
(B) FERNS AND FERN ALLIES				
Adiantum caudatum	Adiantaceae	Herb	Common	NA
Equisetum diffusum	Equisetaceae	Herb	Common	NA
Marselia minuta	Marseliaceae	Herb	Common	NANIC
Pteris biaurita	Pterideae	Herb	Rare	NA
Seleginella helferi	Selaginellaceae	Herb	Common	NANIC

Abbreviations: VU=Vulnerable, NA=Not assessed but present in the catalogue of Life, NANIC=Not assessed and not pre sent in the catalogue of Life, LC =Least concern, LR =Low risk

Figure 26: Vegetation along the Project Road

Table 29: Invasive Alien Plants in the Study Area

Species	**Family**	**Habit**	**Nativity**
Aervajavanica	Amaranthaceae	Herb	Tropical America
Ageratumconyzoides	Asteraceae	Herb	Brazil
Amaranthusspinosus	Amaranthaceae	Herb	Tropical America
Anagallisarvensis	Primulaceae	Herb	Europe
Argemone mexicana	Papaveraceae	Herb	Tropical South America
Calotropisprocera	Asclapiadaceae	Shrub	Tropical America
Cannabissativa	Cannabaceae	Herb	Tropical America
Chenopodiumalbum	Chenopodiaceae	Herb	Tropical America
Species	Family	Habit	Nativity
Cleome viscosa	Capparaceae	Herb	Tropical America
Cuscuta reflexa	Cuscutaceae	Climber	Mediterranean region
Datura metal	Solanaceae	Shrub	Tropical America
Eichhornia crassipes	Pontederiaceae	Herb	Tropical America
Euphobia hirta	Euphorbiaceae	Herb	Tropical America
E. thymifolia	Euphorbiaceae	Hurb	Tropical America
Galinsoga paviflora	Asteraceae	Herb	Tropical America
Lantana camara	Verbenaceae	Shrub	Tropical America
Oxalis corniculata	Oxalidaceae	Herb	Europe
Parthenium hysterophorus	Asteraceae	Herb	Tropical America
Physalis minima	Solanaceae	Herb	Tropical America
Portulaca oleracea	Portulacaceae	Herb	Tropical South America

Species	Family	Habit	Nativity
Prosopis juliflora	Mimosaceae	Small Tree	Mexico
Saccharum spontaneum	Poaceae	Herb	Tropical America
Side acuta	Malvaceae	Herb	Tropical America
Solanum nigrum	Solanaceae	Herb	Tropical America
Tridex procumbens	Asteraceae	Herb	Tropical America
Typha angustifolia	Typhaceae	Herb	Tropical America
Xanthium strumarium	Asteraceae	Herb	Tropical America

Endemic and Threatened Medicinal Plant Species:

There are many medicinal plants, which have been classified as endemic and/or threatened in the state depending on their distribution pattern and population size. Eight medicinal plant species such as Camellia caduca Cl ex Brandis, Citrus latipes Tanaka, Nepenthes khasiana Hk.f, Osbeckia capitata Benth are reported to be endemic to Meghalaya only. Thirty-seven medicinal plants, like Schima khasiana Dyer, Boehmeria macrophylla D.Don, Citrus medica L, Ilex khasiana Purk, Piper griffithii C.DC, Acanthus leucostachys Roxb. etc. which has been classified as endemic to Eastern Himalayas, Western Ghats, Indo-Burma region and Peninsular India, are also found in Meghalaya. Seventeen medicinal plant species found in Meghalaya have been classified under threatened category some of these are Taxus wallichiana var. baccata, Dendrobium nobile, Panax pseudo-ginseng, Nepenthes khasiana etc.

But dependency on traditional medicines had drastically reduced to increased demand for modern medicine. During consultation, it is been informed due to lack of traditional knowledge, over harvesting, rapid mining activity, collection of medicinal plants had reduced and availability of medicinal plants on the ROW is nil due to existing road network.

However, no medicinal plant growing area has been observed within the ROW of the Nongstoin town roads.

Natural Vegetation

Natural Vegetation of the project area is fairly poor due to tremendous biotic factors such as recurring fire hazards, overgrazing and browsing. Over exploitation of timber and fuel wood and charcoal burning etc. have destroyed the economical species and left scrub vegetation in most of the area. The area consists mostly of degraded and open forest with scattered pockets of the clad trees. The area consists mostly of degraded and open forests with scattered pockets of tree clad areas. The following species area available in the Project area:

Pinus kesiya (Diengkseh)	Betula alnoides (dieng lienglieh)
Schima wallichi (Diengngan)	Bamboo
Quercus spp. (dieng sning, diengsai)	Castanapsis spp (Diengstap, diengsohot)
Toona ciliate (dieng Tanglung)	Morus alba (Sohlungdkhur)
Bucklandia populnea (DiengDoh)	Myrica nagii (sohphie)
Alnus nepalensis (Dieng ling Iong)	

However, none of the above trees were found within the project impact zone.

Fauna in Study Area:

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

Mammals present in the study area:

Though the state of Meghalaya recorded presence of about 139 different species of mammals, but mammalian Diversity is not high in the project site as the area doesn't have any dense forestcover. Only minor mammals like rats, bats etc. were observed.

Table 30: Mammals in The Study Area

Order	Common Name	Scientific Name	Local Availability	IUCN Status	WPA Status
Primates	Monkey	Macaca mulatta	Common	LC	II
Pholidota	Chinese pangolin	Manis pentadactyla	Very Rare	CR	I
Artiodactyla	Wild Boar	Sus scrofa	Common	LC	III
Artiodactyla	Barking Deer	Muntiacus muntjak	Common	LC	II
Carnivora	Jackal	Canis aureus	Rare	LC	II
Carnivora	Jungle Cat	Felis chaus	Rare	LC	II
Carnivora	Common Palm Civet	Paradoxurus hermaphroditus	Common	LC	II
Carnivora	Indian Grey mongoose	Herpestes edwarsdii	Common	LC	IV
Chiroptera	Flying Fox	Pteropus giganteus	Common	LC	V
Eulipotyphla	The Asian House Shrew	Suncus murinus	Common	LC	V
Rodentia	Porcupine	Hystrix sp	Common	LC	II
Rodentia	Hoary-Bellied Squirrel	Callosciurus pygerythrus	Common	LC	V
Rodentia	The House Mouse	Mus musculus	Common	LC	V
Rodentia	Bandicoot Rat	Bandicota bengalensis	Common	LC	IV

Herpetofauna of the study area:

Herpetofauna includes Reptiles and amphibian animals of a particular area.

Table 31: Herpetofauna of the Study Area

Order	Common Name	Scientific Name	Local Availability	IUCN Status	WPA Status
Agamidae	Garden Lizard	Calotes versicolor	Common	LC	IV
Gekkonidae	Indian House Gecko	Hemidactylus sp	Common	LC	IV
Scincidae	Common Skink	Eutropis carinata	Common	LC	IV
Varanidae	Common Indian Monitor	Varanus bengalensis	Rare	LC	I
Pythonidae	Burmese Python	Python bivittatus	Rare	VU	I
Typhlopidae	Brahminy blind snake	Indotyphlops braminus	Common	LC	IV
Colubridae	Common Wolf Snake	Lycodon aulicus	Common	LC	IV
Colubridae	Indian Rat Snake	Ptyas mucosa	Common	LC	IV
Colubridae	Checkered Keelback	Fowlea piscator	Common	LC	IV
Colubridae	Indo-Chinese Rat snake	Ptyas korros	Common	LC	IV
Elapidae	King cobra	Ophiophagus hannah	Very Rare	VU	I
Elapidae	Northeastern hill krait	Bungarus bungaroides	Rare	LC	IV
Viperidae	Mountain Pit Viper	Ovophis monticola	Rare	LC	IV
Colubridae	Painted Bronzeback Tree Snake	Dedrelaphis pictus	Common	LC	IV
Turtles and Tortoises					
Testudines	Tricarinate Turtle	Melanochelys tricarinata	Very Rare	EN	I
Testudines	Yellow Tortoise	Indotestudo elongata	Rare	EN	IV
Amphibians					
Bufonidae	Common Asian Toad	Duttaphrynus melanostictus	Common	LC	~
Rhacophoridae	Terai Tree Frog	Polypedates teraiensis	Common	LC	~
Rhacophoridae	Common Tree Frog	Polypedates leucomystax	Common	LC	~
Rhacophoridae	Assam Tree Frog	Polypedates assamensis	Common	LC	~
Dicroglossidae	Indian Bull Frog	Hoplobatrachus tigerinus	Common	LC	IV
Dicroglossidae	Indian Skipping Frog	Euphylctis cyanophlyctis	Common	LC	IV
LC= Least Concern, EN= Endangered, NT= Near Threatened, VU= Vulnerable					

Common Fishes of study area:

Diversity of the West Khasi hills is good due to presence of numerous water bodies, smalls Strems. As commercial fishery is important livelihood option in West Garo hills, many different species of fishes are being farmed in the region. The project site does not have any major river system and fish sanctuary within its limits.

Table 32: Common Fishes of Study Area

Species	IUCN Status	Remarks
Brachydanio rerio	Least Concern	
Heteropneustes fossilis	Least Concern	
Mastacembelus armatus	Least Concern	
Glyptothorax striatus	Least Concern	
Heteropneustes fossilis	Least Concern	
Mastacembelus armatus	Least Concern	
Garra nasuta	Least Concern	
Neolissocheilus hexagonolepis	Near Threatened	Very rare
Puntius. shalynius	Least Concern	
Brachydanio rerio	Least Concern	
Heteropneustes fossilis	Least Concern	
Mastacembelus armatus	Least Concern	
Glyptothorax striatus	Least Concern	
Heteropneustes fossilis	Least Concern	
Chana stewartii	Least Concern	
Labeo rohita	Least Concern	
Catla catla	Least Concern	
Labeo gonius	Least Concern	
Cyprinus carpio	Vulnerable	Farm fish, locally common
Mystus sp	Least Concern	
Sperata sp	Least Concern	
Wallago attu	Near Threatened	Farm fish, locally common

Common Birds of study area:

Avian Diversity is quite low due to large scale mining, jhum cultivation. The common birds of thestudy area are listed below.

Table 33: Common Birds of the Study area

Order	Common Name	Scientific name	IUCN Status	WPA Status
COLUMBIFORMES	Rock Dove	Columba livia	LC	IV
COLUMBIFORMES	Oriental Turtle Dove	Streptopelia orientalis	LC	IV
COLUMBIFORMES	Yellow-Footed Green-Pigeon	Treron phoenicoptera	LC	IV
COLUMBIFORMES	Spotted Dove	Streptopelia chinensis	LC	IV

Order	Common Name	Scientific name	IUCN Status	WPA Status
COLUMBIFORMES	Red Collared Dove	Streptopelia tranquebarica	LC	IV
COLUMBIFORMES	Emerald Dove	Chalcophaps indica	LC	IV
CUCULIFORMES	Indian Cuckoo	Cuculus micropterus	LC	IV
CUCULIFORMES	Asian Koel	Eudynamys scolopaceus	LC	IV
GALLIFORMES	Red Jungle Fowl	Gallus gallus	LC	IV
GALLIFORMES	Kalij Pheasant	Lophura leucomelanos	LC	IV
PELECANIFORMES	Indian Pond Heron	Ardeola grayii	LC	IV
PELECANIFORMES	Cattle Egret	Bubulcus ibis	LC	IV
PELECANIFORMES	Little Cormorant	Microcarbo niger	LC	IV
CHARADRIIFORMES	River Lapwing	Vanellus duvaucelii	LC	IV
ACCIPITRIFORMES	Crested Serpent-Eagle	Spilornis cheela	LC	IV
STRIGIFORMES	Barn Owl	Tyto alba	LC	IV
STRIGIFORMES	Jungle Owlet	Glaucidium radiatum	LC	IV
BUCEROTIFORMES	Oriental Pied-Hornbill	Anthracoceros albirostris	LC	IV
BUCEROTIFORMES	Common Hoopoe	Upupa epops	LC	IV
CORACIIFORMES	Common Kingfisher	Alcedo atthis	LC	IV
CORACIIFORMES	White-Throated Kingfisher	Halcyon smyrnensis	LC	IV
CORACIIFORMES	Green Bee-Eater	Merops orientalis	LC	IV
CORACIIFORMES	Indian Roller	Coracias benghalensis	LC	IV
PICIFORMES	Coppersmith Barbet	Psilopogon haemacephalus	LC	IV
PICIFORMES	Blue-Eared Barbet	Psilopogon duvaucelii	LC	IV
PICIFORMES	Lineated Barbet	Psilopogon lineatus	LC	IV
PICIFORMES	Blue-Throated Barbet	Psilopogon asiaticus	LC	IV
PICIFORMES	Common Flame-Backed Woodpecker	Dinopium javanense	LC	IV
PICIFORMES	Black - Rumped Flame back	Dinopium benghalense	LC	IV
PICIFORMES	Greater Flameback	Chrysocolaptes guttacristatus	LC	IV
PASSERIFORMES	Scarlet Minivet	Pericrocotus speciosus	LC	IV

Order	Common Name	Scientific name	IUCN Status	WPA Status
PASSERIFORMES	Black-Hooded Oriole	Oriolus xanthornus	LC	IV
PASSERIFORMES	Indian Golden Oriole	Oriolus kundoo	LC	IV
PASSERIFORMES	Black-Naped Oriole	Oriolus chinensis	LC	IV
PASSERIFORMES	Common Iora	Aegithina tiphia	LC	IV
PASSERIFORMES	Black Drongo	Dicrurus macrocercus	LC	IV
PASSERIFORMES	Bronzed Drongo	Dicrurus aneus	LC	IV
PASSERIFORMES	Ashy Drongo	Dicrurus leucophaeus	LC	IV
PASSERIFORMES	Long-Tailed Shrike	Lanius schach	LC	IV
PASSERIFORMES	Rufous Treepie	Dendrocitta vagabunda	LC	IV
PASSERIFORMES	Common Tailorbird	Orthotomus sutorius	LC	IV
PASSERIFORMES	Red-vented Bulbul	Pycnonotus cafer	LC	IV
PASSERIFORMES	Ashy Bulbul	Hemixos flavala	LC	IV
PASSERIFORMES	Red-whiskered Bulbul	Pycnonotus jocosus	LC	IV
PASSERIFORMES	Jungle Babbler	Turdoides striata	LC	IV
PASSERIFORMES	Indian White-eye	Zosterops palpebrosus	LC	IV
PASSERIFORMES	Asian Pied Starling	Gracupica contra	LC	IV
PASSERIFORMES	Common Myna	Acridotheres tristis	LC	IV
PASSERIFORMES	Bank Myna	Acridotheres ginginianus	LC	IV
PASSERIFORMES	Jungle Myna	Acridotheres fuscus	LC	IV
PASSERIFORMES	Great Myna	Acridotheres grandis	LC	IV
PASSERIFORMES	Common Hill Myna	Gracula religiosa	LC	IV
PASSERIFORMES	House Sparrow	Passer domesticus	LC	IV
PASSERIFORMES	Oriental Magpie-Robin	Copsychus saularis	LC	IV
PASSERIFORMES	Baya Weaver	Ploceus philippinus	LC	IV
PASSERIFORMES	Citrine Wagtail	Motacilla citreola	LC	IV
PASSERIFORMES	White Wagtail	Motacilla alba	LC	IV
PASSERIFORMES	Scally Breasted Munia	Lonchura punctulata	LC	IV
PASSERIFORMES	Purple Sunbird	Cinnyris asiaticus	LC	IV
PASSERIFORMES	Crimson Sunbird	Aethopyga siparaja	LC	IV

Plankton Diversity:

Plankton are the microscopic organisms that drift on the water currents. Phytoplankton forms the sole base of food chain in aquatic system as they act as energy transducers and convert thesolar energy into chemical energy of food. Zooplankton passes this food energy to the higher trophic levels and thus provides a link between energy producers and the consumers. These organisms are important biological indicator of water quality and trophic status of aquaticecosystem as they respond quickly to the environmental changes. A rapid survey of the differentwater bodies was carried out to determine the species diversity in project site.

Table 34: Phytoplankton of the Study Area

Class: Bacillariophyceae	**Class: Chlorophyceae**
Frustulia sp.	Staurastrum rotundum
Gyrosigma sp.	Staurastrum leptocladium
Navicula sp.	Cosmarium decoratum
Tabellaria sp.	Cosmarium reniforne
Gomphonema sp.	Cosmarium leibleinii
Fragilaria sp.	Draparnaldiopsis sp.
Diatoma sp	Hyalotheca sp.
Synedra sp.	Spirogyra sp.
Pinnularia sp.	Gonatozygon sp.
Class: Cyaenophyceae	Ulothrix sp.
Anabaena sp.	Eudorina sp.
Oscillatoria sp.	**Class: Desmidiacae**
Microcystis aeruginosa	Closterium sp.
Spirulina sp.	**Class: Chrysophyceae**
Nostoc sp.	Dinobryon sociale
Class: Dinophyceae	**Class: Dinophyceae**
Ceratium sp.	Ceratium hirudinella
Glenodinium sp.	

Table 35: Zooplankton found in the Project area

Kindom: Animalia; Phylum: CRUSTACEA	**Order: Rotifera**
Nauplii sp. larvae	Anuraeopsis fissa
Order : Copepoda	Pleosoma hudsoni
Cyclops sp.	Polyarthra vulgaris
Diaptomus sp.	Ascomorpha sp

Mesocyclops sp.	Conochilus unicornis
Tropocyclops sp.	Trichocerca sp
Order : Cladocera	Pompholyx sulcata
Moina sp.	Asplanchna priodonta
Bosminopsis deitersi	Monostyla sp.
Diaphanosoma	Brachionus sp.
Chydorus sphaericus	Keratella sp.
Bosmina sp.	Lepadella sp.
Ceriodaphnia sp.	Nauplius sp.
Daphnia sp.	Euchlanis sp.
Class: Rhizopoda	**Kingdom: PROTISTA**
Difflugia lebes	Paramoecium sp.
Arcella vulgaris	Euglena sp.
Acanthocystis chaetophora	
Polymyxa sp.	

Heritage Trees:

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

In order to identify Heritage trees in the study area a detailed field study was conducted. As per the study conducted, no such Heritage trees of cultural significance have been identified along the road i.e. within 1 Km radius of the alignment.

Sericulture

No Sericulture activities were identified in the project region i.e. in the Nongstoin Town.

Rare or Endangered Species

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

Joint inspection is being carried out with field officials from the local forest department to prepare the detailed inventory and marking of the trees to be cut. During the joint inspection, if any endangered and or protected species of flora are found within the formation width of the subproject road, necessary mitigation measures will be adapted to protect such species. Also based on the joint inspection, a suitable compensatory afforestation plan will be prepared to mitigate the loss of vegetative cover due to the subproject activities.

Rice Cultivation

No large-scale rice cultivation has been found during the field visit along the project site as theproject area is inside the Nongstoin town.

Tea Estates

No tea Plantation is present along the Project Site.

4.10.1 Educational Institutions / Hospitals

The educational institutions and hospital/health centres constitute the sensitive environmentalreceptors. The list of such features along the ROW along the project roads is presented in Table 33. A total number of 6 educational institutions are located along the project stretches. Nohealth care centre was found within the project core zone which is 500m either side of the road.

Table 36: Sensitive receptors along the project road

Sl.	Receptor	Road Name	Approx distance from the edge of the road (m)	Physically Impacted or Not
1	Church	Nongstoin-Sonapahar Road to Mawsiangphet, Link 2	142.07	Not impacted at all
2	College	Nongstoin-Sonapahar Road to Mawsiangphet, Link 1	34.47	Not impacted at all
3	School	Nongstoin-Sonapahar Road to Mawsiangphet, Link 1	77.78	Not impacted at all
4	Church	Nongstoin-Sonapahar Road to Mawsiangphet, Link 1	122.15	Not impacted at all
5	District Veterinary Office	Nongstoin-Sonapahar Road near AH & Veterinary Office to Nongstoin-Pyndengrei Road	16.39	Not impacted at all
6	Church	Nondein, New Nongstoin, Link 1	43.27	Not impacted at all
7	College	Nongstoin College to permanent campus of Rev. S. Wollington Children Home of the KJP Synod Sepngi	22.08	Not impacted at all
8	Church	Nongstoin-Old Nongstoin road to Domthangksing at Nonstoin, Link2	22.74	Not impacted at all
9	Church	Ladweitang-Mawiong Lumsyntiew to connect Nongstoin- Rambrai road at 3rd km	131.49	Not impacted at all

Sl.	Receptor	Road Name	Approx distance from the edge of the road (m)	Physically Impacted or Not
10	Church	5th km of Nongstoin- Markasa Road to Mawrok Porsohsat Village, Link 5	46.10	Not impacted at all
11	Church	A village road from Nongstoin-Mawkawah road to Peacenola Memorial Playground Mawkawah, Link 2	13.16	Not impacted at all
12	School	Nongstoin-Sonapahar Road to Mawsiangphet upto St. Francis D' Assisi College, Link 1	74.44	Not impacted at all
13	College	Nongstoin-Sonapahar Road to Mawsiangphet upto St. Francis D' Assisi College, Link 1	25.82	Not impacted at all
14	School	road from Nongstoin-Mawkawah road to Petjyllan (Near Anderson H/S School) to connect NH-44E	1.25	Not impacted
15	Church	Nondein,New Nongstoin, Link 1	48.05	Not impacted at all
16	School	Nondein,New Nongstoin, Link 1	1.21	Not impacted

School

Church

College

School

Figure 27: Photographs of some sensitive receptors along the road stretch

School

4.11 Social Environment

4.11.1 The State Profile of Meghalaya

The State of Meghalaya was carved out of Assam as an autonomous State in April 1970 and was declared as a full-fledged State in January 1972. Meghalaya, situated in the Northeastern 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 Northeastern 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 Bodos etc. The Khasis and the Jaintias predominantly inhabiting the districts towards eastern part of Meghalaya, belong to the Proto Austroloid Monkhmer race. The ESIA Study Proposal of Roads lies under West Khasi, Ri-Bhoi, South West Khasi, Jaintia, East Garo Hills respectively.

4.11.2 District Profile:

West Khasi Hills is an administrative district in the state of Meghalaya in India. The West Khasi Hills district was carved out of the Khasi Hills district, which was divided into West and East Khasi Hills districts on 28 October 1976. The district headquarters is located at Nongstoin. The district occupies an area of 5247 km2. Khasi society has greatly been transformed by many factors which have arisen in recent times. Adoption of the Western style of life, especially among the literate and educated, has been quite rapid although the matrilineal laws of inheritance and succession and the other cultural states are still retained.

West Khasi Hills District was carved out of the state of Meghalaya in the year 1976 on the 28 day of October which in fact is the largest of all the eleven districts in the state of Meghalaya and since its existence, it has been bifurcated into two Civil Sub-divisions and a new district in Southwest Khasi Hills. It spreads through the heart of the state running high with plateau ranges and low with rich plain lands.

4.11.3 Demographic Profile

Out of total population of Meghalaya, 54.75% people live in urban regions. The district occupies:

Table 37:Demographic Profile of West Khasi Hills District

Description	Census 2011	Census 2001
Total Population	383461	296049
Male	193715	150419
Female	189746	145630
Population Growth	29.53%	33.05%
Area Sq..Km	5247	5247
Density /Km2	73	56
Proportion to Meghalaya Population	12.92%	12.77%
Sex Ratio (Per 1000) Males	980	968
Average Literacy	77.87	65.10
Male Literacy	78.53	66.49
Female Literacy	77.19	63.65
No. of Blocks	6	NA
No. of Villages	232	NA

Source: Census 2011

As per 2011 census, 88.76% population of West Khasi Hills district lives in rural areas of villages. The total West Khasi Hills district population living in urban areas is 43105 of which males and females are 21335 and 21770 respectively. In rural areas of West Khasi Hills district,sex ratio is 974 females per 1000 males.

Table 38: Distribution of Rural and Urban Population

Description	Urban	Rural
Population (%)	11.24%	88.76%
Total Population	43105	340356
Male Population	21335	172380
Female Population	21770	167976
Sex Ratio	981	974

Source: Census 2011

4.11.4 Schedule Castes and Schedule Tribes

The social stratification of the project area shows of Schedule Tribe population with 97.8% households. The second stratum of the social grouping in the area is of Schedule castepopulation of 0%.

4.11.5 Literacy Rate

The literacy rate in the district of West Khasi Hills is 77.87%, whereas the literacy rate in the PIAis around 67.37%. The respective male and female literacy rate is 78.53% and 77.19% in the district of West Khasi Hills, whereas resembles 50.21% and 51.2% in the PIA.

4.11.6 Employment Pattern

Economic backwardness is a 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 occupational pattern of labour force and status of employment to analyse the development in the state.

West Khasi Hills:

More than 80% of the total population in West Khasi Hills is agrarian as their main backbone of livelihood is basically agriculture. Rice, Maize, potato, and ginger are the main crops grown in West Khasi Hills. Agriculture and allied activities provide income and employment for the peoplein West Khasi Hills. Mono cropping in low land areas and mixed cropping in upland areas arethe features of agriculture in the district.

4.11.7 Economic Development

Meghalaya has predominantly an agrarian economy with a significant commercial forestry industry. Meghalaya's gross state domestic product for 2012 was estimated at16,173 crore (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 center for trade with Bangladesh. Meghalaya has an ideal location advantage for South East Asia Market. The neighbouring countries of India viz Bhutan, Bangladesh, Myanmar have 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 upcomingservice 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 Ri-Bhoi district.

West Khasi Hills:

Although the district is endowed with many economically important minerals but the operations are limited mostly to the mining of these minerals. The minerals found in the district are coal, limestone, sillimanite, and uranium, among these last two are major deposits in the district (coal mining is carried out at minor scale at shallang and rambari. Coalfields are mainly found and extracted in large scale from Nongri, Nonghyllam, Nongkulang areas). Mining of Uranium has not so far been undertaken due to opposition from the people. As per census, 2011, there are many small-scale industries in the district.

4.11.8 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 itviz NH 40, NH 44, NH 51 and NH 62.

The project road stretches are of great importance, as the road will carry not only the normal town traffic, but also the freight traffic that will connect the export points to the National Highway. The road network of the West Khasi Hills district is given below:

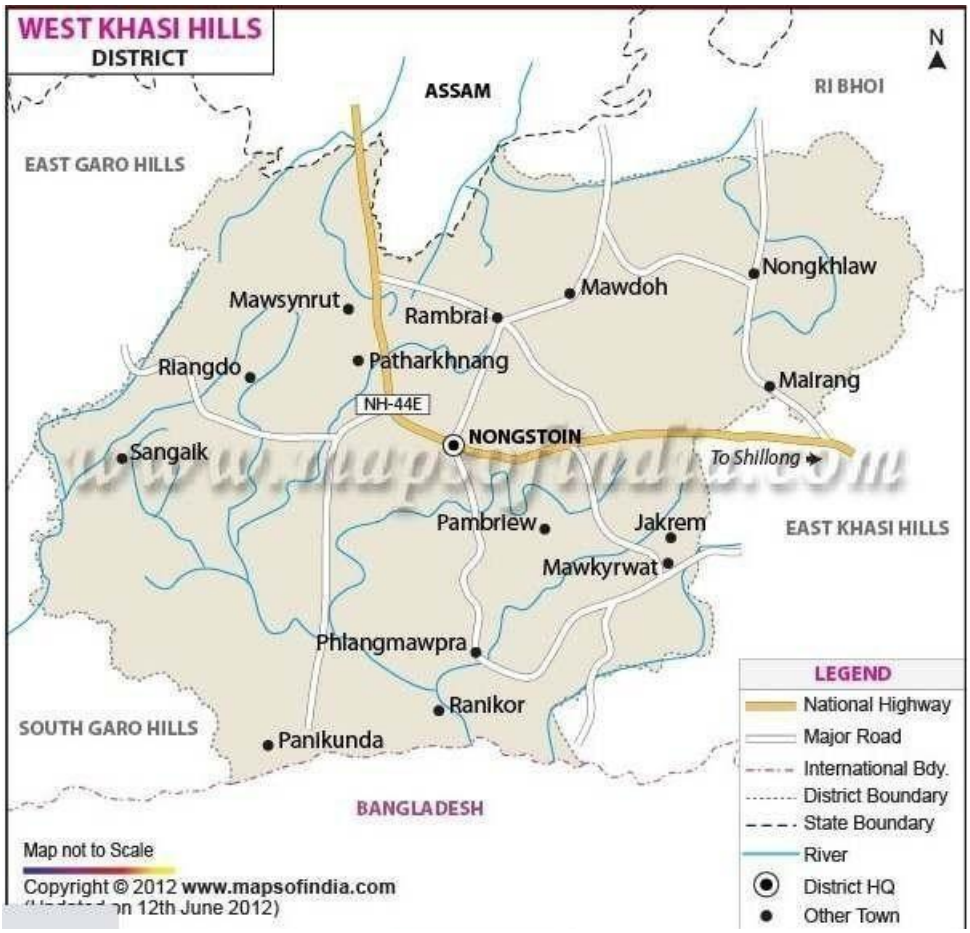


Figure 28: Road Network of West Khasi Hills

4.11.9 Railway

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

4.11.10 Aviation

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

4.11.11 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 Shorea robusta, Artocarpus heterophyllus, Albizzia species, Bahaunia variegetta etc. are seen in the Watershed Area.

West Khasi Hills:

More than 80% of the total population in West Khasi Hills is agrarian as their main backbone of livelihood is basically agriculture. Rice, Maize, potato and ginger are the main crops grown in West Khasi Hills. Agriculture is the main stay of the population in the district. As per census 2011, 52% of the population is engaged in agriculture and 22.8% of total workers population is engaged as agriculture labourers. The area is endowed with diversified climatic conditionthereby offering good scope for cultivation of temperate and subtropical crops. Principal crops grown in the district are rice, maize, millets, oilseeds and pulses. Horticulture products include orange, pineapple and many local fruits. Vegetables like potato, cucumber, squash, beans etc. are also grown.

4.11.12 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 Ri Bhoi 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 oflivestock 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.

West Khasi Hills:

The Animal Husbandry and Veterinary Department is established in the District in 1976 and functional right from 1976-1977 with the main objective of combating diseases in livestock andto encourage and assist the people of the district to take up farming in livestock on commercialscale so as to substantiate their income generating capacity. The people mostly rear local breeds of livestock characterized by low productivity in terms of meat, milk and meat.

4.11.13 Fishery

The PIA 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 (Puntius bartissp) is not so much satisfactory.
The Government of Meghalaya has identified fisheries as a key sector and launched the Meghalaya State Aquaculture Mission (MSAM) in 2012. Under this mission, a large water areain the state has been brought for fish culture.

In West Khasi Hills District, the total water area assisted under MSAM is 99.5 ha which includes 970 nos. of individual ponds and 5 nos. of community ponds. There are 5 nos. of fish ponds under convergence of MSAM with other Departments covering an area of 3.5 ha which will be implemented shortly. The area covered under the 1000 ponds scheme of the Fisheries Department is 67.45 ha. There are 2 nos. of Govt. fish farms in the District. There are also 3 nos. of fish sanctuaries which aim at conserving the indigenous and endemic fish species. According to the Fisheries Department, fish production (2014-15) in the District is 386 MT.
The project area is devoid of any fishery activity as it is inside Nongstoin town.

4.11.14 Hospitals

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

5 CHAPTER-VI: ANALYSIS OF POTENTIAL ENVIRONMENTAL &SOCIAL IMPACTS & MITIGATION- MEASURES

The potential environmental and social impacts due to project activities are discussed in this section. For the impact assessment, environmental parameters were assessed both within area of impact of 50 meter either side of the alignment and project's area of influence up to 10 km. A Corridor of Impact of 100 m along the road alignment has been considered for the social parameters.

5.1 Environmental 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. The detail of potential impacts & mitigation measures are mentioned in the below table.

5.1.1 Impacts During Design/ Pre-constructional Phase

The project envisages upgrading the existing single lane carriageway to intermediate lane for augmenting the capacity of the project road and significantly extending its service life. There is no need to acquire land for the proposed improvement/widening. The impacts during Design and Preconstruction stage have been discussed in the following sections:

5.1.1.1 Impacts on Physiography

The project section is already existing road and located on hill and plain terrain. The same alignment will be followed for improvement from existing single lane with earthen shoulder to standard single lane configuration with paved shoulder and geometric correction at few locations. The existing ground profile will be followed with minor profile corrections at few locations without significant alteration of existing vertical profile, except for improvement of geometrics and road safety. The rehabilitation and widening will be generally restricted withinthe existing ROW, except for few locations where small land parcel would be required beyond existing RoW. The entire project lies over flat land. The project will not have any impact on the topography/ Physiography within the project influence area and hence does not require any mitigation measures.

5.1.1.2 Ambient Air Quality

Impact to air environment during pre-construction stage will be limited to activities such as setting of construction camp, unloading of materials, exhaust from Diesel Generators, etc.

Mitigation Measure:

- Consent to Establish for emission/continuation of emission under Section 21 of the Air (Prevention and Control of Pollution) Act, 1981 should be obtained for Diesel Generator Set (s) of > 15 KVA for Non-Industrial use from SPCB
- LPG should be used in the labour camps for cooking purposes instead of wood.

5.1.1.3 Felling of Trees

No tree felling is there. The project road is not passing through any reserved or protected forest.Hence does not require any mitigation measure.

5.1.1.4 Impacts on Fauna

There is no wildlife habitat located along the project area nor any migratory route/ animal crossings in the project area. So, any risk or impact on wild animals or incidence of habitat fragmentation or disturbances to the wildlife migration route due to project is not anticipated in any of the project sections.

5.1.1.5 Impacts on Ecologically Protected Area

The project road does not pass through any ecologically protected areas such as Wildlife Sanctuary, National Park, Tiger Reserve or any notified ecologically sensitive area not is locatedin any Eco-sensitive zone. Further no movement of wild animals has been reported near the project alignment. So, any impact on such feature due to the project is not envisaged.

5.1.2 Impacts during Construction Phase

Most of the adverse environmental impacts are related to construction works which are inevitable but are manageable through certain environmental friendly practices. The negative environmental effects can be taken care of at an early stage through proper engineering designs and through the contract during construction practices.

No significant natural habitat conversion is envisaged to take place as a direct consequence of this project. Since the road improvements would follow the existing alignment of the road and allimprovements will be undertaken within the formation width of the road, there will no direct impacts on land use conversion.

The standard road construction works involve are site clearance, excavation, filling of earth materials and sub grade materials, laying of bituminous mixtures, handling of hazardous materials like bitumen, diesel, etc., dumping of unusable debris materials, transportation of materials from production site to construction site, and other constructional activities and associated works like mobilization of constructional equipments, setting up of different construction plants, setting up of workforce camps, quarrying, material storage etc. These activities have certain impacts of various magnitudes on different components of environment. The anticipated impacts due to all these activities have been described below:

5.1.2.1 Compaction and Contamination of Soil

Contamination of soil during construction stage may happen primarily due to construction and allied activities. The sites where construction vehicles are parked and serviced are likely to be contaminated because of leakage or spillage of fuel and lubricants. Contamination of soil during construction might be a major long-term residual negative impact. Unwarranted disposal of construction spoil and debris will add to soil contamination. This contamination is likely to be carried over to water bodies in case of dumping near water bodies.

Mitigation Measures:

- Construction equipment/vehicles should be routinely maintained to prevent leakage of fuels/ lubricants;
- Construction equipment/vehicles should be parked and maintained in designated areas on hard stand having perimeter drains to collect spilled liquids;
- Fuels and other liquid chemicals should be stored in designated storage areas with drip trays to collect leaked materials, if any.
- The Contractors shall ensure the use of a relatively new, well maintained hot mix plant (batch type) and maintenance of hot mix plants and batching plants should be regular and periodic to prevent any kind of oil leakage on soil surface.

5.1.2.2 Increased erosion and loss of top soil

Loss of topsoil: The topsoil on the land parcels, which is either used for short term (e.g., borrow areas, construction camps etc.) or permanent use (expansion of the road alignment), would be lost unless the same is preserved. The alignment passes through areas which have sandy loamor sandy clayey loam. These soils are light textured and are thus prone to erosion by winds and during rain, gravity erosion. Further, the movement of vehicle over land next to existing road andto access the construction site would also cause compactions of soil and affect soil fertility.

Waste from off-spec hot-mix as wells as from the regular operations of the machinery e.g. layersand bitumen sprayers during the surfacing of the roads. The concrete wastes from the batching plant and transit mixer wash water would also be generated.

The labour camps that would be setup for construction would generate municipal solid waste and hazardous waste (waste oil from the maintenance and operation of machinery). These wastes have potential to contaminate the soil around the site if it is not properly stored, handled and disposed. If these excess excavated material, construction and demolition wastes are disposed on agricultural land it may result in loss of productivity of land.

Mitigation Measures:

- The existing vegetation on slopes outside the immediate area of construction must remain undisturbed during construction and/or upgrading.
- Engineering and bioengineering techniques to be used to prevent barren slopes and to stop soil erosion and protect erosion prone areas from excessive grazing by animals;
- Slope failures should be monitored and remedial actions initiated at the earliest possible time
- Logging immediately above road should be restricted to reduce erosion/landslide potential;
- 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. Gabions are made up of Galvanized iron wire netting of 4 mm diameter having 10 cm square or hexagonal openings and filling the sausages with hammer dressed stones and wrapping the wire net at top.
- 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, shotcrete crib wall with vegetation and hedge brush layer
- Where practicable, excavated areas should be backfilled at the end of the working day.
- Guidance for establishment of construction camps, material storage or staging of plant and machinery.

Sites /land types to be avoided:

– Lands close to habitations
– Irrigated agricultural lands
– Lands belonging to small farmers
– Lands under village forests
– Lands within 100m of community water bodies and water sources as rivers to avoid contamination.
– Lands supporting dense vegetation and Forest with/without conservations status
– Low lying lands within 100m of watercourses
– Grazing lands and lands with or without tenure rights
– Lands where there is no willingness of the landowner to permit its use
– 2km from towns 500m from any villages
– Community land (Church, community forest) which is traditionally used asconservation areas

Land Types Preferred:

– Waste lands.
– Waste Lands belonging to owners who look upon the temporary use as a source ofincome.
– Community lands or government land not used for beneficial purposes.
– Private non-irrigated lands where the owner is willing.
– Lands with an existing access road.

5.1.2.3 Borrow Areas and Quarries

Need for opening borrows areas is anticipated. It may cause some adverse impacts if left un- rehabilitated. It may pose risk to people, particularly children and animals of accidentally falling into it as well as become potential breeding ground for mosquitoes and vector born disease. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, airand noise pollution. Quarry material will be sourced from existing licensed quarries. The dredging and use of dredged material, if involved, may have its impact in terms of localized sedimentation level increase and dispersion of pollutants present in the dredged material in the river water.

Mitigation Measures

- Borrow areas if required, shall not be located near forest areas. The edges of borrow sites shall be no closer than 3 meters from any fence line or boundary. Adequate clearance shall be provided for the construction of catch drains. Borrow sites shall have adequate drainage outlets unless the relevant landowner has agreed that the borrow area is to create a permanent tank or dam. Cut batter slopes shall not be steeper than 3 to 1 and shall be left by the Contractor in a tidy and safe condition to the satisfaction of the Engineer. Written clearance from the land owner/village head shall be obtained before leaving a site
- 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 land owners' desires to level the land. The top soil 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. TheIndian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed.

- The dredged material from the nearby water body shall be tested for presence of heavy metals and other pollutants before its reuse.
- 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 populated areas. Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil.

5.1.2.4 Ambient Air Quality

Construction stage impacts will have adverse impacts on the workers as well as the settlementsadjacent to the road, especially those in the down wind direction. Bituminous concrete which is used for pavement rehabilitation can affect the air quality by producing toxic gases. If the hotmix plant is installed nearby project road it will emit number of pollutants that can affect construction workers as well as habitation along the project stretches.

if the bituminous concrete cannot be sourced from outside, and install near project stretches, then there will be adverse impacts on air quality during construction stage. They are classified and presented in the table below. There are two types of pollution i.e. dust pollution and pollution from harmful gases.

Table 39: Adverse impacts on air quality during construction stage

Sl.	Impact	Source
1	Generation of dust	Transportation and tipping of cut material - while the former will occur over the entirestretch between the cutting location and disposal site, the latter is more location specific and more intense;
		Transportation of raw materials from quarries and borrow sites
		Stone crushing, handling and storage of aggregates in asphalt plants
		Site levelling, clearing of trees, laying of asphalt
		Concrete batching plants;
		Asphalt mix plants – due to the mixing of aggregates with bitumen;
		Construction of structures and allied activities
2	Generation of polluting gases including SO_2, NOx and HC	Hot mix plants
		Large construction equipment, trucks and asphalt producing and paving equipment
		The movement of heavy machinery, oil tankers etc.
		Toxic gases released through the heating process during bitumen production
		Inadequate vehicle maintenance and the use of adulterated fuel in vehicles.

The impacts are expected to be temporary (limited to construction period) and confined within construction areas.

Mitigation Measures:

- Vehicles delivering loose and fine materials shall be covered
- Limiting unnecessary idling of heavy machineries and other vehicles significantly reduce emission of polluting gases.
- Loading and unloading of construction materials in covered area or provisions of waterfogging around these locations.
- Storage areas should be located downwind of the habitation area.
- Periodic water sprinkling needs to be done wherever required.
- Regular maintenance of machinery and equipment needs to be done. Vehicular pollutioncheck shall be made mandatory and renewed as per requirement.
- Hot mix plants and other plants should be located at least 1.5 km from the nearest habitation, school, hospital, archaeological site, forest, rivers, streams and lakes, 500 m

from ponds, and national highway, 250 m from state highway, unless otherwise requiredby statutory requirements after securing a No-Objection Certificate (NOC) from the SPCB. Hot mix plant shall be fitted with stack of adequate height as may be prescribed by SPCB to ensure enough dispersion of exit gases.

- Bitumen emulsion and bitumen heaters should be used to extent feasible.
- CTE & CTO for HMP, BMP, crushers & DG sets need to be obtained.
- LPG should be used as fuel source in construction/labour camps instead of firewood.
- Mask and other PPE shall be provided to all the staffs/workers at construction site.
- Diesel Generating (DG) sets shall be fitted with stack/chimney of adequate height as per regulations (Height of stack = height of the building + 0.2 KVA. Low sulphur diesel shall be used in DG sets as well as machineries.
- Contractor should submit a site-specific air pollution management plan.
- Avenue plantation may improve the air quality during operation stage.
- Regular air monitoring will be done to check the ambient air quality of the area.

Table 40: Impact on Air Environment and Mitigation Measures

Parameters	Potential Impact	Mitigation Measures Suggested
Air Environment	• Generation of dust	• Sprinkling of water a. Earth handling site b. Borrow area. c. Road construction site d. Access road route • Air pollution control at crusher and Plants a. PPE for Workers b. Stone crushing units and Plants should be with environment compliance. c. Necessary clearance needs to be obtained prior to operation of the borrow area. • Regulations of construction timings near sensitive receptors and settlements
	• Gaseous Pollution	• Vehicles and machineries will be regularly maintained to conform to the emission standards. • Asphalt mixing sites and Crusher should be placed 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.

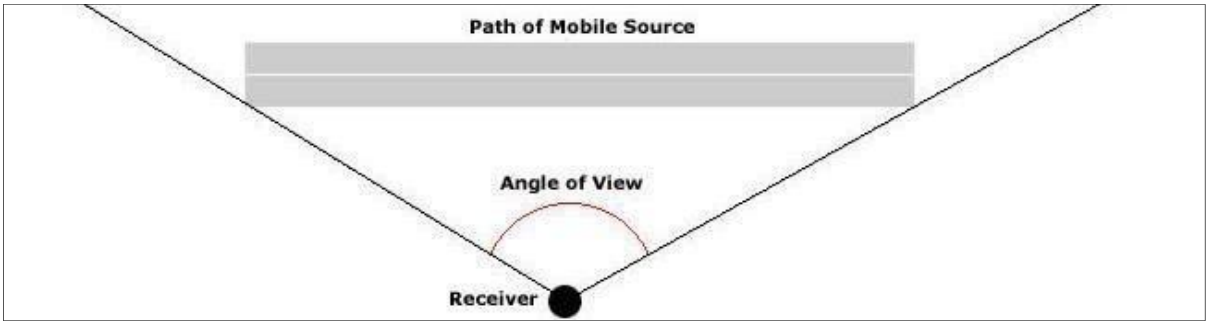
5.1.2.5 Noise

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

At the outset, it should be noted that unavailability of exact information on the construction methodology, hours of work, no. of equipment and their ratings / fuel consumption, construction schedule, etc. are the limiting factors while estimate the construction noise for this subject project; however, to represent the possible worst-case scenario, an effort has been made basedon 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 managingnoise on construction sites" by Dr Alan Wills (KVÆRNER) and David Churcher (CIRIA). Thetool 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 41: Typical noise levels of principal construction equipment (Noise Level in dB (A) at 50 Feet

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

ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / Hour	Speed (km/hr.)	Total (dB(A))
Total noise from site at receiver										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
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

ID	Type	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (^{0})	Traffic Volume / Hour	Speed (km/hr.)	Total (dB(A))
Total noise from site at receiver										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										
1	Asphalt melter (Stationary)	103	50	None	None	70	NA	NA	NA	59

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	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 thereceiver – considered as 50m.
- On Time (%): The percentage of time (of the overall time period in question) for which this plant ison.
- Barrier: If there is a barrier between the source and the receiver (None - To reflect the worst-casescenario)
- 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 anhour
- Speed: Average speed of the plant in kilometers per hour

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

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

The principal source of noise during construction of highway would be from operation ofequipment, machinery and vehicles. Earth moving machineries e.g. excavators, graders and vibratory rollers has potential to generate high noise levels. These machineries produce noise level of more than 70 dB (A). This can cause disturbance to the settlement, adjacent to the carriageway or at 500 m from the worksite. The vibration produced by rollers can be transmittedalong the ground. This may cause damage to kutcha structure located along the alignment. The extent of damage would be dependent on the type of soil, the age and construction of the structure. The noise generated during the construction would cause inconvenience to the population adjoining the road especially within 500 m of the alignment after which it would be attenuated to acceptable levels Since, the settlement along the road alignment is sparse the severity of the noise in sensitive receptor are given below.

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

Table 42: Anticipated Noise due to construction in the sensitive receptor

Name of the Component	Description	Road Name	Distance from the road (m)	Noise Level (dB)
CHC	Church	Nongstoin-Sonapahar Road to Mawsiangphet, Link 2	142.07	61.92
CLG	College	Nongstoin-Sonapahar Road to Mawsiangphet, Link 1	34.47	74.23
SCH	School	Nongstoin-Sonapahar Road to Mawsiangphet, Link 1	77.78	67.16
CHC	Church	Nongstoin-Sonapahar Road to Mawsiangphet, Link 1	122.15	63.24
DVO	District Veterinary Office	Nongstoin-Sonapahar Road near AH & Veterinary Office to Nongstoin-Pyndengrei Road	16.39	80.68
CHC	Church	Nondein, New Nongstoin, Link 1	43.27	72.25
CLG	College	Nongstoin College to permanent campus of Rev. S. Wollington Children Home of the KJP Synod Sepngi	22.08	78.09
CHC	Church	Nongstoin-Old Nongstoin road to Domthangksingat Nongstoin, Link 2	22.74	77.84
CHC	Church	Ladweitang-Mawiong Lumsyntiew to connect Nongstoin-Rambrai road at 3rd km	131.49	62.60
CHC	Church	5th km of Nongstoin-Markasa Road to Mawrok Porsohsat Village, Link 5	46.10	71.7
CHC	Church	A village road from Nongstoin-Mawkawah road to Peacenola Memorial Playground Mawkawah, Link 2	13.16	82.5
SCH	School	Nongstoin-Sonapahar Road to Mawsiangphet upto St. Francis D' Assisi College, Link 1	74.44	67.54
CLG	College	Nongstoin-Sonapahar Road to Mawsiangphet upto St. Francis D' Assisi College, Link 1	25.82	76.74
SCH	School	Road from Nongstoin-Mawkawah road to Petjyllan (Near Anderson H/S School) to connect NH-44E	1.25	103.04
CHC	Church	Nondein, New Nongstoin, Link 1	48.05	71.34
SCH	School	Nondein, New Nongstoin, Link 1	1.21	103.32

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

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

Control Measures adopted during Construction Phase for Noise Environment

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

5.1.2.6 Surface Water Quality and Siltation

Construction activities may increase turbidity level increasing the sediment load. Sometimes contamination of surface water may take place due to accidental spills of construction materials,oil, grease, fuel, and paint. Degradation of water quality is also possible due to accidental discharges into watercourses from drainage of workers camps and from spillages from vehicle parking and/or fuel and lubricant storage areas. During construction phase, care would be exercised to control silt so that the water available in the ponds and wells especially those located very near to the ROW may not be contaminated.

Extraction of sand from the river bed will increase turbidity and affect propagation of fishes and other aquatic life mainly benthic organisms. The macro-benthic life which remains attached to the river bed material may get dislodged and carried away downstream by turbulent flow. Miningand dredging activities, poorly planned stockpiling and uncontrolled dumping of overburden, and chemical/fuel spills from equipment's and machinery involved in dredging may cause deterioration of water quality for downstream users, and poisoning of aquatic life. However, the river bed sand quarries identified for the project have no density and diversity of benthic fauna. Fishing is practiced in the water bodies intersecting the project road. There are several ponds adjacent to the proposed project road. Moreover, any extraction of river bed material is regulated by different authorities like State Environmental Impact Assessment Authority, State Pollution Control Board and State Mining Department with an objective to conserve top soil, avoid impact on aquatic biodiversity, hydrological regime etc. by haphazard and unscientific mining of minor minerals. The project will utilize river bed materials from existing licensed quarries with all stipulated conditions of above-mentioned authorities.

Mitigation Measure**:**

- Construction works near waterways/water bodies will not be undertaken during themonsoon season
- Retaining walls have been proposed to prevent erosion
- Installation temporary silt traps or sedimentation basins along the drainage leading to thewater bodies;
- No construction camp within 500m of any water body
- Locating all parking, repair and fuel and hazardous material storage area away from any water body. Vehicle parking and maintenance areas will have waterproof floors from which drainage is collected and treated to legal standards.
- Refuel vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge
- Collect all waste oil, store in sealed damage-proof containers and dispose it to recyclers.
- All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.
- Temporary retention ponds, interception drains, and silt traps are installed to prevent siltladen water from entering adjacent water bodies/waterways;
- Modification and rechanneling of the slope of embankments leading to water bodiesshould be modified and rechannelled to prevent entry of contaminants.
- Comply with requirements of the clearance issued by the relevant state authority formining in rivers

- No construction related activities of bridges during breeding season of fish and otheraquatic species.

5.1.2.7 Impacts on natural drainage and watershed management (flooding)

Along the rivers and streams crossed by the road, there is a need for bank protection measures to avoid accelerated sedimentation that can affect drainage pattern as well as riverine habitats. The alignment follows the existing topography except for the location of the cross-drainage structure. There is no existing Major Bridge on the Project Road section only 4 nos. of RCC Bridge and 11 nos. wooden bridges exist, and no additional bridges are proposed to be constructed. Out of the 196 nos. of existing culverts, 45 nos. are Pipe Culvert, 1 no. is RSJ with Wooden Deck & 150 nos. are Slab culvert. All culverts present in the project road are either hydraulically inadequate or structurally unsafe & hence are proposed for reconstruction.

- **Proposed Mitigation Measure:** At all locations where the preliminary design has indicated araise in the level of the embankment, the final design should review the feasibility of the same and if possible, reduce the embankment height.
- At all location where the vertical profile has increased by 0.25 to 0.50 m or more protections of embankment is required.

A slope protection measure that has been successful in Meghalaya has been the use of Vertiveras a Bio engineering measure. The basis of this technique is plantation of Vetiver plants of approved variety specifically designed as per the soil and site conditions. For controlling the underwater erosion, a flexible mattress is proposed to be used. This mattress made of waste/recycled items like empty cement bags which will remain intact for long periods under water has been found effective in controlling underwater erosion elsewhere in Meghalaya. The stretches along the river bank will also have a reed bed which will absorb the flow energy beforethe water current hits the bank.

5.1.2.8 Ground Water Quality

Water for construction purpose will be sourced mainly through major streams along the project road. Suitable arrangement for drinking in the campsite will be managed by contractor without affecting availability to local community. The area is not classified as critical semi-critical or overexploited by CGWB. However, uncontrolled drinking water abstraction can deteriorate the situation. Contamination of groundwater is not envisaged since all construction camps will have septic tanks or mobile toilets depending on the number of workers in each camp.

Mitigation Measures:

Provision for adequate numbers of septic tank to avoid contamination of ground water.

- Requisite permission will be obtained for abstraction of groundwater.
- The contractor will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected.
- Water harvesting structures shall be proposed for groundwater augmentation in the projectarea.
- No change in groundwater regime is envisaged hence no mitigation is proposed.

5.1.2.9 Construction and Demolition Waste

Construction and Demolition waste shall be generated during the project construction phase. A certain amount of waste will be generated. Those wastes shall be utilized by the Contractor depending upon suitability. However, Contractor shall dispose unused C&D waste at designated disposal site as per construction and demolition waste management rules 2016.

Mitigation measures:

Contractor will use the excavated road side material for construction of road. The rest unsuitablematerial will be disposed suitably. The lead and lift have been considered in cost estimates. The Contractor will not dispose the excavated unsuitable material generated from hill section to other side (valley side) of the project road. Proper disposal plan will be prepared by theContractor to dispose the unsuitable material generated from hill cutting/ road excavation.

5.1.2.10 Natural Disaster

Flood and flash flood is common during the monsoon in the vicinity of the proposed project road. During public consultation it was revealed by the local people that flash flood occurs in several villages in the project area during the months of monsoon season. Hence All CD structures have been proposed to design with anticipated risk of flood. Embankment height along potential flood affected areas shall increase. Lined and unlined side drains have been included in the design to avoid waterlogging.

Relevant IS codes have been adopted in designing the structures to sustain the highest magnitude of earthquake.

5.1.2.11 Disruption of Community Services

Local services, including water supply lines, irrigation line, drainage, ditches, streets are commonly cut during road earthworks. These activities are required by the local people for crop production, drinking water supply and access, and have the potential to damage road work too. These services are often either inadequately reconnected or not reins ted at all.

Mitigation Measures

- The Contractor will arrange their own source to cater for their water requirement for construction and other activities and will not interfere with the local water supply system
- All irrigation canals, water supply lines and stand pipes, drainage and streets will be maintained during construction or if necessary, temporary services shall be arranged of the owner/ user's permission for temporary cessation will be gained.
- All the Services will be progressively reinstalled as soon as road excavation has been completed.

5.1.2.12 Diversion of Traffic

Since the road upgradation works will be on the existing road only, therefore there will be direct interface with the road traffic. The Short-term impacts associated with the project will be traffic diversion and management during construction phase. Construction activities will cause hindrance to the existing traffic flow. There is possibility of accident hazards during construction

phase of the widening project. There will be requirement for diversion of existing traffic atvarious construction sites during construction phase. It needs to be mentioned that though thereare no direct impacts on the natural environment due to disruption/diversion of such services, but diversion can also lead to adverse impacts if not planned properly. Rapid restoration of diverted services can help in minimizing the severity of impacts arising out due to diversions of existing services.

Mitigation Measures

- Proper preventive measures will be taken during the construction activities at theconstruction sites
- Reduce speed through construction zones.
- Construction of bridges/culverts will be carried out prior to construction of newcarriageway at the first stage.
- Strengthening/raising of existing two lanes will be done only after the completion of thefirst stage.
- Proper warning signs will be displayed at construction sites.

5.1.2.13 Impacts on Occupational Health & Safety

The Construction workers are continuously exposed to dust and gaseous emission during construction activities. The construction industry falls in hazardous category and there is always risks of accidents to the labours. However, this type of risks of Occupational hazards can be managed with implementation of proper safety at site.

Mitigation Measures:

- The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and all national, state and local core labor laws on working conditions and safety during construction.
- The Contractor will Develop and implement site-specific Health and Safety (H&S) Plan including SoP for preventing spread of COVID-19 epidemic which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) H&S training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents
- The Contractor will provide adequate good quality Personal Protective Equipment (PPE) to all the workers working at construction zones and Plant sites and will ensure thatthese PPEs are used by workers at all time during works.
- Safe access to the work site and safe working conditions to be maintained throughoutthe working period.
- Adequate drainage, sanitation and waste disposal will be provided at workplaces.
- Proper drainage will be maintained around sites to avoid water logging leading to variousdiseases.

- Adequate sanitation and waste disposal facilities will be provided at construction campsby means of septic tanks, soakage pits etc.
- A health care system will be maintained at construction camp for routine check-up ofworkers and avoidance of spread of any communicable disease.
- Readily available First Aid kit bearing all necessary first aid items will be proved at all the worksites and should be regularly maintained.
- The Contractor will organize awareness program on occupational health and safetyaspects as well as on HIV/AIDS and sexually transmitted diseases (STDs) and COVID-19 on periodic basis through authorized agency.
- Preventive measures require to be followed to avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labour for workers on periodic basis.

5.1.2.14 Work Site Safety

Construction site safety is one of the most overlooked things during a construction project. In most workplaces accidents are common due to lack of work site safety. Accidents have the potential to be life-threatening and can be avoided through proper Work site Safety.

Mitigation Measures:

- Safe access to the work site and safe working conditions to be maintained throughoutthe working period
- Scaffolding to be used properly.
- Avoid enter a trench that is unprotected.
- Avoid ladders with metallic components near electrical work and power lines
- Head Protection, use helmet or body harnesses
- Construction workers should wear work boots with slip-resistant and puncture-resistantsoles
- Hazard communication: Make information accessible to employees at all times in a language or formats
- Check all electrical tools and equipment regularly for defect
- The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and the statutory norms on safety during construction.

5.1.2.15 Anticipated Impact on Biological Environment:

Impact on Faunal and Terrestrial Ecology:

The entire project site is within the Town there are no National Parks, Wildlife Sanctuaries and other eco-sensitive areas nearby.

There is hardly the presence of any Endangered/ Schedule - I species in the project area, as confirmed by site visits as well as consultation with community and Forest/Wildlife department. Majority of the important species are reported from outside of the ROW.

The traffic – animal conflicts during the operation stage shall be resolved by implementingspeed calming mitigation measures such as road humps, rumble strips, speed limits, signboards etc.

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

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

Mitigation

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

Impact on Flora and Mitigation measures:

The project has significant, direct and long-term impact on roadside trees in the Pre- construction stage. The cutting of trees shall have manifold impact. Most visible impact will be the loss of shade. Also, there is a possibility of the local people being deprived of tree products, such as wood, fruits, leaves etc. Removal of roadside tress will reduce comfort levels for slow moving traffic and pedestrians.

- Trees impacted due to the project shall only be cut after requisite permission from State Forest Department is obtained.
- Trees impacted by the project shall be compensated by planting of endemic tree specieswhich are highly tolerable to vehicular emissions and dust as per IRC: SP 21.

- All necessary measures such as siting of construction establishments away from human habitations; increase of stack height; regular maintenance of construction equipments and vehicles; etc. shall be taken up to reduce the dust and gaseous emissions during construction activities.
- The compensatory plantation shall act as the new habitat for avifauna, lesser mammals, herpetofauna & insects. List of species recommended for taking up compensatory afforestation has been presented in the table below. Local authority and populace may also be consulted for selection of species types.
- All efforts shall be made for the survival of planted trees. A Memorandum of Understanding should be signed with competent authority or agency to take up the plantation.

Species Recommended for Plantation:

Table 43: Species name for plantation

Scientific Name	Role
Azadirachta indica	Noise barrier, Pollution sink, Economic & Medicinal Value
Cassia fistula	Landscaping, Flowering plant, Pollution sink
Ficus bengalensis	Noise barrier, Pollution sink, Shade, Supports other species, Religious values
Ficus religiosa	Noise barrier, Pollution sink, Shade, Supports other species, Religious values
Mangifera indica	Noise barrier, Pollution sink, Shed, Economic & Medicinal Value
Syzygium cumini	Pollution sink, Economic Value (fruit bearing)
Terminalia arjuna	Noise barrier, Pollution sink
Terminalia chebula	Noise barrier, Pollution sink, Shed, Economic & Medicinal Value
Alstonia scholaris	Noise barrier, Pollution sink, Shade, Supports other species
Dillenia indica	Noise barrier, Pollution sink, Shed, Economic & Medicinal Value
Mimusops elengi	Noise barrier, Pollution sink, Shed, fruit
Lagerstroemia speciosa	Landscaping, Flowering plant, Pollution sink
Bombax ceiba	Landscaping, Flowering plant, Pollution sink
Mesua ferrea	Noise barrier, Pollution sink, Shed, Economic & Medicinal Value
Neolamarckia cadamba	Noise barrier, Pollution sink, Shed, Economic & Medicinal Value

Impact on Aquatic Ecology:

The Simsang River is situated within close proximity to the Project Site. The major impacts on the aquatic ecology during construction include increase in the silt inflow to the surface water bodies and disposal of liquid wastes and untreated sewage from construction camps and labour

camps into the surface water bodies. No negative impacts are envisaged on the aquatic ecologyduring the operational phase.

Mitigation measures

- Construction of road embankments shall be adhered to base on specified norms as per slope ratio and turfing on the slopes to reduce the embankment erosion. Construction of cross drainage structures will be taken up during lean flow period to avoid the silt inflow to the surface water bodies.
- If any aquatic animals, such as turtles, are found near the construction site at any pointof time, the contractor shall immediately upon discovery thereof contact authorized wildlife rescuer or Forest Dept. for rescue of the said animals.
- No fishing should be allowed by construction workers
- Liquid wastes and sewage from the construction establishments will be treated to meet the CPCB standards before disposing it into water bodies.
- Accidental chemical spills shall be handled by emergency spill procedures such as stopping the flow; removing ignition source; initiating emergency response; cleanup and safe disposal.
- Provision for silt traps has been made at regular intervals, especially at major cross drainage structures to trap the silt before it reaches the water bodies along the subproject road.

Management of Construction Debris/Waste

Construction debris/waste is generated due to demolition of existing structures, scarification of existing pavement and excavation on some sections of the subproject road etc. Improper disposal of scarified bitumen causes decrease in soil fertility and water pollution. Careless disposal of debris can obstruct waterways causing siltation of reservoirs and reduce capacity. Unleaded demolition wastes will cause traffic blockage and dust, thus causing inconvenience and health risks.

Mitigation measures

- During the site clearance and disposal of debris, the contractor shall take full care to ensure that public or private properties are not affected; there are no dwellings below thedumpsite and the traffic is not interrupted.
- The Contractor shall at all times ensure that the entire existing canal and drains within and adjacent to the site are kept safe and free from any debris.
- Construction waste debris shall be utilised for backfilling embankments, filling pits, construction of cross roads, approach roads and landscaping before being disposed intodisposal pits.

- Debris disposal sites shall be sited away from sensitive locations like settlements, water body, forest areas and any other sensitive locations.
- The debris dumpsites have to be suitably rehabilitated by planting local species ofshrubs and other plants so that the landscape is coherent with the local environment.
- Care should always be taken to maintain the hydrological flow in the area and that the dumping sites do not contaminate the water sources such as rivers and ponds.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location. Permission from the Village/local community is to be obtained for the Disposal site selected.

Environmental Management Plan for Construction Stage						
	Tree cutting in ROW	Land clearing activities at the construction site should be kept at an absolute minimum. No tree felling is there.	Throughout the Project area	Construction Stage	Contractor And Supervision Consultant Forest Dept.	PIU
	Endangered s species	- Relevant information (e.g., encounter with vulnerable species during engineering work) shall be shared withthe State Environment and Forest Department and concerned regional environmental experts. - Anti-poaching measures during the construction phase should be strengthened to check for any violationof existing regulations. Awareness campaign to be made among the workers to make them aware about theendangered and other important species. - Construction vehicles must be operatedat safe speed to avoid collision with wildlife. - In case rare birds of prey are observed near the construction area, the construction work will be avoided duringtheir breeding season. - Before construction of piers the construction site must be checked for the presence of threatened turtles, migratory birds and other threatened species and their nests. If turtles and/or their nests are found inside or near the construction site, the animals and/or the eggs must be physically moved to safe habitat areas under the guidance of the local wildlife experts. Natural bank slope is preserved and location of the bridge piers by avoidingsuch areas will be ensured. The construction camp, borrow areas or disposal sites will be established within100m of the shorelines at the highest water level period.	Throughout the project area	Construction Stage	Contractor and Supervision consultant	PIU

Environmental Management Plan for Construction Stage						
	Hygiene at Construction Camps	- The Contractor during the progress of work will provide erect (temporary) living accommodation for the labourers and maintain necessary and ancillary facilities for labourers at appropriate standards and scales approved by the resident engineer - All temporary accommodation shall be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. The sewage system for the camp must be properly designed, builtand operated. - Compliance with the relevant legislation must be strictly adhered to. Garbage bins shall be provided in the camp and regularly emptied and the garbage disposed of in lined landfill sites. - Upon completion of the works, the entire temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the entire site left clean and tidy.	Wherever labour camp is setup	Construction Stage	Contractor a Supervision Consultant	PIU

5.2 Social Impact Assessment

5.2.1 Projects Impacts

The urban infrastructures project is associated with some adverse impacts as well as some benefits. There was no land acquisition and impact on livelihood of the people living.

To identify the impacts, Census survey was carried out in September, 2021. The ESIA was conducted during the pandemic situation in 2021, Socio-Economic Survey for the families who will be affected due to construction work, was conducted from 10th November to 20th December 2021.During the socio-economic survey, public consultations were also carried out.

5.2.2 Positive Impact

This sub-project aims to reduce traffic congestion within the Nongstoin Town roads. The storm water drain improves the existing system of rainwater 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 corridorwill reduce accidents.

- People residing at the Nongstoin Town Roads can easily travel within the area. It will give a major fillip to the quest for all weather good roads for the PIA.
- Lower accidents and provide quick accessibility to services like hospital, market, office etc.

5.2.3 Impact on Land

As discussed earlier, there is no scope of land acquisition in the project area because all of the proposed sub-projects are well within the available existing RoW. The proposed construction of Parking areas is within the available Government land. Thus, the project does not involve any land acquisition or land donation.

5.2.4 Impact on Structures

During the census survey the structures were also enumerated along the sub-project road.Based on the updated DPR design, there would be no impact on any structures belong to private individuals both title and non-title holders or Community Displaced Families

5.2.5 Impacts on Families

As there is no land acquisition and the RoW is free from any encroachments or encumbrances there will be no permanent impact to any families.

5.2.6 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.There will not be any impact on gender pattern of Meghalaya.

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. Thus, the impact Gender is not different from the general population. Itwas identified that social and economic benefits for affected STs 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.

5.2.7 Migration

The Decadal growth rate of the West Khasi Hills district and town clearly indicates influx of migrates from the nearby districts and villages. During the field survey it was found thatmigration is very low percentage in the society.

5.2.8 Impact on Tribal People

a. Impact on Land, Structure& Livelihood of ST

As there is no Land Acquisition and the RoW is free from all encumbrances there will be no impact of the land, structures and livelihood of the ST population.

b. Impact on Socio Economic Profile of ST

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.

c. Impact on Community

There is no cultural heritage site of the ST which comes in the way of the road alignment. There was no impact on cultural or social impact on the ST population was found.

5.2.9 Impact on Access to Services Amenities

- 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. Nongstoin Town roads are of great importance, as the road will carry not only the normal town traffic, but also the freight traffic that will connect the export points to the National Highway.

- Solid Waste Dumping Facilities

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

- Source of Drinking Water

Table 44:Source of Drinking Water

Sl.	Types of drinking Water Source	Numbers	Percentage
1	Tap Water by ULB	15	100%
2	Groundwater/surface water	-	-
Total		15	100%

Source: Survey, September 2021

- Distance of Medical Facilities

Medical facilities like government hospital and urban health centres (UHC) are not easilyavailable within 5km for 14% of the population.

Table 45:Distance of Medical Facilities

Sl.	Distance of Medical Facilities	Numbers	Percentage
1	Within 1km	4	27%
2	Within 2km	5	33%
3	Within 5km	6	40%
4	More than 5km	-	-
Total		15	100%

Source: Census & SES Survey, September 2021

The proposed project will enhance the standard of living and/or quality of life of the residents ofWest Khasi Hills. During the construction there might be some temporary restrictions to reach / cross the road etc. have to be taken care in the Resettlement Plan.

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

5.3 Impacts on Road Safety and Human Health

The planning and designing of the project road are 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 the condition of curves in road geometrics, (3) improving upon road crossings and (4)putting right signals and signboards.

5.4 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 negativepotential 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 46: 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 tobe 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 town hospital • Preventive measures should be taken to check the spreading of STDs
Influx of Labour force from nearby states	The project is not huge and can be easily completed with the local labour force. There might movement of labour from the neighboring districts within the state.

6 CHAPTER-VI: ENVIRONMENTAL MONITORING PROGRAM

The purpose of the monitoring program is to ensure that the envisaged purpose of the project isachieved 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 planin future projects.

6.1 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 establishthe current status of an environment or to establish trends in environmental parameters. In all cases the results of monitoring will be reviewed, analyzed statistically and published. The design of a monitoring program must therefore have regard to the final use of the data before monitoring starts.

6.2 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 Table 47**.**

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

Table 47: 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	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. (Total 02 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 Samplerto be located50m from theplant in the downwind direction. Use Method specified by CPCB for analysis	Air (P&CP) Act,1981 and its amendment	As directed by the PIU (02 Project locations)	Three times in a year for two years (Excluding Rainy season)	P I U through NABL approved monitoring agency	P I U
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 01surface water samples in project stretch	Three times in a year for two years (Excluding Rainy season)	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
Water Quality	**Operation Stage**	Parameter 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 (02 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. (Total 03 locations)	Three times in a year for two years.	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU
	Operation Stage	Noise levels on dB (A) scale	As per CPCB	Noise standards by CPCB	As directed by the PIU (Total 03 locations)	Three times in a year for two years.	PIU through NABL approved monitoring agency	PIU
Soil Erosion	**Construction Stage**	Turbidity in Storm Water Silt load in ponds, water courses	----	As per Standard (ICAR)	01 location construction camp and 01 major Construction locations. (Total 02 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 (Total 02 locations)	Three times in a year for two years.	PIU through NABL approved monitoring agency	PIU

6.3 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 6, 18,000/- is estimated for the construction and Operation stages. The details have been presented in Table 48

Table 48: Environmental Monitoring Cost

Cot of Environment / Migration Plan Description	Unit	Quantity	Unit Rate	Cost
Air quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Construction Stage)	No.	12	9000	108,000
Air quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Operation Stage)	No.	12	9000	108,000
Water quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Construction Stage)	No.	12	7000	84,000
Water quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Operation Stage)	No.	12	7000	84,000
Noise quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Construction Stage)	No.	12	3000	36,000
Noise quality monitoring at 3 locations for 3 seasons for 2 consecutive years.(Operation Stage)	No.	18	3000	54,000
Soil quality monitoring at 2 locations for 3 seasons for 2 consecutive years.(Construction Stage)	No.	12	6000	72,000
Soil quality monitoring at 2 locations for 3 seasons for 2 consecutive years. (Operation Stage)	No.	12	6000	72,000
Total				**618,000**

7 CHAPTER-VIII: Climate Change Impact & Risk

A rapid increase in the number of motor vehicles on road in Meghalaya has been observedover 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 thefuture and to ease off the pressure of vehicles on the roads, hence. This would require policy changes in the way lending is done by banks, enabling fuel mix with biofuels, and behavioral changes of the population whereby they use more and more non- motorized transport at short distances and public transport for long distances.

7.1 Climate Change Mitigation

The Transport Emissions Evaluation Model for Projects (TEEMP) developed by Clean Air Asia was utilized to assess the CO2 gross emissions with and without the project improvements.The main improvement from the project that was considered for the model are better surface roughness with initially 6 m/km which may deteriorate over a period but not less than 2 m/km and widening of roads from the single/intermediate lane to two lanes with paved shoulder (7m). These were translated into impacts on traffic speed and hence fuel consumption. Themodel also allows for the inclusion of impacts related to traffic congestion with and without project through provisions for inserting data on the traffic numbers, lane width, number oflanes, and volume/capacity saturation limit.

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

- The road configuration will change from an intermediate lane to two lanes with a carriageway width of varies from 2.4 to 7 m with 1.5 m hard shoulder on both sides. The road will have an asphalt concrete surface.
- The surface road roughness is mostly 6 m/km and will be improved to 2.0 m/km, which may further reach up to 3.5 m/km during 5 years of road operations. Resurfacing of the road would be required after 5 years.
- The design life of the road is 20 years.
- Other improvements include the repair or reconstruction and improvement of culverts, longitudinal and cross drains, and removal of irregularities on the existing vertical profile and road safety appurtenances.

Emission factors were mostly taken from the CPCB/MOEF (2007) Draft Report on Emission Factor Development for Indian Vehicles, the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and Health, Relevant Emissions from in-Use Indian for three- wheelers rickshaw as presented in Table below. Emission factors were taken from the CPCB/MOEF&CC (2007) Draft Report on Emission Factor Development for Indian Vehicles,the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and HealthRelevant Emissions from in-Use Indian for three-wheelers rickshaw as shown in Table 49

Table 49: CO2 Emission Factors

VehicleType	Petrol	Diesel	LPG/CNG
2-Wheel	1.37kg/l		

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

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

For 20.925 km of road construction would result in emission of approximately 2155.275 tCO2eq. (Source: Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation - A Toolkit for Developing). This value if based on estimation of materials required to upgrade /construct of rural road which include cement, steel, gasoline, diesel, and bitumen etc.

Estimated carbon emissions:

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

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

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

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

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

Therefore, for 20.925 km of road construction would result in emission of approximately 2155.275 ton CO_2 eq.

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.

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 202184, 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. Highestannual rainfall is 5440.8 mm in the year of 1995. Details rainfall variation table is given below:

	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

Table 47: Mean rainfall (mm) and coefficient of variation (CV) of the state for the monsoon months,southwest monsoon season and annual

Comparing[5] 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. [6] 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 cancause disruption of the road networks, decreased accessibility, erosion of roads and embankments, surface water drainage problems, slope failures, landslides,among others. Increased river flow resulting from precipitation and storminess may result in damages to bridges, pavements, and other road structures. Bridge/culvert capacities are reduced or exceeded, causing upstream flooding to occur.
- **High Temperature Impacting Road Stability**: Extreme heat, combined with traffic loading, speed, and density can soften asphalt roads, leading to increased wear and tear. There would likely be concerns regarding pavement integrity such as softening, traffic-related rutting, embrittlement, migration of liquid asphalt. Additionally, thermal expansion in bridge expansion joints and paved surfaces may be experienced.
- **Earthquake**: All districts of the state of Meghalaya lie in Zone V. Centered 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

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

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 withhighly 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, Dilni etc. 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 isa 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.

7.2 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 50**.** It must be noted that all these events either simultaneously or in isolation can generate severe disastrous impacts on road infrastructure.

Table 50: Possible Climate Events, Risks, and Adaptation Measures

Sl..	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 pressureof roads iv. Decreased cohesionof soil compaction v. Traffic hindrance and safety	a. Certain critical sections affected by overland floodingof 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 werefound 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 pocketshave been provided. e. Improved cross-drainage capacities required for thequick conveyance of floodwater by replacing small diameter pipes with box culverts with higher dischargeopenings has been considered. f. The bottom of the sub-grade has been kept 0.6m above HFL, to avoid over topping, water-logging of theroad 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 ruttingunder 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

8 CHAPTER-VIII: PUBLIC CONSULTATION

8.1 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 atthe 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 likelyto 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, 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, village council 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 widerpublic input from both the primary and secondary stakeholders.

8.2 Objectives of the Public Consultation

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

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

Identification of Stakeholders

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 negativelyor positively by the project, like the project beneficiaries and project implementing agencies. Secondary stakeholders included other individuals and groups, with an interest in the project, viz., the town/urban road users, Government Stakeholders and the line departments.

8.2.1 Project Stakeholders

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

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

Stakeholders and their level of interest may change as the project progresses, depending onthe impacts associated with each stage of planning, construction and post-construction. Table 51 below provides a list of specific stakeholder's involvement and their level of impact and interest during project lifecycle.

Table 51 Consultation Methods

Sl.	Categories of Stakeholders	Involvement of Stakeholders		
		Planning	Construction	Post Construction
2	Local Communities	Frequent	Occasional	On required basis
3	Village Headmen & Gram Panchayat members (local elected representatives)	Frequent	Occasional	On required basis
4	Women's belonging to various socio-economic groups	Frequent	Occasional	On required basis
6	Local Elected Members	Occasional	On required basis	On required basis
7	Concerned Officials from Government	Frequent	Occasional	On required basis
8	NGOs and CBOs	Occasional	frequent	As and when required

8.3 Methodology for Consultations

Both formal and informal modes of consultation were used in the public consultation process forthe project. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questionnaires. In addition, focused ground discussions (FGDs) and personal discussions with officials, on-site discussion with project affected stakeholders, and reconnaissance visits have also been madeto the project area. The attempts were made to encourage participation in the consultation process of the government officials from different departments that have relevance to the project. Same way, local people from different socio-economic backgrounds in the villages as well as urban areas along the road alignment and at detours, women, residents near the existing road, local commuters, and other concerned were also consulted.

Stakeholder Consultations

8.4 Project Stakeholders

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

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

Stakeholders and their level of interest may change as the project progresses, depending onthe impacts associated with each stage of planning, construction and post-construction. Table 52 below provides a list of specific stakeholder's involvement and their level of impact and interest during project lifecycle.

Table 52: Consultation Methods

Sl.	Categories of Stakeholders	Involvement of Stakeholders			Pre-Construction	
		Planning	Construction	Post Construction	Level of Impact	Level of Interest
1	Persons living near to the alignment	Frequent	Occasional	On required basis	Moderate (Entrance to the home may be blocked sometime)	Low
2	Local Communities	Frequent	Occasional	On required basis	Moderate (Traffic movement will be slow during construction)	Low
3	Village Headmen & Gram Village Council members (local elected representatives)	Frequent	Occasional	On required basis	Moderate (Traffic movement will be slow during construction)	Low
4	Women's belonging to various socio-economic groups	Frequent	Occasional	On required basis	Moderate (Traffic movement will be slow during construction)	Low
5	Other vulnerable groups	Frequent	Occasional	On required basis	Moderate (Traffic movement will be slow during	Low

Sl.	Categories of Stakeholders	Involvement of Stakeholders			Pre-Construction	
		Planning	Construction	Post Construction	Level of Impact	Level of Interest
					construction)	
6	Local Elected Members	Occasional	On required basis	On required basis	Low	High
7	Concerned Officials from Government	Frequent	Occasional	On required basis	Low	High
8	NGOs and CBOs	Occasional	frequent	As and when required	Low	High

8.5 Methodology for Consultations

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

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

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

Table 53: Consultation Methods

Sl.	Stakeholders	Dialogue Level	Issues for discussion	Frequency of Engagement	Form of Engagement
2	Agricultural laborers	Proactive Information	Issues related to livelihood and livelihood and training opportunities in the project and through other programs under CSR	Monthly	Open Dialogue with the affected persons
3	Women and Girls	Direct Contact and discussions	Issues related to GBV, safety, sanitation, and hygiene. Vocational training for women empowerment	Monthly	Open discussions with women and girls through the ANM and school authorities
4	Indigenous people (ST Community)	Contact through the Gram Pradhan	Common interest with that of the local community	Quarterly	Open Dialogue
5	Contractors and	Regular	Issues of common Interest in the day-	weekly	Regular Direct

Sl.	Stakeholders	Dialogue Level	Issues for discussion	Frequency of Engagement	Form of Engagement
	Sub-contractors	Direct Contact	to-day functioning of the project.		Contact
6	Unskilled and semi-skilled local labour	Regular contact through the labour supplier	Issues related to employment opportunities and payments	monthly	Information dissemination and redressal of payments related complaints raised by the labourers.
7	Surrounding Community	Regular Direct Contact	Common Interest on social and environmental issues	Monthly	Community event and open dialogue
8	Gram Village Council	Regular Direct Contact	Common Interest on employment, livelihood trainings, CSR activities, and social & environmental issues	Monthly	Information dissemination and suggestions and feedback.
9	Tehsil/District Officials	Occasional Direct Contact	Documentation of land deeds and local permits	As required	Formal meetings
10	Central and State Level authorities	Occasional Direct Contact	Permits and clearances	As required	Formal meetings
11	Local Political groups	Occasional Direct Contact	Common interest with that of the local community and administrative issues	As required	Information dissemination
12	NGOs and CBOs	Occasional Direct Contact	Common interest with that of the local community	As required	Information dissemination

Source: Socio-Economic Survey on 2021

8.6 Consultation with Local People and Beneficiaries

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

- Awareness and extent of the project and development components;
- Benefits of the project for the economic and social upliftment of community;
- Labour availability in the project area or requirement of outside labour involvement;
- Local disturbances due to project construction work;
- The necessity of tree felling etc. at project sites;
- Impact on water bodies, water-logging, and drainage problem if any;
- Environment and health
- Flora and fauna of the project area
- Socio-economic standing of the local people.

Table 54: Brief Description of some sample Public Consultation

Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input totechnical Design
Place: Maweit Nongstoin Date: 22/01/2022	Total-4 Male-2 Female-2	The town is basically a trading hub. The cultivators as well as the traders are concern of selling their agricultural and industrial output at proper price. Though the town faces lack of infrastructural facilities, but they think that with better communication there would be economic development which would add on to their prosperity. As this proposed road is the only communicationto the outer world, they want the road to be completed withinschedule time.	The road after constructed would have majorimpact on both the economic andsocial life of the local people.	The road is expectedto be completed by two years.
Place: Mawbyrshem Nongstoin Date: 22/01/2022	Total-5 Male-3 Female-2	The livelihood loss of the people is apprehended. The local people want some jobs ofunskilled labour and petty supplier to the Civil Contractor. The local were positive about development. As per the suggestions received through public consultation, the proposed project and its benefits is the only feasible option for development of thearea.	The proposed road project is theonly feasible option for development.	The people agreed to cooperate and help in all possible ways for the successful completion of the project. The PWD assure to provide jobs and petty contract as many as possible to the local people.
Place: Sawap Nongstoin Date: 22/01/2022	Total-4 Male-3 Female-1	The existing alignment passes through the town area. It is alsoa junction town where many Goods vehicles pass through. There are both commercial and residential establishments along the alignment. As the proposed road will allure the motorist to drive fast there lies a probability of increase in roadaccidents and mishaps.	Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for the development. Road Safety will be given first priority.	The local authorities also assured that they would help in development of road project. Road safety awareness campaign should be made at schools. There would be sufficient signage and other road furniture to reduce the accident.

Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input totechnical Design
Place: Pyndengrei Road Date: 22/01/2022	Total-6 Male-4 Female-2	A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers,businessmen, and others regarding the project benefits. The most important topic of discussion was the alignment which passes through the two-market complex, which will be temporarily affected during upgradation of road. .	The local people had agreed in the view of the proposed road project which will bring some hope to the movement of the heavy vehicles and development of the area.	The PWD officials had agreed to take special care for traffic movement and road safety.
In addition to the above specific public consultations and FGDs the peoples were also consulted. In thevillages the impact of social and economic are more. In all the villages the access to the market would increase and based on this the valuation of land and properties would also increase.				

Table 55: Pictures of Consultations and Project Site

		Special attention is needed on the road crossings/intersections and sharp turns to avoid traffic snarls and accidents. Proper traffic signals and signboards should be present at strategic points not only for the sake of motorists but also forthe pedestrians. Dated: 22/01/2021. .
Improper/illegal parking not only causes hindranceto the smooth flow of traffic but also increases the probability of road accident. Therefore, the local people demanded for a separate parking bay especially in congested areas. Dated: 22/01/2021.		

		Existing condition of the present road which needs immediate upgradation/restoration not only to allow smooth flow of traffic but also to minimize the countof road accident. Moreover, the affected stretches of road turn into nightmare during monsoon. Dated: 22/01/2021. .
Public Consultation in progress. Dated: 22/01/2021.		
		Mobile vendors have been identified on different places on the project road that need to be vacatedto allow pedestrians using the footpath. Date: 22/01/2021.
Dumping area should be identified. Dated: 22/01/2021. .		

8.7 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 centerline 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 thefollowing table below

Table 56: Summary of Consultation Outcome

Issues Discussed	Outcome
Relocation Options Compensations/Assistance	During consultation they were convinced that there will be no permanent impact but temporary impact during the active construction period. If there is going to be any economic displacement of petty shop ownersand vendors, all non-title holders, they will be compensated and/or provided assistance as per the ESMF guidelines.
What are all the facilities provided through this project and to whom shouldwe approach?	Facilities like bus shelters, rest rooms, pavements, drains etc. would be provided. Officers such as PWRD Engineers 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. The proposed project does not envisage any widening of the existing roads. Thus, there will be no damage to any structures beyond the existing RoW. 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	There were differences in opinions among the villagers in demolishing/ shifting a Bus shelter. It was agreed that bus shelter has been proposed in the DPR.
Cross Drainage for alignment	People have shown their concern for the proposed drainage pattern forthe 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 linesif 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 there are structure to be impacted, measurements are required. Otherwise, there are no requirements of measurements of structures.

Issues Discussed	Outcome
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. If there is any inconvenience of access, loss or damage of structures of any immovableassets the Civil Contractor will provide necessary access and compensation of the same will be provided as per the ESMF in discussion with the affected party.

Table 57:Consultation Conducted on Proposed Road 2nd Phase

Sl.	Location	Date	Participants	Male	Female
1	Sibsing Memorial School	28.01.20222	2	2	0

8.8 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 Assessment on Nongstoin Town Roads.

Location:	Office of CETEST Pvt. Ltd, Kolkata and CEG Tower, Jaipur vide Video ConferenceMode
Date:	21.01.2022
Time:	4.00 pm
Attendees:	Mr. Sukesh Gupta, Team Leader, CEG Ltd. My. Shyam Sundar Khandelway, Asso. Director, CEG Ltd.Mr. Anirban Nayak, Road Safety Specialist, CE Testing Mr. Supriya Deb, Highway Expert, CE Testing Mr. Swarnava Bandhopadhyay, Environmental Specialist, CE TestingMr. Suman Sarkar, Social Specialist, CE Testing

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

Table 58: Minutes of the meeting of ESIA and DPR consultant

Sl.	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 thatthere is no proposal for Land Acquisition.
2	**Demand forall weatherroad**	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.

Sl.	Topic	Details of Discussion	Decision
3	**Road safety**	ESIA Consultants asked about theconvex 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 clarifiedthat all the required safetymeasures 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 itnot only act as a prevention of accidents but also an important source of public security intended to reducecrime. 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 likelyin the dark than in daylight. Severaldecades 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 atbuilt – up areas and other safety measures viz. Chevron signboards, Road studs are proposedas safety measures at night.
5	**Storm Water Drain**	The Local People demanded storm water drain as much as possible throughout the alignment. At congestedarea it should also have cover and use as footpath.	DPR Consultants clarified that storm water drains are provided at all required locations. Trapezoidal 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 shouldbe proposed at regular intervals.	Bus shelters are proposed in the DPR at all built up locations where people are expected to use public transport.
7	**Other facilities**	There should be speed breakers in front of school, church and market place	Boundary wall is proposed to completely segregate the school from traffic. Road humps/Rumble strips are proposed at cross roads of all junction. Hence safetyis 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 ESIA 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 were found to be inside Proposed RoW; Hence no tree felling

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

The Details of Participants and Public Consultation photographs are attached in Annexure 2:

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: Town: **Nongstoin** Urban/ Rural Area: **Urban**

Tehsil: **Nongstoin** District: **West Khasi Hills**

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 Usageof land
3. Private land required	Acres			
a. No. of land owners affected	Number			
b. Persons whose livelihood is primarilydependent 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
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

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

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	Nil
b. Title Holders	Number	Nil
c. Non-Titleholders – Encroachers	Number	Nil
d. Non-Titleholders – Squatters	Number	Nil
e. Vendors affected	Number	Nil
f. Petty shop keepers & Kiosk affected	Number	Nil

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**

S No	Items	Results
5	Total number of Community Property Resources affected	**Nil**
6.	Total Number of Families temporarily affected during construction	Nil

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) not required	**Abbreviated Resettlement Action Plan (ARAP)not required**
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) not required	Not Applicable
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 notrequired	ESIA required

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 A

3

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Table 59: Details of Public Consultation at Sibsing Memorial School on 2nd Phase

Date	Issues Discussed	Response	Participant
28.01.2022	➢ During school hours, presence of children are seen, thus must planthe work schedule avoiding the entry and exit timing of the students. ➢ The road must be diverted from the place into the side as the school is planning to prepare the playground which is present in theside of the existing road which is again in the school's property. ➢ Maximum students are coming from the Maweit area which takesa lot of time for the children. Thus,this road development will absolutely benefit the students of the school. ➢ Noise must be monitored during school hours so that disturbancein class can be avoided 	➢ It was assured that the construction workwill be stopped duringthe school hours. ➢ The Contractor will be persuaded to induct the local people as per their skills.	Total = 2 Male = 2 Female = 0

Table 60: Details of Public Consultation at DFO, Nongstoin

Date	Issues Discussed	Response	Participant
28.01.2022	➢ A joint survey is required to identify the way of the road duringplanning phase. During the implementation phase it is to be identified what are the trees required to fall under the forest sector area are to be surveyed and then finalized. ➢ For involving the forest officers, Project award with alignment along with KML file must be submitted to the DFO office from PWD department for receiving the clearance. ➢ No wildlife sanctuary is present in the area as the forests are mainly community forest and managed and maintained by local villagers. ➢ No forest is involved in the Town roads modification, only in the Nongstoin- Maweit road there are some forests but all are of privatein nature. ➢ According to the meeting there are around 250 trees having GBHof around 15cm in where continuous 4 hectres are forest. ➢ There are no declaredforest foundin the Nongstoin-Maweit road according to the last census available. ➢ As of wildlife availability, need to talk with Khasi hills Wildlife division, Social and Territorial section for more updates. 	➢ A framework has to be develop to addressthis issues. ➢ Alignment of the project road along with KML file will besubmitted to DFO Office. ➢ Afforestation activity will be done along the project road as per the ratio of 1:10.	1

9 CHAPTER-IX: RESETTLEMENT ACTION PLAN

As there is no scope of land acquisition and the RoW is free from all encroachments and encumbrances in the project area after final design. As per the guidelines of World Bank there will be only ESIA. No Resettlement Plan or Abbreviated Resettlement Plan is envisaged at this stage.

10 CHAPTER-X: Tribal People's Development Plan

The Tribal People in India are categorized as indigenous community who often become vulnerable in development projects because of their cultural autonomy, economic status, and enduring 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 identifying characteristics:

- Self-identification as members of a distinct indigenous cultural group and recognition ofthis identity by others;
- Collective attachment to geographically distinct habitats or ancestral territories in theproject area and to the natural resources in these habitats and territories
- Customary cultural, economic, social, or political institutions that are separate fromthose of the dominant society and culture; and
- An indigenous language, often different from the official language of the country orregion.

There is no impact on the community structure or community land of cultural or religious sentiment of the ST Population in the Primary PIA. The proposed project will ensure that STs receive culturally appropriate social and economic benefits, do not suffer adverse impacts as a result of projects, and can participate actively in projects that affect them. There is no cultural heritage site of the ST which comes in the way of the road alignment. The ST population among the Surveyed Families in the PIA are living in the towns and in the due course of time became the part of the main stream population. Presently the impacted ST population does not follow any customs that are attached to their land or natural habitat which will be impacted. Thus, there will be no cultural or social impact on the ST population and no requirement of Tribal People's Development Plan.

11 CHAPTER-XI: Gender Action Plan

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 abouthuman and tribal rights. Thus, there no specific requirement to create an institutional frameworkto make gender sensitive decisions. Women consulted within project associated villages and together identify awareness programs on "women's role in development and maintenance of public assets".

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. answered, "Securing equal treatment for men and women in the workplace." Following measures are proposed as part of Gender Action Plan:

11.1 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.

11.2 Recommendation for Gender Sensitization

- Implementation of the Vishakha Guidelines as amended as The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013 in case of sexual harassment against women should be displayed at the project sites and other important location.
- Earmarked parts of parking bays for women two-wheeler drivers and women car drivers to ensure their security.
- Making Sulabh toilets for women workers, with fittings for pregnant and disabled women at the project site.
- Better maintenance of street lighting and roads, especially near education institutions and workplaces of informal sector workers.
- Provision of quality drinking water and sanitation services, including menstrual hygiene facilities for women workers at the project office and other site offices.
- Safer vending and market places at project sites and by the road side.
- Conduct regular trainings of drivers, conductors, auto-drivers and traffic police on sexual harassment in public spaces and what support systems can be accessed.
- Develop protocols and response systems to address sexual harassment in transport facilitiesand display police and women's helpline numbers prominently in all project offices, public places and important junctions
- Ensure regular patrolling by PCR vans in highly vulnerable areas.

- Ensure presence of visible security, including CCTV at all important and vulnerable locations. Build trust and confidence among female citizens.
- Ensure effective operation of the women's helpline and registering FIRs and other complaints.
- Ensure effective functioning of Sexual Harassment Committees in all institutions and Local Complaint Committees at local, district level that can be accessed by women workers in the informal sector.

12 Chapter XII: Implementation of ESMP and RAP

Due to is wide scope, the project activities will be implemented by many agencies: Public Works Department (PWD), Urban Affairs (UA)Department, Department of Tourism, Transport Department and Community and Rural Development Department. Each of the mentioneddepartments, 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).

PDs will work under the overall guidance and oversight of a Project Advisory Committee headed by 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 project implementation.

Meghalaya Infrastructure Finance Development Corporation (MIFDC) set up under the Planning Department will be responsible for overall planning, coordination, implementation and monitoring 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 the entire project. It will ensure that ESIA is conducted and ESMPs are prepared and that the ESMF 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 following diagram.

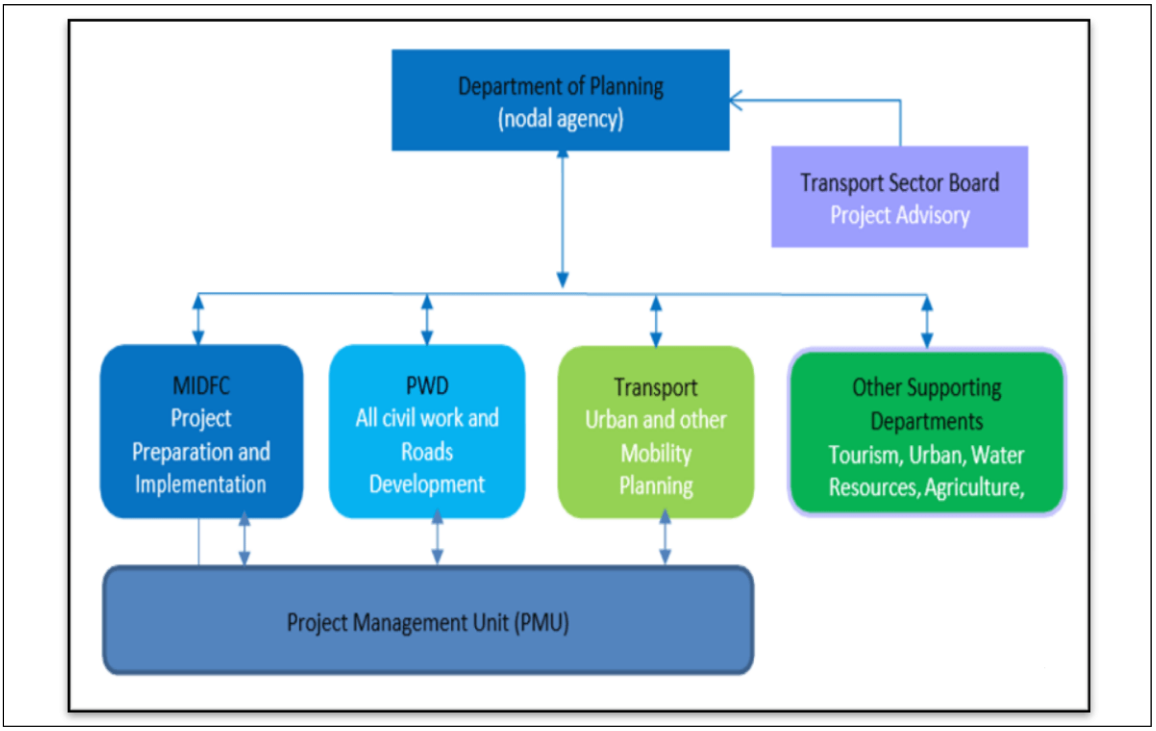

Figure 29:Project Implementation Arrangement

12.1.1 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 (including E&SMPs). The PMC will also assist MIDFC in preparing semi-annual safe guards monitoring reports. Specific roles of the PMC with regard to ESMF implementationwould include the followings.

12.1.1.1 Preparatory Stage:

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

12.1.1.2 Implementation Stage:

- Conducting periodic site visits and observe the measures taken as per the safeguard norms.
- On the spot guidance to contractors / implementing agencies on safeguards;
- Preparation of site-specific reports and sharing with MIDFC;
- Documentation of learning cases for sharing and dissemination;
- Visual documentation of site-specific safeguard measures;
- Tracking activity specific environmental and social monitoring indicators;
- Organizing / facilitating refresher training courses for stakeholders;
- Monthly and quarterly progress report preparation and submission to MIDFC.

12.1.1.3 Post-Implementation Stage:

- Consolidation of periodic monitoring reports;
- Support in conducting environment and social audit;
- Consolidation of good practice documents and its submission to MIDFC;
- Final sharing workshop on environment and social safeguard practices and its outcome.

12.1.1.4 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 gender aspects. The district/sub-district level implementing agencies will execute and monitor the 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 realization 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 Director directly.

12.1.1.5 Environmental Expert

The environment expert will look after environmental aspects. She/he will guide the project team on environmental aspects and support in building environmental parameters to be built in the bids. She /he will also guide the contracts and monitor their works from time to time. In case ofrequirement, she/he will prepare a detail environment management plan for different activitiesto be executed by the project. The expert will be guided by the MIDFC Project Director andreporting to the Project Director directly.

12.1.2 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.

12.1.3 Institutional Capacity to Manage Social Development Aspects

12.1.3.1 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. The Project lies within the Khasi Hills Autonomous District Councils. The ADC with the village councils or looks after the administration of the Council areas.

12.1.3.2 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.

Grievance Redressal Committee

(GRC) Grievance Redress

Mechanism

Effective grievance redressal mechanism gives an opportunity to the organization to implementa set of specific measures to ensure good governance accountability and transparency inmanaging and mitigation of environmental land social issue of a particular project. This consists of defining the process for recording/receiving complaints and their redressal in respect of environmental andsocial matters. 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. The grievance redressal mechanism should be in place at the time of initiating the implementation of ARAP & RAP and civil construction activities in the project area. A platform for grievance redressal should 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. The project, apart from web-based mechanism, will have three-tire grievance redressal mechanism, i.e., (1) at the project site level, (2) State level (PMU level) and (3) Judiciary level.

Web based grievance mechanism[11]: In case of grievances received through toll free numberor 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 aunique number will be generated for all such complaints. The complainant should follow upbased on that unique number. All calls and messages should be responded within 15 days. Ifresponse is not received within 15 days, the complaint should be escalated to the Project Director.

Tier I: Under this project, the local VECs and community level organizations will serve as the first- tier mechanism to handle complaints and grievances. The local Headman will be the focal point whowill receive, address, and keep record of the complaints and feedbacks. The grievance focal point will first review the grievances submitted. If grievances or disputes cannot be solved at the VEC's 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 orshe can escalate the grievance to state level grievance cell. The tier II cell will be under theChairmanship of Secretary, Department of Planning. The other members will include Chief Engineer; Project Director and Social Expert of the Project. The second level of grievance cell will provideits view within 30 days of receiving the grievance.

Tier III: The aggrieved person if not satisfied with the verdict given by State level grievance cell, will havethe right to approach the Judiciary. Project will help the aggrieved person in all respect if personwants 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.

Grievance management through Electronic Mode

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

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 is currently being undertaken. Before the start of civil contractor appointment, the GRC at project level will be formed with consultation with the populations and Beneficiaries so that the grievances are resolved at the project site only. There should be a Women Cell at the PMU. The contractorand the other stakeholder's office will display the Vishaka 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 61: Details 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

13 CHAPTER-XIII: MONITORING & EVALUATION

The M&E framework of ESMF is designed to assess the progress and achievements againstthe 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 institutionalarrangements; 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 eachproject activity.

13.1 M&E of the ESMP application

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

- Has the categorization of the project activities be end one accurately and or changed (A to B)?
- Has the Environmental and Social Screening Checklist been used in all applicable activities?
- Has the scoping for further assessment been done comprehensively for all applicable activities?

Monitoring of E&S aspects in project activities:

- Are the contractors and implementing agencies undertaking periodic and regular monitoring of the E&S implementation in the project activities?

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 the contractors?

13.2 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 be
quantitatively and qualitatively measured and compared over a period of time to understand theimpacts.
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 projectsand regular visits by the Social cum Gender and Environmental specialists of the PMU.

13.3 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:

13.4 Periodic Evaluation

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. Itwould 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.

13.5 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 underthe supervision of Project Director/Chairman of ULB. Data collected for monitoring activities shall be suitably analyzed 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 affected person, if occurs duringconstruction (Now PAP=0) establishment of grievance redressal mechanism (including processes and timeline for redressal of grievances),
- consultation meetings with local populations and communities regarding issues related with construction,
- 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.
- 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 forcomparison

14 CHAPTER-XIV: 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 theproject to eliminate adverse environmental impacts, to offset them, or to reduce them toacceptable 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:

- Required permission for Camps, CTO/CTE for DG sets.
- Relocation of common property resources and community assets like temples, telephone poles, electric poles and hand pumps etc. if any;
- 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 activitiesundertaken 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 mixplants, 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 theagencies concerned.
- Planning traffic diversions and detours including arrangements for temporary land acquisition (if required).

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 issuesthat have been addressed as part of good engineering practices, the costs for which have beenaccounted for in the Engineering Costs.

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

The PIU/Independent Engineer shall be involved in the smooth execution of the project andassisting the contractor during this phase. Their work shall include but not limited to:

- Monitoring and guiding the contractor on adopting good environmental andengineering practices;
- Arrangement of plantation through the Forest Department;
- Arranging training to the contractor and other stakeholders according to the needsarising; 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 62: 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.	Throughout Corridor	PIU, Revenue Dept. NGOs Collaborating Agencies	-
P2	Land Acquisition	The same alignment will be followed for improvement from existing single lane with earthen shoulder to standard single lane configuration with paved shoulder and geometric correction at few locations. There will be no widening of any road. Hence, land acquisition for this project not required.	Throughout Corridor	PIU, Revenue Dept. NGOs Collaborating Agencies	-
P3	Preservation of Trees	• All efforts will be made to preserve trees including	Throughout Corridor	PIU Forest	

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		evaluation of minor design adjustments/ alternatives to save trees. Specific attention will begiven for protecting giant trees, and locally important trees (religiously important etc.). (No Tree Cutting) • In the event of design changes, additional assessments includingthe possibility to save trees shall be made. • Stacking, transport and storage of the wood will be done as per the relevant norms.		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 keptin mind while relocating all utilities and CPRs. • There are 7 educational institute (ref totable 49) and 8 religious structures are found in this project road which areaway (minimum 10 m) from project road and no impact was anticipated on them	Throughout Corridor	PIU Concerned Agencies Contractor	
P5	Orientation of Implementing Agency and Contractors	• The PIU shall organize orientationsessions and regular training sessions during all stages of the project. Thisshall include on-site training (generalas 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 andContractor. 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 communityresources. • The verification exercise should assessthe need for additional protection measures or changes in design/ scale/ nature of protection measures	Throughout out Corridor	Contractor and Environment al Expert of AE	PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		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.			
P7	Assessment of Impacts due to Changes/ Revisions/ Additions in the Project Work	• The Environmental Expert of AE willassess impacts and revise/ modify the EMP and other required sections of the project documents in the event of changes/ revisions (including addition or deletion) in the project's scope of work.	Throughout out Corridor	Contractor Environment al Expert of AE	PIU
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 totheir 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 CTO/CTE/Consent/NOC for allsuch 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. 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 standardspromulgated under the Environment Protection Act, 1986 will be strictly adhered to. • Noise limits for construction equipments to be procured such as	Throughout out Corridor	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		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 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 atleast 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 environmentalrequirements, as applicable, will be thesole 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 reportto 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 asfar 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
P11	Quarry	• Authorized Quarries that meet environmental and social standards and the necessary technical specifications will be	Along the Project Influence Area	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		identified by PIU in the project area - Quarries must adhere to World Bank Environmental Health and Safety Guidelines - In case of new Quarries, they must have permission from the Department of Mining and Geology and have the necessary clearances from Pollution Control Board and Forest Department and a valid Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA); - Quarry should not be operating in any sites of valuable critical or natural habitat - Quarry should not be operating in landslide or erosion prone zones - Quarry should not disrupt drainage pattern or cause water pollution - Quarry should not be operating on the road where operations can disrupt traffic or pose safety risks - Quarry workers must haveaccess to Personal ProtectiveEquipment during operations - Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials and other logistic arrangements. In case the contractor decides touse quarries other than recommended by DPR consultant, then will be selected based on the suitability of the materials.			

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• 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.			
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 withthe requirements of the State Ground Water Department and seek their approval for doing so and submit copies of the permission to AE and PIUprior 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 Lay-out	• Sitting of the construction camps willbe selected by the contractor as per the guidelines. • 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 1000m from watercourses. • The waste disposal and sewage system for the camp will be designed, built and operated such that no odor is generated.	Along the Project Road	Contractor	Environmental Expert of AE and PIU
P15	Arrangements	• The contractor as per prevalent rules	Along the	Contractor	Environmental

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
	for Temporary Land Requirement	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 Expertof 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 orcompletion of the activity) is included in the contract.	Project Road		Expert ofAE and PIU
P16	Implementation - Information Meetings	• The contractor will organize at least 2 implementation information meetings inthe 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 localresources (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(Village Council offices, offices of Market committees, notice board of religious places etc.) and distribution of pamphlets along roadside communitiesor 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 disclosureshall be approved by PIU prior to the meetings.	Along the Project Road	Contractor	Environmental Expert of AE and PIU
P17	Disaster Management	• The Contractor will develop and maintain emergency response system in order to address any	For entire project stretch	Contractor	Environmental Expert of AE and

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
	and Emergency Response Plan	accidents or other emergency situation or disaster at site such as fall of workers from height, collapse of pier, flood, earthquake, accident,etc.	including bridge locations, camp site and plat site		PIU
P18	Chance Finds Procedure	• As unknown features/objects could be encountered during works, earthworks, a "chance finds procedure" shall be in place to stop works and require investigation by an archaeologist in case of such findings and involvement of relevant state entities	Along the Project Road	Contractor	Environmental Expert of AE and PIU
CONSTRUCTION STAGE					
C1	Clearing and Grubbing	• Vegetation will be removed from the construction zone before commencement of construction. Allworks will be carried out such that the damage or disruption to flora other than those identified for cutting isminimum. • 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. • No tree cutiign is there. • 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 utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.	Along the work in progress	Contractor	Environmental Expert of AE and PIU
C2	Disposal of debris from dismantling structures and road surface	• The contractor shall identify disposalsites. The identified locations will bereported 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	Along the work in progress	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		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 intothe surface water bodies or form mud puddles in the area.			
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 anywater 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 disposalor any non-compliance that may arise on account of lack of action on his part.	Along the Road	Contractor	Environmental Expert of AE and PIU
C4	Stripping, stocking and preservation of top soil	• The topsoil from all areas of cuttingand 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	Along the Road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		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 - • 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	• Temporary diversions will be constructed with the approval of the	Along the Road	Contractor	Environmental Expert of

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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	Detours	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 and TheContractor 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 ofwater three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).			AE and PIU
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 areaswill 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 outas 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	Borrow Areas	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		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 forRedevelopment of Borrow Areas or as suggested by Environmental Expert of AE. • The final rehabilitation plans will be approved by the Environmental Expert of AE.			
C8	Quarry Operations	• The contractor shall obtain materialsfrom 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 besubmitted 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 toPIU and AE prior to opening of the quarry site. • The quarry operations will be undertaken within the rules andregulations 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
C10	Construction Water	• Contractor will arrange adequate supply and storage of water for the whole construction period at his own	Along the Project	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		costs. The Contractor will submit a list of source/s from where water will be used for the project to 'PIU' through theEngineer. • The contractor will source the requirement of water preferentially from ground water (NOC from CGWA) 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 precautionto minimize the wastage of water in the construction process/ operation.			
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 and Flood control	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. 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 temporaryor permanent flooding of the site or any adjacent area. Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert of the PIU to prevent temporary or	Drainage line along the road	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		permanent flooding of the siteor any adjacent area • To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like: • Drainage line will be constructedall 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. • Although, effective drainageof water from road side drainage system has been provided throughout the project stretch			
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. • The fencing will be provided prior to commencement of earthwork andcontinue 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 andbus 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, Howeverthe 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
C14	Slope Protection and Control of Soil Erosion	• The contractor will take slopeprotection measures as per design, or as directed by the Environmental Expert of AE to control soil erosion and sedimentation.	Along the Roads	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• All temporary sedimentation, pollution control works and maintenance thereofwill 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 ofgrass 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 thebank. 4. Along sections abutting water bodies, stone pitching as per design specification will protect slopes.			
C15	Water Pollution from Construction Wastes	• The Contractor will take allprecautionary measures to prevent the wastewater generated duringconstruction 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. • The Environmental Expert of the PIU will certify that all liquid wastes disposed off from the sites meet the discharge standards.	Along the road	Contractor	Environmental Expert of AE and PIU
C16	Water Pollution from Fuel and Lubricants	• The contractor will ensure that all 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	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 PIU. • Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelingwill 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 fueling locations, to preventcontamination of water. • 'Oil interceptors' shall be provided in wash down areas and re-fueling 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 offin 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.			
C17	Dust Pollution	• The contractor will take every precaution to reduce the level of dust from crushers/hot mix plants, construction sites involving earthwork by sprinkling of water, encapsulation ofdust 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 controllegislation. • The suspended particulate mattervalue at a distance of 40m from a unit located in a cluster should be less than500 g/m3. The pollution monitoring isto be conducted as per the monitoring plan. • Alternatively, only crushers licensed bythe SPCB shall be used. Required	Along the Roads, Construction Site/ Camps	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		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.			
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 PUCcertificates 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. • Servicing of all constructionvehicles and machinery will bedone regularly and during routine servicing operations, the effectiveness of exhaustsilencers 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 atthe 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	Along the Roads , all vehicles used/Camps	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		the night time between 10.00 pmto 6.00 am. • No construction activities will be permitted around educational institutes/health centers (silence zones) up to a distance of 100 mfrom the sensitive receptors i.e., school, health centers and hospitals between 10.00 pm to 6.00 am. • Monitoring shall be carried out atthe construction sites as per the monitoring schedule and results will be submitted to Environmental Expert of AE through the 'Engineer'. • No noisy construction activities will be permitted around educational institutes/health centers (silence zones) up to adistance of 100 m from thesensitive receptors i.e., school, health centers and hospitals between 9.00 am to 5.00 pm			
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 toworkers who are engaged in welding works • Protective goggles and clothing toworkers engaged in stone breaking activities and workers will be seated at 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	Along the Roads, all vehicles used/Camps	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
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		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 beemployed on the work of painting with products containing lead in any form. • The contractor will also ensure that no paint containing lead or lead productsis 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 rubbedand 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.			
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.	Along the Roads	Contractor	Environmental Expert of AE and PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		• 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'.			
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 for prompt first aid treatment. Construction Safety Plan prepared by the Contractor will identify necessary actions in the event of an emergency.	Along the Roads, construction Camps	Contractor	Environmental Expert of AE and PIU
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 MoRTH 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 reasonable precaution to prevent his workmen or	Along the Roads	Contractor	Environmental Expert of

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		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 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, if required in consultation with the forest officials. • No tree felling is there. Still all efforts during the design stage should be made to minimize the tree felling requirement • No compensatory plantation will be required.			AE and PIU
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 onthe 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 acquaintthe 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 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	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
		construction. • The construction will commence onlyupon the written approval of the Environmental Expert of AE. • The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienicmanner and as approved by the AE. • The sewage system for such campswill be properly designed and built so that no water pollution takes place in adjacent canals			
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 providepotable 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 • Adequate water supply is to be provided in all toilets and urinals	Along the Roads, construction Camps/ Construction Sites	Contractor	Environmental Expert of AE and PIU
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	Along the Roads	Contractor	Environment al Expert of

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		enhancement drawing of the site forwhich enhancement has been proposed and take their consent beforethe start of work. • Accesses to Different Schools along the road will be developed to the satisfaction of 'PIU'.			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, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor'sexpense, to the entire satisfaction tothe Environmental Expert of AE andPIU will certify in this regard.	Along the Roads, construction Camps	Contractor	Environmental Expert of AE and PIU
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

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
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. • 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	Along the Road	PIU through Pollution Monitoring Agency	PIU
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 beblown 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	Soil Erosion and Monitoring of Borrow Areas	• Visual monitoring and inspection of soil erosion at borrow areas, quarries (ifclosed 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
O8	Road Safety and Traffic	• Road Safety will be monitored during operation especially at location where traffic-calming measures have been proposed. • 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	Along the Road	PIU	PIU

Sl. No.	Environmental Issue	Management Measures	Location	Responsibility	
				Planning and Execution	Supervision/ Monitoring
		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 toensure 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 ofthe 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 timeperiod 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 remindersshall 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 lapsefrom the date of issuing the second reminder.

- If a major lapse is not rectified upon receiving the notice PIU shall invoke reduction, inthe 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.

Table 63: Environmental 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 ofthe road where construction is in progress at the site. (Total 02 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 Samplerto be located50m from theplant in the downwind direction. Use Method specified by CPCB for Analysis	Air (P&CP) Act,1981 and its amendment	As directed by the PIU (02 Project locations)	Three times in a year for two years (Excluding Rainy season)	P I U through NABL approved monitoring agency	P I U
Water Quality	Construction	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	Three times in a year for two years (Excluding Rainy season)	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
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 (02 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. (Total 02 locations)	Three times in a year for two years.	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU
	Operation Stage	Noise levels on dB (A) scale	As per CPCB	Noise standards by CPCB	As directed by the PIU (Total 02 locations)	Three times in a year for two years.	PIU through NABL approved monitoring agency	PIU
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. (Total 02 locations)	Three times in a year for two years	Contractor through NABL approved monitoring agency	Environment Expert-AE/IE/PIU

Environmental Component	Project Stage	Monitoring					Institutional Responsibility	
		Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
	Operational Stage	Turbidity in Storm Water Silt load in ponds, water courses	----	As per Standard (ICAR)	As directed by the PIU (Total 02 locations)	Three times in a year for two years.	PIU through NABL approved monitoring agency	PIU

14.8 Environmental Monitoring Budget:

The environmental monitoring cost is estimated on the basis of the length and existing environmental scenario of the proposed project. Environmental management cost of INR26,02,000 is estimated for the construction and Operation stages. The details have been presented in Table 64

Table 64: Environment Management Plan Implementation Budget

Sl. no	Environmental Components	Particulars		Unit		Rate In (Rs.)	Approx. Quantity	Total Cost In
								(Rs.)
		Mitigation / Enhancement Cost						
2		Construction Stage						
2.1	Air	Dust Management with sprinkling of water, covers for vehicles transporting construction material		20.925Km		Cost included in Total Civil Cost		
2.2	Water	Provision of Taps		No.		Included in utility shifting and replacement cost.		
	Water Bodies	Enhancement of Road side Ponds		No.		Retaining wall has been proposed to protect this water bodies. Cost of retaining wall is included in total Civil Cost.		
		Oil trap at parking/servicing of construction vehicles (at three location every 14km)-		No.		Ref: Project Cost Estimate		

Sl. no	Environmental Components	Particulars	Unit	Rate In (Rs.)	Approx. Quantity	Total Cost In (Rs.)
2.3	Environmental Enhancements	Enhancement of traffic sign outside of most sensitive locationsmentioned in EMP, by planting of traffic sign and planting of 1 row oftrees at a distance of 3m c/c and as per directions of the Engineer	No.	At this location proper traffic sign has been proposed. The cost of traffic sign isincluded in total civil cost.		
2.4	Flora	No tree felling will be required	Nil			
	Provision of Mobile Toilets at Work Site	Supply and commissioning of mobile toilets on wheel (5 units each Toilet and Bathroom) with proper water supply and drainage system, electric supply and safe access at work site locations	Nos.	1	250000	250000
		Maintenance: Daily cleaning twice a day by engaging one permanent helper	Monthly	24	18000	432000
		Painting at every six months	Six Monthly	4	25000	100000
	Noise barrier	Provide the Noise barrier at sensitive areas like schools andhospitals. The noise barriers of hollow brick wall/reinforced concrete panels with height of 3.5m. The design of the noise barrier shall be approved by the engineer in charge**.**		Cost of noise barrier is included in Total Civil Cost.		
2.5	Silt Runoff Control	Slope stabilization, turfing, silt fencing etc.		For slope stabilization turfing has been proposed on high embankment. Cost of slope stabilization is included in Total CivilCost.		
2.6	Slope/ embankment protection measures	Stone pitching, Gabion, retaining wall, Turfing at toe line, etc.		For Slope/ embankment protection Retaining wall, Turfing has been proposed. Cost of Slope/ embankment isincluded in Total Civil Cost.		
2.7	Relocation of sensitive receptor	Relocation of religious structure, educational properties and health care center		Cost of relocation is included in Total Civil Cost.		
		Total Mitigation / Enhancement Cost				782000

Sl. no	Environmental Components	Particulars	Unit	Rate In (Rs.)	Approx. Quantity	Total Cost In (Rs.)
3		**Operation Stage**				
3.1	Soil erosion	Mitigation measure for soil erosion		included in Total Civil Cost		
3.2	Contamination from spills due to traffic and accidents	Clearing of spills at accident site			Averagecost	700,000
3.3	Flora	Maintenance of planted trees	Already included in construction phase			
3.4	Safety	Traffic management and Traffic control	Part of project construction cost.			
		Total Mitigation / Enhancement Cost				700,000

Table 65: Summary of Environmental Management Budget

Sl. No.	Environmental Components	Cost (Rs.)
1	**Construction Phase**	
1.1	Total Mitigation / Enhancement Cost	782000
1.2	Environmental Monitoring Cost	309000
Total Cost in Construction phase		**1091000**
2	**Operation Phase**	
2.1	Total Mitigation / Enhancement Cost	700000
2.2	Environmental Monitoring Cost	309000
Total Cost in Operation Phase		**1009000**
3	**Miscellaneous Cost**	
3.1	Environmental Awareness and Training	1,20,000
3.2	Administrative Charges including logistics	4,00,000
Total Cost in Miscellaneous		**520000**

TOTAL BUDGETED COST (1+2+3)	**2620000**

An environmental management budget at of INR 26,02,000 has been estimated for implementation of the environmental management plan. This budget includes cost of environmental monitoring and associated trainings.

15 CHAPTER-XV: 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 peopleabout 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,). The project is not huge and can be easily completed with the local labour force. There might movement of labour from the neighbouring districts within the state.

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 forremedial 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 ofthe 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

Name of the sub-project	NONGSTOIN ROADS
Size of the project (approx. area in sq. mt/hac or length in mt/km, as relevant)	20.925 Km
Location of the proposed sub-project	Meghalaya, India
Name of the of the district, block	West Khasi Hills
Name of the settlement/ area, where the bridge is located	This road goes through Nongstoin town which is the district headquarter of West Khasi Hills district in the state of Meghalaya, India.
Latitude and longitude	Lat: 25.5301583^0 Long: 91.2763324^0
New construction/ repair/ rehabilitation/ expansion (if there is an existing bridge, please share picture of old bridge.Also, the approach roads.)	Rehabilitation of the project road
If expansion, then is there any need of new land	NA
If yes, please share detail: - Total requirement - Private land - Govt. land - Forest land	NA
What is the High Flood Level in the sub-project area?	

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	No				
	Standing water bodies (ponds, lakes, etc.)	Yes	_	Low (L)	Likely	Increase in turbidity

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
	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	Extraction of Water
	Meandering River	No				
	Erosion prone stretches[7]	Yes	_	Medium (M)	Likely	In some location, soil erosion may take place. Lack of drainage facilities and unsustainable agricultural practices are two key reasons behind soil erosion.
	Areas with high slope (higher than15 percent)	Yes	_	Medium (M)	Likely	High slope will cause soil erosion problem.
	Landforms (hills, valleys)	Yes	_	Medium (M)	Likely	Project road is mostly going through the hilly areas and for this, hill cutting may be required.
	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 are locating along the project road
	Community Forest/ Fisheries	Local consultation				No

[7] https://slusi.dacnet.nic.in/srm/srmabstracts/SRM_138_West_Khasi_Hills.pdf

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
		Fish breeding Around the area – unique amphibian species (relevant dept.)				
	Large Trees / Woodland	Visual checks – if found, please click photograph	_	Medium (M)	Likely	Tree cutting causes soil erosion
	Sacred Groves					No
	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						
	Settlements/Habitations	Yes	+	Low	Likely	Connectivity Improvement
	Sensitive Receptors (schools, hospitals, markets etc.)	Yes	_	Low	Likely	Increase of noise and air pollution.
	Drinking water sources	Yes	_	Low	Likely	
	Underground utility lines like electricity lines, pipelines for gas,etc	Yes	_	Low	Likely	Utility trench may come in the project road and may need to shift
	Physical cultural resources – Protected monuments, historical/ heritage sites etc.	No				
	Physical cultural resources –	Yes	_	Low	Likely	Sensitive locations such as

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
	Religious structures, other sites significant to community					church, temple, mosque and hospitals, schools, collages present along theproject road. Increase of noise and air pollution may impact on the physicalcultural resources.
	Agricultural land/ Other activities	Yes	_	Low	unlikely	
	Defence Installations / Airports	No				
	Heavy polluting Industry	No				
	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 andlivelihood					
	Whether land acquired / donated is more than 10% of the total holding					
	Land acquisition resulting to loss of					

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
	income; livelihood; sources of livelihood; loss of access to common property resources and / or private residential and/or property 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:

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: Town: **Nongstoin** Urban/ Rural Area: **Urban**

Tehsil: **Nongstoin** District: **West Khasi Hills**

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 Usageof 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
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	Nil
c. Non-Titleholders – Encroachers	Number	Nil
d. Non-Titleholders – Squatters	Number	Nil
f. BPL Families losing Commercial Properties	Number	Nil
g. Total vulnerable families (including BPL)	Number	Nil
h. Total Tribal Families	Number	Nil
i. Vendors affected	Number	Nil
j. Petty shop keepers & Kiosk affected	Number	Nil

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	Nil
b. Title Holders	Number	Nil
c. Non-Titleholders – Encroachers	Number	Nil
d. Non-Titleholders – Squatters	Number	Nil
e. Vendors affected	Number	Nil
f. Petty shop keepers & Kiosk affected	Number	Nil

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	Nil

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) not required	**Abbreviated Resettlement Action Plan (ARAP)not required**
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) not required	Not Applicable
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 notrequired	ESIA required

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: Photographs of Public Consultation