

Public Works Department Government of Meghalaya

Environmental and Social Impact Assessment (ESIA) Report of Williamnagar Town Roads





Report No PI/CETKI21-19/R1

Revision No.R2

Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Roads



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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. Economical 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 major stretches (Nongstoin-Maweit, Umsning-Jagi Road, Borsora road, Cherragoan road, Bagli and Nongpoh-Umden-Sonapur) in the 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 transportinfrastructure 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 will design the plans for rehabilitation / up gradation of existing roads and construction of missing links / bypasses / bridges in the stretches from Nongstoin-Maweit (35km), Umsning- Jagi Road (40km), Borsora (6.50Km), Cherragoan (6.80 Km), Bagli (4.00 Km), Nongpoh-Umden-Sonapur (25.0km), Shillong town roads (12.591km), Jowai Town roads (34.843km), Nongstoin Town roads (20.752 km) and Williamnagar Town roads (23.451 km).

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

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

1.1 Details of the project stretches are elaborated below:

1.1.1 Non-Urban Roads

- **A. Nongstoin-Maweit corridorsection** has a length of 35km in the West Khasi Hills districts of Meghalaya state. The Project Road will connect the major towns and villages.
- **B. Umsning-Jagi Road corridor (SH-8) section** extends up to 40 km length in the district Ri-Bhoi of Meghalaya state. The project road starts from the junction with National Highway 6 /Asian Highway. The NH-6 is also a part of the Asian Highway. It is mainly connected between the cities Guwahati to Shillong. The project scope ends at Km 40.00 of SH-8 near Sonidan town



- **C.** Up-Gradation/improvement of road to Export point from the main road Borsora corridor sections covers a length of 6.50 Km, the Cherragoan corridor sections has a length of 6.80 Km, and Bagli corridor sections has a length of 4.00 Km. These roads are located under the Districts of South West Khasi Hills of Meghalaya state. (Border road)
- **D. Nongpoh-Umden-Sonapur Road corridor section** has a length of 25 km in the districts Ri-Bhoi of Meghalaya state. The project road starts from Nongpoh connecting with NH-6 /Asian Highway. The NH-6 is mainly connected between the Guwahati to Shillong location. The scope of project road ends at junctions of RDBR road near by Umden town. List of the project roads are given below :

1.1.2 Urban Roads

A. Shillong Town Roads:

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

B. Jowai Town Roads:

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

C. Nongstoin Roads:

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

D. Williamnagar Town:

All the project roads come under East Garo Hills district and are a part of Williamnagar town. 35 roads are part of this project having total length of 13.989 Kms.

The present Environment and Social Impact Assessment (ESIA)report has been prepared for the **Williamnagar Town Roads**under Non-urban Roads.

1.1.3 Williamnagar Town Roads :

- Williamnagar Town Roads section has a length of 13.989 km in the district of East Khasi Hills of Meghalaya.
- The first seven project road stretches lie in plain terrain whereas the last two roads lie in hilly terrain
- The carriageway width varies from 2.4m to 7m.

1.2 The Project Road

Williamnagar Town Road is extended up to 13.989 km length in the East Garo Hills district of Meghalaya state. The road project involves the improvement of 13 road stretches. The Project Roads for the Williamnagar Town are shown in the Figure 1.



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Figure 1: Location Map of the Williamnagar Town Roads

The urban roads of William Nagar town are around 13.99 kms in length. The project road stretches of Williamnagar Town Roads are listed table below.:

Table 1: The project road stretches of	f William	Nagar town
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SI No.	Name of Road	Length (Meter)
1	ABDK Mission Compound to 9th Km of RSN Road	1724
2	RSN Road 7th to 8th Km	2835
3	William Nagar Soil Bazar to Nama Bazar Junction	2270
4	All India Radio Station to Fishery Colony	941
5	Agriculture Colony to Fishery Colony	334
6	Approach Road to Circuit House in William Nagar	246
7	Fishery Colony to William Nagar Main Bazar 442	442
8	14th km RSN Road to Terrracegittim via Dawa Koksi and Dawa	1668
	Nengjata	
9	14th Km. Of RSN Road To Loyola College William Nagar	488
10	Warimagre to Fire Service Station	593
11	William Nagar Soil Bazar to Poultry Farm Colony	181
12	Internal Link Road at Kusimkolgre in William Nagar	939
13	Internal Link Road at Nokgil Awe (Phase II) (8th km of RSN Road to	1411
	Sacred Heart School	
	Total	13989

The first seven stretches of the project road lie in plain terrain and the last two road stretches lie in the hilly terrain. Carriageway width varies from 2.4 m to 7m.



1.3 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 rehabilitatation of selected roads:
- (ii) facilitatation of safe and appropriate road usage,
- (iii) Improvement of public and external stakeholder support and awareness.
- (iv) Increasing the efficiency of transport services
- (v) Enhancing the GoM capacity for road asset development
- (vi) Widening of all the project roads to the maximum possible extent without overruling the existing Right-Of- Way.
- (vii) Most of the project roads will undergo overlay scheme whereas few roads are proposed for pavement reconstruction.
- (viii) Pedestrian safety barricades, collapsible barricades etc. related to traffic safety are 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, reduced accidents, reduced vehicle emissions and better employment opportunities outside agriculture, both through improved access to economic centres and increased industrial activities in the project area.

1.4 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 specificallyfor the rural roads the ESMF guidelines delineated under PMGSY RRP II (P165402) and subsequently revised for Additional Finance in 2018 will 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.
- Undertaking the given special and additional assessments as applicable.
- Application of scientific and expert judgement for adding or skipping any element of assessment
- Preparation of screening report for all the subprojects and defining the Scope of Work (SoW) for detailed assessment, if required.
- Screening report will include 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 willconsider but not be limited to the following:
 - a) Conducting a comprehensive Environmental and Social Screening for all the subprojects.
 - b) Establishing an environmental and social baseline for the project area.
 - c) Conducting a detailed Environmental and Social Impact Assessment (ESIA) only for those subprojects against which the 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, Resettlement Action Plan (RAP), 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 clearances like forest/environmental/wildlife clearances, if applicable, and presentation before the expert panel committees of MoEF&CC, Govt. of India.
 - g) Conducting consultations with identified stakeholders and project-affected parties /community from the early stage of project planning and design stages of the assignment.
 - h) Developing monitoring programme to ensure that the proposed mitigation measures are being implemented effectively.



Table 2: Project Salient Features

SI. No.	Salient Features	Details
1	Design Chainage	-
2	Total Length (Km)	13.989
3	Proposed Carriageway width	The carriageway (BT) width varies from 2.4 to 7 m either side of design center line. 7
4	Major Junctions (Nos.)	12
5	Major Bridge	Nil
6	Minor Bridge	5
7	Total Culverts (Nos)	100
8	Bus Shelters (Nos.)	
9	Slope Protection	Retaining Walls, Breast Walls, Parapet Walls

1.5 Structure of ESIA Report

The EIA notification of the MOEF& CC on dated 14 September 2006 & it's subsequent amendments provides a generic structure for the EIA report detailing the title of the chapters:

The EIA report for the project road has been prepared complyingto the country regulations and The World Bank Guidelines for Environmental Assessment. The report has been structured into 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 Mitigation Measures

Chapter -VII: Environmental Monitoring Plan

Chapter -VIII: Climate Change Impact and Risk

Chapter -IX: Additional Studies

Chapter -X: Resettlement Action Plan

Chapter -XI: Monitoring and Evaluation

Chapter -XII: Abbreviated Resettlement Action Plan



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Chapter -XIII: Project Benefits

Chapter –XIV: Environment and Social Management Plan

Chapter –XV: Conclusions and Recommendations



2 CHAPTER-II: Project Description

The urban roads of William Nagar town are around 13.989 km in length and are situated in the East Garo Hills district of Meghalaya state. The project road starts from the ABDK Mission Compound of RSN Roadand is interconnected to 13 road junctions within Williamnagar Town.

2.1 Need for the Project

The project stretch has bitumen surface throughout. 70% 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 and state is realised.

Many settlements are located close to project road, which further make the roads narrow and congested. Poor road conditions and geometry of the project road results in slow economic growth and poor infrastructure facilities in the area. Therefore, rehabilitation and upgradation of the project road is needed with proper traffic engineering alongwith enforcement of rules and regulations on 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

The project road starts from the ABDK Mission Compound of RSN Road.The project road ends at 13.989 km at Internal Link Road at Nokgil Awe. The Project Highway corridor is situated in East Garo 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

SI. no	Project Component	Details			
1	Location of Project	Williamnagar Town (13.989km). Project road is			
		situated in East Garo Hills in the state of Meghalaya.			
2	Administrative locations	East Garo Hills			
3	State	Meghalaya			
4	Length of the project section	13.989 km			
5	Terrain	Few road stretches of Williamnagar passes through			
		Plain terrain and others pass through hilly terrain			
7	Land use	The land use pattern along the project			
		stretchesconsists mostly of built-up areas, forest area			
		constitute only 20%.			
8	Forest area	20% area of the project road is under forest area			

The existing project features are given below.



9	Bridge	There are total 5 Nos. of minor Bridges along the project road
10	Road Configuration	Most of the roads are of single lane, some are with intermediate or two lane configuration.
11	Pavement condition	Existing road is not motorable, thus 70% of the roads are 'poor' in condition.
12	High embank road stretches	Nil

2.4 Right of Way (RoW)

The carriageway width of the existing road varies from 2.4 to 7 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 improvement is well within the existing Right of Way, so there is No New Land is required and thus No Land Acquisition.

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 2.4 TO 7m carriageway width.

Shoulder: Earthen shoulders are proposed to be 0 TO 1.5 m on both sides of the Carriageway.

Typical Cross Section:

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





Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Roads









Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Roads





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. The traffic survey data used is provided by PWD, Meghalaya and was conducted in the month of August,2019 at different road stretches of Williamnagar as listed below:

Internal Link Road at Kusimolgre:

Vehicle Type	No. of Vehicles
Bus	0
Mini Bus	0
Truck	10
Tractor	5
Car/Jeep	15
Three-Wheeler	24
LCV	20
Two-Wheeler	30
Rickshaw	0
Bicycle	10

Internal link road within Williamnagar Town

Vehicle Type	No. of Vehicles
Bus	20
Mini Bus	24
Truck	50
Tractor	25
Car/Jeep	35
Three-Wheeler	50
LCV	200
Two-Wheeler	214
Rickshaw	10
Bicycle	62

Junction27- Junction15- Junction14- Junction13- Junction12- Junction11- Junction20-Junction21- Junction28 within Williamnagar Town

Vehicle Type	No. of Vehicles
Bus	21
Mini Bus	25
Truck	55
Tractor	28
Car/Jeep	45
Three-Wheeler	60
LCV	210
Two-Wheeler	214
Rickshaw	0
Bicycle	20



13th Km from RSN Road to Terrace Gittim via Dawa Kosi and Dawa nengjata within Williamnagar Town

Vehicle Type	No. of Vehicles
Bus	6
Mini Bus	8
Truck	30
Tractor	6
Car/Jeep	25
Three-Wheeler	10
LCV	8
Two-Wheeler	56
Rickshaw	6
Bicycle	21

2.8 Proposed Roadside Drainage

To ensure effective drainage of water, road side drainage system has beenprovided 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 the hill slope. Road on ridge alignment may not require the same section of drains due to lesser quantity of flow of water. For the convenience of construction, however, 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 as parabolic (Saucer shape), trapezoidal, triangular, V-Shape, kerb and channel or U-Shaped crosssections. The parabolic section is hydraulically the best and most erosion resistant. The trapezoidal sections are easier to construct and hence 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 to and adequate road width is available.

Drawings of Structures of different shapes of roadside drains are given below in Figure 2.



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

Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road



Figure 2: Structure of Road Side Drains

2.9 Proposed Pedestrian and Animal Crossing

On the basis of 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

Passenger shelters have been proposed at 20 nos. of locations near built up areas(both side).The details are given inTable 3



Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road

SI.	Chainage (km)	Side
1	0+370	Both
2	0+990	Both
3	1+850	Both
4	2+575	Both
5	3+460	Both
6	4+430	Both
7	5+400	Both
8	7+930	Both
9	9+220	Both
10	11+000	Both
11	14+220	Both
12	17+690	Both
13	19+750	Both
14	22+310	Both
15	24+225	Both
16	25+620	Both
17	30+235	Both
18	32+800	Both
19	33+915	Both
20	34+475	Both

Table 3: Details of Proposed Bus Shelters

• Truck Lay Bye

No Truck Lay Byes are proposed along the project road.

• Footpath

Drain cum footpath facility has been provided in urban areas for the safety of pedestrians. The details are provided in Table 4 below

Table 4:Details of Footpath

Chainage(m)		a : 1		Lengthof	Net	
From	То	Side	Length(m)	CD(m)	Length(m)	
0	330	Both	330	2	656.0	
1775	2200	Both	425	4	842.0	
2620	3300	Both	680	6	1348.0	
3700	4410	Both	710	4	1412.0	
33630	34340	Both	710	2	1416.0	
TotalLength					5674.0	



Paver Block

Paver blocks have been provided in urban areas as per below table.

Chainage(m)		Cide	Low oth (m)	Lengthof		
From	То	Side	Length(m)	CD(m)	Net Length(m)	
0	330	Both	330	2	656.0	
1775	2200	Both	425	4	842.0	
2620	3300	Both	680	6	1348.0	
3700	4410	Both	710	4	1412.0	
33630	34340	Both	710	2	1416.0	
TotalLength (m)					5674.0	

Table 5: Details of Paver Block

2.11 Pavement Condition

The project stretch has bitumen surface throughout. Most of the existing road stretches are 'poor' in condition. But some of the roadsare intact and motorable and in 'good' or 'fair'condition. The summary of the visual pavement condition(survey carried out in October, 2021) of the project roads are given below:

Williamnagar Town Road PavementCondition SI. From(Km) To (Km) Length (Km) (Good/Fair/Poor) 1 0.000 0.060 0.060 Good 2 0.060 2.780 2.720 Fair 3 2.780 2.843 0.063 Good 4.175 1.332 4 2.843 Fair 5 4.175 35.312 31.137 Poor

Table 6: Summary of Pavement Condition



Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road

2.12 Construction Material Requirement

• Quarry and Crusher Information

Stone quarry and crusher locations are located close to each other. The Crusher is located approximately 200 metres ahead of the Quarry location. The location of the quarries along with other relevant details is provided in the tables below:

Table 7: Details of Stone Quarry

Description	Location	Lead	Coordinates	
			Ν	Е
Stone Quarry	Porsohsat	23.2 kms from the Centre Point of the total road to the Crusher	2824936	329266

Sand

Table 8: Details of Sand Quarry

Description	Location	Lead	Coordinates	
			Ν	E
Sand	Jaidoh village on Nongkasen to Nongkhlaw Road	33.8 kms from the Centre point of the total road to the Quarry	334477	2819531





Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road

2.13 Minor Bridge

There are total No. of 5 Minor bridges alongtheprojectroad. The details o of the minorbridges, indicating locations and type of bridges is given in Table 9

			Spanarra	ingement	Width	Condition		
SI.No.	Chainage(km)	Type ofStructu re	No. ofpipe/ Span	Spanl ength (m)	ofMINO RBRIDG E(m)	MINORBRIDO	Remark	
ABDKMissionCompoundto9th KmofRSNRoad								
а	0+625	MinorBridge	1	12.0	8.0	Good	The Overall bridgeconditi on is good.Thebrid geistobe retained.	
b	1+285	MinorBridge	1	6.5	9.5	Good	The Overall bridgeconditi on is good.Thebrid geistobe retained.	
		Williamn	agarSoilBa	zartoNama I	BazarJunction			
a	0+150	MinorBridge	1	12.0	10.7	Good	The Overall bridgeconditi on is good.Thebrid geistobe retained.	
		Agr	icultureCol	onytoFishe	ryColony		Totamodi	
a	0+150	MinorBridge	1	13.4	5.15	Poor	Constructed in1982,the Bridge issingle lane and requiresreplac ement bytwolanenew	
Int	Internall inkRoadat NokgilAwe(Phasell)(8thkmofRSNRoadtoSacredHeartSchoolViaNokgilAwe)							
a	1+230	MinorBridge	1	12.0	8	Satisfactory	The superstructure of the bridge requires repair. Thebridgecan be retained.	

Table 9: Minor Bridges along the Project Streches



Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road

2.14 Culvert

A total no. of 55 culverts is there along the project stretche. Thedetailsofculvertsobservedalongtheprojectstretchareasfollows:

Table 10: Culverts along the Project streches

ABDKMissionCompoundto9th KmofRSNRoad								
			SpanA	rrangement				
SI.No.	Chainage	Туре	No.of Pipe/Span	Diameter/Span	Width(m)	Condition	Remark	
1	175	Slab	1	x 6.00	9.40	good	Overallconditi onof theculvertisgo od.	
2	698	Pipe	1	x 1.00	10.50	good	Overallconditi onof theculvertisgo od.	
3	526	Pipe	1	x 1.00	10.05	good	Overallconditi onof theculvertisgo od.	
4	800	Pipe	1	x 1.00	10.62	Fully choked, and the head wall is indistressed condition.	Culvert is in chokedconditi on andneedscle aning.	
5	1200	Pipe	1	x 1.00	9.80	Almost Chockedco ndition.	Culvert is in chokedconditi on and needs cleaning.	
6	1090	Pipe	1	x 1.00	9.20	good	Overallconditio nof theculvertisgoo d.	
			RS	SNRoad7thto8thKm	า			
SLNe	Chainaga	Turne	SpanA	rrangement	Miath (ma)	Condition	Domork	
51.NO.	Chainage	Гуре	No.of Pipe/Span	Diameter/Span	wiath(m)	Condition	Remark	
1	0+015	Pipe	1	x 1.00	11.00	good	Overallconditio nof theculvertisgoo d.	
2	0+850	Pipe	1	x 1.00	10.00	good	Overallconditio nof theculvertisgoo d.	
3	0+175	Pipe	1	x 1.00	8.10	FullyChoked	Cleaningisrequi red.	
4	0+425	Pipe	1	x 1.00	9.80	good	Overallconditio nof theculvertisgoo d.	
WilliamnagarSoilBazartoNama BazarJunction								
1	0+675	Pipe	1	x 1.00	10.00	good	Overallconditio nof theculvertisgoo d.	



Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road

ABDKMissionCompoundto9th KmofRSNRoad							
	SpanArrangement						
SI.No.	Chainage	Туре	No.of Pipe/Span	Diameter/Span	Width(m)	Condition	Remark
2	0+640	Pipe	1	x 1.00	10.00	good	Overallconditio nof theculvertisgoo d.
3	0+432	Pipe	1	x 1.00	9.85	good	Overallconditio nof theculvertisgoo d.
4	0+313	Pipe	1	x 1.00	10.00	good	Overallconditio nof theculvertisgoo d.
5	0+910	Pipe	1	x 1.00	9.70	Choked	Needscleanin gofthe culvert.
6	1+280	Pipe	1	x 1.00	10.00	good	Overallconditio noftheculvertisg ood.
7	1+650	Pipe	1	x 1.00	10.00	good	Overallconditio nof theculvertisgoo d.
8	2+005	Pipe	1	x 1.00	10.10	good	Overallconditio nof theculvertisgoo d.
9	2+095	Pipe	1	x 5.00	7.50	good	Overallconditio nof theculvertisgoo d.
10	2+135	Pipe	1	x 1.00	9.90	good	Overallconditio nof theculvertisgoo d.
			Agricul	tureColonytoFisher	ryColony		
1	0+43 0	Pipe	1	x 1.00	8.90	good	Overallconditio nof theculvertisgoo d.
2	0+657	Pipe	1	x 1.00	9.75	good	Overallconditio nof theculvertisgoo d.
3	0+725	Pipe	1	x 1.00	14.30	good	Overallconditio nof theculvertisgoo d.
4	0+900	Pipe	1	x 1.00	9.20	Chokced	Needscleanin gofthe culvert.
AllIndiaRadioStationtoFisheryColony							
1	0+025	Pipe	1	x 1.00	7.00	good	Overallconditi onof theculvertisgo



Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road

ABDKMissionCompoundto9th KmofRSNRoad								
SpanArrangement								
SI.No.	Chainage	Туре	No.of Pipe/Span	Diameter/Span	Width(m)	Condition	Remark	
							od.	
2	0+092	Pipe	1	x 1.00	7.00	good	Overallconditio nof	
							theculvertisgoo d.	
3	0+250	Pipe	1	x 1.00	7.00	good	Overallconditio	
					Heuro		theculvertisgoo d.	
			Appr	oachRoadtoCircuit	House			
1	0+010	Pipe	1	x 1.00	12.00	Poorconditio n	Overallcondit ionoftheculve rtispoor. Replacement required.	
2	0+120	Pipe	1	x 1.00	6.00	good	Overallconditio nof theculvertisgoo	
							d.	
			FisheryCo	olonytoWilliamnaga	rMainBazar			
1	0+100	Pipe	1	x 1.00	9.00	good	Overallconditio nof theculvertisgoo	
2	0+157	Pipe	1	x 1.00	9.60	good	Overallconditio nof theculvertisgoo	
3	0+235	Pipe	1	x 1.00	10.00	good	Overallconditio nof theculvertisgoo d.	
4	0+380	Pipe	1	x 1.00	9.90	good	Overallconditio nof theculvertisgoo d.	
		14	4thKm.OfRsnl	RoadToLoyola Colle	egeWilliamna	gar	<u> </u>	
1	0+125	Pipe	1	x1.00	4.50	Chocked	Cleaningisrequi red.	
WarimagretoFire ServiceStation								
1	0+120	Pipe	1	x1.00	6.00	good	Overallconditio nof theculvertisgoo d	
2	0+262	Pipe	1	x1.00	5.20	good	Overallconditio nof theculvertisgoo d.	
3	0+330	Pipe	1	x1.00	5.00	good	Overallconditio nof theculvertisgoo	



Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road

ABDKMissionCompoundto9th KmofRSNRoad							
SLNo	SpanArrangement		rrangement	\\/idth/ma)	Condition	Pomark	
31.NO.	Chanlage	туре	NO.Of Pipe/Span	Diameter/Span	width(iii)	Condition	Remark
							d.
			InternalLinkR	oadatKusimkolgrei	inWilliamnaga	ar	
							Overallconditio
1	0+810	Pipe	1	x1.00	5.00	good	nof
							theculvertisgoo d
2	0+730	Pine	1	x1.00	5 10	dood	overallconditio
2	0+750	i ipe	I	X1.00	5.10	good	nof
							d.
3	0+090	Pipe	1	x1.00	5.10	good	Overallconditio
						-	not theculvertisgoo
							d.
4	0+125	Pipe	1	x1.00	5.00	good	Overallconditio
							theculvertisgoo
Int	ernall inkRo	adat Nok	ailAwo(Phasol	II)/8thkmofRSNR02	dtoSacredHe	artSchoolViaNo	d.
							, rginawe)
1	0+035	Pipe	1	x1.00	5.20	good	Overallconditio
							theculvertisgoo
							d. Overalleopditio
2	0+100	Pipe	1	x1.00	5.10	good	nof
							theculvertisgoo
	0.405	Disc			5.00		a. Overallconditio
3	0+125	Pipe	1	x1.00	5.30	good	nof
							theculvertisgoo d.
4	0+660	Pipe	1	x1.00	5.30	aood	Overallconditio
						3	nof theculvertisgoo
							d.
5	0+680	Pipe	1	x1.00	5.00	good	Overallconditio
							theculvertisgoo
						acad	d. Overelleerditie
6	0+720	Pipe	1	x1.00	5.00	good	nof
							theculvertisgoo
	0.075	D:			4.00	Chocked	u. Overallconditio
	0+975	Pipe	1	x1.00	4.90		nof
							theculvertispoo r.
8	1+060	Pine	1	x1 00	5.00	good	Overallconditio
Ĭ		1.100			0.00		nof theculvertisaco
							d.



2.15 Estimated Project Cost

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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 (MoRTH). Summary of the Preliminary Cost Estimate for all the improvement works is presented in the table below

Bill No.	Description	Amount (Rs.)	Amount (Cr.)
1	SiteClearance	1,24,44,328	1.244
2	Earthwork	16,55,83,800	16.558
3	Sub BaseandBaseCourses	46,99,73,398	46.997
4	BituminousCourses	11,75,81,632	11.758
5	Culverts		
5(a)	PipeCulvert	3,00,49,599	3.005
5(b)	Slab Culvert	15,69,86,689	15.699
6	Bridges		
6(a)	MajorBridges		
6(b)	MinorBridges	13,86,39,046	13.864
6(c)	RepairAndRehabilitation OfExistingStructures		
7	DrainageAnd ProtectiveWorks		
7A	DrainageWorks	10,96,13,899	10.961
7B	Breast Wall	7,58,68,600	7.587
7C	Gabion Wall	10,58,02,282	10.580
7D	Crash Barrier&Railing	2,96,96,026	2.970
7E	HydroSeeding withJute Net	58,34,136	0.583
8	Traffic Signs, Markings, SafetyDevicesandRoad Appurtenances	4,16,44,742	4.164
9	Junction	2,01,06,668	2.011
10	Bus Shelter	1,40,00,000	1.400
11	Traffic Management DuringConstruction	1,01,06,368	1.011
12	Utility Shifting	1,00,00,000	1.000
Α	TOTALCONSTRUCTION COST(Without GST)	1,51,39,31,213	151.39
В	TOTALCONSTRUCTION COST(Including 12% GST)	1,69,56,02,959	169.56
1	Contingencies@1% of(A)above	15139312.13	1.514
2	Agency charges@3% of (A)	45417936.39	4.542
3	Supervision Charges@3% of (A)	45417936.39	4.542
4 4	MaintenanceCharges(2.5% of A)(Firstyear-Nil, 2 nd year-0.5%, 3rd year-0.5%,4th year-0.5%&5thyear1%.)	37848280.33	3.785
5	PriceEscalation @5% perannumfor1 yearof (F)	75696560.65	7.570
С	TOTALPROJECTCOST	1,91,51,22,985	191.51
D	TOTALPROJECTCOSTPERKm	5,50,30,688	5.503

Table 11 :Summary of Project Cost



2.16 Implementation Schedule:

Since as a widening proposal, intermediate lane has been proposed, a construction period of 730 days (2022-23, 2023-24) has been envisaged with a phasing of 60% & 40% respectively.

2.17 Sub-project Benefits

The Project Benefits comprises the cost savings in operation of vehicles and maintenance of the road between Without Project and With Project options. The Project Benefits results in the form of-:

- 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 as a 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 traffic emissions, 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-III: NEED OF ENVIRONMENT & SOCIAL IMPACT ASSESSMENT

The analysis of location of environmental features with respect to the project alignment and extentof identified impacts due to project, reflect that most of the impacts are of low and medium extentand mainly related to construction activities which are mostly temporary in nature. Based on theenvironmental screening, environmental screening checklist is added in **Error! Reference source not found.** The project is Classified as Category-B project in accordance with WorldBank's Policy (OP 4.01 Environmental Assessment) and therefore it warrants site specificEnvironmental Impact Assessment.

Similarly, in accordance with World Bank's Operational Policy OP 4.12 (Involuntary Resettlement), this project mandates the preparation of the Social Impact Assessment (SIA) and Resettlement Action Plan (RAP). Accordingly, detailed assessments of the environmental and social impacts have been carried out following a suitable methodology.

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

3.1 **Project Approach for Environmental Studies**

The approach followed for conducting ESIA study of the Project to identify the environmental and social issues arising out of the current practices adopted for planning, design, and construction of the project roads, includes assessment of the environmental and social conditions along the project roadsduring site visits.During these visits, consultations through group discussions with local communities, road users and panchayat/ village members were done to understand their perceptions and needs. The main approaches for the study are:

- Identification, appraisal and division between positive and negative impacts, direct and indirect impacts, and instant and long-term impacts likely to result from project road;
- Identification of unavoidable or irreversible impacts;
- Exploration towards the opportunities for environmental enhancement;
- Identification of feasible and cost-effective mitigation measures to minimize negative impacts and enhance positive impacts by incorporating them in the preliminary engineeringdesign; and
- Preparation of Environmental Management Plan for effective implementation of environmental mitigation measures at different stages of the project.

A standard methodology was adopted for fulfilling the ESIA requirements; key features/tasks of the methodology are detailed as follows:





Environmental and Social Impact Assessment (ESIA) for MITP of Williamnagar Town Road



Task 1: Field Reconnaissance Survey and Review of Earlier Studies:

The field reconnaissance survey has been carried out along the project roads to understand salient environmental and social features that are likely to cause adverse impacts, and sensitive environmental and social issues via-a-vis proposed project interventions. The salient feature includes, the topography of the land, road geometry, environmental features like trees, any forest area, water bodies like ponds, rivers, etc., social and physical feature like settlement pattern, its density, typology of buildings, especially the presence of religious buildings, land use, etc.

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

Task 3: Delineation of Study Area for Assessment:

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



Task 4: Assessment of Baseline Environmental and Social Conditions:

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

Task 5: Public Consultations/ Focus Group Discussions:

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

Task 6: Prediction of Environmental and Social Impacts:

The task identifies the likely impacts that would arise due to the construction of project roads, through changes in the physical, biological or socio-economic environment. Based on the baseline environmental profile of the project and analysis of the primary and secondary data collected, impacts of the proposed project on various environmental components were identified. The impacts were also analysed with respect to pre-construction, construction and operation phases and were categorised in terms of magnitude and significance.

The assessment considered both positive and negative impacts at different stages of implementation, i.e. pre-construction, construction and operation stages of the project roads.

Task 7: Preparation of Environment and Social Management Plan (ESMP):

A comprehensive Environmental and Social Management Plan (ESMP) was prepared which includes mitigation measures for all the negative impacts of the sub-projects and enhancement measures for the positive impacts.

Task 8: Preparation of Resettlement Action Plan (RAP):

Based on the updated DPR there will be no Land Acquisition and all improvements are well withing the existing RoW, which is free from all encroachments and encumbrances. Thus, as per the World Bank norms only ESIA shall be prepared to specify the procedures it will follow and the actions it will take to properly resettle/compensate affected people and communities. The objective of the RAP is to assist the affected people in their efforts to improve their living standards or at least regain their living standards to their pre displacement levels.

Task 9: Preparation of Environmental and Social Management Budget:

Based on the impact assessment for the environmental and social components a suitable budget has been estimated to compensate for the temporary and permanent impacts that are likely during the project implementation. As part of the project implementation monitoring, budgetary provision has been allotted for RAP implementation and environmental monitoring.



The budget also includes compensatory afforestation measures for the loss of avenue trees due to road widening.

Task 10: Environmental Safeguard Clauses in the Bid Document:

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

3.2 Study Area

Area of Influence (Aol)

The effects of the Project activities on a particular resource or receptor will have spatial (distance) and temporal (time) dimensions. Some activities would impact a larger radius than other identified impact sources. The spatial and temporal dimensions have therefore been taken into account todefine a Project's Area of Influence and given below

SI. No.	Environmental and Social Issues	Area of Influence (Aol)	Justification
1	Air Quality	500 m	Dust emissions, fugitive dust, etc. is typically observed within 100-200m from the construction /operation area. A minimum of 500m AoI on either side of road has been taken to capture all sources of these emissions including vehicular movement across access roads.
2	Noise Pollution	500 m	Noise can often be detected up to 400-500m from any operation.
3	Water Environment	200 m	Waterbody located in the vicinity of the project area may get impacted due to activities at project footprint and allied sites.
4	Land Environment	Within proposed RoW	Impacts on soil and land are often restricted to the Project footprint area. An Aol with proposed RoW was taken into account. The indirect effects usually occur due to vehicular/ heavy machinery movements and activities at allied sites
5	Socio- economicConditions	Within proposed RoW	Within proposed RoW is considered as an Aol for socioeconomic consultations to determine perceived impacts due to the Project
6	Ecology	10 Km	An Aol of 10 km on either side of the roads are considered for the ecological study to understand the ecological settings in and around the project area

Table 12: Area of Influence (Aol)



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Corridor of Impact (CoI): The area of 500 m on either side of the proposed road centreline is considered as the corridor of impact. This area is more vulnerable to the project's direct impacts. The core zone area for the study is project direct corridor impact and adjacent area within 500 m on either side of the project roads.

Project Influence Area (PIA): In accordance with MoEF&CC's EIA Guideline Manual for Highways and as per guidelines of EIA Notification-2006, the Project Influence Area has been defined as 10 km on either side (Aerial distance) from boundary of road. Collection of secondary data, including likely impacts due to ancillary sites like borrow areas, quarry, material storage, disposal areas, etc. are done within this influence area.



Figure 4: 10 Km buffer Zone of the Project Road



3.3 Scope of the ESIA/ESMP Study

The scopes of the EIA/EMP study are: -

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



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4 CHAPTER: IV- LEGAL FRAMEWORK

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

4.1 Institutional Setting

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

The Government of India through specific legislations regulates the environmental management system in India. The Ministries / Statutory Bodies responsible for ensuring environmental compliance by project proponents include:

- The Ministry of Environment & Forests and Climate Change (MoEFCC)
- Central Pollution Control Board (CPCB)
- Meghalaya Pollution Control Boards (MPCB)
- Ministry / Department of Environment in the States

4.2 Acts & Regulation

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



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SI.	Act/Regulations	Main Objective	Applicability to this	Implementation
NO.			Project	Agency
1.	Air (Prevention and Control of Pollution) Act, 1981	quality as per prescribed limits	and operation of Hot Mix/ Stone crusher/ WMM/ Batching Plants during construction, etc. (Construction Stage)	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 (Construction Stage) Pollution Under Control Certificate	Motor Vehicles Department, Govt. of Meghalaya.
4.	TheForestConservationAct,1980	To check deforestation	No. No forest land is required	Forest Department GOI and Government of Meghalaya & MoEF & CC
5.	Wild Life (Protection) Act, 1972	To protect and improve the overall wild life	No. No Wildlife Sanctuary or National Park/Tiger reserves lies within 10 kms of project boundary	Chief Conservator wild life, Forest Department, Meghalaya.
6.	Environment Protection Act, 1986	To protect and improve the overall environment	Yes, discharge Standards, Hazardous material management and handling Rules & Regulations (Construction Stage)	Dept. of Environment and Forest, Meghalaya.
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 Environmental	Ministry of Environment,

Table 13: Applicable Acts & Regulations



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SI.	Act/Regulations	Main Objective	Applicability to this	Implementation
No.			Project	Agency
			Clearance.	Forest & Climate
0	National	Ear Grievance Podross	No	CC) Ministry of
9	Environmental	FOI Glievalice Rediess	INU.	Environment
	Appellate Authority			Forest & Climate
	Act. 1997			Change (MoEF &
	,			CC)
10.	Integrated Waste	Waste management and	Yes, it is applicable as	Ministry of
	Management	control.	domestic solid waste is	Environment,
			generated from the	Forest & Climate
			canteens, residences	Change (MoEF &
			located within the	CC) and State
			Construction camp.	Pollution Control
				Board
11	Fly Ash Notification,	Mandate use of fly ash in	Yes. Because as per the	MOEF & CC
	2011 and 2016	road construction within	notification every	
			engaged in construction	
			of roads within a radius of	
			300 kilometers from a	
			coal or lignite based	
			thermal power plant	
			would be bound to use fly	
			ash in accordance with	
			the guidelines or	
			specifications issued by	
			the Indian Road	
			Thermal Power Project in	
			Dolaigaon Assam	
			Bongaigaon Thermal	
			Power Project lie within	
			300km radius of the	
			project road.	
12	Noise Pollution	To regulate and control	Yes	State Pollution
	(Regulation and	noise producing and		Control Board
	Control) Rules The	generating sources with		
	Noise Pollution	the objective of		
	(Regulation and	maintaining the ambient		
	Control) Amendment	air quality standards in		
	Rules 2006	respect of noise		



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SI. No.	Act/Regulations	Main Objective	Applicability to this Project	Implementation Agency
13	The Explosives Act &	An Act to regulate the	Yes, if the storage	Petroleum &
	Rules, 2008	manufacture, possession,	quantityof Diesel and	Explosives
		use, sale, transport,	Bitumenexceeds the	Safety
		import and export of	allowablelimit.	Organization
		Explosives (For		(PESO)
		transporting and		
		storingdiesel, bitumen		
		etc.)		
14	Ground Water	For regulating ground	Yes, NOC for establishing	State Ground
	(Management	waterabstraction and	bore wells for abstraction	Water Board
	&Regulation) Act,	maintainingground water	of ground water for use in	
	2019	table.	construction as well as in	
			domestic use.	
15	The Petroleum	Delivery, dispatch or	Yes	A person
	Rules,2002	storage of petroceum		recognized by
		products by authorized		the Chief
		persons/organization		Controller

4.3 Clearance Requirement

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

Table 14: Applicable Acts & Regulations (Construction Phase)

S. No.	Clearance Required for	Statute under which clearance is required	Statutory Authority
1	Hot mix plants, Crushers,	Air (Prevention and Control of Pollution) Act,	State Pollution
	Batch Mix Plants & DG Sets.	1981 and Noise Pollution (Regulation and	Control Board
		Control) Rules, 2000	
2	Storage, handling and	Hazardous Waste (Management and	State Pollution
	transport of hazardous	Handling) Rules, 1989 and Manufacturing,	Control Board
	materials.	Storage and Import of Hazardous Chemicals	
		Rules, 1989.	
3	Location/ layout of workers	Environment Protection Act, 1986 and	State Pollution
	camp, equipment and	Manufacturing, Storage and Import of	Control Board
	storage yards	Hazardous Chemicals Rules, 1989	
4	Quarries (Aggregates, Sand	Environment Protection Act, 1986	MoEF&CC
	& Earth)		
5	Permission for withdrawal of	Environment Protection Act, 1986	CGWB
	groundwater and for		
	construction purpose.		
6	Disposal of bituminous	Hazardous Waste (Management and	As per state norm/



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S. No.	Clearance Required for	Statute under which clearance is required	Statutory Authority
	wastes	Handling) Rules, 1989	Local Civic Body
7	Pollution Under Control	Central Motor and Vehicle Act 1988	Department of
	Certificate		Transport, State
			Government.
8	Storage of fuel oil, lubricants, explosives, diesel etc. at construction camp.	Manufacture, storage and Import of Hazardous Chemical Rules 1989	State Pollution Control Board & PESO.

4.4 MoRTH & IRC Specifications

All road works in India are to be in accordance with the Ministry of Road Transport and Highway(MoRTH) specifications for Road and Bridge works and the guidelines of Indian Roads Congress (IRC). The MoRTH specifications have special provisions towards the protection of environment under Clause 501, Annexure A and the contractor has to satisfy these 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.

4.5 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 SP 108-2015)
- 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)



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- 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.

4.6 Other Applicable Policies (Social Security & Labor Welfare)

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

Table 15: 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, The Constitution (Eighty-Ninth Amendment) Act, 2003, Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, PESA, Vishaka Guidelines, Equal Remuneration Act, 1976, The Child and Adolescent Labour (Prohibition and Regulation) Act, 1986, The Immoral Traffic (Prevention) Act, 1956, Sexual Harassment of Women at Workplace (prevention, Prohibition and Redressal) Act, 2013 and POSCO Act.2013	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 four labour laws concerning wage and bonus payments and makes	Ministry of labour and Employment



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Applicable Codes	Concerns	Remarks
	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.	

4.6.1 World Bank safeguard/ Operational policies

The World Bank policies and directives on environmental and social safeguards have been adhered to for the project roads. The applicability of the relevant policies to the project roads that are undergoing up-gradation (strengthening and widening) are summarized in the following Table 16:

Table 16: Applicable World Bank Operational policies

OP 4.01 Environmental Assessment	The objective of this policy is to ensure that Bank financed projects are environmentally sound and sustainable. Help to ensure the environmental and social soundness and sustainability of investment projects. Support integration of environmental and social aspects of projects in the decision-making process. Yes, this operational policy is applicable in this project. The project is Classified as Category-B project and EIA study is required.
OP 4.04 Natural Habitats	The policy recognizes that the conservation of natural habitats is essential for long-term sustainable development.Promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions. This policy may be triggered to improvement activity of road requiring forest/ wildlife lands, locating close to the natural habitats with the potential to cause significant adverse impact or degradation of natural habitats whether directly (through construction) or indirectly (through human activities induced by the project). The project does not pass through reserved forest or natural habitat of wild animals therefore this operational policy is not applicable in this project.
OP 4.36 Forestry	Aims to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively for sustainable economic development and protect vital local and global environmental services and values of forests. The widening of project road section will require felling of 166 numbers of trees within the existing ROW, although these trees will be compensated afforestationas per the Forest Department Regulation.
OP 4.09 Pest	The objective of this policy is to promote the use of biological or



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

The World Bank has classified the type of projects into following categories depending on the extent of the impact on environment:

Category A: A proposed project is classified as Category A, if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. Such project requires full EIA study.

Category B: A proposed project is classified as Category B if it's potential adverse environmental impacts on human populations or environmentally important areas— including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category A projects.

Category C: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.

Category FI: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts



As per World Bank categorization, the project comes under Category-B project.Hence, the current project covered under this scheme, required an EIA study and preparation of anEIA report including EMP.

Applicability of new ESF: The new ESF is applicable from 1 October, 2018. This ESF will be applicable for all new projects signed after 1st October, 2018. For ongoing projects or scheme the old safeguard policy will continue. Since MITP is an old project, which is an ongoing scheme with financial assistance from the World Bank, the Bank's old Operational Policies (OP) and Bank's Procedures (BP) will be applicable.

Resettlement Policy Framework (RPF): Resettlement Policy Framework (RPF) consisting of national/state policies and the World Bank's operational policy on involuntary resettlement is being implemented in MITP. The frameworks provide an overview of screening of the roadprojects for social impacts, the process for social impact assessment, preparation of land plan schedules, entitlements for different impact categories, institutional arrangements, information disclosure and consultations and the preparation and implementation of Resettlement Plan (RP). Land will be acquired following provisions of Meghalaya PWD Rules, Meghalaya RFCTLARR Rules, 2017 and RFCTLARR Act, 2013. For the compensation for land, the competent authority will be guided by the provisions of Sec 26, Sec 27, Sec 28, Sec 29 and Sec 30 of RFCTLARR Act, 2013. The replacement value of houses, buildings and other immovable properties will be determined based on the latest PWD Standard Schedule of Rates (SSOR) as on date without depreciation. Compensation for trees will be based on their market value. Disputes relating to ownership rights, apportionment issues, amount of compensation awarded will be referred by the Special DRO to the jurisdictional LARR Authority, to be constituted following Section 51(1) of the RFCTLARR Act, 2013 and Meghalaya RFCTLARR Rules, 2017. However the project does not envisaged any new Land Acquisition

4.6.2 Applicable Legal Framework for Social

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

4.6.3 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) including special needs of Tribal and vulnerable sections;



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• To provide better standard of living to APs.

4.6.4 Policy Framework for this Project

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

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

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

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

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

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

All Common Property Resources (CPR) lost due to the project are replaced or compensated by the project. Cash compensation for properties belonging to the community if opted by the community, were provided to enable construction of the same at new places through the community/ local self-governing bodies / appropriate authority in accordance with the modalities determined by such bodies / authority to ensure correct use of the amount of compensation.

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

SI.	Name of Act/ Rules	Purpose	Applicable /Not Applicable	Description	Responsible Agency
1.	The Scheduled	Grants Legal	Applicable	This Act is Applicable	Ministry of
	Tribes and	recognition to the		as it protects the rights	Tribal Affairs,
	other Traditional	rights of traditional		of the schedule tribes	Gol and
	Forest Dwellers	forest dwelling		& other traditional	Department of
	(Recognition of	communities.		communities living in	Tribal Welfare
	Forest Rights)			the forested areas.	of State
	Act				Government

 Table 17: Applicable Legal Framework for the entire Project



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SI.	Name of Act/ Rules	Purpose	Applicable /Not Applicable	Description	Responsible Agency
2.	The Minimum Wage Act,1948	Payment of minimum rate of wages as fixed and periodically revised by the State Government	Applicable	Construction/daily wageworkers are involved and was involved in the project	District Labour Commissioner.
3.	Workmen Compensation Act, 1923	It provides for payment of compensation by Employers to their Employees for injury by accident i.e., personal injury or occupational disease.	Applicable	The Insurance Policy covers the compensation, hospitalization and transportation of workers /employees	District Labour Commissioner
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 migrant workmen need to obtain registration under this act	Applicable	Construction workers involved in the project may or may not be from the neighboring state. Presently the construction workers are from within the state of Meghalaya.	District Labour Commissioner/ Govt. Of Meghalaya
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 child labour is engaged in the project	District Labour Commissioner
6.	Building and Other Construction Workers Welfare Cess	An Act to provide for the levy and collection of a Cess on the cost of construction	Applicable	Project involves employment of construction workers	District Labour Commissioner



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SI.	Name of Act/ Rules	Purpose	Applicable /Not Applicable	Description	Responsible Agency
	Act, 1996	incurred by employers.			
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.	
8.	The Equal Remuneration Rules, 1976	Equal Remuneration for identical works	Applicable	Project has not discriminated between sex, race, caste or creed in payments to the employees	District Labour Commissioner
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 persons affected by accidents, occurring while handling any hazardous substance	Applicable	Project has been adhering to all the relevant provisions made under the act	District Labour Commissioner
11	World Bank OP/BP 4.12 – Involuntary Resettlement	The project was not involved land acquisition though, at a very low scale widening, realignments, junction improvements, bypasses etc might adversely affect non-titleholders' structures used for various purposes, livelihood of people	Applicable	The project does not envisage land acquisition as there is a very low scale widening, realignments, junction improvements etc however might adversely affect non- titleholders' structures used for various purposes, livelihood of people (mainly earning their livelihood by	Project Implementing Unit (PIU)/ Implementing Agency



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SI.	Name of Act/ Rules	Purpose	Applicable /Not Applicable	Description	Responsible Agency
		(mainly earning their livelihood by means of petty shops and providing various services).		means of petty shops and providing various services).	
12	Indigenous Peoples OP/BP 4.10	In the context of India Indigenous Peoples may be referred to "scheduled tribes". As per the Census of India, 2011 about 86% of the Meghalaya state belongs the Schedule Tribe. The population is distributed across 11 districts of Meghalaya.	Not Applicable	The 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 Indigenous People is triggered. as the presence of tribal groups with close attachment to land in the project area is not established. Further, this policy is not triggered in terms of "collective attachment to geographically distinct habitats" and "institutions".	PIU/ Implementing Agency
14	Bank Policy – Access to Information	The policy governs the public accessibility of information in the Bank's possession.	Applicable	Documents such as RPF, all ESIA and ARAPs was disclosed both by the borrower and Bank and uploaded in the website.	PIU/ Implementing Agency

4.6.5 Social Categorization:

There are 8 identified sub-projects 4 are urban and 4 are rural. All activities under these subprojects are limited to the available RoW, thus no land acquisition and resettlement and rehabilitation are envisioned for these activities. As there is impact on ST population due to the project thus, the World Bank OP 4.10 does trigger for these projects. Again, impacts on the livelihood of vendors, petty shopkeepers and likes cannot be fully avoided and thus need to be mitigated in accordance with the policies of the World Bank (OP 4.12).



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As per World Bank's guidelines of Categorization for Involuntary Resettlement, this sub-project is categorized as Category S2 as the total permanently impacted population is less than 200 PAPs in all the sub-projects. Thus, an Abbreviated Resettlement Action Plan (ARAP) is prepared on the possible impacts identified and measured in SIA and mitigation measures as provisioned in the Entitlement Matrix of the Resettlement Framework and is as per the Guideline and Template of ESMF. The ARAP will be disclosed and will be implemented in the project and the compensation and R&R assistances will be released to the displaced families before the Civil Construction starts.

All the activities in the urban or rural projects will impact the tribal population though it is limited to the existing land area already available. However, "collective attachment to geographically distinct habitats" and "institutions that are separate from those of the dominant society and culture is not present in the project impact area. As per World Bank's guidelines of Categorization for Indigenous People Impact this sub-project is categorized as Category S3. As per the guidelines no specific action is required, still the mitigation methods are reflected in the related plans such as an Abbreviated Resettlement Plan, ESMP and Gender Action Plan.



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5 CHAPTER: V- DESCRIPTION OF ENVIRONMENT

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

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

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

5.1 Topography:

Meghalaya: Meghalaya state is also known as Meghalaya plateau. The highest point in the state is the Shillong Peak with an altitude of 1961 meters. The state can, broadly, be divided into three physiographic zones, namely:

- Central Plateau Region comprising the Khasi Hills and has the highest elevations between 900-2000m
- Sub-montane region in continuation with the Central Plateau below 900m which gradually merges with the plains in the West and North, namely the Jaintia Hills, and
- Border region which stretches south-wards abruptly from the Central Plateau to the plains in Bangladesh, mainly the Garo Hills region, and is nearly plain.



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East Garo Hills:

East Garo Hills is mainly lies in hilly terrain. The hills are highly dissected and one major formation is the Arbella Range, which cuts through the south-central part of the district. The range consists of peaks with an average height of 700 metres above sea level. Another important physiographic feature is the Simsang Valley which runs through the southern part of the district. The River Simsang is the longest river in Garo Hills, which originates in West Garo Hills and flows through East Garo Hills and thence to South Garo Hills. The topography of the rest of the district is of undulating low hills, with altitude ranging from 150 to 600 metres above sea level. Besides the Simsang (Someshwari), the district is also drained by the rivers Manda (Dudhnoi) & Damring (Krishnoi), which have their sources within the district. Other than the Simsang which drains southeastwards, the others all run north or northwest towards the Brahmaputra.

Most of the project stretches lies in plain terrain but two of them lies in hilly terrain. First 11 project road stretches lie in plain terrain whereas the last two roads lie in hilly terrain. Digital elevation map and contour map around 10km radius of project is given below:



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Figure 5: Digital Elevation Map of ProposedProject Road



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Figure 6: Contour Map of Project Area

5.2 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 redges with prominent Valleys. Quartzite and conglomerate form high hills whereas phyllites, slate and quaternary valley fills



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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 the foliation 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 travers through the eastern part of the district.

East Garo Hills:

Three major soils can be found in this district viz.,

i)Lateritic soil: It is found in the northern parts of the district. They are characterized by reddish brown colour and are rich in iron. It occurs in areas around Rongmil, Karkutta, Resulbelpara, Wagensi, etc.,

ii) Red - Loamy soil, and

iii) Red and Yellow soil: These soils are the most prevalent one, covering the middle and southern part of the district. In the parts of Rongjeng and Songsak read-loamy soil can be found. And Red and Yellow soil is found in Samanda and Williamnagar areas of the district. These soils are acidic in character with pH ranging from 4.9 to 5.6.

Soil profile of the project location is drawn below:



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Figure 7: Soil Map of Project Area

The improvement work of project road can have some temporary effect upon soil quality, but it will not be for a long period. That's why soil quality monitoring is not needed for the project stretches.

5.3 Climate:

Meteorology:

According to the reviewed research paper the climatic seasons in the state of Meghalaya has been four. As per the Kalita et.al.(2020), the state of Meghalaya has four distrinct season viz.

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

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

Monsoon season is being from June to September



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

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

East Garo Hills District:

The Climate of the district varies in latitudinal and longitudinal directions and is influenced mainly by physiography. There are four seasons in the district namely pre-monsoon, monsoon, retreating monsoon and winter. The summer season starts from the last part of the pre-monsoon season, which is characterized by relatively higher temperatures. Rainy season starts with the onset of southwest monsoon in April and lasts up to October. Then this is followed by short autumn season which starts from mid-October and continues till November. This season is characterized by clear and sunny sky. Winter season starts from December and continues till the end of March. This time of the year is characterized by sharp decline in the temperature.

• Rainfall:

In terms of precipitation received, in Williamnagar June and July is the most rainy month. During the month of June, **W**illiamnagar gets 257mm rainfall while **in** December **it** gets the lowest amount of rainfall i.e. 5mm. Rainfall profile remains high during the south-west monsoon. The study area is surrounded by hills and is subjected to a wet weather. The area experiences a lot of rainfall every year.



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Figure 8: Precipitation in Williamnagar (Source-meteoblue)



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• Temperature:

From March to October, temperature ranges between 30 °C to 32 °C. The hottest month of the year in Williamnagaris April, with anaverage of 32°C. From December to February, the temperature ranges between 13 °C to 15 °C. The coldest month of the year in Williamnagar is January, with an average of 13 °C.



Figure 9: Average Temperature in Williamnagar

(Source-meteoblue)

• Wind Speed/Direction:

The average hourly wind speed in Williamnagar experiences significant seasonal variation over the course of the year. The windiest month in Williamnagar is May with the wind speed of 16.8 Km/hand so in these months there is a chance of soil erosion in this area. Potholes can also be created due to continuous soil erosion and water may get logged into the potholes during heavy rainfall which can ultimately led to the destruction of roads. While January is the month when the wind speed is very low i.e 2.9 Km/h. 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 decided because the construction of roads should not affect the air quality of residential areas in the down wind direction.



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Figure 10: Average Wind Speed in Williamnagar (Source:Meteoblue)



Figure 11: Wind Rose Diagram ForWilliamnagar (Source:Meteoblue)



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• Relative Humidity:

The air is generally humid in this region during the monsoon season when the maximum relative humidity was observed to be 99.6% in the month of July. Similarly, the minimum relative humidity was observed to be 53.6% in the month of March.

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 12: Average Humidity of previous 10 years

(Source:Meteoblue)

5.4 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



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population and infrastructure seismic vulnerability has increased and previous earthquakes have provided a glimpse of the devastating potential of seismic tremors

• Seismicity:

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Earthquake is a natural disaster so necessary safety measures may be adopted considering the vulnerability to avoid enhanced risk. As per the 2002 Bureau of Indian Standards (BIS) map, the state of Meghalaya falls in a region of high to very high seismic hazard.All districts of the state of Meghalaya lie in Zone V. This state also falls in Zone V

Seismically, East Garo 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-west trending 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.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 Williamnagar.

The seismic map of Meghalaya indicating the location of project stretch is shown in Figure 13



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



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Figure 14: Earthquake Zones Map of Meghalaya



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Figure 15: 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 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.

The Flood Prone Areas of Meghalaya:

Western part of Meghalaya like Tikrikilla, Phulbari, Rajabala, Garobadha, Hallidaygunj, Bhaitbari, Fersakandi, Magurmari, Silkata, Mahendraganj etc.

Plain areas near Bangladesh like Baghmara, Balat, Shella, Dawki etc.

Urban Flooding in localized areas of Shillong, Williamnagar, Tura etc.

Localised areas of West Khasi Hills, South West Khasi Hills, East Khasi Hills Jaintia Hills and in Ri-Bhoi Districts.

Project district also fall under flood prone area. Flood prone area of Meghalaya is shown in the Figure below



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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.

REFERENCES NOT TO SCALE STATE BOUINDARY NATIONAL HIGHWAY OTHER MAIN ROADS TRECKS Å TOURIST CENTRE TONALBAR 0 OTHER CENTRES ASSAM **O NOWGONG** BOK ASSAM Ri Bhoi BA East Garo Hills UGIRI CHERAN West Khas ANAU INSNING DAMBL NONGKHLAW RONGRAM RATC SHILLONG GARAMPANI MAIRAN D IRA NONGSTOIL TOHALFLONG MAWPHLANC st Garo Hills PAMBRIEW A SOHRARIM RINGKHAR \$ SLIU KHERAPARA SONG NURSLA O TONSENG South Garo Hills CHERRAPUNJEE REast Khasi Hills DENIGADAR **Jaintia Hills** LAKADO В ASSAM Н S A D E N G A TO SYLHET TOSILCHAR

• Flood prone areas of Meghalaya is shown in Figure 16.

Figure 16: Flood Prone Zones of Meghalaya

Source:<u>http://www.mati.gov.in/docs/Academic%20Module%20-</u> %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.. The existing road section comes under high landslide zones.


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Figure 17: Landslide Map of North-Eastern Himalayas

Source:https://megrevenuedm.gov.in/reports/Meghalaya_State_Disaster_Management_Plan_V olume1.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.¹

East Garo Hills district and project area road section also comes under high cyclonic zone. The Cyclone Zone map of Meghalaya indicating the location of the project stretch is shown in the figure below.

¹ Meghalaya State Disaster Management Plan



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Figure 18: Map of Wind and Cyclone Zone in Meghalaya showing the project road

5.5 Land Environment:

The project area is passing through mainly built-up area. The land use pattern alongside the project roads is predominantly built-up. Around 80% of the project area is passing through built-



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5.6 Drainage

The drainage system of the district is controlled by topography. The East West trending hills ranges passing through the area of Dilmagiri, Rongdolgiri, Narringiri, Wethesa ranging in elevation between 688 to 784 m above mean sea level serves as water divide and dissect the



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area into two drainage basins viz the Brahmaputra and the Meghna.

The northern basin drains the water into the mighty river Brahmaputra, Assam where as the

southern ones into Meghna, Bangladesh. The southern basin is drained by the river Simsang

which is the major perennial river in the southern part of the district. The northern basin isdrained by the tributaries viz Manda (Dudhnoi), Damring (Krishnoi) etc into the

Brahmaputra.



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5.7 Water Environment:

Surface water Scenario

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



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SI.No	Water Body	Road	Distance from the road (m)
1.	Pond	Junction to junction 22 start point	3.53
2.	Pond	Junction to junction 21 start point	5.82
3.	Pond	Junction to Junction Kusimkolgre near Simsang	15.91
		River	

Table 18: Water Bodies Along the Project Road



Figure 21: Photographs of few Surface Water Bodies along the Project Road



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. As per a surface water quality study conducted by Meghalaya SPCB, the surface water quality data of Samsing river in Williamnagar is presented below:

Location	рН 6.5 -8.5	DO >4.0 mg/l	BOD <3.0mg/l	FC <2500MPN/ 100ml	TC <5000MPN /100ml	Fs <500/100 ml	Water Quality Status
Simsang at Williamnagar	7.1	7.5	1.6	84	330		Satisfactory

(Source: <u>https://megspcb.gov.in/</u>)Ground water Scenario

Hydrogeology

The hydrogeological framework of the district is essentially controlled by geological setting, distribution of rainfall and movement of ground water through inter-connect weak planes due to joints, fissures and faults, primary and secondary porosities of the Geological formation. Hydrogeologically, the district can be divided into three units, namely consolidated, semiconsolidated and unconsolidated formations.

Ground water Quality

The natural quality of ground water depends largely upon the geological characteristics and climate conditions. Broadly, the chemical constituents present in the ground water are within the permissible limits set by BIS and WHO. However, sporadic occurrence of higher concentration of Iron is detected /reported from some localities in the district.

Ground water Development

Development of ground water in the district is practically negligible. As the district is characterized by undulatory terrain, the scope for development of ground water lies in low lying depressions and the valley fills, which hold good prospects for ground water development. Moreover, in the district all the minor irrigation scheme are executed by the surface water only and as per Ground water resources estimation, the stage of ground water development is only 0.005% which leaves a greater scope for ground water development. Ground water development is being done through dug wells and bore wells in the intermontane valleys and linear ridges. The development of springs is seen mainly along the foothills. The ground water is mainly used for domestic purposes such as washing and drinking. Therefore, there is ample



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scope for future development of ground water in the area. The Figure 22depicting the Ground water quality of the area is given below.

(Source: http://cgwb.gov.in/)



Figure 22: Ground Water Quality of the project Area

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

5.7.1 Water Quality Monitoring

To corroborate the generic data given above, secondary data was used from verified sites and EIA projects available on the website.



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The quality of ground water is influenced by surface and sub-surface environmental conditions. The quantity and quality of water entering the underground regime is another important parameter, which influences underground water quality. The secondary monitoring data is taken from the website of Central Pollution Control Board and an environmental assessment report of Rongram -Rongrenggre -Darugre Road.

Location	Distance Name of from		Coordinates		
No.	place	Williamnagar (Km)	Latitude	Longitude	
1	Chinabat	21.18	25°43'2.39"N	90°32'49.50"E	
2	Asanang	32.85	25°36'1.46"N	90°16'25.46"E	

Table 19: Groundwater sampling locations near Williamnagar



Figure 23: Groundwater sampling locations near Williamnagar

Table 20: Ground Water quality result

SI No.	Parameter	Asanang	Chinabat	Permissible Limit	Unit
1	pН	6.9	6.8	6.5-8.5	
2	EC	0.22	0.24	-	mmh
					os/c
3	Nitrate	0.31	0.29	45	mg/l
4	TotalHardness	91	93	200	mg/l
5	Chloride	6.7	5.9	250	mg/l
6	Sulphate	5.24	7.26	200	mg/l



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7	Fluoride	0.53	0.54	1.0	mg/l
8	TSS	182	175	-	mg/l
9	Dissolvedsolids	141	134	500	mg/l
10	Iron	0.7	0.8	0.3	mg/l
11	Potassium	3.8	3.4		mg/l
12	Magnesium	7.1	8.2	30	mg/l
13	Calcium	23.2	21	75	mg/l
14	Lead	BDL	BDL	0.01	mg/l
15	Cadmium	BDL	BDL	0.01	mg/l
16	Copper	0.01	0.02	0.04	mg/l
17	Chromium	BDL	BDL	0.01	mg/l
18	Zinc	0.19	0.23	5	mg/l
19	Nickel	BDL	BDL	-	mg/l

Source: Environmental Baseline Monitoring

It can be seen from Table 20that, the pH of the drinking water varies from 6.8 to 6.9. Total hardness as $CaCO_3$ varies from 91 to 93 mg/l. It can be seen from the results that the ground water quality meets the standards of IS:10500-2012 standards for drinking water and CPCB standards for ground water, except for the high level of Iron content at all sampling locations.

Secondary data is collected from the website of CPCB and an environmental assessment report of Rongram Rongrenggre Darugre Road in order to assess the surface water quality within the project area. The water samples from the following water sources were collected for assessing the physico-chemical characteristic of water. The analysis result of various quality parameters has been presented inTable 21.

Table 21: Surface water sampling locations near Williamnagar
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Location	Name of Source		Distance	Coordinates	
No.	place	Source	(km)	Latitude	Longitude
1	Chinabat	Road side pond	21.18	25°43'2.39"N	90°32'49.50"E
2	Asanang	Road side Pond	32.85	25°36'1.46"N	90°16'25.46"E

Source: environmental assessment report of Rongram Rongrenggre Darugre Road.



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Figure 24: Surface water sampling locations near Williamnagar

SI.	Parameters	Asanang	Chinabat	Units
NO				
1	рН	7.1	6.8	
2	EC	0.211	0.209	millimhos/c
-				m
3	Acidity	11.5	14.1	mg/lasCaC
4		00	<u> </u>	0_3
4	Alkalinity	82	62	mg/lasCaC
5	Nitrata	0.82	0.04	
5		0.82	0.94	mg/l
7	Magaasium	0.9	0.42	mg/l
1		3.1	3.2	mg/i
8	Chloride	11	13	mg/i
9	Sulfate	5.1	5.1	mg/I
10	DO	4.7	5.6	mg/l
11	Sodium	22.3	25.8	mg/l
12	TotalSuspendedSolid	177	171	mg/l
	S	1.5		
13	Dissolvedsolids	46	41	mg/l
14	Iron	0.67	0.73	mg/l
15	Potassium	3.7	4.2	mg/l
16	Lead	BDL	BDL	mg/l
17	Cadmium	BDL	BDL	mg/l
18	Copper	0.03	0.01	mg/l
19	Chromium	0.07	0.6	mg/l
20	Zinc	0.21	0.32	mg/l
21	Nickel	BDL	BDL	mg/l

Table 22: Surface Water quality result



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In the table it is clear that at Asanang pH and TSS value is higher than Chinabat. In the case of DO, Chinabat has slightly greater value than Asanang.

CPCB and MOEF&CC has categorized the surface water in 5 different categories namely A, B, C, D and E (Ref: http://cpcb.nic.in/water-quality-criteria/). From Table 21, it can be inferred that in all 2 surface water monitoring locations the pH values are between 6.8 - 7.1, dissolved oxygen level is above 4 mg/l. . Hence the surface water along the project road can be classified as Category A.

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

Table 23: Categorisation of surface water by CPCB and MOEF & CC



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As seen from the results, the pH of the drinking water in the region is well within permissible limits (6.8-6.9). The total dissolved solids in the samples collected vary from 134mg/l to 141 mg/l which is well within the permissible standards. Total hardness as CaCO3 in the water sample varies from 91 mg/l to 93 mg/l which is within the standard limits. Other parameters analysed like chloride, sulphate, fluorides are found well within standards. The surface water quality in the region is reported to be well within the permissible limits and also found so by visual identifications. There are no reports of any water-borne diseases in the region. People use this water for various domestic purposes.

5.8 Air Environment:

Air pollution is caused due to both natural and manmade processes. The main source of manmade air pollution 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 the study area are in the 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.

5.9 Monitoring Parameters and Standards

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

5.9.1 Ambient Air Quality Monitoring

The air quality parameters viz. Sulphur di-oxide (SO₂), Oxides of Nitrogen (NO_X), 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.



5.9.1.1 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 studyThe design of monitoring network in the air quality surveillance program has been based on the following considerations:

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

5.9.1.2 Frequency and Parameters for Sampling

Ambient air quality monitoring was carried out for 24hrs representing winter season. High volume samplers were used to collect/measure the air pollutant concentration data at 24 hours averaging periods for all stations. Thebaseline data of air environment was monitored for parameters mentioned below:

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

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

The baseline status of the ambient air quality has been checked through ambient air quality monitoring at selected points along the project road. The ambient air quality has been monitored at 2 locations as shown inTable 25along the project road for particulate matter ($PM_{2.5}$ and PM_{10}), sulphur dioxide (SO_2), oxides of nitrogen (NO_X); and carbon monoxides (CO) using standard analysis technique is shown in Table 24.

Table 24: Techniques Used for Ambient Air Quality Monitoring

Sr. No.	Parameter	Technique	Minimum Detectable Limit (μg/m³)
1.	Particulate Matter (PM _{2.5})	Gravimetric Method	10.0
2.	Particulate Matter (PM ₁₀)	Gravimetric Method	25.0
3.	Sulphur dioxide	Modified West and Gaeke	5.0



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Sr. N	No.	Parameter	Technique	Minimum Detectable Limit (μg/m ³)
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 airquality, air sampling was carried out in the winter season. To generate post-monsoon airquality of the project area, samples of ambient air was collected from four (2) locations for twicea week for two weeks.

Table 25: Air Quality Monitoring locations along the project road

	Name of	Distance	Coordinates		
SL. no	place	(km)	Latitude	Longitude	
1	Chinabat	21.18	25°43'2.39"N	90°32'49.50"E	
2	Asanang	32.85	25°36'1.46"N	90°16'25.46"E	
3	Office Premises of E.E, PHED , Nongstoin	67.96	25°30'19.04"N	90°11'40.76"E	
4	PHED, Araimille, , Tura	39.96	25°31'17.49"N	91°15'45.78"E	

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



Figure 25: Air Quality Monitoring locations along the project road

Ambient air quality monitoring results for $PM_{2.5}$, PM_{10} , SO_2 , NO_X , and CO concentrations are given in Table 26 and summarized below. The monitored values are compared with National Ambient Air Quality Standards prescribed by Central Pollution Control Board (CPCB) and WHO Ambient Air Quality Guidelines (IFC EHS) for residential, rural, and other areas.

Table 26: Ambient Air Quality along the Project Road

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	S. N.	Particulate Matter (PM ₁₀)	Particulate Matter (PM _{2.5})	Sulphur Dioxide	Nitrogen Dioxide
NationalAmbient Air Quality Standard (CPCB) - Permissible limit		100	60	80	80
Chinabat	1			12	24
Asanang	2			9	22
Office Premises of E.E, PHED , Nongstoin	3	36	24	5	15
PHED, Araimille, , Tura	4	43	14	4	14





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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 fourlocations are within the National Ambient Air Quality Standard (CPCB) - Permissible limit.

- > $PM_{2.5}$: The mean $PM_{2.5}$ concentration at ambient air quality monitoring locations varies from 14 µg/m³ to 24 µg/m³. The values are within the permissible limit at all the stations.
- PM₁₀: The mean PM₁₀ concentration at ambient air quality monitoring locations varies from 36to 43 µg/m³. The values are within the permissible limit at all the stations as per the NAAQS.
- > SO₂: The mean concentrations of SO₂ at all ambient air quality monitoring locations vary from 4 μ g/m³ to 12 μ g/m³. 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 14 to 24 μ g/m³. The values are within the permissible limit at all the stations.

5.10 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.



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

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

Table 27: Ambient Noise Standards

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

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

5.10.1 Noise Quality Monitoring

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

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

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

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



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Identification of Sampling Locations

A preliminary reconnaissance survey was done to identify the major noise generating sources along the proposed alignment. The noise at different noise generating sources has been identified based on industrial, commercial, and residential activities, traffic, and noise at sensitive areas. Sound Pressure Level (SPL) measurements were undertaken at all locations, with an interval of about 5 seconds over 10 minutes per hour for 24 hr. The day noise level has been monitored from7 AM to 10 PM and night levels from 10 P.M. to 7 AM at 2 locations. The Details of the monitoring locations are given in Table 28 . Day and night-time Leq have been calculated from hourly Leq values and compared with the stipulated standards.

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

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

Sampling	Location Name	Distance	Coord	linates
Location			Latitude	Longitude
1	Chinabat	21.18	25°43'2.39"N	90°32'49.50"E
2	Asanang	32.85	25°36'1.46"N	90°16'25.46"E

Table 28: Noise Monitoring locations along the project road

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



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Figure 26: Noise monitoring locations along the project road

Table	29:	Dav	and	Niaht	Time	Lea
abio	20.	Duy	unu			

SI. No	Location	AverageNoiseLevelindB	
		DayTi	NightTi
		me	me
1	Asanang	44	33
2	Chinabat	36	30
A	verage	40	31.5

It can be seen from Table 29 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 44dB(A) and night time noise level is 36 dB(A) at Asanang. Average day and night time noise level along the subproject roads varies from 31.5dB(A) to 40 dB(A).

5.11 Biological Environment:

Meghalaya (in Sanskrit, Meghalaya = abode of the clouds) is situated on the western position of the North eastern region of India. It is one of the main constituents of "Seven Sisters" and is predominantly a land of hills and valley. Due to its vast natural beauty and grace, it has been also named as 'Scotland of the East'. Till 1970 Meghalaya was part of undivided Assam, with Shillong as its capital. On January 21, 1972, Meghalaya was created by combining the hill regions of Garo, Khasi, and Jaintia to form a separate state, housing a Legislative Assembly of its own. Geographical location of the state is between 89° 45' to 92° 48' and 25° 02' to 26° 05'.



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The total geographical area of the state is 22, 429 Sq Km, extending 300 km west to east and 100 km from north to south. The state comprises 11 districts, namely South Garo Hills, South West Garo Hills, West Garo Hills, East Garo Hills, North Garo Hills, West Khasi Hills, East Khasi Hills, South Khasi Hill, Ri bhoi, West Jaintia Hills and East Jaintia Hills. It is bounded on the north by Goalpara, Kamrup, Karbi Anglong and Nagaon districts, east by Cachar and North Cachar Hills districts of Assam and west and on the south by Rangpur division and Mymensingh divisions of Bangladesh. The altitude ranges from 50 – 1950 m (Talukdar et al. 2004). The highest peak is Shillong Peak.

The major rivers of the state are Ganol, Ringgi, Krishnai, Manda, Darong, Bhogai, Simsang, Dareng, Umkhri, Umtrew, Umiam, Kopili, Kynshiang, Shella, Umngot, Myntdu, Lubha, etc. One of the marked features of River Kynshi in West Khasi Hills is the formation of River Island called Nongkhnum. Nongkhnum is not only India's but Asia's second largest river island.

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

The faunal diversity of Meghalaya constitutes a total of 5538 species recorded so far, of a total 89,451 species known from India. Nearly 35 % of Indian Mammals and 50 % of the birds are represented in the state (. Invertebrates are represented by 2114 genera and 4580 species, of which 3624 species are insects. Among invertebrates, the porifera is the smallest group represented by only one genus and one species. Meghalaya has 139 species of Mammals, 659 species of Birds, 107 species of Reptiles, 55 species of Amphibia and 152 species of Fishes. Of these, 35 species of Mammals are endangered, vulnerable or insufficiently known. Similarly, 10 species of birds and 9 species of reptiles are either endangered or vulnerable. Along with the species diversity, the State has a significant percentage of endemic elements.

	No. of Genera	No. of Species
Vertebrates		
Mammalia	83	139
Aves	232	659



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Reptilia	51	107
Amphibia	11	55
Pisces	74	152
Invertebrates	2114	4580
Bryozoa	3	5
Arthropoda	1825	3901
Annelida	25	49
Mollusca	67	223
Nematoda	49	77
Rotifera	30	111
Platyhelminthes	56	83
Medusae	2	2
Porifera	1	1
Protozoa	56	128

East Garo Hills District at a Glance:

East Garo Hills District was upgraded from a sub-division to a full-fledged district in 1976, after the erstwhile Garo Hills District was re-organized with a view to bring the administration closer to the people. In 2012 East Garo Hills District was further re-organized to form a new district, the North Garo Hills District, out of the erstwhile Resubelpara Civil Sub-Division. The district is bounded by South Garo Hills on the south, West Garo Hills on the west, West Khasi Hills on the East and North Garo Hills on the north.

As is evident from the name, the district of East Garo Hils is a hilly terrain. The hills are highly dissected and one major formation is the Arbella Range, which cuts through the southcentral part of the district. The range consists of peaks with an average height of 700 metres above sea level. Another important physiographic feature is the Simsang Valley which runs through the southern part of the district. The River Simsang is the longest river in Garo Hills, which originates in West Garo Hills and flows through East Garo Hills and thence to South Garo Hills. The topography of the rest of the district is of undulating low hills, with altitude ranging from 150 to 600 metres above sea level. Besides the Simsang (Someshwari), the district is also drained by the rivers Manda (Dudhnoi) & Damring (Krishnoi), which have their sources within the district. Other than the Simsang which drains southeastwards, the others run north or northwest towards the Brahmaputra. The district enjoys comfortable temperature throughout the year; not very hot in summer and not very cold in winter. Over-all the climatic condition of the district is healthy and tropical. The whole district is under the influence of the monsoons characterised by hot and humid rainy seasons during the summer, and cool and dry seasons during the winter. Temperature ranges from minimum of 5°C to maximum of 36°C.

East Garo Hills supports an incredibly rich biodiversity and some parts of the Nokrek Biosphere Reserve fall under the district. Bamboos are tall arborescent grasses belonging to the



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family Graminaceae. They have an extremely wide range of distribution and are found as an understorey in many types of forests occurring in the state. They form rich belts of vegetation in well-drained parts of tropical and subtropical habitats and rise up-to the highest point in Meghalaya. In East Garo Hills the forests under the control of District Council have been badly mauled by the practice of shifting cultivation. The tree species in these areas have been replaced by pure bamboo crop, over vast areas. In abandoned Jhum areas, pure crops of *Dendrocalamus hamiltonii* (Hamilton's Bamboo), *Melocanna bambusoides* (Muli Bamboo) and *Gigantochloa nigrociliata* have sprung up.

Meghalaya, and Garo Hills in particular is home to several rare animal species. Among them is the Western Hoolock Gibbon, popularly known as the Huro among Garos. It is the only ape species found in India. There are about 2,000 elephants in Garo Hills. The favourite habitat of the elephants is tall forest areas and undulating grounds. They can live in steamy humid jungles as well as in cool elevated forests. Thick bamboo forests are liked by them for food. During the rains, they come out into open valleys and often enter into cultivations.

WILLIAMNAGAR

Williamnagar is a town in district of East Garo Hills of Meghalaya. It lies along the banks of Simsang River due to which it was formerly known as Simsanggre. It is situated about 245 km away from the state capital Shillong and 70 km from Tura, the second largest town of state. It serves as district headquarters and is an important center for cultural, educational and socioeconomical activities. Climate of Williamnagar is pleasant, neither too hot in summers nor too cold in winters. The rain profile is very high during the south west monsoon. The topography of the place is of undulating low hills, with altitude ranging from 150 to 600 metres above sea level.

Protected Areas of Meghalaya:

The protected area network in Meghalaya occupies 1133.9 Sq. Km area which constitutes 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 site does not have any Protected area within its boundary. The nearest Protected area is Nokrek National Park, which is about 12 km away from the project site and falls outside of both Direct and Indirect impact zone. The Protected Area Network of Meghalaya is given in Figure 27 and the distance of the Project site from the Nokrek National park is given in Figure 28.

SI No	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



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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 27: Protected Area Network: Meghalaya



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Figure 28: Distance of Nokrek National Park from the project stretch

Elephant Reserves:

The state has a substantial population of Asian elephant and due to this high density of elephants in the state; the state has developed various policies for their conservation. 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



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forms the core area (400 Km²) of the Elephant Reserve and majority of the part of the Elephant Reserve is situated in East Garo and South Garo Hill Districts. Williamnagar Town is situated outside Elephant Reserve and no presence of elephant had been recorded anywhere from the Williamnagar town in recent years.

Reserved Forests of Meghalaya State:

There are 24 Reserved Forests (RFs) in the state with area varying from 0.44 km² to 150 km² covering a total of 712.74 km² area. The nearest RF is the Rongrenggiri, which is about 3 km from the nearest project site and as the project site is entirely inside the William Nagar Town, there would be no impact on the Reserve Forest. The RF is already degraded due to encroachment and wood extraction and other previous road projects. The distance of the Project Site from the Rongrenggiri RF is shown in Figure 29

District	Name of Reserved Forests	Area (in sq. km.)
East Garo Hills District	Darugiri R.F.	10.36
	Rongrenggiri R.F.	36.26
	Dambu R.F.	18.13
	Songsak R.F.	23.31
Geogle Larth Pro		- 0 X



Figure 29: The distance of the Project Site from the Rongrenggiri RF

Forest Status in Project District:



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As per the latest State of Forest Report 2019 published by Forest Survey of India (FSI) it has been observed that there is a loss of about 87.9 km² of forest cover from 2017 estimation. It is evident from below mentioned table that the project area district has a very high forest cover, i.e., 87.9 % of the geographical area of the district, which mostly comprises of moderately dense or open forest and majority of the forests are either private or owned by the community.

East Garo Hill- Forest Cover (Area in Sq. km)							
District	Geographic Area		As per 2017 Assessment				
		Very Dense	Mod Dense	Open	Total	Forest	
		Forest	Forest	Forest		cover	
East Garo	2,603	62.73	1,085.89	1,139.34	2,287.96	87.90	
Source: Indian	State of Forest Repo	ort, 2019					

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 East Garo Hill District are away from the project sites.

District	Name of Community Reserve	Area (Ha)
	Mandalgre	50
Fact Care Hills	Daribokgre	173
East Garo Hills	Dura Kalakgre	60
	Aruakgre	10

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.



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Tawny-breasted Wren babbler (*Spelaeornislongicaudatus*) 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.

SI No.	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 Figure 30

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 National Park with Baghmara Reserve Forest	Regular
Balpakram		



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Figure 30: the Elephant Corridors in Meghalaya

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 of the groves are in the catchment areas of major rivers. The information on floristic richness of the sacred groves of Meghalaya revealed that at least 514 species representing 340 genera and 131 families are present in these sacred forests. Many endemic, 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., William Nagar Town.



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SI.No.	SacredGroveName	SacredGroveLocation	Area(Hectares)		
District-EastGaroHills					
1	BoraMiapara	BoraMiapara	1		
2	GannaRamRock	Megapgiri	30		
3	Jongola	Jongola	1		
4	KimpraHills	Risubakrapara	20		
5	KonkalHills	Risubakrapara	10		
6	MiaparaRongadom	Miapara	1		
7	Rautagiri	Rautagiri	37		
8	WalchiRuramHills	Risubakrapara	25		

Table 32: Sacred Grove in East Garo Hills District

Sensitive Ecological and cultural attributes:

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

Biodiversity Profile of the Study area:

The whole project site is within William Nagar itself, thus **the biodiversity of the project site is very low.** During the survey, the team has also given emphasis to the presence of different species within the 10 km and 15 km Buffer area of the project site through interview, field visit and literature review. The tree species common to the project site includes – *Shorea robusta* (Sal), *Schima walichii* (Needlewood Tree), *Terminalia bellerica* (Bahera), *Emblica officinalis* (Amla), *Bahunia variegate* (Kanchan), *Duabanga* spp. and *Ficus* spp. However, due to encroachment, wood cutting and urbanization, the forest cover of the area has reduced considerably.

ScientificName	Family	Сгор Туре	Local/English Name
Allium cepa	Amaryllidaceae	Vegetable	Piyaj
Allium sativum	Amaryllidaceae	Spice	Lahsun
Amaranthus sp.	Amaranthaceae	Vegetable	Lalsag
Ananas comosus	Bromeliaceae	Fruit	Pineapple
Areca catechu	Arecaceae	Plantation Crop	Tambul
Artocarpus heterophyllus	Moraceae	Vegetable	Kathal
Capsicum annuum	Solanaceae	Vegetable	Mirch
Carica papaya	Caricaceae	Fruit	Papita
Colocasia esculenta	Aracea	Vegetable	Kachchu

Table 33: Agro-biodiversity in the Study Area



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Cucumis sativa	Cucurbitaceae	Fruit	Kheera
Daucus carota	Apiaceae	Vegetable	Gajar
Lycopersicon esculentum	Solanaceae	Vegetable	Tamatar
Momordica charantia	Cucurbitaceae	Vegetable	Karela
Musa indica	Musaceae	Fruit	Kela
Oryza sativa	Poaceae	Cereal	Dhan
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
Zea mays	Poaceae	Cereal	Makka
Zingiber officinalis	Zingiberaceae	Rhizome	Adrakh

The list presented below tabulates the Angiosperms (a large group that comprises those that have flowers and produce seeds enclosed within a carpel, including herbaceous plants, shrubs, grasses, and most trees) and the Ferns and Fern Allies that are found in the area.

Common Name	ScientificName	Family	LocalAvailabi lity	IUCN Status
Angiosperms				•
Climbing wattle (Climbing Shrub)	Acacia pennata	Mimosaceae	Common	LC
Billy-Goat weed (Herb)	Ageratum conyzoides	Asteraceae	Very Common	NA
White Siris (Tree)	Albizia procera	Mimosaceae	Rare	NA
Kadam (Tree)	Anthocephalus chinensis	Rubiaceae	Common	NA
Kanthal (Tree)	Artocarpus integrifolia	Moraceae	Common	NA
(Grass)	Arundinella nepalensis	Poaceae	Common	NA
Common Name	ScientificName	Family	LocalAvailability	IUCN Status
Giant reed (Grass)	Arundo donax	Poaceae	Common	LC
Shatavari (Woody Climber)	Asparagus racemosus	Liliaceae	Rare	NA
White Orchid Tree (Shrub)	Bauhinia acuminata	Caesalpiniaceae	Common	LC
Silk Cotton Tree (Tree)	Bombax ceiba	Bambacaceae	Very Common	NA
Narrow leafed Bittercress (Herb)	Cardamine impatiens	Brassicaceae	Common	NA
Golden Shower Tree (Tree)	Cassia fistula	Caesalpiniaceae	Common	NA
Chakunda (Shrub)	Cassia tora	Caesalpiniaceae	Common	NA
Guria Grass (Herb)	Chrysopogon fulvus	Poaceae	Common	NA
Velvet Leaf (Herb)	Cissampelos pariera	Manispermacea e	Rare	NANIC
Wandering Jew (Herb)	Commelina benghalensis	Commelinaceae	Very Common	NANIC
Purple Nut Sedge (Herb)	Cyperus rotundus	Cyperaceae	Abundant	NANIC



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Hamilton's Bamboo (Herb)	Dendrocalamus hamiltonii	Poaceae	Common	NA
Air yam (Climber)	Dioscorea bulbifera	Dioscoreaceae	Common	NA
Indian Coral tree (Tree)	Erythrina variegata	Papilionaceae	Rare	NA
Bristly Spurge (Herb)	Euphorbia emodi	Euphorbiaceae	Common	LC
Asthma Weed (Herb)	E. hirta	Euphorbiaceae	Common	NA
Hairy fig (Small tree)	Ficus hispida	Moraceae	Common	NA
	Galium sp.	Rubiaceae	Common	NA
Gamhar (Tree)	Gmelina arborea	Verbenaceae	Common	NA
Cogon Grass (Herb)	Imperata cylindrica	Poaceae	Common	LC
Railway Creeper (Herb)	I. cairica	Convolvulaceae	Very common	NA
Vasak (Herb)	Justicia adhatoda	Acanthaceae	Common	NA
(Tree)	Lagerstroemia speciosa	Lytharaceae	Rare	NA
Yellow pea (Creeper)	Lathyrus aphaca	Fabaceae	Common	NA
Duckweed (Aquatic Herb)	Lemna minor	Lemnaceae	Common	LC
Virginia Papergrass (Herb)	Lepidium virginicum	Brassicaceae	Common	NA
Indian Laurel (Tree)	Litsea glutinosa	Lauraceae	Rare	NA
Kumkum Tree (Tree)	Mallotus philippensis	Euphorbiaceae	Common	NA
Touch-me-not (Creeper)	Mimosa pudica	Mimosaceae	Rare	NA
Touch-me-not (Creeper) Common Name	Mimosa pudica ScientificName	Mimosaceae Family	Rare LocalAvailability	NA IUCN Status
Touch-me-not (Creeper) Common Name Tall reed (Herb)	Mimosa pudica ScientificName Phragmites karka	Mimosaceae Family Poaceae	Rare LocalAvailability Common	NA IUCN Status LC
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree)	Mimosa pudica ScientificName Phragmites karka Phyllanthus emblica	Mimosaceae Family Poaceae Euphorbiaceae	Rare LocalAvailability Common Common	NA IUCN Status LC NA
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree) Annual Meadowgrass (Herb)	Mimosa pudica ScientificName Phragmites karka Phyllanthus emblica Poa annua	Mimosaceae Family Poaceae Euphorbiaceae Poaceae	Rare LocalAvailability Common Common Common	NA IUCN Status LC NA LC
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree) Annual Meadowgrass (Herb) Fennel-leaved Pondweed (Herb)	Mimosa pudica ScientificName Phragmites karka Phyllanthus emblica Poa annua Potamogeton pectinatus	Mimosaceae Family Poaceae Euphorbiaceae Poaceae Potomogetonac eae	Rare LocalAvailability Common Common Common Common	NA IUCN Status LC NA LC LC
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree) Annual Meadowgrass (Herb) Fennel-leaved Pondweed (Herb) (Herb)	Mimosa pudica ScientificName Phragmites karka Phyllanthus emblica Poa annua Potamogeton pectinatus Pycrius spp.	Mimosaceae Family Poaceae Euphorbiaceae Poaceae Potomogetonac eae Cyperaceae	Rare LocalAvailability Common Common Common Abundant	NA IUCN Status LC NA LC LC NA
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree) Annual Meadowgrass (Herb) Fennel-leaved Pondweed (Herb) (Herb) Corn Buttercup (Herb)	Mimosa pudica ScientificName Phragmites karka Phyllanthus emblica Poa annua Potamogeton pectinatus Pycrius spp. Ranunculus arvensis	Mimosaceae Family Poaceae Euphorbiaceae Poaceae Potomogetonac eae Cyperaceae Ranunculaceae	Rare LocalAvailability Common Common Common Abundant Common	NA IUCN Status LC NA LC LC NA
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree) Annual Meadowgrass (Herb) Fennel-leaved Pondweed (Herb) (Herb) Corn Buttercup (Herb) Kans grass (Herb)	Mimosa pudicaScientificNamePhragmites karkaPhragmites karkaPhyllanthus emblicaPoa annuaPotamogeton pectinatusPycrius spp.Ranunculus arvensisSaccharum spontaneum	Mimosaceae Family Poaceae Euphorbiaceae Poaceae Potomogetonac eae Cyperaceae Ranunculaceae Poaceae	Rare LocalAvailability Common Common Common Abundant Common Abundant	NA IUCN Status LC NA LC LC NA NA LC
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree) Annual Meadowgrass (Herb) Fennel-leaved Pondweed (Herb) (Herb) Corn Buttercup (Herb) Kans grass (Herb)	Mimosa pudicaScientificNamePhragmites karkaPhyllanthus emblicaPoa annuaPotamogeton pectinatusPycrius spp.Ranunculus arvensisSaccharum spontaneum	Mimosaceae Family Poaceae Euphorbiaceae Poaceae Potomogetonac eae Cyperaceae Ranunculaceae Poaceae	Rare LocalAvailability Common Common Common Abundant Common Abundant	NA IUCN Status LC NA LC LC NA NA LC
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree) Annual Meadowgrass (Herb) Fennel-leaved Pondweed (Herb) (Herb) Corn Buttercup (Herb) Kans grass (Herb)	Mimosa pudicaScientificNamePhragmites karkaPhragmites karkaPhyllanthus emblicaPoa annuaPotamogeton pectinatusPycrius spp.Ranunculus arvensisSaccharum spontaneumSapium baccatum	Mimosaceae Family Poaceae Euphorbiaceae Poaceae Potomogetonac eae Cyperaceae Ranunculaceae Poaceae Euphorbiaceae	Rare LocalAvailability Common Common Common Abundant Common Abundant	NA IUCN Status LC NA LC LC NA LC NA
Touch-me-not (Creeper) Common Name Tall reed (Herb) Amla (Tree) Annual Meadowgrass (Herb) Fennel-leaved Pondweed (Herb) (Herb) Corn Buttercup (Herb) Kans grass (Herb)	Mimosa pudicaScientificNamePhragmites karkaPhragmites karkaPhyllanthus emblicaPoa annuaPotamogeton pectinatusPycrius spp.Ranunculus arvensisSaccharum spontaneumSapium baccatumScripus spp.	Mimosaceae Family Poaceae Euphorbiaceae Poaceae Potomogetonac eae Cyperaceae Ranunculaceae Poaceae Euphorbiaceae Cyperaceae	Rare LocalAvailability Common Common Common Abundant Common Abundant Common Common	NA IUCN Status LC NA LC NA LC NA LC NA



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Kumarika (Climber)	Smilax zeylanica	Smilaceae	Rare	LR
Ban tamakhu (Small tree)	Solanum erianthum	Solanaceae	Common	NANIC
	Sonchus spp.	Asteraceae	Common	NA
Common chickweed (Herb)	Stellaria media	Caryophylaceae	Common	NA
Jamun (Tree)	Syzygium cumini	Myrtaceae	Common	NA
Teak (Tree)	Tectona grandis	Verbenaceae	Common	NA
Broom Grass (Herb)	Thysanolaena maxima	Poaceae	Common	NA
Giloy (Climber shrub)	Tinospora cordifolia	Manispermacea e	Rare	NA
Red Cedar (Tree)	Toona ciliata	Meliaceae	Common	NA
False white teak (Tree)	Trewia nudiflora	Euphorbiaceae	Rare	LR
(Tree)	Vitex peduncularis	Verbenaceae	Rare	NA
Ber (Tree)	Zizyphus mauritiana	Rhamnaceae	Abundant	NANIC
Tailed maidenbair (Herb)	Adjantum caudatum	Adiantacaaa	Common	ΝΙΛ
Himalayan horsetail (Herb)	Equisetum diffusum	Equisetaceae	Common	NA

Abbreviations:VU=Vulnerable,NA=NotassessedbutpresentinthecatalogueofLife,NANIC=Notassessedandnotpre sentinthecatalogueofLife, LC =Least concern, LR =Lowrisk

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 as Camellia caduca C.B.Cl.ex Brandis, Citrus species such *latipes* Tanaka (Khasi papeda), Nepenthes khasiana Hk. F (Indian Pitcher plant), 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, II ex 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, presently, harvesting of medicinal plants has drastically reduced due to increased dependency on modern medicine and lack of traditional knowledge. The project site is entirely



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within William Nagar and it is already a built-up and developed area and there are no reports of medicinal plants within the project site.

Fauna in Study Area:

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

Mammals present in the study area:

Though the state of Meghalaya records the 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 forest cover. The table given below tabulates the list of mammals found in the study area.

Order	Common Name	Scientific Name	Local Availability	IUCNSt atus	WPASta tus
Primates	Rhesus macaque	Macaca mulatta	Common	LC	II
Artiodactyla	Wild Boar	Sus scrofa	Rare	LC	
Artiodactyla	Barking Deer	Muntiacus muntjak	Rare	LC	II
Carnivora	Jungle Cat	Felis chaus	Rare	LC	II
Carnivora	Common Palm Civet	Paradoxurus hermaphroditus	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

Table 35: Mammals found in the study area

Herpetofauna of the study area:



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Herpetofauna includes reptiles and amphibians of a particular area. Major reptiles include snakes, lizards etc. Snakes, lizards are common in the project site as the area is a predominantly agriculture zone. Being an urban area, the herpetofauna diversity is very low in the project site. The table presented below lists the reptiles and the amphibians found in the area.

Order	Common Name	Scientific Name	Local	IUCN	WPA
			availability	Status	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
Pythonidae	Burmese Python	Python bivittatus	Common	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	Mountain Pit Viper	Ovophis monticola	Rare	LC	II
Colubridae	Red Necked Keelback Snake	Rhabdophis subminiatus	Rare	LC	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	Garo Hill Bush Frog	Philautus garo	Very Rare	VU	IV
LC= Least Concern, EN= Endangered,NT= Near Threatened, VU= Vulnerable					

Table 36: Snakes and lizards found along the project area

Common Fishes of study area:

Fish diversity of the West Garo hills is quite high due to presence of numerous water bodies, smalls streams etc. As commercial fishery is an important livelihood option in West Garo hills, many different species of fishes are farmed in the region. The River Simsang is situated in very


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close proximity to the Project Site, but due to over fishing resulting from the close proximity to the town limit, the fish diversity is very low and production is also very low.

The table given below lists the fishes found in the study area.

Order	Scientific Name	Common Name	Local Name	IUCN Status
Cypriniformes	Gudusia chapra	Indian river shad	Na Patchi/Puti	LC
Cypriniformes	Danio sp	Zebra Fish	Na bat	LC
Cypriniformes	Puntius chola	Barb	Na Patchi/Puti	LC
Cypriniformes	Puntius conchonius	Rosy Barb	Na Patchi/Puti	LC
Cypriniformes	Puntius sophore	Pool Barb	Na Patchi/Puti	LC
Cypriniformes	Amblypharyngodon mola	Mola Carplet	Kha Muka	LC
Cypriniformes	Botia rostrata	Gangetic Loach	Kah Syiem(khasi)	VU
Cypriniformes	Garra sp			LC
Cypriniformes	Neolissocheilus hexagonolepis	Copper Mahsheer	Na rong	NT
Cypriniformes	Tor putitora	Golden Mahsheer	Na gitchak	EN
Cypriniformes	Labeo pangusia		Na wak	NT

Table 37: Common fishes found in the study area

Common Birds of study area:

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

Table 38: Common Birds found in the Study area

Common Name	Scientific Name	IUCN Status	WPA1972 Schedule
Black drongo	Dicrurus macrocercus	Least concern	Schedule IV
Blue throated barbet	Psilopogon Asiaticus	Least concern	Schedule IV



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Common myna	Acridotheristristis	Least concern	Schedule IV
Common tailorbird	Orthothomus sutorius	Least concern	Schedule IV
Emerald Dove	Chalcophaps indica	Least concern	Schedule IV
Great barbet	Psilopogon virens	Least concern	Schedule IV
House sparrow	Passer domesticus	Least concern	Schedule IV
Indian pond heron	Ardeola grayii	Least concern	Schedule IV
Jungle myna	Acridothers fuscus	Least concern	Schedule IV
Red vented bulbul	Pycnonotus cafer	Least concern	Schedule IV
Shikra	Accipiter badius	Least concern	Schedule IV
spotted dove	Spilopelia chinensis	Least concern	Schedule IV
white throated kingfisher	Halcyon smyrnensis	Least concern	Schedule IV
Oriental white eye	Zosterops palpebrosus	Least concern	Schedule IV
Asian Koel	Eudynamys scolopeceus	Least concern	Schedule IV
Common Hoopoe	Upupa epos	Least concern	Schedule IV
Rufous woodpecker	Micropternus brachyurus	Least concern	Schedule IV
Common Iora	Aegithina tiphia	Least concern	Schedule IV
Scarlet minivet	Pericrocotus flammeus	Least concern	Schedule IV
Bronzed Drongo	Dicrurus aeneus	Least concern	Schedule IV
Black Hooded Oriole	Oriolus xanthornus	Least concern	Schedule IV
Rufous treepie	Dendrocitta vagabunda	Least concern	Schedule IV
Barn Swallow	Hirundo rustica	Least concern	Schedule IV
Asian pied Starling	Gracupica contra	Least concern	Schedule IV
Paddy field pipit	Anthus rufulus	Least concern	Schedule IV
Oriental turtle dove	Streptopelia orientalis	Least concern	Schedule IV
Red collared dove	Streptopelia tranquebarica	Least concern	Schedule IV
Green bee eater	Merops orientalis	Least concern	Schedule IV
White wagtail	Motacilla alba	Least concern	Schedule IV
Grey wagtail	Motacilla cinerea	Least concern	Schedule IV
Citrine wagtail	Motacilla citreola	Least concern	Schedule IV
Common stonechat	Saxicola torquatus	Least concern	Schedule IV
Crimson sunbird	Aethopyga siparaja	Least concern	Schedule IV
Purple sunbird	Cinnyris asiaticus	Least concern	Schedule IV
Jungle owlet	Glaucidium radiatum	Least concern	Schedule IV
Jungle babbler	Turdoides striata	Least concern	Schedule IV
Greater necklaced laughing			
thrush	Garrulax pectoralis	Least concern	Schedule IV
Black throated sunbird	Aethopyga saturata	Least concern	Schedule IV
Green tailed sunbird	Aethopyga nipalensis	Least concern	Schedule IV
Purple rumped sunbird	Leptocoma zeylonica	Least concern	Schedule IV



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Ruby cheeked sunbird Chalcoparia singalensis		Least concern	Schedule IV
Scarlet backed			
flowerpecker	Dicaeum cruentatum	Least concern	Schedule IV
Plain prinia	Prinia inornata	Least concern	Schedule 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 the solar 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 aquatic ecosystem as they respond quickly to the environmental changes. A rapid survey of the different water bodies was carried out to determine the species diversity in project site.

Given below is the list of phytoplanktons and zooplanktons found in 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.	

Table 39: Phytoplanktons found in the project area



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Spirulina sp.	Class: Chrysophyceae
Nostoc sp.	Dinobryon sociale
Class: Dinophyceae	
Ceratium sp.	
Glenodinium sp.	
Ceratium hirudinella	

Table 40: Zooplankton found in the Project area

Kingdom: Animalia; Phylum: CRUSTACEA	Order: Rotifera
Nauplii sp. larvea	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—make 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 a risk of being lost. The non-material criteria relate to the cultural and aesthetic aspects. It could be that the tree has a historical or cultural association



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either with a person, or 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.

Sericulture

NoSericulture activities were identified in the project region.

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 was 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 were to be found within the formation width of the subproject road, necessary mitigation measures would have been 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

Tea Estates

No tea Plantation is present along the Project Site.

5.11.1 Educational Institutions / Hospitals

The educational institutions and hospital/health centres constitute the sensitive environmental receptors. The list of such features along the ROW along the project roads is presented in Table 41. A total number of 3 educational institutions are located along the project stretches. No health care centre was found within the project core zone which is 500m either side of the road.

Sr. No.	Receptor	Road Name	Side	Approx distance from the edge of the road (m)
1	School	RSN road to Terrace Gittim-Dawa Nengjata	LHS	194.47

Table 41: Sensitive receptors along the project road



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2	School	RSN road to Terrace Gittim-Dawa Nengjata	RHS	2.92
3	School	Williamnagar City Roads: junction to junction Kusimkolgre	RHS	5.28
4	Church	RSN Road to Terrace Gittim opposite Loyola College William Nagar	RHS	1.78
5	Hospital	Junction to Junction 23 Start point	RHS	0.39
6	District & Session Court	Junction to Junction 24 Circular Road	RHS	8.81





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Figure 31: Photographsofsomesensitivereceptorsalongtheroadstretch

5.12 Social Environment

5.12.1 The State Profile of Meghalaya

The State of Meghalaya was carved out of Assam as an autonomous State in April 1970 and was declared a full-fledged State in January 1972. Meghalaya, situated in the north eastern region of India is a narrow stretch of land, running between Bangladesh on the South and West and Assam on the North and East, Meghalaya lies between 24° 58' N to 26° 07'N latitudes and 89° 48'E to 92° 51' E longitudes. It covers an area of 22,429 sq. km. The State has most of its land covered by hills interspersed with gorges and small valleys. Endowed with dense forests and rivers cascading down undulating terrain, this region is one of the most scenic of the North Eastern States.

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



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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 AustroloidMonkhmer race. The ESIA Study Proposal of Roads lies under West Khasi, RiBhoi, South West Khasi, Jaintia, East Garo Hills respectively.

5.12.2 District Profile:

East Garo Hills District was upgraded from a sub-division to a full fledged district in 1976, after the erstwhile Garo Hills District was reorganised with a view to bring the administration closer to the people. In 2012 East Garo Hills District was further reorganised to form a new district, the North Garo Hills District, out of the erstwhile Resubelpara Civil Sub-Division. The District is bounded by South Garo Hills on the south, West Garo Hills on the west, West Khasi Hills on the East and North Garo Hills on the north.

The new headquarter-complex is a neatly planned township. It has been christened as Williamnagar after Captain Williamson A. Sangma, the first Chief Minister of the State of Meghalaya. Williamnagar now has all the amenities of a modern town and is the largest growth centres in Garo Hills, next to Tura.

5.12.3 Demographic Profile

Out of total population of Meghalaya, 13.9% people live in urban regions. The district occupies: Table 42:Demographic Profile of West Khasi Hills District

Description	Census 2011	Census 2001
Total Population	317,917	250,582
Male	161,223	127,474
Female	156,694	123,108
Population Growth	26.87%	32.45%
Area Sq.Km	2,603	2,603
Density /Km2	122	96
Proportion to Meghalaya Population	10.72%	10.81%
Sex Ratio (Per 1000) Males	972	966
Average Literacy	73.95	60.59
Male Literacy	77.72	66.12
Female Literacy	70.05	54.84
No. of Blocks	6	NA
No. of Villages	492	NA

Source: Census 2011

As per 2011 census, 86.1% population of East Garo Hills district lives in rural areas of villages. The total East Garo Hills district population living in urban areas is 44192 of which males and females are 22,460 and 21732 respectively. In rural areas of East Garo Hills district, sex ratio is 968 females per 1000 males.

Table 43 Distribution of Rural and Urban Population



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Description	Urban	Rural
Population (%)	86.10 %	13.90 %
Total Population	273,725	44,192
Male Population	138,763	22,460
Female Population	134,962	21,732
Sex Ratio	973	968

Source: Census 2011

5.12.4 Schedule Castes and Schedule Tribes

The population of East Garo Hills district consists of two major groups - tribal & non-tribal. The tribal population of the district amounts to 96.54 % of the total population. The majority of the tribal population are the Garos, while the other indigenous inhabitants are the Hajongs, Rabhas, Koches, Rajbansis, Kacharis and Dalus. The small non-tribal population, including the Scheduled Castes is mostly concentrated in the urban settlements of Williamnagar and semi-urban habitations like Rongjeng, Songsak & Rongsak.

5.12.5 Literacy Rate

Average literacy rate of East Garo Hills in 2011 were 73.95 compared to 60.59 of 2001. If things are looked out at gender wise, male and female literacy were 77.72 and 70.05 respectively. For 2001 census, same figures stood at 66.12 and 54.84 in East Garo Hills District. Total literate in East Garo Hills District were 192,147 of which male and female were 102,513 and 89,634 respectively. In 2001, East Garo Hills District had 120,874 in its district.

5.12.6 Employment Pattern

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

As unemployment and poverty are correlated, it becomes necessary to understand the occupational pattern of labour force and status of employment to analyse the development in the state.

East Garo Hills:

More than 80% of the total population in East Garo Hills is agrarian as their main backbone of livelihood is basically agriculture. Rice, Maize, potato and ginger are the main crops grown in East Garo Hills. Agriculture and allied activities provide income and employment for the people



in West Khasi Hills. Mono cropping in low land areas and mixed cropping in upland areas are the features of agriculture in the district.

5.12.7 Economic Development

Since independence, various schemes have been adopted by the central and local governments for economic development. The district council was created under the sixth schedule of the Constitution of India to preserve the traditional way of life of the people, to protect them from exploitation by others, and to make them leaders of their own progress. The tribal development blocks came into existence to ensure speedy development. Incentives provided for cash crops and efforts made to popularize terrace cultivation have yielded some results. The communication bottle-neck, soil erosion and loss of fertility are, however, among the problems retarding prosperous economic growth.

The occupational mobility is a noticeable phenomenon. The literacy rate is on increase and the educated gentry is involved in professions other than traditional agriculture. Many are employed outside Garo Hills. Some are wealthy farmers, taking advantage of the official schemes. The multi-tier democratic political system has converted many into whole-timers in politics. The contractors constitute the wealthy class. The growth of population and markets inspired many to set themselves in business. Poultry and diary farming and bee-keeping are also practiced.

5.12.8 Road Network

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

The project road stretchesare of great importance, as the road will carry not only the normal city traffic, but also the freight traffic that will connect the export points to the National Highway. The road network of the East Garo Hills district is given below:



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Figure 32: Road Network of East Garo Hills

5.12.9 Railway

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

5.12.10 Aviation

The state has an airport atUmroi which is at a distance of 30 kilometres from Shillong. There is also a helicopter service connecting Shillong to Guwahati and Tura. Baljek Airportnear



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Turabecame operational in 2008. Other nearby airports are in Assam, Borjhar, Guwahatiairport, about 124 kilometres (77 mi) from Shillong. Newly operational Rupsi Airport is also near to Tura.

5.12.11 Agriculture and Cropping Pattern

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

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

East Garo Hills:

Agriculture is the mainstay of livelihood of the people in the district, covering about 80% of the total population. The people are dependent on traditional jhum cultivation and forests for their livelihood. Efforts to improve food production through agriculture are impeded by the limited area available for cultivation, hilly terrain, low land holdings, landlessness, and low availability of technical support.

5.12.12 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 of livestock and poultry, the productivity of livestock and poultry is very poor due to stunted growth and low production of local breeds of livestock and poultry, non-scientific approach of livestock and poultry farming.

5.12.13 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.



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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 area in 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 farm in the District. There are also 3 nos. of fish sanctuaries which aims at conserving the indigenous and endemic fish species. According to the Fisheries Department, fish production (2014-15) in the District is 386 MT.

5.12.14 Hospitals

The PIA has 1 hospital, 1 dispensaries, 7 primary health centres, 1 community health centres, 1 leprosy control unit, 1 set centre, 1 ayurvedic dispensary and 3 homeopathic dispensaries. Para medical personnel registered during the year for the service of the people of the district.



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

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

Environmental parameters are broadly classified into three groups.

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

6.1 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 details of potential impacts & mitigation measures are mentioned in the below table.

6.1.1 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. However, at few locations small parcel of land will be required to accommodate the proposed improvement/widening. The impacts during Design and Preconstruction stage have been discussed in the following sections:

6.1.1.1 Impacts on Physiography

The project section is an already existing road and located within city limits. 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



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locations without significant alteration of existing vertical profile, except for improvement of geometrics and road safety. The rehabilitation and widening will be generally restricted within the 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.

6.1.1.2 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, and 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.

6.1.1.3 Felling of Trees

The amount of tree within toe line due to widening of highway is 166 trees. Compensatory afforestation will be done to restore the green cover. The project road is not passing through any reserved or protected forest. Hence does not require any mitigation measure.

6.1.1.4 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.

6.1.1.5 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 located in 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.

6.1.2 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.

The standard road construction works involve site clearance, excavation, filling of earth materials and sub grade materials, laying of bituminous mixtures, handling of hazardous



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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.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 all improvements will be undertaken within the formation width of the road, there will no direct impacts on land use conversion. The anticipated impacts due to all these activities have been described below:

6.1.2.1 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; Must include ETP in such designated locations.
- 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.

6.1.2.2 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 loam or 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 and to 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. layers and bitumen sprayers during the surfacing of the roads. The concrete wastes from the batching plant and transit mixer wash water would also be generated.



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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, handleds 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 constructionof
 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 (Chruch, community forest) which is traditionally used as conservation areas

Land Types Preferred:

- Waste lands.



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 Waste Lands belonging to owners who look upon the temporary use as a source of income.

- 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.

6.1.2.3 Borrow Areas and Quarries

Need for opening borrows areas is anticipated. It may cause some adverse impacts if left unrehabilitated. 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, air and 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. The Indian 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% and, 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.

6.1.2.4 Ambient Air Quality

Construction stage impacts will have adverse impacts on the workers as well as the settlements adjacent 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 hot



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mix 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 44: Adverse impacts on ai	r quality during	construction stage
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SI. No.	Impact	Source
1 Generat of dust	Generation of dust	Transportation and tipping of cut material - while the former will occur over the entire stretch 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	Hot mix plants
	of	Large construction equipment, trucks and asphalt producing and paving equipment
	polluting	The movement of heavy machinery, oil tankers etc.
	gases	Toxic gases released through the heating process during bitumen production
	including SO_2 , NO_x and HC	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 water fogging 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 pollution check 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 required by statutory requirements after securing a No-Objection Certificate (NOC) from the



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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 needs 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.

Parameters	Potential Impact	Mitigation Measures Suggested
Air Environment	• Generation of dust	 Sprinkling of water Earth handling site Borrow area Road construction site Access road route Air pollution control at crusher and Plants PPE for Workers Stone crushing units and Plants should be with environment compliance. Necessary clearance needs to be obtained prior to operation of the borrow area. Regulations of construction timings near sensitive receptors and settlements
	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.

Table 45: Impact on Air Environment and Mitigation Measures

6.1.2.5 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



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increase temporarily in the close vicinity of various construction activities, maintenance workshops, and vehicles and earthmoving equipment. These construction activities are expected to generate noise levels in the range of $80 - 95 \, dB(A)$ at a distance of about 5 m from the source.

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

The QUESTOR Construction Noise Tool is a simple application capable of calculating noise levels for construction sites. It is based on the construction site noise calculation model documented in PR70 "How much noise do you make? A guide to assessing and managing noise on construction sites" by Dr Alan Wills (KVÆRNER) and David Churcher (CIRIA). The tool itself works on a relationship of one receiver to many sources.

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



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

<u>Inference</u>

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.



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ID	Туре	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))
Sit	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 nois	e from site a	t receiver	80
Gro	ound Excavatior	١								
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										

Table 46: Typical noise levels of principal construction equipment (Noise Level in dB (A) at 50Feet



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ID	Туре	Noise pressure (dB), 1m from the source	Distance (m)	Barrier	Reflection	On Time (%)	Angle of View (⁰)	Traffic Volume / hour	Speed (km/hr)	Total (dB(A))
1	Dump Truck	110	50	None	None	100	90	10	10	57
							Total nois	e from site a	it 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 nois	e from site a	t receiver	81
Sp	reading Fill									
1	Wheeled excavator / loader	104	50	None	None	50	90	10	10	81
2	Dozer	117				50	90	10	10	61
							Total nois	e from site a	t receiver	81
Gro	ound 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			
Un	loading									
1	Tipper lorry	113	50	None	None	50	90	10	10	57
2	Tracked	112				50	90	10	10	89



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ID	Туре	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))
	loader									
Total noise from site at receiver								89		
Rolling gravel / bricks										
1	Road roller	108	50	None	None	100	90	10	10	55
							Total nois	e from site a	t receiver	85
Co	mpacting 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 nois	e from site a	t receiver	88
Co	mpacting sub-b	ase								
1	Compactor rammer	108	50	None	None	100	90	20	15	89
							Total nois	e from site a	it receiver	89
Co	mpacting earth									
1	Compactor rammer	108	50	None	None	100	90	20	15	89
Total noise from site at receiver							89			
Ro	ad surfacing									
1	Asphalt	103	50	None	None	70	NA	NA	NA	59



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ID	Туре	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))
	melter (Stationary)									
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		
Ins	Installation of traffic light controls									
1	Groove cutter	115	50	None	None	100	NA	NA	NA	73
Total noise from site at receiver							71			

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

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

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



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The principal source of noise during construction of highway would be from operation of equipment, 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 transmitted along 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.

Name of the	Description	side of the road	Distance	Noise
Component		(L/R)	from the	Level
			road (m)	(dB)
SCH	School	LHS	194.47	59.20
SCH	School	RHS	2.92	95.67
SCH	School	RHS	5.28	90.52
CHC	Church	RHS	1.78	99.97
HSP	Hospital	RHS	0.39	113.15
CRT	District Session Court	RHS	8.81	86.07

Table 47: Anticipated Noise due to construction in the sensitive receptor

From the above study we have observed that the range of noise level of maximum locations is exceeding the permissible limit for both Sensitive and Non-sensitive receptors. To avoid impacts, the mitigation measures are proposed below.

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

Control Measures adopted during Construction Phase for Noise Environment

• Site Controls: Stationary equipment will be placed along un-inhabited stretches, as 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.. 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.

6.1.2.6 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. Mining and 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



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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 the monsoon season
- Retaining walls have been proposed to prevent erosion
- Installation of temporary silt traps or sedimentation basins along the drainage leading to the water 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.
- Refueling vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge
- Collecting all waste oil, store in sealed damage-proof containers and disposing it to recyclers.
- All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.
- Installation of temporary retention ponds, interception drains, and silt traps to prevent silt laden water from entering adjacent water bodies/waterways;
- Modification and rechanelling of the slopes of embankments leading to water bodies to prevent entry of contaminants.
- Compliance with requirements of the clearance issued by the relevant state authority for mining in rivers
- No construction related activities of bridges during breeding season of fish and other aquatic species.

6.1.2.7 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



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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 a raise 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 Vertiver as 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 before the water current hits the bank.

6.1.2.8 Ground Water Quality

Water for construction purpose will be sourced mainly through major streams along the project road. Suitable arrangement for drinking water 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 project area.
- No change in groundwater regime is envisaged, hence no mitigation is proposed.

6.1.2.9 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



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depending upon suitability. However, Contractor shall dispose unused C&D waste at designated disposal site as per theConstruction and Demolition Waste Management Rules, 2016.

Mitigation measures:

Contractor will use the excavated road side material for construction of road. The rest unsuitable material will be disposed suitably. The lead and lift has 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 the Contractor to dispose the unsuitable material generated from hill cutting/ road excavation.

6.1.2.10 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 be designed 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 water-logging.

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

6.1.2.11 Disruption of Community Services

Local services, including water supply lines, irrigation line, drainage, ditch, and 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 reinstated at all.

Mitigation Measures

- The Contractor will make arrangements for their own source to cater to 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.

6.1.2.12 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



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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 at various construction sites during construction phase. It needs to be mentioned that though there are 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.

MitigationMeasures

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

6.1.2.13 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 a risk of accidents to the labours. However this type of risks of Occupational hazards can be managed with implementation of proper safety at site.

MitigationMeasures:

- 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 that these PPEs are used by workers at all time during works.
- Safe access to the work site and safe working conditions to be maintained throughout the 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 various diseases.
- Adequate sanitation and waste disposal facilities will be provided at construction camps by means of septic tanks, soakage pits etc.
- A health care system will be maintained at construction camp for routine check-up of workers 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 work sites and should be regularly maintained.
- The Contractor will organize awareness program on occupational health and safety aspects 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.

6.1.2.14 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 throughout the 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-resistant soles
- Hazard communication: Make information accessible to employees at all times in a language or formats
- Check all electrical tools and equipment regularly for defect



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• 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.

6.1.2.15 Anticipated Impact on Biological Environment: Impact on Faunal and Terrestrial Ecology:

The entire project site is within the William Nagar Town and 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 implementing speed calming mitigation measures such as road humps, rumble strips, speed limits, sign boards 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, at every 2 km, on alternate sides 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 Preconstruction 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 trees 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 species which 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:

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

Table 48: Species name for plantation



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Scientific Name	Role
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 causing water pollution. No negative impacts are envisaged on the aquatic ecology during the operational phase.

Mitigation measures

- Construction of road embankments shall be done based 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 point of 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 the dumpsite 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 into disposal 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 of shrubs 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.


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Environmental Management Plan for Construction Stage					
Tree cutting in ROW	Land clearing activities at the construction site should be kept at an absolute minimum.	Throughout the projectarea	Construction Stage	Contractor andSupervisi onConsultant ForestDept.	PIU
species	 with vulnerable species during engineering work) shall be shared with the State Environment and Forest Department and concerned regional environmental experts. Anti-poaching measures during the construction phase should be strengthened to check for any violation of existing regulations. Awareness campaign to be made among the workers to make them aware about the endangered and other important species. Construction vehicles must be operated at 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 during their breeding season. . Natural bank slope is preserved and location of the bridge piers by avoiding such areas will be ensured. The construction camp, borrow areas or disposal sites will be established within 100m of the shorelines at the highest water level period. 	theprojectar ea	Stage	andSupervisi onConsultant	



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Hygiene	-	The Contractor during the progress of	Wherever	Construction	Contractor	PIU
atC		work will provide erect (temporary)	labo	Stage	aSup	
onstruction		living accommodation for the	rcampissetu		ervisionCons	
Camps		labourers and maintain necessary	р		ultant	
		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, built and 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 entiret site left				
		clean and tidy.				

6.2 Social Impact Assessment

6.2.1 Projects Impacts

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

6.2.2 Positive Impact

This sub-project aims to reduce traffic congestion within the Nongstoin-Maweit road. The storm water drain improves the existing system of rain water flow as most of the drain chokes due to



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silting. The new design will make easy cleaning/desilting of the storm water drain and thus prevent the overflow of water on the black top. The footpath over the drain and utility corridor will reduce accident.

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

6.2.3 Impact on Land

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

6.2.4 Impact on Structures

During the census survey the structures were also enumerated along the proposed developments. Based on the updated DPR there will be no impact on private structures.

SI.	Type of Ownership	No. of Structures
1	Total Affected Families	Nil
2	Title Holders	
3	Non-Titleholders – Encroachers	
4	Non-Titleholders – Squatters	
5	BPL Families losing Commercial Properties	
6	Total vulnerable families (including BPL)	
7	Total Tribal Families	
8	Vendors affected	
9	Petty shop keepers & Kiosk affected	

Table 49: Loss of Structure in the Sub-Project

Source: Census Survey, September 2021

6.2.5 Impact on Community Structures

The Details of all common Properties and Government structure are summarized in Table 50 below.

Table 50: Loss of CPRs in the Sub-Project

SI.	Summary of CPRs	Numbers
1	Religious structure (specify)	Nil
2	Well	Nil
3	Waiting Shed/Rain Shelter	Nil
4	Schools/Educational/ Cultural Structures	Nil
5	Government/ Community Structures	Nil

Source: Census Survey, September 2021



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6.3 DisplacedFamilies

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

- Titleholder: A person who has legal rights of the land acquired/purchased by the project;
- Encroacher: A person/family, who transgresses into the public land (i.e., extended their building, agricultural lands, business premises or work places into public land), adjacent to his/her own land or other immovable assets and derives his/her additional source of shelter, livelihood, etc.;
- Squatter: A person/family who has settled on public/government land, land belonging to institutions, trust, etc. and or someone else's land without permission for residential, business and or other purposes or has been occupying public building without authority prior to the cut-off date and is depending for his or her shelter or livelihood and has no other source of shelter or livelihood;
- Tenant: A person who holds/occupies land/structure of another person and (but for a special contract) would be liable to pay rent for that land/structure. This arrangement includes the predecessor and successor-in-interest of the tenant but does not include mortgage of the rights of a landowner or a person to whom holding has been transferred; or an estate/holding has been let in farm for the recovery of an arrear of land revenue; or of a sum recoverable as such an arrear or a person who takes from Government a lease of unoccupied land for subletting it;
- Family: Includes a person, his or her spouse, minor children, minor brothers and minor sisters' dependent on him. Widows, divorcees, and women deserted by families shall be considered separate families;
- Persons losing their livelihood: Persons losing their livelihood are individual members of the PAFs/households, who are at least 18 years of age and are impacted by loss of primary occupation or source of income;
- Business Owner: Persons owning shops or running any commercial activities and/or within any commercial interest and above the age of 18 is considered as business owner.
- Employees to Commercial Structures: Persons being employed formal or informal, temporary or permanent to any commercial enterprise or entities in lieu of some remuneration/ salaries/ payments are considered as employees to commercial structures.
- Petty shop/Kiosk: It could be cubicle/booth/stall/cabin made of wood or iron or any other building material which could be shifted to another location as a single unit without much damage and is used for carrying out petty business, commercial activities and has been in operation/existence prior to cut off date;



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6.3.1 Impacts on Displaced Families

During the social survey both title holders and non-titleholders who would be impacted (positively) were taken as sample households. Based on the social survey data of 7 sample Families the socio-economic condition of the area is depicted.

6.3.2 Demography of Families

Socioeconomic survey was carried out for 7 sample families with 32 number of total populations. The sample was selected at the primary beneficiaries such that there is proportional representation of the socio-economic parameters of the PIA. The sample survey data reveals that average family size of the sample family is (4.6).

6.3.3 Family Pattern

Socio-economic survey reveals that only 29% of the Surveyed Families are Joint in nature.

SI.	Family pattern	Numbers	Percentage
1	Joint	2	29%
2	Nuclear	5	71%
	Total	7	100%

Table 51: Family Pattern

Source: Census & SES Survey, September 2021

6.3.4 Religious Stratification

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

Table 52: Religious Stratification

SI.	Category	Percentage
1	Hindu	14%
2	Muslims	-
3	Christian	86%
4	Sikh	-
5	Buddhist	-
6	Jain	-
7	Others	-
8	Not Stated	-
	Total	100.00%

Source: Census & SES Survey, September 2021

6.3.5 Social Stratification

The social stratification of the project area shows dominance of ST population with 86% families followed by Other Caste families at 14%. The detail of social grouping in the project area is presented in the Figure below:



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Figure 33 :Categories of Surveyed Families along the Project Road

Source: Census & SES Survey, September 2021

6.3.6 Educational Status of PAPs

The educational status of the PAPs, above 6 years of age, reveals that overall scenario of literacy level is not very encouraging in the project area. Out of total 32 sample population the number of child population (0-6 yrs.) is 3 which are kept aside for this category. Only 10% of the population is still illiterate and about 7% PAPs are graduates; while no one having a degree of master and above. The educational status is presented in the Figure below:



Figure 34: Educational Status of PAPs



Source: Census & SES Survey, September 2021

6.3.7 Occupation of PAPs

The occupational status of PAPs reveals that 86% Population are depending on business and this includes the business they are carrying out along the road, mainly shops and kiosks. 14% are engaged in government jobs & private Jobs. The details of occupations by the PAPs are presented in the Table below.

SI.	Type of Occupation	Percentage
1	Agriculture & Allied Activities	-
2	Government & Private Services	14%
3	Trade & Business	86%
4	Self Employed	-
5	Casual Labour	-
6	Non-Remuneratively Engaged	-
	Total	100%

Table 53: Occupational Status of PAPs (18-60 Years)

Source: Census & SES Survey, September 2021

The total number of persons is 32 and the number of persons within the active age group of 15 to 64 years is 19. Thus, the dependency ratio is about 35^2 .

6.3.8 Income and Expenditure Profile of DFs

All the families surveyed have an average annual income more than Rs. 30000/. About 43% Surveyed Families are having average annual income in the range of Rs. 30000-50000, while 43% of the families are earning between Rs. 50000-100000. It has been observed that about 14% Surveyed Families have annual income more than Rs. 1,00,000. The average income level of DF in the project area is summarized in the Table below.

Table 54 : Annual Income Profile

SI.	Annual Income Categories in (Rs)	% Age
1.	More than 30000 but less than or equal to 50000	43%
2.	More than 50000 but less than or equal to 100000	43%
3.	More than 100000	14%
	Total	100.00%

Source: Census & SES Survey, September 2021

The expenditure pattern of the families surveyed revealed that about 56% of the average expenditure incurred by the Surveyed Families is on the food items. The detail of the same is presented in graphical format in Figure below. The average annual expenditure is about Rs. 47,205 for the 7 sample families.



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Figure 35: Annual Expenditure Profile

6.3.9 Holding of Agricultural Land (Immovable Assets)

Only 14% of the population owes more than 0.25 acre of land. The detail of the land holding is depicted in the Table below.

Table 55 : Agricultural/Homestead	Land Holding
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SI.	Land owned (area in Acres)	Numbers	Percentage
1	Less than 0.25	6	86%
2	0.25-0.5	1	14%
3	More than 0.5	-	-
4	No land	-	-
	Total	7	100%

Source: Census & SES Survey, September 2021

6.3.10 Possession of Vehicle (Movable Asset)

Majority of the population (86%) have only two wheelers followed by four wheelers (14%) as mode of Family transport. The detail of the movable assets holding is depicted in the Table below.

Table 56: Movable Assets Holdings

SI.	Family assets	Numbers	Percentage
1	2-wheeler	6	86%
2	3-wheeler	-	-
3	4-wheeler	1	14%
4	2-wheeler & 4-wheeler	-	-



Source: Census & SES Survey, September 2021

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SI.	Family assets	Numbers	Percentage
5	More than one 2-wheeler & 4-wheeler	-	-
6	No Assets	-	-
	Total	7	100%

Source: Census & SES Survey, September 2021

6.3.11 Vulnerability

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

The census survey finding reveals that there is 86% surveyed population along the roadside who belong to the ST community and 14% belong to BPL category.

SI.	Category	%Age to total population
1	Schedule Tribe	86%
2	Schedule Caste	-
3	Below Poverty Line (Excluding ST, SC)	14%
4	Women Headed Households	Li.
5	Senior Citizen living alone	-
	Total Vulnerable DFs	100.00%

Table 57 : Vulnerability Status of the Affected Families

Source: Census & SES Survey, September 2021

6.3.12 Impact on Gender

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

The gender composition of surveyed persons shows that the male accounts for 51% and female accounts for 49%. The gender disparity is not so much visible in among surveyed persons i.e. 986 against state level statistic having 989 but as per census data of India, 2011. The sex ratio of West Khasi Hills district is 974 females per 1000 males in 2011. The illiterate among the female is slightly higher than of the male counterparts. There is One (1) of the Surveyed Families are Women Headed Households. From the SES survey the total Population is 32, of which 17 are males & 15 are females.



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6.3.13 Migration

The Decadal growth rate of the East Garo Hills district and town clearly indicates influx of migrates from the nearby districts and villages. The SES reveals that about 2.38% of the population or One Family has immigrated in the urban in the last 25 years.

6.3.14 Impact on Tribal People

a. Impact on Land & Structure of ST

Most of structures impacted by the proposed project belong to the STs. Only one non-title holder family does not belong to ST which is commercial in nature. Table 58:Impact of ST DFs

SI.	Type of Ownership	No of Affected Household Families	No. of Structures
1	Title Holder	-	-
2	Non-title holder	7	7
3	Tenants	-	-
4	Losing land only	-	-

Source: Census & SES Survey, September 2021

b. Impact on Socio Economic Profile of ST

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

c. Impact on Community

This sub-project has ensured that the designed and implementation will be in such away that it fosters full respect for ST identity, dignity, human rights, livelihood systems, and cultural uniqueness as they define them. 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.

d. ImpactonGender

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

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

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

6.3.15 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-Maweit road is of great importance, as the road will carry not only the normal city 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 and as it is situated on the hill slope, solid waste dumping is a very sensitive issue in the area. As per the SES it is revealed that more than 95% of the people dispose solid waste by the method of 'door to door' collection by local Authority in the urban area.

Source of Drinking Water

The main source of drinking water in the PIA is river, streams and ponds (nearly 68%). Table 59 :Source of Drinking Water

SI.	Types of drinking Water Source	Numbers	Percentage
1	Tap Water by ULB	6	86%
2	Groundwater/surface water	1	14%
	Total	7	100%



Source: Census & SES Survey, September 2021

Distance of Medical Facilities

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

SI.	Distance of Medical Facilities	Numbers	Percentage
1	Within 1km	3	43%
2	Within 2km	3	43%
3	Within 5km	1	14%
4	More than 5km	-	-
	Total	7	100%

Table 60: Distance of Medical Facilities

Source: Census & SES Survey, September 2021

Other Services

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

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

6.4 Impacts on Road Safety and Human Health

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

The chances of accidents could be minimized by (1) strengthening the pavements, (2) improving upon the curves in road geometrics, (3) grade separators (4) proposing the service lanes in market places and near schools, etc (5) providing proper median, (6) improving upon road crossings (7) putting right signals and signboards, (8) new under passes.

6.5 Mitigation Measures:

The project is likely to bring some negative impacts on the environment and socio-economic structure of the region. While deciding the alignment from environment point of view, some negative potential impacts are unavoidable. In such cases, adoption of mitigation measures is the only solution. Mitigation should be focused on achieving goals within clear timeframes. Use of SMART approach is recommended to evaluate the likely effectiveness of alternative mitigation strategies or measures. The SMART refers to measures that are Specific, Measurable, Achievable, Realistic and Timely.GBV is rare in Meghalaya Societies and the influx of labour from nearby districts is very low as the volume of work is not huge.



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Table 61	: Potential	impact ar	nd mitigation	measure	along the	project road
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Potential Impacts	Mitigation
Accidental spots can be	• Proper provision of service roads, junctions, fly-over, under passes to
reduced by providing proper	be provided at appropriate places
signs and warnings,	Truck parking places
improvement of junctions,	• Medical facility to be provided (an ambulance fitted with all medical
new under pass, fly-over etc.	equipments and a doctor)
Sexually transmission	Detected diseased person to be carried to the nearest city hospital
diseases (STDs)	• Preventive measures should be taken to check the spreading of STDs



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7 CHAPTER-VII: ENVIRONMENTAL MONITORING PROGRAM

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

Objective of Monitoring Program

The Objectives of environmental monitoring program are-

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

7.1 Environmental Monitoring

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

7.2 Monitoring 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 62.



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

-				Instit Respo	utional onsibility			
Environmenta Component	Project Stag	Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
Air Quality	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 amendme nt	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 (Excludin g Rainy season)	Contracto r through NABL approved monitorin g agency	Environmen t Expert- AE/IE/PIU
	Operational Stage	PM10, PM 2.5, SO _x , NOx, CO	Respirable Dust Sampler to be located 50m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (P&CP) Act,1981 and its amendme nt	As directed by the PIU (02 Project locations)	Three times in a year for two years (Excludin g Rainy season)	P I U through NABL approved monitorin g agency	ΡΙU
Water	Constru	Paramet ers as per IS: 10500	Grab sample collected from source and analyze as per	Water quality standards	01 drinking water sample- Labour	Three times in a year for	Contracto r through NABL approved	Environmen t Expert- AE/IE/PIU

Table 62: Environment Monitoring Plan



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al	0	Monitoring						Institutional Responsibility	
Environment: Component	Project Stag	Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision	
		and standar ds of surface water	Standard Methods for Examination of Water quality	by CPCB	Camp and 01 surface water samples in project stretch.	two years (Excludin g Rainy season)	monitorin g agency		
Water Quality	Operation Stage	Paramet ers as per IS: 10500 and standar ds 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 (Excludin g Rainy season)	P I U through NABL approved monitorin g agency	PIU	
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.	Contracto r through NABL approved monitorin g agency	Environmen t Expert- AE/IE/PIU	
	Operatio	Noise levels on dB (A)	As per CPCB	Noise standards by CPCB	As directed by the PIU (Total 03	Three times in a year for two	PIU through NABL approved	PIU	



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-				Instit Respo	utional Insibility			
Environmenta Component	Project Stage	Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
		scale			locations)	years.	monitorin g agency	
osion	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	Contracto r through NABL approved monitorin g agency	Environmen t Expert- AE/IE/PIU
Soil Er	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 monitorin g agency	PIU

7.3 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 63



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

Table 63: Environmental Monitoring Cost



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8 CHAPTER-VIII: Climate Change Impact & Risk

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

8.1 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 (7 m). These were translated into impacts on traffic speed and hence fuel consumption. The model also allows for the inclusion of impacts related to traffic congestion with and without project through provisions for inserting data on the traffic numbers, lane width, number of lanes, and volume/capacity saturation limit.

Information that was fed into the model for projecting the CO₂ 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 Health Relevant Emissions from in-Use Indian for three-wheelers rickshaw as shown inTable 64.

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

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

For 13.989 km of road construction would result in emission of approximately 1431.5 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

TheGHGemissionsduringaroadconstructionprojectinvolvethefollowingmajorsources:

- Transportemissionsowingtotransportationofmanandmaterial
- Materialemissionsowingtoextraction/productionofconstructionmaterials
- Machinesemissionsowingto consumptionoffuelbyenginesusedin construction

A detailed study conducted for the World Bank titled "Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation- A Toolkit for Developing Countries" established the typical GHG emission rate in terms of ton CO₂eq 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	Transport	Materiale	Machines	Total
ofRoad	emissions	missions	emissions	(t C0 ₂ eq.)
Rural Road—DBST	26	62	14	103

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

Therefore, for 13.989 km of road construction would result in emission of approximately 1431.5 tonCO2eq.

Operation Phase

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

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 (CO₂) levels in the atmosphere have risen by 35% since the pre-industrial era. Rising CO₂ 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 202183, highest rain fall (31% of south west monsoon rainfall) is observed in month of July. Similarly, state experienced 30% of the south west monsoon rainfall in June month. Also, in August and September, 23% and 17% of south west monsoon rainfall were observed in the State. Highest annual rainfall is 5440.8 mm in the year of 1995. Details rainfall variation table is given below:

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

Table 65 : Mean rainfall (mm) and coefficient of variation (CV) of the state for the monsoon months,southwest monsoon season and annual

Comparing⁴ 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. ⁵ Minimum temperatures during summer and winter seasons are 15°C & 4°C.

Increased temperature and precipitation will have the following impacts:

- High Precipitation Impacting Roads /Bridge /Embankment: Heavy rains can cause disruption of the road networks, decreased accessibility, erosion of roads and embankments, surface water drainage problems, slope failures, landslides, among others. Increased river flow resulting from precipitation and storminess may result in damages to bridges, pavements, and other road structures. Bridge/culvert capacities are reduced or exceeded, causing upstream flooding to occur.
- > High Temperature Impacting Road Stability: Extreme heat, combined with

⁵https://www.mapsofindia.com/meghalaya/geography.html



³https://imdpune.gov.in/hydrology/rainfall%20variability%20page/meghalaya_final.pdf

⁴https://meghalaya.pscnotes.com/meghalaya-geography/climate-of-meghalaya/

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. Centred across the state border in Assam, much of Meghalaya was severely jolted especially Shillong.
- Drought: The Average Annual Rainfall in Meghalaya is 2818 MM (source: rainwaterharvesting.org), whereas, Sohra or Cherrapunjee and Mawsynram in Meghalaya receive the highest rainfall in the world i.e. about 11000 mm annually, but this huge rainfall is concentrated only in monsoon months. 11, 667 sq km of the State drains into the Brahmaputra basin and the rest 10,650 sq km into the Barak Basin (Source: Central Water Commission). In less than 12 hours all the rainfall runoff water reaches the plains of Bangladesh and Assam taking along with-it top soil, boulders and logs besides creating flood-havoc in Bangladesh. In contrast during non-monsoon months, most of the rain-fed surface sources and spring sources get dried up, leading to water scarcity, which is a major problem as the people living in these areas with highly variable rainfall, experience droughts like situation and floods and often have insecure livelihoods. In many dire cases people do not even have regular access to water for drinking purposes.
- Cyclone Meghalaya is situated in the north eastern direction of Bangladesh which is highly prone to cyclone/ winds. Every year about 60% of the area is affected by cyclone in Bangladesh. The Districts of West Jaintia Hills and East Jaintia Hills may experience a wind speed of up to 55m/s. Occasional cyclones do occur in western Meghalaya their severity being more during monsoon season. The districts close to Bangladesh like South West Garo Hills, South Garo Hills, South West Khasi Hills, West Khasi Hills, fall in very high cyclonic zone due to close proximity to Bay of Bengal (which is a cyclone basin). In this zone wind speed can reach up-to 50 m/s, which can cause large scale damages. The Bay of Bengal accounts for seven percent of the annual tropical cyclone activity worldwide; the recorded frequency of cyclones per year along the Bay of Bengal is four and inevitably one of the four transforms into a severe cyclone causing human and property losses

> Flood:

The plain areas of Meghalaya adjoining Assam are affected by flood due to the back flow of water from the River Brahmaputra during the flood season between June and October. The tributaries like Krishnai, Jinari, Jingjiram, Rongai, Dudhnoi, Ringgi, Gohai, 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 is a threat to the sustainability of the road. However, these measures also contribute to the adaptation of the roads for future increases in precipitation. This risk screening and risk identification exercise have helped to ensure that the project road with climate risks have adequate risk mitigation or adaptation measures. Provisions have also been made in the bidding documents for the Contractor to prepare contract package-specific EMP's based on the final detailed design to address a range of issues including climate-related risks and vulnerabilities.

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

Sr. No.	Climate Change Events	Risks to the Road Infrastructure	Adaptation Measures incorporated in Detailed Design of Project Roads
1	Extreme rainfall events	 i. Overtopping and wash away ii. Increase of seepage and infiltration pass iii. Increase of hydrodynamic pressure of roads iv. Decreased cohesion of soil compaction v. Traffic hindrance and safety 	 a. Certain critical sections affected by overland flooding of the road raised(vertical alignment, embankment improvement) to be free from the onslaught of flooding events under intense precipitation. b. Road asset survey has considered certain critical road sections where the sub-grade strength and integrity were found to be compromised; the sub-grade strength specification meeting the recent-most IRC specifications has been adopted. c. The highest assessment of design discharge for sizing culverts and bridges from among the several
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 	 discharge methods as outlined in recent IRC guidelines has been adopted. d. In terms of floodwater conveyance to prevent stagnation, closed concrete drains in settlement pockets have been provided. e. Improved cross-drainage capacities required for the quick conveyance of floodwater by replacing small diameter pipes with box culverts with higher discharge openings has been considered. f. The bottom of the sub-grade has been kept 0.6m

Table 66: Possible Climate Events, Risks, and Adaptation Measures



Sr. No.	Climate Change Events	Risks to the Road Infrastructure	Adaptation Measures incorporated in Detailed Design of Project Roads
		the precipitation pattern	above HFL, to avoid over topping, water-logging of the road surface.
3	Increased maximum temperature and a higher number of consecutive hot days (heat waves)	 i. Concerns regarding pavement integrity, e.g., softening, traffic-related rutting, cracking, fracture, etc. ii. Thermal expansion in bridge expansion joints and paved surfaces Temperature break soil cohesion and increase dust volume which caused health and traffic accidents 	 a. An adequate binding layer thickness has been proposed to offset the wear, surface fatigue, and rutting under climate stresses. b. In terms of pavement integrity, the choice of viscosity grade VG30 has been maintained.
4	Extreme wind speed under cyclonic conditions	i. The threat to the stability of bridge decks ii. Damage to signs, lighting fixtures and supports	Business As Usual



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9 CHAPTER-IX: ADDITIONAL STUDIES

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

9.1 Public Consultation

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

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

Different categories of Consultations planned in this project are a) Village Consultations, b) Focus Group Discussions (FGD), c) Consultation with Women, d) Consultation with Vulnerable groups and e) Consultations with Traders etc.

9.2 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 hem
- 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 mitigationmeasures
- To appraise gender issues and accordingly incorporate views of women into the project design
- Tounderstandspecificissuesrelatedtotribalpeopleandthoseofvulnerablesections
- Tofacilitatedevelopmentofappropriateandacceptableentitlementoptions
- 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 itssustainability.

9.3 Methodology for Consultations

Both formal and informal modes of consultation were used in the public consultation process for the project. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questionnaires. In



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addition, focused ground discussions (FGDs) and personal discussions with officials, on-site discussion with project affected stakeholders, and reconnaissance visits have also been made to the project area. The attempts were made to encourage participation in the consultation process of the government officials from different departments that have relevance to the project. Same way, local people from different socio-economic backgrounds in the villages as well as urban areas along the road alignment and at detours, women, residents near the existing road, local commuters, and other concerned were also consulted.

Identification of Stakeholders

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

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

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

9.4 Stakeholder Consultations

Project Stakeholders

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

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

Stakeholders and their level of interest may change as the project progresses, depending on the impacts associated with each stage of planning, construction and post-construction. Table 67 below provides a list of specific stakeholder's involvement and their level of impact and interest during project lifecycle.

	Categories of	In	volvement of Sta	akeholders	Pre-Construction	
SI.	Stakeholders	Planning	Construction	Postconstruction	Level of Impact	Level of Interest
1	Displaced Persons (TH & NTH)	Frequent	Occasional	On required basis	High	Low
2	Local Communities	Frequent	Occasional	On required basis	High	Low
3	Village Headmen & Gram Panchayat members (local elected representatives)	Frequent	Occasional	On required basis	High	Low
4	Women's belonging to	Frequent	Occasional	On required basis	High	Low

Table 67: Consultation Methods



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	Categories of	Involvement of Stakeholders			Pre-Construction	
SI.	Stakeholders	Planning	Construction	Postconstruction	Level of Impact	Level of Interest
	various socio-economic groups					
5	Other vulnerable groups	Frequent	Occasional	On required basis	High	Low
6	Local Elected Members	Occasional	On required basis	On required basis	Low	High
7	Concerned Officials from Government	Frequent	Occasional	On required basis	Low	High
8	NGOs and CBOs	Occasional	frequent	As and when required	Low	High

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

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

Engaging in an appropriate way and communicating adequately is fundamental for a good relationship. Engagement methods have been tailored according to the needs and influence of the two categories of stakeholders. A summary of the proposed level of engagement with stakeholders has been presented in Table 68.

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

Table 68:Consultation Methods



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	people (ST Community)	through the Gram	community		
		Pradhan/No kma			
5	Contractors and Sub-contractors	Regular Direct Contact	Issues of common Interest in the day- to-day functioning of the project.	weekly	Regular Direct Contact
6	Unskilled and semi-skilled local labour	Regular contact through the labour supplier	Issues related to employment opportunities and payments	monthly	Information dissemination and redressal of payments related complaints raised by the laboures.
7	Surrounding Community	Regular Direct Contact	Common Interest on social and environmental issues	Monthly	Community event and open dialogue
8	Gram Panchayat	Regular Direct Contact	Common Interest on employment, livelihood trainings, CSR activities, and social & environmental issues	Monthly	Information dissemination and suggestions and feedback.
9	Tehsil/District Officials	Occasional Direct Contact	Documentation of land deeds and local permits	As required	Formal meetings
10	Central and State Level authorities	Occasional Direct Contact	Permits and clearances	As required	Formal meetings
11	Local Political groups	Occasional Direct Contact	Common interest with that of the local community and administrative issues	As required	Information dissemination
12	NGOs and CBOs	Occasional Direct Contact	Common interest with that of the local community	As required	Information dissemination

Source: Socio-Economic Survey on 2021

9.5 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



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> Socio-economic standing of the local people.

Table 69: Brief Description of some sample Public Consultation

Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input to technical Design
Place: Williamnagar Bazar, Date: 04/09/2021	Total-3 Male-3 Female-0	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 lacks in many infrastructural facilities, but they think that with better communication there would be economic development that would add to their prosperity. As this proposed road is the only communication to the outer world, they want the road to be completed within schedule time.	The road after constructed would have major impact on both the economic and social life of the locals of the area.	The road is expected to be completed by two years.
Place: Rongongre, Date: 04/09/2021	Total-5 Male-3 Female-2	The livelihood loss of the people is apprehended. The local people want some jobs of unskilled 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 the area.	The proposed road project is the only feasible option for development.	The people agreed to cooperate and help in all possible ways for the successful of the project. The PWD assure to provide jobs and petty contract as many as possible to the local people.
Place: Dawa- Nengkatok, Date: 04/09/2021	Total-5 Male-4 Female-1	The existing alignment passes through the town area. It is also a junction town and many Goods vehicles passes through the town. There are both commercial and residential establishments along the alignment. As the proposed road will allure the motorist to drive fast there may be increase in road accident.	Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for development. Road Safety will be look after.	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 ample signage and other road furniture to reduce the accident.



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Date / Place	No of Participants	Major Issues	Agreed upon	Mitigation Measures - Input to technical Design
Place: Tura Williamnagar Road. Date: 04/09/2021	Total-5 Male-3 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 and vis-à-vis estimated loss. The most important topic of discussion was the alignment which passes through the two- market complex, which is fully	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 but against any	The PWD officials had agreed to take special care for traffic movement and road safety. It was assured that there would be no damages of any structures at the market place
In addition to rillages the in	the above spec	affected. The residents with their representatives all disagree in demolishing of the market complex, partially or fully. cific public consultations and FGE and economic are more. In all th	damages to the market structures.	also consulted. In the

Table 70: Pictures of First Stage Consultations





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Improper/illegal parking not only causes hindrance to 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. Place:Williamnagar Bazar Dated: 04/09/2021.



9.1 Outcome of the Consultation

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

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

Provision for adequate tree plantation should be made to compensate tree cutting

Table 71 :Summary of Consultation Outcome

Issues Discussed	Outcome
Relocation Options	Displaced Persons whose residential structures are getting affected
Compensations/Assistance	temporarily prefer not to get disturbed and if disturbance is not avoidable
	then they shall be relocated very nearby. Shop owners and workers
	raised the issue of loss of their livelihood during the resettlement period
	due to loss of business.
	During consultation they were convinced that there will be no permanent
	impact but temporary impact during the active construction period.
What are all the facilities provided through this project and to whom should we approach?	Facilities like bus shelters, rest rooms, pavements, drains etc would be provided. Officers such as PWRD Engineers, Town Councilcould be approached for grievances.
Safety due to alignment	People expressed their views on the risk if the road is widened at the
	dense settlement area affecting structures on both sides.
	During consultation they were convinced that there will be no permanent
	Impact with updated DPR but temporary impact during the active
	construction period.
Could you inform us the	Would be informed well in advance and compensation will be paid
time when our assets be removed?	before vacating assets, if required.



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Issues Discussed	Outcome
Relocation of school	The sites for relocation of schools and CPR were identified in
buildings Relocation of Bus	consultation with the villagers and the village Headman was carried out.
shelter/CPR	There were differences in opinions among the villagers in demolishing/
	shifting the Bus shelter.
Cross Drainage for	People have shown their concern for the proposed drainage pattern for
alignment	the alignment of a portion of the project road. In this regard the lined
	rectangular drains with proper outfall shall be planned as a part of the
	project design of the main carriageway. Adequate cross drainage
	structures are planned after study of hydrology of the Survey area.
Utilities and basic	People showed their concern about what will happen with the utility lines
infrastructures	if the road is widened. Adequate care shall be taken for the shifting of
	the utilities.
Employment during	People were of demand if the local people are given preference for
construction	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	If and only the structure to be impacted, measurements are required.
along the road were not measured?	Otherwise, there is no requirements of measurements of structures.
What about the loss of	The active phase of construction is planned in such a way that there will
livelihood during active	be minimum (temporary) loss of access and/or livelihood. If there is any
phase of construction?	loss or damage of structures or any immovable assets the Civil
	Contractor will compensate the same in discussion with the affected
	party. Civil Contractor will minimize the impact of accessibility of the
	residential structures and the temporary loss of livelihood of the
	Commercial structures will be minimized by speeding up the civil work
	and doing the work on one side of the road at a time and providing
	accessibility to the customers. However if there is any temporary loss of
	livelihood it would be compensated as per the ESMF.

Table 72:Consultation Conducted on Proposed Road 2nd Phase

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

9.2 Minutes of meeting with the DPR consultant

Table 73 :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 plan the 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 the side of the existing road which is again in the school's property. Maximum students are coming 	 It was assured that the construction work will be stopped during the school hours. The Contractor will be persuaded to induct the local people as per their skills. 	Total = 2 Male = 2 Female = 0



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Date	Issues Discussed	Response	Participant
	 from the Maweit area which takes a 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 disturbance in class can be avoided 		

Figure 36: Public Consultation at Sibsing Memorial School



Table 74 :Details of Governmnet OfficialConsultation With DFO, Nongstoin

Date	Issues Discussed	Response	Participant
28.01.2022	 A joint survey is required to identify the way of the road during planning phase. During the implementation phase it is to be identified what trees are required to be felled 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 	 A framework has to be develop to address this issues. Alignment of the project road along with KML file will be submitted to DFO Office. Afforestation activity will be done along the project road as per the ratio of 1:10. 	1



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Date	Issues Discussed	Response	Participant
	 roads modification, only in the Nongstoin- Maweit road there are some forests but all are of private in nature. According to the meeting there are around 250 trees having DGH of around 15cm in where continuous 4 hectres are forest. There are no recorded forest found in 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. 		

Figure 37Government OfficialConsultation at DFO Office





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10 CHAPTER-X: RESETTLEMENT ACTION PLAN

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

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

11 CHAPTER-XI: Tribal People's Development Plan

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

- Self-identification as members of a distinct indigenous cultural group and recognition of this identity byothers;
- Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories
- Customarycultural,economic,social,orpoliticalinstitutionsthatareseparatefromthoseofthe 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


12 CHAPTER-XII: Gender Action Plan

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

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

Three major tools are used to identify and deal with gender issues in the project cycle: gender analysis, project design, and policy dialogue. Gender analysis will be an integral part of the initial social assessment at the screening stage itself. The issues identified can be scaled up during the

feasibilityanddetailedanalysiscanbecarriedoutduringtheprojectpreparationstage.Theproject designs will be gender responsive based on gender analysis and will be included in the SIA report. The findings and recommendations from the gender analysis during project planning and feedback from beneficiaries during implementation will be discussed thoroughly to determine the need for further action. Listed below are the key actionpoints:

a Core Requirement for MainstreamingGender

- 1 All data should be disaggregated by gender, caste, ethnicity, location, and age
- 2 Issues of division of labour, access to resources and decision-making power (who is doing what, who has access to what, who makes the ultimate decision) have to be assessed for their gender differential impact on women and men of different social identity groups.
- 3 Assessment of policies, programs, institutional arrangements, human resources issues, and M&E system has to be done from a gender perspective of the project, project authorities and community groups.

12.1 Monitoring Gender Action Plan

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



Aspects	Monitoring Indicators (Process	Frequency	Monitoring
Aspects	and Outcome)	ricquency	Responsibility
Economic	 No. of women engaged in different activities and their proportion to the total workforce; Days of engagement of women in different wage / non-wage activities and proportional days of engagement in comparison to their malecounterpart; Growth in income of women due to suchengagements; Reduction in no. of days of migration (if migrating earlier); No. of women having additional/new market oriented employable skillsfor self-engagement; No. of women accessed different govt.schemes/provisionsincluding beneficial enrolment in agricultural interventions; Improvement in asset holding of women (productive andhousehold assets). 	 Planning Stage: for the base linedata Half yearly Monitoring Mid Term Review (MTR) Final Impact Assessment 	PMU Third party Monitor along withPMU
Social	 Improvement of association of women in local institutional and decision- making process (membership, management position,etc.); 	 Planning Stage: for the base linedata Half yearly Monitoring Mid Term Review (MTR) Final Impact Assessment 	PMU Third party Monitor along withPMU
Influx of labour force	 Project may allure laboures from the neighbouring states which may bring menance to the society. The project is not huge and civil construction is very limited. Thus, there is minimum chance of influx of labour force from neighbouring states. However, there will be labour coming from the neighbouring districts of Meghalaya and accustomed with the culture and tradition of the society. 	 Labour influx during civil construction. 	PMU 13

Table 75: Monitoring Indicators for Gender Action Plan

13.1 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.

13.1.1 Implementation Arrangements

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

13.1.2 Implementation of ESMP and RAP

Due to is wide scope, the project activities will be implemented by many agencies: Public Works

Department(PWD),UrbanAffairs(UA)Department,DepartmentofTourism,TransportDepartment and Community and Rural Development Department. Each of the mentioned departments, will depute a Project Director (PD) preferably at the level of a Chief Engineer/Superintending Engineer along with the required supporting staff with the overall responsibility for project implementation with the involvement of the various field divisions and other units at the headquarters (HQ – Shillong).

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

Meghalaya Infrastructure Finance Development Corporation (MIFDC) set up under the Departmentwillberesponsiblefor Planning 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 theentireproject.ItwillensurethatESIAisconductedandESMPsarepreparedandthattheESMF is followed during project implementation. Additionally, a project management unit (PMU) will be mobilized under MIDFC to support the implementing agencies during project preparation and subsequent implementation. The overall institutional arrangement for the implementation of the project is outlined in the followingdiagram.

Figure 38: Project Implementation Arrangement



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13.1.3 Project Management Unit (PMU)

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

13.1.3.1 Preparatory Stage:

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

13.1.3.2 Implementation Stage:

- Conductingperiodicsitevisitsandobservethemeasurestakenasperthesafeguardnorms;
- On the spot guidance to contractor/s / implementing agencies onsafeguards;
- Preparation of site-specific reports and sharing withMIDFC;
- Documentation of learning cases for sharing anddissemination;
- Visual documentation of site-specific safeguardmeasures;



- Tracking activity specific environmental and social monitoringindicators;
- Organizing / facilitating refresher training courses forstakeholders;
- Monthly and quarterly progress report preparation and submission toMIDFC.

13.1.3.3 Post-Implementation Stage:

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

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

The Social cum Gender Expert at the PMU level will guide the overall process related to social and genderaspects. The district/sub-districtlevelimplementing 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 realisation of the social / gender inclusion parameters. She / he will be looking after social / gender aspects of the project, including monitoring of social / gender indicators and coordinating with different agencies / institutions. The expert will be guided by the Project Director from MIDFC and reporting to the Project Director directly.

13.1.3.5 Environmental Expert

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

13.1.4 Capacity Building Strategy

The concerned officials within the project implementation agencies will be oriented on different social and environment aspects by which they will be equipped well to manage the related issues effectively and efficiently.

13.1.5 Institutional Capacity to Manage Social Development Aspects

13.1.5.1 Autonomous District Councils

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

groups'traditionalpracticeandtoactasaconduitbetweentheformalstategovernmentandthe informal grassroots tribal institutions.



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

13.1.5.2 Grassroots Institutions

The third centre of authority is the grassroots tribal institutions and practices. In the Khasi and Jaintia Hills, these are powers that rest at the village level's elected members to govern the village.

13.2 Grievance Redressal Committee (GRC)

13.2.1 Grievance Redress Mechanism

Effective grievance redressal mechanism gives an opportunity to the organization to implement a set of specific measures to ensure good governance accountability and transparency in managing and mitigation of environmental and social issue of a particular project. This consists of defining the process for recording/receiving complaints and their redressal in respect of environmental and social matters.

An integrated system will be established with Grievance Redressal Cell (GRCs), with necessary officients, 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 redress mechanism should be in place at the time of initiating the implementation of R&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, willhavethree-tiregrievanceredressalmechanism, i.e., (1) at the project site level, (2) State level (PMU level) and (3) Judiciarylevel.

Web based grievance mechanism¹¹: In case of grievances received through toll free number or web-based system, a person should be made in-charge of screening and resolution of the same/communicatingwiththeconcerneddivisionsforresolutionofthesame.Thepersonin-charge

based on nature of complaint, should forward the same to the concerned official. A ticket or a unique number will be generated for all such complaints. The complainant should follow up based on that unique number. All calls and messages should be responded within 15 days. If response is not received within 15 days, the complaint should be escalated to the ProjectDirector.

Tier I: Under this project, the local VECs and community level organizations will serve as the first- tiermechanismtohandlecomplaintsandgrievances.ThelocalHeadmanwillbethefocalpointwho will receive, address, and keep record of the complaints and feedbacks. The grievance focal point 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 or she can escalate the grievance to state level grievance cell. The tier II cell will be under the ChairmanshipofSecretary,DepartmentofPlanning.TheothermemberswillincludeChiefEngineer; Project Director and Social Expert of the Project. The second level of grievance cell will provide

Project Director and Social Expert of the Project. The second level of grievance cell will provide its view within 30 days of receiving thegrievance.



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

13.2.2 Grievance management through Electronic Mode

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

13.2.3 Grievance Redressal Mechanism

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

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

Table 76:Details of contact for Grievances

13.2.4 Disclosure of Project Information

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



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14 CHAPTER-XIII: MONITORING & EVALUATION

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

The M&E is to be undertaken at two levels:

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

14.1 M&E of the ESMF application

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

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

Monitoring of E&S aspects in project activities:

• Arethecontractorsandimplementingagenciesundertakingperiodicandregularmonitori ng of the E&S implementation in the projectactivities?

Capacity building arrangements for management of E&S aspects:

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



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14.2 M&E of E&S Management Plans

Monitoring and evaluation of the project is significant for achieving the project development objective (PDO) within the stipulated time period. The key environmental and social aspects, those that have been highlighted in each E&SMPs at site level are to be monitored periodically. The approved E&SMPs will give the direction and indicate the milestones achieved as per the national / state benchmarks / norms. The following specific environmental and social parameters should bequantitatively and qualitatively measured and compared over a period of time to understand the impacts.

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

14.3 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:

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

Table 77: Monitoring Protocol



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Milestones	Objectives	Process	Responsibility	Decision/Target/ Deliverable
		adequacy of safeguard measures, risk analysis and regulatory clearances). DPR to be submitted for approval		reject and instruct to resubmit
Approval	Approvals from PMU	PIU to recommend to PMU PMU to review and approve	PIU and PMU	Approval of RAP, GAP and IPDP if required
Implementation of RAP, GAP and IPDP, Monitoring and Review	Ensure Implementation of agreed RAP, GAP and IPDP where applicable)	Prepare quarterly progressreports Schedule field visits as required Midterm and end term evaluation	PIU, PMU, NGO	Quarterly ProgressReport

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

14.4 Periodic Evaluation

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

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

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

14.5 Arrangements for Monitoring

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

- disbursement of compensation and assistance to PAPs, if any
- establishment of grievance redressal mechanism (including processes and timeline for redressal of grievances),
- consultation meetings with PAPs and communities regarding resettlement and rehabilitation issues,



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

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

14.6 PeriodicEvaluation

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

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

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



15 CHAPTER-XIV: PROJECT BENEFIT

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

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

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

- > Improvements in the physical infrastructure and road access.
- > Improvement in social services due to quicker and safe mode of transport
- > Reduction in pollution, vehicle maintenance costs, fuel usage due to free flow of traffic
- Employment potential for skilled, semi-skilled and unskilled labour, during construction and operational phases of the project, with specific attention to employment potential of local population as well as necessity for imparting any specialized skills to them to be eligible for such employment in the project
- > Over-all development in economy in terms of industry and improved lifestyle
- > Minimize road accidents by increasing road widths.
- Minimize the travel time.
- > Better connectivity to economic, social and political hubs of Meghalaya.
- > Better approach to medical, educational and essential services.
- > Better opportunities for transporting, processing and marketing of agricultural products.
- > Development of tourism and pilgrimage.
- > Opening up of opportunities for new occupations and trade on the route.
- Improved road connectivity helps in better implementation and management of government schemes.
- The construction of the project road in the state of Meghalaya will ensure smooth flow of the traffic. Installation of proper road safety system through signage, barricades, and crash barriers will add to be safety to the traffic.
- Vehicle Operating Cost (VOC) will be reduced when the National Highway is constructed. Fuel consumption, wear and tear of tyres, suspension will be benefited when a geometric of the road is improved. VOC consist of the following components.
 - ✓ Fuel consumption
 - ✓ Lubricating oil consumption
 - ✓ Spare part consumption
 - ✓ Tyre consumption
 - ✓ Vehicle depreciation





16 CHAPTER-XV: 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.

16.1 Objectives of EMP

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

16.2 Pre-Construction Stage

16.2.1 Pre-construction activities by PIU/Independent Consultant

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

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

16.2.2 Pre-construction activities by Contractor

- Pre-construction stage involves mobilisation of the contractor and the activities undertaken by the contractor pertaining to the planning of logistics and site preparation necessary for commencing construction activities. The activities include:
- Joint field verification of EMP by the Environment Expert of the Independent Engineer/Authority Engineer and Contractor.
- Identification and selection of material sources (quarry and borrow material, water, sand etc).
- Procurement of construction equipment / machinery such as crushers, hot mix plants, batching plants and other construction equipment and machinery.
- Selection, design and layout of construction areas, hot mix and batching plants, labour camps etc.
- Apply for and obtain all the necessary clearances/ NOC's/ consents from the agencies concerned.
- Planning traffic diversions and detours including arrangements for temporary land acquisition (if required).



16.3 Construction Stage

16.3.1 Construction activities by the Contractor

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

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

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

- Monitoring and guiding the contractor on adopting good environmental and engineering practices;
- Arrangement of plantation through the Forest Department;
- Arranging training to the contractor and other stakeholders according to the needs arising; and
- Implementation of Environment Management and Monitoring Plan.
- Making changes in the design if need so arises.

16.4 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 78: Environment Management Plan (EMP)

				Respon	sibility		
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring		
PRE-0	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	 No Land Acquisition is envisaged PIU has to ascertain that any additional environmental impacts resulting from acquisition of land are addressed and integrated into the EMP and other relevant documents. 	Throughout Corridor	PIU, Revenue Dept. NGOs Collaborating Agencies	-		
P3	Preservation of	• All efforts will be made to preserve	Throughout	PIU			



				Respor	nsibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
	Trees	 trees including evaluation of minor design adjustments/ alternatives to save trees. Specific attention will be given for protecting giant trees, and locally important trees (religiously important etc.). Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and formal Clearances from the Forest Dept./ MoEF & CC are completed and subsequently a written order is issued to the Contractor. In the event of design changes, additional assessments including the possibility to save trees shall be made. Stacking, transport and storage of the wood will be done as per the relevant norms. 	Corridor	Forest Department Contractor	
P4	Relocation of Utilities and Common Property Resources (CPR)	 All utilities and CPRs i.e., water supply lines, religious structures, hand pumps will be relocated before the construction starts. The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community. Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all utilities and CPRs. 	Throughout Corridor	PIU Concerned Agencies Contractor	
P5	Orientation of Implementing Agency and Contractors	 The PIU shall organize orientation sessions and regular training sessions during all stages of the project. This shall include on-site training (general as well as in the specific context of the sub-project). These sessions shall involve all staff of Authority Engineer, field level implementation staff of PIU and Contractor. The contractor will ensure that his staff including engineers, supervisors and operators attend the training sessions. 	Throughout Corridor	PIU Concerned Agencies Contractor	
P6	Joint Field Verification	 The Environmental Expert of AE and the Contractor will carry out joint field verification to ascertain any additional possibility to saving trees, environmental and community resources. The verification exercise should assess 	Throughout out Corridor	Contractor and Environment al Expert of AE	PIU



				Responsibility	
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 the need for additional protection measures or changes in design/ scale/ nature of protection measures including the efficacy of enhancement measures suggested in the EMP. Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed. 			
P7	Assessment of Impacts due to Changes/Revisi ons/Additions in the Project Work	• The Environmental Expert of AE will assess impacts and revise/ modify the EMP and other required sections of the project documents in the event of 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 to their establishment. Arrangements to control dust pollution through provision of windscreens, sprinklers, and dust encapsulation will have to be provided at all such sites. Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be submitted to the "PIU through Environmental Expert of AE/PMC. The Contractor shall not initiate plant/s operation till the required legal clearances are obtained and submitted. The engineer will ensure that the regulatory and legal requirements are being complied with. 	Throughout out Corridor	Contractor	Environment al Expert of AE and PIU
P9	Other Construction Vehicles, Equipment and	• All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Indian Standard (IS) norms. The discharge standards	Throughout out Corridor	Contractor	Environment al Expert of AE and PIU



				Respor	nsibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
	Machinery	 promulgated under the Environment Protection Act, 1986 will be strictly adhered to. Noise limits for construction equipments to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986. The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which shall be produced for NH verification whenever required. Mobile equipment shall be placed at least 100 m away from the nearest dwelling. 			
P10	Borrow Areas	 Finalizing borrow areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor. The Contractor will not start borrowing earth from selected borrow areas until the formal agreement is signed between landowner and contractor and a copy is submitted to the PIU/Environmental Expert of AE through the Engineer. Locations finalized by the contractor shall be reported to the Environmental Expert of AE and who will in turn report to PIU. Planning of haul roads for accessing borrow materials will be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas as far as possible (in case such a land is disturbed, the Contractor will rehabilitate it as per Borrow Area Rehabilitation Guidelines) and will use the existing village roads wherever available. In addition to testing for the quality of borrow materials by the AE, the environmental personnel of the AE will be required to inspect every borrow area location prior to approval 	Along the Project Influence Area	Contractor	Environment al Expert of AE and PIU



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



				Responsibility		
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring	
		 facilities with the local community. Location for stockyards for construction materials will be identified at least 1000 m from watercourses. The waste disposal and sewage system for the camp will be designed, built and operated such that no odor is generated. 				
P15	Arrangements for Temporary Land Requirement	 The contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/hot mix plants/traffic detours/borrow areas etc. The Contractor will submit a copy of agreement to the Environmental Expert of AE. The Environmental Expert will be required to ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is included in the contract. 	Along the Project Road	Contractor	Environment al Expert of AE and PIU	
P16	Implementation - Information Meetings	 The contractor will organize at least 2 implementation information meetings in the vicinity of Project Site (minimum one in each section) for general public to consult and inform people about his plans covering overall construction schedule, safety, use of local resources (such as earth, water), traffic safety and management plans of debris disposal, drainage protection during construction, pollution abetment and other plans, measures to minimize disruption, damage and in convenience to roadside users and people along the road. The first Implementation information meeting be conducted within four weeks of mobilization. The people should be informed about the date, time and venue at least 7 days prior to meetings. Public shall be informed about the meeting through display of posters at prominent public places (panchayat offices, offices of Market committees, Notice board of religious places etc.) and distribution of pamphlets along roadside communities or in any manner deemed fit. The contractor will maintain a channel of communication with the communities through his designated Environment and Safety Officer to the safety of the safety officer to the the safety officer to the the the the the the the the the the	Along the Project Road	Contractor	Environment al Expert of AE and PIU	



				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 address any concern or grievances. Periodic meetings will also be conducted during the construction period to take feedback from communities or their representatives to ensure minimum disturbance. The mechanism and contents for disclosure shall be approved by PIU prior to the meetings. 			
	Clearing and	E Vagatation will be removed from the	Along the	Contractor	Environment
C1	Clearing and Grubbing	 Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert of AE. The Contractor under any circumstances will not cut trees other than those identified for cutting and for which he has written instructions from the PIU. The PIU will issue these instructions only after receiving all stages of clearances from the Forest Department/ MoEF& CC. Vegetation only with girth of over 30 cm will be considered as trees and shall be compensated, in the event of PIU's instruction to undertake tree cutting. The sub grade of the existing pavement shall be used as embankment fill material. The existing base and sub-base 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	Environment al Expert of AE and PIU
C2	Disposal of debris	The contractor shall identify disposal		Contractor	Environment
	from dismantling structures and road surface	sites. The identified locations will be reported to the Environmental Expert of AE. These locations will be checked on site and accordingly approved by Environmental Expert of AE prior to any disposal of waste materials.	Along the work in progress		al Expert of AE and PIU



				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, will be considered incidental to the work and will be planned and implemented by the contractor as approved and directed by the Environmental Expert of AE. The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Environmental Expert of AE. Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area. 			
C3	Other Construction Waste Disposal	 The pre-identified disposal locations will be a part of Comprehensive Waste Disposal Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of AE. Location of disposal sites will be finalized prior to initiation of works on any particular section of the road. The Environmental Expert of AE will approve these disposal sites after conducting a joint inspection on the site with the Contractor. Contractor will ensure that any spoils of material unsuitable for embankment fill will not be disposed off near any water course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and low-lying areas located in barren lands along the project corridors (if so desired by the owner/community and approved by the Environmental Expert of AE). All waste materials will be completely disposed and the site will be fully cleaned and certified by Environmental Expert of AE before handing over. The contractor at its cost shall resolve any claim, arising out of waste disposal or any non-compliance that may arise on account of lack of action on his part. 	Along the Road	Contractor	Environment al Expert of AE and PIU
C4	Stripping, stocking	 The topsoil from all areas of cutting and all areas to be permapently 	Along the Road	Contractor	Environment al Expert of
	and procervation	and an arous to be permanently			



				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
	of top soil	 covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert of AE. The following precautionary measures will be taken to preserve them till they are used: Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, silt fencing will protect the edges of the pile. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be utilized for - 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. 			AE and PIU
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 	Along the Road	Contractor	Environment al Expert of AE and PIU



				Respor	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		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.			
C6	Planning for Traffic Diversions and Detours	 Temporary diversions will be constructed with the approval of the Resident Engineer and Environmental Expert of AE for which contractor will seek prior approval for such plans. Detailed Traffic Control Plans will be prepared and submitted to the Resident Engineer for approval, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details diversions; traffic safety arrangement during construction; safety measures for night – time traffic and precautions for transportation of hazardous materials. Traffic control plans shall be prepared in line with requirements of IRC's SP- 55 document and The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. 	Along the Road	Contractor	Environment al Expert of AE and PIU
		 The contractor will also more local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from AE and PIU. The temporary traffic detours will be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic). 			
C7	Earth from Borrow Areas for Construction	 No borrow area will be opened without permission of the Environmental Expert of AE. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of AE and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961). The borrowing operations will be carried out as specified in the guidelines for sitting and operation of borrow areas. The unpaved surfaces used for the haulage of borrow materials, if passing 	Borrow Areas	Contractor	Environment al Expert of AE and PIU



				Respor	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 through the settlement areas or habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out twice a day to control dust along such roads during their period of use. During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Expert of AE will decide the numbers of sprinkling depending on the local requirements. Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the guidelines for Redevelopment of Borrow Areas or as suggested by Environmental Expert of AE. The final rehabilitation plans will be approved by the Environmental Expert of AE. 			
C8	Quarry Operations	 The contractor shall obtain materials from quarries only after the consent of the Department of Mining / SPCB (both the states) / District Administration or will use existing approved sources of such materials. Copies of consent/ approval/ rehabilitation plan for opening a new quarry or use of an existing quarry source will be submitted to Environmental Expert of AE and the Resident Engineer. The contractor will develop a Comprehensive Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy to PIU and AE prior to opening of the quarry site. The quarry operations will be undertaken within the rules and regulations in force in the state. 	Quarry Areas	Contractor	Environment al 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 	All Roads Used	Contractor	Environment al Expert of AE and PIU



				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 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. 			
C10	Construction Water	 Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to 'PIU' through the Engineer. The contractor will source the requirement of water preferentially from ground water but with prior permission from the Central Ground Water Board. A copy of the permission will be submitted to 'PIU' through the Engineer prior to initiation of construction. The contractor will take all precaution to minimize the wastage of water in the construction process/ operation. 	Along the Project	Contractor	Environment al Expert of AE and PIU
C11	Disruption to Other Users of Water	 While working across or close to any perennial water bodies, contractor will not obstruct/ prevent the flow of water. Construction over and close to the perennial streams shall not be undertaken in any season. The contractor will take prior approval of the River Authority or Irrigation Department for any such activity. The PIU and the Engineer will ensure that contractor has served the notice to the downstream users of water well in advance. 	All Water Bodies Used	Contractor	Environment al Expert of AE and PIU
C12	Drainage	 Contractor will ensure that no construction materials like earth, stone, ash or appendage is disposed off in a manner that blocks the flow of water of any water course and cross drainage channels. 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 	Drainage line along the road	Contractor	Environment al Expert of AE and PIU



				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
613	Siltation of Water	 of AE and the 'Resident Engineer' to prevent temporary or permanent flooding of the site or any adjacent area. To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like: i. Drainage line will be constructed all along the project road. ii. 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. 	All Surface	Contractor	Environment
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 and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. The contractor will also put-up sedimentation cum grease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m. in present case three Sedimentation Cum Grease Trap are proposed, However the item has been kept in case need arises during construction. Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse. 	All Surface Water Bodies Along the Road	Contractor	Environment al Expert of AE and PIU
C14	Slope Protection and Control of Soil Erosion	 The contractor will take slope protection measures as per design, or as directed by the Environmental Expert of AE to control soil erosion and sedimentation. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the 	Along the Roads	Contractor	Environment al Expert of AE and PIU



				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 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: 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. Turfing works will be taken up as soon as possible provided the season is favorable for the establishment of grass sods. Other measures of slope stabilization will include mulching netting and seeding of batters and drains immediately on completion of earthworks. In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank. Along sections abutting water bodies, stone pitching as per design specification will protect slopes. 			
C15	Water Pollution from Construction Wastes	 The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. Contractor will avoid construction works close to the streams or water bodies. All waste arising from the project is to be disposed off in the manner that is acceptable and as per norms of the State Pollution Control Board. 	Along the road	Contractor	Environment al 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 Environmental Expert of AE and PIU. Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refueling 	Along the Roads	Contractor	Environment al Expert of AE and PIU



				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refueling areas as per the design provided. Oil and grease traps will be provided at fuelling locations, to prevent contamination of water. 'Oil interceptors' shall be provided in wash down areas and re-fuelling areas 			
		 In all, fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such storage. Contractor will arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to AE and PIU) and approved by the Environmental Expert of AE. All spills and collected petroleum products will be disposed off in accordance with MoEF&CC and state PCB guidelines. Environmental Expert of AE and Resident Engineer' will certify that all arrangements comply with the guidelines of PCB/ MoEF&CC or any other relevant laws 			
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 of dust source and by erection of screen/barriers. All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement. The contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation. The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less than 500 g/m3. The pollution monitoring is to be conducted as per the monitoring plan. Alternatively, only crushers licensed by the SPCB shall be used. Required 	Along the Roads, Construction Site/ Camps	Contractor	Environment al Expert of AE and PIU



				Respor	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 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 PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to 'PIU' through the 'Engineer'. 	Along the Roads , all vehicles used/ Camps	Contractor	Environment al 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 construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced. Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986. Maintenance of vehicles, equipment and machinery shall be regular to keep noise levels at the minimum. At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching will be stopped during the night time between 10.00 pm to 6.00 am. 	Along the Roads , all vehicles used/Camp s	Contractor	Environment al Expert of AE and PIU



				Respor	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		 No construction activities will be permitted around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centers and hospitals between 10.00 pm to 6.00 am. Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to Environmental Expert of AE through the 'Engineer'. 			
C20	Personal Safety Measures for Labour	 Contractor will provide: Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc. Welder's protective eye-shields to workers who are engaged in welding works Protective goggles and clothing to workers engaged in stone breaking activities and workers will be seated at sufficiently safe intervals Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation. Adequate safety measures for workers during handling of materials. The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 as far as those are applicable to this contract. The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. The contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form. 	Along the Roads, all vehicles used/Camp s	Contractor	Environment al Expert of AE and PIU



				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
004	Tactilia and October	 The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. Contractor will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint dry is rubbed and scrapped. The Contractor will mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and will be approved by AE and PIU. 		Ocertee day	
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/Camp s	Contractor	Environment al Expert of AE and PIU
C22	Risk from Electrical Equipment(s)	 The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that: No material will be so stacked or placed as to cause danger or inconvenience to any person or the public. All necessary fencing and lights will be provided to protect the public in construction zones. All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be 	Along the Roads	Contractor	Environment al Expert of AE and PIU



				Respor	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
		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, constructio n Camps	Contractor	Environment al 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, constructio n Camps	Contractor	Environment al Expert of AE and PIU
C25	Informatory Signs and Hoardings	 The contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required as per IRC and MoRT&H specifications. 	Along the Roads, constructio n Camps	Contractor	Environment al 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 plantation guidelines. 	Along the Roads	Contractor	Environment al Expert of AE and PIU
C27	Flora and Fauna	• The contractor will 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.	Along the Roads	Contractor	Environment al Expert of AE and PIU



				Respor	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
C28	Chance Found Archaeological Property	 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. All efforts during the design stage should be made to minimize the tree felling requirement Compensatory plantation should be started during construction phase parallel to the construction activities. All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Environmental Expert of AE of such discovery and carry out the AE instructions for dealing with the same, waiting which all work shall be stopped. 	Along the Roads, constructio n sites/Camp s	Contractor	Environment al 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 construction. The construction will commence only 	Along the Roads, constructio n Camps/site	Contractor	Environment al Expert of AE and PIU



	Environmental Issue	Management Measures	Location	Responsibility	
SI. No.				Planning and Execution	Supervision/ Monitoring
		 upon the written approval of the Environmental Expert of AE. The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the AE. The sewage system for such camps will be properly designed and built so that no water pollution takes place in adjacent canals 			
C30	Potable Water	 The Contractor will construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing. The Contractor will also provide potable water facilities within the precincts of every workplace in an accessible place, as per standards set by the building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. Testing of water will be done as per parameters prescribed in IS 10500:1991. 	Along the Roads, constructio n Camps/con struction site	Contractor	Environment al 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, constructio n Camps/Co nstruction Sites	Contractor	Environment al 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, constructio n Camps	Contractor	Environment al Expert of AE and PIU



				Responsibility	
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
C33	Consultation	 The Environmental Expert of AE will contact the responsible people with the enhancement drawing of the site for which enhancement has been proposed and take their consent before the start of work. Accesses to Different Schools along the road will be developed to the satisfaction of 'PIU'. 	Along the Roads	Contractor	Environment al Expert of AE and PIU
C34	Clean-up Operations, Restoration and Rehabilitation	 Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of AE. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. The contractor will clear all temporary structures; dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by AE. All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed in pre identified approved areas or in places suggested by the Environmental Expert of AE areas in a layer of thickness of 75 mm-I50 mm. All construction zones including riverbeds, 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's expense, to the entire satisfaction to the Environmental Expert of AE and PIU will certify in this regard. 	Along the Roads, constructio n Camps	Contractor	Environment al Expert of AE and PIU
OPEF	RATION STAGE		I		L
		Activities to be carried Out by	PIU		
01 M	Aonitoring 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
02 M	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	Along the Road	PIU	PIU


			Responsibility			
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring	
		 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. 				
03	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	
04	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	
05	Noise Pollution	 Noise pollution will be monitored as per monitoring plan at sensitive locations. Noise control programs are to be enforced strictly. According to monitoring results, use of sound barriers / trees will be considered where warranted Signs for sensitive zones (health centers / educational institutions etc.) will be put up where horn should not be blown or traffic speed need to be regulated Pressure Horn must be banned in the project road 	Along the Road	PIU through Pollution Monitoring Agency	PIU	
O6	Water Pollution	Water Quality will be monitored as per monitoring plan	Along the Road	PIU through Pollution Monitoring Agency	PIU	
07	Plantaton (Flora and Fauna)	 Monitoring of survival of trees should be done at regular interval and suitable mitigation measures should be taken to protect the trees. Efforts will be made for proper maintenance of planted trees, shrubs and grasses to maintain greenery and aesthetics Planted tree should be covered with fence or net 	Along the Road	PIU through Pollution Monitoring Agency	PIU	



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				Respon	sibility
SI. No.	Environmental Issue	Management Measures	Location	Planning and Execution	Supervision/ Monitoring
08	Soil Erosion and Monitoring of Borrow Areas	 Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankment> 2m. and other places expected to be affected, will be carried out once in every three months as suggested in monitoring plan. In case soils erosion is found, suitable measures should be taken to control the soil erosion. 	Along the Road	PIU	PIU
09	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 locations and near sensitive locations Traffic control measures including speed limits will be enforced strictly. Engagement with local community / Awareness Training 	Along the Road	PIU	PIU

16.5 Reporting System

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

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

16.6 Technical set up

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



16.7 Nonconformity To Environmental Management Plan (EMP)

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

- Any complaints of public, within the scope of the Contractor, formally registered with the PIU and communicated to the Contractor, which is not properly addressed within the time period intimated by the PIU shall be treated as a major lapse.
- Non-conformity to any of the mitigation measures like unsafe conditions, non-collection of excavated material (during laying of drainage pipes) regularly and other unattended Environment, Health & Safety (EHS) issues, as stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.
- On observing any lapses, PIU shall issue a notice to the Contractor, to rectify the same.
- Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.
- If a major lapse is not rectified upon receiving the notice PIU shall invoke reduction, in the subsequent interim payment certificate.
- For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum limit of about 0.5% of the contract value.
- If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited immediately.

SI. no	Environment al 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	13.989 Km	Cost included in Total Civil Cost				
2.2	Water	Provision of Taps	No.	Included in uti	lity shifting an cost.	nd replacement		

Table 79:Environment Management Plan Implementation Budget



SI. no	Environment al	Particulars	Unit	it Rate In Approx. (Rs.) Quantity		Total Cost In
	Components					(Rs.)
	Water Bodies	Enhancement of Road side Ponds	No.	Retaining wa protect this wa wall is included	ll has been iter bodies. Co d in total Civil	proposed to ost of retaining Cost.
		Oil trap at parking/servicing of construction vehicles (at three location every 14km)-	No.	Ref: Project C	ost Estimate	
2.3	Environmental Enhancements	Enhancement of traffic sign outside of most sensitive locations mentioned in EMP, by planting of traffic sign and planting of 1 row of trees 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 included in total civil cost.		sign has traffic sign is
2.4	Flora	tree within toe line due to widening of highway is 166 trees which will be transplanted.	Nos.	The cost of trees plantationis included in total civil cost.		
	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 and hospitals. 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 theengineer in charge.		Cost of noise barrier is included in Tota Civil Cost.		ded in Total
2.5	Silt Runoff Control	Slope stabilization, turfing, silt fencing etc		For slope stab proposed on h slope stabiliza Cost.	ilization turfing igh embankm tion is include	g has been ent. Cost of d in Total Civil



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SI. no	Environment al Components	Particulars	Unit	Rate In (Rs.)	Approx. Quantity	Total Cost In	
						(Rs.)	
2.6	Slope/ embankment protection measures	Stone pitching, Gabion, Retaining wall, Turfing at toe line, etc		For Slope/ em Retaining wall proposed. Cos included in To	tection een ibankment is		
2.7	Relocation of sensitive receptor	Relocation of religious structure, educational properties and health care center		Cost of relocation is included in Tota Cost.		d in Total Civil	
		Total Mitigation / Enhancement Cost782					
3			Operation Sta	ige			
3.1	Soil erosion	Mitigation measure for soil erosion		includ	ded in Total Ci	vil Cost	
3.2	Contaminatio n from spills due to traffic and accidents	Clearing of spills at accident site			Average cost	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 Mitigatio	n / Enhancement	Cost		700,000	

Table 80: Summary of Environmental Management Budget

SI. No.	Environmental Components	Cost (Rs.)			
1	Const	ruction Phase			
1.1	Total Mitigation / Enhancement Cost	782000			
1.2	Environmental Monitoring Cost	309000			
Total Cos	t in Construction phase	1091000			
2	Operation Phase				
2.1	Total Mitigation / Enhancement Cost	700000			



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2.2	Environmental Monitoring Cost	309000
Total Co	ost in Operation Phase	1009000
3	Misce	llaneous Cost
3.1	Environmental Awareness and Training	1,20,000
3.2	Administrative Charges including logistics	4,00,000
Total C	ost in Miscellaneous	520000
TOTAL	BUDGETED COST (1+2+3)	2620000

An environmental management budget at of INR **2620000** has been estimated for implementation of the environmental management plan. This budget includes cost of environmental monitoring and associated trainings.



17 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 people about the proposed project. The stakeholders selected included shop keepers, residents along the road, owners/ workers of local commercial establishments etc. The outcome of the consultations depicts the requirement for the road safety measures; road furniture's (including street lights, additional bus bays, signage's, speed breaker etc,).Project may allure laboures from the neghiboring states which may bring menance to the society. The project is not huge and civil construction is very limited. Thus, there is minimum chance of influx of labour force from neighbouring states. However, there will be labour coming from the neighbouring districts of Meghalaya and accustomed with the culture and tradition of the society.

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 offsite, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported by the contractor to the CSC/PIU.

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



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Annexure 1: Environmental Screening Checklist

Name of the sub-project	WILLIAMNAGAR TOWN ROAD
Size of the project (approx. area in sq. mt/hac or length in mt/km, as	13.989 KM
relevant)	
Location of the proposed sub-project	Meghalaya, India
Name of the of the district, block	East Garo Hills district
Name of the settlement/ area, where the bridge is located	This road moves through the Williamnagar town which is a
	headquarter of East Garo Hills district in the state of
	Meghalaya in India.
Latitude and longitude	Lat: 25.5134268 ⁰ Long: 90.6436182 ⁰
New construction/ repair/ rehabilitation/ expansion (if there is an	Rehabilitation of the project road
existing bridge, please share picture of old bridge. Also, the	
approach roads.)	
If expansion, then is there any need of new land	NA
If yes, please share detail:	NA
- Total requirement	
- Private land	
- Govt. land	
- Forest land	
What is the High Flood Level in the sub-project area?	Flood prone 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
Physica	al Environment					
	Springs	No				
	Standing water bodies (ponds, lakes, etc.)	Yes	_	Low (L)	unlikely	



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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)	Unlikely	Extraction of groundwater
	Meandering River	No				
	Erosion prone stretches ⁶	Yes	_	Medium (M)	Likely	Because of unscientific agricultural practices and poor drainage facilities, soil erosion takes places in some locations.
	Areas with high slope (higher than 15 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 Plain areas and for this, hill cutting may be required.
	Coal Mine					
Biologi	cal 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 Fish breeding Around				No

⁶https://slusi.dacnet.nic.in/srm/srmabstracts/SRM_129_East_Garo_Hills.pdf



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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
		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				
	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	+	Medium (M)	Likely	improve the connectivity
	Sensitive Receptors (schools, hospitals, markets etc.)	Yes	_	Low	Likely	Increase of noise and air pollution.
	Drinking water sources	yes	_	Low	Unlikely	
	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				



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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 cultural resources – Religious structures, other sites significant to community	Yes	_	Low	Likely	Increase of noise and air pollution.
	Agricultural land/ Other activities	No				
	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).					Refer to Annexure 2
	Adverse impacts to women, gender issues including economic and safety concerns	Community consultation				Refer to Annexure 2
	Presence of Indigenous / vulnerable communities	Community consultation				Refer to Annexure 2
	Land acquisition of private land leading to loss of shelter and livelihood					Refer to Annexure 2
	Whether land acquired / donated is more than 10% of the total holding					Refer to Annexure 2
	Land acquisition resulting to loss of income; livelihood; sources of livelihood; loss of					Refer to Annexure 2



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
	access to common property resources and / or private residential and/or property resources.					
	Possible conflicts with and/or disruption to local community					Refer to Annexure 2
	Significant issues raised by the stakeholders during consultation	MoM of the community consultation				Refer to 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 c	of: Town: <u>Willia</u>	<u>mnagar</u>	Urban/ Rural	Area:	<u>Urban</u>
Tehsil:	Willia	mnagar	District:		East Garo Hills
1.	Does the project activ	ity require additiona	Il land area?	No	

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

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

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

Details	Unit	Quantity



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

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

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

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

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

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



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Details	Unit	Quantity
a. Total Affected Residential/Commercial Families	Number	48
b. Title Holders	Number	42
c. Non-Titleholders – Encroachers	Number	5
d. Non-Titleholders – Squatters	Number	1
e. Vendors affected	Number	1
f. Petty shop keepers & Kiosk affected	Number	5

10. Summary:

S No	Items	Results
1	Total no of Families (permanently) affected due to proposed project activity (Single or multiple impacts)	7
2	Total no of BPL Families (permanently) affected due to proposed project activity (Single or multiple impacts)	3
3	Total no of vulnerable Families (permanently) affected (including BPL) due to proposed project activity (Single or multiple impacts)	5
4	Total no of Tribal Families (permanently) affected (including BPL) due to proposed project activity (Single or multiple impacts)	4
5	Total number of Community Property Resources affected	Nil
6.	Total Number of Families temporarily affected during construction	48

11. Result/ Outcome of Social Screening Exercise

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



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

12. Additional information to be collected about the site:

SI. No.	Previous usage of site	Response
1	Whether the present site or part of present site ever used for any of the follow	ing 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	No
	supernatural forces	
	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	No
	may later on influence the project)	
	Open defecation	No
2	No specific usage/ plain ground/ agricultural	No





Annexure 2: Minutes of meeting with the DPR consultant C

A meeting via video conference was held between ESIA Consultant and the DPR Consultant for discussion on Environmental and Social Impact Assessment on Nongstoin to Maweit Road. Location: Office of CETEST Pvt. Ltd, Kolkata vide Video Conference Mode

Date:

23.12.2021

Time:

4.30 pm

Attendees: Team Leader, DPR with Mr. Swarnava Bandhopadhyay, Environmental Specialist, Mr. Suman Sarkar, Social Specialist and team members of DPR and ESIA Consultant.

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

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

Table 81 :Minutes of the meeting of ESIA and DPR consultant



SI.	Topic	Details of Discussion	Decision
4	Road safety	ESIA Consultants recommended for	DPR Consultants clarified that
4	Road safety at Night	ESIA Consultants recommended for street lighting. Provision of street lighting is absolutely necessary as it not only act as a prevention of accidents but also an important source of public security intended to reduce crime. Studies have shown that darkness results in a large number of crashes and fatalities, especially those involving pedestrians; pedestrian fatalities are 3 to 6.75 times more likely in the dark than in daylight. Several decades ago, when automobile crashes were far more common, street lighting was found to reduce pedestrian	DPR Consultants clarified that street lightings are proposed at built – up areas and other safety measures viz. Chevron sign boards, Road studs are proposed as safety measures at night.
		Furniture and Road Signage are to be introduced at all proper and suitable places.	
5	Storm Water Drain	The Local People demanded storm water drain as much as possible throughout the alignment. At congested area it should also have cover and use as footpath.	DPR Consultants clarified that storm water drains are provided at all required locations. 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 should be 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 are proposed to completely segregate the school from traffic. Road humps/Rumble strips are proposed at cross roads of all junction. Hence safety is given prime consideration in the proposal.
8	Utility Corridor	There should be utility corridor at underground near the congested place	Utility corridor will be provided as per actual requirement.
9	Public Transport	There are very few public transports in the total alignment. The frequency of public transport should increase.	The matter belongs to Govt. of Meghalaya and 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 will be cut



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

