PUBLIC WORKS DEPARTMENT
GOVERNMENT OF MEGHALAYA

PROJECT NAME: **MEGHALAYA INTEGRATED TRANSPORT PROJECT (MITP)**

ROAD NAME: AGIA MEDHIPARA PHULBARI TURA (AMPT) ROAD (1ST TO 32ND KMS)

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

First Draft : 06.01.2020

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Prepared: BK
Checked:BK/CB
Approved:BPS

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Executive Summary

1. The Government of India thus, on behalf of Government of Meghalaya has applied for financing an amount of US$ 82 Million equivalent from the World Bank for Meghalaya Integrated transport project, MITP Phase - I Roads. Up-gradation of 266.82 km road length will be carried out in Phase-I. The Department of Economic Affairs (DEA) and The World Bank (WB) has accorded in principle approval of Tranche-I of MITP for US$ 110 million (loan assistance of US$ 82 million and State Share of US$ 28 million), under which State Road Network roads measuring 128 km length will be upgraded along with certain other institutional development activities. There are total 10 road sections selected under Phase-I, 5 road sections in East Meghalaya and 5 road sections in West Meghalaya. The Government of India thus, on behalf of Government of Meghalaya has applied for financing an amount of US$ 110 Million equivalent from the World Bank.

2. The Meghalaya PWD is in the process of preparing DPR (Detailed Project Road) for about 140 km (Stage -1) in West Meghalaya as part of whole MITP (see table below). The main objective of the proposed consultancy assignment is to carry out Environmental Impact Assessments for a total design length of 139.668 km of major road sections in Meghalaya West to be undertaken in Phase 1 is listed below:

Sl. No	Name of Road	Total Length in Km
1	Bajengdoba Resu Mendipathar Damra Road	35.860
2	Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms)	31.955
3	Rongram Rongrenggre Darugre (RRD) Road	40.400
4	Parallel Road to existing Dalu Baghmara Road	20.853
5	Rongjeng Mangsang Adokgre (44th to 55th km) Ildek A'kong to A'dokgre	10.600
	Total	139.668km

3. The proposed road i.e. Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) is situated in the district of West Garo Hills. Project road is under Meghalaya PWD NH Works. The proposed Project road under study will start at Agia and ends at Nidanpur (Tura). The Project Road traverses from East to West direction. The project road coordinates are as follows:

Road Name	Start Point Coordinates	End Point Coordinates
ADOKGRE:	$25^0$49'55.65"N $90^0$58'27.23"E	$25^0$52'46.09"N $90^0$59'50.56"E
Agia Medhipara Phulbari Tura (AMPT) Road	$26^0$00'14.66"N $90^0$21'01.16"E	$25^0$56'07.11"N $90^0$07'00.69"E
BAJENGDOBA	$25^0$54'13.81"N $90^0$31'38.44"E	$25^0$55'57.44"N $90^0$46'18.03"E

BARENGAPARA	$25^0$12’38.87”N $90^0$13’49.22”E	$25^0$09’48.92”N $90^0$24’33.78”E
RRD ROAD	$25^0$35’56.67”N $90^0$16’47.14”E	$25^0$35’03.34”N $90^0$31’06.45”E

4. The entire project road passes through plain area. Land used along the road is either cultivable land, grazing land, private, submerged area or government land. The proposed road has been a State Highway which connects the Tura Town via Phulbari also through Goalpara district Assam with the Tikrikilla town. The road passes through 22 villages viz. Mothapara, Tikripara, Borogobol, Belguri, Lahapara, Naguapara, Rhaslapara, Ganegruge, Upper Darengchigre, Lower Darengchigre, Bondukmali, Photamati, Dhelapara, Abirampara, Baghpara, Kanthalbari, Dhapangapara 1, Dhapangapara 2, Bagodal, Upper Khamari, Williampur, Nidhanpur.

5. The AMPT road at present has an intermediate carriageway and no widening is proposed on the road which will remain as intermediate carriageway. The project road has poor to fair pavement condition in general, with few stretches having very poor pavement condition.

Sl.no	**Name of Road**	**Present carriageway width (M)**	**Proposed carriageway width (M)**
1	Bajengdoba- Resubelpara Mendipahar Damra road	Single lane (3.75)	Intermediate (5.5)
2	**Agia – Medhipara – Phulbari – Tura (AMPT) Road**	**Intermediate (5.5)**	**Intermediate (5.5)**
3	Parallel Road to existing Dalu Baghmara Road	Single lane (3.75)	Single lane (3.75)
4	Rongram – Rongrenggre – Darugre (RRD) Road	Single lane (3.75)	Intermediate (5.5)
5	Rongjeng – Mangsang – Adokgre (44^{th} to 55^{th} km) Eldek Akong to Adokgre Road	Single lane (3.75)	Intermediate (5.5)

6. This Environmental Impact Assessment Report is prepared for Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) section in order to identify all relevant direct, indirect and cumulative environmental and social risks and impacts for construction and operational phase. For environmental studies and subsequently the assessment the Corridor of Impact is considered of 500m on either side of the proposed road and project influence zone is taken 10km on either side (Arial distance) from boundary of road.

7. The environmental assessment study was prepared between the months of October-December 2019 as part of detailed project report. This is Detailed Environmental Impact Assessment (EIA) report prepared to fulfil requirements of the Operational Policy 4.01 for World Bank funded Project.

8. The baseline environment parameter within the Corridor of Impact, was conducted by the consultants during November-December 2019. Primary data for ambient air quality, ambient noise status, water quality (Ground and surface) and soil quality was collected and analysed through an NABL accredited laboratory. The monitoring results are found within the prescribed limits for air and noise level at the monitored locations in the project area.

9. Climate of Meghalaya plateau is influenced by elevation and distribution of physical relief. On the basis of weather condition, the Meghalaya plateau has 4 distinct seasons. The project road is within the West Garo Hills District of Meghalaya state. The general topography of West Garo Hills district is hilly with plain area on the north. The proposed Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) is located in northern Part of West Garo Hills District.

10. The proposed project road falls under the Seismic Zone V, which is susceptible to major earthquakes as per the seismic zone map of India (IS 1893 - Part I: 2002). 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.

11. Land use pattern abutting the project road section is mainly modified habitat comprising of agricultural land, horticultural estates, rubber, areca nut plantations and homesteads and built up areas having dense population in Tikrikilla area.

12. In the project influence area there were **8 species of mammals, 74 birds species, 54 butterfly species and 9 herpetofauna species** recorded during the field survey. List of the fauna along with the WPA (1972) schedule and IUCN status has been included in the Appendix I. The Asian elephant found in the road corridor area is anticipated to be the only schedule I species (WPA, 1972) and IUCN Endangered species.

13. It is estimated **54 trees need to be felled for this project**. All cut trees will be compensated at the rate of 1:10 based on an assessment of the species lost; preference to indigenous species will be given.

14. There are no National Parks, Wild Life Sanctuaries or Important Bird Areas or Key Biodiversity Areas within 10 km of the site. Also, there are no protected forest which would interfere with the alignment. There are **two reserved Forest being crossed by the project road,** the Nakkati R.F. and Hollaidanga/Dibruhill R.F. This road section has no community forest lands abutting the road. In the R.F areas, there will be no tree cutting undertaken and road will continue within its formation width. To enhance safety measures, adhesive reflectors will be attached to each of the standing trees to increase road safety.

15. The primary survey for EIA identified 7 occasional elephant crossings. The Asian Elephant is a Schedule 1 Species, under the Wildlife Protection Act, 1972 and an Endangered species as per the IUCN Red List. AMPT road has been operational since the year 1972, with significant natural habitat converted to agricultural landscapes and thus the road will not lead to any direct impacts on elephant habitats. However, improvements on the road would lead to increased speeds and increase in traffic plying on the road that could result in accidents posing a threat to human life, vehicles and potential elephant road kill and reducing permeability. Yet, elephants are known to be attracted to roads where secondary forest and open habitats are abundant and contain more food[1], which could be the case on the AMPT road

[1] Wadey et. al Why did the elephant cross the road? The complex response of wild

16. The elephant crossings identified on this road are **not** part of a national study that has identified 101 elephant corridors in India including 5 corridors in Meghalaya undertaken by national and international conservation organisations[2]. However, given the conservation status of the elephant, risks posed to the species as well as road safety, and potential risk of human-wildlife conflict and poaching, the EIA has recommended that a detailed biodiversity assessment, undertaken by national biodiversity and species experts be completed. The assessment based on stronger data and documentation of elephant behaviour should be used to prepare an Elephant Management Plan, **prior to commencing the bidding** and construction of this road.

17. The Environment Impact Assessment has outlined management and mitigation measures to be undertaken by the PIU and the Contractor and a detailed Environmental Management Plan has been prepared The Social Impact Assessment and Social Management Plan for the road have been prepared separately. The EMP covers issues of Environmental Health and Safety, including Occupational Health and Safety and Community Health and Safety that have some overlaps with SIA and SMP.

18. A summary of significant points from the EMP are summarized below:

    i) **Preparation of Environmental Health and Safety Documents including Occupational Health and Safety Plan and associated documents** in adherence with World Bank EHS Standards http://documents.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final- General- EHS-Guidelines.pdf. This should include a Site Establishment Plan, Health and Safety Plan, Emergency Preparedness Plan, Chance finds procedures and Traffic Management Plan.

    ii) Water Use. Surface water will be used for construction activity. The construction activities e.g. earthwork, concreting of structure and labour camps, would require 80 KLD of water. In project construction area, withdrawal of water for any purpose other than for drinking will be taken with permission from CGWB. To access surface water from springs, contractor must have prior permission (pre-construction) from the Nokma (Village council head). Where feasible, the contractor can undertake the building of tanks or check dams for water storage for the dry period for use in construction, which can be handed over to the community after. It is estimated that approximately an average of 100-140 KLD of water would be required during the peak construction period for construction purpose and 25 KLD for domestic purpose in the road section. Water would also be required for domestic requirements water from streams meet the required standards of IS 10500: 2012. In periods and locations of water scarcity, contactor can consider dust suppressant /dust binders shall be to reduce water consumption.

    iii) All Material Sources should adhere to World Bank EHS Standards and Operational Policies. The PIU and Contractor should identify and authorized Quarries for Construction Materials such as Stone and Sand ensuring that they are not operating in sites of critical or valued natural habitat, or operating during breeding season

elephants to a major road in Peninsular Malaysia. Biological Conversation 208 (2018) 91–98

[2] Wildlife Trust of India, IFAW, Elephant Family, IUCN and World Land Trust

(relevant to river bank sand mining). They should adhere to the Meghalaya Minor Minerals Concession Rules, 2016 and have an environmental clearance from the State Impact Assessment Authority (SEIAA), necessary permissions from Pollution Control Board and Forest Departments. Quarries should not be operating in erosion or landslide prone zones, disrupting drainage patterns or causing water pollution, disrupting traffic or posing safety risks. Quarry workers must have access to necessary personal protective equipment.

iv) Construction Waste and Debris Disposal: Approximately 600.86 cum of excavated soil from hill cutting material will be scarified from existing carriageway and wastes will also be generated form scarified bitumen, dismantling and excavation of existing culvert. The excavated material will used in backfilling in the project and balanced quantity will be disposed of at approved designated sites. Muck disposal sites have been identified in the DPR and disposal sites for bituminous wastes need to be identified by the contractor as part of their site management plan and approved by the engineer-in-charge prior to commencing construction.

iv) Construction Camp Management should adhere to World Banks Worker Accommodation Processes and Standards - http://documents.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10B ox358316B01PUBLIC1.pdf, the Labor Management Plan and EIA Appendix 4 on Construction Camp Management.

v) All Biodiversity related guidelines and measures as identified from the detailed biodiversity assessment must be included in the bid document and followed by the contractor. This includes implementation of measures identified in the Elephant Management Plan, measures to reduce risks to labour from wildlife, prohibiting the hunting of wild animals, and good practices to conserve biodiversity such carrying out clearing activities outside of bird breeding /nesting periods.

vi) **All necessary measures for Road Safety of traffic and pedestrians and workers must be taken by the contractor.** Contractors must familiarize themselves with World Banks Good Practice Note on Road Safety http://pubdocs.worldbank.org/en/648681570135612401/Good-Practice-Note-Road-Safety.pdf

19. The key Environmental Monitoring Reports for this road section include a Pre-Bid Clearence Report that incorporates the recommendations of regional biodiversity experts and species specialists into the bid documents and EMP, to be approved by the engineer in-charge and shared with the World Bank, a pre-construction clearance report including Contractors EMP, OHS plan and associated documents, Construction Camp establishment plan, list of authorized sources for raw materials, and plans and permissions for water for construction and project related domestic use, to be approved by the engineer in-charge and shared with the World Bank. Bi-weekly reports by the contractor will be prepared during the construction phase on parameters identified in the monitoring plan, and consolidated quarterly reports will be prepared by the environmental expert, PIU and approved by Engineer in-charge.

20. The Contractor‘s Environmental Engineer and Health Safety Officer would be responsible for the implementation of environmental safeguards and supported by the

Environmental Expert of the PIU. The Environmental and Social Cell of the PWD will be responsible for training and capacity building of PIU staff as well as contractors on environmental and social safeguards.

1. Introduction

1.1 Background

In Meghalaya, over 80 percent of freight and almost all of passenger movement within the state depends on roads. Yet, about half of the habitations lack all-weather road access. The problem is further compounded by difficult terrain and extreme climatic condition, leading to high maintenance cost of the roads. Similarly, rapid urbanisation has created a huge gap between demand and supply of urban services and infrastructure. To overcome the abovementioned challenges in a holistic and all-inclusive manner, the Government of Meghalaya, with financing and technical support from the World Bank, is preparing a project titled "Meghalaya Integrated Transport Project". The objective of the project is to "provide a well-connected efficient, good quality and safe transport network on long-term basis in a cost-effective manner maximizing economic and social outcomes".

MITP is an ambitious project of the Government of Meghalaya (hereinafter refer to as GoM) under which it intends to strategically transform the Core Road Network of 2000 km road length. A map of the road network is provided as Figure 1. In the project, State Road Network roads of 650 km road length will be widened, and 1350 km road length will be provided periodic maintenance besides other institutional, development activities. The Project shall follow a Multiphase Programmatic Approach (MPA). Up-gradation of 266.82 km road length will be carried out in Phase-I. The Department of Economic Affairs (DEA) and The World Bank (WB) has accorded in-principle approval of Tranche-I of MITP for US$ 110 million (loan assistance of US$ 82 million and State Share of US$ 28 million), under which State Road Network roads measuring 128 km length will be upgraded along with certain other institutional development activities. There are total 10 road sections selected under Phase-I, 5 road sections in East Meghalaya and 5 road sections in West Meghalaya.

The details of roads in the Meghalaya West are provided in Table 1.

Table 1-1: MITP Phase - I Roads (West Meghalaya)

S.No.	Division	Name of Road	Category	Total Length (km)	Proposed Length (km)
1	Resu Belpara	Bajengdoba Resu Mendipathar Damra Road	MDR	35.860km	35.860km
2	NEC	Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms)	SH	31.955 km	31.955 km
3	Williamnagar / NH Tura	Rongram Rongrenggre Darugre (RRD) Road	MDR	40.400 km	40.400 km
4	Barengapara	Parallel Road to existing Dalu Baghmara Road	MDR	20.853 km	20.853 km
5	Resu Belpara	Rongjeng Mangsang Adokgre	MDR	10.600 km	10.600 km
Total Length (km)				139.668km	139.668km

The project roads prioritised for design shall be subjected to Environmental Assessment (EA) /Social Assessment (SA) as per the requirements of Government of India (MoEF) and the World Bank. It is also decided that SA/EA projects and project surveys will be undertaken by appointing external consultants. The task of Environmental and Social Assessment of above roads was undertaken by a team of specialists: Environmental Experts – Dr Brighu Prasad Saikia and Dr Kuldip Sarma; Social Experts – Prafulla Hazwary Leo and Kamal Kumar Narjinary, Biodiversity

Expert – Dr Prasanta Kumar Saikia, Bioengineering Expert – Dr Anup Kumar Das and Gender Expert – Ms Berlin Gogoi.

Table 1-2: AMPT Proposed Road Width

Sl.no	Name of Road	Present carriageway width (M)	Proposed carriageway width (M)
1	Bajengdoba- Resubelpara Mendipahar Damra road	Single lane (3.75)	Intermediate (5.5)
2	**Agia – Medhipara – Phulbari – Tura (AMPT) Road**	**Intermediate (5.5)**	**Intermediate (5.5)**
3	Parallel Road to existing Dalu Baghmara Road	Single lane (3.75)	Single lane (3.75)
4	Rongram – Rongrenggre – Darugre (RRD) Road	Single lane (3.75)	Intermediate (5.5)
5	Rongjeng – Mangsang – Adokgre (44^{th} to 55^{th} km) Eldek Akong to Adokgre Road	Single lane (3.75)	Intermediate (5.5)

1.2 Purpose of ESIA Report

This Environmental Impact Assessment Report has been prepared for Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) Road in order to identify all relevant direct, indirect and cumulative environmental risks and impacts for construction and operational phase and prepare the Environment Management Plan to manage and mitigate the potential impacts on the physical, biological and socio-economic parameters.

The environmental assessment study was done between the months of October-December 2019 to inform the preparation of the Detailed Project Report (DPR). This detailed Environmental Impact Assessment (EIA) report prepared fulfills requirements of World Banks Operational Policy 4.01.

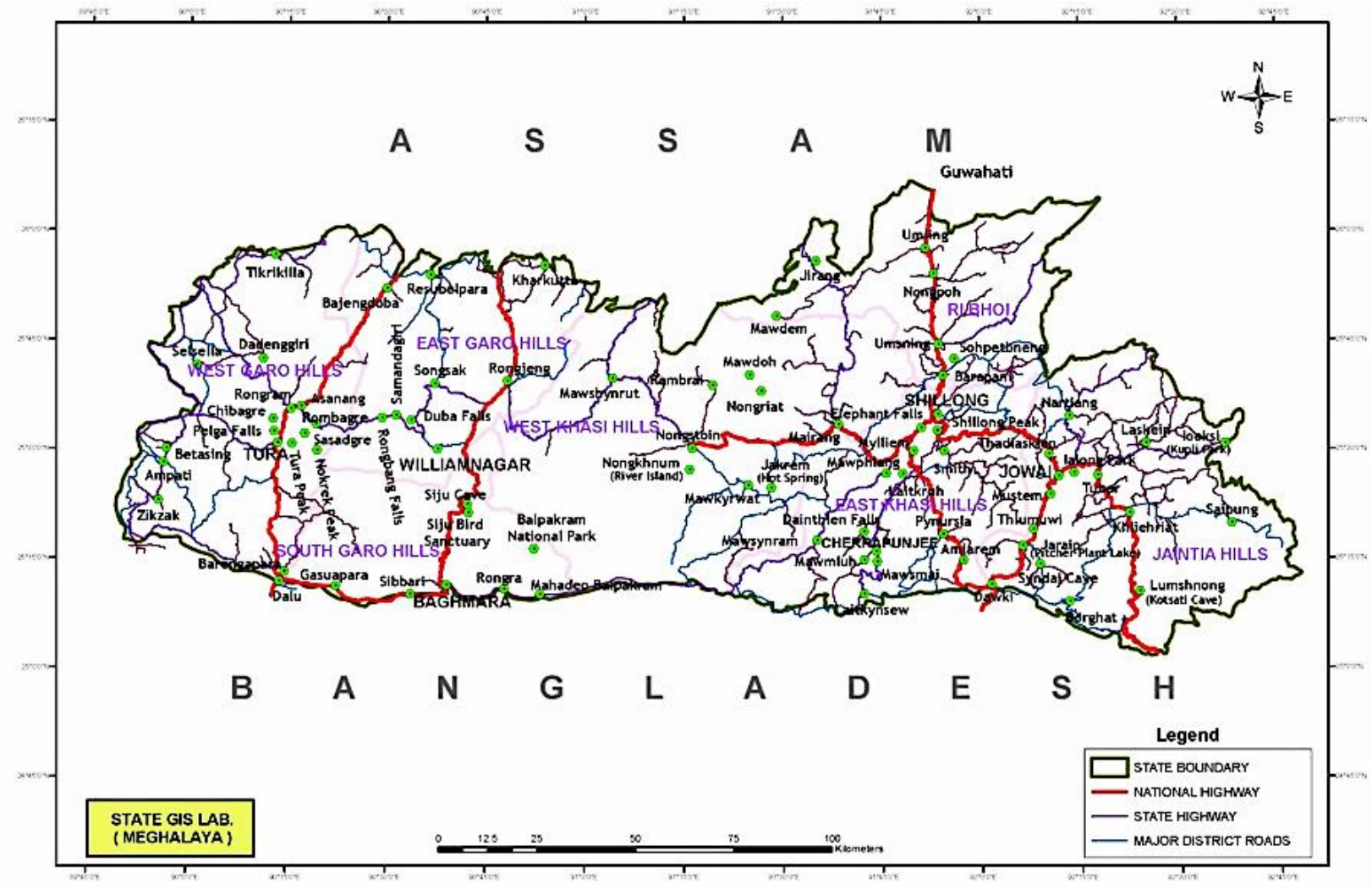


Figure 1 Road Network of Meghalaya

1.3 Objective and Scope of the EIA Study

The objective of the present, EIA study is to identify potential environmental impacts of the proposed Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) Road improvement measures and formulate strategies to avoid / mitigate the same. The scope of work to accomplish the above objective, comprise the following.

- Collecting primary and secondary environmental baseline data within the project boundary and surrounding areas; Assessing potential adverse environmental impacts that might arise during operation of the Project after reviewing Project information and using the environmental baseline study conducted during the feasibility study;
- Suggesting appropriate mitigation measures to effectively manage potential adverse impacts; and
- Analyse the alternatives in terms of alternative alignment, technology, design and operation, including the ―with project‖ and "without project" situation were carried out to analyse the feasibility
- Consultation with the Public/Stakeholders and incorporate their concerns into the project design;
- Developing an Environmental Management Plan (EMP) to implement suggested mitigation measures and management plans to minimize adverse impacts through effective management systems including formulation of monitoring and reporting requirements;
- Conducting additional studies for the enhancement of the benefit to the local Community and the road users;

The environmental studies have been confined to the situation around the deemed areas of direct influence caused by constructional and operational facilities along Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) the proposed major district road section in the state of Meghalaya. The following sections of the report, discusses the methodology adopted by the consultant in conducting the study and presents the results of the same.

1.4 Approach and Methodology Adopted for EIA Study

The Environmental Impact Assessment has been carried out, in accordance with the requirements of the World Bank‘s Operational Policy 4.01. The Government of India guidelines for Rail/Road/Highway project; EIA notification 2006 and its amendment of MoEFCC and Highway Sector EIA guidance manual 2010 has also been followed in the process of this environmental assessment. The study methodology has been adopted in such a manner to ensure that environmental concerns are given adequate weightage in the selection of alignment and design of proposed road improvements. The study in the road section project employ an iterative approach in which potential environmental issues have been examined at successive levels in detail and specificity, at each step in the process.

The EIA is based on the information collected from secondary as well as primary sources on various environmental attributes. Monitoring of air, water, noise and soil quality was also carried out along

the road section alignment and significant issues were examined during field surveys to determine the magnitude of significant environmental impacts.

The major steps in the EIA process for the project were as follows:

(i) Screening of Project Road

As a part of the project feasibility study, Environmental Screening is undertaken in parallel with the Preliminary Economic and Engineering studies to determine any significant social or environmental issues which could require further analysis (including the analysis of alternative alignments, improvement of junctions etc.) to resolve such issues.

The environmental screening typically identifies the natural habitats (e.g. national parks, wildlife reserves, sanctuaries, sacred groves, protected areas, forests, water bodies etc.), major rivers and waterways, notified cultural heritage sites and any other potentially sensitive areas. The information available from secondary sources along with the inputs from the site visits and consultation with local people are used to identify these issues and sensitive receptors which might be located along the corridor. The results of this analysis are communicated to the design team to resolve them (including recommendation for exclusion, analysis of alternative alignment and/or mitigation) as a precursor to the engineering design and before initiating the detailed environmental impact assessment study.

(ii) Delineation of Project Impact Zone

For carrying out further environmental studies and subsequently the assessment it was required to delineate the project influence zone. Depending on the severity of impact the Project influence zone has been classified as:

Corridor of Impact (CoI): The area of 500 m on either side of the proposed road center line is considered as the corridor of impact. The proposed formation width i.e. 9 m is thus included within the CoI. This area is more vulnerable to the project‘s direct impacts.

Project Influence Area (PIA): In accordance with MoEFCC‘ 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 (Arial distance) from boundary of road for collection of secondary data, including impacts due to ancillary sites like borrow areas, quarry, material storage, disposal areas, etc. According to the office memorandum of MOEFCC vide no. F. No. 22-43/2018-IA.III dated 8th August, 2019 which describes that―Proposals involving developmental activity/project located within 10 km of National Park/Wildlife Sanctuary wherein final ESZ notification is not notified (or) ESZ notification is in draft stage, prior clearance from Standing Committee of the National Board for Wildlife (SCNBWL) is mandatory. In such cases, the project proponent shall submit the application simultaneously for grant of Terms of Reference/environmental clearance as well as wildlife clearance. And to fulfil this clause 10 km on either side (Arial distance) from boundary of road has been considered as the project influence area to investigate whether there is any Eco sensitive zone of National Park/Wildlife Sanctuary or not.

(iii) Preliminary Engineering Surveys

With the information available from the screening the design team took the preliminary surveys of the project site to assess the engineering aspects of the road including the likely environmental issues associated with the project. The survey carried out as part of the detailed design data collection also provided valuable information regarding area adjacent to the proposed project corridor.

(iv) Collection of Secondary Environmental Data

Secondary data was collected from various verifiable sources about different components e.g. Climate, Physiography, Soil type, Ecology, etc. The sources from which information is gathered is presented in **Table 1-3.**

Table 1-3 Sources of secondary information

S.No	Aspects	Parameters	Source of Information
1	Climatic Conditions in the Project Influence Area	Climate, Temperature, Rainfall	Indian Metrological Department
2	Soil & Geology	Soil type and its stability, Fertility of the soil potentiality for soil erosion	Geological Survey of India, State Mining Department
3	Slopes	Direction of slope, Percentage of slope	Contour Survey, satellite image and Survey of India topographic sheets
4	Drainage/ Flooding	Existing drainage map and flooding level including its extent of water spread. Identification of drainage channel and its catchments area around the Project stretch	Satellite Imagery/ Topo sheet/Hydrology study/State Water Resource Department.
5	Water Bodies and Water Quality	Identification of water bodies/canal/drainage channels where the run off surface water will flow/due to erosion and also due to spillage oil and other hazardous materials. Status of surface water and ground water quality	Topography sheets/field study. Hydrological data from the CGWB Reports
6	Forest within Proposed ROW Legal Status – Protected Areas, Endangered Plant and Animal, Ecological Sensitive Area, Migratory Corridor/Route,	Status of the forests, Conservation of forest area, & endangered plant and animal and any other species	Department of Forest, Govt. of Meghalaya, DFOs, Discussion with local community and local DFO officers
7	Trees and Vegetation Cover	Identification of existing tree species in the project influence area	Forest Department, Research Institution, Field Survey.

8	Settlements along the PROW	Settlements & its population along the corridor. Its location & numbers	Population/ District Census Report 2011. Topographic survey
9	Cultural / Heritage and Ancient Structures	Conservation areas if any, Protected structures, monuments and heritage structures.	Archaeological Survey of India, State Archaeological Department

(v) Collection of Primary Baseline Information

For gathering the baseline environmental condition along the project corridor baselines studies were conducted. These baseline studies carried out included:

a) Baseline environmental surveys for assessing the ambient air, water and noise quality;
b) Enumeration of trees to identify the Location, number, types spread, girth etc. Local name, no. of the trees within the proposed RoW;
c) Ecological surveys to identify the habitats and the flora and fauna;
d) Structure enumeration to identify the one likely to be impacted;
e) Socio-economic surveys to identify the condition of the impacted persons.
f) In addition to the above survey interactions are carried out with the populations along the project corridor to gather local level information on the following:
g) Local practices and traditions with respect to conservation and use of natural resources;
h) Farming practices and Cropping pattern;
i) Perception of the people about the project
j) Traffic surveys were used to estimate the present and future traffic
k) Preliminary engineering surveys to identify the topographical features
l) This information was used to develop the baseline environmental condition in the project area and identify the environmental sensitivities which might still get affected by the proposed alignment.

(vi) Public consultation

At the beginning of the EIA process, a preliminary identification of probable stakeholders was carried out. An inventory of actual / potential stakeholders, including local groups and individuals, local institutions like the village councils which may be directly or indirectly affected by the project or with interest in the development activities in the region was made at a preliminary stage. This inventory was arrived through discussions with local PWD official and also in consultation with members of the local community. Consultations with the community were a continual process that was carried out during the EIA study and would also be continued during the construction and operation phases of the project. Issues like disturbance during the construction, severance and increased congestion, noise and air pollution, employment opportunities, need for development of basic infrastructure, safe drinking water, sanitation facilities in the villages adjoining to the corridor were discussed during the consultations so that they can be adequately addressed through the environment management plans. The consultations with community and local institution like village councils also helped in developing preliminary understanding of the requirement of people in the area and identification of the enhancement proposals.

(vii) Impact Identification and Evaluation

Potential significant impacts were identified on the basis of: analytical review of baseline data; review of environmental conditions at site; analytical review of the underlying physical, biological and socio-economic conditions within the project influence area.

(viii) Environmental Management, Mitigation and Monitoring

The final stage in the EIA Process is definition of the management and monitoring measures that are needed to ensure: a) impacts and their associated Project components remain in conformance with applicable regulations and standards; and b) mitigation measures are effectively implemented to reduce the effects to the extent predicted. An Environmental Management Plan, which is a summary of all actions which the Project has committed to execute with respect to environmental/social/health performance for the Project, is also included as part of the Bidding Documents. The Environmental Management Plan includes mitigation measures, compensatory measures and offsets and management and monitoring activities.

1.5 Caveats to EIA Study

This report is based on the Detailed Project Report (DPR) and engineering designs of the road section and was used to inform the DPR. In case, of any changes to the design undertaken by the contractor the EIA report will need to be revisited. In case of minor changes, PWD will review social and environmental impacts, and add the necessary environment management actions to be taken to the ESMP and bid document. In case of any major changes to design, this being a Category A project, the PWD will seek a no objection from the World Bank and process of EIA for the change proposed could apply.

The report has been developed on certain information available at this point of time, scientific principles and professional judgement to certain facts with resultant subjective interpretation. Professional judgement expressed herein is based on the available data and information. Further, the report has been developed on certain information available at this point of time, scientific principles and professional judgment to certain facts with resultant subjective interpretation.

1.6 Structure of EIA Document

This EIA report has been presented as per requirements of the World Bank‘s Operational Policy 4.01. The report is organized into ten chapters, a brief of each chapter is described below:

- Chapter 1 - Introduction: This section described the background information about the project and EIA study.

- Chapter 2 - Project Description: This section presents the key features and components of the proposed project.

- Chapter 3 - Policy, Legal, and Administrative Frameworks: this section summarizing the national and local legal and institutional frameworks that guided the conduct of the assessment.

- Chapter 4 - Environmental Baseline Status: This section discussing the relevant physical, biological, and socioeconomic features that may be affected by the proposed project.

- Chapter 5- Analysis of Alternatives: This section covers analysis of various alternatives considered to minimize the overall impacts of proposed development and suggest most appropriate alternatives based of detailed analysis of impact and risk associated with each alternative.

- Chapter 6– Impact Assessment and Mitigation: This section presents the environmental assessment of likely positive and adverse impacts attributed to the proposed project and concomitant mitigation measures.

- Chapter 7– Public Consultation and Discussion: This section describing the consultation process undertaken during the environmental examination and its results, their consideration in the project design, and manner of compliance to the World Banks Publication Policy and related national laws.

- Chapter 8 - Environmental Management Plan: This section discussing the lessons from the impact assessment and translated into action plans to avoid, reduce, mitigate or compensate adverse impacts and reinforces beneficial impacts, across the pre-construction, construction and operational phase of the project. It includes the parameters for monitoring and reporting.

- Chapter 9–Implementation Arrangements: This section brief the institutional set up in the executing & implementation agency and contract for the execution of the project along with responsibilities on environmental management.

2. Project Description

2.1 Brief Description of the Project Road

This road section Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) is an alternate road to reach the Tura from Goalpara distict, Assam. It is located in the district of West Garo Hills in the State of Meghalaya and lies between Latitude 90° 30' and 89° 40' E, and the longitudes of 26° and 25° 20' N. The Project Road traverses from East to West direction.

The entire project road passes through plain and gently rolling terrain. Land used along the road is either cultivable land, grazing land, private, submerged area or government land. The proposed road is a State Highway which connects the town of Tura via Phulbari and the Goalpara district of Assam with the town of Tikrikilla. The road passes through 22 villages viz. Mothapara, Tikripara, Borogobol, Belguri, Lahapara, Naguapara, Rhaslapara, Ganegruge, Upper Darengchigre, Lower Darengchigre, Bondukmali, Photamati, Dhelapara, Abirampara, Baghpara, Kanthalbari, Dhapangapara 1, Dhapangapara 2, Bagodal, Upper Khamari, Williampur, Nidhanpur.

2.2 Project Design Features

Carriageway and Right of Way: The carriageway width in the road section varies from 5.0m to 5.50m with unpaved shoulders of 0.5 to 1.0 m width on each side and right of way as was observed, varies from 9.0 m to 14.0 m.

The RoW for the proposed road will be provided as per table 6.4. of IRC:SP:48 Hill Road Manual as shown below and will be adopted as MDR exceptional category.

Table 2.3 : Desirable Road Land Widths (Meters)

SL. NO.	Road Classification	Open areas		Built Up Areas	
		Normal	Exceptional	Normal	Exceptional
1	National and State Highways	24	18	20	18
2	Major District Roads	18	15	15	12
3	Other District Roads	15	12	12	9

Pavement Conditions: The existing pavement of project road is bituminous surface with earthen shoulders of width 0.5 m to 1.0 m exist predominantly on both sides throughout the project stretch. The pavement is flexible type having earthen/gravel shoulders. Pavement condition is fair except few locations where it has been badly damaged. The pavement is showing signs of distress at some locations. The defects noticed include Cracking (alligator, transverse, longitudinal, edge cracks), Rutting and edge breaking. The shoulders are earthen/gravel with fair to poor condition. The road surface is black topped with Bituminous Macadam (BM); Semi Dense.

Topography: The road lies in Plain terrain in all section from Km 0+000 to Km 31+955. The embankment height is 1.1m (approx) in 0+000 to 31+200 and the road lies low area from 31+200 to 31+955. Land used along the road is either cultivable land, grazing land, private, submerged area or government land.

Pavement Surface Condition:

Pavement condition survey has been carried out and seen as below.

Figure 2 Pavement Condition of AMPT Road

Junctions: There are about 64 Nos. of Minor Junctions out of which 59 Nos are T Junctions and 09 Nos. are Y Junctions .

Culverts Major Bridges and Minor Bridges (Proposed): There are 95 locations where existing hume pipe, culvert and bridges are been present.

ROB, RUB & Railway Crossings: There is no existing manned railway crossing (LC), ROB & RUB along the proposed project road stretch.

Existing Bypass: There is no bypass in the proposed project road stretch.

Tree Cutting: As per the preliminary engineering design, that felling of 54 trees is required for the improvement of road section. Broadly the species composition of the roadside trees found are Rain Tree (*Caesalpinea sp.*), Sal tree (*Sorea robusta*), Shegun (*Tectona grandis*), Fig Trees (*Ficus religiosa, Ficus benghalensis & Ficus* raecemos*a*), *Cassia sp.*, Jamun (*Syzigium cumini*). List of the roadside trees to be cut along with GPS locations and side of the alignment is provided as Appendix I.

Estimated Duration of the Construction: The improvement works on AMPT road are expected to be completed in 42 months

Labor Requirements: At its peak, 50 labor will be required for the construction works; Of this 40% is expected in be skilled labor and 60% will be unskilled labor. A large portion of the unskilled labour will be hired from local population and will be a condition for the contractor mentioned in the bid document.

3. Policy, Legal and Administrative Frameworks

To address environmental risks of the project and manage and mitigate adverse impacts, the regulations, policy and guidelines enacted by the Government of India and Government of Meghalaya which must be followed are presented in the section below. In addition, requirements of adhering to the World Banks Operational Policies are also detailed.

This Section focuses on the administrative framework under the purview of which the Project will fall and the EIA study will be governed, namely:

- The National and Local, Legal and Institutional Framework;
- World Bank Operational Policies and Guidelines

3.1 Government (India) Environmental Legal Framework

The national legal framework of India consists of several acts, notifications, rules and regulations to protect environment and wildlife. In 1976, the 42nd Constitutional Amendment created Article 48A and 51A, placing an obligation on every citizen of the country to attempt to conserve the environment.

The environmental impact assessment requirement in India is based on the Environment (Protection) Act, 1986, the Environmental Impact Assessment Notification, 2006 (amended 2009), all its related circulars, MOEF&CC's Environmental Impact Assessment Guidance Manual for Highways 2010 and IRC Guidelines for Environmental Impacts Assessment (IRC:104-1988) of highway projects. In addition to road widening and rehabilitation including establishment of temporary workshops, construction camps, hot mix plants, and opening of quarries for road construction work require to comply with provisions of The Forest (Conservation) Act 1980 (Amended 1988) and Rules 1981 (Amended 2003): The Wildlife (Protection) Act, 1972 (Amended 1993); The Water (Prevention and Control of Pollution) Act 1972 (Amended 1988) and Rules 1974; The Air (Prevention and Control of Pollution) Act, 1981 (Amended 1987) and Rules 1982; The Noise Pollution (Regulation and Control) Rules, 2000 (Amended 2002) and Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules 2008 (Amended 2009).

The Acts and Regulations require the project to comply with the following:

a) As per provisions of Environmental Impact Assessment Notification 2006 (amended in 2009, 2011 and 2013), the expansion of State Highways require environmental clearance from the State level Environment Impact Assessment Authority (SEIAA) Forests & Climate Change and thus AMPT road will require this clearance.

b) Forest Clearance from Department of Forests is required for diversion of forest land to non-forest purpose. Prior permission is required from Forests Department to carry out any work within the forest areas and felling of road side trees. Cutting of trees need to be compensated by compensatory afforestation as required by the Forest Department.[3]

c) As per Office Memorandum (OM) issued by MOEFCC on 19 March 2013 the grant of environmental clearance for linear projects including roads has been delinked from the forestry clearance procedure. Hence, after receipt of environmental clearance construction works may commence on sections/parts of a linear project that do not require forestry clearance. Construction works may commence on sections requiring forestry clearance only after receipt of the respective clearance.

[3]For the proposed Road Project Sections, no forest land will be diverted in this road section however permission would be required for cutting of road side trees from Forest D

d) Placement of hot-mix plants, quarrying and crushers, batch mixing plants, discharge of sewage from construction camps requires No Objection Certificate (Consent to Establish and Consent to Operate) from State Pollution Control Board prior to establishment.

e) Permission from Central Ground Water Authority is required for extracting ground water for construction purposes, from areas declared as critical or semi critical from ground water potential prospective by them.

Specifically, for the proposed Major District Road section Project in Meghalaya, the following environmental laws and regulations are applicable:

Applicable Environmental National and State Requirements

Sl. No.	Policy/Act/Rule	Project relevance	Requirement	Competent Authority	Responsible Agency for Obtaining Clearance
1.	Environmental (Protection) Act, 1986 amended 1991 and associated rules / notifications	The Environment (Protection) Act is an umbrella legislation on control of pollution (the Water Act and the Air Act) by enacting a general legislation for environment Protection.	The Act and the Rules framed under the act defines the standards for emission and discharges. All the equipment machinery which would be used in the project has to comply with the emission and or discharge standards specified.	MoEFCC	Contractor
2.	Notification on Environment Impact Assessment of Development projects, 2006 as amended in 2009 and 2013, 2016	Sand borrow soil and aggregate used for road construction has been classified as a minor mineral as per The Meghalaya Minor Mineral Concession Rules, 2016.	The quarry sites borrow areas and the sand mines would require a prior environmental clearance under the EIA Notification 2006.	District Level Expert Appraisal Committee/ District Level Impact Assessment Authority	The Contractor has to obtain necessary clearance before use of any borrow area and quarry.
3	The Forest Conservation Act 1980 and The Forest Conservation Rules 1981	The central government enacted The Forest (Conservation) Act in1980 to stop largescale diversion of forest land for non-forest use.	The proposed alignment does not pass through any forest area hence no clearance is required.	The Forest Department, Government of Meghalaya and MoEF & CC	MPWD
4	Wildlife (Protection) Act, 1972 amended 1993 and Rules 1995; Wildlife (Protection)	The act was enacted to protect wild animals and birds through the creation of National Parks,	The present alignment does not pass through any wild life sanctuary.	Wildlife Division, Government of Meghalaya/ MoEF & CC	MPWD

Sl. No.	Policy/Act/Rule	Project relevance	Requirement	Competent Authority	Responsible Agency for Obtaining Clearance
	Amendment Act, 2002	Sanctuaries, Conservation Reserve, Tiger Reserve.	Not Applicable		
5.	Cutting of road side trees	The Forest (Conservation) Act 1980 (Amended 1988) and Rules 1981 (Amended 2003) and Environmental Protection Act of 1986 and as amended Meghalaya Forest Regulation (Application and Amendment) Act, 1973 The Meghalaya Tree (Preservation) Act, 1976	Permit from Autonomous District Councils Garo/Khasi/Jaintia Hills / Forest Department	Autonomous District Councils / State Department of Forests	MPWD
6.	Ancient Monuments & Archaeological Sites and Remains Act, 1958	The act has been enacted to prevent damage to archaeological sites identified by Archaeological Survey of India	The present alignment does not encroach within legally marked boundary of any national and state protected heritage sites. Not Applicable	Archaeological Dept. GOI and GoM	MPWD
7.	Construction and Demolition Waste Management Rules, 2016	Rules to manage construction waste resulting from construction, remodeling, repair and demolition of any civil structure.	Construction and demolition waste generated from the project construction shall be managed and disposed as per the rules.	State Pollution Control Board	The Contractor
8.	Municipal Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing and disposal.	Solid waste generated during construction stage at construction camp shall be managed and disposed in accordance with the Rules.	State Pollution Control Board	The Contractor
9.	Establishing stone crusher, hot mix plant, wet mix plant and Diesel Generator Sets	Water Act of 1974, Air Act of 1981, Noise Rules of 2000 and Environmental Protection Act of 1986 and as amended	Consent-for-establishment	State Pollution Control Board	The Contractor

Sl. No.	Policy/Act/Rule	Project relevance	Requirement	Competent Authority	Responsible Agency for Obtaining Clearance
	and construction vehicles	Central Motor Vehicle Act, 1988 and Central Motor Vehicle Rules,1989			
10.	Operating stone crusher, hot mix plant, wet mix plant and Diesel Generator Sets	Water Act of 1974, Air Act of 1981, Noise Rules of 2000 and Environmental Protection Act of 1986 and as amended	Consent-for-operation	State Pollution Control Board	The Contractor
11.	Use and storage of explosive for quarry blasting work	India Explosive Act 1984	Explosive licence for use and storage	Chief Controller of Explosives	The Contractor
12.	Storage of fuel oil, lubricants, diesel etc. at construction camp	Manufacture storage and Import of Hazardous Chemical Rules 1989 Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2015	Permission for storage of hazardous chemical	State Pollution Control Board or Local Authority (DM/DC)	The Contractor
13.	Quarry operation	State Minor Mineral Concession Rules, The Mines and Minerals (Regulation and Development) Act (MMRD Act), 1957, The Meghalaya Minor Minerals Concession Rules 2016	Quarry Lease Deed and Quarry License	State Department of Mines and Geology	The Contractor
14.	Extraction of ground water	Ground Water Rules of 2002	Permission for extraction of ground water for use in road construction activities	State Ground Water Board	The Contractor
15.	Use of surface water for construction	-	Permission for use of water for construction purpose	Irrigation Department	The Contractor
16.	Engagement of labour	Labour Act	Labour license	Labour Commissioner	The Contractor

3.2 World Bank Operational Policies and Environmental Requirements

A review of all applicable operational policies / directives of The World Bank and environmental laws / regulations in India, was carried out in this task as well as a gap analysis in measures and standards for environmental compliance.

Safeguard Policies	Triggered ?	Gaps between National Policy and OPs	Measures Taken
Environmental Assessment OP/BP 4.01	Yes	In undertaking Environmental Impact Assessment, the project will adhere to World Banks OP 4.01 and the Notification of Environmental Impact Assessment of Development Projects, 2006 and related amendments. As per national law, the road being a State Highway and due to the noted presence of Schedule 1 Species, the project requires environmental clearance (EC) from the State Environment Impact Assessment Authority (SEIAA)	The Environmental Impact Assessment is based on the suggested content of OP 4.01 for EIA and has been undertaken for a corridor specific sub-project. The findings of the community consultations and assessment were integrated into the Detailed Project Report (DPR) for the road and an Environmental Management Plan (EMP) to manage and mitigate impacts was prepared.
Natural Habitats OP/BP 4.04	Yes	The provisions of the laws - Biological Diversity Act, 2002, Wildlife Protection Act 1972 (WLPA) largely meet the requirements of the OP within Protected Areas, Wildlife Sanctuaries and govern the protection of Schedule 1 species; However, there are gaps in ensuring management of biodiversity/wildlife outside Protected Areas and Wildlife Sanctuaries for which measures have been proposed in the EMP.	In the AMPT road (SH) there are seven sections where the Asian Elephants a schedule I species (WPA, 1972) occasionally crosses the road. Asian elephants in these sections move to and fro between reserved forest situated in Assam and forests areas in Meghalaya, which are not adjacent to the road (6-7 Km away). The mitigation measures proposed to avoid any negative impact have been proposed in section 6.2.2
Forests OP/BP 4.36	Yes	The Forest (Conservation) Act 1980 (Amended 1988) and Rules 1981 (Amended 2003) and Environmental Protection Act of 1986 and as amended Meghalaya Forest Regulation (Application and Amendment) Act, 1973 and The Meghalaya Tree (Preservation) Act, 1976 are the National and State laws in place governing the diversion of forest land for non-forest purposes and removal of trees and meet the requirements of OP 4.36.	The project road passes through two reserved forest areas viz Nakkati R.F. Hollaidanga R.F. It has been recommended that no tree cutting be adopted in these sections and adhesive reflectors be attached to each of the standing trees to increase road safety, as the road corridor will remain narrow in these sections. Permissions for Tree cutting along the road section will be taken under the Meghalaya Tree Preservation Act, 1976.
Physical Cultural	Yes	Ancient Monuments and Archaeological Sites and Remains Act, 1958 and The Meghalaya Ancient and Historical Monuments and Archaeological Sites and Remains Act, 1976; Provisions form the act	There are no adverse impacts on physical cultural resources identified on this road section. However, this policy is triggered in case contractors become aware of any previously undocumented

Resources OP/BP 4.11		meets the ESS requirements. Chance find procedures is included in EMSP.	physical cultural resources identified during construction or should there be any chance finds excavated during road works, chance finds procedures will apply.
Pest Management OP 4.09	No		
Safety of Dams OP/BP 4.37	No		
Projects on International Waterways OP/BP 7.50	No		
EHS General Guidelines and Guidelines for Construction Materials Extraction, April, 2007, IFC	Yes	Several Acts govern EHS including Occupational Health and Safety and Community Health and Safety; While the Project will comply with all national and state laws and regulations, it will adhere to the EHS guidelines and other best practice documents to maintain the highest EHS standards. The national laws applicable are: Air (Prevention and Control of Pollution) Act, 1981; Water (Prevention and Control of Pollution) Act, 1974, for Pollution-Prevention-and-Management; The Noise Pollution (Regulation And Control) Rules, 2000, Notification for use of fly ash, 2003 and MoEF&CC notification dated 25th March 2015, Municipal Solid Waste (Management & Handling) Rules, 2000 (MSW Rules), Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008, Batteries (Management and Handling) Rules, 2001, Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules 1989, The E-Waste (Management) Rules, 2016, Plastic waste Management Rules, 2016, Construction & Demolition, Waste Management Rules, 2016, The Mines and Minerals (Development and Regulation) Act 1957, State Minor Mineral Concession Rules, The Meghalaya Minor Minerals Concession Rules 2016;	World Bank EHS and Best Practice Guidelines that will be followed are: IFC General Environmental Health and Safety Guidelines and Guidelines for Construction Materials Extraction: • http://documents.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf • For labor camp establishment, adherence to World Banks Worker Accommodation Processes and Standards: http://documents.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10Box358316B01PUBLIC1.pdf • World Banks Good Practice Note on Road Safety: http://pubdocs.worldbank.org/en/648681570135612401/Good-Practice-Note-Road-Safety.pdf

3.3 Environmental Clearance Required

The Proposed Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) road improvement project is classified under Category B1 type project as per the latest EIA amendment, 2009 because the road has Asian elephant movement paths. The Asian Elephant is a Schedule 1 Species, under the Wildlife Protection Act, 1972. During the primary survey and through stakeholder consultations, seven occasional crossings as described in the table below were identified. The elephant road crossing areas are:

S No	**Name of Area**	**CH/BM**
1	Mothapara	2/150
2	Mothapara	2/200
3	Borogobol	4/280
4	Belguri	5/810
5	Nanguapara part -2 (khasipara)	9/330
6	Nanguapara part -2	9/690
7	Hollaidanga Reserve Forest	29/100

Further details on crossings are provided in section 4.3. The project road does not attract any of the General Conditions (GC‘s) specified under the highways project activities. Since the project is classified under the Category B, it requires Environmental Clearance (EC) from the State Environmental Impact Assessment Authority (SEIAA) and consultation with the State Wildlife Board, Meghalaya.

The project shall also require obtaining consent from competent authorities such as the PCB, Meghalaya for Consent to Establish‘ by submitting a Common Application (as per Schedule-I), under Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981) and authorization under Hazardous Wastes (Management and Handling) Rules, 1989, as amended.

4. Environmental Baseline Status

4.1 Introduction and Methodology

Study Area: Entire stretch of proposed strengthening & improvement corridor (Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) Road) falls in the district of West Garo Hills in the north-west part of Meghalaya bordering the state of Assam. The West Garo Hills District of Meghalaya is situated approximately between the latitudes 90° 30' and 89° 40' E, and the longitudes of 26° and 25° 20' N. The West Garo Hills district being relatively lower in altitude to the rest of Meghalaya, experiences a fairly high temperature for most part of the year. The district covers an area of 1,831 Km^2 and is bounded by West and East Garo Hill districts of Meghalaya on the South and Kamrup District on the East, Dhubri District on the West River Brahmaputra all along the North.

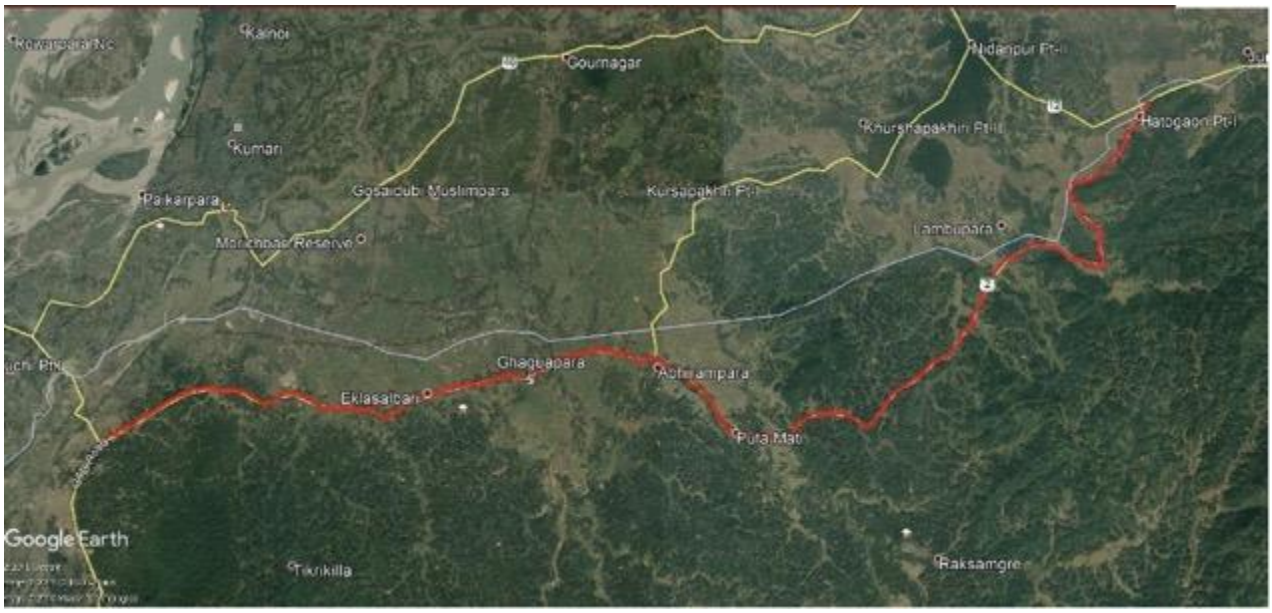


Figure 3 AMPT Road

Corridor of Impact (CoI): The area of 500 m on either side of the proposed road centre line is considered as the corridor of impact. The proposed RoW i.e. 10 m is thus included within the CoI. This area is more vulnerable to the project‘s direct impacts.

Project Influence Area (PIA): The Project Influence Area has been taken as 10 km on either side (Arial distance) from the boundary of road within which Valued Environmental Components (VECs) have been assessed. This 10 km influence area is also in adherence with the Environmental Impact Assessment (EIA) Notification, 2006 that requires that any projects witin 10 kms of National Parks/Wildlife Sanctuary require clearance from Standing Committee of the National Board for Wildlife (SCNBWL).

The proposed road is an existing road and the adjacent land has been already modified for human settlement, horticultural plantation, agriculture, terrace cultivation, rubber plantation etc. Thus, the project deems that 10kms influence area is adequate to understand the direct, indirect and cumulative impacts of project. Collection of secondary data, including likely impacts due to ancillary sites like borrow areas, quarry, material storage, disposal areas, etc. have been done within this influence area.

Valued Environmental Components (VEC) and Environmental Surveys and Studies: Field surveys were carried out to collect information on the faunal and floral diversity around the project road. The presence of animal corridors has been recorded along with the GPS locations and chainage of the road. To assess the baseline environmental status of the Corridor of Impact, monitoring of various environmental attributes was conducted by the consultants during November-December 2019. Primary data for ambient air quality, ambient noise status, water quality (Ground and surface) and soil quality was collected and analysed through an NABL accredited laboratory. The detailed results of baseline monitoring and photographs are given in Appendix-1. Information of various physical parameters was collected from the Guwahati Centre of Indian Meteorological Department, Statistical Department, Gazetteer of Meghalaya, Forest Department, Department of Environment and other concern Government Departments and discussions with the officials from these agencies.

4.2 Physical Environment and Valued Environmental Components

The physical components in this sub-project include features such as topography and geomorphology, land use, regional geology (soil type and distribution, slope stability, seismicity), hydrology and natural drainage, climate, ground water and air quality. Reviewing the baseline information and consideration of potential interactions between project (highway upgrades and operations), other linear infrastructure development and physical environment the following valued environmental components were identified:

- Topography (bank slope stability and soil erosion) and Soil
- Natural drainage and watershed management (flooding);
- Water and Atmosphere (Air and noise pollution).

Valued Environmental Components of Physical Environment West Garo Hills were selected after assessment of possible adverse impacts of road upgrades on physical components as follows:

4.2.1 Topography, Soil, Geology and Seismicity

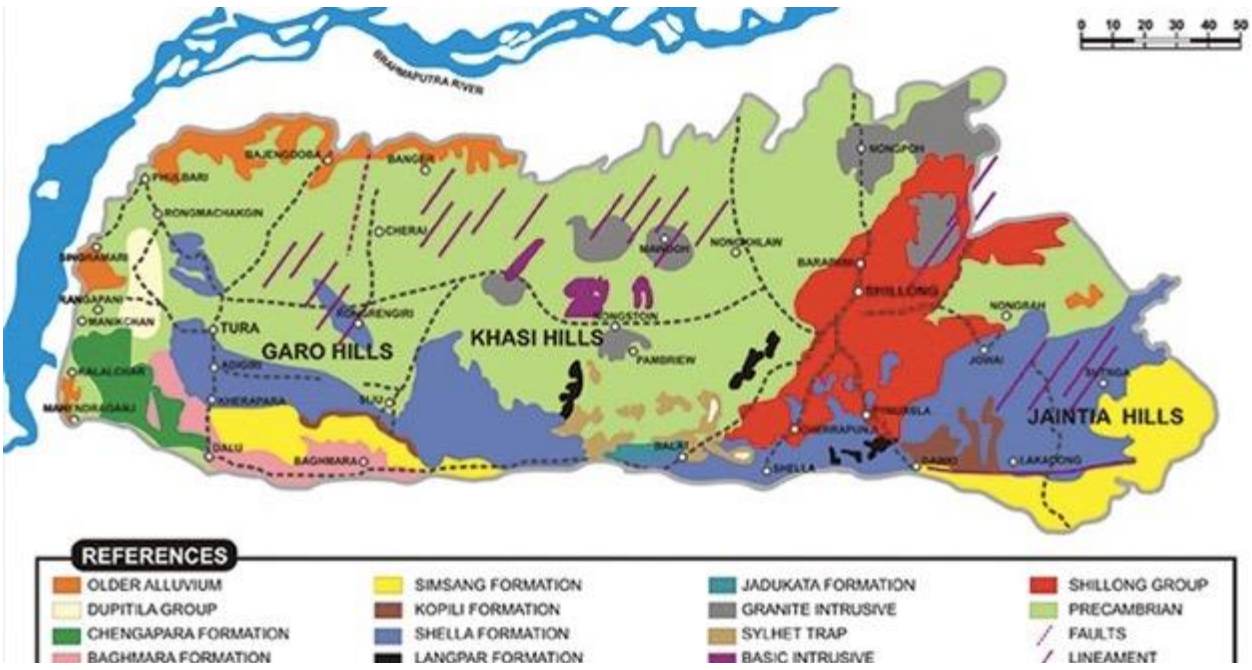


Figure 4 Geological Map of Meghalaya

The road lies in Plain terrain in all section from Km 0+000 to Km 31+955. The embankment height is 1.1m (approx) in 0+000 to 31+200 and the road lies low area from 31+200 to 31+955. Land used along the road is either cultivable land, grazing land, private, submerged area or government land. The plain areas bordering Brahmaputra River and in between the inselbergs are occupied by alluvial sediments belonging to quaternary ages. Based on such criteria such as sedimentation, soil characteristics and geomorphic features, the quaternary sediments can be grouped into two subdivisions, viz. Older Alluvium, and Younger alluvium. The Older alluvium by virtue of its relative maturity is composed of somewhat oxidized sediments comprising yellow and reddish brown colour sand, silt and clay in contrast to the light colour, less compact Younger alluvial sediment. The Older alluvium always occupies the higher grounds than the adjacent Younger alluvium but takes the proper stratigraphical position underlying the younger alluvium sediments in the plain areas.

Geologically, the district may be divided into two broad groups, viz (i) Pre-Cambrian crystallines occupying in the hills and the Inselbergs and (ii) Quaternary sediments constituting the river valleys and the plain areas in between the Inselbergs. The proposed project corridor attracts under zone-4 (Plate boundary zone of the Shillong Plateau and Assam Valley). Seismicity in this zone is considered as the plate-boundary zone activity and seismic activity is quite high in this zone.

A combination of conversion of land use to agriculture and plantations, deforestation and periods of intense rainfall render several tracts of land abutting the road to be erosion prone. These tracts are mentioned in the table below:

Sl. No.	**CHAINAGE IN (M)**					
	L.H.S OF ALIGNMENT			**R.H.S OF ALIGNMENT**		
	FROM	**TO**	**IMPACT**	**FROM**	**To**	**IMPACT**
1	3335.00	3387.00	Soil erosion	2838.00	2903.00	Soil erosion
2	3411.00	3500.00	Soil erosion	3450.00	3500.00	Soil erosion
3	5110.00	5158.00	Soil erosion	5450.00	5600.00	Soil erosion
4	6006.00	6050.00	Soil erosion	5900.00	5963.00	Soil erosion
5	7518.00	7618.00	Soil erosion	6060.00	6085.00	Soil erosion
6	8690.00	8735.00	Soil erosion	6244.00	6360.00	Soil erosion
7	9718.00	9861.00	Soil erosion	7532.00	7610.00	Soil erosion
8	13314.00	13364.00	Soil erosion	8672.00	8742.00	Soil erosion
9	13500.00	13540.00	Soil erosion	9076.00	9120.00	Soil erosion

10	13617.00	13677.00	Soil erosion	9656.00	9694.00	Soil erosion
11	14772.00	14845.00	Soil erosion	9716.00	9794.00	Soil erosion
12	14872.00	15026.00	Soil erosion	13053.00	13107.00	Soil erosion
13	15050.00	15115.00	Soil erosion	13300.00	13344.00	Soil erosion
14	20300.00	20410.00	Soil erosion	13500.00	13548.00	Soil erosion
15	20483.00	20560.00	Soil erosion	13605.00	13670.00	Soil erosion
16	23461.00	23496.00	Soil erosion	14810.00	14845.00	Soil erosion
17	23541.00	23601.00	Soil erosion	23426.00	23496.00	Soil erosion
18	23923.00	23963.00	Soil erosion	23505.00	23600.00	Soil erosion
19	24025.00	24086.00	Soil erosion	23765.00	23810.00	Soil erosion
20	25282.00	25398.00	Soil erosion	23863.00	23966.00	Soil erosion
21	25974.00	26034.00	Soil erosion	25380.00	25495.00	Soil erosion
22	29020.00	29077.00	Soil erosion	25868.00	26054.00	Soil erosion
23	29718.00	29814.00	Soil erosion	27032.00	27067.00	Soil erosion
24	-	-	Soil erosion	27211.00	27257.00	Soil erosion
25	-	-	Soil erosion	28905.00	28960.00	Soil erosion
26	-	-	Soil erosion	29012.00	29075.00	Soil erosion
27	-	-	Soil erosion	29757.00	29793.00	Soil erosion
28	-	-	Soil erosion	31273.00	31330.00	Soil erosion

4.2.2 Natural Drainage and Watershed Management

The project corridor crosses two rivers Jinjiram river and Gagua river and 63 major/small streams. The Project road is aligned in South-East—North-West direction, across the general ground slope from North-west to South-east thereby crossing a number of streams and nallahs necessitating a number of cross drainage structures.

Table 4-2: Rivers/ Streams Crossing Across Project Road (Primary survey)

Sl. No	Rivers	Chainage (Km)	Type
1	Jinjiram River	18/500	Perennial
2	Gagua river	20/790	Perennial

There are 63 streams crossed by the project road. These are-

Sl. No.	Road Chainage	Stream/Spring
1	0+285	Stream
2	00+608	Stream
3	0+760	Stream
4	0+783	Stream
5	2+970	Stream
6	3+900	Stream
7	4+875	Stream
8	6+300	Stream
9	6+781	Stream
10	7+600	Stream
11	8+190	Stream
12	9+744	Stream
13	10+045	Stream
14	12+018	Stream
15	12+234	Stream
16	20+660	Stream
17	21+190	Stream
18	21+293	Stream
19	21+330	Stream
20	21+543	Stream
21	21+658	Stream
22	21+755	Stream
23	23+010	Stream
24	22+338	Stream
25	22+673	Stream
26	23+254	Stream
27	23+363	Stream
28	23+500	Stream
29	23+648	Stream
30	24+360	Stream
31	24+435	Stream
32	24+458	Stream
33	24+505	Stream
34	25+103	Stream
35	25+351	Stream
36	25+460	Stream
37	25+500	Stream
38	25+685	Stream
39	25+864	Stream

40	26+197	Stream
41	26+260	Stream
42	26+340	Stream
43	26+600	Stream
44	26+771	Stream
45	27+065	Stream
46	27+221	Stream
47	27+241	Stream
48	27+555	Stream

49	27+737	Stream
50	28+851	Stream
51	29+080	Stream
52	29+202	Stream
53	29+368	Stream
54	29+478	Stream
55	29+549	Stream
56	29+671	Stream
57	29+871	Stream
58	30+008	Stream
59	30+122	Stream
60	30+184	Stream
61	30+229	Stream
62	30+319	Stream
63	30+647	Stream

The project district i.e. West Garo Hills is not known to face significant impacts from monsoon floods. However, it does witness flash floods in certain low-lying areas near Medhipara. The patterns of floods cannot be forecasted, although there is a warning system in place. One stretch of the road which is flood-prone during the monsoon was identified during the survey:

Table 4-1: Flood prone stretch of Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) Road

Sl.No.	Chainage		Length	Depth of submergence (cm)	Remarks
	From	To			
1	31/200	31/995	200	10 to 15	Local depression

Source: Primary Analysis

There are few ponds and a big fishery (16/200, 27/800) identified along the project stretch, all are found to be monsoon dependent. However, at the time of observation the ponds seem to be perennial in nature. The available water source is utilized for irrigation and aquaculture purpose.

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, semi-consolidated and unconsolidated formations.

Recharge Zones: In the deeper aquifer of older alluvium, medium/heavy duty tube wells range in depth from 82 to 93 m and tap 18–36 m of granular zone yielding 55 – 110 m^3 per hour for draw down ranging up to 9m. In the Younger alluvial areas, there is no deep tube well. However, the low duty small diameter (8 cm) shallow tube wells constructed in the similar younger alluvium range in depth from 25 to 30 m tapping 8 – 10 m granular zones and yield about 25 – 40 m^3 per hour for a draw down up to 8 m.

4.2.3 Water Quality and Atmosphere (Air and noise pollution).

Surface Water Quality: The assessment of water quality in the study area was done by comparing with the standards prescribed in the IS: 2296. After studying the drainage pattern of the study area, 3 samples of surface waters were collected; one is from Medhipara, the second is from the water body near Ghagua and the third from Tikrikilla.

The analytical results of surface water samples show that the Calcium and Magnesium content indicates water to be soft and suitable for drinking as well as for construction activities. The

dissolved oxygen value for all the samples ranging from 4.7 to 5.3 indicates the sustainability of aquatic life. Thus, almost all physico-chemical parameters are well within the prescribed limits as per IS: 10500:1991 standards.

Table 4-3: Surface Water Quality

Sl. No	Parameters	Medhipara	Ghagua	Tikrikilla	Units
1	pH	7.2	6.9	6.8	
2	EC	0.213	0.214	0.24	millimhos/cm
3	Acidity	12.3	13.5	15	mg/l as $CaC0_3$
4	Alkalinity	106	68	65	mg/l as $CaC0_3$
5	Nitrate	0.81	0.95	1.2	mg/l
6	Calcium	6.8	6.52	6.21	mg/l
7	Magnesium	3.2	3.1	2.85	mg/l
8	Chloride	14	12	11	mg/l
9	Sulfate	6	5.4	6.75	mg/l
10	DO	4.6	5.4	5.2	mg/l
11	Sodium	25.8	25.3	18.4	mg/l
12	Total Suspended Solids	179	174	198	mg/l
13	Dissolved solids	47	42	52	mg/l
14	Iron	0.68	0.72	0.8	mg/l
15	Potassium	3.8	4.1	4.7	mg/l
16	Lead	BDL	BDL	BDL	mg/l
17	Cadmium	BDL	BDL	BDL	mg/l
18	Copper	0.02	0.02	0.01	mg/l
19	Chromium	0.06	0.05	0.05	mg/l
20	Zinc	0.22	0.31	0.35	mg/l
21	Nickel	BDL	BDL	BDL	mg/l

Source: Primary Analysis

Ground water quality: Water samples were collected from the project area to represent the baseline condition. Even though impact on ground water is not envisaged in the proposed road improvement works, three groundwater samples were collected from Medhipara, water body near Ghagua and the third from Tikrikilla (Figure 4-7) were analysed for its chemical parameters. The following Table 4-4 furnishes the various physico-chemical property of the groundwater.

Table 4-4: Groundwater Quality

Sl. No	Parameters	Medhipara	Ghagua	Tikrikilla	Units
1	pH	6.8	7.1	6.9	
2	EC	0.21	0.23	0.24	mmhos/c
3	Nitrate	0.30	0.28	0.32	mg/l
4	Total Hardness	90	92	91	mg/l
5	Chloride	6.6	5.8	5.95	mg/l
6	Sulphate	5.23	7.25	6.8	mg/l
7	Fluoride	0.52	0.52	0.54	mg/l
8	TSS	192	181	182	mg/l
9	Dissolved solids	142	139	143	mg/l
10	Iron	0.8	0.9	0.8	mg/l
11	Potassium	3.9	3.6	3.1	mg/l
12	Magnesium	7.2	8.1	8.6	mg/l
13	Calcium	24.3	22	25	mg/l
14	Lead	BDL	BDL	BDL	mg/l
15	Cadmium	BDL	BDL	BDL	mg/l
16	Copper	0.02	0.04	0.03	mg/l
17	Chromium	BDL	BDL	BDL	mg/l
18	Zinc	0.23	0.24	0.21	mg/l
19	Nickel	BDL	BDL	BDL	mg/l

Source: Primary Analysis

The water quality with respect to almost all the essential parameters was observed to be good and acceptable quality except for the concentration of iron which was found to be very high. Sulfate was found to be higher at one of the sites (Ghagua/Tikrikilla town) in groundwater compared to surface water. There was no significant difference in total hardness in the different locations and also in the fluoride concentration. Similarly, no significant differences were observed in the levels of inorganic pollutants with the location.

Climate: The meteorology data were obtained from the Regional Meteorology Centre (RMC), which is located at Airport, Borjhar. The meteorological parameters include, wind speed, wind directions and other information, viz. humidity, rainfall, temperature. The study area is low lying and surrounded by hills and is subjected to a wet weather. The area experiences a lot of rainfall every year. The pre-monsoon months, March-April, have winds from North East. The temperature varies from 33 degree centigrade during summer to 4 degree centigrade during winter. The highest rainfall occurs in the month of July followed by June. The annual average mean relative humidity is 82% in the morning and 70% in the evening. The climatic condition (Table 4-5) in the area is thus humid and tropical.

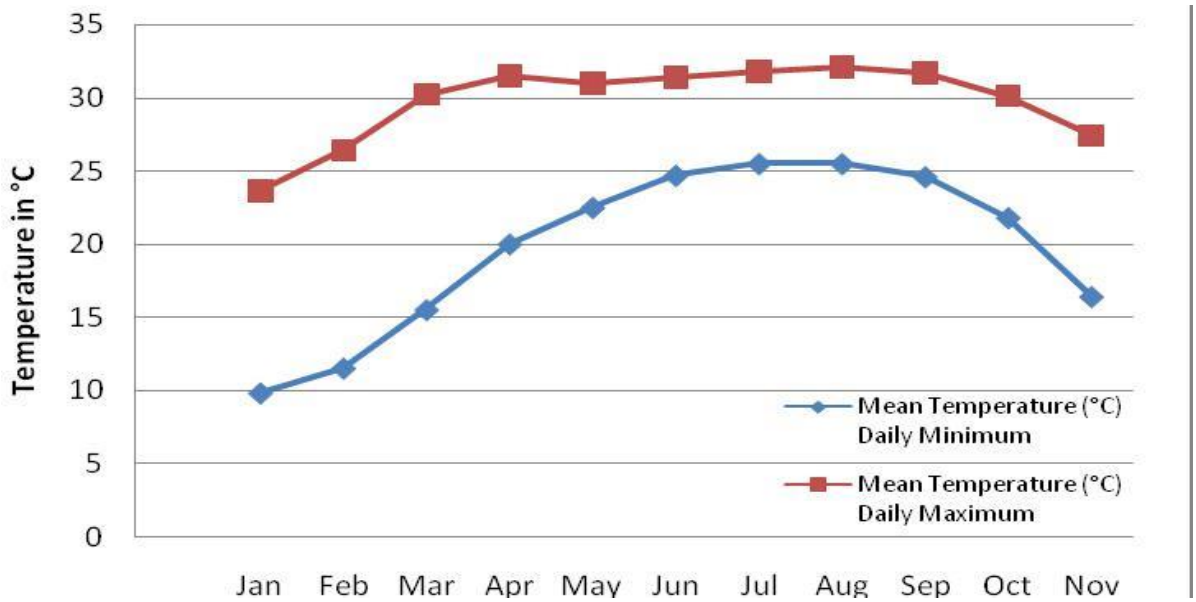


Figure 4-6: Temperature variation Graph

Table 4-5: Climatology Table (Nearest Station at Tura)

Month	Mean Temperature (°C) Daily Minimum	Daily Maximum	Mean Total Rainfall (mm)	Mean Number of Rainy Days	Mean Number of days with Hail	Thunder	Fog	Squall
Jan	11.8	23.4	10.5	1	0	0.8	12.2	0
Feb	14.1	26.1	11.5	1.5	0.2	2.4	1.4	0.2
Mar	17.9	29.8	58.36	4.7	0.2	4.5	0.1	0.8
Apr	21.4	31.6	156.25	9.5	0.8	14.56	0.1	2.4
May	22.7	30.4	348.5	15..1	0.2	16.5	0	2.6
Jun	23.3	29.5	352.4	17.1	0	15.2	0	0.4
Jul	24.1	29.5	356.2	17.6	0	13.2	0	0.1
Aug	24.2	29.8	272.5	12.5	0	17.5	0	0.1
Sep	23.6	29.8	167.5	12.4	0	14.1	0.5	0.1
Oct	21.3	29.1	81.2	4.8	0	5.7	2.0	0
Nov	17.1	26.7	21.6	1.2	0	2.0	11.23	0

Source: Regional Meteorology Division – Guwahati (2018-2019)

Ambient Air Quality: Following the reconnaissance survey of the study area and taking into account the predominant environmental factors such as winds, topography and details of existing residential, commercial activities in the region, Ambient air quality was monitored at three stations (Figure 4-9) viz.. Medhipara, the second is from the water body near Ghagua and the third from Tikrikilla. Selection of Air quality monitoring station was done as per MoEF guidelines for conducting EIA study. High volume samplers were used to collect/measure the air pollutant concentration data at 24 hours averaging periods for all stations. The recorded observations are given in the Table 4-6

Table 4-6: Ambient Air Quality Monitoring Analysis

Sl. No	Parameter	Medhipara	Ghagua	Tikrikilla	CPCB
1	SO_2	8	11	14	80
2	NO_x	24	25	28	80
3	RPM	57	62	67	100
4	SPM	67	87	92	200

Source: Primary analysis

The pollutant concentration data was analyzed to evaluate the air quality in the study region. The pollutant concentration levels of NOx, SO2, and RPM were measured at all the stations (Figure 4-9). The pollutant concentrations were compared with the National Ambient Air Quality Standards (NAAQS) as notified by CPCB. It was observed that pollutant concentration levels of NOx and SO2 at all the stations were very low in concentrations and complies with the NAAQS. The recorded RPM ranges from 57-67 mg/m3. Recorded SPM concentration also exceed the CPCB air quality standards for residential area at almost all the stations and it is in the range of 67-92 mg/m3. The higher values are attributed to the re-suspended dust from the unpaved / damaged roads in the area used by trucks for carrying soils and other materials.

Noise Environment: Noise is considered to an important dimensions of pollution, which can lead to the gradual degradation of environment and also poses health and communication hazards. Noise pollution can impact humans and animals including birds. For measuring ambient noise levels, SLM100 sound level meter was used at the site (Noise monitoring locations) as shown in Figure 4-8.

Table 4-7: Noise Monitoring Observations

Sl. No.	Location	Average Noise Level in dB	
		Day Time	Night Time
1	Medhipara	43	31
2	Ghagua	38	36
3	Tikrikilla	54	38

Source: Primary analysis

The Leq was found to be in the range of 38 – 54 dB (A) in the daytime and 31 – 38 dB (A) at night. Though the observed values are near to the specified noise standard and within the limits set by the CPCB (Table 4-8). Minimum noise level recorded in Medhipara, the second is from the water body near Ghagua and the third from Tikrikilla. Maximum noise level recorded Tikrikilla area due to the presence of commercial and residential activities.

Figure 4-8: Ambient Noise Quality – Sampling Location Map

Table 4-8: CPCB Ambient Noise Standards

Area Code	Category of Area	Limits in dB(A)	
		Day Time	Night-Time
(A)	Industrial area	75	70

(B)	Commercial area (C)	65	55
(C)	Residential area (R)	55	45
(D)	Silence zone	50	40

Source: CPCB

4.3 Biological Environment and Valued Environmental Components

Key issues that should be considered during the selection of Valued Components for biological environment include their importance for people and regulatory requirements. The Valued Environmental Components for Biological Environment in the project area consist of environmentally sensitive areas, terrestrial and aquatic habitats, threatened and endangered species.

4.3.1 Presence of Threatened and Endangered Species: While AMPT Road has no National Parks or Wildlife Sanctuaries within its Project Influence Area, the primary survey revealed that the road has 7 crossings where elephants are known to cross occasionally. The Asian Elephant is a Schedule 1 Species, under the Wildlife Protection Act, 1972 and an Endangered species as per the IUCN Red List. During the primary survey and through stakeholder consultations, seven occasional crossings as described in the table below were identified. The elephant road crossing areas are:

S No	**Name of Area**	**CH/BM**
1	Mothapara	2/150
2	Mothapara	2/200
3	Borogobol	4/280
4	Belguri	5/810
5	Nanguapara part -2 (khasipara)	9/330
6	Nanguapara part -2	9/690
7	Hollaidanga Reserve Forest	29/100

As per the consultations with communities and department of forests, the elephants move to and fro between Reserved forests situated in Assam and forest areas in Meghalaya, not adjacent to the road but approximately 6-7 kilometres away. The elephant population of north-eastern India's wild elephants is 10,139, and nearly 25% of the total Asian Elephant (*Elephas Maximus*) stock. Of these 5,719 are found in Assam, 1,754 in Meghalaya, and 1,614 in Arunachal Pradesh, the three-major elephant-range states[4].

[4] Synchronized elephant population estimation India 2017, Ministry of Environment Forests and Climate Change (MOEFCC)

Regulatory requirements: The Proposed Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) road improvement project is classified under Category B1 type project as per the latest EIA amendment, 2009 because the road has Asian elephant movement paths, which is a Schedule 1 species. As per this classification, the project needs to seek clearances from the State Environmental Impact Assessment Authority and State Wildlife Board.

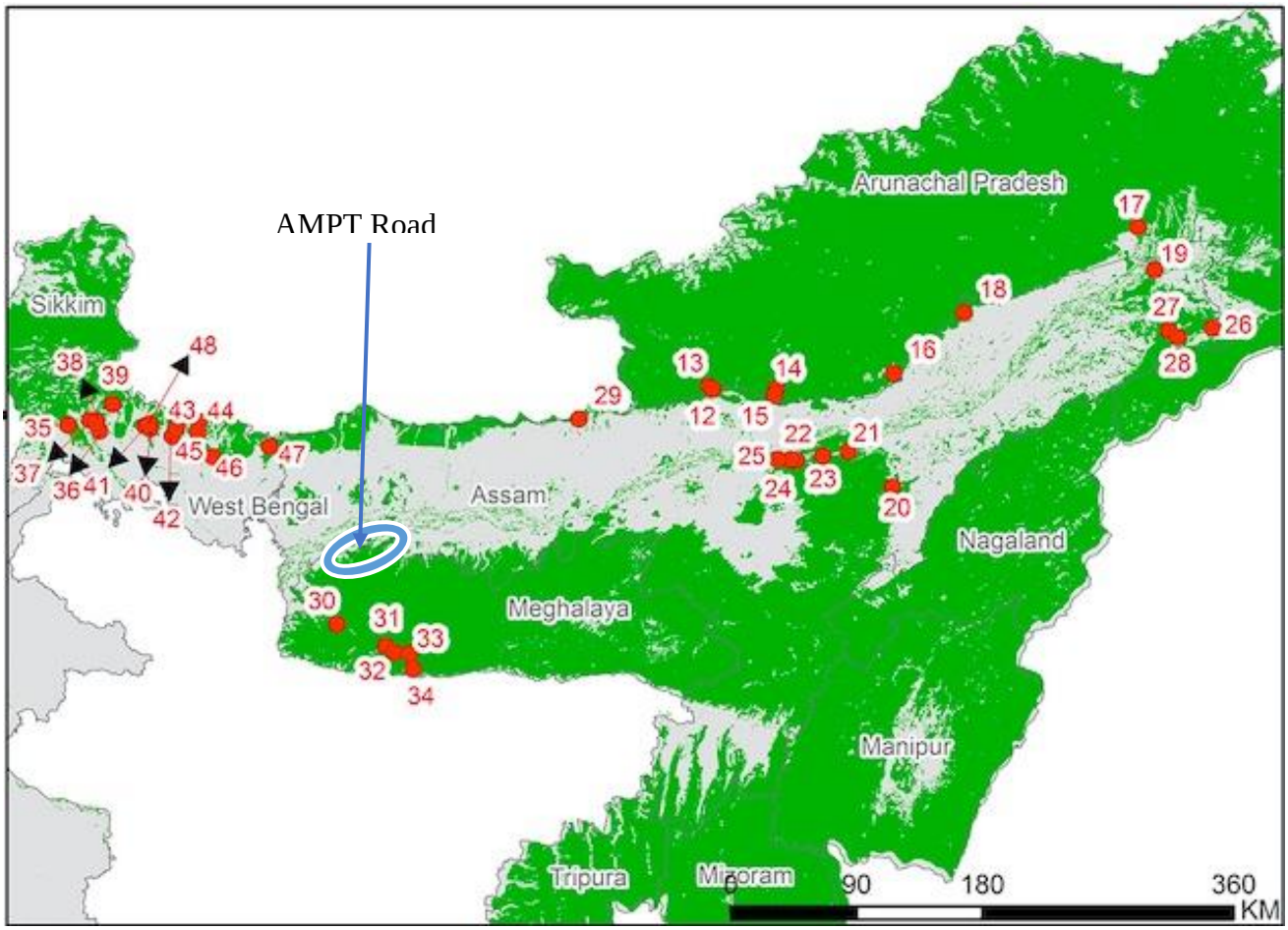


Figure 5 Elephant Corridors in Meghalaya

World Bank Natural Habitats OP/BP 4.04: In order to ensure that there are no adverse direct, indirect or cumulative impacts on natural habitats and this particular valued environmental component of Asian Elephant, an endangered IUCN and Schedule 1 species, the project needs to put in place management and mitigation measures to avoid impacts on these elephant populations.

The elephant crossings identified on this road are **not** part of a national study that has identified 101 elephant corridors in India including 5 corridors in Meghalaya undertaken by national and international conservation organisations[5]. These 5 corridors in Meghalaya are (see figure 2 map) 30 Ranggira-Nokrek, 31 Imangiri – Nokrek, 32 Rewak – Imangiri, 33 Siju-Rewak and 34 Baghmara-Balpakram.

Based on assessments of linear infrastructure on wildlife, especially elephants in other locations, roads have been responsible for reducing permeability of roads as well as increasing risks and

[5] Wildlife Trust of India, IFAW, Elephant Family, IUCN and World Land Trust

mortality to elephants from poaching and accidents. Yet, elephants are known to be attracted to roads where secondary forest and open habitats are abundant and contain more food[6], which is the case on the AMPT road. While there is acknowledgement of the elephant crossings by wildlife officials, these crossings are not part of any wildlife or biodiversity management plan of the government or any other international or national conservation organisation.

The road has been in existence since the year 1972, and no widening is proposed – the road has an Intermediate lane carriageway and improvements will take place within the formation width of the road. However, these improvements on the road would lead to improved connectivity, increased speeds and increase in traffic plying on the road that could result in accidents posing a threat to vehicles and humans as well as increased elephant road kill. While some mitigation measures that have worked in other States of India and other regions, have been proposed in section 6.2.2, as well as monitoring measures to understand the behaviour and crossing patterns of the elephants, it is recommended that these be strengthened in consultation with wildlife and species experts, strengthening of data on elephant crossings and the **preparation of a Biodiversity/Elephant Management Plan for the road prior to the bidding process for this road.**

4.3.2 Terrestrial Ecosystems and Aquatic Ecosystem

Forests, Flora and Fauna: Land adjacent to the road mainly consists of agricultural fields and modified habitat. Due to the practice of shifting cultivation or *Jhum*, most of the forest areas have been cleared and secondary monoculture forests have been established. Based on primary data collection from the field, predominant tree species found in project area are Rain Tree (*Caesalpinea sp.*), Sal tree (*Sorea robusta*), Shegun (*Tectona grandis*), Fig Trees (*Ficus religiosa, Ficus benghalensis & Ficus* raecemos*a*), *Cassia sp.*, Jamun (*Syzigium cumini*), Elephant apple (*Dilenea indica*), Tamarind (*Terminalia indica*), Simul tree (*Bombax ceiba*), Sonaru (*Cassia pistula*), Gulmohar Tree (*Dilonix regia*), Poma, Lali (*Walsura robusta*), Mango (*Mangifera indica*), Jackfruit (*Atrocarpus sp.*), Ghora Neem (*Azadirachta sp.*), Gamari (*Gmelia arborea*) Sotiona (*Alstonia scholaris*), Indian jujube (*Zhizyphus zuzuphus*), Acacia , Ghora Neem (*Azadirachta sp.*) and Fig Trees (*Ficus religiosa, Ficus benghalensis & Ficus* raecemos*a*) are commonly found (Figure 4-9 and Figure 4-10).

[6] Wadey et. al Why did the elephant cross the road? The complex response of wild elephants to a major road in Peninsular Malaysia. Biological Conversation 208 (2018) 91–98

The lower canopy is formed by *Miliusa velutina, Hibiscus macrocarpus, Zizyphus rugosa, Helicia robusta, Engelhardtia spicata var. Colebrooliana and Ficus prostrata* and the main components of Shrubby species are – *Capparis zeylanica, Garcinia lancifolia, Bauhinia acuminata, Mimosa himalayayana, Acacia Concinna, Mussaenda Roxburghii, Eupatorium Modiflorum, Solanum Kurzii and Phlogacanthus tubiflorus*. In a few areas, numerous lianas intertwine the trees e.g. *Dysolobium grande, Mucuna bracteata, Fissistigma wallichii, Paederia scanders, Solena heterophylla and Aristolocjia saccata* are prominent. The ground flora in deciduous forests is very poor and seasonal. In more or less open moist localities and near water sources, herbs like *Dictyospermum, Aneilema Scaberrimum, Burmania Sp., Coiictyospermum, Aneilema Scaberrimum, Burmania Sp., Coix sp. Cyprus spp., Oxalis Corniculate, Anemone spp. and Ericcaulon* can be seen. None of these species are vulnerable or endangered as per the IUCN Red List.

The

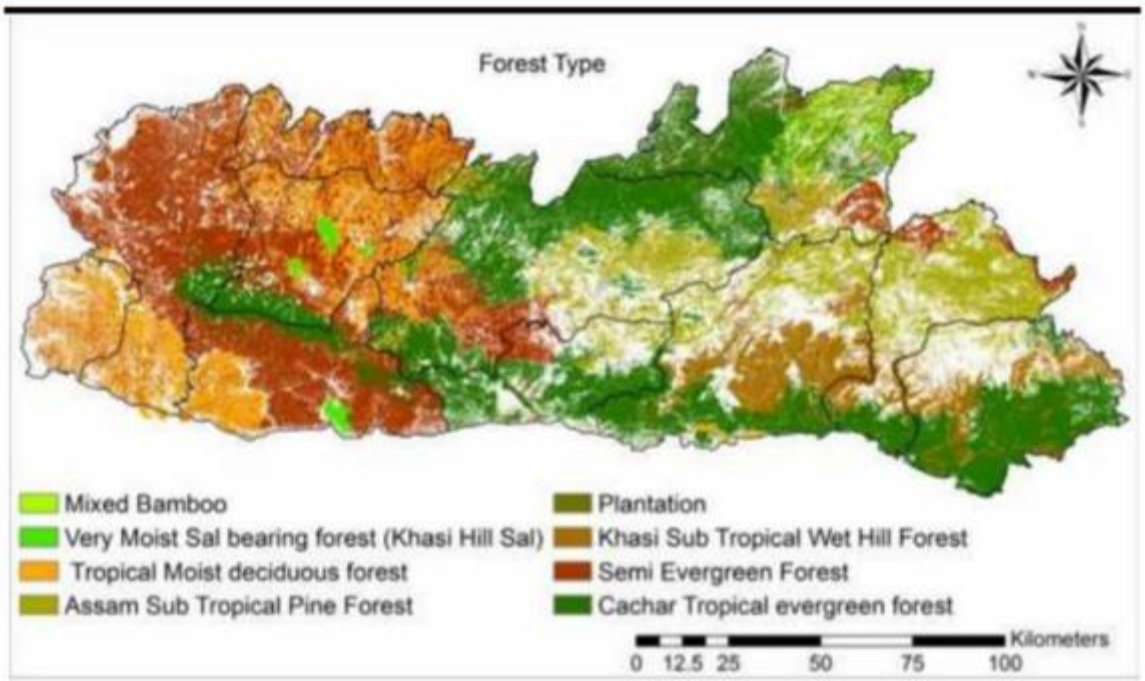


Figure 6 Forest Types of Meghalaya

landscape and tree and ground flora on chainage 12/500 to 14/700 and 25/100 to 24/900 are depicted in the images below.

In the project influence area there are 8 species of mammals, 74 birds species, 54 butterfly species and 9 herpetofauna species recorded during the field survey. List of the fauna along with the WPA (1972) schedule and IUCN status has been included in the Appendix I. The Asian elephant found in the road corridor area is anticipated to be the only schedule I species (WPA, 1972) and IUCN Endangered species.

Aquatic Ecosystems: These are two rivers that the road crosses – the Jinjiram and Gagua . (Figure 4-15).

Figure 4-14: Map View of River Jinjiram

Figure 4-15: Map View of stream near Gagua

The rivers and nalas in the project corridor act as storm water drain and have a usual aquatic ecosystem. The presences of fishes are listed in Table 4-9. None of these fish are known to be endangered or threatened as per the IUCN Red List.

Table 4-9: Fishes in Gagua River

Sl. No	Species Name	Order
1	*Gudusia chapra* (Hain.)	Clupeiformes
2	*Danio devario* (Ham.)	Clupeiformes
3	*Danio (Brachydanio) rerio (* Hanl.)	Clupeiformes
4	*Ghagunius chagullio* (Ham.)	Clupeiformes
5	*Labeo boga* (Hanl.)	Clupeiformes
6	*Labeo gonius* (Hanl.)	Clupeiformes
7	*Lobeo pangllsia* (Ham.)	Clupeiformes
8	*Puntius ehola* (Hanl.)	Clupeiformes
9	*Puntius sarana* (Ham.)	Clupeiformes
10	*Puntius sophore* (Ham.)	Clupeiformes
11	Puntius ticto (Ham.)	Clupeiformes
12	*Tor tor* (Ham.)	Clupeiformes
13	*Botia dario* (Ham.)	Clupeiformes
14	*Noemacheilus scaturigna* (McClelland)	Clupeiformes

15	Somileptes eangota (Ham.)	Clupeiformes
16	Ompok bimaculatus	Siluriformes
17	*Rara hara* (HaITI.)	Siluriformes
18	*Heteropneustes fossilis* (Bloch)	Siluriformes
19	*Clarias batrachus* (Lin.)	Siluriformes
20	*Xenentodon canciia* (Ham.)	Atheriniformes
21	*Channa orientaus* Bl. & Schn.	Atheriniformes
22	*Channa punctata* (Bloch)	Atheriniformes
23	*Ambassis baculis* (Ham.)	Perciformes
24	*Ambassis nama* (Ham.)	Perciformes
25	*Badis badis* (Ham.)	Perciformes
26	*Anabas testudineus* (Bloch)	Perciformes
27	*Glossogobius giuris* (Ham.)	Mastacembeliformes
28	*Pillaia indica* Yazdani	Mastacembeliformes
29	*Mastacembelus armatus* .(Lacep.)	Mastacembeliformes

Source: Primary survey

4.4 Project Affected Parties (Summary)

The impacts on Project Affected Parties is summarised here and details on their socio-economic status detailed in the Social Impact Assessment. No adverse social impacts are anticipated on improvements undertaken on AMPT Road. Out of five proposed road sections in west Meghalaya under MITP, three roads namely Bajengdoba Resu Mendipathar Damra Road; Parallel Road to existing Dalu Baghmara Road; and Rongjeng Mangsang Adokgre (44th to 55th km) Ildek A'kong to A'dokgre will require approximately 0.5 ha of private land. The project in all will impact 20 households across all five road corridors of which 14 are non-titleholders. Half of the affected households are from Bajengdoba Resu Mendipathar Damra Road in North Garo Hill district. A total of 80 persons will be impacted by the project in Meghalaya West of which 56 will be displaced, there are 14 non-titleholders who will be displaced. A total of 11 common property resources will be partially affected that includes boundary wall of 4 schools; part of 2 play grounds; boundary wall of 3 churches and two community hall. None of these common property require relocation.

5. Analysis of Alternatives

This chapter presents a comparative analysis of various alternatives considered to avoid or minimize impacts that would be inevitable if technically (based on design speed and geometrics) best-fit alignment is followed. Cross-sections adopted for the up-gradation component as presented in Chapter -2 (project description) are flexible in design to avoid most of the impacts within RoW. Along the project road sections there are number of habitation/settlements. Of them, mostly villages appear to be not very congested as they are mostly temporary roadside establishment spilling along the project road sections. An analysis of various alternatives is attempted to arrive at the technically and environmentally best-fit alternative.

Consideration of Alternative Alignment and Other Measures

There are no alternative alignments proposed for this road, which has been in existence since the year 1972 and has the status of a State Highway. Based on the secondary traffic data and traffic during site visit, the current intermediate lane width will be maintained and no widening is proposed. No additional land acquisition along the existing road section alignment. Under the present circumstance, No Bypass option is therefore proposed for the project road section.

The project road section has number of geometric deficient locations and efforts have been made to improve these locations by providing alignment improvement where it is feasible and workable. In order to make the road more-climate resilient and address areas of high erosion and those that are landslide prone, a series of measures are proposed: These include engineering and bio-engineering measures for slope protection, mainly the Vetiver System. To control under-water erosion – a flexible mattress, made of waste/ recycled items is proposed. For stretches along the river bank, a reed bed is proposed to absorb the flow energy before the water current hits the bank. All these measures have been deployed in the neighbouring state of Assam that has similar terrain with success.

With and Without Project' Scenario

The existing road section has poor riding condition with landslide zones, poor drainage conditions and poor geometry. Poor drainage is seriously impacting and deteriorating the road surface. This is further compounded by the landslides and disrupting the traffic for long hours particularly in monsoon season. The poor road conditions, population growth, increase in traffic volumes and the economic development along the project corridor would continue to occur and will exacerbate the already critical situation. The existing unsafe conditions and the adverse environmental consequences, in terms of the environmental quality along the roads, would continue to worsen in the absence of the proposed improvements.

The with project' scenario includes the improvements on the intermediate lane, which will continue to be maintained as intermediate lane and improvements undertaken within the formation width of the road. It is assessed to be economically viable and will improve road drainage and quality enabling better connective and improved traffic speeds. It would thereby, contribute to the

development goals envisaged by the Government of Meghalaya, and enhance the growth potential of the regional and the state.

Therefore, the no-action alternative is neither a reasonable nor a prudent course of action for the proposed project, as it would amount to failure to initiate any further improvements and impede economic development.

6. Potential Environmental Impacts and their Management and Mitigation

Based on the project details and baseline information, Environmental impacts anticipated from the road section have been categorized based on those from the construction phase and those from the operational phase of the road. The impacts and management and mitigation measures on the Valued Environmental Components are outlined in the this chapter.

6.1 Impacts on Physical Environment and Valued Environmental Components

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. Significant land use conversion has already taken place on this stretch of the road which is single cropped agricultural land or community homesteads.

The impacts on key valued environmental components from a physical environment perspective are as follows:

6.1.1 Increased erosion and loss of top soil

Loss of topsoil. The topsoil on the land parcels which is ether 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.

It is estimated that approximately 600.86 cum of material would be excavated during construction and will be scarified from existing carriage from the construction of minor bridge or culvert, demolition and waste generated during the dismantling of the existing cross drainage structure and bituminous waste generated during dismantling of pavement.

In addition, 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.

The labour camps 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, handles 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.

Indirect and cumulative impacts could result in conversion of land use to monoculture plantations and conversion from forests to agriculture and commercial land use types which could exacerbate erosion prone areas.

Management and mitigation measures proposed to check this are as follows:

i) The existing vegetation on slopes outside the immediate area of construction must remain undisturbed during construction and/or upgrading.

ii) 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

iii) Support structures will be installed where slope failures are anticipated or may have occurred previously.

iv) Monitoring of slope failures should be monitored and remedial actions initiated at the earliest possible time.

v) Logging immediately above road should be restricted to reduce erosion/landslide potential;

vi) Excavated material should be properly disposed of and not simply dumped downhill; – adequate reclamation (e.g. fertilisation and reseeding) along denuded ROW should be implemented;

vii) Awareness generation and support for species such as trees and shrubs that are soil binding and reduce erosion and landslides should be undertaken for private and community lands adjoining the road/ in upstream areas through convergence with programmes such as MNREGA

Erosion protection measures identified to be undertaken in specific road sections are specified below:

Sl. No.	CHAINAGE IN (M)					
	L.H.S OF ALIGNMENT			R.H.S OF ALIGNMENT		
	FROM	TO	Erosion Protection Measure	FROM	To	Erosion Protection Measure
1	3335.00	3387.00	RRM Toe Wall	2838.00	1.50	RRM Toe Wall
2	3411.00	3500.00	RRM Toe Wall	3450.00	0.75	RRM Toe Wall
3	5110.00	5158.00	RRM Toe Wall	5450.00	0.75	RRM Toe Wall
4	6006.00	6050.00	RRM Toe Wall	5900.00	0.75	RRM Toe Wall
5	7518.00	7618.00	RRM Toe Wall	6060.00	0.75	RRM Toe Wall
6	8690.00	8735.00	RRM Toe Wall	6244.00	0.75	RRM Toe Wall
7	9718.00	9861.00	RRM Toe Wall	7532.00	0.75	RRM Toe Wall
8	13314.00	13364.00	RRM Toe Wall	8672.00	0.75	RRM Toe Wall
9	13500.00	13540.00	RRM Toe Wall	9076.00	0.75	RRM Toe Wall
10	13617.00	13677.00	RRM Toe Wall	9656.00	0.75	RRM Toe Wall
11	14772.00	14845.00	RRM Toe Wall	9716.00	0.75	RRM Toe Wall
12	14872.00	15026.00	RRM Toe Wall	13053.00	0.75	RRM Toe Wall
13	15050.00	15115.00	RRM Toe Wall	13300.00	1.50	RRM Toe Wall
14	20300.00	20410.00	RRM Toe Wall	13500.00	1.50	RRM Toe Wall
15	20483.00	20560.00	RRM Toe Wall	13605.00	0.75	RRM Toe Wall
16	23461.00	23496.00	RRM Toe Wall	14810.00	0.75	RRM Toe Wall

17	23541.00	23601.00	RRM Toe Wall	23426.00	0.75	RRM Toe Wall
18	23923.00	23963.00	RRM Toe Wall	23505.00	0.75	RRM Toe Wall
19	24025.00	24086.00	RRM Toe Wall	23765.00	0.75	RRM Toe Wall
20	25282.00	25398.00	RRM Toe Wall	23863.00	0.75	RRM Toe Wall
21	25974.00	26034.00	RRM Toe Wall	25380.00	0.75	RRM Toe Wall
22	29020.00	29077.00	RRM Toe Wall	25868.00	0.75	RRM Toe Wall
23	29718.00	29814.00	RRM Toe Wall	27032.00	0.75	RRM Toe Wall
24	-	-	RRM Toe Wall	27211.00	0.75	RRM Toe Wall
25	-	-	RRM Toe Wall	28905.00	1.50	RRM Toe Wall
26	-	-	RRM Toe Wall	29012.00	0.75	RRM Toe Wall
27	-	-	RRM Toe Wall	29757.00	0.75	RRM Toe Wall
28	-	-	RRM Toe Wall	31273.00	0.75	RRM Toe Wall

vii) 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 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.

– 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.

viii) Detailed guidelines for Borrow areas are provided in Appendix 2 and summarized as follows: Excess excavated material should not be dumped by the contractor on any adjoining property. The excess excavated material to be stored at a specified location so that it can be reused where ever

possible or used for strengthening of shoulders of village roads; All demolition debris especially from cross drainage structures and pavement should be utilised in the backfilling where ever possible. No virgin material shall be utilised unless the demolition debris are certified by the Engineer as ―not fit for use‖. All construction debris which cannot be reused, should be disposed at pre-designated sites as identified in the Site Management Plan approved by the project engineer. The Contractor should identify site for temporary storage of the construction debris during the preconstruction.

6.1.2 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. At these locations the vertical profile has been changed and the height of the finished level has been increased by approximately 0.25 to 0.5m. There is no existing Major Bridge on the Project road section only one Minor Bridge exist, and No additional bridges are proposed to be constructed. There are existing 199 pipe culverts and 37 slab culverts. Thus, any change in the drainage is also not envisaged.

Management and mitigation measures proposed to check this are as follows:

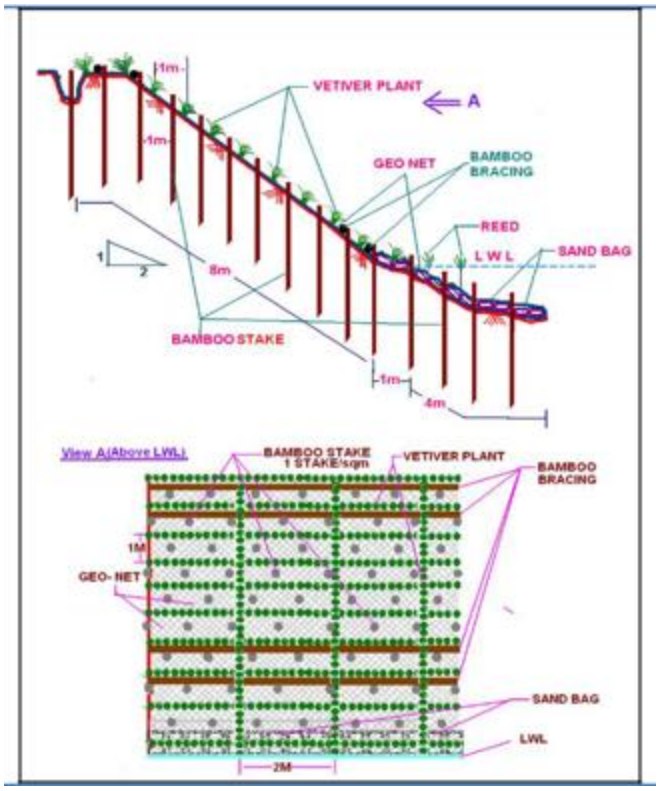
i) At all locations where the preliminary design has indicated in raise in the level of the embankment the final design should review the feasibility of the same and if possible, reduce the embankment height.
ii) At all location where the vertical profile has increase by 0.25 To 0.50 m or more protections of embankment is required.

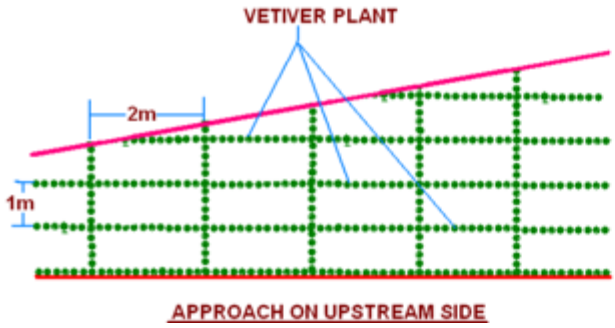
A slope protection measure that has been successful in Meghalaya has been the use of Vertiver as a Bio engineering measure. The basis of this technique is plantation of Vetiver plants of approved variety specifically designed as per the soil and site conditions. For controlling the underwater erosion, 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 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. Slope Protection design.

Slope Protection @ the River bank: Plantation of the vetiver system will need to be in grid pattern. The rows parallel to the flow of river will arrest land slip whereas the rows normal to the flow will reduce the energy and initiate sedimentation. The anti-erosion mattress, pegging with bamboo stakes, reed etc. are shown in Figure 6-2.

Slope Protection @ Bridge approach (Upstream side): This face of the approach will have grid pattern of the vetiver plantation. This is suggested as there will be flow of flood water

Slope Protection @ Bridge approach (Downstream side): The plantation is proposed to be only in parallel rows as shown in Figure 6-3.





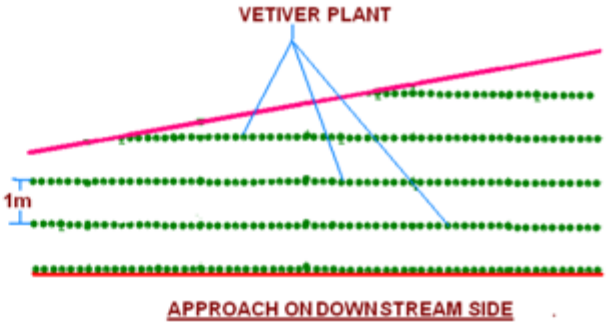


Figure 6-2 Slope Protection @ Bridge approach (Upstream side)

Figure 6-3: Slope Protection @ Bridge approach (Downstream side)

Slope Protection Measures Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) Road -

Sl. No	Location	Start Chainage	End Chainage	Type of Protection
1	Jinjiram River	18/500	18/600	Slope Project Measures
2	Gagua river	20/800	20/800	Slope Project Measures

6.1.3 Impacts on Water Resources (Quality and Quantity)

Surface water will be used for construction activity. The construction activities e.g. earthwork, concreting of structure and labour camps, would require 80 KLD of water and may result in conflicting situations with local communities, in case of competing uses for the water source in times of scarcity. Construction activities would also witness influx of skilled labour who would be

housed in construction camps. It is estimated that approximately an average of 100-140 KLD of water would be required during the peak construction period for construction purpose and 25 KLD for domestic purpose in the road section. Water would also be required for domestic requirement and the stream water in the state meet the required standards of IS 10500: 2012.

Construction camps and construction activities would also generate waste water. These would include domestic wastewater from the construction camp and the wash water from the machinery e.g. batching plant concrete transit mixers would cause deterioration of the water quality These liquid wastes have potential to contaminate the water bodies around the site if it is not properly handled.

Management and mitigation measures proposed to check this are as follows:

i) In project construction area withdrawal of water for any purpose other than for drinking will be taken with permission from CGWB.
ii) In order to access surface water from springs, prior permission should also be sought from the Nokma (Village council head) for construction or drinking purposes.
ii) The contractor can also identify areas, if required, to store water for construction purpose. The entire exercise should be conducted in consultation with the local community. **These check dams can be handed over to the community for use and maintenance** after the completion of construction.
iii) In periods of water scarcity, contactor can consider dust suppressant /dust binders shall be to reduce water consumption. The acceptable dust suppressants include: Acrylic polymers, Solid recycled asphalt, Chloride compounds (calcium chloride and magnesium chloride), Lignin compounds (lignin sulphate and lignin sulfonate powders), Natural oil resins (soybean oil) and Organic resin emulsions.
iv) The Contractor should notify the executing agency for its source for procurement of water. It should provide monthly reports of water consumed and its source. The water consumption for concrete mixing can be reduced by use of plasticizers/ super plasticizers as mentioned in IRC 015:2011.
v) Construction water would not be procured from any unauthorised wells or existing wells. The permission of CGWB would be obtained in case new wells are sunk;
vi) No wastewater should be discharged from construction camps. Runoff from the camp shall be passed through an oil-water separator.
vii) The Contractor shall make arrangement for bottle drinking water which conforms to IS 14543 (2004). In case the contractor uses groundwater for drinking purpose he shall install adequate treatment technologies e.g. reverse osmosis and fluoride removal filters.
viii) Water usage for construction work would be reduced by adopting following best practices:

- Use buckets etc. to wash tools instead of using running water;
- Use of auto shut off taps (without sensors) in labour accommodation;
- Install water metres with main supply pipes/water tanks/bore well to assess quantity of consumed water and – Use of plasticizers/super plasticizers in the concrete production to reduce water consumption.

ix) The construction camps facilities are presented in Appendix 4.

6.1.4 Air and Noise Pollution

Construction phase Air Pollution: the activities related to the earthwork is likely to generate large quantities of particulates. The possible sources of generation of such particulates are borrow area operations, transport of material, storage of construction material, carrying out of earthwork, movement of vehicles on unpaved road. Vehicular movement due to the project would also add to PM 2.5 and SOx and NOx emissions. In case of the project road both PM 10 and PM 2.5 are identified as a major source of pollutant. The operations of the Hot-mix plant, handling of cement in batching plants is also likely to generate the air pollutant. The generation of PM 2.5 due to the construction activities would add on the already stressed air environment.

Construction phase Noise Pollution: 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 impact would below. The impact on the workers however would be dealt with in separate section.

Operation Phase Air pollution: The strengthening of the carriageway would improve vehicular movement, congestion is likely to get reduced and speed to vehicles is likely to improve. Even though there would be a decrease in vehicular emission due to the reduction in congestion the increased vehicular traffic on the MDR would increase the pollution load.

Operation Phase Noise pollution: The development of the road is expected to increase the traffic volume but at the same time reduce the congestion in the settlements. The noise levels are still expected to increase with the increase in traffic. As pointed out in section 4.4.3 the noise measured in front of the sensitive receptors e.g. schools are within the standards prescribed for sensitive receptors. The increase in traffic would further aggravate the problem and would cause inconvenience especially at educational institution. As pointed out earlier in some case due to the proximity of the classroom to the exiting highway student have complained about noise. The operations of the highways and the increased traffic would further aggravate the noise levels.

Management and mitigation measures proposed to check this are as follows:

i) The following best practice guidelines are proposed to prevent the generation of dust and particulate matter during construction phase:

- The speed limit of project vehicle movement over unpaved surface should be limited to 15 kmph;
- All vehicles carrying construction material should be covered;

- The construction material should be stored against wind breaks so that they are not carried away by wind. The length of the windbreak wall shall be twice the height for it to effectively work. The stockpiling of material should be carried out considering the prevailing wind direction;
- Water sprinkling should be restricted due to the scarcity of water. Dust suppressant should be applied on the surface of the unpaved earthwork to reduce the consumption of water;
- Vehicular movement on the unpaved pavement should be strictly restricted. The access roads within the construction camp should be paved using the waste concrete or batching plant and concrete mixer wash;
- All project related vehicles and equipment should have valid Pollution Control Certificates.
- The pollution control equipment in the Hot-mix plant shall be kept in working condition at all times. The plant shall not be operated if the pollution control equipment is not functional;
- Requisite permits shall be obtained from the MSPCB for operation of the Hot Mix Plant and Quarry (in case of new Quarry);
- The grievance redressal mechanism for the project would also be used for reporting any matter related to air pollution

ii) To mitigate the impacts of vehicular pollution during operation phase, green belt shall be developed along the corridors. Local species which can arrest both gaseous and particulates shall be planted.

iii) To mitigate the impacts of noise pollution during construction phase, the following measures should be followed:

- The DG sets used in the project road section should conform to the CPCB stimulated standards for installation and operation.
- Regular maintenance of the machinery, equipment and vehicle would be carried out to prevent excessive noise. A maintenance schedule would be prepared and maintained by the contractor.
- Night time construction activity would be prohibited in case settlement/habitation is located within 500 m of the construction site. Consider the use of traffic calming measures in the final design to reduce the speed of the vehicle, especially in proximity to schools, hospitals and other areas of interest such as sites of cultural or religious interest.

iv) To mitigate the impacts of noise pollution during operation phase, where land is available three-layer plantations would be carried out with local species to act as a vegetative barrier for noise.

6.2 Impacts on Biological Environment and Valued Environmental Components

6.2.1 Impact on Trees and Flora

Along the road alignment, most of the forest areas have been cleared and secondary monoculture forests have been established, thus the main impact will be on standing trees. It is estimated that 54 trees would be felled for the proposed road improvement project. **There are two forest patches through which the road alignment is passing These are: Nakkati Reserve Forest and Hollaidanga (Dibruhill) Reserve Forest**

	CHAINAGE IN (M)

Sl. No.	L.H.S OF ALIGNMENT			R.H.S OF ALIGNMENT		
	FROM	TO	Name	FROM	To	Name
1	10/000	10/400	Nakkati R.F.	10/000	10/400	Nakkati R.F.
2	29/100	30/200	Hollaidanga R.F.	29/100	30/200	Hollaidanga R.F.

Species composition of trees to be cut are- Rain Tree (Caesalpinea sp.), Sal tree (Sorea robusta), Shegun (Tectona grandis), Fig Trees (Ficus religiosa, Ficus benghalensis & Ficus raecemosa), Cassia sp., Jamun (Syzigium cumini), Elephant apple (Dilenea indica), Tamarind (Terminalia indica), Simul tree (Bombax ceiba), Sonaru (Cassia pistula), Gulmohar Tree (Dilonix regia), Poma, Lali (Walsura robusta), Mango (Mangifera indica), Jackfruit (Atrocarpus sp.), Ghora Neem (Azadirachta sp.), Gamari (Gmelia arborea) Sotiona (Alstonia scholaris), Indian jujube (Zhizyphus zuzuphus).

Management and Mitigation Measures proposed to check this are as follows:

i) Site clearance activities should be carried out outside of bird breeding /nesting periods where possible
ii) Plantation would be taken along the corridor to compensate for the tree felled. At least 10 trees would be planted for every tree felled or as mentioned in the permission for tree felling provided by the Autonomous District Council and Department of Forest, Government of Meghalaya
iii) Only native species, or non-native species that are already established in the area should be planted, with a preference for trees with soil binding properties.
iii) No trees are to be felled within Reserve Forests. During road improvement works only existing RoW should be used for road construction in RF areas. These forest will enhance the aesthetic beauty of the AMPT road and lead to minimal impacts on biodiversity in the Reserve Forests.

6.2.2 Impact on Fauna during construction (with detailed measures to manage and mitigate impacts from Elephant crossing areas identified)

The proposed project has no national parks, wildlife sanctuaries or Key Biodiversity Areas or Important Bird Areas within a 10-kilometre influence area and will not have any significant direct, indirect or cumulative impacts on critical or natural habitats. However, 7 sections of the road are, as mentioned in the baseline, crossed by elephants and these sections are mentioned below:

OCASSIONAL ELEPHANT CROSSING SECTIONS

SI No.	Name of Area	CH/BM
1	Mothapara	2/150
2	Mothapara	2/200
3	Borogobol	4/280
4	Belguri	5/810
5	Nanguapara part -2 (khasipara)	9/330

6	Nanguapara part -2	9/690
7	Hollaidanga Reserve Forest	29/100

The known presence of the Asian Elephant, an IUCN endangered species and Schedule 1 species as per the Indian Wildlife Act of 1972, necessitates measures to reduce any direct, indirect or cumulative impacts on the species. Based on assessments of linear infrastructure on wildlife, especially elephants in other locations, roads have been responsible for reducing permeability of roads as well as increasing risks and mortality to elephants from poaching and accidents. Yet, elephants are known to be attracted to roads where secondary forest and open habitats are abundant and contain more food[7], which is the case on the AMPT road.

While there is acknowledgement of the elephant crossings by wildlife officials, these crossings are not part of an assessment of critical elephant corridors undertaken by national or international conservation organisations, or any current wildlife or biodiversity management plan of the government, and thus at the time of the EIA, sufficient data on the impact of the road on the elephant populations crossing the road – such as herd size and season and timing of crossings. Additionally, factors such as habitat conversion in locations in Assam and Meghalaya that maybe causing these elephants to cross the road, and the role of the road, which has been in existence since 1972, in reducing permeability are not entirely well documented.

The increased speeds and increase in traffic plying on the road could result in accidents posing a threat to vehicles and humans as well as increased elephant road kill.

Management and Mitigation Measures proposed to check this are as follows:

Pre – Bidding Phase:

i) Detailed assessment to establish seasonal data on elephant numbers, herd size, periods of road crossing, changes in natural habitat on road section and any increased vulnerability/ threats to elephants, any increased incidences of human-elephant conflict

ii) Identification of vulnerable stretches of the road with respect to road kill

ii) PWD in consultation with communities, Autonomous District Council, forest department and wildlife experts with experience of engineering measures and habitat management measures (bio-fencing, plantations, non-preferred crop cultivation, solar electric fencing etc.) to prepare an elephant management plan for the elephant crossings identified to be implemented by the contractor and in coordination with the Forest department and Police department.

Construction Phase

Building on the proposed 'Elephant management plan', undertake measures as appropriate:

i) Avoiding further road expansion (currently this is the case on AMPT road, which is not being widened and the intermediate lane formation is being maintained)

[7] Wadey et. al Why did the elephant cross the road? The complex response of wild elephants to a major road in Peninsular Malaysia. Biological Conversation 208 (2018) 91–98

ii) Display boards (as per IRC 30 - 1968 - Numerals of Different Height for Use on Road Signs and IRC 67 - 2012: Code practice for Road Signs) should be placed ahead of the stretch to warn drivers of the approaching wildlife crossing areas.
iii) Establishment of elephant watch towers in coordination with forest department and local communities
iv) Plan construction schedule to avoid migration season or periods when elephant crossings are at their peak
v) Establishment of construction camps, storage sheds or parking lots away from known elephant crossing zones and other habitats of wild animals

Operation Phase
Building on the proposed 'Elephant management plan', undertake measures as appropriate:
iii) Reducing and enforcing speed limits; effectiveness of speed limits has been known to be enhanced if signs are marked with flashing lights or flashing speed limit signs, to be lit during periods of high animal activity; This can be combined with a wildlife warning system which uses heat sensors to reduce collisions; Heat sensors can detect approaching mammals upto a distance of 250 m and trigger fibre optic wildlife warning signs combined with speed reduction signs (30-40 km)
iv) Limiting traffic volume at night: Elephants are known to cross mainly at night, and controlling traffic volumes on the road at night, during the crossing periods is an important measure. This can be done through closing the road entirely at night, or through barricading the road or in coordination with Forest Department guards who can direct limited traffic through the elephant crossings during peak activity.
vi) Enhancing patrolling and other anti-poaching efforts at known elephant crossing locations
vii) Implement systems for further evidence and improvement such as installation of camera traps at known elephant crossings and collation and analysis of data to assess efficacy of mitigation measures.

Measures for conservation and protection of Fauna and Faunal habitat:
i) Site clearance activities should be carried out outside of bird breeding /nesting periods where possible
ii) Improvement of natural drainage through the installation of box culverts, that are known to facilitate the passage of fauna as well as fish species
iii) Establishment of construction camps, storage sheds or parking lots away from known habitats of wild animals
iv) During the construction areas which have proven wildlife movement or presence temporary woven wire mesh guards of about 2.4 m (8 ft.) high will be put around the excavated areas to prevent small wild animal from falling. No harm would be done to the animal if they are trapped in the excavated area. The contractor in association with Executing Agency and Forest Department would ensure safe release of the animal.
v) Enforce good behaviour by construction workers to prevent illegal hunting, fishing and pilferage of resources

6.3 Impacts on Community Sensitive Receptors and Health and Safety

6.3.1 Impacts during Construction

Traffic and Road Safety Risks

Traffic and road safety risks will arise as a result of construction activities which will change vehicular and pedestrian traffic patterns, flows and or speeds through and around the construction work zone. They will also arise from the use of construction equipment and vehicles including those transporting construction materials in or to the project site.

Any excavations carried out close to a village access road or settlement could cause potential accidents or injuries to the public unless safety measures are put in place. There could also be respiratory distress from dust, fumes, or noxious odors may due to stone crushers machinery, rock blasting and movement of heavy machines. During the operations phase of the highway the traffic volumes and vehicular speeds are both likely to increase. This can potentially be risky both for pedestrian as well as slow - moving traffic. AMPT road has 22 villages and 26 community sensitive receptors such as schools, churches and health centres along its alignment. Measures for a pedestrian safety, reduced impacts from pollution from construction activity and noise need to be put in place.

There is a practice of putting up weekly markets in various villages/areas encroaching up on the carriageway, with buyers spilling over on the roads. Another road safety risk identified was springs contiguous to the road, that are used by women and children and are also in use at night.

Two Accident Prone areas were also identified on the AMPT Road. These are:

Sl. No.	Chainage (km)		Location/ Village	Landuse category
	From	To		
1	20/900	21/400	**Tikrikilla**	Market/Institutional area (School)
2	31/500	31/600	Pabomari	Commercial/ Institutional area

Impact on Host Community due to Labor Influx

Further, there would be impacts on the host community due to labour influx. Since project involves construction work that will demand a constant supply of labourers, the influx of migrant workforce will put additional pressure on existing resources. Consultation with the officials revealed that the workforce in general will consist of solitary migrant males. This will be a potential risk for the host population. Specifically, the influx of labour force will lead to: Risk of conflict and social unrest due to cultural differences between the labour force and local community, Risk of spread of communicable diseases due to interaction of the labour and the local community, Risk of gender-based violence, Risk of violation of child-safety measures , Health hazard

for host community due to lack of sanitation facilities and waste management and Additional pressure on the local resources and social infrastructures

Mitigation Measures

Pre-Construction

- Planning and Implementation in adherence to the Labour Management Plan which is part of the Social Impact Assessment and Social Management Plan.
- The Contractor needs to adhere to World Banks Environmental Health and Safety Standards including Occupational Health and Safety, further guidance for these can be found at: IFC General Environmental Health and Safety Guidelines: http://documents.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf
- Contractors must familiarize themselves with World Banks Good Practice Note on Road Safety: http://pubdocs.worldbank.org/en/648681570135612401/Good-Practice-Note-Road-Safety.pdf
- For labor camp establishment, adherence to World Banks Worker Accommodation Processes and Standards: http://documents.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10Box358316B01PUBLIC1.pdf

Design features

- The road will be furnished with necessary road furniture and appurtenances to ensure a safe and smooth passage along and across the road to enhance road safety including:
- Traffic signs: Reflectorised traffic signs are proposed for the Project and will cover Mandatory and Regulatory signs, Cautionary or Warning signs including for narrow bridge/culvert, pedestrian crossings, schools, animal crossings and information signs. The specifications and standards for traffic signs should be as per IRC: 67-2001.
- Contractor should consider the use of reflective thermoplastic paint mixed with retro-reflective beads which has a long life and night visibility and a shorter drying period, useful for the wet conditions of the state.
- Road markings; road delineators include hazard markers wherever there are objects close to the road as to constitute an accident hazard. The specifications and standards for road markings should be as per IRC: 35: 1997.
- Safety Barrier/ crash barriers – road edge (embankments, near roadside obstacles, specified locations for ensuring safety of bystanders, pedestrians and cyclists, deep ditches, step grades)

- Protection Works: Construction of embankment slope for ensuring safety of bridge structure along with bio-engineering
- Road design to include a dedicated area for weekly markets along with provision for vehicle parking
- Pedestrian crossings at such locations to be provided with barricades to effectively segregate the pedestrians from the moving vehicles and decongest the traffic. 1.5 m wide foot path at all built-up locations. Apart from this pedestrian crossing should be provided at all schools, Built-up area and other sensitive locations as per IRC guidelines. The width of side-walks depends upon the expected pedestrian flows and could be fixed with the help of guidelines given in IRC 103-1988, subject to a minimum width of 1.5 m.
- Installation of solar rights and reflective signs on sections of the road where there are water sources such as springs accessed by the community

Construction Phase

All worksites should be barricaded, and the integrity of the workspace segregation from the traffic maintained at all times;

- In settlement area, the workplace should be segregated by erecting barriers. Separate walkway should be identified in the settlement areas for use by pedestrians and slow moving traffic Crossover points should be provided at the worksite locations in settlement areas so that people can easily crossover without coming is in close proximity with the construction work or equipment.
- At the point of entry or exit from the work site flagman should be provided. The entry and exit vehicle shall be regulated by the flagman to prevent collision;
- All worksite shall be provided with reflective stickers so that it can be easily identified during night;
- Precautionary signage should be put-up well in advance to warn drivers of impending construction works;
- Flashers should be provided near excavation to warn the traffic of the excavations;
- The worksite within the settlement shall be properly illuminated as a safety precaution;
- The construction debris should not be placed on the road as it would further constrict the space available for the public.

Operation Phase

- During the operations of the road traffic hotspot studies should be carried out every year as per the MoRTHs Circular. The traffic safety expenditure should be included in the annual budget.

- Engineer to Adhere to Environment and Social Incident Response Toolkit
- Ensure that safety features are properly maintained and kept in service.
- Control speeds so that they are appropriate for the road conditions.
- Reduce traffic running intersections with red lights.
- Control the overloading and imbalanced loading of trucks.
- Control passenger vehicles from exceeding their recommended capacity.
- Put in place measures to check for inebriated/drunk driving

6.3 Impacts on Occupational Health and Safety

Road workers are at risk of injury from i) passing traffic vehicles, ii) Construction equipment operating within the work zone and in ancillary areas which support the work zone e.g. batching plant, hot-mix plants iii) construction vehicles entering and leaving the work zone as well as iv) risk of injury from rock falls, blasting, working at heights and excavation. There are occupational risks during operation of the road from traffic and accidents that could occur due to collisions with passing vehicle. The project districts experience extreme weather conditions especially during rainy season and winters. This can cause vulnerability to floods and cold climate.

Mitigation Measures

Pre-Construction:

The Contractor needs to adhere to World Banks Environmental Health and Safety Standards including Occupational Health and Safety, further guidance for these can be found at:

- IFC General Environmental Health and Safety Guidelines: http://documents.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf
- Contractors must familiarize themselves with World Banks Good Practice Note on Road Safety: http://pubdocs.worldbank.org/en/648681570135612401/Good-Practice-Note-Road-Safety.pdf
- For labor camp establishment, adherence to World Banks Worker Accommodation Processes and Standards: http://documents.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10Box358316B01PUBLIC1.pdf

i) Contractor to **prepare suitable Occupational Health and Safety (OHS) Plan and associated documents,** as a part of the bidding documents, which will be reviewed and

approved by the Engineer in-charge, PWD. The specific requirements of these plans need to be included in the contractor bidding documents. This plans include the following:

Site Establishment Plan: site preparation, management, closure and restoration activities indicating the locations and arrangements of all storage areas and work sites subject to activities that may result in environmental impacts. The

- Hard surface Areas. Areas within the site where there is a regular movement of vehicles shall have an acceptable hard surface and be kept clear of loose surface material and shall be so indicated on the required site plan.
- Waste Disposal and Site Drainage System outlining systems for water and waste products arising on the site to be collected, removed from the site via a suitable and properly designed temporary drainage system, and disposed of at a location and in a manner that will cause neither pollution nor nuisance, and is acceptable to the Engineer and the local authorities. The site plan shall indicate the system proposed and the locations of related facilities at the site, including latrines, holding areas, etc. There shall be no direct discharge of sanitary or wash water to surface water. Disposal of materials such as, but not limited to, lubricating oil onto the ground or water bodies shall be prohibited. Liquid material storage containment areas shall not drain directly to surface water. Liquid material storage containment areas equipped with drains shall be valved, and the valve shall be maintained locked in the closed position with supervisory control of the key. Lubricating and fuel oil spills shall be cleaned up immediately and spill clean-up materials shall be stocked and maintained at the storage area. The site plan shall be devised to ensure that run-off from excavations in the different parts of the works is not deposited directly into any watercourse, stream, or canal and shall indicate the system proposed, including the locations of retention ponds and other facilities. There shall be no direct discharge of sanitary wastewater, wash water, chemicals, spoil, waste oil or solid waste generated in connection with the Works to surface water bodies. Prevention of logging and establishment of efficient drainage structures in the logging-prone areas.
- *Biodiversity*. The site plan shall avoid establishment of labour camps, stockpiling sites and other temporary structures, relevant to construction, on distance, from any environmentally-sensitive areas as well as measures to prevent any risks from human-wildlife conflict.
- *Temporary Construction Facilities Relative to Watercourses*. The site plans shall be devised to ensure that, insofar as possible, all temporary construction facilities are located at least 50 meters away from an existing water course, stream, or canal.

- *Other Water-Related Facilities*. Site Plans must indicate adequate precautions to ensure that no spoil or debris of any kind is allowed to be pushed, washed down, fallen or be deposited on land or water bodies adjacent to the site.
- *Location of Batching Plant(s)*. Dry mix batching shall be carried out in a totally enclosed area with exhaust to suitable fabric filters. The locations of these facilities should be clearly illustrated by the site plans. 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 1000 m away from the nearest village/settlement preferably in the downwind direction. Arrangements to control dust pollution through provision of wind screens, sprinklers, dust encapsulation must 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 SC and PIU.
- *Location of Wheel Washing Facilities*. The Contractor shall provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the excavation sites. The Contractor shall ensure that all vehicles are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the construction site and entering public areas and ensure that water or debris from such cleaning operations is contained and not deposited into nearby drains and watercourses. The locations of these facilities shall be clearly illustrated by the site plans.
- *Location of Sand and Aggregate Storage Provisions*. The Contractor shall implement dust suppression measures that shall include, but not be limited to the following:
    - Stockpiles of sand and aggregate greater than 20 cubic meters for use in concrete manufacture shall be enclosed on three sides, with walls extending above the pile and two (2) meters beyond the front of the piles.
    - Cement and other such fine-grained materials delivered in bulk shall be stored in closed silos
- *Locations of Liquid and Toxic Material Storage Areas.* The site plans shall specify the locations for the storage of liquid materials and toxic materials including the following such conditions to avoid adverse impacts due to improper fuel and chemical storage:
    - All fuel and chemical storage (if any) shall be sited on an impervious base within a bund and secured by fencing. The storage area shall be located away from any watercourse or wetlands. The base and bund walls shall be impermeable and of sufficient capacity to contain 110 percent of the volume of tanks.

- Filling and refueling shall be strictly controlled and subject to formal procedures, and will take place within areas surrounded by bunds to contain spills/leaks of potentially contaminating liquids.
- The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contaminated discharges enter any drain or watercourses.
- Disposal of lubricating oil and other potentially hazardous liquids onto the ground or water bodies will be prohibited.
- Should any accidental spills occur, immediate cleanup will be undertaken and all cleanup materials stored in a secure area for disposal to a site authorized for the disposal of hazardous waste.

- *Contractor to conduct a Radiological Survey to determine if there are any radiation sources (Uranium is found in parts of Garo Hills, Meghalaya)*

Health and Safety Plan (H&S Plan):

The Construction Contractor(s) are obliged to implement all reasonable precautions to protect the health and safety of workers. Construction Contractors(s) will be required to have a standalone Health and Safety Plan and associated procedures that will, as a minimum, adhere to the World Bank's Health & Safety policies and ensure the health and safety of all workers employed during the construction phase of the project. The Construction Contractor(s) shall establish an H&S Plan in accordance with the content and requirements specified in the OHS Plans. The plan needs to cover, at a minimum, measures to protect workers from physical, chemical, biological and radiological hazards, Personal Protective Equipment to be provided to workers based on their work and measures for operating in hazardous environments. On roads with elephant and other wildlife crossings, measures to avoid any human-animal conflict also need to be covered. In light of the COVID-19 outbreak and increased risks to community health and safety and occupational health and safety, the contractor needs to put in place a COVID-19 preparedness and response plan as outlined in Annexe 6.

Emergency Preparedness Plan (EPP)

In case of any accidents, the procedures contained within the EPP will be undertaken immediately. In Meghalaya, the EPP must include measures for natural calamities such as earthquakes, flash floods, landslides and forest fires. A copy of the EPP and the list of emergency contact numbers are to be posted in a highly visible place within the construction site area.

Chance Finds Procedure (CFP)

The effective protection of cultural heritage is based on an understanding of the key issues, appropriate assessment and the correct action to minimize possible damage or loss. As unknown features/objects could be encountered during works, in particular earthworks, a "chance finds procedure" shall be in place to stop works and require investigation by an archaeologist in case of such findings and involvement of relevant state entities.

Traffic Management Plan (TMP)

The TMP needs to clearly define (i) the approved haul routes for all construction traffic; (ii) maximum speed limits (which are often lower than the legal speed limit) at locations on the route (e.g. 40 km/h or 30 km/h when vulnerable users are present, such as during school hours starting 200m before to 200m after a school), and the hours at which vehicles operate and; (iii) Temporary Traffic Management (TTM) in work zones. The Plan is to approved by the Engineer in-charge, PWD and monitored by the PWD Engineer and regular reports need to be made on any accidents or incidences.

Construction Stage:

In accordance with World Bank EHS Standards including OHS and Community Health and Safety, Contractors are obliged to implement all reasonable measures with regards to soil erosion, water and air quality, noise and vibration, solid waste, hazardous materials, wastewater discharges, health and safety hazards, labor and working conditions. In a similar way, the Construction Contractor(s) are obliged to implement risk management strategies to protect the beneficiary communities from 1) physical, chemical, or other hazards associated with sites under construction, 2) hazards associated with the increased traffic, and 3) communicable and vector-borne diseases associated with the population of workers.

6.4 Cumulative Impact:

VECs	Potential Changes or Impacts to VECs	Other Potential Sources of Contribution to Cumulative Impacts on Potential VECs	Potential Road Sub-project Contribution to Cumulative Impacts on Potential VECs	Significance and Management Strategy
1 Elephant population along the area of influence of the road sub-project Indicator Herds of 20-25 Elephants pass through 3 locations in Holaidanga 10-12 times a year; Herds of 18-22 Elephants pass through sections at Lahpara, Borogobol, Dalchangpara and Mendal	1. Reduction in number of elephants recorded in the area of influence of the road sub-project (may vary in different months of the year) 3. Loss of elephant habitat	1. Agricultural activities 2. Horticultural activities 3.Tourism activities 4. Poaching	Increased collisions with wildlife Reduction of habitat quality near the road (due to noise, exhaust, reduced permeability) Increased access for poachers	Given the nature of roads works (mainly safety improvements and maintenance of existing roads) and what is known about ongoing and future developments and trends in the project areas, the cumulative impacts of the road are not significant. The mitigation measures included in the ESMPs are expected to prevent the sub-projects from making a significant contribution to such impacts through mitigation measures and a detailed elephant management plan. • Mitigation: (a) Regulating traffic and avoidance of construction during the elephant movement during the construction phase; (b) Regulating traffic and warning of road users during the operational phase; (c) Ensuring that land use conversion for plantations, processing zones and solar projects are given taking into account elephant corridors. • Monitoring: (a) Monitoring of elephant herd movement in the aforesaid locations during the construction phase by the PWD & contractors; (b) Monitoring of herd movement upfront in the wildlife sanctuary by the Forest & Environment Department in order to give the PWD advance intimation. • Supervision mechanism: (a) Forests and Environment Department and PWD to coordinate about elephant herd movement during construction & operational phase; (b) Agriculture Department for regulating the issuance of permission for expanding plantations, and setting-up of processing facilities; (c) ADCs for regulating the issuance of permission for community solar PV power.

7. Public Consultation and Disclosure

Preliminary consultations were held with the people AMPT road who could be affected in local language of Garo. The team spoke to residents as well as shops in habitations close to the road.

Figure 7 Consultations at Shops and with Residents

The summary of environmental issues that were identified during the consultations are presented below:

- Communities enquired about the loss of any trees or plantations they world loose as a result of the project and requested the Forest Department to guide them on replacement plantations of economically and environmentally valuable trees
- **Agia Medhipara Phulbari Tura (AMPT) Road (1st to 32nd kms) Road** is the only route from Resubelpara, District HQ to reach NH 51. So they want the road to be constructed as soon as possible as it would lead to better and faster connectivity with Tura and other parts of the state
- Prices of all essential commodities have gone high because of the poor road condition. So the construction of the road would lead to reasonable pricing

- Transportation has become a big issue as even the few vehicles that ply through the existing road. The building of the road thus would lead to more buses and other carriers and lead to quick and faster access to other places
- Bad roads have led to the disinvestment of many agro-based industries in the thus losing a lot of employment opportunities and in turn hampering economic growth. Thus this project would trigger investment and in turn employment opportunities and economic growth.
- Bad and uneven roads have also led to a lot of accidents over the years specially in Medipathar area. So the construction of the new road would reduce accidents
- As regards to the places of worship and other social property the people were of the view that they would discuss among themselves and let the authorities know about it. However any kind of opposition was not witnessed in this regard
- Petrol and diesel consumption in vehicles is more due to the bad roads and with the increasing prices of crude oil it has become an economic issue
- With the construction of the road fire brigades would reach in time and the emergency ambulance service which refuses to come now would come

General Suggestions on Road Design and construction:

- The local residents suggested that the MPWD proposed width of the road should be marked by boundary pillars as soon as possible
- The people suggested that the road should be aligned properly to reduce the impact on the community infrastructures, households, horticulture estates.
- The people are concerned about the open bath area by women in the roadside streams and river. They suggest that the covered bathing sheds near the streams to be constructed and should be included as part of the project
- The People suggested siltation near the paddy field to be minimized during the construction phase. They suggest that construction should not be done during the paddy season.
- They suggested to have less cutting on hill side to save the betel nut orchards.

Mitigation Measures

- PAP‘s were explained that the necessary provisions are made in the project for shifting the utilities such as electrical lines, telephone OFC lines and water pipelines.
- Assurance was given that all eligible PAPs will be suitably compensated for trees in their horticulture gardens as no household is coming under the impact zone in this area.
- Assurance was also given by the PWD that drains would be constructed along the roadside and silt traps will be installed during constructions.
- Assurance was given that the marking of the proposed road width has already started and should be completed for the entire corridor soon. They said it is being done with assistance from the revenue department. They also confirmed that the proposed ROW for rural areas is 9m-14 (as available without impacting any households) and for urban areas it is 9m.

- The PWD officials informed that a joint verification is being made with the Forest and Revenue Department on acquisition and the result would be out soon
- Assurance was given that prior notice would be given to all the PAPs (Only horticulture gardens came under impact zone) with all the details of acquisition.

- Assurance was given by the PWD that all safety measures would be taken into consideration while constructing the road

7.1.4 Consultations with Secondary Stakeholders

Consultation with the MPWD officials at Head Quarter and field offices informed the integrated approaches being used for road improvements, understanding field conditions, environmental & social impacts, mitigation measures etc. The EIA took account of the proposed design like proposed RoW, proposed bridges, bus bays, proposed alternative alignments, proposed drains and utility shifting in consultation with secondary stakeholders. Consultation with the District Officials and other key persons (Deputy Commissioner) were organized. Issues discussed in the meeting included regulatory clearances such as Permission of tree cutting, Land acquisition, Entitlement Framework, Utility shifting.

7.1.5 Disclosure: The draft and final versions of the EIA will be disclosed for public knowledge through the website of the Executing Agency (EA) and the World Bank. The full document and executive summary (in local language - **Garo**) shall be disclosed by uploading at respective websites of EA. The copy of document will be made available at the offices of PMU, district level offices of line departments, State and District Libraries, Local municipal and ADCs and VECs offices for public reference.

8. Environmental Management Plan

8.1 Environmental Management Plan

This chapter presents a phase wise Environmental Management Plan with key roles and responsibilities over the Pre-Bidding (in case of presence of sites that could be critical habitat), Pre-Construction and Construction phase. The Environmental Management Plan covers issue-wise guidelines to ensure adherence to national and State regulations, relevant World Bank Operational Policies, Standards and Best Practices. Where there is need for more detailed guidance, it makes mention of the relevant Annexures and related documents where this guidance is provided.

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
	Pre-Bidding activities by Project Implementation Unit			
1	Terrestrial/ Aquatic Biodiversity/ Rare, Endangered and Threatened Species	• Detailed Biodiversity Assessment including Critical Habitat assuagement where EIA has identified that the road is within 10 kms of an area of high biodiversity such as wildlife sanctuary, national park or presence of rare, endangered and threatened (RET) species are noted • Detailed assessment, including cumulative impacts, of project impacts on Valued Environmental Components (VECs) such as critical habitat, natural habitat and RET species. • Identification of Mitigation measures and design of natural/ habitat related solutions, engineering measures and offsets (where required) • Clearances from the SEIAA and State Wildlife Board	National Biodiversity Experts, State Wildlife Board, Forest Dept, Autonomous District Council (ADC), and Village Council representatives	PIU/ World Bank
	Pre- construction activities by Project Implementation Unit and Contractor			
2	Land Acquisition	• The acquisition of land and private properties will be carried out in accordance with the RAP and entitlement framework for the project. PIU has to ascertain that any additional environmental impacts resulting from acquisition of land shall be addressed and integrated into the EMP and other relevant documents. • No land acquisition is involved in this road section.	PIU, Revenue Dept., NGOs, Collaborating Agencies	PIU
3	Preservation of Trees, Shrubs and	• Specific attention will be given for protecting giant trees and locally important trees, shrubs and flora (religions, spiritual importance) and any rare,	PIU, Forest Dept, ADCs	PIU

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
	Ground Flora	endangered or threatened species. • Tree cutting (approx. 54 nos.) is to proceed only after all the legal requirements including attaining of In-principle and Formal Clearances from the Forest Dept and/or Autonomous District Council (ADC) are completed and subsequently a written order is issued to the Contractor. • The removal of species declared as 'protected' by the State's Forest Dept. or vulnerable or endangered species as per IUCN threat assuagement will be avoided. Incase avoidance is not possible; they will be removed only after due clearance from the Forest Dept. and Autonomous District Council (ADC) and the design of appropriate offsets to replace the species. • Stacking, transport and storage of the wood will be done as per the relevant norms. • The replacement of trees and shrubs removed will be planned and implemented with the Forest Department and ADCs • Awareness generation and support for species such as trees and shrubs that are soil binding and reduce erosion and landslides should be undertaken for private and community lands adjoining the road/ in upstream areas through convergence with programmes such as MNREGA and World Bank CLLMP	Contractor	
4	Relocation of Community Utilities and Common Property Resources	• All community utilities and properties i.e., water supply lines, sewer lines, bank buildings, health centers, schools, health clinics and veterinary hospitals will be relocated before construction starts, on any section of the project corridor. The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community. The schools and health centers will be constructed as per the relevant state norms. • All other community property resources within the corridor of impact such as hand pumps, spring sheds, ponds, grazing lands etc. will be relocated. The relocation sites for these schools will be identified in accordance with the choice of the community. • Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all community utilities and resources.	PIU, Concerned Agencies, Contractor	PIU
5	Relocation of	• All religious property resources such as shrines, churches, temples and	PIU, NGOs,	PIU

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
	affected Cultural and Religious Properties	mosques within the project zone will be relocated. Sites for the relocation of these religious structures will be identified in accordance with the choice of the community. • The NGO and PIU in consultation with local people will finalize design of these structures. As far as possible, the architectural elements of the structure should be conserved/ reflected/translated into the design of new structures. • The entire process (i.e. selection of relocation sites and designs) will be under supervision of Environmental and Social Experts of the PIU. The relocation should be completed before construction starts in these sites.	Contractor	
Pre-construction activities by the Contractor/ PIU				
6 Field Verification and Suggested Changes in Design				
6.1	Joint Field Verification	• The Environmental Expert of the PIU and the Contractor will carry out joint field verification confirming/ finalizing the design confirming measures to manage and mitigate impacts on valued environmental components (VECs) identified by the EIA.	Contractor/ Environmental Expert of the PIU	Project Engineer, PIU
6.2	Assessment of Impacts in case of Changes/Additions in the Project	• In case of any minor changes in design, the Environmental Expert of the PIU will assess impacts and if required, revise/modify the Construction EMP. In case of major changes (such as change in alignment, widening, presence of critical habitat), PIU will seek a no objection from the World Bank and assess and implement an independent EIA if applicable to the change.	Contractor/ Environmental Expert of the PIU	PIU
7 Occupational Health and Safety and Community Health and Safety Measures				
7.1	Preparation of an Occupational Health and Safety Plan	• Contractor to prepare suitable Occupational Health and Safety (OHS) Plan and associated documents, as a part of the bidding documents, which will be reviewed and approved by the environmental and social experts of PIU and approved by the Engineer in-charge, PIU • Detailed guidance can be found in the EIA and IFC general Health and Safety Guidelines at http://documents.worldbank.org/curated/en/157871484635724258/pdf/112110-WP-Final-General-EHS-Guidelines.pdf and the EIA and SIA prepared under the project	Contractor, Environmental and Social Expert of the PIU	Engineer in-charge, PIU

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		• Contractors must familiarize themselves with World Banks Good Practice Note on Road Safety: http://pubdocs.worldbank.org/en/648681570135612401/Good-Practice-Note-Road-Safety.pdf • For labor camp establishment, adherence to World Banks Worker Accommodation Processes and Standards: http://documents.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10Box358316B01PUBLIC1.pdf • Plans should adhere to the Labor Management Plan		
7.1.1	Site Establishment Plan	• The Site Establishment Plan should include the following: - Hard surface Areas. Areas within the site where there is a regular movement of vehicles shall have an acceptable hard surface and be kept clear of loose surface material and shall be so indicated on the required site plan. - Waste Disposal and Site Drainage System outlining systems for water and waste products arising on the site to be collected, removed from the site via a suitable and properly designed temporary drainage system, and disposed of at a location and in a manner that will cause neither pollution nor nuisance, - *Biodiversity*. The site plan shall avoid establishment of labour camps, stockpiling sites and other temporary structures, relevant to construction, on distance, from any environmentally-sensitive areas. - *Temporary Construction Facilities Relative to Watercourses*. The site plans shall be devised to ensure that, insofar as possible, all temporary construction facilities are located at least 50 meters away from an existing water course, stream, or canal. - *Other Water-Related Facilities*. Site Plans must indicate adequate precautions to ensure that no spoil or debris of any kind is allowed to be pushed, washed down, fallen or be deposited on land or water bodies adjacent to the site. - 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 1000 m away from the nearest	Contractor, Environmental and Social Expert of the PIU	Engineer in-charge, PIU

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		village/settlement preferably in the downwind direction. - Arrangements to control dust pollution through provision of wind screens, sprinklers, dust encapsulation must 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 SC and PIU. - The Contractor shall not initiate plant/s operation till the required legal clearances are obtained and submitted. - *Location of Wheel Washing Facilities*. The Contractor shall provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the excavation sites. The Contractor shall ensure that all vehicles are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the construction site and entering public areas and ensure that water or debris from such cleaning operations is contained and not deposited into nearby drains and watercourses. The locations of these facilities shall be clearly illustrated by the site plans. - *Location of Sand and Aggregate Storage Provisions*. The Contractor shall implement dust suppression measures that shall include, but not be limited to the following: - Stockpiles of sand and aggregate greater than 20 cubic meters for use in concrete manufacture shall be enclosed on three sides, with walls extending above the pile and two (2) meters beyond the front of the piles. - Cement and other such fine-grained materials delivered in bulk shall be stored in closed silos - *Locations of Liquid and Toxic Material Storage Areas.* The site plans shall specify the locations for the storage of liquid materials and toxic materials including the following such conditions to avoid adverse impacts due to improper fuel and chemical storage: - All fuel and chemical storage (if any) shall be sited on an impervious base within a bund and secured by fencing. The storage area shall be located away from any watercourse or wetlands. The base and bund walls shall be impermeable and of sufficient capacity to contain 110 percent of the volume of tanks.		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		- Filling and refueling shall be strictly controlled and subject to formal procedures, and will take place within areas surrounded by bunds to contain spills/leaks of potentially contaminating liquids. - The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contaminated discharges enter any drain or watercourses. - Disposal of lubricating oil and other potentially hazardous liquids onto the ground or water bodies will be prohibited. - Should any accidental spills occur, immediate cleanup will be undertaken and all cleanup materials stored in a secure area for disposal to a site authorized for the disposal of hazardous waste. - *Contractor to conduct a Radiological Survey to determine if there are any radiation sources (Uranium is found in parts of Garo Hills, Meghalaya)*		
7.1.2	Health and Safety Plan	• The Construction Contractor(s) are obliged to implement all reasonable precautions to protect the health and safety of workers. • Construction Contractors(s) will be required to have a standalone Health and Safety Plan and associated procedures that will, as a minimum, adhere to the World Bank's Health & Safety policies and ensure the health and safety of all workers employed during the construction phase of the project. • The Construction Contractor(s) shall establish an H&S Plan in accordance with the content and requirements specified in the OHS Plans. • The plan needs to cover, at a minimum, measures to protect workers from physical, chemical, biological and radiological hazards. • Personal Protective Equipment to be provided to workers based on their work and measures for operating in hazardous environments. • On roads with elephant and other wildlife crossings, measures to avoid any human-animal conflict also need to be covered. • In light of the COVID-19 outbreak and increased risks to community health and safety and occupational health and safety, the contractor needs to put in place a COVID-19 preparedness and response plan as outlined in Annexe 6	Contractor, Environmental and Social Expert of the PIU	Engineer in-charge, PIU
7.1.3	Emergency	• In case of any accidents or emergencies, the procedures contained within the	Contractor,	Engineer in-

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
	Preparedness Plan	EPP will be undertaken immediately. • EPP must include measures for natural calamities such as earthquakes, flash floods, landslides and forest fires. • A copy of the EPP and the list of emergency contact numbers are to be posted in a highly visible place within the construction site area	Environmental and Social Expert of the PIU	charge, PIU
7.1.4	Chance Finds Procedure	• As unknown features/objects could be encountered during works, earthworks, a "chance finds procedure" shall be in place to stop works and require investigation by an archaeologist in case of such findings and involvement of relevant state entities.	Contractor, Environmental and Social Expert of the PIU	Engineer in-charge, PIU
7.1.5	Traffic Management Plan	• The TMP needs to clearly define (i) the approved haul routes for all construction traffic; (ii) maximum speed limits (which are often lower than the legal speed limit) at locations on the route (e.g. 40 km/h or 30 km/h when vulnerable users are present, such as during school hours starting 200m before to 200m after a school), and the hours at which vehicles operate and; (iii) Temporary Traffic Management (TTM) in work zones.. • All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Bureau of India Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to. • Noise limits for construction equipment 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.	Contractor, Environmental and Social Expert of the PIU	Engineer in-charge, PIU
8	**Identification and Selection of Material Sources**			
8.1	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 select borrow area until the formal agreement is signed between land owner and contractor and a copy is submitted to the SC and the PIU. • Locations finalized by the contractor shall be reported to the Environmental	Contractor/ Environmental Expert of the PIU	PIU

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		Expert of the PIU and approved by the Engineer in-charge, PIU. Format for reporting will be as per the Reporting Format for Borrow Area and will include a reference map. 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 SC, the environmental personnel of the SC will be required to inspect every borrow area location prior to approval (follow criteria for evaluation of borrow areas).		
8.2	Quarry	• Authorized Quarries that meet environmental and social standards and the necessary technical specifications will be identified by PIU in the project area - Quarries must adhere to World Bank Environmental Health and Safety Guidelines - In case of new Quarries, they must have permission from the Department of Mining and Geology and have the necessary clearances from Pollution Control Board and Forest Department and a valid Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA); - Quarry should not be operating in any sites of valuable critical or natural habitat - Quarry should not be operating in landslide or erosion prone zones - Quarry should not disrupt drainage pattern or cause water pollution - Quarry should not be operating on the road where operations can disrupt traffic or pose safety risks - Where possible, quarry must include a rehabilitation plan - Quarry workers must have access to Personal Protective Equipment during operations - Quarry workers do not employ child labour - Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials and other logistic arrangements In case the contractor decides to use	Environmental Expert of the PIU and Contractor,	Engineer in-charge, PIU

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		quarries other than recommended by DPR consultant, then will be selected based on the suitability of the materials. - 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 and Environmental Expert of the SC. - Contractor will also work out haul road network and report to Environmental Expert of the PIU and SC will inspect and in turn report to PIU before approval.		
8.3	Sand	• Authorized sources of sand that meet environmental and social standards and the necessary technical specifications will be identified by PIU in the project area - Authorized Sources of Sand that meet environmental and social standards and technical specifications identified and supply chain with contractor established - Sources of Sand adhere to World Bank Environmental Health and Safety Guidelines - Environmental safeguards: - As per the Meghalaya Minor Minerals Concession Rules, 2016 (MMMCR), sand mining is treated as a quarry which requires a permit from the Divisional Forest Officer and the Principle Chief Conservator of Forest & HOFF of the Forest Department. - Permission will not be allowed during the month from June to August, since it is breeding season for the aquatic life. - Source of sand should not be from sites of critical or natural habitat, fish spawning sites, nesting sites or have the presence of known herpetofauna. - In case source of sand is from a river bed, the following should be ensured: - Sand removal rates, and processes of collection and transportation should not cause any changes to channel morphology, increased erosion, impact to aquatic or riparian habitats, decrease in flood control properties of the sand bank or pollute the river.	Environmental Expert of the PIU and Contractor,	Engineer in-charge, PIU

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		- Sand removal incisions should not be from sites that could undermine the stability of support structures such as bridges - Sites should not lead to the creation of deep pools that could lead to an increase in vector borne disease - Sand mining operators have access to appropriate Personal Protective Equipment during operations - Mining operations should not impact other riparian livelihoods such as fishing - Sand mining operations should not employ child labour - Sand mining from any sources that could impact ecosystem structure, process or biodiversity in rivers is strictly prohibited and will be ascertained by the environment expert, PIU - In case identified source of sand is from a river, the following guidelines are to be followed: http://mines.bih.nic.in/Docs/Sustainable-Sand-Mining-Management-Guidelines-2016.pdf		
8.4	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 the PIU before finalizing the locations. • The Contractor will provide a list of locations and type of sources from where water for construction will be used. • Contractor to identify channel along the corridor and create check dams, if required, to store water for construction purpose. The entire exercise should be conducted in consultation with the local community. These check dams can be handed over to the community for use and maintenance after the completion of construction. • The contractor will not be allowed to pump from any irrigation canal and surface water bodies, that are used by communities in times of water stress. • 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 SC and PIU.	Environmental Expert of the PIU and Contractor	Engineer in-charge, PIU
8.5	Construction	• Siting of the construction camps will be as per the guidelines below. Locations	Environmental	

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
	Camp Locations – Selection, Design and Lay-out	identified by the contractor will report as per format given. • Construction camps will not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. • Location for stockyards for construction materials will be identified at least 1000 m from water courses. • The waste disposal and sewage system for the camp will be designed, built and operated such that no odor is generated. Unless otherwise arranged by the 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 the PIU will have to be provided by the contractor (refer to Appendix -4 of EIA report for camp management).	Expert of the PIU Contractor	
8.6	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 Environmental Expert of the PIU 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.	Contractor	Environmental Expert of the PIU and PIU
8.7	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 a sub-project). These sessions shall involve all staff of Environmental Cells, field level implementation staff of PIU, Environmental Experts of SCs and Contractors.	PMU/PIU	PIU
Construction Stage (Activities to be carried out by the Contractor)				
9 Site Clearance				
9.1	Clearing and Grubbing	• Site clearance activities should be carried out outside of bird breeding /nesting periods where possible • Vegetation will be removed from the construction zone before commencement of civil works. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is avoided or minimal. 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 the PIU .		

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		• The contractor, under any circumstances will not cut or damage trees. Trees identified under the project will be cut only after receiving clearance from the Forest Dept./MoEF/concerned authority (as applicable) and after the receipt of PIU's written permission in this regard. Vegetation with girth of over 30 cm only will be considered as trees and shall be compensated, in the event of PIU's instruction to undertake tree cutting.		
9.2	Stripping, stocking and preservation of top soil	• The top soil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert of the PIU . The following precautionary measures will be taken to preserve them till they are used: a) 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, the edges of the pile will be protected by silt fencing. b) 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. c) It will be ensured by the contractor that the top soil 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 (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. • Residual topsoil, if there is any will be utilized for the plantation at median and side of the main carriageway. Construction on the cleared soils shall begin as soon as possible to avoid soil erosion. • Top soil shall not be unnecessarily trafficked either before stocking or when in stockpiles. Slope stabilization shall be done by turfing and planting bush grass. Stockpiled top soil shall be returned to cover the disturbed area & cut slopes. Residual top soil shall be used for redevelopment of borrow areas, landscaping along slopes, medians etc.		
9.3	Compaction of Soil	• Heavy, wide and slow-moving vehicles should be kept away from the sensitive routes such as agricultural land. Use of heavy machinery on productive land is to be minimized. • Limitation on the axle load shall be identified such that topsoil is protected from compaction.		
9.4	Generation of Muck, Debris from hill cutting and	• Debris generated due to the dismantling of the existing structures or scarification of the road will be suitably reused in the proposed construction, subject to the suitability of the materials and approval of the Authority • Engineer (Resident Engineer and Environmental Expert) as follows: – The sub grade of the existing pavement shall be used as embankment fill material.		

<table>
<tr><th rowspan="2">S.No.</th><th rowspan="2">Environmental Issue / Component</th><th rowspan="2">Management Measures</th><th colspan="2">Institutional Responsibility</th></tr>
<tr><th>Planning</th><th>Supervision</th></tr>
<tr><td></td><td>dismantling structures and road surface</td><td>
– The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads
– The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.
• The contractor will suitably dispose off unutilized debris materials either through filling up pre-designated disposal locations, subject to the approval of the Environmental Expert of the PIU. Sites identified are as follows:
<table>
<tr><td></td><td colspan="2">MUCK DISPOSAL AREAS</td></tr>
<tr><td></td><td>LAT</td><td>LONG</td></tr>
<tr><td>MDP1</td><td>25.996755°</td><td>90.344633°</td></tr>
<tr><td>MDP2</td><td>25.987979°</td><td>90.334718°</td></tr>
<tr><td>MDP3</td><td>25.975067°</td><td>90.338036°</td></tr>
<tr><td>MDP4</td><td>25.972251°</td><td>90.332604°</td></tr>
<tr><td>MDP5</td><td>25.960520°</td><td>90.309015°</td></tr>
<tr><td>MDP6</td><td>25.945744°</td><td>90.292117°</td></tr>
<tr><td>MDP7</td><td>25.939317°</td><td>90.270599°</td></tr>
<tr><td>MDP8</td><td>25.951865°</td><td>90.234312°</td></tr>
<tr><td>MDP9</td><td>25.952621°</td><td>90.219746°</td></tr>
<tr><td>MDP10</td><td>25.942051°</td><td>90.173034°</td></tr>
<tr><td>MDP11</td><td>25.944619°</td><td>90.148829°</td></tr>
<tr><td>MDP12</td><td>25.944885°</td><td>90.134007°</td></tr>
</table>
• At locations identified for disposal of residual bituminous wastes, the disposal will be carried out over a 60-mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. The contractor will ensure that the surface area of such disposal pits is covered with a layer of soil.
• 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 the PIU .
• 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 the PIU .
• Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into
</td><td></td><td></td></tr>
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S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
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		the surface water bodies or form mud puddles in the area. • The contractor shall identify dumping sites. The identified locations will be reported to the Environmental Expert of the PIU . These locations will be checked on site and accordingly approved by Environmental Expert of the PIU prior to any disposal of waste materials.		
9.5	Other Construction Wastes Disposal including balance quantity of muck	• The pre-identified disposal locations will be a part of Comprehensive Waste Disposal Solid Waste Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of the PIU . Location of disposal sites will be finalized prior to completion of the earthworks on any particular section of the road. • The Environmental Expert of the PIU 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 (is so desired by the owner/community). • No muck will be disposed in any disposal site. Contractor will take care of residual muck, if any that remains after construction work. Either this will be returned to the source or used in construction of embankment elsewhere with proper protection measures. PIU will keep strict vigil on this aspect. • Non-bituminous wastes other than fly ash may be dumped in borrow pits (preferably located in barren lands) covered with a layer of the soil. No new disposal site shall be created as part of the project, except with prior approval of the Environmental Expert of the PIU . • All waste materials will be completely disposed, and the site will be fully cleaned and certified by Environmental Expert of the PIU 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.		
10	**Procurement of Construction Material**			
10.1	Earth from Borrow Areas for Construction	• No borrow area will be opened without permission of the Environmental Expert of the PIU . The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of the PIU 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 siting and operation of borrow areas. • The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out twice a day to control dust along such roads during their period of use.		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
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		• During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Expert of the PIU 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 the PIU .		
10.2	Quarry Operations	• Sand, Stone and Aggregate will be from authorized sources that adhere to state regulations as well as World Bank Environmental Health and Safety Guidelines and Safeguard standards as outlined in 8.2 and 8.3		
10.3	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. • The contractor will source the requirement of water preferentially from ground water but with prior permission from the Ground Water Board. A copy of the permission will be submitted to PIU prior to initiation of construction. • The contractor will take all precaution to minimize the wastage of water in the construction process/ operation.		
10.4	Transporting Construction Materials and Haul Road Management	• Contractor will maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machineries as précised. All vehicles delivering fine materials to the site will be covered to avoid spillage of materials. • All existing highways and roads used by vehicles of the contractor or any of his sub-contractor or suppliers of materials and similarly roads, which are part of the works, will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. • Contractor will arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces. The unloading of materials at construction sites in/close to settlements will be restricted to daytime only.		
11	**Safety During Construction**			
11.1	Increased Accident Risks in Work Zones - Planning for Traffic Diversions and Detours	• Detailed Traffic Management Plans prepared prior to commencement of works on any section of road shall be executed fully. Temporary diversions will be constructed with the approval of the Resident Engineer and Environmental Expert of the PIU . • Detailed Traffic Control Plans will be prepared and submitted to the Environmental Expert of the PIU for approval, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures undertaken for transport of hazardous materials and arrangement of flagmen. • The Contractor will provide specific measures for safety of pedestrians and workers at night as a part of traffic control plans. The Contractor will ensure that the diversion/detour is always maintained in running condition,		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		particularly during the monsoon to avoid disruption to traffic flow. • The contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from PIU 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). • The contractor shall make sure that adequate traffic measures are available especially near sensitive receptors. • The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking flags, lights and flagmen as may be required by the Engineer for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic or closer of traffic on the highway shall be drawn up. • One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. • For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns/lights Temporary diversion shall be constructed with the approval of the Engineer. • The Contractor shall ensure that the running surface is always properly maintained, particularly during the monsoon so that no disruption to the traffic flow occurs. • The Contractor shall take all necessary measures for the safety of traffic during construction. Care shall be taken to ensure that the working conditions for the workers in stone quarries are up to the required standards. • Construction related activity resulting in direct release of criteria pollutants (CO, NO2, SO2, PM2.5, PM10) to be avoided at busy locations at night during winters.		
11.2	Traffic and Safety	• Contractors must familiarize themselves with World Banks Good Practice Note on Road Safety: http://pubdocs.worldbank.org/en/648681570135612401/Good-Practice-Note-Road-Safety.pdf • 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 the PIU 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 MoRTH 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 the Environmental Expert of the PIU .		
11.3	Loss of	• The construction works shall not interfere with the convenience of the public or the access to use and occupation		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
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	Accessibility and Unsafe Access	of public or private roads, railways and any other access footpaths to or of properties, whether public or private. • Temporary access shall be built at the interchange of the project road and other roads. • 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 also ensure that the existing accesses will not be undertaken without providing adequate provisions and to the prior satisfaction of the PIU . • The contractor will take care that the cross roads are constructed in such a sequence that construction work over the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.		
11.4	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 Factories Act, 1948 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 at site are taken up. – The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. – Daily tool box talk will be conducted by safety officer and reported in monthly report by contractor. – Contractor will share grievance redress mechanism and details on procedure with labor as part of induction training • 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 and World Bank's Environment, Health & Safety Guidelines as far as those are applicable to this contract. • The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. • The contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form. • The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		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 PIU and PIU.		
11.5	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.		
11.6	Risk from Electrical Equipment(s)	• The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that - – No material will be so stacked or placed as to cause danger or inconvenience to any person or the public. – All necessary fencing and lights will be provided to protect the public in construction zones. • All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Environmental Expert of the PIU .		
11.7	Emergency Preparedness Plan	• 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. Emergency Preparedness plan prepared by the Contractor will identify necessary actions in the event of an emergency; Emergency plan and numbers will be displayed at the construction site and orally communicated to all labor.		
11.8	Information Signs and Hoardings	• The contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, as required in line with IRC:55 or as suggested by the Environmental Expert of the PIU .		
12	**Management of Water**			
12.1	Loss of Community Water Resources	• Water reservoir enhancement measures shall be provided for community water sources/pond getting impacted to slight degree and falling within the right of way as per the design provided in annexure of specific EMP. • The enhancement measures shall include provision for stepped access to the edge of water, providing flat boulders for washing, stone pitching for slope stabilization etc.		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		• Roadside water reservoir/streams shall also be enhanced as per the design general EMP.		
12.2	Drainage and Flood Control	• Contractor will ensure that no construction materials like earth, stone, ash or appendage disposed off so as not to block the flow of water of any water course and cross drainage channels. • Contractor will take all necessary measures to prevent the blockage of water flow. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert of the PIU to prevent temporary or permanent flooding of the site or any adjacent area.		
12.3	Water logging	• Adequate water-harvesting structures shall be made part of the project design, all along the storm water drains, at appropriate intervals. • The contractor shall provide RCC covered drains in urban locations in areas with high water table for storm water runoff management. The drains shall be connected to proximal culverts.		
12.4	River Training and 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 non-perennial streams shall be undertaken in the dry season. If construction work is expected to disrupt users of community water bodies, notice shall be served well in advance to the affected community. • The contractor will serve notice to the downstream users well in advance to divert the flow of water of any surface water body. Wherever excavation for diverting water flow will take place, contractor will ensure that the slopes are not steeper than 1:2 (vertical: horizontal) otherwise proper slope protection measures will be taken as approved by the Environmental Expert of the PIU . • The contractor will take prior approval of the River Authority or Irrigation Department or PIU for any such activity. The PIU will ensure that contractor has served the notice to the downstream users of water stream in advance.		
12.5	Disruption to other users	• While working across or close to the Rivers, the contractor shall not prevent the flow of water. If for any bridgework, etc., closure of flow is required, the contractor shall seek approval of the Engineer. • The engineer shall have the right to ask the contractor to serve notice on the downstream users of water sufficiently in advance. • Construction work expected to disrupt users and impacting community water bodies shall be taken up after serving notice on the local community.		
13	**Pollution**			
a	**Water Pollution**			
13.1	Water Pollution	• The Contractor will take all precautionary measures to prevent the wastewater generated during construction from		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
	from Construction Wastes	entering into streams, water bodies or the irrigation system. Contractor will avoid construction works close to the streams or water bodies during monsoon. • All waste arising from the project is to be disposed off in the manner that is acceptable to the State Pollution Control Board or as directed by Environmental Expert of the PIU . • The Environmental Expert of the PIU will certify that all liquid wastes disposed off from the sites meet the discharge standards.		
13.2	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 any water body (including stream) adjacent to the RoW and around the stockpiles at the construction sites close to water bodies, specially at km 13.500. 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 road sections which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m. • Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby water course.		
13.3	Slope Protection and Control of Soil Erosion	• Slope protection shall be provided on embankments abutting water bodies by providing stone pitching for slopes b/w 1:4 (V:H) to 1:2 (V:H). Retaining walls shall be provided at high embankments. • 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. • The contractor will take slope protection measures as per design, or as directed by the Environmental Expert of the PIU to control soil erosion and sedimentation through use of dykes, sedimentation chambers, basins, fibber mats, mulches, grasses, slope, drains and other devices. • All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such as no separate payment will be made for them. • Contractor will ensure the following aspects: – 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.		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
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		– 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 horizontals, from the edge of the final section of the bank. please refer to Annex -2 of EIA report. – Along sections abutting water bodies, stone pitching as per design specification will protect slopes. Soil shall be monitored for erosion at select locations as per the monitoring plan mentioned in General EMP.		
13.4	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 lay-out plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by the Environmental Expert of the PIU and PIU. • Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refueling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refueling areas as per the design provided. • 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 PIU and PIU) and approved by the Environmental Expert of the PIU . • All spills and collected petroleum products will be disposed off in accordance with MoEF and state PCB guidelines. • Environmental Expert of the PIU will certify that all arrangements comply with the guidelines of PCB/ MoEF or any other relevant laws.		
13.5	Contamination of Water Resources	• Silt fencing shall be provided along ponds within the direct impact zone intercepting highway to prevent siltation in water body. Such ponds shall not be getting impacted during construction. • Temporary drains shall be prepared to dispose off the eroded sediments and to prevent them from entering the surface water bodies. • To prevent contamination of water resources due to contaminants from construction camps, adequate sewage disposal measures shall be taken care of at construction camps. • Contaminated discharges containing oil/grease contributed by vehicle parking/repair areas and workshops and construction sites shall be collected and treated using oil interceptors. • Construction work close to water bodies shall be avoided during monsoon. The contractor shall ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refuelling sites shall be located at least 1000 m from rivers and stream/reservoir/tanks or as directed by the		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		Engineer. • Both ground and surface water quality shall be monitored as per the monitoring plan at select locations.		
b	**Air Pollution**			
13.6	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 PCB shall be used. Required certificates and consents shall be submitted by the Contractor in such a case. • 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. • All crushers identified to be used in construction shall conform to relevant dust emission control legislation of the respective SPCB. • Clearance for siting shall be obtained from the respective SPCB. Alternatively, only those crushers that are already licensed by the SPCB shall be used. • All Hot mix plants shall be fitted with dust extraction systems SPM value at a distance of 40 m from a unit located in a cluster should be less than 600 microgram/m3. The monitoring is to be conducted as per the monitoring plan. • Excavation and transport of earth shall be done during the daytime only to minimize risks of the spills etc. from the earthwork on the community. • Transport of the soil/earth shall be done by covering the haulage vehicles with tarpaulin or any other good quality material. • Dust suppression measures in the form of water sprinkling on the lime / cement and earth mixing sites, asphalt mixing site and temporary service and access roads. • Traffic detours shall not be located on areas with loose soils. Temporary pavement shall be made by using dismantled pavement material from existing roads. • All construction workers shall be provided with pollution masks to mitigate the effect of dust generation on the health of workers. • Muck shall be transported in covered dump trucks to the project site and shall be directly dumped on the disposal sites. This shall not be stock piled at the project site.		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
13.7	Emission from Construction Vehicles, Equipment and Machineries (Generation of Exhaust Gases)	• All vehicles, plants and machinery used during construction shall conform to the emission standards promulgated under the Environment (Protection) Act, 1986. 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 PCB. • The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to PIU and PIU as per the monitoring plan. • Traffic detours and diversions shall be designed such as to minimize bottlenecks and ensure smooth traffic. • Air pollution monitoring shall be carried out at specified locations as described in the monitoring plan to verify that air pollution norms are being followed by the contractor and the air quality at the construction site does not exceed the prescribed limits. 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 PCB.		
c	**Noise Pollution**			
13.8	Noise Pollution: Noise from Vehicles, Plants and Equipment	• The Contractor will confirm the following: – All plants and equipment used in construction (including the and PIU, MPWD aggregate crushing plant) shall strictly conform to the MoEF/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 and up to the satisfaction of the Environmental Expert of the PIU 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 9.00 pm to 6.00 am. – No noisy 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 9.00 am to 5.00 pm. – Contractor will provide noise barriers to the suggested locations of select schools (at km 5+860, 8+680 & 11+600) / health centers at km 11+950..		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		– Workers in the vicinity of high noise levels must wear ear plugs, helmets and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90 dB(A). – Blasting operations, if required shall be undertaken so as to produce minimum vibrations in sensitive areas. – Traffic management plans prepared during construction mobilization period shall also be implemented during construction stage. Effective traffic management shall especially be taken care of in sensitive locations, major built-up areas and along important highway junctions. – Asphalt mixing sites and the batching plants should be at a distance of at least 200 m from sensitive receptor locations. – Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to PIU and PIU. Environmental Expert of the PIU will be required to inspect regularly to ensure the compliance of EMP.		
14	**Land/Soil Pollution**			
14.1	Contamination of Soil	• Fuel shall be stored in proper bounded and covered areas. • All spills and collected petroleum products shall be disposed off in accordance with the guidelines framed by Ministry of Environment, Forests &, Climate Change and State Pollution Control Board. • Maintenance and refuelling of vehicles, machinery and other construction equipment shall be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. • An "Oil Interceptor" shall be provided for wash down and refuelling areas. • Debris generated due to the dismantling of the existing road shall be suitably reused in the proposed construction, subject to the suitability of the materials and approval of the Engineer as follows: – The sub-grade of the existing pavement shall be used as embankment fill materials – The existing base and sub- base material shall be recycled as sub-base of the haul road or access roads – The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites, temporary traffic diversions, haulage routes etc. – The contractor shall suitably dispose off un-utilized debris materials including spoils of material unsuitable for embankment; either through filling up of borrow area located in wasteland or at pre-designated dump locations, subject to the approval of the Engineer. – At locations identified for dumping of residual bituminous wastes, the dumping shall be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. – The contractor shall ensure that the surface area of such dumping pits is covered with a layer of preserved topsoil.		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		– All arrangement for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary shall be considered incidental to the work and shall be planned and implemented by the contractor as approved and directed by the Engineer. – The pre-designed dump locations shall be a part of comprehensive solid waste management plan to be prepared by Contractor in consultation with Engineer. – 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. The contractor shall identify dumping sites. The identified locations shall be reported to the Engineer. Location of dump sites shall be finalised prior to earth works on any particular section of the road. – No fly ash shall be disposed in any disposal site. Care shall be taken to return the remaining fly ash after construction work to the source or to use it in construction of embankment elsewhere with proper construction measures. IE shall keep strict vigil on this aspect. – Non-bituminous wastes other than fly ash may be dumped in borrow areas covered with a layer of the conserved topsoil. No new disposal sites shall be created as part of the project, except with prior approval of the Engineer. – All waste materials shall be completely disposed and the site shall be fully cleaned before handing over. – Soil shall be monitored for contamination as per the monitoring plan at locations to be identified by the Engineer. The Engineer shall certify the site after approval. – The contractor at his cost shall resolve any claim arising out of waste disposal.		
15	**Flora and Fauna: Plantation/Preservation/Conservation Measures**			
15.1	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 80 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 Project Authority. • The Environmental Expert of the PIU will inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.		
15.2	Flora and Chance found 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. 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 the PIU and carry out the PIU 's instructions for		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		dealing with the same. IE shall be responsible to intimate the wildlife protection authorities in the area. • The Environmental Expert of the PIU 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.		
16	**Archaeological Resources and Cultural Properties**			
16.1	Chance Found Archaeological Property	• All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. • The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the • Environmental Expert of the PIU of such discovery and carry out the PIU 's instructions for dealing with the same, waiting which all work shall be stopped. • The PIU will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.		
16.2	Impact/s on Cultural/Religious Properties	• All necessary and adequate care shall be taken to minimize impact on cultural properties which includes cultural sites and remains, places of worship including temples and shrines, etc., graveyards, monuments and any other important structures as identified during design. All conservation and protection measures shall be taken up as per design. Access to such properties from the road shall be maintained clear and clean.		
17	**Labor Camp Management**			
17.1	Accommodation	• For labor camp establishment, adherence to World Banks Worker Accommodation Processes and Standards: http://documents.worldbank.org/curated/en/604561468170043490/pdf/602530WP0worke10Box358316B01PUBLIC1.pdf • 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 labour camp. • The location, layout and basic facility provision of each labour camp will be submitted to PIU and PIU prior to their construction. • The construction will commence only upon the written approval of the Environmental Expert of the PIU . • The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the PIU .		
17.2	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.		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		• 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. • The contractor will also guarantee the following: a) Supply of sufficient quantity of potable water (as per IS) in every workplace/labor camp site at suitable and easily accessible places and regular maintenance of such facilities. b) If any water storage tank is provided that will be kept such that the bottom of the tank at least 1mt. from the surrounding ground level. c) If water is drawn from any existing stream/reservoir/well, which is within 30mt. proximity of any toilet, drain or other source of pollution, the water from source will be disinfected before water is used for drinking. d) All such wells will be entirely covered and provided with a trap door, which will be dust proof and waterproof. e) A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. f) Testing of water will be done every month as per parameters prescribed in IS 10500:1991. g) Environmental Expert of the PIU will be required to inspect the labour camp once in a week to ensure the compliance of the EMP.		
17.3	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 places (refer to Annex -3 of EIA for details) – 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 – all toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition – night soil is to be disposed off by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight.		
17.4	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 the PIU • Unless otherwise arranged by local sanitary authority, arrangements for disposal of night soils (human excreta)		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		suitably approved by the local medical health or municipal authorities or as directed by Environmental Expert of the PIU will have to be provided by the contractor.		
17.5	Health and Hygiene Impacts on Construction Camps	• The contractor shall provide erect and maintain necessary (temporary) living accommodation and ancillary facilities for labour up to living standards and scales approved by the IE at the locations identified for such facilities in pre-construction phase. • The contractor shall also guarantee the following: – Supply of sufficient quantity of potable water (as per IS) in every work place/labour campsite at suitable and easily accessible places and regular maintenance of such facilities. – If any water storage tank is provided it shall be kept at a distance of not less than 15m from any latrine drain or other sources of pollution. – If water is drawn from any existing reservoir which is within close proximity of any latrine, drain or other source of pollution the well shall be disinfected before water is used for drinking. – All such reservoir shall be entirely covered and provided with a trap door, which shall be dust proof and waterproof. – A reliable pump shall be fitted to each covered well. The trap door shall be kept locked and opened only for cleaning or inspection, which shall be done at least once a month. – Testing of water shall be done every month as per parameters prescribed in IS 10500:1991. – Engineer shall be required to inspect the labour camp once in a week to ensure the compliance of the EMP. – Contractor shall be responsible for proper functioning and management of sanitation and sewage system as per applicable national and state regulations. – All latrines shall be provided with dry-earth system (receptacles), which shall be cleaned at least four times daily, and at least twice during working hours and kept in a strict sanitary condition. Receptacles shall be tarred inside and outside at least once a year. – Adequate health care is to be provided for the work force. On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer. – Labour from outside of state will be managed as per Labour Management Plan and Gender Management for the project given in SIA report for the project.		
17.6	Deterioration of indoor air quality and risk of water borne diseases	• It shall be the responsibility of the contractor to make adequate provisions for workers at labour camps under the Factories Act, 1948. Dwelling units shall be supplied with clean fuel for domestic purpose. Generation of carbon monoxide under any circumstance shall not be allowed. • Contractor shall make sure that no water stagnation happens in the vicinity of construction camp as well as		

S.No.	Environmental Issue / Component	Management Measures	Institutional Responsibility	
			Planning	Supervision
		anywhere along the project stretch to prevent spread of malaria & other water borne diseases		
18	**Contractor's Demobilization**			
18.1	Clean-up Operations, Restoration and Rehabilitation	• Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of the PIU . 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 PIU . • All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by Environmental Expert of the PIU in a layer of thickness of 75 mm-l50 mm. • All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's expense, to the entire satisfaction to the Environmental Expert of the PIU .		
19	Cumulative Impacts			
19.1	Mitigation	• Mitigation: (a) Regulating traffic and avoidance of construction during the elephant movement during the construction phase; (b) Regulating traffic and warning of road users during the operational phase; (c) Ensuring that land use conversion for plantations, processing zones and solar projects are given taking into account elephant corridors.		
19.2	Monitoring	• Monitoring: (a) Monitoring of elephant herd movement in the aforesaid locations during the construction phase by the PWD & contractors; (b) Monitoring of herd movement upfront in the wildlife sanctuary by the Forest & Environment Department in order to give the PWD advance intimation.		
19.3	Supervision	• Supervision mechanism: (a) Forests and Environment Department and PWD to coordinate about elephant herd movement during construction & operational phase; (b) Agriculture Department for regulating the issuance of permission for expanding plantations, and setting-up of processing facilities; (c) ADCs for regulating the issuance of permission for community solar PV power.		

8.2 Environmental Monitoring Plan

The Environmental Monitoring programme is integral to ensuring that management and mitigation measures are implemented effectively and lays out the roles and responsibilities for monitoring and reporting on environmental safeguards progress, issues, compliance and non-compliance.

- Environmental condition indicators to determine efficacy of environmental management with respect to impacts on identified valued environmental components (VEC)
- Environmental condition indicators to determine efficacy of environmental management with respect to air, noise, water and soil pollution.
- Environmental management indicators to determine compliance with the suggested environmental management measures
- Operational performance indicators have also been devised to determine efficacy and utility of the proposed mitigation measures

Environmental Safeguards Monitoring Checklist to be implemented by Environmental Expert, PIU and signed off by Engineer In charge

Pre- Bid (Biodiversity and Critical Habitat Impact Assessment)			
S No	Indicator	Description	Reporting/ Action/ Responsibility
1	Detailed Biodiversity Assessment by regional experts and species specialists	• Critical Habitat assuagement where EIA has identified that the road is within 10 kms of an area of high biodiversity such as wildlife sanctuary, national park or presence of rare, endangered and threatened (RET) species or Schedule 1 species are noted • Cumulative impacts, of project impacts on Valued Environmental Components (VECs) such as critical habitat, natural habitat and any RET species	Critical Habitat – Yes/ No If No, design of appropriate biodiversity management and mitigation measures update EMP and Bid documents share, with World Bank and proceed for regulatory clearances If Yes, based on assessment determine whether the road will lead to significant and irreversible impacts on critical habitat – Yes/ No and if Yes, decision to not proceed with the road by Engineer in-charge, PIU communicated to World Bank. If No, proceed with regulatory clearances.
2	Regulatory Clearance	• State Wildlife Board and SEIAA Environmental Clearance	Yes/ No If Yes, Proceed with Bid and Pre-Construction Activities If No, decision to not proceed with the road by Engineer in-charge, PIU communicated to World Bank
3	Identification of additional mitigation measures and design of natural/ habitat related solutions, engineering measures and offsets (if required)	• Biodiversity Action Plan • Species Specific Action Plan (eg Elephant Action Plan or Hoolock Gibbons Action Plan) • Engineering Measures	Update EIA and include all measures identified within EMP

4	Disclosure	• Disclosure of EIA and Executive Summary in local language (Garo in West Garo Hills) online and at District Commissioner Office (Tura) and PWD district office and Village Employment Council offices.	Engineer in-charge, PIU

Pre-Construction			
S. No	Indicator	Description	Reporting/ Action/ Responsibility
1	Occupational Health and Safety and Community Health and Safety Aspects Planned	OHS and associate documents complete: Site Establishment Plan Health and Safety Plan Emergency Preparedness Plan Chance Finds Procedure Traffic Management Plan	Contractor to Submit and Environmental and Social Expert to review; Engineer in-charge to Approve and share with World Bank
2	Authorized Stone Quarries that meet Environmental and Social Standards in Project Area Identified	Authorized Quarries that meet environmental and social standards and technical specifications identified and supply chain with contractor established Quarries adhere to World Bank Environmental Health and Safety Guidelines Environmental safeguards: Stone Quarries have the necessary clearances from Department of Mining and Geology Pollution Control Board and Forest Department Quarry should not be operating in any sites of valuable critical or natural habitat Quarry should not be operating in landslide or erosion prone zones Quarry should not disrupt drainage pattern or cause water pollution Quarry should not be operating on the road where operations can disrupt traffic or pose safety risks Where possible, quarry must include a rehabilitation plan Quarry workers have access to Personal Protective Equipment during operations Quarry workers do not employ child labour	Environmental and Social Expert of PIU to monitor if authorized quarries adhere to World Bank EHS Standards and OP 4.04 and 4.36. Engineer in-charge to approve sources.
3	Authorized Sources of Sand Mining	Authorized Sources of Sand that meet environmental and social standards and technical specifications identified and supply chain with contractor established Sources of Sand adhere to World Bank Environmental Health and Safety Guidelines Environmental safeguards: As per the Meghalaya Minor Minerals Concession Rules, 2016 (MMMCR), sand mining is treated as a quarry which requires a permit from the Divisional Forest Officer and	Environmental and Social Expert of PIU to monitor if authorized quarries adhere to World Bank EHS Standards and OP 4.04 and 4.36. Engineer in-charge to approve sources.

		the Principle Chief Conservator of Forest & HOFF of the Forest Department. Permission will not be allowed during the month from June to August, since it is breeding season for the aquatic life. Source of sand should not be from sites of critical or natural habitat, fish spawning sites, nesting sites or have the presence of known herpetofauna. In case source of sand is from a river bed, the following should be ensured: Sand removal rates, and processes of collection and transportation should not cause any changes to channel morphology, increased erosion, impact to aquatic or riparian habitats, decrease in flood control properties of the sand bank or pollute the river. Sand removal incisions should not be from sites that could undermine the stability of support structures such as bridges Sites should not lead to the creation of deep pools that could lead to an increase in vector borne disease Sand mining operators have access to appropriate Personal Protective Equipment during operations Mining operations should not impact other riparian livelihoods such as fishing Sand mining operations should not employ child labour	
4	Water	Sources of water for construction and related project activity to identified, where possible construction of tanks and check dams to be created in consultation with community as community assets Contractor applied for permit for groundwater abstraction or local community permission for use of stream water Source of water should be verified by the Environment expert	Contractor to identify and environmental expert, PIU to verify and Engineer in-charge to approve
5	Siting and facilities in Contractors Camp	Contractors Camp site selected and established with adherence to World Bank Environmental Health and Safety Guidelines and Construction Camp Management Guidelines	Contractor to Implement; Environmental and Social Expert of PIU to monitor
6	Adequacy of cross drainage structures	The adequacy of cross drainage structure should be checked not only from the hydraulic perspective but also whether the location and number of culverts for efficiency in removing water from the different micro-catchment along the alignment, as well as passage of fauna and aquatic species where present, so that the embankment does not impede on the movement of water or there is no back flow.	Environment Expert to monitor and Engineer in-charge to approve

8	Trees and Ground Flora and site clearance and rehabilitation	Ensuring that only the trees identified in permits are cleared; Species identification and restoration plan prepared, including nursery identification and sites for plantation in partnership with Forest Department and ADCs.	Contractor to prepare, Environment Expert to monitor and Engineer in-charge to approve
9	Schools, Hospitals and community sensitive receptors	Design includes mitigation measures for noise and safety of children in front of Schools; Safety and decongestion measures for weekly market incorporated in design such as parking and barricades. Noise attenuation measures and installation of sound barriers at community receptors such as schools, hospitals and churches	Contractor to prepare, Environment Expert to monitor and Engineer in-charge to approve
10	Review of Design for landslide/ erosion prone locations	Engineering and bioengineering measures incorporated in erosion prone zones, community awareness on tree and shrub species for reducing erosion in erosion and landslide prone areas in private/ community lands.	Contractor to prepare, Environment Expert to monitor and Engineer in-charge to approve;
Construction Phase			
11	Prevention of pollution	Air Quality Monitoring carried out by the Contractor PM10, and PM2.5, SOx, NOx, CO (Quarterly - including once prior to start of work) Water Quality upstream and downstream (Quarterly) - test for General parameters and Oil and grease Soil Quality – at workshop and bitumen storage area (Quarterly) Dust suppression activities carried out by the Contractor using the prescribed dust suppressant Construction site – equipment and emission from machinery within standards/norms Safe discharge of solid and liquid waste from labour camps and construction site Safe disposal of excavated materials and other construction wastes at designated sites (Bi-weekly reports from contractor on the above)	Contractor to Implement, Environmental Expert to monitor and Engineer in-charge to approve
12	Design Features	Implementation of engineering and bioengineering measures in erosion and landslide prone zones Adequacy of culverts to maintain natural drainage and enable the passage of faunal and aquatic species	
12	Site clearance and Rehabilitation	Only trees and ground flora identified in approved design cleared Compensatory plantation undertaken Care and safe storage of top soil for later Use (Bi-weekly reports)	Contractor to Implement, Environmental Expert to monitor and Engineer in-charge to approve
13	Community Receptors and Community Health and Safety	Equivalent Day & Night Time Noise Levels at important community receptors within limits Noise monitoring carried out by the Contractor (quarterly)	Contractor to Implement, Environmental Expert to monitor and Engineer in-charge to approve

		Community facilities protected with safety measures as identified in DPR, traffic management plan and health and safety plan Community facilities such as telephone lines, bus stops etc impacted restored to original state (Bi-weekly report)	
14	Usage of Water for Construction	Water use from authorized sources; No obstruction/ conflict to community sources of surface water (Bi-weekly report)	Contractor to Implement, Environmental Expert to monitor and Engineer in-charge to approve
15	Procurement of construction material Aggregate, Sand from approved authorized quarries	Procurement of materials from authorized quarries, maintenance of bi-weekly reports	Contractor to Implement, Environmental Expert to monitor and Engineer in-charge to approve
16	Occupational Health and Safety	Appropriate Personal Protective Equipment used Trafic Safety and Site management plan under implementation Awareness of Health and Safety Plan and Emergency Preparedness Plan among contractors team and labourers	Contractor to Implement, Environmental Expert to monitor and Engineer in-charge to approve
Operation Phase			
17	Design features, Road Safety Measures and measures on valued environmental components (VECs) functioning	Drainage, Speed Control measures, Traffic calming measures, Signage, etc functioning as planned; Rehabilitation successful Biodiversity management plan (if proposed) implemented Compensatory tree plantation completed	Environmental Expert to monitor and Engineer in-charge to approve

Monitoring Reports

S No	Report Description	Frequency	Responsibility
1	Pre-Bid Clearance Report Detailed biodiversity management measures incorporated into bid document, and environmental and wildlife clearance received	One-time	Based on external assessment by regional biodiversity experts and species specialists, Environmental Expert and Engineer in-charge to integrate into bid documents and EMP.
2	Pre-Construction Clearance Report including - Occupational Health and Safety plan and associated documents - Contractor camp establishment plan - List of Authorized sources for raw materials in project area that follow World Bank OPs and EHS guidelines - Arrangement and permissions for Water (Ground water or community water source)	One-time	Contractor to submit, environmental expert to vet and engineer-in charge to approve and share with the World Bank
3	Construction Phase Monitoring Report - Pollution prevention measures	Bi-weekly and Quarterly	Contractor to submit bi-weekly reports;

	- Procurement from approved authorized sources -		Environmental and social specialist to consolidate and prepare quarterly reports
4	Operation Phase Monitoring Report - Road safety - Traffic control - Effectiveness of bio-engineering and engineering measures for biodiversity, erosion prone zones and drainage	Quarterly	Environmental and social specialist to prepare quarterly reports
5	Incidents Report – In case of triggering of Emergency Preparedness plan due to spills, accidents, fatalities, disease outbreaks, human-wildlife conflict, landslides, contractor to take the necessary measures and inform the Engineer-in charge; Action taken report to be prepared after the incident	On incident, occurring (immediately)	Contractor to inform Engineer-in charge who should in-turn inform the World Bank

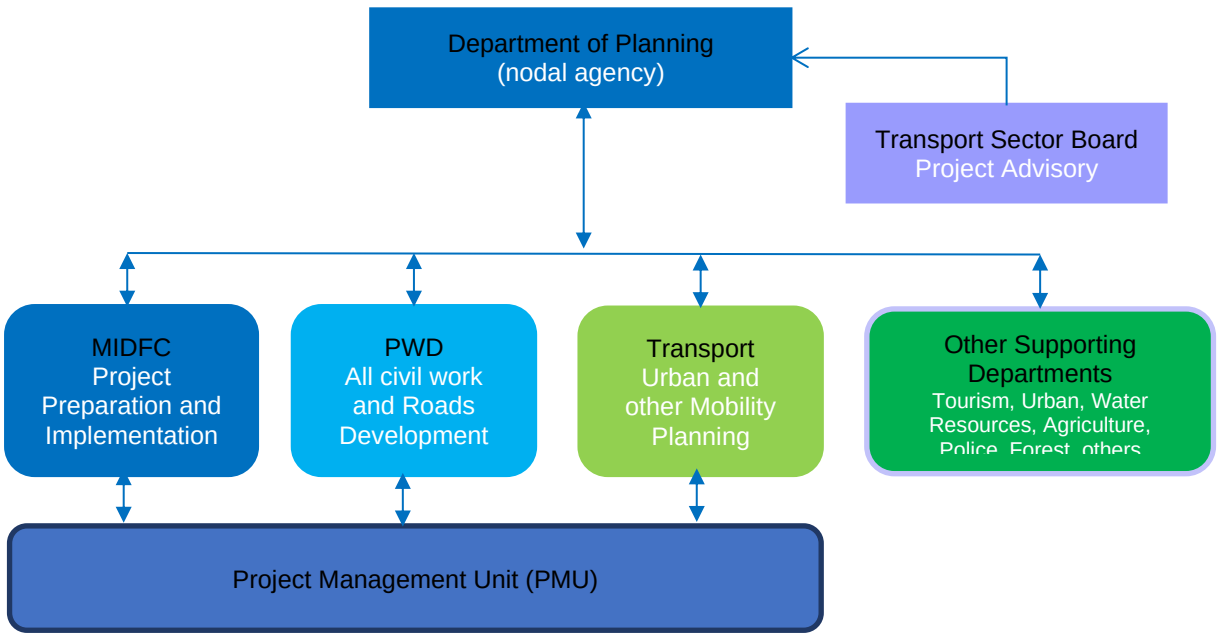
9. Implementation Arrangement

The project has an integrated approach which will extend to ensuring the integration of environmental and social safeguards. The project activities will be implemented by agencies: Public Works Department (PWD), Urban Affairs (UA) Department, Department of Tourism, Transport Department and Community and Rural Development Department.

All civil works component will be implemented mainly by PWD, and involvement UA and Transport departments will be mainly for the technical assistance and pilot projects on improving mobility. When functional, the Transport Sector Board will also be constituted to provide high level policy guidance and oversight for project implementation.

Meghalaya Infrastructure Finance Development Corporation (MIFDC) set up under the Planning Department will be responsible for overall planning, coordination, implementation and monitoring of the project along with various departments. It will also be responsible for mobilizing private sector finance for the development works. The State Planning Department will be the nodal department for the Project. MIDFC will be responsible for overall planning and implementation of the entire project.

Figure 8: Institutional Set-up for project implementation



9.1 Establishment of an Environmental and Social cell within the PWD

The Public Works Department of Meghalaya, the agency in charge of all civil works will have the main responsibility for environmental and social safeguards and an 'Environmental and Social Cell' will be established within the department. This cell will be headed by an Executive Engineer level officer. He/she will be supported by environmental and social expert consultants to facilitate support, capacity building and training to all staff and contractors engaged in the project. Along with the Centre of Excellence the cell will (a) promote the use of environment

friendly and climate resilient road construction (b) mainstream environmental and social safeguards into the DPRs of roads and other infrastructure work (c) integrate the promotion of environment, health and safety (EHS) best practice within contract conditions/ bidding document and (d) implement locally appropriate environment mitigation solutions on water use, slope stabilization/ bio-engineering measures in landslide prone areas, re-use of debris and rehabilitation of material sources.

The cell will monitor and address indirect and cumulative impacts, such as land use conversion, illegal logging, unsustainable tourism by working with the wider project departments such as Community and Rural Development, Tourism, Water Resources, and Urban.

Roles and Responsibilities

The roles and responsibilities of the different officers and professionals involved in the implementation of the environmental safeguards are presented in Table

Roles and Responsibilities for implementation of Environmental Safeguards

S.No.	Position	Responsibilities
1	Chief Engineer (PMU)	• Overview of the project's compliance to Bank's and national laws and regulations • Oversight of the EHS requirements to be integrated in the Project formulation, implementation and formulation e.g. design, bid documents and contract • Ensure that sufficient funds are available for implementation of all agreed Environmental safeguards measures. • Review of environment monitoring and audit findings, grievance associated with environment during each of the project review • Submit annual safeguards monitoring reports to the Bank and closure of the observations made by the Bank. • Review of the annual environmental audit and approve of the mitigation of the EMP if any new or unanticipated environmental impacts occur during project implementation due to design change or other reasons • In case of significant new or unforeseen impacts, immediately inform Bank to make a decision on the same besides updating relevant project reports.
2	Environment and Safety Expert (PMU)	• Ensure that project meets the statutory requirement and Bank's requirement; • Recommend for approval to PMU all document and ensure that design and documents include all relevant EHS Safeguards • Recommend for approval to PMU the Contractor's Environmental Management Plan after approval of the Engineer in charge of the PMC; • Review the environmental performance of the project through Monthly Reports • Environmental Audits reports submitted by the Project Management Consultants and report to the Management; • Carry out quarterly environmental audits and report back to the management • Review Corrective Action Plan for closure of the Environmental Audit Findings • Overall coordination and management through PIU supported by PMC and Authority Engineer for implementation of Environment Safeguards.

S.No.	Position	Responsibilities
		• Review and action on all grievance related to environment through the Grievance Redress Mechanism. • Prepare the Annual Safeguards Monitoring &closure Reports to the Management for review and onwards submission to the Bank and its closure; • Review of all the finding in the monitoring and auditing report and ensuring corrective action are implemented so that it does not reoccur; • Updating of the EMP if any new or unanticipated environmental impacts occur during project implementation due to design change or other reasons • Organise training for Capacity building of the PMU and the PIU for effective implementation of safeguard requirements
3	Engineer in-charge (PMU)	• Ensure that Contractor is in compliance with all the statutory requirement and the Safeguard requirement mentioned in the EMP. • Review and approve Contractors OHS Plan and associated documents • Review and approve the Contractor's EMP Implementation Plan; • Ensure that the weekly environmental reports are compiled by Contractor, reviewed and submitted to PMC; • Carry out any specialized designs which would be required for the environmental safeguards; • Facilitating the Contractor to obtain necessary permissions/ approvals and its submission to PMC • Directly interact with aggrieved persons and record their views and grievances in the Grievance Management System. • Work with the contractor to ensure grievances if any at field level is resolved • Review and approve the package specific EMP's and make necessary modifications if required. • Ensure that all mitigation measures as given in the EMP are implemented properly by the Contractor during the study. • Conduct weekly environmental monitoring of all project during pre-construction, construction and operation phases. • Ensure monthly, quarterly and annual environmental monitoring reports are prepared and submitted to PMC. • Work with the Contractor and PMC for preparation of the environmental corrective actions on audit observations
4	Environmental Engineer (Contractor)	• Responsible for integration of the mitigation measures proposed in the Environmental Management Plans (EMP) associated with the construction activities into the construction processes. • Responsible for daily monitoring of the environmental compliance and submission of the information to the Authority Engineer. • Preparation of Contract Specific management and submission of the same to the Authority Engineer for approval. • Ensure that adequate budget provisions are made for implementing all mitigation measures specified in the Contract specific EMP. • Participate in induction training on EMP provisions and requirements delivered by the PMU and carry out the same for all contract staff. • Carry out liasoning with the regulatory agencies for necessary environmental license(s), permits etc. • Assist the PIU with support required for obtaining necessary environmental permits • Participate in resolving issues as a member of the Grievance Redressal Cell. • Respond promptly to grievances raised by the local community or and implement corrective actions.
5	Health and Safety Office	• Responsible for ensuring integration of the health and safety aspects in the work processes associated with the construction activities.

S.No.	Position	Responsibilities
	(Contractor)	• Responsible for day -to day monitoring of the occupational health and safety performance and submission of the information to the Authority Engineer. • Preparation of a Safety Plan and submission of the same to the Authority Engineer for approval. • Participate in induction training on EMP provisions and requirements delivered by the PMU and carry out the same for all contract staff. • Carry out Construction safety Audits and report it to the Team Leader of the Contractor. • Assist the PMC with the health safety performance of the project • Respond promptly to grievances raised by the local community for the safety and implement corrective actions.

9.2 Training and Capacity Building

Training and capacity building would be required especially for the PMU staff associated with the project as the Environmental Safeguards would be a relatively new area which the staff are required to handle. The training and capacity building would not only be project specific but would also target and develop long term capacities in the PWD Division. The training program would include:

- Sensitisation Training: Introducing World Banks Safeguards standards including aspects of EHS, OHS, Community health and safety and integration of biodiversity aspects.
- Orientation Training: Introducing the Environmental safeguards to the PMU staff and making them aware of the key principles of environmental safeguards
- Detailed Training: aimed at the PMU staff to make them aware of the detailed activities which needs to be implemented and enforced during the EMP Implementations
- Refresher Training: this would be a need-based training organized to rectify the shortcomings identified during the Monitoring
-

9.3 EMP Estimated Implementation Budget for project road section

General Measures akin to Good International Industry Practice (GIIP) considered incidental to works are deemed to be included in the quoted bid price by the contractor. However, certain road specific mitigation measures and/or environmental enhancement measures, considered as additional requirements are to be implemented by the contractor against budget provisions. The mitigation and management measures including the budgetary provisions for project road specific mitigation measures and/or environmental enhancement measures will be integrated in the bidding documents as mandatory contractual obligations the contractor is expected to be fully conversant with the road specific mitigation and management measures during project road construction and make required provisions for implementing EMP at the bidding stage itself.

ESMP Works to be implemented as per Civil Works BOQ

S No	Description	Reference	Amount
1	Embankments	BOQ 3	Cost included in civil works
2	Drainage and Protective Works including Box culverts	BOQ 6,7	Cost included in civil works
3	Traffic and Safety Measures: Signs, Markings and Other road appurtenances; Bus Bay and Truck Lay By	BOQ 8 and BOQ 9	Cost included in civil works
4	Utility Shifting	BOQ 11	Cost included in civil works
5	Clearing of roadside vegetation and debris and cutting of trees	BOQ 2	Cost included in civil works

Budgetary Provisions for Specific Environmental Impact Mitigation / Enhancement Measures (additional Requirements to be implemented by Contractor and PIU against budget)

S No	Measure	Description	Amount (INR)
1	Biodiversity Conservation	Implementation of Elephant Management Plan including engineering and habitat management measures, bio-fencing, solar fencing, thermal detection, camera traps etc.	To be provided in Biodiversity management plan with break up on budget and responsibility for contractor, PMU
2	Development of Water Source	Tanks and Check dams	10,00,000
3	Enhancement measures for river bank (Vertiver Bioengineering and Reed Bed)	Furnishing and laying of the live sods of perennial turf forming grass on embankment slope, verges or other locations shown on the drawing or as directed by the engineer including preparation of ground, fetching of sods and watering complete as per MORT&H technical specifications 307.	4,58,628
4	Bio-engineering measures in erosion prone zones	Vegetated Bamboo Crib Wall during construction, other Bio-engineering measures	86,03,000
5	Plantation and maintenance	54x10 trees and their maintenance	6,75,000 (Cost shall be paid by PIU to Forest Dept/ADCs)
6	Monitoring Cost as per CPCB norms	Air Quality, Monitoring near all hot mix plant locations approved by the Engineer as per NAAQS, 2009 CPCB and Monitoring at construction sites in tandem with construction Engineer as per NAAQS, 2009 CPCB Water Quality At locations specified in the monitoring plan as per IS10,500 and IS2296 (Construction)	9,20,000

		At four locations specified in the Monitoring Plan as per IS 10,500 and IS 2296 (Operation) and Noise At equipment yards as directed by the Engineer as per CPCB guideline 1989	
7	Dust Suppression Measures	Water Sprinkling and use of dust binders/ other dust suppressant materials (in periods of water scarcity)	3,60,000
8	Capacity building of contractor/ PWD to undertake measures in VECs		Cost borne by PWD
			120,16,628
9	Contingencies	@10%	1201663
GRAND TOTAL			132,18,291

Annexures

Annex 1- Checklist of Biodiversity from Field Survey

CHECKLIST OF BIRDS

	Common Name	Scientific name	IUCN status	WPA1972 Schedule
1	Ashy Wood Swallow	*Aratamus fuscus*	Least concern	Schedule IV
2	Asian koel	*Eudynamys scolopaceus*	Least concern	Schedule IV
3	Asian Openbill Stork	*Anastomus oscitans*	Least concern	Schedule IV
4	Barn Swallow	*Hirundo rustica*	Least concern	Schedule IV
5	Black Drongo	*Dicrurus macrocercus*	Least concern	Schedule IV
6	Black Hooded Oriole	*Oriolus xanthornus*	Least concern	Schedule IV
7	Black Kite	*Milvus migrans*	Least concern	Schedule IV
8	Blue tailed Bee eater	*Merops philippinus*	Least concern	Schedule IV
9	Blue Throated Barbet	*Psilopogon Asiaticus*	Least concern	Schedule IV
10	Bronzed Drongo	*Dicrurus aeneus*	Least concern	Schedule IV
11	Brown Shrike	*Lanius cristatus*	Least concern	Schedule IV
12	Cattle Egret	*Bubulcus ibis*	Least concern	Schedule IV
13	Chestnut Tailed Starling	*Sturnia malabarica*	Least concern	Schedule IV
14	Cinereous Tit	*Parus major*	Least concern	Schedule IV
15	Common Iora	*Aegithina tiphia*	Least concern	Schedule IV
16	Common Kingfisher	*Alcedo atthis*	Vulnerable	Schedule IV
17	Common Myna	*Acridotheris tristis*	Least concern	Schedule IV
18	Common Stonechat	*Saxicola torquatus*	Least concern	Schedule IV
19	Common Tailor Bird	*Orthothomus sutorius*	Least concern	Schedule IV
20	Coppersmith Barbet	*Psilopogon haemacephalus*	Least concern	Schedule IV
21	Creasted Serpent Eagle	*Spilornis cheela*	Least concern	Schedule IV
22	Crimson Sunbird	*Aethopyga siparaja*	Least concern	Schedule IV
23	Eurasian Tree Sparrow	*Passer montanus*	Least concern	Schedule IV
24	Golden Fronted Leafbird	*Chloropsis aurifrons*	Least concern	Schedule IV
25	Great Myna	*Acridotheres grandis*	Least concern	Schedule IV
26	Greater Goldenback	*Chrysocolaptes guttacristatus*	Least concern	Schedule IV
27	Greater Necklaced Loughfingthrush	*Pterorhinus pectoralis*	Least concern	Schedule IV
28	Green Bee eater	*Meros orientalis*	Least concern	Schedule IV
29	Grey Backed Shirke	*Lanius tephronotus*	Least concern	Schedule IV
30	Grey Headed Canary Flycatcher	*Culicicapa ceylonensis*	Least concern	Schedule IV
31	Grey Headed Lapwing	*Vanellus cinereus*	Least concern	Schedule IV
32	House Sparrow	*Passer domesticus*	Least concern	Schedule IV
33	Indian Pond Heron	*Ardeola grayii*	Least concern	Schedule IV
34	Indian Rollar	*Coracias benghalensis*	Least concern	Schedule IV
35	Jungle Babler	*Turduides striata*	Least concern	Schedule IV
36	Jungle Crow	*Corvus macrorhynchos*	Least concern	Schedule IV
37	Lesser Goldenback	*Dinopium benghalense*	Least concern	Schedule IV
	Woodpecker			
	Lesser Necklaced			

38	Loughfingthrush	*Garrulax monileger*	Least concern	Schedule IV
39	Liniated Barbet	*Megalaima Liniata*	Least concern	Schedule IV
40	Little Cormorant	*Microcarba niger*	Least concern	Schedule IV
41	Little Pied Flycatcher	*Ficedula westermanni*	Least concern	Schedule IV
42	Longtail Shrike	*Lenius schach*	Least concern	Schedule IV
43	Oriental Honey-Buzzard	*Pernis ptilorhynchus*	Least concern	Schedule IV
44	Oriental Magpai Robin	*Copsychus saularis*	Least concern	Schedule IV
45	Oriental White Eye	*Zostrops palpebrosus*	Least concern	Schedule IV
46	Paddy Field Pipit	*Anthus rufulus*	Least concern	Schedule IV
47	Red Breasted Parakeet	*Psittacula alexandri*	Near Threatened	Schedule IV
48	Red Collered Dove	*Streptopelia semitorquata*	Least concern	Schedule IV
49	Red Vented Bulbur	*Pycnonotus cafer*	Least concern	Schedule IV
50	Red Watled Lapwing	*Vanellus indicus*	Least concern	Schedule IV
51	Rufous Treepie	*Dendrocita vagabunda*	Least concern	Schedule IV
52	Scally Breasted Munia	*Lonchura punctulata*	Least concern	Schedule IV
53	Shikra	*Accipiter badius*	Least concern	Schedule IV
54	Small Minivet	*Pericrocotus cinnamomeus*	Least concern	Schedule IV
55	Spotted Dove	*Spilopelia chinensis*	Least concern	Schedule IV
56	Spotted Owlet	*Athene brama*	Least concern	Schedule IV
57	Sprangled Drongo	*Dicrurus hottentottus*	Least concern	Schedule IV
58	White Breasted Waterhen	*Amaurornis phoenicurus*	Least concern	Schedule IV
59	White Wagtail	*Motacilla alba*	Least concern	Schedule IV
60	White-throated Kingfisher	*Halcyon smyrnensis*	Least concern	Schedule IV
61	White Rumped Munia	*Lonchura striata*	Least concern	Schedule IV
62	Jungle myna	*Acridothers fuscus*	Least concern	Schedule IV
63	Large cuckooshrike	*Coracina dobsoni*	Near Threatened	Schedule IV
64	lesser racquet tailed drongo	*Dicrurus remifer*	Least concern	Schedule IV
65	Greater Racquet tailed Drongo	*Greater Racquet tailed Drongo*	Least concern	Schedule IV
66	Greater Coucal	*Centropus sinesis*	Least concern	Schedule IV
67	Rose Ringed Parakeet	*Psitaculla krameri*	Least concern	Schedule IV
68	Black crested bulbul	*Pycnonotus flaviventris*	Least concern	Schedule IV
69	yellow footed green pigeon	*Treron phonicoptera*	Least concern	Schedule IV
70	Ashy minivet	*Pericrocotus divaricatus*	Least concern	Schedule IV
71	Greaternecklaced laughingtrush	*Garrulax pectoralis*	Least concern	Schedule IV
72	Lessernecklaced laughingtrush	*Garrulax monileger*	Least concern	Schedule IV
73	Fulvous breasted woodpecker	*Dendrocorpus macei*	Least concern	Schedule IV
74	Baya weaver	*Ploceus philippinus*	Least concern	Schedule IV

CHECKLIST OF BUTTERFLIES

SI No.	**Common Nanme**	**Scientific name**	**IUCN status**	**WPA1972 Schedule**
1	Common bush brown	*Mycalesis janardana*	Least Concern	Schedule IV
2	Common Castor	*Ariadne merione*	Not Evaluated	Schedule IV
3	Common crow	*Euploea core*	Not Evaluated	Schedule IV
4	Common emigrant	*Castopsilia pamona*	Not Evaluated	Schedule IV
5	Common evening brown	*Melantis leda*	Least Concern	Schedule IV
6	Common Grass yellow	*Eurema hecabe*	Not Evaluated	Schedule IV

7	Common Lascar	*Pantoporia hordonia*	Not Evaluated	Schedule IV
8	Common Lime butterfly	*Papilio demoleus*	Not Evaluated	Schedule IV
9	Common mormon	*Papilio polytes*	Not Evaluated	Schedule IV
10	Common Nawab	*Polyura athamus*	Not Evaluated	Schedule IV
11	Common Palmfly	*Elymnias hypermnestra*	Not Evaluated	Schedule IV
12	Common pierrot	*Castalius rosimon*	Not Evaluated	Schedule IV
13	Common Sailor	*Neptis hylas*	Not Evaluated	Schedule IV
14	Common striped tiger	*Danaus genutia*	Not Evaluated	Schedule IV
15	Gram blue	*Euchrysops cnejus*	Not Evaluated	Schedule IV
16	Great mormon	*Papilio memnon*	Not Evaluated	Schedule IV
17	Grey Pansy	*Junonia atlites*	Not Evaluated	Schedule IV
18	Lemon Pansy	*Junonia lemonias*	Least Concern	Schedule IV
19	Leopard lacewing	*Cethosia cyane*	Not Evaluated	Schedule IV
20	Mottled Emigrant	*Catopsilla pyranthe*	Not Evaluated	Schedule IV
21	One spotted grass yellow	*Eurema andersoni*	Not Evaluated	Schedule IV
22	Peacock Pansy	*Junonia almana*	Least Concern	Schedule IV
23	Plains cupid	*Luthrodes pandava*	Not Evaluated	Schedule IV
24	Red based jejebel	*Delias pasithoe*	Not Evaluated	Schedule IV
25	Red Spotted jejebel	*Delias aganippe*	Not Evaluated	Schedule IV
26	Slaty Fash	*Rapala manea*	Not Evaluated	Schedule IV
27	Three spotted grass yellow	*Eurema blanda*	Not Evaluated	Schedule IV
28	Common castor	*Ariadne merione*	Not Evaluated	Schedule IV
29	Common jejebel	*Delias eucharis*	Not Evaluated	Schedule IV
30	Common mime	*Papilio clytia*	Not Evaluated	Schedule IV
31	Yellow pansy	*Junonia hierta*	Not Evaluated	Schedule IV
32	Yellow helen	*papilio nephelus*	Not Evaluated	Schedule IV
33	Great egg fly	*Hypolimnas bolina*	Not Evaluated	Schedule IV
34	Plain tiger	*Danaus chrysippus*	Not Evaluated	Schedule IV
35	Glassy Tiger	*Parantica aglea*	Not Evaluated	Schedule IV
36	Common birdwing	*Troides helena*	Not Evaluated	Schedule IV
37	Common five ring	*Ypthima baldus*	Not Evaluated	Schedule IV
38	Commander	*Moduza procris*	Not Evaluated	Schedule IV
39	Common grass blue	*Zizina labradus*	Not Evaluated	Schedule IV
40	Complete paint brush swift	*Baoris farri*	Not Evaluated	Schedule IV
41	Tailed Jay	*Graphium agamemnon*	Not Evaluated	Schedule IV
42	Chocolate Albatros	*Appias lyncida*	Not Evaluated	Schedule IV
43	Pioneer	*belenois aurota*	Not Evaluated	Schedule IV
44	Yamfly	*Loxura atymnus*	Not Evaluated	Schedule IV
45	Common tit	*Hypolycaena erylus*	Not Evaluated	Schedule IV
46	Indian red flash	*Rapala iarbus*	Not Evaluated	Schedule IV
47	Forgetmenot	*Catochrysops strabo*	Not Evaluated	Schedule IV
48	Blue Admiral	*Kaniska canace*	Not Evaluated	Schedule IV
49	Small yellow Sailer	*Neptis miah*	Not Evaluated	Schedule IV
50	Dark Cerulian	*Jamides bochus*	Not Evaluated	Schedule IV
51	Siren	*Hestinapersimilis*	Not Evaluated	Schedule IV
52	Common Redeye	*Matapa aria*	Not Evaluated	Schedule IV
53	Chestnut bob	*Lambrix salsala*	Not Evaluated	Schedule IV
54	Large Snow Flat	*Tagiades gana*	Not Evaluated	Schedule IV

CHECKLIST OF MAMMALS

SI No.	Common Name	Scientific Name	IUCN Status	WPA1972 Schedule
1	Asian Elephant	*Elephus maximus*	Endangered	Schedule I
2	Golden Jackal	*Canius aureus*	Least Concern	Schedule II
3	Hoary bellied squirell	*Callosciurus pygerythus*	Least Concern	Schedule II
4	Jungle cat	*Felis chaus*	Least Concern	Schedule II
5	House Rat	*Rattus rattus*	Least Concern	Schedule V
6	Rhesus macaque	*Macaca mulatta*	Least Concern	Schedule II
7	Greater Bandicoot Rat	*Bandicota indica*	Least Concern	Schedule V
8	Indian Mongoose	*Herpestes javanicus*	Least Concern	Schedule II

CHECKLIST OF HERPETOFAUNA

SI No.	Common Name	Scientific Name	IUCN Status	WPA1972 Schedule
1	Common garden lizard	*Calotes versicolar*	Not Evaluated	Non Schedule
2	Bronze skink	*Eutropis macularia*	Not Evaluated	Non Schedule
3	Checkered keelback	*Xenochropis piscatar*	Least Concern	Schedule III
4	Common Tree Frog	*Polypepdates leucomystax*	Least Concern	Non Schedule
5	Indian Forest Skink	*Sphenomorphus indicus*	Not Evaluated	Non Schedule
6	Spotted forest skink	*Sphenomorphus maculates*	Not Evaluated	Non Schedule
7	Painted bronzeback tree snake	*Dendralaphis proarchos*	Not Evaluated	Schedule IV
8	Indian rat snake	*Ptyas mucosa*	Not Evaluated	Schedule II
9	Common Wolf Snake	*Lycodon aulicus*	Not Evaluated	Schedule IV

LOCATION OF THE ROADSIDE TREES TO BE CUT

Sl No.	GPS Location		Number of trees to be cut	Side
	Latitude (North)	Longitude (East)		
1	25.0041	90.34931	1	Left
2	25.00171	90.34838	1	Left
3	**25.05154**	90.32792	1	Left
4	25.99696	90.34467	1	Left
5	25.99354	90.34322	1	Left
6	25.00274	90.34291	1	Right
7	25.98788	90.33402	1	Left
8	25.97263	90.33844	1	Left
9	25.97163	90.33454	1	Right
10	25.97239	90.33187	1	Right
11	25.97519	90.3237	1	Left
12	25.97245	90.31757	1	Left
13	25.97257	90.31732	1	Left
14	25.96833	90.31335	1	Right
15	25.9645	90.31156	1	Left

16	25.94014	90.25335	1	Left
17	25.94803	90.24583	1	Left
18	25.95102	90.24112	1	Right
19	25.95161	90.23612	1	Right
20	25.95079	90.21386	1	Right
21	25.9487	90.20619	1	Right
22	25.94863	90.20526	3	Left
23	25.94869	90.20498	2	Right
24	25.94863	90.20465	1	Left
25	25.9486	90.2043	1	Right
26	25.94838	90.20369	1	Left
27	25.94831	90.2035	1	Left
28	25.9471	90.19784	1	Right
29	25.94708	90.19718	1	Right
30	25.94669	90.19551	1	Left
31	25.94626	90.19323	1	Left
32	25.94595	90.19211	1	Right
33	25.9449	90.18832	2	Left
34	25.94476	90.18769	1	Left
35	25.94457	90.18729	1	Left
36	25.94423	90.18671	1	Right

37	25.94295	90.18366	1	Left
38	25.94137	90.18122	1	Left
39	25.94068	90.18013	2	Right
40	25.94059	90.17923	1	Right
41	25.9421	90.17055	1	Right
42	25.94221	90.16689	2	Left
43	25.94223	90.16625	1	Left
44	25.94326	90.16318	1	Left
45	25.94321	90.15293	1	Right
46	25.94597	90.14058	1	Left
47	25.94495	90.13451	2	Left

Annex-2: Borrow area management guidelines

Preconstruction Stage

The contractor shall identify the borrow area locations in consultation with the individual owners in case of private lands and the concerned department in case of government lands, after assessing suitability of material. The contractor shall submit an application to the District Level Environmental Assessment Committee for Environmental Clearance with the required details. The Environmental clearance shall be submitted to the Employer before the borrowing operations can begin.

Borrowing are to be avoided in the following areas:

- Lands close to toe line of the existing or proposed road.
- Irrigated agricultural lands shall be avoided. (In case of necessity for borrowing from agricultural land, the topsoil shall be preserved in stockpiles. The subsequent

  Guidelines detail the conservation of topsoil.
- Grazing land or any community property e.g. Orans, Gochars etc.
- Lands within 0.8km of settlements.
- Environmental sensitive areas such as Reserve Forests, Protected Forests, Sanctuary, wetlands. distance of 1000 m should be maintained from such areas.
- Eco-sensitive areas around Mount Abu and Eco-Sensitive Zones of the Wild Life Sanctuaries
- Unstable side-hills.
- Water-bodies.
- Streams and seepage areas.
- Areas supporting rare plant/ animal species;

The Employer/Authority Engineer will have the right to stop work at any borrow location even after the required environmental clearance is received if it violates any of the above. The Contractor shall ensure soft rock is not prominent within the proposed depth of excavation as it will render rehabilitation difficult. The compliance to with MoRTH, clause 305.2.2.2 for redevelopment of Borrow area must be considered. The rehabilitation measures for the borrow areas shall be dependent on the following factors:

- Land use objectives and agreed post-borrowing activities with the owner of the land as per the agreement;

– Physical aspects (landform stability, erosion, re-establishment of drainage, geological profile);

– Biological aspects (species richness, plant density,) for areas of native re vegetation;

– Water quality and soil standards; and

– Public safety issues.

The method statement which can be adopted for different options is presented below in as Options for Rehabilitation of Borrow areas to the Guidance Notes Operation of the Borrow Areas during the Construction Period.

The Contractor will work out statutory requirement for borrowing with the land from the Department of Mining and Geology, Govt. of Meghalaya. The Contractor must also obtain the necessary environmental clearance as per the EIA Notification 2006.

The Contractor shall also work out an agreement for the borrowing of soil with the concerned land owner. The arrangements will include:

– Commitment not to use the topsoil;

– Redevelopment after completion of borrowing;

– Commercial terms and conditions as may be agreed between the two parties;

The contractor shall submit to the Employer/Engineer the following before beginning work on the borrow areas.

– Environmental Clearance Certificate of the borrow area

– Written No-objection certificate of the owner;

– Estimate extent of earth requires;

– Extent of land required and duration of the agreement;

– Photograph of the site in original condition; and

– Site redevelopment plan after completion.

The arrangements (except for the commercial terms and conditions) will be verified by the Employer/Engineer to enable redressal of grievances at a later stage of the project. The Employer/Engineer shall approve the borrow area with or without inspection of the site to verify the reclamation plan and its suitability with the contractor and landowner. The

contractor shall commence borrowing soil only after the approval by the Employer/Engineer.

The depth of excavation should be decided based on natural ground level of the land and its surroundings, as well as based on the rehabilitation plan. In case of highland larger depths may be allowed but the final level of the borrowed land shall in no case be lower than the adjoining plots so that it gets water logged. In case higher depth of excavation is agreed by backfilling using unsuitable excavated soil (from roadway), in those cases filling should be adequately compacted except for topsoil, which must be spread on the top most layer (for at least 20m thick).

In case the borrow pit is on agricultural land, the depth of borrow pits shall not exceed 45 cm and may be dug out to a depth of not more than 30 cm after stripping the 15 cm top soil

aside. In case of stripping and stockpiling of topsoil, provisions of Topsoil Salvage, Storage and Replacement need to be followed.

The guidelines for location, depth, size and shape of the borrow areas are available in the following:

– Clause 305.2.2.2 of MoRTH specification for roads and bridge works of IRC;

– Guidelines for environmental impact assessment of highway projects, Indian Roads Congress, 1989: IRC: 104-1988);

– IRC: 10-1961-Recommended practice for borrow pits for road embankments constructed by manual operations, as revised in 1989;

– Highways Sector EIA manual of MoEFCC, 2010 (http://envfor.nic.in/sites/default/files/highways-10_may_0.pdf);

During the excavation the contractor must ensure that following database must be documented for each identified borrow areas that provide the basis of the redevelopment plan.

– Chainage along with offset distance;

– Area of the plot (Sq.);

– Geo-tagged Photograph of the borrow pit from all sides;

– Type of access/width/kutcha/pucca etc from the carriageway;

– Soil type;

– Slope/drainage characteristics;

– Water table of the area or identify from the nearest well, etc;

– Existing landuse, for example barren/agricultural/grazing land;

– Location/name/population of the nearest settlement from borrow area;

– Present usage of borrow area; and

– Community facility near borrow pit.

Sites identified for Muck Disposal during EIA

These have also been including in the DPR

	MUCK DISPOSAL AREAS	
	LAT	LONG
MDP1	25.996755°	90.344633°
MDP2	25.987979°	90.334718°
MDP3	25.975067°	90.338036°
MDP4	25.972251°	90.332604°
MDP5	25.960520°	90.309015°
MDP6	25.945744°	90.292117°
MDP7	25.939317°	90.270599°
MDP8	25.951865°	90.234312°

MDP9	25.952621°	90.219746°
MDP10	25.942051°	90.173034°
MDP11	25.944619°	90.148829°
MDP12	25.944885°	90.134007°

Annex-3: Guidelines For Storage, Handling And Disposal Of Hazardous Waste, Municipal Solid Waste And Construction And Demolition Waste

Hazardous Waste

• For storing of hazardous waste (Used oil and waste oil, Empty barrels/containers of oil, lubricant and grease, Contaminated cotton rags or other cleaning materials), the Contractor shall follow the guidelines while planning and designing the hazardous waste storage areas:

– The storage area should be provided with concrete floor;

– The storage area floor should be provided with secondary containment;

– Proper slopes as well as collection pit to be provided in the storage area to collect wash water and the leakages/spills etc.;

– Storage area should be provided with the flameproof electrical fittings;

– Automatic smoke, heat detection system should be provided in the sheds;

– Adequate fire fighting systems (ABC type fire extinguisher) should be provided for the storage area; and

– The Storage area shall be designed in such a way that the floor level is at least 150 mm above the maximum flood level.

Municipal Solid Waste

• The Contractor shall segregate and store bio-degradable and non-biodegradable municipal solid waste in two separate bins (primary collection point). The storage area should be provided with concrete floor;

• The Storage area shall be designed in such a way that the floor level is at least 150 mm above the maximum flood level.

• The storage area shall be enclosed, or the storage containers shall be covered to prevent vermis and scavengers from littering.

Construction and Demolition Waste

• The Contractor shall keep the construction and demolition waste within the premise or at a designated place for the collection of the C&D waste. The designated place shall be decided in consultation with the local body. The agreement with the local body shall essentially mention the end-use of the designated location. The designated site shall be away from:

– Located at least 1000 m away from sensitive locations;

– do not contaminate any water sources, rivers etc; and

– Lotal site has adequate capacity equal to the amount of debris generated;

– Public perception about the location of debris disposal site has to be obtained before

– finalizing the location;

– Productive lands are avoided; and available waste lands shall be given preference;

– Forest land shall be avoided.

• During the site clearance and disposal of debris, the contractor will take full care to ensure that the public or private properties are not damaged/affected and that the traffic is not interrupted.

• In the event of any spoil or debris from the sites being deposited on any adjacent land, the contractor will immediately remove all such spoil debris and restore the affected area to its original state to the satisfaction of the Authority Engineer.

• The contractor will at all times ensure that the existing water bodies and drains within and adjacent to the site are kept safe and free from any debris.

• In case the dumping operations are carried out in dry and windy condition Contractor will regulate the dumping operations so that the dust generation is minimised, or preferably carry out the operations in early morning when the environment is moist. The contractor may utilize effective water sprays during the delivery and handling of materials.

• Materials having the potential to produce dust will not be loaded to a level higher than the side and tail boards and will be covered with a tarpaulin in good condition.

• Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and with the permission of Authority Engineer.

• During the debris disposal, contractor will take care of surrounding features and avoid any damage to it.

• While disposing debris / waste material, the contractor will take into account the wind direction and location of settlements to ensure against any dust problems. The contractor can also consider the use of dust screens to prevent dust pollution.

EMERGENCY SPILL CONTROL PROCEDURE

Should a spill occur, either though spillage or equipment failure, the applicable emergency spill procedure outlined below must followed.

Spill Procedure: In the case of a spill, overflow or release fluid into the stream waterway (whether water is flowing during the spill or not), any actions that is practical and safely possible to control the situation, shall be implemented.

- Stop the flow
  - – Stop the release into the stream waterway
  - – Shutdown equipment
  - – Close valves and pumps
  - – Plug hoses
- Remove Ignition Sources
  - – Shut off vehicles and other engines
- Do not allow torches, mobile phone, vehicles, smoking or other sources of ignition near the area. Keep a fire extinguisher on hand but keep it a safe distance away from the potential ignition source (if a fire starts, the extinguisher must be easily accessible).
- Contact the environmental Officer and initiate Emergency Response
- Notify the site supervisor and the Contractor‘s Environmental Engineer and Health and Safety Officer as soon as possible
- The Environmental Engineer of the Contractor will review the situation and decide if Emergency Services like Fire Brigade are required
- Appropriate parties to be notified of the spill are The contractor‘s Project Manager, The
- Authority Engineer through his designated Environmental Officer, The PIU, Regulatory Agencies like Pollution Control Board, Municipal Authorities, as applicable.

Clean up and Disposal

- Identify nature and type of chemical/fuel spilled through information available onsite or from first responder.
- Refer to the MSDS for any special instruction
- Wear personal protective equipment (PPEs) viz. chemical resistant gloves, safety boots ,safety glasses etc. Reach for the spill kit placed at the Contractor Camp.
- In case of spill on land create a dyke on the spill and use readily available sand, saw

dust to contain the spill. Use absorbent pads, to clean up the spill. In case of spill in a water channel which is dry use the above method.

• In case the spill occurs within a water body stop any agitation to the water body and place absorbent material to remove the spill.

• Recover the spill contaminated absorbent materials and use pads and store the same in ―Hazardous Waste‖ containers and store it in the waste storage area for disposal.

• For spill on unpaved areas such as soil, remove the upper layer of soil in the contaminated area with a shovel and transfer it to the hazardous waste containers using a bucket.

• If any of your PPEs have been exposed to spill material dispose it off safely in hazardous waste containers

Reporting

• The Contractor‘s Environmental Officer will document the event and submit reports to the Authority Engineer. The Authority Engineer would send a report of the incident immediately with its observations to the PIU and Environmental Officer at the PMU.

• If required the Client would direct the Contractor to imitate the process of reporting to the regulatory agencies. like the Pollution Control Board.

Procedure Review

• The Environmental Office will review the report, determine if changes are required to procedures and recommend implementation of all required changes. He would also intimate the management of such incident.

Annex 4- Guidance Note on Site Clearance

Vegetation Clearance

• Vegetation clearance shall comprise uprooting of vegetation, grass, brushwood, shrubs, stumps, trees and saplings of girth up to 30 cm. measured at a height of one meter above the ground level. Clearing activities should be carried out outside of bird breeding /nesting periods. Where only clearance of grass is involved it shall be measured and paid for separately. The procedure/ steps involved for uprooting, skating and felling trees are described below.

Uprooting of Vegetation

• The roots of trees and saplings shall be removed to a depth of 60 cm. below ground level or 30 cm. below formation level or 15 cm below sub grade level, whichever is lower.

• All holes or hollows formed due to removal of roots shall be filled up with earth rammed and levelled.

• Trees, shrubs, poles, fences, signs, monuments, pipe lines, cables etc. within or adjacent to the area, which are not required to be disturbed during vegetation clearance shall be properly protected by the contractor at his own cost.

Staking and Disposal

• All useful materials obtained from clearing and grubbing operation shall be staked in the manner as directed by the Consultant.

• Trunks and branches of trees shall be cleared of limbs and tops stacked properly at the places indicated by the Consultant. These materials shall be the property of the Government.

• All unserviceable materials are disposed off in such a manner that there is no livelihood of getting mixed up with the materials meant for construction.

Felling Trees

• Marking of tress: Trees, above 30 cm girth (measured at a height of one meter above ground level) to be cut, shall be approved by the Consultant and then marked at the site.

• Felling of trees: Felling of trees shall include taking out roots up to 60 cm. below ground level or 30 cm. below formation level or 15 cm. below sub-grade level, whichever is lower.

• Filling: All excavations below general ground level arising out of removal of trees, stumps etc. shall be filled with suitable material in 20 cm. layers and compacted thoroughly so that the surface at these points conform to the surrounding area.

- Sizing: The trunks and branches of trees shall be cleared of limbs and tops and cut into suitable pieces as directed by the Consultant.
- Staking: The serviceable materials shall be staked in the manner as directed by the Environmental specialist of Supervision Consultant.

Disposal: The material, which cannot be used or auctioned shall be removed from the area and disposed off as per the directions of the Consultant. Unsuitable waste materials should not get mixed with construction material during disposal.

Annex 5: Construction Camp Management

1. Campsite of a contractor represents the single potentially most polluting location during implementation of any road project. Air pollution may be caused by emissions from Crushers, Hot-Mix, and Concrete Batching Plants. Water pollution may be caused by discharge of sediment, oil & grease, and organics laden run-off from these plants and their ancillary facilities as well as workshops, residential quarters for the labor. Land may be polluted due to indiscriminate disposal of domestic waste or (accidental) release of hazardous solids from storage areas.

2. While the installation and operation of Crushers and Hot-Mix Plants are regulated by the respective Pollution Control Boards, the other sources described above usually do not appear to be causes of significant concern. Items to be considered for labor camps are mentioned briefly in Clause 105.2 (as part of 105: Scope of Work) of the Ministry of Road Transport and Highways (MoRTH) publication: Specifications for Road and Bridge Works. Some specific requirements for labor accommodation and facilities are to be met by the Contractor in line with Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. Currently, there is no one-point guidance regarding the environmental management aspects of the Contractor‘s campsite. This guideline on Campsites is designed to fill this gap.

A. Scope

3. This guideline covers the Contractors‘ camp sites – whether used by in-house crew or by any sub-contractors‘ crew. It covers siting, operation, maintenance, repair and dismantling procedures for facilities for labor employed on project (and ancillary) activities as well as equipment and vehicles.

1. Siting, Establishing, Operation and Closure of Construction

Camp a. Potential Environmental Impacts

4. Construction camps require large areas for siting facilities like major plants, storage areas for material, residential accommodation for construction labor and supervisors, and offices. Removal of topsoil and vegetation from the land to be utilized for camps is the first direct impact of any such establishment. In addition, local drainage may be impaired if proper drainage is not effected by grading. Other impacts may include damage to ecologically important flora and fauna, if campsites are located close to such areas. Water pollution because of discharge of sediment, fuel and chemicals is also a possibility. Pollution of land due to indiscriminate disposal of construction wastes including scarified pavement, concrete

and even substantial quantities of domestic wastes from residential areas can also be potentially disastrous, especially if the site is reverted to its original use after the project (mostly agriculture).

b. Mitigation Measures

2. Siting of Construction Camps

5. The following guidelines will assist the Contractor to avoid any environmental issues while siting construction camps:

- Maintain a distance of at least 1 km from boundaries of designated Reserved Forests, Sanctuary or National Park area for locating any temporary or permanent camps.
- Maintain a distance of 500m from river, stream, lake and ponds
- Maintain a distance of 200 m from the boundary of state and national highways.
- Locate facilities in areas not affected by flooding and clear of any natural or storm water courses.
- Locate campsites in the (most prevalent) downwind direction of nearestvillage(s). The boundary of the campsite should be at least 500 m from the nearest habitation so that the incoming labor does not stress the existing local civic facilities.
- The ground should have gentle slope to allow free drainage of the site.
- Recorded consultations should be held with residents of the nearest settlement and/or their representatives to understand and incorporate where possible, what they would like to see within their locality.

3. Establishment, Operation, and Closure of Camps

- The facilities within the camp site should be laid out so that the separation distances suggested in other guidelines are maintained. A notional lay-out of the facilities except the major plants is included in this guideline.
- Topsoil from the area of the plant shall be stored separately for the duration of the operation of the camp and protected from being washed away, unless agreed otherwise in writing with the owner. If stored, it will be returned on to its original location at the time of closure of the site.
- The Contractor shall prepare, make widely available (specially to staff responsible for water and material management), and implement a Storm water Management Plan (SWMP) for (all) the site(s) following approval of the same by the Engineer.
- The Contractor shall prepare an Emergency and Spill Response Plan as per the requirements of Annex 1 to Clause 501 of Specifications for Road and Bridge Works to cover the spillage of bitumen and/or chemicals like retarders, curing compounds, etc.

- The Contractor shall prepare a Waste Management Plan describing the types and quantities that are likely to be generated from within the camp site, with the period and duration during the construction schedule; methods to be adopted to minimize these; methods of removal, treatment and (on-site or off-site) disposal for each type; as well as location of final disposal site, if any.
- The Contractor shall provide safe ingress and egress for vehicles from the site and public roads and shall not impact existing through traffic.
- Water tankers with sprayers must be available at the camp site at all times to prevent dust generation.
- In case of stockpiles of stored material rising higher than wind-breaking perimeter fencing provided, sprinklers shall be available on site to prevent dusting from the piles during windy days.
- On completion of works, the Contractor shall restore the site to the condition it was in before the establishment of the campsite, unless agreed otherwise in writing with the owner(s) of the site(s). If such a written agreement has been made, the Contractor shall hand over the site to the owner(s) in accordance with such an agreement.
- Construction waste disposal should be disposed only at landfill facilities which are selected, designed, constructed and operated to ensure environmentally safe disposal, and these facilities have to be approved by the regulators.

4. Equipment and Vehicle-related issues

a. Potential Environmental Impacts

6. The maintenance and repair of equipment and vehicles in Contractor‘s camp are activities that can have significant adverse impacts if not carried out properly. The concern mainly arises from discharge of wash water contaminated with oil and grease, whether from washing of vehicles or degreasing of equipment and vehicle parts. Vehicle washing, especially dirt from tires, also gives rise to sediment-laden run-off. No such discharges should be directly allowed into surface water bodies since they can be harmful to aquatic species.

b. Mitigation Measures

i. Vehicles

- All vehicles used by the Contractor must have copies of currently valid Pollution Under Control Certificates displayed as per the requirement of the Motor Vehicles Department for the duration of the Contract.
- All vehicles and equipment will be fitted with silencers and/or mufflers which will be serviced regularly to maintain them in good working condition and conforming to the standard of 75dB (A) at 1m from surface of enclosure.

ii. Workshop and Maintenance areas

- These areas must have impervious flooring to prevent seepage of any leaked oil & grease into the ground. The area should be covered with a roof to prevent the entry of rainwater.
-
- The flooring shall be sloped to from both directions to one corner where an oil-and-grease trap with sufficient capacity should be installed. All discharges from the workshop area must pass through the trap to remove the floating oil and grease before entering the drainage system of the site. The trap should be designed to provide a hydraulic residence time of about 20 minutes for the peak hourly discharge anticipated from the area (as per following figure).
-
- Alternatively, degreasing can also be carried out using mechanical spray type degreaser, with complete recycle using an enclosure with nozzles and two sieves, coarse above and fine below, may be used as shown in the
-
- adjacent photograph. This arrangement will require some initial investment and running cost for the pump, but the payback period, in terms of the use of diesel, under Indian conditions, has been reported to be less than 1 year.

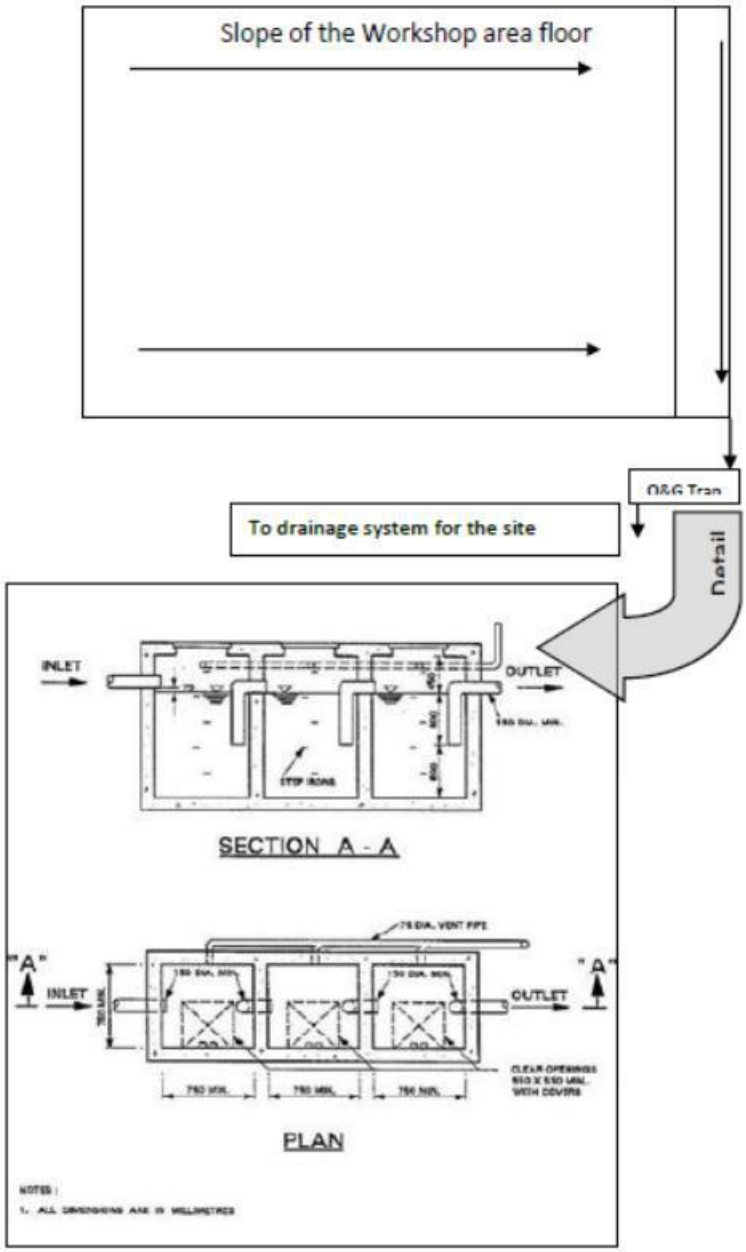


Figure 1: Workshop Area Pollution Control

- All the waste oil collected, from skimming of the oil trap as well as from the drip pans, or the mechanical degreaser shall be stored in accordance with Slope of the Workshop area floor O&G Trap Details To drainage system for the site the Environment Protection (Storage and Disposal of Hazardous Wastes) Rules, 1989. For this purpose, metallic drums should be used. These should be stored separately in sheds, preferably bunded. The advantage of this arrangement is that it allows for accurate accounting in case the waste material is sold to oil waste recyclers or other users like brick-kiln owners who can burn such inferior fuel.
- A separate vehicle washing ramp shall be constructed adjacent to the workshop for washing vehicles, including truck mounted concrete mixers, if any, after each day‘s construction is over, or as required. This ramp should have an impervious bottom and it

should be sloped so that it drains into a separate chamber to remove the sediment from the wash water before discharge. The chamber should allow for a hydraulic residence time of about 10 minutes for discharge associated with the washing ofeach truck. Following figure 2 shows an outline sketch for a sedimentation chamber.

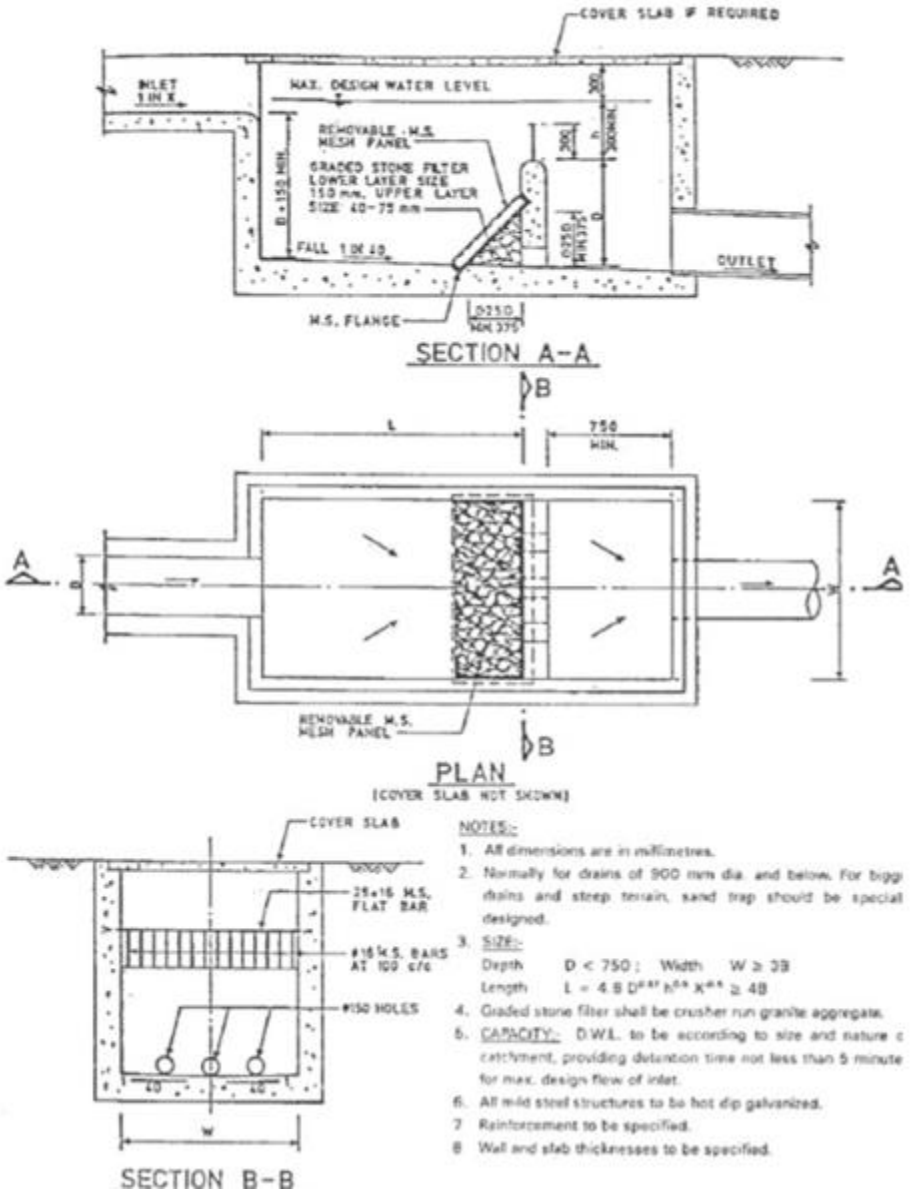


Figure 2: Sedimentation Chamber for vehicle washing ramp discharge

5. Facilities for Labour

a. Potential Environmental Impacts

7. At its peak, the project envisages a maximum of 50 labourers working on the site. Pollution from domestic wastes can affect local sources of water supply and may harm the crew themselves as well as local residents. The contractor is responsible for safe an sanitary conditions and the health and safety of workers.

b. Mitigation Measures

8. It should be emphasized that the Indian Law requires that the Contractor provide several facilities to for the workers as per Building and Other Construction Workers (Regulation of

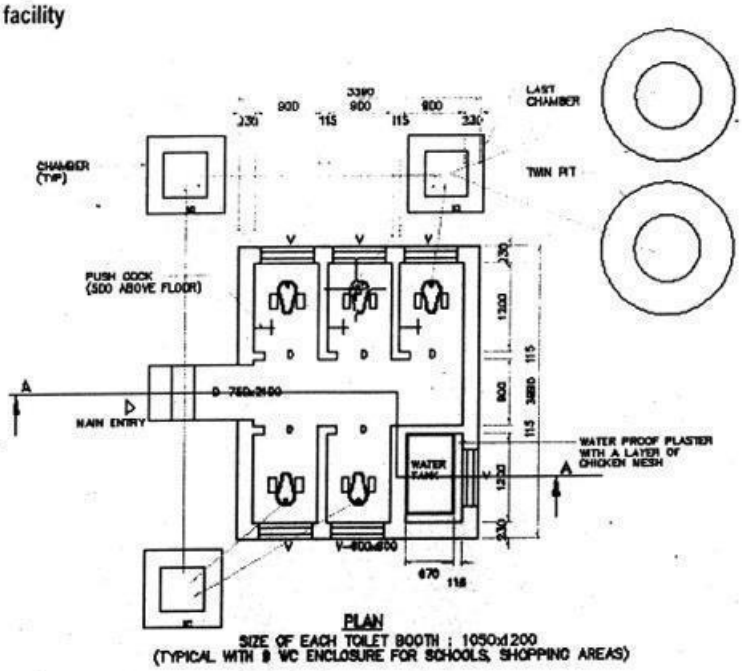
Employment and Conditions of Service) Act, 1996. Some of the provisions described herein are more stringent to act as benchmark for improved environmental performance of road projects:

- The contractor shall provide free-of-charge temporary accommodation to all the labour employed for the project. The accommodation includes separate cooking place, bathing, washing and lavatory facilities. At least, one toilet will be provided for every 35 people and one urinal will be provided for every 20 persons. More toilets and/or urinals may have to be provided if the Engineer decides that these numbers are insufficient. In case female labourers are employed, separate toilet and urinals will be provided in locations clearly marked ―Ladies Toilets‖ in a language understood by most labourers.

- The contractor shall ensure the supply of wholesome water for all the labour, including those employed by any other agency working for the contractor. These locations will be marked ―Drinking Water‖ in the language most commonly understood among the labour. In hot season, the contractor shall make efforts to ensure supply of cool water. No water point shall be located within 15 m of any washing place, urinal, or latrine.
- The contractor shall ensure that adequate cooking fuel, preferably kerosene or LPG, is available on-site. The contractor will ensure that wood/ coal are not used as fuel on the site. Workers need to be made aware of this restriction.
- Contractor must prepare a comprehensive health and safety plan and a COVID-19 plan, including provisions for treatment of any illness, accidents or outbreaks at the campsite. The plan must also include measures for any accidents that may occur due to anthropogenic or natural factors. A doctor and ambulance and designated hospital for the project location should all be identified and be available on call for the duration of project implementation.
- The contractor shall obtain the approval of the Engineer for these facilities within 30 days of mobilization.

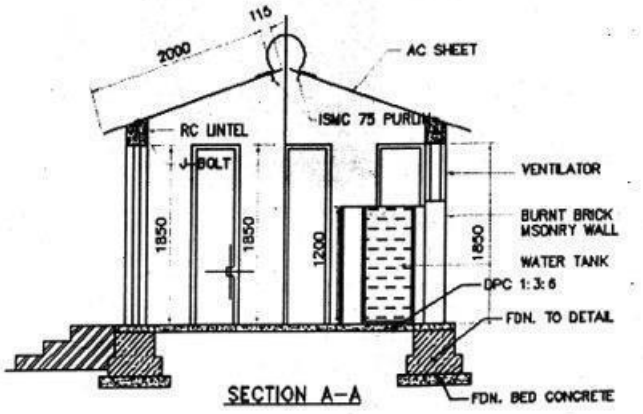
TYPICAL DRAWING OF WORKERS' CAMP SANITARY FACILITY

Sanitary facility



PLAN

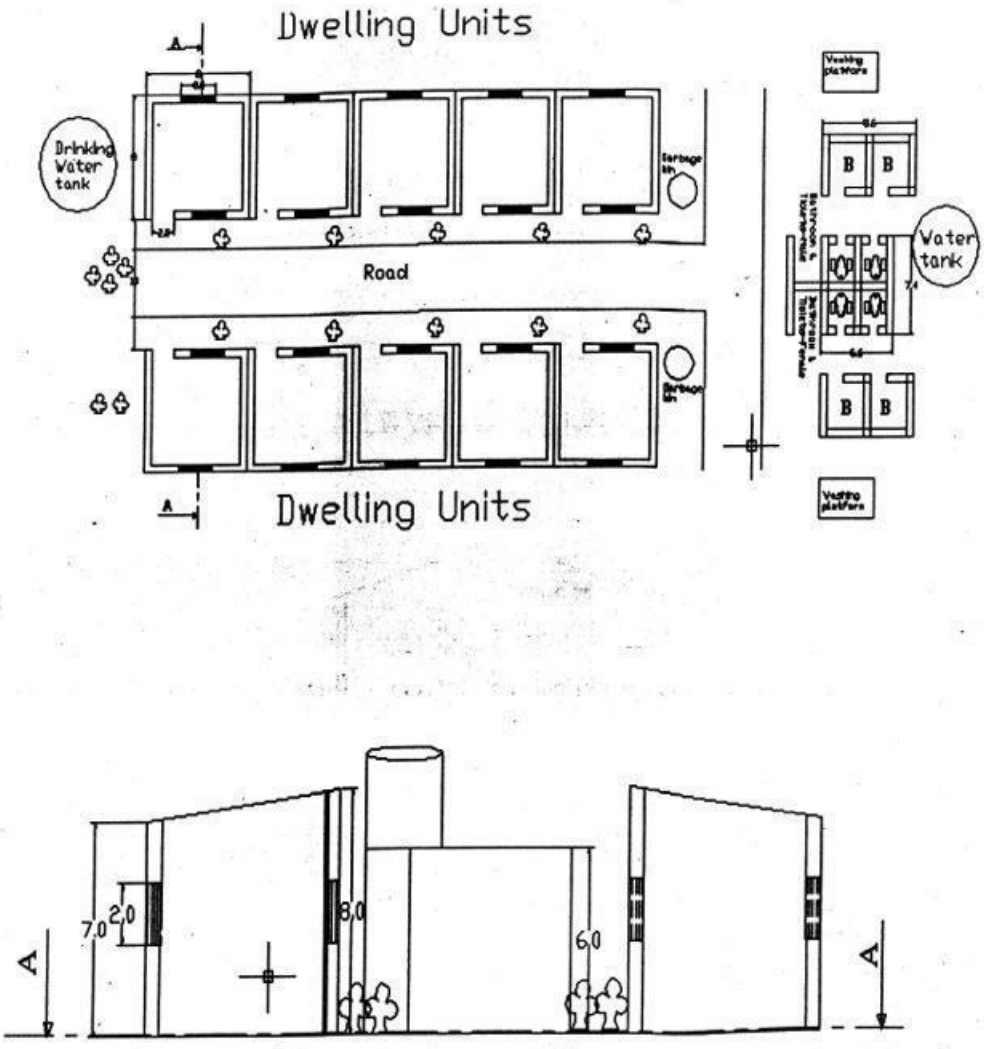
SIZE OF EACH TOILET BOOTH : 1050x1200
(TYPICAL WITH 8 WC ENCLOSURE FOR SCHOOLS, SHOPPING AREAS)



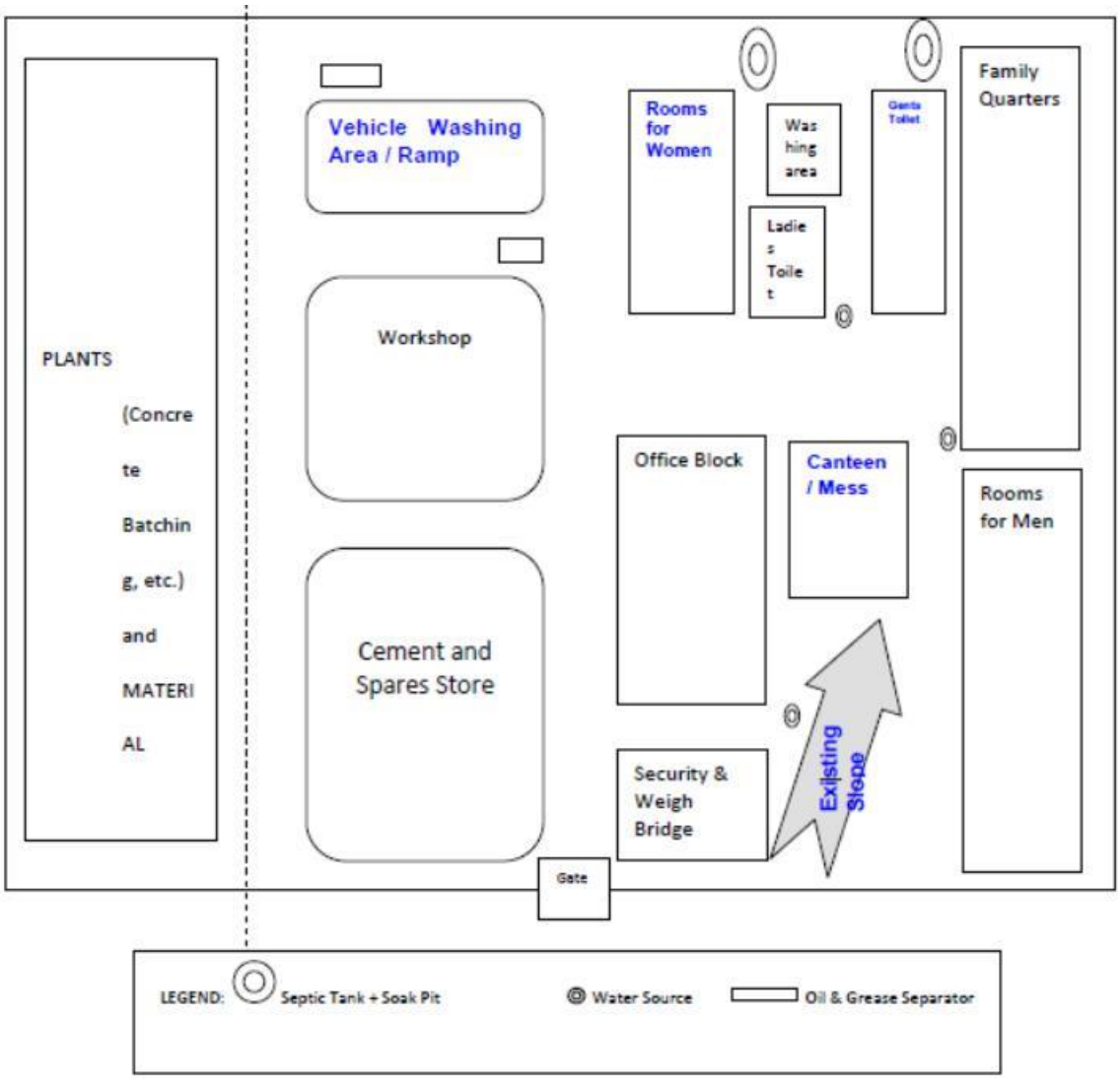
SECTION A–A

NOTES:

1. INSPECTION CHAMBER (IC) 600x600x600 DEEP WITH AIRTIGHT MH COVER
2. SEPTIC TANK & SOAK PIT AS PER SITE CONDITIONS



Layout of a Construction camp


PLANTS
(Concrete Batching, etc.) and MATERIAL
Vehicle Washing Area / Ramp
Workshop
Cement and Spares Store
Rooms for Women
Washing area
Ladies Toilet
Gents Toilet
Family Quarters
Office Block
Canteen / Mess
Rooms for Men
Security & Weigh Bridge
Existing Slope
Gate
LEGEND:
Septic Tank + Soak Pit
Water Source
Oil & Grease Separator

Annex 6: Contractors Responsibility for COVID-19 and other Pandemics

The COVID-19 pandemic presents unprecedented challenges and that circumstances require a highly adaptive responsive management design to avoid, minimize and manage in this rapidly evolving situation. This section of the ESMF provides guidance to the Borrowers in addressing key issues associated with COVID-19. This section emphasizes the importance of careful scenario planning, clear procedures and protocols, management systems, effective communication and coordination, and the need for high levels of responsiveness.

Key Challenges:
Though MITP will not require huge labour camps, still there will be approximately 50 workers at the peak time. The skilled labour may come from outside the state where as unskilled labour will be largely local. Still, they may need to live in labour camps even though if they return to their homes after work. The camp may also see traffic from suppliers and service providers on regular basis which will have the potential for the spread of infectious disease in projects. Impact on the project workers may lead to additional burden on the local health services which certainly will not be able to take the additional load.

Contractor's Responsibility:
The contract document generally has the clauses for health and safety of the workers but does not cover pandemic situation. In MITP, the bid documents the contractor will be required:

- to take all necessary precautions to maintain the health and safety of the Contractor's Personnel
- to appoint a health and safety officer at site, who will have the authority to issue directives for the purpose of maintaining the health and safety of all personnel authorized to enter and or work on the site and to take protective measures to prevent accidents
- to ensure, in collaboration with local health authorities, that medical staff, first aid facilities, sick bay, ambulance services and any other medical services specified are available at all times at the site and at any accommodation
- to ensure suitable arrangements are made for all necessary welfare and hygiene requirements and for the prevention of epidemics
- to provide health and safety training for Contractor's Personnel (which include project workers and all personnel that the Contractor uses on site, including staff and other employees of the Contractor and Subcontractors and any other personnel assisting the Contractor in carrying out project activities)
- to put in place workplace processes for Contractor's Personnel to report work situations that are not safe or healthy
- gives Contractor's Personnel the right to report work situations which they believe are not safe or healthy, and to remove themselves from a work situation which they have a reasonable justification to believe presents an imminent and serious danger to their life or health (with no reprisal for reporting or removing themselves)
- requires measures to be in place to avoid or minimize the spread of diseases including measures to avoid or minimize the transmission of communicable diseases that may be associated with the influx of temporary or permanent contract-related labor
- to provide an easily accessible grievance mechanism to raise workplace concerns

Specifically, contractor shall

- prepare a detailed profile of the project work force, key work activities, schedule for carrying out such activities, different durations of contract and rotations.

- Consideration should be given to ways in which to minimize movement in and out of site. This could include lengthening the term of existing contracts, to avoid workers returning home to affected areas, or returning to site from affected areas.
- Workers accommodated on site should be required to minimize contact with people near the site, and in certain cases be prohibited from leaving the site for the duration of their contract, so that contact with local communities is avoided.
- Consideration should be given to requiring workers lodging in the local community to move to site accommodation (subject to availability) where they would be subject to the same restrictions.
- Workers from local communities, who return home daily should be subject to health checks at entry to the site.
- Establishing a system for controlling entry/exit to the site, securing the boundaries of the site, and establishing designating entry/exit points (if they do not already exist). Entry/exit to the site should be documented.
- Training security staff on the (enhanced) system that has been put in place for securing the site and controlling entry and exit, the behaviors required of them in enforcing such system and any COVID -19 specific considerations.
- Training staff who will be monitoring entry to the site, providing them with the resources they need to document entry of workers, conducting temperature checks and recording details of any worker that is denied entry.
- Confirming that workers are fit for work before they enter the site or start work.
- COVID-19 related issues to be part of daily tool box talk such as cough etiquette, hand hygiene and distancing measures, using demonstrations and participatory methods.
- During tool box talk, reminding workers to self-monitor for possible symptoms (fever, cough) and to report to their supervisor or the COVID-19 focal point if they have symptoms or are feeling unwell.
- Preventing a worker from an affected area or who has been in contact with an infected person from returning to the site for 14 days or (if that is not possible) isolating such worker for 14 days.
- Preventing a sick worker from entering the site, referring them to local health facilities if necessary or requiring them to isolate at home for 14 days.
- Training workers and staff on site on the signs and symptoms of COVID-19, how it is spread, how to protect themselves (including regular handwashing and social distancing) and what to do if they or other people have symptoms.
- Placing posters and signs around the site, with images and text in local languages.
- Ensuring handwashing facilities supplied with soap, disposable paper towels and closed waste bins exist at key places throughout site, including entry /exits points, toilet, canteen / mess, drinking water points; worker accommodation; stores; and common spaces. Where handwashing facilities do not exist or are not adequate, arrangements should be made to set them up. Alcohol based sanitizer (if available, 60-95% alcohol) can also be used.
- Providing cleaning staff with adequate cleaning equipment, materials and disinfectant.
- Review general cleaning systems, training cleaning staff on appropriate cleaning procedures and appropriate frequency in high use or high-risk areas.
- Where it is anticipated that cleaners will be required to clean areas that have been or are suspected to have been contaminated with COVID-19, providing them with appropriate PPE: gowns or aprons, gloves, eye protection (masks, goggles or face screens) and boots or closed work shoes. If appropriate PPE is not available, cleaners should be provided with best available alternatives.
- Training cleaners in proper hygiene (including handwashing) prior to, during and after conducting cleaning activities; how to safely use PPE (where required); in waste control (including for used PPE and cleaning materials).

The MIDFC / PWD will take in in writing from the Contractor of the

- measures being taken to address the risks, presented as a contingency plan, as an extension of the existing project emergency and preparedness plan or as standalone procedures.
- Contractor to convene regular meetings with the project health and safety specialists and medical staff (and where appropriate the local health authorities), and to take their advice in designing and implementing the agreed measures.
- a senior person should be identified as a focal point to deal with COVID-19 issues responsible for coordinating preparation of the site and making sure that the measures taken are communicated to the workers, those entering the site and the local community.
- The client may provide support to projects in identifying appropriate mitigation measures, particularly where these will involve interface with local services, in particular health and emergency services.
- The grievance redress mechanism set up for the project will have special number only for reporting concerns relating to COVID-19. The number will be widely disseminated and will also be put on the information board at all project sites.

Annex 7: Attendance Sheet of public consultations

Meghalaya Integrated Transport Project (MITP)
List of Participants during consultation with stake holder at Rongsakgre (BNRGSK) on 24th October, 2019.

Sl	Name of Participants	Department/Village/ Organisation	Signature.
1	G.K. Marak	Addl. CE PWD (R) Western Zone	[illegible]
2	A. Ch. Marak	ADC (Rev)	[illegible]
3	A G. Momin	BDO, Samanda	[illegible]
4	Sh H. Nengnong.	EE. PWD(R) Williamnagar	[illegible]
5	C. N. Sangma	S.E., PWD(R), Tura Circle, Tura	
6	S. K. Marak	E.E., PWD(R), Tura North Division, Tura	[illegible]
7	Senfan Ch. Sangma	Act [illegible] PWD(R) Williamnagar Division	[illegible]
8	Hindrin G. Momin	A.E., PWD(R), Tura North Division, Tura	[illegible]
9	Winningsa Sangma	New Rongmalgre	[illegible]
10	Andrew Ch. Marak	Rongsakgri	[illegible]
11	Killingsto Sangma	Rongsakgri	[illegible]
12	Arep Ch Marak.	Bansamgre	[illegible]
13	Delwin. Ch. Marak	Bansamgri	[illegible]
14	Prinson Ch Marak.	Bansamgri	[illegible]
15	Chirong Ch Marak	Bansamgri	[illegible]
16	Bailen Sangma	Pakwakgri	[illegible]
17	Albott Sangma.	pakwakgri	[illegible]
18	Harold Sangma	Rongsakgre	[illegible]

19	Shri, Willing Marak.	Rongsak.	[signature]
20	Balkry Sangma	Rongsak.	[signature]
21	Charebin Marak	Rongsak.	[signature]
22	Daremin Sangma	Rongsak	[signature]
23	Likstone Ch. Marak	Rongsak.	[signature]
24	Janggjin Sangma	Rongsak	[signature]
25	Witenald Marak	Rongsakgre	[signature]
26	Terjen Marak	Rongmalgre Nokmra	[signature]
27	Jumish Marak	Rongsak.	[signature]
28	Horelthon Sangma	Rongsak.	[signature]
29	Prithington Marak	Rongsak.	[signature]
30	Sailetson Marak.	Rongsak-	[signature]
31	Panjoral Ch Marak	Rongmalgre	[signature]
32	Jimsbeth Sangma	Rongmalgre	[signature]
33	Amlw D. Sangma	Rongsak.	[signature]
34	Billinton Marak	Rongmalgre	[signature]
35	Bilthu Sangma	Rongsak	[signature]
36	Tuwin Marak	Samanda.	[signature]
37	Winbarth Sangma	Rongsak	[signature]
38	Greenest Marak	Rongsak	[signature]

39	Blubirth Sangma	Rangmalgre	[signature]
40	Solomon M Sangma	Rongrakgre	[signature]
41	Chidarsy Marak	Sarsamgre	[signature]
42	Asin Sangma	Bansamgri	A.S.
43	Kottingson	Moutoch	K.Ch.M-
44	Healthy Ch. Marak.	Rongsad.	[signature]
45	Terendro K. Marak	Rongsak	[signature]
46	Fellason Sangma	Samanda	[signature]
47	Arhitson Sangma	Bansamgre	[signature]
48	Ramson Sangma	Rongsak	[signature]
49	Lomsusing	Sangma	[signature]
50	Rojing Sangma	Samongdun	Rajy
51	Gromal Sangma	Rangsakogital	GTS
52	Philar Sangma	Rongsakgre	[signature]
53	Salgira Sangma.	A-E.E. T/c William-nagar Division	[signature]
54	Ajay Pratap Singh	Director APS Corporation PVT LTD	[signature]
55	DR. BHRIGU PRASAD SAIKIA	Environment Specialist	[signature]
56	Prafulla H. Leo	Social Expert-(SIA)	[signature]
57	Jogamul Haque	Road Surveyor	[signature]
58	Pallish Sangma	Bansangagre	[signature]

59	Romitison Sangma	Rongmalgre	[signature]
60	Nitking Sangma	Rangmalgre	[signature]
61	Merison G Momin	Rangmalgre	[signature]
62	Jechina R. Marak	Rangmalgre	[signature]
63	Lettish ch Marak	Rangmalgre	[signature]
64	Jyotish Daimary	Consultant (STA)	Jyotish Daimary
65	Britjoy Kherr	Consultant (STA)	B Kherr
66	Bomin Marak	Pakuwakgiri	[signature]
67	Ajay Loying	Consultant	[signature]
68	Nikolin Sangma	Narigri	[signature]
69	Jotsen M Sangma		[signature]
70	Chiffing Marak	Rongmalgre	[signature]
71	Greenber ch. Marak	Bansam-Awe	[signature]
72	Gunderson Momin	Bansam Awe	[signature]
73	Gajaring	[illegible]	[signature]
74	Medina Ch Marak	Rongsakgri	M. [signature]
75	Joldina Sangma	Rongsakgri	J M S
76	Engjilla Sangma	Rongsak	[signature]
77	Margiristdona Sangma	Rangmalgre	[signature]
78	Sonia Marak	Rongsakgre	[signature]

79	Trinilla Marak	Rongsakgre	Tmk
80	Kim mot marak	Rongsakgre	K. Ch. m
81	Balington Momin	W/Nagar (PWD)	[illegible]
82	Karesh M. Sangma	Rongsakgre	[illegible]
83	Ranesh M. Sangma	W/Nagar PWD	[illegible]
84	Hudson M Sangma	Rongsakgre	[illegible]
85	Rusilla M Sangma	Rongsakgre	[illegible]
86	Rojak M Sangma	Rongsakgre	R.M.S
87	Jengsan Sangma	Ban Sangre	[illegible]
88	Santesh B marak	Rongsakgre	[illegible]
89	Anilla M Sangma	Rongsakgre	[illegible]
90	Kraiballine Ch. Momin	Rongsakgre	[illegible]
91	walleng N Sangma	Rongsakgre	[illegible]
92	Mutsing N. Sangma	- do -	[illegible]
93	Silsing Sangma	Rongsakgre	[illegible]
94	Jesngrea marak	Rongsakgre	[illegible]
95	Midalson Sangma	V/Rongsak	[illegible]
96	Nonseng Sangma	V- Bonsengre	[illegible]
97	Rajal Ch Marak	V/Rongsak	[illegible]
98	Evalisa M. Sangma	"	[illegible]

99	Tibilchi Sg	Rongsak	
100	Mithema Marak	Rongsak	
101	Khaitsina Magna.	Rongsak	
102	Hinbath marak	Rangmalgre	
103	gunitha M Sangma	Rongsakgre	
104	Foraibina Ch.marak	Rongsak	
105	Stilla M. Sangma	Rongsak	
106	Chegriemchi M Sangma	Rongsak	
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Annex 8: Terms of Reference for Biodiversity and Critical Habitat Assessment and preparation of Biodiversity Management Plan

Terms of Reference

Consultancy for Biodiversity and Critical Habitat Assessment and Preparation of Site-Specific Biodiversity Management Plans

Background

Government of Meghalaya (GoM), with financing and technical support from the World Bank, is preparing a project titled Meghalaya Integrated Transport Project (MITP). The objective of the project is to "provide a well-connected efficient, good quality and safe transport network on long-term basis in a cost-effective manner maximizing economic and social outcomes" This will involve taking a whole-of-the-state approach of the entire transport sector and introduce innovations, efficiency, and new ways of doing business at various stages of service delivery, ensuring value for money.

The MITP is an ambitious project of the Government of Meghalaya under which it intends to strategically transform the Core Road Network of 2000 km road length. In the project, improvements on State Road Network roads of 650 km road length are proposed and 1350 km road length will be provided periodic maintenance besides other institutional, development activities. The Project shall follow a Multiphase Programmatic Approach (MPA). For the first trance under the project, State Road Network roads measuring 128 km length will be upgraded along with certain other institutional development activities. There are total 10 road sections selected under Phase-I, 5 road sections in East Meghalaya and 5 road sections in West Meghalaya.

Meghalaya is a state with close to 80% of its land under forest and tree cover and areas of high biodiversity and endemism housed not only within its six national parks and wildlife sanctuaries but also interspersed through internationally recognized sites of biodiversity such as Key Biodiversity Area (KBAs), Important Bird Areas (IBAs) and within its community and individual forest lands, sacred groves and riverine ecosystems. Unplanned and unmitigated infrastructural development and road construction could pose threats to forests, fauna and flora in the State.

The project has a 'high' environmental risk rating. It triggers the World Bank Operational Policies (OP) on Natural Habitats OP 4.04, Forests OP 4.36 and Physical Cultural Resources OP 4.11. Project activities, if not properly managed and mitigated, could have adverse environmental impacts. Including impacts on biodiversity rich areas and ecologically important areas, which are protected within the 6 national parks and wildlife sanctuaries of the state but also lie outside the boundaries of these protected areas.

To manage its impact on forests and natural habitat, the project will follow a mitigation hierarchy. (a) Avoidance of impacts on critical natural habitats and EIA process that establishes the presences of such areas; This entails that no new roads passing through designated protected areas will be financed under the project and existing roads will be financed only after ascertaining that the improvements on existing road will not have any significant or irreversible impacts on critical habitat areas; (b) Work on other eco-sensitive roads (located within 10km but not passing through designated Protected Areas) will be undertaken after comprehensive ecological assessments are undertaken that establish that the project intervention would be beneficial to local communities and environmental protection

can be made possible through minimization/mitigation efforts. These roads would also require the necessary clearances from the State Environmental Impact Assessment Authority (SEIAA) and an EMP that is prepared in consultation with wildlife experts, species specialists, NGOs and local communities. (c) Training and capacity building of PWD engineers as well as contractors in addressing specific biodiversity concerns during planning, construction and operation phase and scaling up capacity in the state through the establishment of an environmental and social cell within PWD

Scope of Work

The Meghalaya Integrated Transport Project (MITP) aims to follow an integrated approach and address the transport network of the state using a landscape approach. MITP seeks an independent, regional biodiversity expert, hereafter referred to as 'consultant' to strengthen the integration of biodiversity conservation and management into improvements proposed to the entire transport network and detailed biodiversity assessments on select sub-projects to strengthen biodiversity management measures where roads are proximate to critical and natural habitats. The scope of the work includes:

i) Desk Study / Secondary Survey of Biodiversity Values (Flora & Fauna): Using secondary information and geospatial data, the consultant should identify areas of critical habitat as per the criteria of the IFC Performance Standard 6 to inform project decisions on selection of roads and other interventions such as ropeways and waterways. Critical habitats are identified by the presence of qualifying biodiversity features. These may include significant components of Critically Endangered and Endangered species, species with small ranges, migratory or congregatory species, rare and threatened ecosystems, and key evolutionary processes. The consultant should undertake a biodiversity survey document the notable flora, fauna, including avifauna of the Core Road Network, including records of wildlife movements between community/ reserve forests and other sites.

ii) Primary Biodiversity Survey and Critical Habitat Assessment: The consultant should design and undertake primary surveys to ascertain the presence of critical habitat on roads selected under the first phase, that are proximate to national parks, wildlife sanctuaries or have the presence of Schedule 1 species. These roads include: a) Umling-Patharkama Road section of 3 km length (from km 18 to km 21) that passes through the Eco sensitive Zone of Nongkhyliem Wild Life Sanctuary (NWLS); b) Agia Medhipara Phulbari Tura (AMPT) Road which has occasional elephant crossings observed at 7 sections of the road c) Rongrenggre Darugre (RRD) Road which lies within a 10 km buffer zone of Nokrek National Park and forms the northern periphery of the Nokrek UNESCO Biosphere Reserve as is also within 5 kms of Rongrengri Key Biodiversity Area (KBA); and d) any other road/ intervention site the consultant, in their professional opinion, deems necessary to assess for critical habitat. The consultant should use the methodology of a critical habitat assessment in the IFC Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC, 2012b). iii) The consultant should lead the survey design and implementation to ascertain the valuable flora and fauna on the selected project road sections including an inventory of wildlife movement (s) on the section

iii) Site-Specific Biodiversity Management Plans: Based on the biodiversity survey and critical habitat assessment, including any wildlife fauna movements within the selected project stretches, the consultant will analyse and assess whether any significant and irreversible degradation of forest/habitat is likely due to the proposed

improvements to the road either directly, indirectly or cumulatively. If dealing with habitats for rare, endangered or threatened species, or schedule 1 species, the consultant should identify and consult with specific species specialists (such as from IUCNs Species Survival Commission Specialists Group). The consultant should assess the magnitude and significance of the impacts from the project to wildlife and its habitat and develop site- specific and, where relevant, species-specific management plans. The consultant should work closely with the State Wildlife Board, Forest department, Autonomous District Councils, NGOs and other relevant departments while designing the Biodiversity Management Plan. The management plans should provide holistic and integrated solutions for the management of biodiversity, applying the mitigation hierarchy approach. The solutions must consider hard engineering solutions as well nature based solutions and identify the timeline and budget to implement the measures. This should be combined with suggestion on conservation efforts, community-led approaches and measures to be taken in coordination with line departments such as forest, tourism, aquaculture mission, community and rural development.

iv) Contractors EMP: The consultant work with the PIU to integrate the identified measures into the contractors EMP and sensitize the PIU and contractor on the implementation of the Biodiversity/ Species specific management plan

v) Training and Capacity Building in Environmental and Social Cell, PWD: The consultant must facilitate the development of training modules and train master trainers within the Environmental and Social Cell of the PWD to systematically integrate biodiversity considerations through all phases of infrastructure design - through the planning, construction, operation and maintenance phase. This should include use of Geo-spatial tools, conceptual understanding of critical and natural habitats, consideration of direct, indirect, cumulative and landscape scale impacts and how to assess and manage them, relevant global and national best practices on measures to reduce impacts of roads on biodiversity.

Consultants Profile: The Consultant should be a Regional Biodiversity Specialist with 10-15 years of experience. S/he should have specific experience working on managing impacts of linear infrastructure on biodiversity, including planning and supervision of the implementation of hard engineering measures as well as nature based solutions. Consultant should be familiar with World Bank or other multilateral organization Safeguards Policies and Standards.

Assignment Duration: 8-12 Months

Annex 9: Elephant Crossing Details and Locations

GOVERNMENT OF MEGHALAYA
OFFICE OF THE ADDITIONAL PRINCIPAL CHIEF CONSERVATOR OF FORESTS, WILDLIFE & CHIEF WILDLIFE WARDEN, MEGHALAYA

No. FWC/ Road Project/PWD/20-21/ 86 Dated Shillong, the 4/5 May, 2020

To,

Shri B.P. Marak
Chief Engineer (NH),
Public Works Department (Roads), Meghalaya, Shillong 793001

Sub.: Rehabilitation of AMPT Road under World Bank funded MITP Project in the State of Meghalaya –request for forest clearance

Ref.: Letter No. PW/CE/NH/WB/6/2019/20 dated 24th April 2020.

Sir,

With reference to the letter under reference on the above-mentioned subject it is stated that proposed alignment of the Agia-Medhipara-Phulbari-Tura (AMPT) Road as per a map enclosed with the letter under reference does not pass through any National Park and Wildlife Sanctuary in this State. The said alignment however passes through following elephant/wild animal corridors/crossing zones:

Sl. No.	Name	G.P.S. Coordinates	Remarks
1.	Holaidanga	N 25°56'44.83" & E 090°08'10.86" N 25°56'41.02" & E 090°08'01.83" N 25°56'38.20" & E 090°07'54.57"	Herds of 20-25 Elephants pass through these stretches for around 10-12 times in a year
2.	Lahapara	N 25°58'27.48" & E 090°19'43.28" N 25°58'22.86" & E 090°19'50.24"	Herds of 18-22 Elephants pass through these stretches for around 12-15 times in a year
3.	Borogobol	N 25°58'57.06" & E 090°20'00.45"	
4.	Dalchangpara	N 25°59'22.46" & E 090°20'18.58"	
5.	Mendal	N 25°59'56.64" & E 090°20'47.22"	

To provide safe passage to elephants and other animals through these corridors, installation of adequate number of signages to warn the commuters about the movement of animals and provision of stone paved rough surface similar to one available in a section of *Bhism Pitamah* Marg in front of Sri Sai Mandir near Jawaharlal Lal Nehru Stadium in New Delhi to limit speed of vehicles plying through each of the above-mentioned corridors may be incorporated in the design of the said Highway.

This is for your information and necessary action.

Yours faithfully,

(H.C. Chaudhary, IFS)
Addl. Principal Chief Conservator of Forests (Wildlife), &
Chief Wildlife Warden, Meghalaya: Shillong

Sylvan House, Lower Lachumiere
Shillong 793001
Phone: 91 364 2227271
Mob: +919436999100
e-mail:wildlifemegh@yahoo.com