

Initial Environmental Examination

August 2017

IND: Second Rural Connectivity Investment Program

Assam

Prepared by National Rural Road Development Agency, Ministry of Rural Development,
Government of India for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 6 July 2017)

Currency unit	–	Indian Rupees (INR/Rs)
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ABBREVIATIONS

ADB	:	Asian Development Bank
ASRB	:	Assam State Rural Board
BIS	:	Bureau of Indian Standards
CD	:	Cross Drainage
CGWB	:	Central Ground Water Board
CO	:	Carbon Monoxide
COI	:	Corridor of Impact
DM	:	District Magistrate
EA	:	Executing Agency
EAf	:	Environment Assessment Framework
ECOP	:	Environmental Codes of Practice
EIA	:	Environmental Impact Assessment
EMAP	:	Environmental Management Action Plan
EO	:	Environmental Officer
FEO	:	Field Environmental Officer
FGD	:	Focus Group Discussion
FFA	:	Framework Financing Agreement
GOI	:	Government of India
GP	:	Gram panchyat
GSB	:	Granular Sub Base
HA	:	Hectare
HC	:	Hydro Carbon
IA	:	Implementing Agency
IEE	:	Initial Environmental Examination
IRC	:	Indian Road Congress
LPG	:	Liquefied Petroleum Gas
MFF	:	Multitranchise Financing Facility
MORD	:	Ministry of Rural Development
MORTH	:	Ministry of Road Transport and Highways
MOU	:	Memorandum of Understanding
NAAQS	:	National Ambient Air Quality Standards
NGO	:	Non Governmental Organisation
NOx	:	Nitrogen Oxide
NC	:	Not Connected
NRRDA	:	National Rural Road Development Agency
PIU	:	Project Implementation Unit
PIC	:	Project Implementation Consultants
PRIs	:	Panchyati Raj Institutions
PMGSY	:	Pradhan Mantri Gram Sadak Yojana
POL	:	Petroleum, Oil and Lubricants
PPTA	:	Project Preparation Technical Assistance
ROW	:	Right-of-Way
RPM	:	Respirable Particulate Matter
SRRDA	:	State Rural Road Development Agency

SBD	:	Standard Bidding Documents
SO ₂	:	Sulphur di-Oxide
SPM	:	Suspended Particulate Matter
TSC	:	Technical Support Consultants
UG	:	Upgradation
WBM	:	Water Bound Macadam
ZP	:	Zilla Parisad

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EXECUTIVE SUMMARY

1. Pradhan Mantri Gram Sadak Yojana (PMGSY) aims to provide all-weather road connectivity to currently unserved habitations in India's rural areas, where 70% of the population live. The government of India (GOI) launched "The Pradhan Mantri Gram Sadak Yojna (PMGSY) in year 2000. The objective of PMGSY is to provide all-weather road connectivity to all rural habitations with a population of more than 500 persons in plains and 250 persons in hill states. This program is being implemented through National Rural Road Development Agency (NRRDA) under Ministry of Rural Development (MORD) at central level and through state rural road development authority/agencies (SRRDA) at state level.

2. The Second Rural Connectivity Investment Program (RCIP 2) is the continuation of Rural Connectivity Investment Program (RCIP) and is a Multitranche Financing Facility (MFF) that will be implemented in the states of Assam, Chhattisgarh, Orissa, Madhya Pradesh and West Bengal.

3. The Government of Assam is now planning to submit to ADB the first Periodic Finance Request (PFR) that includes the proposal for about 303 rural roads totalling to 992.91 km in the state of Assam. The project as per classification of ADB has been categorised as 'Category B' project and therefore requires an Initial Environmental Examination (IEE). No categorisation is made under Indian environmental legislation since these small roads do not require any environmental clearance in accordance to Indian Environmental (Protection) Act and Rules, 1986 amended till date.

4. A review of international agreements and conventions where India is a member were made to ensure compliance. These agreements are: Conventions on Wetlands of International Importance Especially as Water Fowl Habitats (Ramsar), Convention concerning the protection of the World Cultural and Natural Heritage, Convention on International Trade in Endangered Species of Wild Fauna & Flora (CITES), Convention on the conservation of Migratory Species of Wild Animals (CMS 1979), and the United Nations Framework Convention on Climate Change, Convention on Biological Diversity.

A. Physical Environment

5. Assam has a humid climatic condition (tropical monsoon rainforest climate). The weather in Assam is dry in winter, hot, and wet in summer. Its most distinguishing feature is the copious rainfall between March and May at a time when precipitation in upper India is at its minimum. The state has three main seasons: a) winter from November to February, when the average temperature ranges from 6-8 °C; b) summer from March to May, when the average temperature is 35 °C and reaches peak of 39°C; and c) monsoon, when the average annual rainfall is around 70 inches in the west and around 120 inches in the east.

6. Assam is in the easternmost projection of the Indian Plate, where it thrusts underneath the Eurasian Plate creating subduction zone. Assam possesses a special geomorphic environment, with large plains and dissected hills of the South Indian Plateau system abutting the Himalayas to the north, northeast and east.

7. Most of the project area lies in vast open agricultural land and is largely free from air pollution sources other than traffic. As such, the ambient air quality for major pollutants like SO₂, SPM and NO_x is expected to be within the limits.

8. All the rivers in Assam are prone to floods, mainly because they receive heavy rainfall within a short time. The river waters collect a tremendous amount of silt and other debris and raise the level of the river beds. Therefore, it becomes impossible for the main channel to cope with the vast volume of water received during the rains.

9. Sample roads are mostly crossed by seasonal small channels. However, many of the sample roads are located in close proximity of the rivers and are prone to flood. Ground water being extracted through hand pumps or tube well and is the main source of water supply to villagers.

B. Biological Environment

10. Assam is one of the richest biodiversity zones in the world. There are a number of tropical rainforests in Assam. Moreover, there are riverine grass lands, bamboo orchards and numerous wetland ecosystems. Many of these areas have been protected by developing national parks and reserved forests. The Kaziranga and Manas are the two World Heritage Sites in the region. The Kaziranga is the home for the rare Indian Rhinoceros, while Manas is a project tiger sanctuary area. However, no project roads pass through any of the protected areas. No wetland or large water body falls in and around the selected project roads area. Fisheries activities are common in Assam including subproject areas.

C. Socio-economic Environment

11. As of 2012, Assam has a population of 30.94 million, 69% of which is engaged in agriculture. Assam produces some of the finest and most expensive teas in the world. Other than the Chinese tea variety *Camellia sinensis*, Assam is the only region in the world that has its own variety of tea, called *Camellia assamica*. Approximately 15% of the world's tea production comes from Assam. Other than tea, the state also grows orange, banana, guava, and pineapple.

12. Assam has 44,309 primary and middle schools, secondary schools, high schools, colleges for professional as well as general education, universities and other educational institutions.

D. Anticipated Environmental Impacts and Mitigating Measures

13. Significant environmental impacts were anticipated mostly during construction phase. Some of these significant impacts include a) impact on common utilities and community properties; b) loss of productive soil; c) impact on hydrology and drainage; d) compaction and contamination of soil; e) generation and management of construction debris and wastes; f) increased air pollution level; g) increased noise level; h) impact on ground and surface water quality and availability; i) loss of trees; j) increased level of vehicle traffic; and k) health and economic hazards to the community. Mitigating measures were proposed in the environmental management measures to address all the anticipated environmental impacts.

14. **Greenhouse gas emission and addressing climate change risks.** Total annual emissions without the project (business as usual) at the middle of the design life of 7.5 years is estimated at 36,692.97 tons/year and with project scenario is estimated at 37,614.68 tons/year, for all 303 roads proposed for Tranche 1 of RCIP 2. The with project scenario is still far below the 100,000 tons per year threshold set in the ADB SPS 2009 and therefore not required to implement options to reduce or offset CO₂ emissions.

15. Key engineering measures to address climate risk variables such as extreme precipitation, high temperatures and vulnerability to landslides include a) increase in road embankment level road section located in low-lying and flood prone areas; b) erosion protection for areas prone to landslides; c) increase in capacity of spillways and culverts; d) embankment protection through tree plantings; and e) improvement of longitudinal ditches and drains. Provisions have also been made in the bidding documents for the contractor to prepare EMPs based on the final detailed design to address climate related risks and vulnerabilities.

16. **EMP implementation.** The Ministry of Rural Development (MoRD), the executing agency has the responsibility for monitoring implementation of the EMP for all subprojects and undertaking necessary due diligence. MoRD ensure this through its Nodal Agency NRRDA (National Rural Road Development Agency). NRRDA constituted by MoRD is the nodal agency for the implementation of the environmental management plan (EMP). SRRDA is the state level agency responsible for implementation of PMGSY program in the state. NRRDA has developed various guidelines and defined institutional arrangements for effective and timely implementation of PMGSY program, which also covers measures for environmental and social safeguards. In line with the defined institutional requirements, each SRRDA has set up district level project implementation units (PIUs). NRRDA also appoints Technical Support Consultant (TSC) to provide technical support for capacity building in SRRDA/PIUs, facilitating them for environmental and social safeguard compliance monitoring and due diligence. SRRDA appoints PIC (project implementation consultant) for supervision of construction work. PIC also helps PIU in monitoring the EMP.

17. **Environmental Management and Monitoring Plans.** The environmental monitoring program is prepared to monitor the environmental performance of environmental management plan. For rural roads, Environmental Monitoring Plan will be more observation oriented and it provides observation areas with frequency of monitoring at pre-construction aspects¹, construction and operation stages.

18. **Grievance Redress Mechanism.** Grievance redress mechanism will be implemented from the subproject to national levels. The PIU will designate a public disclosure and complaints contact person for each subproject to help address all concerns and grievances at the subproject level. Grievances, if any, will be considered at the village level by the Grievance Redress Committee (GRC) consisting of members of Gram Panchayat, and Pradhan / Up-Pradhan of Gram Panchayat. The GRC will meet for addressing grievances as needed. Grievances not resolved at the village level will be addressed through the district level GRC, with the following members: Executive Engineer of the PIU, member of Zilla Parishad, member of the grievance committee of the concerned GP; and representatives of affected people. Grievances at this level need to be resolved prior to contract award. At the national level, NRRDA has made provision of registering complaint /suggestion through its website. NRRDA forwards these complains to concerned SRRDA for necessary actions. SRRDA directly or through concerned PIU initiate the appropriate action and update the complainant as well as NRRDA.

19. **Public Consultation.** Public consultation was undertaken consistent with the ADB requirements. All the five principles of information dissemination, information solicitation, integration, co-ordination and engagement into dialogue were incorporated in the consultation process. Stakeholders', including women, were consulted to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design. Informal

¹ Aspects related to alignment selection for inclusion of new roads

meetings, interviews were organized covering the entire project stretch. Consultations with stakeholders will continue throughout project implementation as necessary at different levels, to update and address the concerns of affected people on environment related issues.

E. Conclusion and Recommendations

20. **Conclusion.** The proposed Rural Connectivity Investment Program Phase has been categorized as "B" for environment under SPS 2009. No categorization is made under the environmental legislation of India, since these small roads do not require any environmental clearance in accordance with Environment (Protection) Act and Rules, 1986 amended till date. The findings of environment assessment of sample roads indicate that impacts are mostly similar and subprojects are unlikely to cause any significant environmental impacts. While some of the impacts are negative, there are many bearing benefits to the area. Most of the impacts are likely to occur during construction stage, are temporary in nature, and can be mitigated with minor to negligible residual impacts. All sample roads included under Tranche I were selected based on ecological and climate change consideration defined under EARF. Accordingly, none of the sample roads passes through protected areas or encroaches precious ecology (sensitive or protected areas) or any historical or archeologically protected areas.

21. Significant impacts are not considered adverse and typical to road constructions that are simple to mitigate. Impacts related to road siting in flood and erosion prone areas are mitigated through proper design. During construction, impacts can be mitigated through good engineering practices and compliance to permits and clearances issued by the regulatory agencies. The mitigating measures are institutionalized through the EMP and EMoP, and institutional arrangements were established to implement these plans.

22. **Recommendations.** Any major changes or any additional work other than the proposed project activities indicated in the IEE and Environment Checklist (formerly Environmental Code of Practice or ECOP) will require updates in the IEE. The updated Environment Checklists and IEE will have to be submitted to NRRDA and ADB for concurrence prior to commencement of civil works.

23. Executing agency shall ensure that updated road specific EMP forms part of DPR and is available to contractor at the time of bidding. The contractor will specify the quantity and budget for various activities like rehabilitation of borrow earth pits, first aid and sanitation facilities at construction camp and temporary office/material storage place as per EMP requirements. The same shall be revised if there is any change in the project design. Any such change shall be reported to ADB as well.

I. INTRODUCTION

A. Project Background

1. Pradhan Mantri Gram Sadak Yojana (PMGSY) aims to provide all-weather road connectivity to currently unserved habitations in India's rural areas, where 70% of the population live. The Government of India (GOI) launched "The Pradhan Mantri Gram Sadak Yojna (PMGSY) in year 2000. The objective of PMGSY is to provide all-weather road connectivity to all rural habitations with a population of more than 500 persons in plains and 250 persons in hill states. This program is being implemented through National Rural Road Development Agency (NRRDA) under Ministry of Rural Development (MORD) at central level and through State Rural Road Development Authority/Agencies (SRRDA) at state level.

2. The Second Rural Connectivity Investment Program (RCIP-2) is continuation of Rural Connectivity Investment Program (RCIP) and is a Multi-Tranche Financing Facility (MFF) that will be implemented in the states of Assam, Chhattisgarh, Orissa, Madhya Pradesh and West Bengal. Investments in rural roads will improve connectivity, cut transport costs, and provide enabling infrastructure to areas currently with poor access to markets and urban towns, and thus contribute to growth and equity in the country's largest sector.

3. The Government of Assam is now planning to submit to ADB the first Periodic Finance Request (PFR) that includes the proposal for about 303 rural roads totalling to 992.91 km in the state of Assam. Assam State Road Board (ASRB) is the Implementing Agency (IA) for the ADB funded subprojects in the state. The preparatory works for the proposed roads under the first tranche have been completed for the state. As per the requirements of ADB, it is mandatory that the subprojects under the programme comply with ADB's environmental safeguards. The project as per classification of ADB has been categorised as 'Category B' project and therefore requires an Initial Environmental Examination (IEE). The Initial environmental examination (IEE) report has been prepared by using environmental checklist for sample roads.

B. Project Roads Identification and Location

4. PMGSY has prepared specific guidelines for the selection of roads under this programme. The key requirements are that any road will be eligible for construction or up-gradation only if it is part of the Core Network² and satisfy the following environmental safeguards:

- i. The selected road shall not disturb any cultural heritage designated by the Government or by international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance.
- ii. The selected road shall not pass through any designated wildlife sanctuaries, national parks, notified ecological sensitive areas or area of international significance (e.g., protected wetland designated by the Wetland Convention);

² Core Network is that minimal network of roads (routes) that is essential to provide access to essential social and economic services to all eligible habitations in the selected areas through at least single all-weather road connectivity. A core network comprises of through routes and link routes. Through routes are the ones, which collect traffic from several link roads or a long chain of habitations and lead it to marketing centres either directly or through the higher category roads i.e., the district roads or the state or national highways. Link routes are the roads connecting a single habitation or a group of habitations to through routes or district roads leading to market centres. Link routes generally have dead ends terminating on a habitation, while through routes arise from the confluence of two or more link routes and emerge on to a major road or to a market centre

- iii. The sub projects shall only involve activities that follow Government of India laws and regulations and meets funding agency safeguard policies.
5. Summary of the proposed subprojects in Second RCIP Tranche I is presented in *Table 1*.

Table 1: Summary of proposed subprojects for Second RCIP-II Tr I

No. of Districts	:	15
No. of Roads in RCIP-II Tranche I	:	303
Total length of Roads in RCIP-II Tranche I (Km)	:	992.91
Maximum Length (km)	:	12.758
Minimum Length (km)	:	0.58
Average Road Length (km)	:	3.277

6. The 992.91 km of roads comprises 303 different stretches spread over in 15 out of the 27 districts of the State. Within each district, the roads are further scattered in several blocks and sub divisions. In this tranche, the longest road is Dayalpur to Gamani of length 12.758 km under Balipara Block of Sonitpur District, while Kharboja to Khagarpur Road of length 0.58 km under Boitamari Block of Bongaigaon District is the shortest. The average length of roads works out to 3.277 km.

7. The list of 992.91 km roads with their location and length is given in **Appendix 1**.

C. Rural Road Construction Proposal

8. The proposal for rural road construction works typically considers a 10-12m right of way (ROW), which includes side slopes for embankment, side drains on either side of the alignment. The roads consist both Black Top (B.T.) and Cement Concrete (C.C.) as per the ROW availability.

9. The construction proposals are confined to the existing alignment of the unpaved / partly paved tracks. Majority of these are pathways traditionally used by the villagers and transformed into the present form of unpaved tracks/roads through minor construction works taken up by the communities, local bodies and state Government over the decades.

D. ADB Safeguard Policies and Category of the Project

10. The Asian Development Bank has defined its Safeguard requirements under its 'Safeguard Policy Statement 2009' (SPS 09). The SPS 09 require environmental assessment, mitigation and commitment towards environmental protection. The prime objectives of these safeguard policies are to (i) avoid adverse impacts of projects on the environment and affected people, where possible; and (ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible. ADB as per SPS 09 classify a project into category A, B or C depending on potential adverse environmental impacts.

11. All environmentally sensitive components along each subproject roads is critically analysed to assess the magnitude and extent of likely impacts. These sample subproject roads stretch does not pass through any protected areas nor located near any archeologically important monument. As per selection guidelines, none of the selected subproject road passes through reserved forests either. Few trees cutting though may be involved. The road primarily

passes through agricultural and residential areas. Most of the roads follow existing village roads and unpaved movement paths. As such, land acquisition is also low. Hence, the project will fall under category B as per ADB Safeguard Policy Statement 2009.

12. No categorisation is made under environmental legislation since these small roads do not require any environmental clearance in accordance to Indian Environmental (Protection) Act and Rules, 1986 amended till date.

E. Objectives and Approach for Environmental Assessment

13. The prime objectives of the environmental assessment is to identify the likely environmental impacts during design, construction and operation stage of each sub project and suggest cost effective mitigation and monitoring measures with institutional mechanism applicable to all the subprojects as well as specific to a subproject.

14. Since there is large number of subproject roads involved under RCIP and magnitude of each road is small, preparation of individual IEE's for each road will be difficult and time consuming. Subprojects specific Initial Environmental Assessment (IEE) is carried out following the IEE checklist in the EARF. These completed IEE checklists with annexures on tree, utility and community structures, strip maps and photographs for selected sample roads are enclosed as **Appendix 2**.

15. The findings of subproject specific assessment suggest that similar issues exist amongst the proposed project roads with very few subproject specific issues. Therefore, state specific IEE report has been prepared based on the IEE checklist of selected sample subproject. This IEE approach will be followed for conducting environmental assessment for remaining subprojects under RCIP.

F. IEE Methodology and Content

16. The state specific IEE has been largely structured as per Safeguards Policy Statement, 2009. The IEE reports including EMPs, and monitoring plans, cover the most environmentally sensitive components in state as well as specific to subproject roads.

17. **Corridor of Impact:** The direct area of influence or the corridor of impact (COI) has been considered as, 10 m on either side of the proposed sample roads alignment Based on the proposed cross-section.

18. **Field visits, Primary and Secondary Data Collection:** Each selected sample road was visited along with concerned PIU officials for environmental assessment and identification of associated environmental issues. Each road specific strip map was prepared during the field visit to capture the information related to tree inventory, utility and community structures located along the proposed road alignment, surface water bodies, and ecological sensitivities. Secondary environmental information pertaining to the environmental issues, protected area, forests areas were collected from various government and non-governmental / research institutions for assessment of the baseline environment of the project locations, district and state.

19. **Data Analysis, Impact identification and Mitigation Measures:** Information collected was analyses and impact was identified using expert's assessment and following established

practices. Mitigative measures are proposed common to larger roads and specific to the roads. EMP is prepared considering mitigative measures and institutional framework of SRRDA.

20. The IEE report includes following seven chapters including this introduction Chapter.

- Chapter 1- Introduction
- Chapter 2- Description of Project
- Chapter 3- Description of Environment
- Chapter 4- Anticipated Impacts and Mitigation Measures
- Chapter 5- Institutional Requirement and Environmental Monitoring Plan
- Chapter 6- Public Consultation and Information Disclosure
- Chapter 7- Conclusion and Recommendation

G. Legal Framework and Legislative Requirements:

21. India has well defined institutional and legislative framework. The legislation covers all components of environment viz air, water, soil, terrestrial and aquatic flora and fauna, natural resources, and sensitive habitats. India is also signatory to various international conventions and protocols.

22. As per Environment (Protection) Act, 1986; the Environmental Impact Assessment Notification, 2006; amended in 2009 defines the environmental impact assessment for defined development projects. All New or expansion of National and State Highways requires Environmental Impact Assessment and Environmental Clearance from central or state level Environmental Appraisal Authority. However, small roads projects as proposed under RCIP do not require environmental assessment or clearance as per above notification. Since above environmental assessment requirement is not applicable, the mainstream environmental concerns specific procedures that were formulated under Second Rural Connectivity Investment Program (RCIP) will in any case be implemented.

23. In addition to above, new road construction or road improvement work attract many legislation including for diversion of forest land, tree cutting, opening of new quarry, establishment of temporary workshops, construction camps, hot mix plants, and use of vehicles for construction. The legislation applicable for sample RCIP roads are listed below:

Sl. No.	Legislation	Applicability
1.	Environment (Protection) Act 1986- EIA Notification 2006 (Amended 2009)	Not applicable to these rural roads. It is applicable only to highways (NH and SH).
2.	Forests (Conservation) Act 1980 (Amended 1988), and Forest (Conservation) Rules, 1981, (Amended 2003)	As per above Act/Rules <i>Forest Clearance</i> from Department of Forests/Ministry of Environment and Forests Govt. of India is required for diversion of forest land (if any) for non-forest purpose. Prior permission is required from forests department to carry out any work within the forest areas and felling of roadside trees. Cutting of trees need to be compensated by compensatory afforestation as per permission condition.
3.	The Wildlife (Protection) Act, 1972 (Amended 1993); Not applicable in this case. Since No roads will be selected passing through protected areas or sanctuaries	Not Applicable, since no sample road is selected if it passes through protected areas.

Sl. No.	Legislation	Applicability
4.	The Water (Prevention and Control of Pollution) Act 1972 (Amended 1988), and the Water (Prevention and Control of Pollution) Rules, 1974	Placement of hot-mix plants, quarrying and crushers, batch mixing plants, discharge of sewage from construction camps requires <i>No Objection Certificate (Consent to Establish and Consent to Operate)</i> from State Pollution Control Board prior to start of construction or setting up specific facility. <i>Authorisation</i> will also be required for disposal of Hazardous Waste like waste oil etc. from State Pollution Control Board
5.	The Air (Prevention and Control of Pollution) Act, 1981, (Amended 1987), and the Air (Prevention and Control of Pollution) Rules, 1982	
6.	The Noise Pollution (Regulation and Control) Rules, 2000 (Amended 2002)	
7.	The Hazardous Waste (Management, Handling and Transboundary Movement) Rules 2008 (Amended 2009), and the Batteries (Management and Handling) Rule, 2001	
8.	Guidelines for Ground Water Extraction Prescribed by Central Ground Water Authority under the power granted under Environment (Protection) Act 1986	<i>Permission</i> from Central Ground Water Authority (CGWA) is required for extracting ground water for construction purposes, from declared as Semi-critical, Critical and Overexploited areas from ground water potential prospective. For NOC, An application in the prescribed Performa is to be submitted either to the Office of the Regional Director, (CGWB) of the concerned state, or to Member Secretary, CGWA, New Delhi

24. The PMGSY Scheme and Guidelines (2004) No. 12025/8/2001-RC, Ministry of Rural Development (MORD) also defines environmental safeguards particularly with respect to sample road selection and regulatory compliance which is also to be complied with.

H. Acknowledgement

25. The Technical Support consultants (TSC) gratefully acknowledge the support received from NRRDA and ASRB throughout the environmental assessment process. We also acknowledge the assistance received from respective PIUs and the PIC during field visits and other government agencies for primary and secondary data collection as well during public consultation.

II. DESCRIPTION OF THE PROJECT

A. General

26. The PMGSY program has mandate to provide all-weather roads to all the rural habitations within the country. Second RCIP is planned to meet above objectives. 90.375 Km roads (30 nos.) are identified as sample roads for Assam under Tranche I of Second RCIP. The broad specification for road alignment selection, payment design, construction methodology, geometric design etc. are same and is as per the "Specification for Rural Roads" published by IRC on behalf of the Ministry of Rural Development, Govt. of India. The design details presented in this chapter are as per above specifications. Minor changes will apply depending on road specific issues and design consideration.

27. Since topography of Assam state is largely flat, the design details applicable to flat terrain are presented in following section.

B. Sample Roads Selected in Assam State

28. Assam state has selected 303 roads with a total length of 992.91 Km spread over 15 districts as summarised at **Table 2** below and detailed at **Appendix 1**.

Table 2: Summary of District Wise Rural Roads

Sl. No.	Name of District	No. of Roads	Length of Roads (Km)			
			Total	Max	Min	Average
1	Bongaigaon	41	78.590	4.74	0.58	1.917
2	Dibrugarh	14	42.305	6.406	0.784	3.022
3	Goalpara	5	9.810	2.842	0.700	1.612
4	Golaghat	1	1.500	1.500	1.500	1.500
5	Jorhat	12	42.664	6.894	0.700	3.555
6	Kamrup	25	74.240	9.36	1.000	2.970
7	Kokrajhar	18	67.295	6.92	2.000	3.739
8	Darrang	62	195.813	7.410	0.704	3.158
9	Nagaon	19	38.113	3.550	0.770	2.006
10	Sivasagar	1	1.540	1.540	1.540	1.540
11	Sonitpur	48	169.345	12.758	0.816	3.528
12	Tinsukia	7	27.574	6.700	2.500	3.939
13	Baksa	15	71.856	10.430	1.000	4.790
14	Chirang	2	6.307	4.060	2.247	4.790
15	Udalguri	33	165.962	12.439	0.689	5.029
Total of RCIP II Tr I		303	992.914	12.758	0.580	3.277

C. Project Description

1. Rural Road Construction Proposals

29. The proposed rural road construction work will provide 3.75 to 7.5 m roadway width³ with 3.75 m carriageway in accordance with the IRC-SP 20: 2002 in plain terrain. The proposal considers a 3.75 m cement concrete pavement with lined storm water drains for stretches passing through built-up areas, waterlogged/water overtopping/ flood prone areas. The pavement design considers a base layer of variable thickness as per the design with granular

³ The road width may be reduced to 6m in case of BT and 3.75 m in case of CC as per PMGSY recent guideline.

sub base, 150 mm thick water bound macadam (WBM grade I & II) and finally topped with 20 mm thick bituminous pavement. Adequate cross drainage structures like pipe or slab culverts/bridge structures are considered for drainage channels across the roads. Few minor bridges are also proposed for construction. **Figure 1** shows the typical cross section of the rural roads.

30. The rural road construction works will be in conformance with the Rural Roads Manual and / or Technical Specifications (IRC: SP20: 2002) for Rural Roads published by the Indian Road Congress (IRC) on behalf of Ministry of Rural Development, Government of India. The broad design considerations are given at latter part of this chapter.

2. Present Condition

31. The project roads mainly pass through plain or riverine terrain and agricultural area. The project roads have several cross-drainage structures, electric posts and telephone post along the existing alignment. There are some community physical structures like Temple, Mosque, primary or secondary schools beside the roads alignment, but largely will not be affected due to the road works.

3. Alignment and Profile

32. The existing road is generally an earthen track with some stretches of brickbat soling (description of the road surface). Thus, the project road is a new connectivity road. The construction works are to be confined to the existing alignment. The existing horizontal and vertical alignment / profile will be generally maintained except for minor smoothening or corrections to sustain consistent design speed without causing any land acquisition requirements and thereby the possible social and/or environmental concerns.

4. Design Considerations

33. **Geometrical Design and ROW Requirements:** The geometric design standards for this project will conform to PMGSY (ADB) guidelines and the guidelines as stated in *IRC-SP 20:2002* and the final recommendations of NRRDA expert committee (*refer D.O. no. - 17305/1/2007-Tech/12 dated 30/09/2010*). Recommended design standards vis-à-vis the standards followed for this road are described below. The requirement of ROW as per PMGSY guidelines considered for the design is given at Table 3 below:

Table 3: ROW Requirement

Road classification	Plain and Rolling Terrain (ROW in m)			
	Open Area		Built-up Area	
	Width	Range	Width	Range
Rural roads (ODR and VR)	15	15-25	6.0	6.0

ODR: Other District Roads; VR: Village Road

34. Since terrain is plain, the design speed considered is as per recommended design speed of 50 Km/h for ruling (40 Km/h as minimum speed). The radius of horizontal curve is considered as 90 m ruling minimum (60m absolute minimum). The vertical alignment is designed as per ruling gradient of 3.3% applicable for plain terrain.

35. **Pavement and Embankment Design:** Considering the sub-grade strength, projected traffic and the design life, the pavement design for low volume PMGSY roads are proposed to

be carried out as per guidelines of IRC: SP: 72 – 2007 or IRC SP:77 “Design of Gravel Road” and IRC SP:62-2004 “Cement Concrete roads”. In built up area for hygienic and safety reasons, C.C pavement is proposed with a hard shoulder and appropriate line drain. A design life of 10 years is considered for pavement design of flexible and granular pavements. The embankment height considered as 1m (average) from ground to crust except at the approaches of cross drainage structures. The embankment height will vary in flood prone area as per the HFL.

36. **Road side drain:** As the insufficient drainage of surface water leads to rapid damage of road, road side drain (**Figure 1**) are provided on the locations of habitation areas with concrete pavement. The rainwater will flow along the longitudinal slope and intermittent gaps in concrete curbs

37. **Carriageway:** The carriageway is proposed as 3.75 m as per IRC-SP20: 2002. It may be even restricted to 3.0 m, where traffic intensity is less than 100 motorised vehicles per day and where the traffic is not likely to increase due to situation, like dead end, low habitation and difficult terrain condition. The ROW requirement in built-up/constricted area may be even reduced to 4 m.

38. **Shoulder:** Earthen shoulder shall be constructed in layers and compacted to 100% of Proctor's Density. It is proposed to have 1.875 m wide shoulder (0.875 m hard shoulder and 1 m earthen shoulder) on either side of carriage way.

39. **Surfacing:** Slow setting bitumen emulsion will be applied as primer on water bound layer. Rapid setting bituminous emulsion shall be used for Tack coat. Premixed carpet 20 mm thick and mixed with equivalent viscosity grade bitumen shall be laid as surfacing course. 6 mm thick, Type B seal coat is considered for sealing of the premixed carpet.

40. **Structural Works:** Following grades of concrete are proposed for structural works as per specified MORD and IRC specifications:

- Concrete in superstructure of Slab Culvert – M-25 (RCC)
- Concrete in Abutment cap, Dirt wall of slab culverts – M-25 (PCC)
- Brickwork in Abutment, Return Wall, Headwall – Cement mortar (1:4)
- Concrete below Abutment, Return Wall, Headwall – M-10 (PCC)
- Concrete in pavement (on carriageway) – M-30 (PCC)
- Concrete in pavement (on shoulder and drain) – M-25 (PCC)

5. Construction Methods

41. Since the proposed rural roads are small in length, NRRDA has framed specific guidelines for cost effective construction of these rural roads. As per the guideline of NRRDA, construction by more of manual means is preferred. Motor grader & tractor-towed rotavator shall be used for handling of bulk materials like spreading of aggregates in sub-base & base courses by mix-in-place method. Ordinary smooth wheeled roller shall be used for compaction if the thickness of the compacted layer does not exceed 100 mm. It is also considered that, hot mix plant of medium type & capacity with separate dryer arrangement for aggregate shall be used for bituminous surfacing work that can be easily shifted. A self-propelled or towed bitumen pressure sprayer shall be used for spraying the materials in narrow strips with a pressure hand sprayer. For structural works, concrete shall be mixed in a mechanical mixer fitted with water measuring device. The excavation shall be done manually or mechanically using suitable medium size excavators.

6. Available Right of Way

42. As per the information available with Assam Public Work Division (PWD), ROW is largely available for the rural roads. Additional land required for road improvement will be secured through voluntary donation from private landowners through the Community Participation Framework (CPF). The CPF establishes guidelines to ensure that donation is voluntary and negative social and economic impacts due to the project will be avoided or minimized. The community consultation processes for subproject preparation result in a set of documents that collectively serve as a plan for mitigating likely negative impacts of each subproject. This process follows the ADB social safeguard requirements mentioned below for projects involving voluntary donations:

- (i) full consultation with landowners and any non-titled people on site selection;
- (ii) voluntary donations do not severely affect the living standards of APs and are directly linked to benefits, with community sanctioned measures to replace any losses that are agreed through verbal and written record by affected people; and
- (iii) Voluntary donations are confirmed through verbal and written record and verified and adopted through constitutional process.
- (iv) Adequate grievance redress mechanisms are in place.

7. Traffic

43. The present traffic data on each of these rural roads typically varies between 10-15 vehicles per day on most of the rural stretches. The traffic largely comprises motor cycles/two wheelers, tractors, light commercial vehicles, animal drawn carts and bicycles.

8. Economic Assessment

44. The economic analysis carried out for the project has indicated that the rural road construction works will act as a catalyst for the rural economic growth and poverty alleviation of the community in the region.

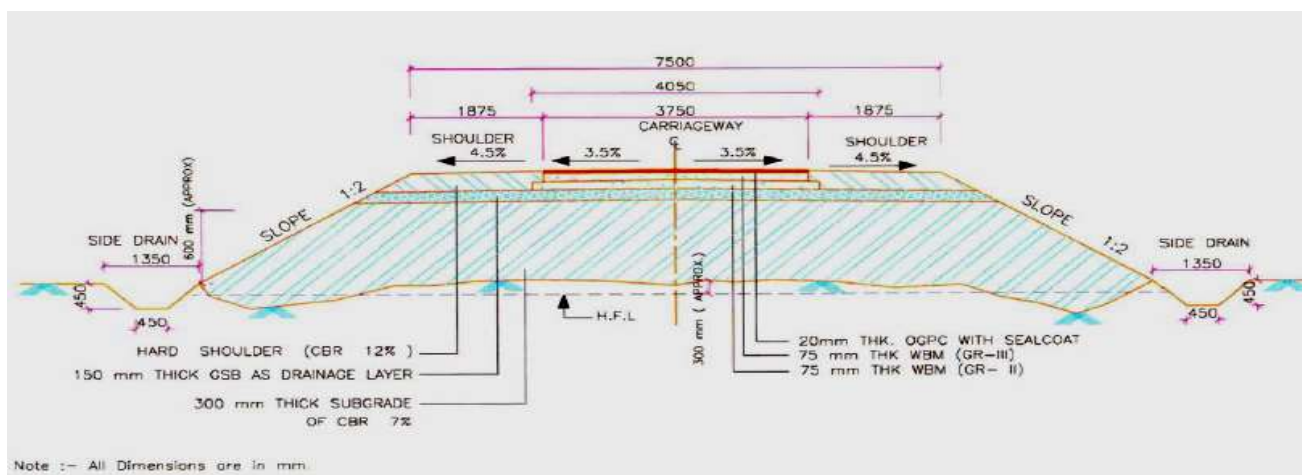


Figure 1: Cross-section of Rural Roads

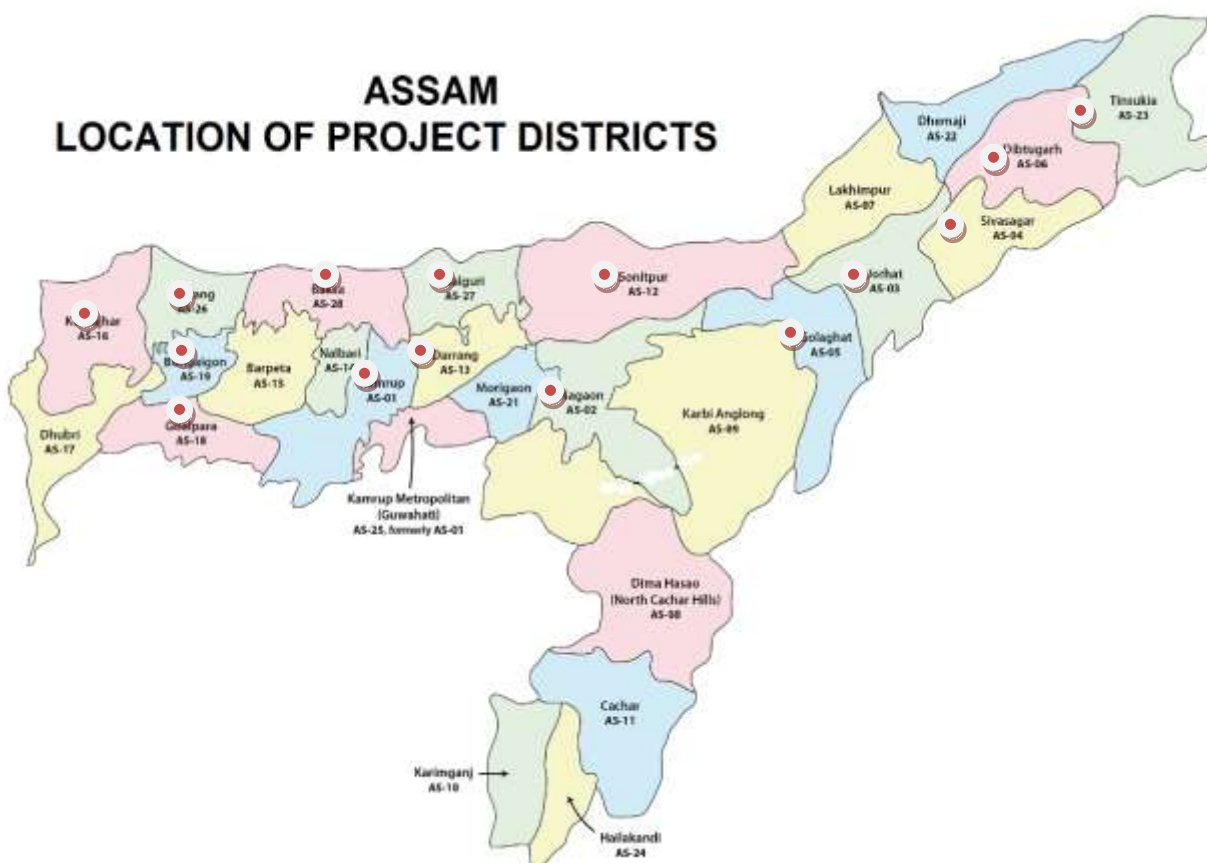
III. DESCRIPTION OF THE ENVIRONMENT

A. Background

45. Baseline environmental conditions about all facets of environment viz. physical, biological and socio-economic have been established using both primary and secondary sources. Efforts have been made to collect the latest information both at regional as well as local level especially along the project corridor. This will help to predict likely changes in the environment due to the project and will serve as performance indicators for various components.

46. The project roads are spread all over the state covering 15 out of the 32 districts. The baseline information is presented below. Road specific environmental salient features has also been summarised in this chapter.

47. Assam is located between Lat 24° 07' to 28°00' N Long 89° 42' to 96°02' E. The geographical area of the state is 78,438 km² (30,285 sq mi), which constitutes 2.4 % of the area of the country. The forest area of the state is 27,826 km² (10,743.68 Sq mi) constituting 35.48% of the geographical area of the state and 0.85% of the forest area of the country. The state boundary touches in the North and East by the Kingdom of Bhutan, along the South lie Nagaland, Manipur and Mizoram. Meghalaya lies to her South-West, Bengal and Bangladesh to the West.



B. Physical Environment

1. Meteorology and Climate

48. Assam has a humid climatic condition (Tropical Monsoon Rainforest Climate). The weather in Assam is dry in winter, hot, and wet in summer. Its most distinguishing feature is the copious rainfall between March and May at a time when precipitation in upper India is at its minimum. The state has three main seasons:

- **Winter:** November to February are the months of winter during which the average temperatures range from 06° to 08° C (42° to 46° F).
- **Summer:** The March-to-May season is hot and wet. Summers are hot, with an average temperature of 35° C (92° F) and a high temperature that at times reaches 39° C (102.2° F).
- **Monsoon season:** This season brings relief from the scorching heat of the summers. The average annual rainfall in the state is around 70 inches in the west and around 120 inches in the east.

2. Air Quality

49. Most of the project area lies in vast open agricultural land and is largely free from air pollution sources other than traffic. As such, the ambient air quality for major pollutants like SO₂, SPM and NO_x is expected to be within the limits. However, in absence of any existing data on ambient air quality levels of the project area, secondary sources were referred.

Table 4: Maximum observed Ambient Air Quality during 2008

Area classification	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	RSPM (µg/m ³)	SPM µg/m ³)
Industrial (maximum observed value)	30	27	265	30
Residential (maximum observed value)	8	20	105	8
National Ambient Air Quality Standards for Industrial and Residential Areas	80	80	100	80

Source: National Ambient Air Quality Status, 2008, CPCB, and Table 3.3

50. The above **Table 4** reveals that concentration of all the pollutants is higher in industrial area especially respirable suspended particulate matter. The levels of sulphur dioxide and nitrogen dioxide are however, well within the limits (NAAQS). The higher particulate matter levels are attributed to the vehicular movement on unpaved roads and the loose dust in the agricultural fields that lead to formation of dust clouds over short periods. The same can be concluded from **Table 5** which provides a comparison of air quality at different locations.

Table 5: Ambient Air Quality Status of Assam in Previous Years

City	Location	Type of Area	SO ₂	NO ₂	RSPM (PM10)	SPM
NAAQS						
Bongaigaon	Barapara office Bldg	R	5	11	56	91
	Campus of oil India	R	5	10	76	113
Dibrugarh	Dibrugarh office Bldg	R	5	11	56	92
Golaghat	Golaghat office Bldg	R	4	11	71	108
Guwahati	Fire brigade station	R	9	18	141	211
	Gopinath Nagar	R	7	14	103	163
	Head office	R	9	19	152	233
	Near Pragiyotish college	R	7	15	96	151
Hailakandi	CISF Campus	R	6	13	66	104
Shivsagar	Shivsagar Office Bldg	R	5	12	81	119
Tezpur	Tezpur office Bldg	R	5	11	76	131

R – Residential and other areas, I – Industrial area, L- Low, M- Moderate, H – High and C – Critical levels of pollution based on exceedance factor (calculated for n > 50 days)

BDL=Below Detection Limit (Concentration less than 4 g/m³ for SO₂)

BDL = Below Detection Limit (Concentration less than 9 g/m³ for NO₂)

Source: National Ambient Air Quality Monitoring Series, CPCB, 2008

3. Noise

51. Along the proposed road construction proposals, there is neither significant industrial activity nor significant vehicular traffic contributing to ambient noise levels. The occasional vehicular movement on the unpaved roads contributes to increased noise levels over short duration and limited to daytime. The existing roads do not appear to have vehicular traffic in the night time. Therefore, the ambient noise levels are expected to be within the National Ambient Noise Standards

4. Topography and Geomorphology

52. Assam is an important geographic location of North-East India. Situated between altitudes 28°18' and 24° North and latitudes 89° 46' and 97° 4' East, Assam is bordered in the North and East by the Kingdom of Bhutan, along the South lie Nagaland, Manipur and Mizoram. Meghalaya lies to her South-West, Bengal and Bangladesh to the West.

53. The alluvial soils are extensively distributed over the Brahmaputra plain and are very fertile. The alluvial soils can further be divided into two main sub types-young alluvial and old alluvial soils. The young alluvial soils are characterized by modern alluvium deposits. The colour of these soils is generally gray to molted gray. On the other hand, the old alluvial soils occur in some patches of Kokrajhar, Barpeta, Nalbari, Kamrup, Darrang, Sonitpur, Lakhimpur and Dhemaji district. Generally, the old alluvial soils are very deep with fine loams to coarse loams in texture. The piedmont soils are confined to the northern narrow zone along the piedmont zone of the Himalayan foothills. The soils are very deep and fine to coarse loamy in texture. The hill soils are generally found in the southern hill regions of the state. These soils are deep, dark grayish brown in colour and fine to coarse loamy in texture. The lateritic soils are extensively occurring in NC Hills district and in some parts of the southern Karbi Plateau. These soils are dark and finely textured with heavy loams.

5. Geology/Soil

54. Geologically, as per the plate tectonics, Assam is in the eastern most projection of the Indian Plate, where it thrusts underneath the Eurasian Plate creating a subduction. It is postulated that due to the north-easterly movement of the Indian plate, the sedimentary layers of an ancient geosynclines called the Tethys (in between Indian and Eurasian Plates) were pushed upward to form the Himalayas. It is estimated that the height of the Himalayas is increasing by 4 cm each year. Therefore, Assam possesses a special geomorphic environment, with large plains and dissected hills of the South Indian Plateau system abutting the Himalayas to the north, north-east and east.

55. Geomorphic studies also conclude that the Brahmaputra is a paleo-river, older than the Himalayas, which often crosses higher altitudes in the Himalayas eroding at a greater pace than the increase in the height of the mountain range to sustain its flow. The Brahmaputra valley in Assam is underlain by recent alluvium approximately 200-300m thick consisting of clay, silt, sand and Pebbles.

6. Soil

56. Soil is the most valuable nature resource and serves as one of the prime requisite of life. Soils and in its turn the land through their relative fertility support all agricultural activity and the plant growth and thereby the most important element of the natural ecosystem. As regards the soils of Assam, geology (parent material), topography and climate seem to play vital role in their formations. Therefore, under varying geological conditions, topographical characteristics and agro-climatic situations different types of soils are found to occur in the hills, piedmonts, plateaus and plains. The soils of Assam may thus generally be divided into four groups, viz. a) Alluvial soils b) Piedmont soils c) Hill soils d) Lateritic soils.

57. The major soil types within the state can be classified into five groups namely Entisols, Mollisols, Alfisols, Ultisols, Histosols. These soil types can be further classified into several sub groups. The Entisols can be sub classified into Younger alluvium and Bhabar. The Younger alluvium can be predominantly seen along the Brahmaputra River and some sporadic patches in southern parts of state. The Mollisols can be seen in western and Northern fringes of the state. The alfisols can be seen in central parts of state.

7. Earthquake & Seismicity

58. **Seismic Hazard.** The seismic hazard map of India was updated by Bureau of Indian Standards (BIS). The entire state of Assam lies in Zone V (Highest level of vulnerability)

59. The Brahmaputra valley and its adjoining highlands are seismically very unstable. The earthquakes of 1897 and 1950, measuring 8.7 on Richter scale are among the most severe in recorded history, and have caused extensive landslips. Rock falls on hill slope, subsidence and fissuring of ground in the valley changes in the courses and morphology of several tributary rivers.

8. Land Use

60. The large geographical area is classified as forest area (26832 sq km or 34.21% of the total geographic area of the State). According to legal classification, reserved forests constitute 66.58 % and Unclassified forests, 33.42%. Details of land use is given in **Table 6** and **Figure 2**.

Table 6: Land Use Pattern in the State

Land Use	Area in '000 ha	Percentage
Total geographical area	7844	
Reporting area for land utilization	7844	100.0
Forests	1855	24.78
Not Available for cultivation	2459	32.84
Permanent pastures and other grassing land	227	3.03
Land under miscellaneous tree crops & groves	177	2.36
Culturable wasteland	145	1.93
Fallow lands other than current fallows	86	1.15
Current fallows	88	1.18
Net area sown (as per agriculture census 1995-96 expect total cropped area)	2809	37.51

Source: Assam State Statistical Handbook 2015

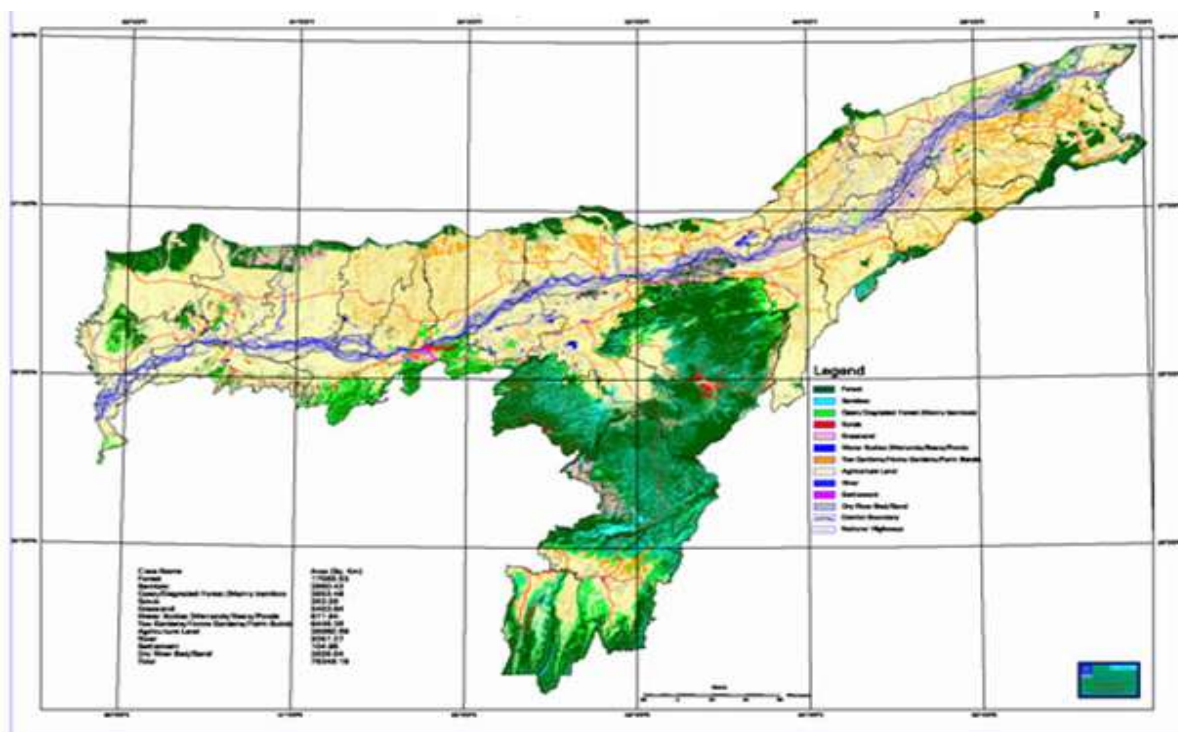


Figure 2: Landuse Map of Assam

9. Hydrology and Water quality

61. Assam has extensive river system consisting of the Brahmaputra, the Kusiya and their tributaries. All the rivers in Assam are liable to floods, mainly because they receive heavy

rainfall within a short time. These rivers are in their early stage of maturity and are very active agents of erosion. The river waters collect a tremendous amount of silt and other debris and raise the level of the river beds. Therefore, it becomes impossible for the main channel to cope with the vast volume of water received during the rains. The Brahmaputra River has a total drainage area of about 935,500 sq. km. So far, a total of 4, 77,163 hectares of land have been irrigated in Assam. The drainage map of the project districts in Assam is presented in **Figure 9**.

62. Sample roads are mostly crossed by seasonal small channels. However, many of the sample roads are located in close proximity of the rivers and are prone to flood. Ground water being extracted through hand pumps or tubewell and is the main source of water supply to villagers.

63. In Assam, pollution is increasing in most of surface water resources in major towns due to increasing urbanization trend. None of the water sources are safe for drinking or bathing without conventional water treatment. Rivers such as Bharmputra, Buridihing, Disang, Jhanji, Dhansiri, Subbansiri and Borakk etc. are found to be polluted at different stretches due to industrial, domestic and agricultural pollution. Among all the rivers, Bharmputra and Dhansiri River is the most polluted. The hydro geological conditions in both porous and fissured formations spread across project districts / state are given in **Table 7**.

Table 7: Hydro geological Conditions of Project District / Assam

Dynamic Ground Water Resources	
Annual Replenishable Ground water Resource	27.23 Billion Cubic meter
Net Annual Ground Water Availability	24.89 Billion Cubic meter
Annual Ground Water Draft	5.44 Billion Cubic meter
Stage of Ground Water Development	22 %
Ground Water Development & Management	
Over Exploited	NIL
Critical	NIL
Semi- critical	NIL
Artificial Recharge to Ground Water (AR)	<ul style="list-style-type: none"> Feasible AR structures: 250 Check Dams, 500 weirs, 1000 Gabion structures, 250 development of springs 600 RWH in Urban Areas
Ground Water Quality Problems	
Contaminants	Districts affected (in part)
Fluoride (>1.5 mg/l)	Goalpapra, Kamrup, Karbi Anglong, Nagaon,
Iron (>1.0 mg/l)	Cachar, Darrang, Dhemaji, Dhubri, Goalpapra, Golaghat, Hailakandi, Jorhat, Kamrup, Karbi Anglong, Karimganj, Kokrajhar, Lakhimpur, Morigaon, Nagaon, Nalbari, Sibsagar, Sonitpur
Arsenic (>0.05 mg/l)	Dhemaji

64. **Surface water Quality:** Water resources of the State as a whole are substantial. About 8251 sq km, which is 10.5% of the total geographical area of the State, is occupied by surface water bodies. Of this about 6503 sq km is occupied by the river systems including the mighty Brahmaputra and 1748 sq km by natural wet lands including seasonal and permanent water logged and marshy areas and man-made reservoirs and tanks of size more than 2.5 ha. The total surface water resource of the State is estimated at about 600 billion cubic meters.

65. **Groundwater Quality and Availability:** The annual replenishable ground water resource of the state has been estimated as 27.23 billion cubic meters and net annual groundwater availability 24.89 billion cubic meters. The annual groundwater draft is estimated as 5.44 billion cubic meter of which 4.85 billion cubic meter is for irrigation and 0.59 billion cubic meter is for domestic and industrial uses. The overall stage of groundwater development in the state is 22% with the lowest at 2% in Cachar district and highest 56% in Bongaigaon district.

66. **Flood Affected Prone areas:** The chronically flood prone areas within the state are mainly along the river Brahmaputra from eastern to western part of the state. The year 1988 witness worst flood when a total of 42.23 lakh hectares of land (including 11.20 lakh hectares of crop damage) affecting more than 8 million people in 8770 villages.

67. **Hydrology:** The Brahmaputra River and the 33 major tributaries joining it in Assam, including the main trans-Himalayan tributaries of Subansiri, Jia Bharali, and Manas, carry about 30% of the country's total surface water. Surface water bodies covering about 8,251 square kilometers (km²) account for 10.5% of the geographical area of the state. Of these, the river systems, including waterlogged areas, occupy 6,503 km². The annual surface water availability is more than 53 million hectare-meters. Brahmaputra valley in Assam has 3,513 wetlands, covering 1,012.3 km². Groundwater is also plentiful at shallow depth in the valley; utilizable groundwater is estimated to exceed 2 million hectare-meters.

C. Biological Environment / Ecological Resources

1. Biological Environment / Ecological Resources of the State

68. Assam is one of the richest biodiversity zones in the world. There are a number of tropical rainforests in Assam. Moreover, there are riverine grass lands, bamboo orchards and numerous wetland ecosystems. Many of these areas have been protected by developing national parks and reserved forests. The Kaziranga and Manas are the two World Heritage Sites in the region. The Kaziranga is the home for the rare Indian Rhinoceros, while Manas is a project tiger sanctuary area. However, no project roads pass through any of the protected areas.

2. Floral diversity of the state

69. Forest and forest type of State. Forestry in Assam is one of the most important economic activities of the state. This has been possible due to the vast stretch of forests in Assam. The forest in Assam can be described as: Tropical Wet Evergreen Forests, Tropical Semi Evergreen Forests, and Tropical Moist Deciduous Forests. The total forest area of state is 26,748 Sq. Km. (2.4 % of Country). Reserved Forest 13,870 Sq. Km. (17.68% of State Geo Area) Protected Area is 3,925 Sq. Km. (5% of State's Geo Area).

70. Although, none of the road stretches passes through any forest land/area but still has trees, which might require felling during clearing up operations for construction of rural roads. In most of cases, tree cutting has been minimized by suitably modifying the alignment

71. **Mammals.** Macaca (Rhesus macaque), Golden langur (*Trachypithecus geei*), Bay bamboo rat (*Connomys badius*), Spotted Deer (*Axis axis*), Otter (*Aonyx congica*), Indian Mongoose (*Herpestes javanicus*), Clouded leopard (*Neofelis nebulosa*) were reported in the forests of Guwahati. List of mammals is given in **Table 8**.

Table 8: Mammals Recorded In Guwahati City and Forest Area

S.N	Common Name	Scientific Name
1.	Spotted deer	<i>Axis axis</i>
2.	Swamp deer	<i>Rucervus duvaucelii</i>
3.	Clouded leopard	<i>Neofelis nebulosa</i>
4.	Golden langur	<i>Trachypithecus geei</i>
5.	Indian mongoose	<i>Herpestes javanicus</i>
6.	Bay bamboo rat	<i>Cannomys badius</i>
7.	Hog badger	<i>Arctonyx collaris</i>
8.	Rhesus macaque	<i>Macaca mulatta</i>
9.	Hoary bamboo rat	<i>Rhizomys pruinosus</i>
10.	Otter	<i>Lutra perspicillata</i>
11	Ganges river dolphin	<i>Platanista gangetica</i>

72. **Avifauna.** Assam state supports rich avifauna, due to abundance of feeding, breeding and roosting places. In this state both endemic and exotic species were reported. Mainly endemic species were confined to upper Assam and exotic species were mainly migratory birds, which arrive in winter for roosting. Birds reported during the time of survey in Guwahati were cosmopolitan in distribution. No endangered species were noticed. Due to high abundance of avifauna, they were noticed along the roadside, in market places, along the banks of river, lakes and in human settlement areas. Majority of the birds recorded in core and buffer zone show short distance and local migration during the daytime (diurnal migration). Their migrations were mainly in search food and new feeding ground.

73. Birds recorded in large number were rock pigeon (*Columba livia*), house crow (*Corvus splendens*), cattle egret (*Bubulcus ibis*), House sparrow, Myna. Three subspecies of myna like pied myna, common myna and bank myna were commonly noticed. They represent species diversity. **Table 9** gives the list of avifauna found in Assam including part of subproject districts.

Table 9: List of Fauna

S. N	Scientific Name	Common Name
1.	<i>Acridotheres tristis</i>	Common myna
2.	<i>Columba livia</i>	Blue rock pigeon
3.	<i>Corvus splendens</i>	House crow
4.	<i>Dicrurus adsimilis</i>	Black drongo
5.	<i>Haleyon smyrensis</i>	White breasted
		kingfisher
6.	<i>Milvus migrans</i>	Pariah kite
7.	<i>Passer domesticus</i>	House sparrow
8.	<i>Streptopelia chinensis</i>	Spotted dove
9.	<i>Apus affinis</i>	House swift
10.	<i>Tringa hypoleucos</i>	Common sandpiper
11.	<i>Mirafra assamica</i>	Lark
12.	<i>Corvus</i>	Jungle Crow
	<i>macrorhynchos</i>	
13.	<i>Ocyrceros birostris</i>	Indian Grey
		hornbill
14.	<i>Dicrurus hottentottus</i>	Hair-crested
		Drongo
15.	<i>Anthus rufulus</i>	Paddyfield pipit

S. N	Scientific Name	Common Name
16.	<i>Cercomela fusca</i>	Indian Chat
17.	<i>Coracias benghalensis</i>	Indian Roller
18.	<i>Merops orientalis</i>	Green Bee Eater
19.	<i>Ardeola gravii</i>	Pond heron
20.	<i>Turdoides striata</i>	Red vented bulbul
21.	<i>Vanellus indicus</i>	Red wattled lapwing
22.	<i>Egretta garzetta</i>	Little egret
23.	<i>Ardeola grayigrayi</i>	Indian pond heron
24.	<i>Bubulcus ibis</i>	Cattle egret
25.	<i>Turdoides striata</i>	Jungle babbler
26.	<i>Acridotheres ginginianus</i>	Bank myna
27.	<i>Gracupica contra</i>	Pied myna
28.	<i>Psittacula kramen</i>	Rose ring parakeet
29.	<i>Upupa epops</i>	Hoopoe

3. Wildlife and Protected Areas:

74. **Table 10** provides details of national park and sanctuaries. There are no wildlife sanctuaries/national parks, tiger reserves etc. along the project area.

Table 10: List of Protected Areas in Assam

Name	Area in Sq. km	Main attraction
Kaziranga NP	858.98	Rhino, Tiger, Bears, Wild Buffalo, Swamp Deer, Gaur, Gibbon, Bengal Florican, Dolphin, Otter
Manas NP	500	Tiger, Asiatic Wild Buffalo, Asian Elephant, Gaur, Dhole Pigmy hog, Hispid hare, Golden langur, Bengal florican
Dibru-Saikhowa NP	340	Ferel horses, Asiatic Wild Buffalo, White winged wood duck and Salix swamp
Nameri NP	200	Tiger, 4 species of Hornbill, White Winged Wood duck, Golden Mahaseer
Rajiv Gandhi	78.91	Rhino, Tiger, Maljurias Bengal Florican, Otter
Wildlife Sanctuaries		
Garampani	6.05	Elephant, Hot Water Springs
Laokhowa	70.13	Elephant, Tiger, Asiatic Wild Buffalo, Bengal Florican
Bornadi	26.22	Hispid Hare, Pygmy Hog, Dhole, Elephants, Tiger, Great Pied Hornbill, Peafowl
Chakrasila	45.5	Golden Langur, Gaur, Sambar, Barking deer
Burachapori	44.06	Elephants, Tiger, Wild buffalo, Aquatic Birds, Bengal Florican
Pani-Dihing	33.93	Stray Elephants; Birds Paradise
Hollongapar Gibbon	20.98	7 Primates (Hoolock Gibbon, Stump-tailed Macaque, Capped Langur, Pig –tailed Macaque, Assamese Macaque, Slow Loris and Rhesus Macaque), Elephant, Leopard
Pobitora	38.8	Rhino, Leopards, Barking Deer, Migratory Birds
Sonai -Rupai	220	Elephant, Tiger, Gaur, Dhole, Sambar, White Winged Wood duck

Name	Area in Sq. km	Main attraction
Bherjan, Borajan-Padumoni	7.22	Hoolock Gibbon, Capped Langur, Pig-tailed Macaque, Slow Loris and Rhesus Macaque, Leopard
East Karbi Anglong	222	Gaur, Elephants, Tiger, Sambar, Barking Deer, Lesser Cats, Hoolock, Gibbon, Capped Langur, Wreathed Hornbill,
Nambor	37	Gaur, Elephants, Tiger, Sambar, Barking Deer, Lesser Cats, Hoolock Gibbon, Capped Langur, Wreathed Hornbill
Marat Longri	451	Tigers, Leopards, Gaur, Elephants, Hoolock Gibbon
Nambor- Doigurung	97.15	Gaur, Elephants, Tiger, Sambar, Barking Deer, Lesser Cats, Hoolock Gibbon, Capped Langur, Wreathed Hornbill
Amchang	78.64	Elephant, Gaur, Leopard, Lesser Cats, Slow Loris, Hoolock Gibbon, Capped Langur
Dehing Patkai	111.19	Elephants, Tiger, Hoolock Gibbon, White winged Wood Duck, Hornbills, Rain forests
Borail	326.25	Serow, Himalayan Black Bear, Hoolock Gibbon, Langur, Spectacled Monkey

4. Aquatic Biology:

75. No wetland or large water body falls in and around the selected project roads area. Fisheries activities are common in Assam including subproject areas.

D. Socio-Economic Environment

76. Following paragraphs describes about the socio-economic and cultural environmental of the project surrounding area.

1. Demography

77. As per census state having highest population density among NE states, of 339 persons per sq. km. As against decadal growth rate of 21.54% at the national level, the population of the State has grown by 18.92% over the period 1991-2001. The sex ratio of Assam at 935 females to 1000 males is higher than the national average of 933. Female literacy of the State rose to 56.03% from 43.03% in 1991. There are so many major tribes and a number of sub-tribes inhabiting the area. (**Table 11**)

Table 11: Demographic Profile

Population (2011 census)	31169272
Males	15954927
Females	15214345
Urban population (Census 2001)%	12.72
Literacy Rate (census 2011) in %	73.18
Male Literacy in %	78.81
Male Literate in numbers	10756937
Female Literacy in %	67.27
Female Literacy in numbers	8750080

Note: Figures in bracket indicate percentage Source: Census, 2011

2. Healthcare

78. The Total Fertility Rate of the State is 2.6. The Infant Mortality Rate is 64 and Maternal Mortality Ratio is 480 (SRS 2004 - 2006) which are higher than the National average. The Sex Ratio in the State is 935 (as compared to 933 for the country). Comparative figures of major health and demographic indicators are as follows:

Table 12: Demographic, Socio-economic and Health profile of Assam State as compared to India

S. No.	Item	Assam	India
1	Total population (Census 2001) (in million)	26.66	1028.61
2	Decadal Growth (Census 2011) (%)	16.93	17.64
3	Crude Birth Rate (SRS 2008)	23.9	22.8
4	Crude Death Rate (SRS 2008)	8.6	7.4
5	Total Fertility Rate (SRS 2008)	2.6	2.6
6	Infant Mortality Rate (SRS 2008)	64	53
7	Maternal Mortality Ratio (SRS 2004 - 2006)	480	254
8	Sex Ratio (Census 2011)	954	940
9	Population below Poverty line (%)	36.09	26.10
10	Schedule Caste population (in million)	1.83	166.64
11	Schedule Tribe population (in million)	3.31	84.33
12	Female Literacy Rate (Census 2001) (%)	54.6	53.7

3. Literacy and Education

79. The state as well as the central government gives primary focus on developing the state of the education in the state. Assam has the highest number of schools, colleges and universities in the region. There are a total number of 44,309 primary and middle schools, secondary schools, high schools, colleges for professional as well as general education, universities and other educational institutions in the state. There are some of the best known technical and professional institutes of international repute. These include; Cotton College, Centre for Plasma Physics, Indian Institute of Technology Guwahati, National Institute of Technology, Silchar, North Eastern Regional Institute of Water and Land Management, Defence Research Laboratory, and others.

Universities	5
College of general education	431
College of professional education	34
High School	620
Secondary School	4607
Primary and Middle School	38,410
Other Institutions	202
Total	44,309

4. Affluence

80. The percentage of pucca houses both in rural and urban areas of Assam is lower than the all India average. There has also been a reduction in the percentage of pucca houses in rural Assam between 1991 and 1993-94. Households with semi pucca houses continued to be higher in urban Assam and lower in rural Assam than the corresponding all India averages. The

percentage of households with semi pucca houses in urban Assam decreased between 1991 and 1993-94.

5. Economy

81. Agriculture is the main occupation of the people of the state. Since rice is the staple diet of the people, cultivation of rice is the main occupation of those practicing agriculture. Other than that, pulses, tea, jute and fruit are also cultivated in good quantity.

82. Approximately 15% of the world's tea production comes from this small state, which is its main source of revenue. Almost 75% of the tea gardens are upper Assam districts of Darrang, Sibsagar and Lakhimpur. Other than tea, fruits like oranges, bananas, guavas, pineapples and guavas are also grown. Forests are an important part of the economy. Timber and bamboo are major products from these forests that bring income to the state.

6. Agriculture

83. Agriculture accounts for more than a third of Assam's income and employs 69 percent of total workforce. Assam's biggest contribution to the world is its tea. Assam produces some of the finest and most expensive teas in the world. Other than the Chinese tea variety *Camellia sinensis*, Assam is the only region in the world that has its own variety of tea, called *Camellia assamica*. Assam tea is grown at elevations near sea level, giving it a malty sweetness and an earthy flavor, as opposed to the floral aroma of highland (e.g. Darjeeling) teas. Assam also accounts for fair share of India's production of rice, rapeseed, mustard, jute, potato, sweet potato, banana, papaya, arecanut and turmeric. Assam is also a home of large varieties of citrus fruits, leaf vegetables, useful grasses, herbs, spices, etc, which are mostly subsistence crops.

7. Industries, Cottage and Small Industries

84. Agro-based industries of Assam include-Tea industry, Sugar industry, Grain mill products industry-(Rice, Oil and Flour Mill), Food processing industry and Textile industry.

85. Assam was traditionally famous for its cottage industry, especially spinning and weaving. Pat or pure silk production is essentially confined to Assam. Assam produces about 10% of total natural silk of India. Assam also produces Muga, the golden silk. Weaving is an important cottage industry of Assam. It is a traditional industry, which can be traced back to very ancient times. Assam also has, agro-based industries which include-tea, sugar, grain mill products (Rice, Oil and Flour Mill), Food processing and Textile industries. Mineral-based industries of Assam includes railway workshop, engineering industry, re-rolling mill, steel work etc.

Table 13: Impacts on Biological Environment, Utility, Community and Religious Structures

District	Block	Name of Road	Length Km	Features with 10m either side of existing road centre line					
				Landslide prone	Water Body	Water Stagnation Area	Forest Area	Trees#	Utliity Structures
Bongaigaon	Dangtol	Majgaon to Ghondal	2.230	No	No	No	No	59	EP 18
Bongaigaon	Dangtol	Paltanbazar to Hollaguri	4.200	No	1 Pond	No	No	109	No
Dibrugarh	Joypur	Cherepajan to Lonjong Road	1.590	No	1 stream crossing, 1 pond	No	No	50	No
Goalpara	Lakhipur	Thorko Chaibari	0.790	No	1 stream crossing, 2 pond	No	No	87	No
Golaghat	Morongi	NH-39 to No.3 Koibtra	1.500	No	No	No	No	274	EP 11
Jorhat	Ujani Majuli	Bali Deori to Deori Pam	6.894	No	Wetland, 1 pond	No	No	356	EP 9, TR 1, SP 1
Jorhat	Majuli	Baraguri to Silakola Gaon	4.850	No	No	No	No	223	EP 3
Kamrup	Chandrapur	Niz Panbari No-2 to Sahabarbori Path	1.900	No	No	No	No	3	EP 15, SP 4
Kamrup	Dimoria	Khat Tetelia to khat Tetelia NC	1.340	No	No	No	No	55	
Kamrup	Dimoria	Rewa to Rewa NC	1.220	No	No	1 locations	No	9	EP 12 SP1
Kokrajhar	Dotma	Pratapkhata to Jogdoi Mechpara	3.000	No	Canal, 6 ponds	No	No	72	EP 1
Kokrajhar	Dotma	Dhauliguri ITI to Kumguri	2.565	No	Stream - 2 & Nalas – 3, 2 ponds	No	No	12	EP 13
Darrang	Pachim Mangaldoi	Kachamari to MB Road	1.112	No	2 Pond	No	No	45	No
Darrang	Pachim Mangaldoi	Keotpara to Harinkhoja	1.980	No	Nalas-2, 6 Pond	No	No	333	EP4
Darrang	Pachim Mangaldoi	Lankapuri to MB Road	1.584	No	2 Pond	1 Location	No	191	EP24
Darrang	Pachim Mangaldoi	Tamulipara to MPK Road	1.133	No	13 Pond	1 Location	No	297	EP8 SP 1
Darrang	Pachim Mangaldoi	Sarreng Chuburi to MM Road	2.187	No	12 Ponds	No	No	175	No
Nagaon	Raha	Khaigar L.P. School to Amonisali L.P. School	1.000	No	Kolong River	No	No	35	EP8
Nagaon	Odali	Beltola PWD Road to Pachim Odali	1.710	No	2 Pond	No	No	223	No
Nagaon	Raha	Pub Saragaon PHE to Pachim Katahguri	1.420	No	2 Pond	No	No	29	EP3
Nagaon	Raha	Petboha to Bokula	3.220	No	No	1 location	No	47	No

District	Block	Name of Road	Length Km	Features with 10m either side of existing road centre line					
				Landslide prone	Water Body	Water Stagnation Area	Forest Area	Trees#	Utliity Structures
Sivasagar	Sapekhaiti	Borhat Forest Road to Nagakata Bolomi	1.540	No	10 Ponds	No	No	258	No
Sonitpur	Gabharu	Tezpur Jamuguri road to Jahajduba Khanamukh	2.840	No	Hahkhati River	No	No	76	No
Tinsukia	Kakopathar	Bormaithong Road (04TS45)	4.300	No	Maithang River, 7 ponds	No	No	779	No
Tinsukia	Kakopathar	NH52 to Jengoni	2.550	No	No	No	No	34	EP 8
Baksa	Tamulpur	Hortla to Sukanjuli	1.000	No	Bolia River, 54 ponds	No	No	239	EP 1 SP1
Baksa	Tamulpur	Barkhata to Jarkona	4.930	No	No	No	No	892	EP 25
Chirang	Borobajar	Panbari Chowrangi road to Barpathar II	4.060	No	No	No	No	124	No
Chirang	Sidli Chirang	Bilaspur to Silpota	2.247	No	1 ponds	No	No	99	EP 2
Udalguri	Udalguri	Ghagrapara to U.T. Road (Sensua Naharani Ali)	6.000	No	No	No	No	337	EP 5 SP 5
Total			76.892						

No of trees likely to be affected in all the 30 sample roads – 218 nos

IV. ANTICIPATED ENVIRONMENTAL IMPACTS AND ITS MITIGATION MEASURES

86. Road improvements work brings substantial economic and social benefits to rural communities and national economies. However, it may also cause adverse environmental impacts though of smaller magnitude, since rural road subprojects aligned along the existing road alignments and will be of 7.5 m width only (in special cases it will be between 4-6m). The impacts are expected largely during construction phase, which can be mitigated through engineering measures and adoption of best construction practices. This section outlines the identified impacts during design, construction and operation phases along with proposed mitigation measures for eliminating or minimizing the adverse impacts.

87. The associated environmental impacts are assessed considering present environmental setting of the project area, nature, and extent of the proposed activities. Impacts are analysed on both generic and specific nature and are classified as insignificant, minor, moderate and major.

88. Since the issues associated with most of the roads are similar, the impacts and mitigation measures given below are applicable to most of the subprojects. Any issue specific to a road, is separately mentioned.

A. Common Impacts during Design and Construction Phase

1. Climate change

89. **Impact:** The proposed roads are analysed considering climate change vulnerability screening checklist defined under EARF to second RCIP. The resource (like barrow earth, aggregate, cement, concrete) requirements for these rural roads as such are minimal. None of these resources is likely to be affected by climate changes (such as changes in temperature and precipitation). None of the project roads passes through protected areas. Some of the sample roads (8 out of the 30 samples) are prone to flood from river/streams, ponds and due to heavy rains (**Table 14**). Adequate engineering measures are adopted to protect the roads. The entire Assam state fall under zone V indicating highest level of seismicity. All the subproject roads therefore are prone to earthquake. The habitation is less along these rural roads and as such, no exponential population growth is expected considering the generic trend of population migration from rural to urban areas. Most of the sample roads pass through agricultural fields and along the existing road alignments with low embankment height of 1m (average) from ground to crust except at the approaches to cross drainage structures. As such, the sub project roads are unlikely to be vulnerable or increase the vulnerability of surrounding areas (with respect to population growth, settlement patterns, increasing runoff or landslides).

Table 14: List of Sample Subproject Roads Prone to Flood and Erosion

District	Block	Name of Road	Length prone to flooding (km)
Dibrugarh	Joypur	Cherepajan to Lonjong Road	0.200
Jorhat	Ujani Majuli	Bali Deori to Deori Pam	0.600
Jorhat	Majuli	Baraguri to Silakola Gaon	0.500
Darrang	Pachim Mangaldoi	Keotpara to Harinkhoja	0.600
Chirang	Sidli Chirang	Bilaspur to Silpota	0.250
Baksa	Tamulpur	Hortla to Sukanjuli	0.100
Tinsukia	Kakopathar	Bormaithong Road (04TS45)	0.250
Nagaon	Odali	Beltola PWD Road to Pachim Odali	0.200

90. **Mitigation Measures:** Roads will be designed considering IRC guidelines for earthquake prone areas. Compensatory tree plantations⁴ (1:3) will be made to compensate the loss of trees if any for the construction of sample roads. Additional efforts shall be made for tree plantation wherever feasible. All non-sample rural roads to be included in second RCIP, will also be screened for climate change vulnerability and necessary mitigation measures shall be adopted for minimisation of identified vulnerability if any.

2. Finalization of Alignment

91. **Impact:** The proposed rural road will be constructed to provide 7.5 m roadway in accordance with PMGSY guidelines and technical specifications (IRC-SP 20: 2002) for plain terrains. Sample rural road are aligned to existing road (earthen track with some stretches of brickbat soling). The existing road passes through plain terrain and primarily agriculture areas. None of the sample roads passes close to any protected monument or through protected areas. Impacts due to road alignment and design is expected to be minor and limited to shifting of some common utilities, community structures (temple, school) and cutting of trees falling within road way.

92. **Mitigation Measures:** The road alignment is finalised considering availability of right of way. The ROW is reduced in built up area or constricted areas to minimize land acquisition. The road alignment is modified to avoid tree cutting, shifting of utilities or community structure to the extent feasible. The road is designed to follow natural topography to avoid excessive cut and fill. All future roads to be included in second RCIP will follow above measures. In addition these subprojects will comply with the following alignment finalisation criteria :

- a. The road will be part of district core network and will comply with PMGSY guidelines
- b. Subproject shall not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance.
- c. Subproject will not pass through any designated wild life sanctuaries, national park, notified eco-sensitive areas or area of international significance such as protective wet land designated under Wetland Convention, and reserve forest area..
- d. Subproject to comply with local and National legislative requirements (such as forest clearance for diversion of forest land) and ADB's Safeguard Policy Statement 2009.

3. Land Acquisition

93. **Impact:** Minor impact, since no land acquisition is involved due to various measures considered for finalisation of road alignment. Villagers have volunteered to donate their land if at certain stages land is required for geometrical correction or alignment adjustment for avoiding tree cutting or shifting of community structure.

94. **Mitigation Measures:** Minimize the land acquisition while finalising the alignment. In an unavoidable situation, adopt suitable engineering measures to reduce the ROW requirement or

⁴ SRRDA mostly undertake this activity through state forest department. The forest department plants tree either along the proposed roads if land is available otherwise on nearby degraded forest land.

donation of land from landowners. The CPF will ensure that donation of land is voluntary and negative and social impacts will be avoided or minimized.

4. Protected Areas (National parks, wild life sanctuaries, Eco sensitive zones, protected /historical monuments) and Forest Areas.

95. **Impact:** Assam state including the project districts has many wild life sanctuaries but none of it is located close to the sample project roads. None of the sample road passes through any forestland and as such, project has no impact on forest cover of the state/Country. Assam has several national parks and sanctuaries located all over the state. However, none of them is located in close vicinity of sample project roads.

96. **Mitigation Measures:** As there are no protected/ecologically sensitive areas in the sub project areas, no such measures are proposed. In case of a diversion of forest land, prior forest clearance shall be obtained under Forest (Conservation) Act 1980 (amended 1988).

5. Land Clearing Operations

97. **Impact:** The site clearing operations may have impact on common utilities, community properties, land use and vegetation profile of the area if adequate considerations not given to road alignment finalisation, utility and community structure shifting plan, tree felling, and demolition waste disposal.

98. **Mitigation Measures:** The following steps shall be taken to minimise the associated impact with land clearing operations.

- (i) The land clearing operation should be undertaken as per the defined road alignment and community structure, utility and road furniture-shifting plan.
- (ii) The road land width shall be clearly demarcated on the ground.
- (iii) The utility and community structure shifting shall be as per plan and with consultations and concurrence of the community.
- (iv) Tree felling shall be limited to those, which could not be saved even by design measures. The tree shall be cut with a permission of Forest department. The vegetable cover shall be removed and disposed in consultation with community.
- (v) All public utilities shall be shifted with a concurrence of respective agencies/authority and to the adjacent location approved by them.
- (vi) The top soils shall be collected and preserved for reuse as a base for turbing of embankment slopes or development of barren areas along roadside. The top soil shall be preserved at identified location with the provision of watering /grass development on the heap surface to prevent air pollution.

6. Cut and Fill and Embankment construction

99. **Impact:** Inadequate alignment planning may increase the cut and fill requirement as well as need for more borrow earth for embankment formation leading to some impact on land use. Inadequate provision for drainage and embankment slope protection may lead to soil erosion. Due consideration is given to above aspect for alignment finalisation of sample road. With the adoption of appropriate mitigation measures, the impact due to above activity on land use and other environmental component is expected to be minimal.

100. **Mitigation Measures:** The alignment design shall consider options to minimise excessive cuts and fills. The cut and fill quantities shall be used for embankment to minimise borrow earth requirement. The design shall be as per relevant IRC provisions for cut and fill, slope protection and drainage. Adequate provision shall be made for cross drainage structures for maintaining natural drainage pattern in the subproject area and preventing soil erosion. The top soil of the cut and fill area shall be used for embankment slope protection.

7. Establishment of Construction Camp, Temporary office and Storage Area

101. **Impact:** The congregation of labour population and technical staff in the subproject area during the construction phase is likely to put considerable stress on the limited resources of village areas. Some of the associated impacts are related to health, safety of the labourers at the construction campsites, availability of safe drinking water, and sanitation.

102. The establishment of construction camp temporary office and storage area will reduce land productivity if these are established on agricultural land. Loading and unloading of construction material, transportation of material, handling of fuel and waste disposal from these areas may have direct and indirect impact on soil, water and air quality

103. **Mitigation Measures:** The following steps shall be taken to minimise/reduce these impacts:

- Construction campsites shall be located away from any local human settlements (minimum 1 km away) and preferably located on lands, which are not productive barren/waste lands presently. Similarly temporary office and storage areas shall be located away from human settlement areas (minimum 500 m).
- The construction camps, office and storage areas shall have adequate water supply, sanitation and all requisite infrastructure facilities. This would minimize dependence of construction personnel on outside resources, presently being used by local populace and minimize undesirable social friction thereof.
- The construction camps shall be located at a minimum 0.5 km from forest land/areas to deter the construction labour in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 0.5 km from forest land/areas.
- The construction camps, office and storage areas shall have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use.
- All construction camps shall have rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided completely to the extent possible.
- The construction camps, office and storage areas shall have health care facilities for adults, pregnant women and children.
- All construction personnel shall be subjected to routine vaccinations and other preventive/healthcare measures.
- Contractor shall arrange all personal protective equipment (PPEs) like helmet, boots, and earplugs for workers, first aid and fire fighting equipment at construction sites. An emergency plan shall be prepared to fight with any emergency like fire.
- Garbage bins must be provided in the camp and regularly emptied and disposed off in a hygienic manner. Domestic solid waste shall be disposed of in a control

manner. The recyclable waste shall be sold off and non-saleable and biodegradable waste shall be disposed through secured land filling.

- All fuel oil/lubricant unloading and storage shall be made on the paved areas away from storm water drainage.
- After completion of construction work, the camp /temporary office/storage areas sites shall be restored to its original condition.

8. Traffic Movement

104. **Impact:** Construction work along the existing road could cause disturbances to traffic movements. It will also pose risk of accident to motorist at night if these blockages and disruption are not clearly demarcated.

105. **Mitigation Measures:** The contractor will prepare appropriate traffic diversion scheme, which shall be implemented in different stretches of the road as per the progress of the construction work. This plan shall be approved by PIU and implemented before start of any construction work to avoid any inconvenience to the present road users. The diversion plan should ensure smooth flow of traffic, minimise accidents to road users during construction works. Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and visible and retro reflective in nature for day and night visibility.

9. Associated Impacts due to Construction Activities

a. Loss of productive soil, erosion and land-use

106. **Impact:** No land use will change due to the project, since required ROW is available throughout the alignment. Land use though will change temporarily of construction camp, temporary office storage areas for the period of construction. This will also result in loss of soil productivity. Soil erosion may take place along steep and un-compacted embankment slope, and wherever vegetation is cleared. Soil erosion may have cumulative effect viz. siltation, embankment damage, drainage clogging etc. The siltation, due to soil erosion may occur only in the ponds located close to the roads. There are 8 out of the 30 sample roads reviewed that are located near river or flood prone area. Erosion may increase due to proximity to these water bodies and flooding of the area. Loss of soil due to run off from earth stockpiles may also lead to siltation. Land use may also change due to borrowing the earth.

107. **Mitigation Measures:** It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities, is restored back to its original land use before handing it over back to land owner. The top soil from the productive land (borrow areas, road widening areas etc.) shall be preserved and reused for plantation purposes. It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. Therefore, cut and fill shall be planned as per IRC provisions and rural road manual. All steep cuts shall be flattened and benched. Shrubs shall be planted in loose soil area. IRC: 56 - 1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration. Soil erosion shall be visually checked on slopes and embankment areas. If soil erosion observed, suitable measures shall be taken to control it.

b. Borrow Areas and Quarries

108. **Impact:** Borrow areas if left un-rehabilitated may pose risk to people, particularly children and animals of accidentally falling into it. This may also become potential breeding ground for mosquitoes and vector born disease. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, air and noise pollution.

109. **Mitigation Measures:** Borrowing earth from agricultural land shall be minimised to the extent possible. Further, no earth shall be borrowed from already low-lying areas. The borrow earth shall be sourced from identified locations and with prior permission of landowner and with clear understanding for its rehabilitation. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and quantity that can be borrowed. The borrow area shall be located/ rehabilitated as per the guidelines given at **Appendix 3**. Fly ash shall also be used in road embankment as per IRC guidelines wherever thermal power plant is located within 100 km of the road alignment. The stone aggregate shall be sourced from existing licensed quarries only. The quarry should have requisite consent to operate from State Pollution Control Board. No new quarry shall be opened for the proposed project.

c. Hydrology and Drainage

110. **Impact:** The activities involved with proposed road development may alter the hydrology and drainage pattern of the area in absence of adequate provision for cross drainage structure, construction wastes disposal and drainage in habitat areas.

111. Out of the 30 roads reviewed 4 have river crossings (Kolong River in Khaigar L.P. School to Amonisali L.P. School road of Nagaon, Hahkhathi River in Tezpur Jamuguri road to Jahajduba Khanamukh of Sonitpur, Maithang River in Bormaithong Road (04TS45) of Tinsukia and Bolia River in Hortla to Sukanjuli road of Baksa district) while other 3 roads have local stream crossings. There are other roads that are prone to water logging due to accumulation of heavy rainwater. Certain project roads are crossing local and seasonal drains. Village ponds are also located close to few roads. The impact on hydrology and drainage pattern is expected to be minimal.

112. **Mitigation Measures:** The provision of adequate cross drainage structures shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. The discharge capacity of the CD structure shall be designed accordingly. Road levels shall be designed considering HFL. Low cost measures like using locally available bamboo or eucalyptus tree will be adopted for embankment protection and control of soil erosion. Other slop stabilisation measure like vegetative protection will be made additionally. The construction work shall be planned in dry season so that water quality of the water channel is not affected due to siltation. Elaborate drainage system shall be provided to drain the storm water from the roadway and embankment and to ensure minimum disturbance to natural drainage of surface and subsurface water of the area. Provision of additional cross drainage structures shall be made in the areas where nearby land is sloping towards road alignment in both the both sides.

113. Provision of CC road construction in habitat area with drainage of both side of the road shall be made as per the design specifications and with adequate slope to prevent any water logging.

d. **Compaction and Contamination of Soil**

114. **Impact:** Soil in the adjoining productive lands beyond the ROW, haulage roads, and construction camp area may be compacted due to movement of construction vehicles, machineries, equipments and construction camps/storage facilities. It may get contaminated due to inappropriate disposal of liquid waste, (lubricating oil and fuel spills, waste oil and lubricant and vehicle/equipment washing effluent) and solid waste (fuel filters, oily rags) likely to be generated from repair and maintenance of transport vehicles, construction equipment and machinery.

115. **Mitigation Measures:** To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. The productive land shall be reclaimed after construction activity. Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. The non-biodegradable and recyclable waste shall be sold off. Fuel and lubricants shall be stored at the predefined storage location. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fuelling areas, "oil interceptors" shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners.

e. **Construction Debris and Wastes**

116. **Impact:** Uncontrolled disposal of debris and waste may create unhygienic and unsafe condition around the disposal areas.

117. **Mitigation Measures:** All excavated materials from roadway, shoulders, verges, drains, cross drainage shall be used for embankments formation if feasible, filling pits, and landscaping. Unusable debris material should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. MOSRTH guidelines shall be followed for debris, wastes removal and disposal at unproductive/wastelands which shall be selected with the consent of villagers and Panchayat. The dumping site should be of adequate capacity and to be located away from residential areas (at least 500m away). It should also be located away from water bodies to prevent any contamination of these bodies.

f. **Air Quality**

118. **Impact:** The potential sources of air emission during the construction phase of the project are given below which can cause localised air pollution.

- Dust from earth works (during site preparation).
- Emissions from the operation of construction equipment and machines.
- Fugitive emissions from vehicles plying on the road, during the transport of construction materials.
- Emissions other than dust particularly from the hot mix plants and laying of bitumen. Hot mix plant will generate carbon monoxide (CO), un-burnt

hydrocarbon (HC), sulphur dioxide (SO₂), particulate matters (PM), and nitrogen oxides (NO_x) emissions.

- Localised increased traffic congestion in construction areas. Most of the emissions will be in the form of coarse particulate matter, which will settle down in close vicinity of construction site. This may affect the air quality of nearby areas, especially, due to emission discharge from low height of the stack.

119. **Mitigation Measures:** All these impacts will be temporary and hence, no significant impact is envisaged. The following measures will be taken to minimise these:

- Vehicles delivering loose and fine materials like sand and aggregates shall be covered.
- Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads⁵, earthworks, stockpiles and asphalt mixing plant areas.
- Mixing plants and asphalt (hot mix) plants shall be located at least 0.5 km away and in downwind direction of the human settlements.
- Material storage areas shall also be located downwind of the habitation area.
- Hot mix plant shall be fitted with stack of adequate height (30 m) or as may be prescribed by state pollution control board (SPCB) to ensure enough dispersion of exit gases. Consent to establish and operate shall be obtained from State Pollution Control Board and comply with all consent conditions.
- Diesel Generating (DG) sets shall also be fitted with stack of adequate height. Low sulphur diesel shall be used in DG sets and other construction machineries. Construction vehicles and machineries shall be periodically maintained.
- The requisite PPE (helmet, mask, boot, hand gloves) shall be provided to the construction workers.

g. Noise Quality

120. **Impact:** Ambient noise level may increase temporarily in the close vicinity of various construction activities, maintenance workshops, vehicles movement and earthmoving equipment.

121. **Mitigation Measures:** The noise level will be intermittent and temporary and will attenuate fast with increase in distance from noise source. Further, vehicles and equipment should be fitted with silencers and maintained regularly. The workers shall be provided with personal protection devices such as earplugs and earmuffs.

h. Groundwater and Surface Water Quality and Availability

122. **Impact:** Water will be required for compaction of formation and domestic purposes in the workers camp. These requirements will be mainly sourced from groundwater. Any uncontrolled abstraction of ground water can deplete the ground water table fast. Contamination of groundwater is not envisaged since all construction camps will have septic tanks or mobile toilets depending on the number of workers in each camp. The drinking water supply to the habitat is primarily through hand pumps and bore wells. No significant impact is anticipated on surface water bodies except probability of siltation during construction. Due to non-perennial

⁵ Water suppression of fugitive dust can reduce emissions from 12% to 98%

nature of surface water bodies, water requirements for drinking and construction purpose shall be met from ground water sources.

123. Mitigation Measures: Requisite permission shall be obtained for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority⁶ if applicable. The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. Water intensive activities shall not be undertaken during summer period to the extent feasible. Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting. Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. Measures are already purposed in earlier section for prevention of siltation in water bodies.

i. Biological Environment

124. Impact: Since the sample roads are not passing through any protected areas or forest area, there is no diversion of forestland. The major adverse impacts will be due to tree cutting, Siltation and contamination of water bodies may affect the aquatic life particularly pond fisheries.

125. Mitigation Measures: All efforts shall be taken to avoid tree cutting wherever possible. Requisite permission from forest department shall be obtained for cutting of roadside trees. Compensatory Afforestation shall be made on 1:3 ratio basis. Additional trees shall be planted wherever feasible. All care shall be taken to avoid siltation/contamination of water bodies. Movement of herbivores like Cattle, Goats, Cows etc., have been observed in the surrounding agriculture fields. Disturbance to these animals will be avoided to the extent possible.

j. Impact on Common Property Resources

126. Impact: There are public utilities like Electric transformer, electric poles, and hand pumps all along the rural roads. The road construction may require shifting of these utilities. There are many community structures like school, playground village office temples.

127. Mitigation Measures: All efforts are made to minimize shifting of common utilities and community structures. ROW has been reduced in constricted areas with appropriate engineering measures to minimize land acquisition and shifting of community structures. The community structures/utilities which can not be saved will be shifted to adjacent area with the concurrence and in consultation with community.

B. Common Impacts during Operation Phase

1. Air Quality

128. Impact: Decrease in air quality due to increase in traffic, idling at congestions.

129. Mitigation Measures: The bad road condition is the main cause of poor air pollution at present. The improved road conditions will result in the improved ambient air quality. In addition, the subproject road is largely traversing through vast open agriculture areas, which will provide

⁶ As per Central Ground Water Authority (CGWA), there are 43 notified blocks in India where prior permission is required for extraction of ground water. Currently there are no notified areas in Chhattisgarh state. CGWA is continually updating the list of notified areas.

adequate dispersion to gaseous pollutants, generated from vehicles and will offset the increased pollutants.

2. Noise

130. **Impact:** During the operational phase, movement of traffic will be the prime source of noise. Traffic congestion and pedestrian interferences increase the use of horns. This may result in increased noise levels at habitat areas, nearby schools and religious places.

131. **Mitigation Measures:** Awareness signboard shall be provided for safe driving near the habitat areas. Speed limitation and honking restrictions may be enforced near sensitive locations.

3. Land, Soil, Tree Plantation

132. **Impact:** The better access can lead to conversion of agriculture land for residential and commercial purposes close to roads, which may result in loss of productive land and agricultural produce. Since the rural road are aimed at connecting the villages, and with the general trend of migration of rural population to urban areas, the phenomena of conversion of agriculture land to residential area is unlikely to change.

133. The land occupied for construction camp /temporary office/material storage area will remain unproductive if it is not restored after completion of construction activities.

134. It shall be essential to ensure the survivability of the compensatory tree planted

135. **Mitigation Measures** It shall be ensured that all construction camp/temporary office/material storage areas are restored to its original conditions. The borrow area rehabilitation will also be ensured as per the agreed plan with the landowner. Contractor and PIC will ensure the same and obtained clearance from PIU before handing over the site to SRRDA.

136. The PIC will undertake survivability assessment and report to PIU the status of compensatory tree plantation at a stage of completion of construction with recommendation for improving the survivability of the tree if required.

4. Groundwater

137. No impact is anticipated on groundwater due to the project during operation phase, hence, no specific mitigation is proposed.

5. Hydrology and Drainage

138. **Impact:** Water accumulation incidence may occur due to inadequate availability of cross drainage structure or clogging of cross drainage structures.

139. **Mitigation Measures:** Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions shall be regularly conducted.

6. Socio-Economic Impact

140. Assessment of project impact on socio-economic conditions point to the conclusions that positive benefits are many fold compared to its adverse impact.

141. **Positive Impacts:** The better road access is likely to contribute the overall economic condition of village community. With the quick access to urban market areas, the farmers are likely to get better prices for their farm produce. Children will also be able to access the school and education facilities in the near by urban areas.

142. **Safety Measures** shall be adopted as per NRRDA guidelines. Some of them are highlighted below :

- Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp curves design and bends where the curve design speed is less than 40 km per hour in plain in rolling terrain.
- Speed breakers shall also be provided at a threshold of habitation (as per NRRDA guidelines) at regular intervals (150-200 m) through habitation.
- The speed breakers are provided and directional sight boards installed at sites where reverse horizontal curves are closely spaced and speed reduction is required.
- Hazard markers to be installed at each end of all box culverts, river crossing causeways and similar CD structures
- Shoulder side slopes shall not be steeper than 2h: 1V unless stone pitching of the slopes is provided.
- Cement concrete pavement and V-shaped drain is constructed to the full width of the available roadway within densely populated habitation.
- Directional sight board are installed on all sharp curves and bends
- At main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road.

C. Road Specific Impacts

143. The assessment of sample roads indicates that environmental issue associated with all the roads are similar except eight roads (Table 4.1), which are prone to flood. Hence, mitigation measures applicable to the entire road are also will be similar except variation in terms of magnitude, which will depend on length of the road, the presence various environmental components. These components may be assessed in terms of no of pond, number of community structure (mostly temples, playground, school, gram Panchayat office) likely to be shifted, number and type of common utilities (hand pump, water tank, electric transformer, electrical poles).

D. Climate Change Impacts and Risks

1. Climate Change Mitigation

144. The Transport Emissions Evaluation Model for Projects (TEEMP) is an excel based tool to assess CO₂ gross emissions without (business as usual or BAU) and with the project improvements (with project scenario or WPS). The tool, which was developed by Clean Air Asia and the Institute for Transportation and Development Policy, was funded by ADB. The main improvement from the project that was considered for the model are better surface roughness with less than 2.5m/km, and improved traffic speed and hence less fuel consumption. The model has also been used for CO₂ emission assessment during construction stage. The model

also allows for the inclusion of impacts related to traffic congestion with and without project through provisions for inserting data on the traffic numbers, lane width, number of lanes and volume/capacity saturation limit. The model also computes for emission and emission intensity of PM and NOx.

145. The following information were used to project CO₂ emissions for Tranche 1 of the Facility:

- a. RCIP 2 subprojects in Assam state will upgrade 303 rural roads with a total length of 992.91 km;
- b. Road improvements will be confined to the existing one-lane 3.75-m road right-of-way, with lined storm water drains for stretches passing through built-up areas, waterlogged/water overtopping, and flood prone area; and
- c. Road roughness will improve from the current 8.0 m/km to 2.5 m/km.

146. Traffic forecasts were generated from the economic analysis for each road section, disaggregated into vehicle types and share to the annual average daily traffic (AADT). The cumulative AADT for the state is indicated in Table 15.

Table 15: AADT Composition

Vehicle Type	Percentage
Motorized	
Two-wheeler	37.30
Three-wheeler	15.63
Car/Jeep/Van	23.27
Multi-axle	7.25
Bus	2.21
Two-axle	14.34
Total (motorized)	100
Non-motorized	
Bicycle	96.00
Bullock cart	4.00
Total (non-motorized)	100.00

147. There are 303 rural roads proposed in Assam, with a total length of 992.91 km and with a carriageway width of 3.75m. Road capacity of 7,200 PCU/lane/day for rural roads was adopted for the project. The design life of the roads is 15 years.

148. Emission factors were taken from CBCP/ MOEF Draft Report on Emission Factor Development for Indian Vehicles (2007) and the Automotive Research Association of India.

Table 16. CO₂ Emission Factors

Vehicle Type	Gasoline (kg/liter)	Diesel (kg/liter)	LPG (kg)
2-wheeler	1.37		
3-wheeler	2.12	2.63	3.0
Car	2.24	2.59	
Multi-axle		3.21	
Bus		3.61	
2-axle		3.50	

149. To account for construction emission, the amount of emission per km was estimated. For rural roads, the emission factor for rural road in India (kg CO₂/km) was estimated at 48.4 tons/km⁷. These emissions were from construction materials used (aggregates/base materials, cement, bitumen and emulsion), and fuel used for transporting construction materials.

150. Total annual emissions without the project (business as usual) at the middle of the design life of 7.5 years is estimated at 36,692.97 tons/year and with project scenario is estimated at 37,614.68 tons/year, for all 303 roads proposed for Tranche 1 of RCIP 2. The with project sceanrio is still far below the 100,000 tons per year threshold set in the ADB SPS 2009 and therefore not required to implement options to reduce or offset CO₂ emissions.

2. Climate Risks and Adaptation Needs

151. The Assam State Disaster Management Authority (ASDMA) places Assam as a multi-hazard State prone to floods, earthquake, storms and landslides besides man-made disasters. ASDMA also reports that all rivers in Assam are prone to floods because these rivers receive heavy rainfall in short time. Assam is also vulnerable to cyclone impacts as the approach of the southwest tropical monsoon is marked by strong winds, accompanied by thundershowers and hailstorms between April and May. In addition, continuous deforestation and demand for more agricultural land also led to destabilization of hill slopes which results to landslides during monsoon period.

152. Risks specific to road projects in the state of Assam are those resulting from increased frequency and intensity of extreme weather events. Temperature and precipitation changes, increased cyclonic storms, flooding, and landslides in road sections running through the hilly regions of Assam, and water availability during the dry season.

153. The possible events related to climate change and their possible effects on Assam road infrastructure are summarized in Table 17. All these events either simultaneously or in isolation may generate major disastrous impacts on road infrastructure.

Table 17. Possible Climate Events and Risks to Roads in Assam

Climate Change Events	Risks to the Road Infrastructure
Extreme rainfall events	<ul style="list-style-type: none"> • Overtopping and wash away • Increase of seepage and infiltration pass • Increase of hydrodynamic pressure of roads • Decreased cohesion of soil compaction • Traffic hindrance and safety
Seasonal and annual average rainfall	<ul style="list-style-type: none"> • Impact on soil moisture levels, affecting the structural integrity of roads, bridges and tunnels (if any) • Adverse impact of standing water on the road base • Risk of floods from runoff, landslides, slope failures and damage to roads if changes occur in the precipitation pattern
Increased maximum temperature and higher number of consecutive hot days (heat waves)	<ul style="list-style-type: none"> • Concerns regarding pavement integrity, e.g. softening, traffic-related rutting, cracking, fracture, etc.

⁷ <https://www.adb.org/sites/default/files/publication/28555/estimating-carbon-footprints-road-projects.pdf>

Climate Change Events	Risks to the Road Infrastructure
	<ul style="list-style-type: none"> • Thermal expansion in bridge expansion joints and paved surfaces • Temperature break soil cohesion and increase dust volume which caused health and traffic accidents
Extreme wind speed	<ul style="list-style-type: none"> • Threat to stability of bridge decks • Damage to road signs, lighting fixtures and supports • Increase of wind speed causes increased dynamic force of water generated by waves on road embankments

154. Key engineering measures to address climate risk variables such as extreme precipitation, high temperatures and vulnerability to landslides include a) increase in road embankment level road section located in low-lying and flood prone areas; b) erosion protection for areas prone to landslides; c) increase in capacity of spillways and culverts; d) embankment protection through tree plantings; and e) improvement of longitudinal ditches and drains.

155. Provisions have also been made in the bidding documents for the contractor to prepare EMPs based on the final detailed design to address climate related risks and vulnerabilities.

V. ENVIRONMENTAL MANAGEMENT PLAN, INSTITUTIONAL ARRANGEMENTS AND GRIEVANCE REDRESS MECHANISM

A. Environmental Management Plan

156. The Environmental Management Plan (EMP) is prepared to facilitate effective implementation of recommended mitigations measures with defined roles and responsibility for implementation and monitoring, regulatory compliance requirements, stages of implementation with location, period and costs. The mitigation measures are proposed to eliminate or minimise the identified impact associated with design, construction and operation stages of the project, to acceptable level by adopting the most feasible options.

157. The EMP is prepared as per Environmental Management Standard (ECOP) applicable to rural road defined by ADB at RRS I stage.

158. The identified impacts are insignificant and are related to clearing operations of RoW, traffic diversions, setting and operation of construction camps, quarry and borrowing operations, transportation of materials, construction of cross drainage structures, air & noise pollution due to construction activities and operation of construction equipment, tree cutting and shifting of utilities and physical community structure.

159. Appropriate mitigation measures are identified for all rural road construction and operation activities. The identified impacts associated with rural roads and mitigative measures are largely common to most of the roads. The EMP is detailed at **Appendix 4**. It provides action common to all roads at pre construction, construction and operation stage. Since IEE is carried out, prior to preparation of DPR, the EMP will be updated specific to road as per DPR requirements by PIU and included with DPR, which shall be available to contractor at the time of bidding. The areas to be updated as per DPR provisions are highlighted under location column of EMP.

160. Since, these are rural road, the vehicular density and speed will be low. Movement of vehicles would be confined primarily for transfer of agricultural produce to market places. As such, no major emergency is anticipated. In any accidental eventuality, local administration can be reached quickly for help through Gram Panchayat (village administration) communication systems.

B. Environmental Monitoring Plan

161. The environmental monitoring program is prepared with aim to monitor the environmental performance of environmental management plan. The EMOP is planned with the focus on following objectives:

- To assess the effectiveness of mitigation measures proposed
- To assess the change in environmental quality during construction and operation stage with respect to before the project scenario.
- To assess compliance to regulatory requirements
- To monitor the status of corrective action taken in case of deviation from the planned measures or regulatory requirements.

162. For rural roads, Environmental Monitoring plan will be more observation oriented and it provides observation areas with frequency of monitoring at pre-construction aspects⁸, construction stage and operation stage. A monitoring plan with monitoring indicator and frequency of monitoring is given at **Appendix 5**.

C. Institutional Arrangements and Responsibilities

163. **Institutional Arrangement.** NRRDA constituted by MORD is the nodal agency for the implementation of PMGSY in India. SRRDA is the state level agency responsible for implementation of PMGSY program in the state. NRRDA has developed various guidelines and defined institutional arrangements for effective and timely implementation of PMGSY program, which also covers measures for environmental and social safeguards. In line with the defined institutional requirements, each SRRDA has set up district level project implementation units (PIUs). NRRDA also appoints Technical Support Consultant (TSC) to provide technical support for capacity building in SRRDA/PIUs, facilitating them for environmental and social safeguard compliance monitoring and due diligence. SRRDA appoints PIC (project implementation consultant) for supervision of construction work. PIC also helps PIU in monitoring the EMP.

164. NRRDA is also responsible to coordinate with SRRDA and ensure compliance to ADB safeguard requirements.

165. The institutional arrangement at National Level and state level for implementation of PMGSY including second RCIP is shown at **Figure 3**.

D. Institutional Environmental Responsibilities

166. The institutional environmental responsibilities for different level and function is elaborated below

167. **MORD**⁹ the executing agency has the responsibility for monitoring implementation of the EMP for all subprojects and undertaking necessary due diligence. MORD ensure this through its Nodal Agency NRRDA (National Rural Road Development Authority). MORD will also ensure that

- ADB is given access to undertake environmental due diligence for all subprojects, if and when needed as per EARF requirements.
- SRRDA meet all environmental assessment requirements in accordance with EARF
- It undertakes random monitoring of the implementation of the EMP
- Ensure compliance to legislative requirements such as forest clearance for diversion of forest land for non-forest purposes and Consent to Establish/Operate for hot mix plant, batching plant
- Appoint Technical Support Consultant (TSC) to assist SRRDA for various environmental aspect and safeguard compliances

⁸ Aspects related to alignment selection for inclusion of new roads

⁹ MoRD implements it through its nodal agency NRRDA which undertakes this with the help of Environmental Expert of Technical Support Consultant

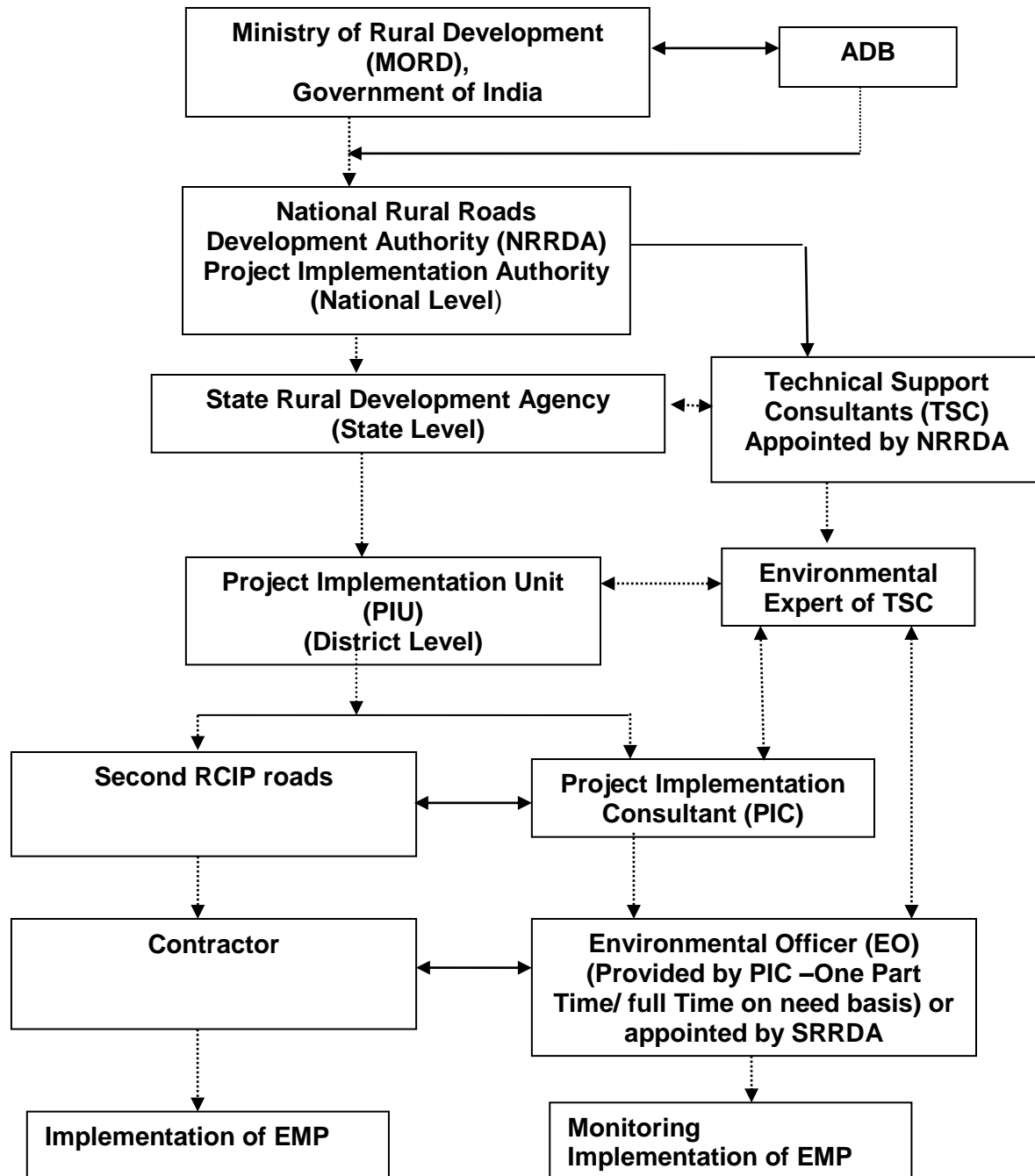


Figure 3: Institutional Arrangement for EMP Implementation

168. **SRRDA**¹⁰ will ensure that :

- ECOP checklist is prepared for each road
- The completed ECOP checklist is included in the DPR with the help of PIC.
- Ensure that all required statutory environmental clearances are obtained and comply with clearance conditions;
- Ensure that the subproject specific EMPs and respective budget are included in the bidding documents;
- Ensure that the ECOP checklists and EMP (including general and site specific issues) are made available to the contractors;
- Undertake routine monitoring of the implementation of the EMP including spot checks on site and prepare monitoring reports at least once a year; and
- With the support of technical support consultants prepare satisfactory environmental due diligence reports of the earlier tranche/periodic financing request before implementing the next tranche.
- Appoint Project Implementation Consultant (PIC) for construction supervision and assist PIUs for EMP implementation and related safeguard compliances.

169. **PIU** will be responsible to :

- Complete the ECOP checklists and prepare subproject specific EMPs (including monitoring plan) for each subproject
- Obtain necessary statutory environmental clearance prior to commencement of civil works
- Update the respective ECOP checklists and EMPs if there are any changes in alignment of the subprojects
- To conduct monitoring of all subprojects and prepare pre-, during and post-construction monitoring checklists through the project implementation consultants,
- Prepare and submit to SRRDA annual monitoring report as per ADB defined format

170. The **Technical Support Consultants (TSC)** appointed by NRRDA. The Environmental Expert of TSC:

- Will provide technical assistance to SRRDA/PIU regarding environmental aspects, environmental permitting/clearances requirement,
- Periodically review EMP implementation status including spot site inspections.
- Conduct workshops/capacity building program at different level and functions.
- Prepare environmental Due Diligence report for each trench before implementing next trench
- Prepare state Level IEE reports and EMPs for non sample roads based on the ECOP checklist completed by the PIC

171. **Project Implementation Consultant (PIC)** is appointed by SRRDA. PIC will provide one Environmental Officer (EO). The EO will be responsible to ensure adherence and implementation of EMP at all stages of works by the contractor. The EO, if found warranting

¹⁰ With assistance from PIC (Project Implementation Unit)

may also conduct field tests, independent of the contractor to determine the effectiveness of EMP under approval of PIC/PIU. The broad duties / responsibilities of the Environmental Officer will include:

- Review of project design and specifications to ensure their adequacy and suitability with respect to the implementation of EMP.
- Collection and dissemination of relevant environmental documents including amendments to environmental protection acts issued by the various agencies, namely, ADB, Government of India / State and local bodies;
- Interact with the counterpart of the Contractor(s), review work progress/plans and ensure implementation of the EMP;
- Co-ordination with the NGOs, community groups and Government departments on environmental issues, provide clarifications/ and obtain clearances during project implementation if any, as required from the regulatory authorities and/or submitting periodic compliance reports as required by the State Authorities;
- Monitoring sensitive environmental attributes during construction and operation stages¹¹ to ensure that the suggested mitigation measures in the EMP are implemented;
- Facilitate PIU for preparation of annual monitoring report as per ADB defined format
- Documentation of the environmental management/monitoring activities for the regular project implementation progress report, which will serve as the basis for the annual environmental monitoring reports.
- Conducting environmental training/awareness programs for the contractors, the project implementation personnel and the communities.

172. **Contractor** is appointed by SRRDA for construction of road and ensures implementation of EMP proposed. The broad duties of contractor are as follows:

- Make adequate costs provision for EMP requirements while bidding
- Ensure effective implementation of mitigative measures as per road specific EMP
- Comply with all applicable legislative requirements and obtain necessary consents for to Establish/Operate before start of hot mix plant and batching plants. Comply with al permit conditions
- Create awareness amongst workers for environment, occupational health and safety aspects. Participate in training and awareness programme along with its executives conducted by PIC.
- Provide PPE and adequate resources for Environment Occupational Health and Safety
- Follow all the guidelines for borrowing earth and restoration of borrow areas, setting up construction camps
- Sourcing of quarry material from approved quarries only
- Provide all required input to PIC for environmental monitoring as per EMP.

¹¹ Normally PIC is supposed to undertake five site visits and five monitoring reports as per contracts being issued by different SRRDA. It is proposed that PIC shall submit the following five monitoring reports: (1) First report at pre construction stage, (2) Second report after three months of start of construction or on completion of 25% construction (3) Thrid report after seven months of start of construction or on completion of 75% of construction, (4) Fourth report after one month of completion of construction and first year of operation stage (5) Fifth report in second month of second year of operation stage.

E. Environmental Assessment and Review Framework (EARF) for Second RCIP

173. An Environmental Assessment and Review Framework (EARF) has been prepared that identifies the broad scope of the MFF, outlines the policy, environmental screening and assessment, and institutional requirements for preparing the environmental assessments to be followed for subsequent batches and tranches. This EARF also specifies criteria for eligibility for selection rural roads under second RCIP. The sample roads are selected following these criteria. The EMP, monitoring requirement, institutional aspects, capacity building, grievance redress mechanism presented in this chapter are developed in line with above EARF. The eligibility criteria for selection of roads under second RCIP, environmental assessment requirement for each trench and legal framework are given below:

174. **Selection Criteria and Environmental Assessment Requirement.** The following criteria will be followed for selection of non-sample roads.

- No Category A (as per ADB's SPS) subproject will be included in the MFF.
- Subprojects will be eligible for construction or upgrading in accordance with the PMGSY guidelines, and be included in the respective district core network.
- The subprojects shall not disturb any cultural heritage designated by the Government or by international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance.
- The subproject will not pass through any designated wildlife sanctuaries, national parks, other sanctuaries, notified ecological sensitive areas or area of international significance (e.g., protected wetland designated by the Wetland Convention).
- The projects shall only involve activities that follow Government of India laws and regulations, ADB's Safeguard Policy Statement (2009)

175. The following environmental Assessment requirement will be followed roads included under second RCIP

- ECOP checklists with annexes on trees, utility structures, community structures, strip plans and photographs will be completed for each and every road.
- Based on the requirements of the PMGSY guidelines separate ECOP checklists will be prepared for bridges that are longer than 15 m.
- Based on the completed ECOP checklists for roads and bridges, IEE reports will be prepared at a state level. These reports must contain a general EMP and a site specific EMP where there are site specific issues.
- ADB's REA checklist for roads and highways will be completed based on the state level IEE reports prepared and submitted to ADB to confirm categorization

176. The vulnerable to climate change will also be screened following screening checklists, which was integrated in the ADB REA Checklists and corresponding mitigation measures will be prepared.

- Is the project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes

- Could changes in precipitation patterns or evaporation rates over the lifespan of the project affect its sustainability and cost (i.e., increased landslides increase maintenance costs)?
- Does the project use or depend on resources which could be affected by climate changes such as changes in temperature, precipitation, wind (increased soil moisture content in the sub-grade)?
- Are there any demographic or socioeconomic aspects of the subproject and project area (e.g., population growth, settlement patterns) that increase the vulnerability of the project and surrounding area?
- Could the subproject potentially increase the vulnerability of the surrounding area (i.e., by increasing runoff, encouraging settlement in earthquake zones)

177. **Legal Framework.** As per Indian legislation, an environmental clearance is not required for rural roads. However, it may attract provisions of Forest Conservation Act, Wild Life (Protection) Act, and other legislation related with Air, Water and Noise pollution controls and prevention. The legislative applicability screening is presented in chapter 1 of this report and it will apply for non-sample road as well. Additionally, to ensure conformance to ADB's Safeguard Policy Statement, 2009 (SPS), the subprojects will be subject to the following requirements:

- Submission of a completed Rapid Environment Assessment (REA) checklist for Roads and Highways and a categorization form for each state level IEE that is prepared.
- An Initial Environmental Examination¹² (IEE) report including the preparation of an Environmental Management Plan (EMP) and a Monitoring Plan.
- Regular monitoring of implementation of the EMP and submission of monitoring reports and due diligence reports to ADB as necessary

F. Capacity Building

178. Existing capacity of the State Rural Roads Development Agencies (SRRDAs) and Project Implementation Units (PIUs) for implementing environmental safeguard issues need substantial strengthening. Capacity building activities will mainly comprise training workshops for SRRDA and PIU environmental officers on (i) completion of environmental code of practice (ECOP) checklists; (ii) preparation of environmental management plan (EMP) and monitoring plans; (iii) monitoring of EMP implementation and completion of pre-, during and post-construction monitoring checklists; and (iv) preparation of monitoring reports. These few workshops have already been conducted at participating states though ADB /TSC Environmental specialist. Additional training will be carried out periodically by In-house trained and experienced officials.

G. Consultation and Information Disclosure

179. During the preparation of ECOP and Detailed Project Report (DPR), the PIU has to ensure consultation and address concerns of the affected people.

180. All environmental assessment documents are subject to ADB's Public Communication Policy (2005) and will be made available to the public, upon request. The SRRDAs are responsible for ensuring that all environmental checklist documentation, including the environmental due diligence and monitoring reports, are properly and systematically kept as

¹² As per selection criteria, no Category A subproject will be included under RCIP.

part of the Investment Program specific records. MORD must disclose state specific sample road IEE reports on its website.

H. Grievance Redress Mechanism

181. **Subproject Level.** Public disclosure and complaints contact person will be designated by the PIU for each subproject to help address all concerns and grievances of the local communities and affected parties. Contact details will form part of the subproject identification display board that will be placed at both ends of the rural road being constructed.

182. **Village Level.** If there are environmental issues concerning road subprojects, community consultation process that is transparent, gender responsive and accessible to all stakeholders, in accordance with PMGSY guidelines and SPS 2009 will be conducted. Grievances, if any, will be considered at the village level by the Grievance Redress Committee (GRC) consisting of members of Gram Panchayat, and Pradhan / Up-Pradhan of Gram Panchayat. The GRC will meet for addressing grievances as needed.

183. **District Level.** Grievances not resolved at the village level will be addressed through the district level GRC, with the following members:

- (i) Executive Engineer of the PIU;
- (ii) Member of Zilla Parishad;
- (iii) Member of the grievance committee of the concerned GP; and
- (iv) Representatives of APs will be active participants in the proceedings of grievance redressal.

184. Grievance procedures, which can be easily understood by stakeholders, and preferably in the local language, will be disseminated to affected communities. Issues need to be resolved prior to awarding of civil work contract.

185. **Nationa Level.** NRRDA has made provision of registering complaint /suggestion through its website. NRRDA forwards these complains to concerned SRRDA for necessary actions. SRRDA directly or through concerned PIU initiate the appropriate action and update the complainant as well as NRRDA. It is proposed that NRRDA website will be cross-linked to each SRRDA website as well or SRRDA will also make provision of complain registry at its website.

186. The following indicative timeline to resolve grievances at different levels will be observed: Subproject level – 3 days; Village level – 1 week; District level – 1 week; and National level – 2 weeks. GRM related costs, which mostly include travel expenses and meeting related expenses such as refreshments, will be covered by PIU. The GRC meetings will only be convened onlyif and when necessary. Hence, GRC members will not be required to be present in all times during project implementation. Cost for other activities such as recording complaints, minutes of meetings, preparing reports, etc., will be carried out by the PIU / PIC. Complainant has the option to resort to legal redress at any stage.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. General

187. Public consultation was undertaken consistent with the ADB requirements. All the five principles of information dissemination, information solicitation, integration, co-ordination and engagement into dialogue were incorporated in the consultation process. A framework of different environmental impacts likely from the project was strengthened and modified based on opinions of all those consulted, especially in the micro level by setting up dialogues with the village people from whom information on site facts and prevailing conditions were collected.

188. Stakeholder's consultations were held from March to June 2017. Some of these consultations, reflected below, were done in Kamrup, Bongaingaon, Darrang and Nagaon. Consultations were also done with affected people in Kamrup District, as well as PIU consultation in Sibsagar and Darrang. Stakeholders', including women, were consulted to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design. Informal meetings, interviews were organized covering the entire project stretch. The informal consultation generally started with explaining the sub projects, followed by an explanation to potential impacts. Participant's views were gathered about loss of agricultural land, effect on air and noise quality of the area due to traffic, water availability, accident and risk.

189. The discussions were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the sub-project. They were given the brief outline of the project to which their opinion was sought. Suggestions were also sought for mitigating any potential adverse impact.

B. Compliance with Relevant Regulatory Requirements

190. In India, public consultation is mandatory in case of Category A and B1 category projects¹³ in select conditions. Being a category B project as per ADB Safeguards Policy Statement (2009), consultation was carried out during the early stage of IEE report preparation. The requirement of public consultation during the implementation of the project has been proposed as part of the mitigation plan.

C. Beneficiaries' Comments

191. The project has immense acceptability among the local people. They perceived that in addition to providing all weather connectivity, the sub-project road will bring positive socio-economic changes in the area. Local people mainly discussed on issues related to drainage and commencement of the construction work.

192. Some of the general issues raised during the different consultation sessions can be summed up as follows.

- **Construction Camp** - The participants did not apprehend any adverse impact due to the construction camp near to their villages. They responded positively towards providing support to these, if required, in terms of any food, water requirements.

¹³ As per schedule I of EIA notification number S.O. 1533, dated 14th September 2006. This notification also defines when a public consultation is mandatory.

- **Water Logging and Drainage** - Participants informed about few low-lying areas particularly in along sample roads in Jorahat, Kamrup and Golaghat districts where water logging takes place during monsoon season. The villagers requested for provision of adequate drainage and cross drainage structures at these locations. Villagers also reported for road overtopping in road where they have suggested to raise the road levels.
- **Loss of Livelihood and Income Restoration Options** - This issue was raised by those who had encroached on the proposed alignment. However, they offered the encroached space for the proposed project, if demanded.
- **Road Safety** - Safety issues did not raise concern among the inhabitants including women.
- **Land Acquisition** - People were in full support of the project and were ready to donate their land for the same, if required.
- **Losses of Idols/Shrines** - Participants supported the project and were willing to shift the idols, burial grounds and other religious structures observed at certain locations.
- **Loss of Trees Due to Road Construction** - Respondents believed tree cutting should be avoided or else minimised. For trees to be cut compensatory plantation should be done. Some villagers expected additional plantation should be done. Recommended tree species for plantation were other local varieties.
- **Impacts on Health** - Separate consultation sessions were organised by social team to identify issues pertaining to health specifically for sexually transmitted diseases (STDs). Settlements along the rural roads were reported to be getting exposed to such diseases, as there are no long-distance users on the project roads.
- **Ambient Air & Noise Quality** – The respondents viewed that these are the problems of urban areas and their villages are still untouched from this aspect. They even do not anticipate any of these problems after the completion of the project.
- **Inconvenience during Construction** - The participants viewed that they will manage it as it will be temporary phenomenon.
- **Employment during Construction** - The locals expected that they should be given preference in employment during project implementation.
- **Perceptions and Expectations** - Perceptions and expectations of the community recorded during the consultation sessions can be broadly listed as:
 - The public and the PAPs appreciated and supported the project with their open hearts.
 - Community at large appreciated overall benefits to them resulting from project development;
 - They were aware of the increased access, lesser commuting time after project implementation;
- **Addressal of Issues** - The project has tried its best to address all the issues raised during consultations under the constraints of suitability from engineering point of view.

193. Some of the provisions made under the project to address the issues and concerns of the community are given in Table 15. Consultations with stakeholders will continue throughout project implementation as necessary at different levels, to update and address the concerns of affected people on environment related issues.

Table 18: Addressal of Issues and Concerns under the Project

Issue/Concern	Addressal under the project
Water Logging and Drainage	Adequate cross drainage structures have been planned
Road Safety	Adequate safely signage planned all along the rural road.
Land acquisition and Mode of compensation	The proposed RoW is 12m along the rural road. No land acquisition is planned in project road.
Loss of roadside idols/shrines	Idols and shrines will be relocated to the other nearby places with consultation and proper rituals
Loss of trees	Compensatory afforestation would be done at the ratio of three trees for each tree to be cut.
Increased pollution levels	Pollution levels are not crossing the prescribed limits of CPCB and planned plantation will screen the emission.
Utilities and basic infrastructure	All the utilities, electric poles, telephone lines, wells, tube wells etc. to be impacted will be relocated under the project cost.
Employment of locals during construction	Locals will be given preference for employment during the project implementation

Photographs of Consultation

Consultation with the villagers in Kamrup



Consultation in Bongaingaon



Consultation with PIU in Sibsagar



Visiting the road in Sonitpur



Public Consultation with PIU & Local people in Darrang

Public Consultation in Nagaon

Consultations in Kamrup District



VII. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

194. The findings of Environment Assessment of sample roads indicate that impacts are mostly similar and subprojects are unlikely to cause any significant environmental impacts. While some of the impacts are negative, there are many bearing benefits to the area. Most of the impacts are likely to occur during construction stage, are temporary in nature, and can be mitigated with minor to negligible residual impacts.

195. The project received immense support from local people, as they perceive that this project will improve the overall connectivity and bring various economic opportunities to the people of the area.

196. All sample roads included under second RCIP were selected based on ecological and climate change consideration defined under EARF. Accordingly, none of the sample roads passes through protected areas or encroaches precious ecology (sensitive or protected areas) or any historical or archeologically protected areas. As per selection guidelines, none of the selected sample road passes through reserved forests either. Few trees cutting though may be involved.

197. Among the sample project roads there are 23 roads which are prone to flood due to river, proximity to rivers or due to accumulation of rainwater in and around project road area. Adequate engineering measures like cross drainage structures, slop stabilisation are proposed for the protection of road from the flood.

198. All the sample roads are aligned with existing village roads and unpaved movement paths. As such, land acquisition is nil or very minimal which is also acquired through donations from villagers.

199. Considering insignificant environmental sensitivity, the project is categorised as category B as per ADB Safeguard Policy Statement 2009.

200. No categorisation is made under environmental legislation of India, since these small roads do not require any environmental clearance in accordance to Indian Environmental (Protection) Act and Rules, 1986 amended till date. However, clearance from Forest Department will be required for cutting of trees.

201. The impacts identified are mostly related to alignment selection, land clearing, borrowing earth, and cutting of trees, shifting of utilities and community structures, establishment of construction camp or material storage areas, transportation of material and operation of hot mix plant. All identified impacts are either eliminated or minimised through design consideration and suitable mitigative measures.

202. Environmental Management plan covering all stages of road construction (design, construction and operation) is prepared with defined responsibility for its implementation. Environmental Monitoring plan is also prepared to ensure effective implementation of EMPs.

203. NRRDA/SRRDA has defined institutional setup including specified responsibility for environmental management. Existing capacity of the State Rural Roads Development Agencies (SRRDAs) and Project Implementation Units (PIUs) for implementing environmental safeguard

issues need substantial strengthening. The capacity enhancement is proposed through focused workshops and training session. Few workshops have already been conducted at participating states through ADB officials and TSC Experts. Trained and experienced in-house officials should carry out more raining in future periodically.

204. The IEE also indicate that rural road construction works does not warrant further EIA study for subsequent rural road construction works in Assam.

B. Key Recommendations:

205. Any major changes or any major additional work other than the proposed project activities will require preparation of another environmental assessment. This additional assessment must be submitted to NRRDA, Concerned Government authorities and ADB for concurrence before civil works commence.

206. The implementation of prescribed mitigation measures will minimize/avoid the adverse impacts. Moreover, the impacts shall be monitored continually by implementing and updating the Environmental Management plan and Environmental Monitoring Plan.

207. These IEE is prepared based on ECOPs and feasibility stage. Subproject specific EMP shall be improved as per the final provisions made under DPRs. The updated EMP if there is any change shall also be sent to ADB for information.

208. Executing agency shall ensure that EMP and EMoP is included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. The contractor will specify the quantity and budget for various activities like rehabilitation of borrow earth pits, first aid and sanitation facilities at construction camp and temporary office/material storage place. The same shall be revised if necessary during project implementation or if there is any change in the project design. Any such change shall be reported to ADB as well.

APPENDIX 1: DETAILS OF PROPOSED RCIP II TRANCHE I ROADS IN ASSAM

S. No.	District	Block	Package No.	Road Name	Road length in Km
1	2	3	4	5	6
1	Bongaigaon	Boitamari	AS-02-91	NH-31 (Amguri) to Barkhata Road	1.880
2	Bongaigaon	Boitamari	AS-02-92	Khagarpur Part VIII to Durgapur (T-1)	2.934
3	Bongaigaon	Boitamari	AS-02-96	NH-31B to Bechimari Road	1.570
4	Bongaigaon	Boitamari	AS-02-97	Jogighopa Paper Mill to Koreya-I	2.375
5	Bongaigaon	Boitamari	AS-02-99	Balapara Haakodoba Road	1.690
6	Bongaigaon	Boitamari	AS-02-100	Kharboja to Khagarpur Road	0.580
7	Bongaigaon	Dangtol	AS-02-104	T 06 to Chungapota Road	0.720
8	Bongaigaon	Dangtol	AS-02-119	Chiponsila to Kandulimari Road	1.460
9	Bongaigaon	Dangtol	AS-02-121	T1 to Kandulimari Pahar NC	2.080
10	Bongaigaon	Dangtol	AS-02-122	Dholagaon to Kachuagaon	1.500
11	Bongaigaon	Dangtol	AS-02-127	T02 to Jelkajhar Pt-II	0.717
12	Bongaigaon	Dangtol	AS-02-129	T04 to Chaprakata Pt-III	0.883
13	Bongaigaon	Manikpur	AS-02-142	Palengbari - I to Palengbari - II	2.970
14	Bongaigaon	Manikpur	AS-02-145	Dhupuri to Garoleti	1.150
15	Bongaigaon	Tapattary	AS-02-147	Gobindapur to Tinkonia-III	1.760
16	Bongaigaon	Tapattary	AS-02-148	Kuchbari (Baghekhaiti) to Merechar (Balargudam)	0.800
17	Bongaigaon	Tapattary	AS-02-149	Bamungaon 1 to Khudranarikola	2.350
18	Bongaigaon	Tapattary	AS-02-153	Bamungaon I to Bamungaon II Road	2.020
19	Bongaigaon	Tapattary	AS-02-155	Bhakuamari to Khoragaon Part-II Road	1.156
20	Bongaigaon	Tapattary	AS-02-156	Khoragaon to Machpara Road	0.680
21	Bongaigaon	Srijangram	AS-02-159	Telipara Ujanpara Road	1.300
22	Bongaigaon	Boitamari	AS-02-90	Khagarpur Part VI to Khagarpur III(T1)	3.550
23	Bongaigaon	Boitamari	AS-02-94	Khagarpur-Part-V to NH31 (T-3)	3.230
24	Bongaigaon	Boitamari	AS-02-98	Sajanbhita to Birpara	2.020
25	Bongaigaon	Boitamari	AS-02-99A	Similaguri to NH 31 B	0.738
26	Bongaigaon	Boitamari	AS-02-101	Barkhata I to Barkhata II	0.905
27	Bongaigaon	Boitamari	AS-02-102	Kabaitary to Kabaitary VI	0.880
28	Bongaigaon	Dangtol	AS-02-111	Majgaon to Ghondal	2.230
29	Bongaigaon	Dangtol	AS-02-113	Paltanbazar to Hollaguri	4.200
30	Bongaigaon	Dangtol	AS-02-116	Dhontola to Nankargaon	3.080
31	Bongaigaon	Dangtol	AS-02-125	Mulagaon to Mulagaon Rvapara	1.740
32	Bongaigaon	Dangtol	AS-02-128	Siponsila to Kashibari	1.445
33	Bongaigaon	Manikpur	AS-02-141	Bhandara Pt I to Bhandara Pt V	3.026
34	Bongaigaon	Manikpur	AS-02-143	Monakosa II to Ujandubi	1.300
35	Bongaigaon	Manikpur	AS-02-144	Jamdoha II to Jamdoha VI	1.450
36	Bongaigaon	Tapattari	AS-02-146	Kushbari Part II to Kushbari Part I Road	1.430
37	Bongaigaon	Tapattari	AS-02-154	Haripur to New Piradhara Rd	1.920
38	Bongaigaon	Tapattari	AS-02-157	Khoragaon Part I to Malegarh Part II	2.524
39	Bongaigaon	Srijangram	AS-02-160	T01 to Chotobaregarh	1.967
40	Bongaigaon	Srijangram	AS-02-161	Simlaguri Parapara to N H 31 Road	3.640
41	Bongaigaon	Manikpur	AS-02-166	Gargaon II to Charapet I	4.740
Sub Total (Bongaigaon)			41		78.590
42	Dibrugarh	Joypur	AS-06-387	Cherepajan to Lonjong Road	1.590
43	Dibrugarh	Khowang	AS-06-203	Bamunbari Bharali Road to Thengal (TRACK76)	3.963
44	Dibrugarh	Barbarua	AS-06-229	Mankota to Khanikar TE (VR53)	3.636
45	Dibrugarh	Tingkhong	AS-06-256	NA BHAKATIA TO SUKAN POTHAR ROAD	3.000
46	Dibrugarh	Lahowal	AS-06-261	T1 to Khagorijan	3.780
47	Dibrugarh	Khowang	AS-06-262	MN ROAD TO GHORAGHASH NO 1	4.525
48	Dibrugarh	Khowang	AS-06-263	Sensua Naharani Ali to Demowkinar Changmai (TRACK67)	2.069
49	Dibrugarh	Tingkhong	AS-06-264	DEROI TE TO KHERONI POTHAR	6.406
50	Dibrugarh	Barbarua	AS-06-265	Mankata to Jokai Timona (VR55)	4.927
51	Dibrugarh	Barbarua	AS-06-266	Mankata to Maju Temptoo (VR54)	2.149
52	Dibrugarh	Lahowal	AS-06-267	PHULAMPUR ROAD	1.600

S. No.	District	Block	Package No.	Road Name	Road length in Km
53	Dibrugarh	Barbarua	AS-06-275	Lezai Kalakhowa Road to Chakipathar No 2 (VR65)	1.646
54	Dibrugarh	Lahowal	AS-06-280	Dhupabar Chuk Road (VR31)	0.784
55	Dibrugarh	Tengakhata	AS-06-362	FEKELAJAN ROAD	2.230
Sub Total (Dibrugarh)			14		42.305
56	Goalpara	Rangjuli	AS-07-196	L027-AdokgiriNEC Ambuk III	1.070
57	Goalpara	Lakhipur	AS-07-320	Thorko Chaibari	0.790
58	Goalpara	Balijana	AS-07-328	NEC Road to Rongchapara	2.430
59	Goalpara	Rangjuli	AS-07-330	Khutabari Bordol I	4.000
60	Goalpara	Rangjuli	AS-07-346	Bongaon Tiplai II	1.520
Sub Total (Goalpara)			5		9.810
61	Golaghat	Morongi	AS-08-203	NH-39 to No.3 Koibtra	1.500
Sub Total (Golaghat)			1		1.500
62	Jorhat	Ujani Majuli	AS-10-146	Bali Deori to Deori Pam	6.894
63	Jorhat	Ujani Majuli	AS-10-162	BHURAMORA TO GUSAIBARI	1.000
64	Jorhat	Majuli	AS-10-170	Baraguri to Silakola Gaon	4.850
65	Jorhat	Ujani Majuli	AS-10-171	JAMUANI TO BORPHULONI	3.000
66	Jorhat	Majuli	AS-10-183	MUDOICHUK TO DOLONI CHAMOGURI	1.690
67	Jorhat	Ujani Majuli	AS-10-184	East Sriram Deori to Deori gaon	1.930
68	Jorhat	Ujani Majuli	AS-10-187	Cikari gaon to Kachari Gaon	5.650
69	Jorhat	Ujani Majuli	AS-10-198	T01 to Punia Satra Gaon	0.700
70	Jorhat	Majuli	AS-10-200	KHARJANPATHAR NO 1TO KOIBATRA GOAN	1.010
71	Jorhat	Ujani Majuli	AS-10-201	Pahumora To Gualabari	5.030
72	Jorhat	Ujani Majuli	AS-10-202	T05 to Rangachai	4.880
73	Jorhat	Ujani Majuli	AS-10-230	Phuloni No.1 to Phuloni No.2	6.030
Sub Total (Jorhat)			12		42.664
74	Kamrup	Boko	AS-11-207	Nagopara Bhagdabari	3.100
75	Kamrup	Chaygaon	AS-11-217	Batakuchi to Dakuapara Road	2.500
76	Kamrup	Chaygaon	AS-11-219	Bamunigaon to Karoipura	9.360
77	Kamrup	Hajo	AS-11-238	Khetri Hardia Village Road	1.600
78	Kamrup	Rani	AS-11-242	Muduki PWD Road	7.950
79	Kamrup	Chayani Borduar	AS-11-244	Salesala Gohaitat Road	2.300
80	Kamrup	Rani	AS-11-249	Rd from Matekher PWD Rd to Ranibari	1.560
81	Kamrup	Chayani Borduar	AS-11-252	Rajapara Baraigaon Road	8.500
82	Kamrup	Rani	AS-11-256	Patgaon Umsur Road (T13) to Nagaon	1.650
83	Kamrup	Chayani Borduar	AS-11-263	PL Rajapara to Southala	3.660
84	Kamrup	Chandrapur	AS-11-265	Niz Panbari No-2 to Sahabarbori Path	1.900
85	Kamrup	Dimoria	AS-11-308	Khat Tetelia to khat Tetelia NC	1.340
86	Kamrup	Chandrapur	AS-11-310	Borghuli to Santipur Kamarpur Rd	1.660
87	Kamrup	Dimoria	AS-11-311	Rewa to Rewa NC	1.220
88	Kamrup	Chandrapur	AS-11-315	Dhankhunda Garubandha Road	1.800
89	Kamrup	Hajo	AS-11-327	L027 Nadia to Muslimpara Road	2.000
90	Kamrup	Rampur	AS-11-458	Dhalipar Sapathuri Road	1.000
91	Kamrup	Rampur	AS-11-459	Kukurmar Kandapara to Charaimari	1.050
92	Kamrup	Dimoria	AS-11-563	Diksak Topatoli road	1.850
93	Kamrup	Chayani Borduar	AS-11-234	Komargaon Urput Road	3.630
94	Kamrup	Chayani Borduar	AS-11-262	Palashbari Rajapara Road to Japargaon	1.600
95	Kamrup	Chandrapur	AS-11-264	Thakurkuchi Hajongbori Road via Khankar Gaon	2.300
96	Kamrup	Chandrapur	AS-11-317	Hatibagara to Mikir Pam Path	1.500
97	Kamrup	Hajo	AS-11-412	L082 Nadia Muslimpara Road	1.160
98	Kamrup	Bongaon	AS-11-645	Majaibari Chakrapani	8.050
Sub Total (Kamrup)			25		74.240
99	Kokrajhar	Dotma	AS-14-179	Pratapkhata to jogdoi Mechpara	3.000
100	Kokrajhar	Dotma	AS-14-180	Dhauliguri ITI to Kumguri	2.565
101	Kokrajhar	Gossaigaon	AS-14-183	Bhumka to Singimari -I	2.630
102	Kokrajhar	Gossaigaon	AS-14-184	Satyapur to Borobil	2.500
103	Kokrajhar	Kokrajhar	AS-14-193	NH-31C to Bhumka F.V	2.000

S. No.	District	Block	Package No.	Road Name	Road length in Km
104	Kokrajhar	Dotma	AS-14-199	Ghoskata to Ghoramora	2.470
105	Kokrajhar	Kokrajhar	AS-14-201	Benibari to Chautaki	4.650
106	Kokrajhar	Kokrajhar	AS-14-202	Nayekgaon to Kultungpara	4.210
107	Kokrajhar	Kokrajhar	AS-14-207	NH31 C to Maligaon Forest Block	4.200
108	Kokrajhar	Kokrajhar	AS-14-209	Chaibari to Bangaldoba	3.040
109	Kokrajhar	Kokrajhar	AS-14-210	Bashbari to Bashbari Forest Block	4.350
110	Kokrajhar	Kachugaon	AS-14-171	8th Km of Gossaigaon Saraibil Road to Panowari	2.000
111	Kokrajhar	Kokrajhar	AS-14-196	Mahanpur to Maligaon Forest Village	2.200
112	Kokrajhar	Gossaigaon	AS-14-200	Singimari II to Fulkumari II via Gendrabil	5.000
113	Kokrajhar	Kokrajhar	AS-14-203	Maorigaon to Pakriguri	6.920
114	Kokrajhar	Kachugaon	AS-14-205	Simultapu Kashiabari Road to Pakriguri FV	4.760
115	Kokrajhar	Kokrajhar	AS-14-212	Amlaiguri to Samukha F Block	5.800
116	Kokrajhar	Kokrajhar	AS-14-221	Haltugaon to Chandrapur	5.000
Sub Total (Kokrajhar)			18		67.295
117	Darrang	Pachim Mangaldoi	AS-16-72	Monitari to NH-52	2.500
118	Darrang	Pachim Mangaldoi	AS-16-90	Kachamari to MB Road	1.112
119	Darrang	Pachim Mangaldoi	AS-16-91	Keotpara to Harinkhoja	1.980
120	Darrang	Pachim Mangaldoi	AS-16-93	Lankapuri to MB Road	1.584
121	Darrang	Pachim Mangaldoi	AS-16-95	Tamulipara to MPK Road	1.133
122	Darrang	Pachim Mangaldoi	AS-16-96	Bolopara to MB Road	1.666
123	Darrang	Pachim Mangaldoi	AS-16-97	Sarreng Chuburi to MM Road	2.187
124	Darrang	Pachim Mangaldoi	AS-16-98	Adhamapara to MB Road	1.240
125	Darrang	Pachim Mangaldoi	AS-16-99	Niz Mangalbesa to MB Road	0.704
126	Darrang	Kalaigaon	AS-16-103	Botiamari to Bhanga Barua Bajar Road (VR40)	2.820
127	Darrang	Sipajhar	AS-16-107	Batabari to NH-52	4.847
128	Darrang	Pub Mangaldoi	AS-16-110	Mahaliajhar to Bhakatpara Road Ramhari Bhalukmari Road	4.600
129	Darrang	Sipajhar	AS-16-111	Kanar Chuba to Ghorabandha Garukhuti Road	1.450
130	Darrang	Kalaigaon	AS-16-113	Namjalah to Tokankata (VR43)	3.390
131	Darrang	Bechimari	AS-16-114	Garakhata to NH 52	2.070
132	Darrang	Kalaigaon	AS-16-115	Teteliguri to Teteli Bhanguri	3.000
133	Darrang	Kalaigaon	AS-16-117	Laoduar to Chamuakhat via Naokhat (VR50)	7.410
134	Darrang	Sipajhar	AS-16-118	Tengera to Dipila Borigaon Road	3.200
135	Darrang	Bechimari	AS-16-119	Chengelimari to Bangaligaon	2.810
136	Darrang	Dalgaon Sialmari	AS-16-120	Rahmanpur to Ghiladhari	2.970
137	Darrang	Bechimari	AS-16-121	Khirbari to Borjhar No.1	3.610
138	Darrang	Sipajhar	AS-16-122	Birat Chuba to NH-52	1.220
139	Darrang	Dalgaon Sialmari	AS-16-123	Nadir-Par to Rowmari-Chapari	3.540
140	Darrang	Pub Mangaldoi	AS-16-124	Tangnijhar to NH 52 Road	1.200
141	Darrang	Kalaigaon	AS-16-125	Dalagranta to Nij-Dola (VR41)	2.400
142	Darrang	Sipajhar	AS-16-126	Boro Chuba to Andherighat Jayantipur Road	2.220
143	Darrang	Sipajhar	AS-16-127	Kalitapara to Dumunichowki Kurua Road	1.200
144	Darrang	Sipajhar	AS-16-128	Tila Chuba (Debananda Satra) to Ghorabandha Garukhuti Road	1.850
145	Darrang	Sipajhar	AS-16-129	Baniapara to Ghorabandha Garukhuti Road	2.380
146	Darrang	Sipajhar	AS-16-130	Kanital Road to NH-52	3.000
147	Darrang	Sipajhar	AS-16-131	Baghmari to Dipila Borigaon Road	5.730
148	Darrang	Dolgaon Sialmari	AS-16-132	Simalubari to Kuaripukhuri No.2	4.930
149	Darrang	Kalaigaon	AS-16-133	Bhanga Baruah to Bhanga Baruah bazar	3.030
150	Darrang	Kalaigaon	AS-16-134	Jhargaoon to Tangni Kalaigaon	1.770
151	Darrang	Sipajhar	AS-16-135	Bogachola to Andherighat Jayantipur	5.810
152	Darrang	Pub Mangoldoi	AS-16-136	Warpara to TK Road	3.980
153	Darrang	Pub Mangoldoi	AS-16-137	Jamuguri to Tangni Kalaigaon Road	4.540
154	Darrang	Sipajhar	AS-16-138	T04 to Padmajhar (Padmajhar Andherighat Jayantipur)	3.040
155	Darrang	Pub Mangoldoi	AS-16-139	Kehutoli to Bhakatpara Road	3.470

S. No.	District	Block	Package No.	Road Name	Road length in Km
156	Darrang	Sipajhar	AS-16-140	Kuwarijan Road to Dumunichowki Kurua Road	1.570
157	Darrang	Sipajhar	AS-16-141	Naopota to Dumunichowki Khatara	3.540
158	Darrang	Sipajhar	AS-16-142	Solpam to Dumunichowki Khatara	2.860
159	Darrang	Besimari	AS-16-143	Madhugohain grant to Bangaligaon	3.410
160	Darrang	Besimari	AS-16-144	Madhugohain No. 1 to Jhargaon	4.890
161	Darrang	Kalaigaon	AS-16-145	Khas Bokrajhar to Ujhagaon	3.940
162	Darrang	Pub Mangoldoi	AS-16-146	Algachar to NH-52	5.940
163	Darrang	Sipajhar	AS-16-147	Choto Athiabari to Bordoulguri	4.670
164	Darrang	Sipajhar	AS-16-148	Nao-Dinga to Andherighat Jayantipur	3.880
165	Darrang	Dolgaon Sialmari	AS-16-149	Rongagora pather to Ghiladhari	6.920
166	Darrang	Sipajhar	AS-16-150	Behaigaon to MPK Road	3.650
167	Darrang	Besimari	AS-16-151	Madhugohain No. 3 to Chikonmati	4.230
168	Darrang	Besimari	AS-16-152	Chikonmati No. 2 to Chakara Basti	2.960
169	Darrang	Kalaigaon	AS-16-153	L026-Kadamtola to Bholabari No1	2.730
170	Darrang	Kalaigaon	AS-16-154	L038-Kapilisatra to Kumarpara Road	5.460
171	Darrang	Kalaigaon	AS-16-155	L025-Kheterchar No3 to NH 52 Road	1.990
172	Darrang	Kalaigaon	AS-16-156	L040-Kheterchar No.1 to NH-52	4.080
173	Darrang	Kalaigaon	AS-16-157	L049-Mathonga to Outola Road	1.110
174	Darrang	Kalaigaon	AS-16-158	L043-Tokankata Balipara Road	3.090
175	Darrang	Kalaigaon	AS-16-159	Galandihabi to Chenibari Road	2.620
176	Darrang	Kalaigaon	AS-16-160	Panbari to Barkhat Road	2.060
177	Darrang	Kalaigaon	AS-16-161	Chamuakhat to Panbarihabi Road	1.340
178	Darrang	Kalaigaon	AS-16-162	Borjhar No2 to Rajapukhuri Road	7.280
Sub Total (Darrang)			62		195.813
179	Nagaon	Lamding	AS-19-448	Kaki 3 Chariali to Kaki 3 Village 3	2.550
180	Nagaon	Raha	AS-19-477	Khaigar L.P. School to Amonisali L.P. School.	1.000
181	Nagaon	Barhampur	AS-19-561	Nalbara Gaon to Mohpara	1.251
182	Nagaon	Barhampur	AS-19-562	Niz Chalchali to Niz Chalchali Muslimgaon	1.871
183	Nagaon	Bajiagaon	AS-19-564	Bajiagaon (Geruamukh) to NH-37 at Samaguri College	2.400
184	Nagaon	Kaliabar	AS-19-565	Jakhalabandha to Keribakori	3.200
185	Nagaon	Raha	AS-19-397	Dakhinpat to Dighaldori via Baligaon	3.550
186	Nagaon	Odali	AS-19-402	Lalong gaon1to Tapanpur Road	3.090
187	Nagaon	Odali	AS-19-405	Beltola PWD Road to Pachim Odali	1.710
188	Nagaon	Kathiatali	AS-19-409	KSB Road to Madhapara Jeetgaon	0.851
189	Nagaon	Raha	AS-19-474	Pub Saragaon PHE to Pachim Katahguri	1.420
190	Nagaon	Raha	AS-19-475	NH 37 to Amonisali Das Chuburi	0.770
191	Nagaon	Raha	AS-19-476	Khetali Tiniali to Namati Chariali	1.810
192	Nagaon	Raha	AS-19-478	Balisara Tiniali to Balisara Doloni	1.300
193	Nagaon	Raha	AS-19-499	Petboha to Bokula	3.220
194	Nagaon	Raha	AS-19-547	Jakaruabil to Udarveti	2.150
195	Nagaon	Kathiatali	AS-19-549	Garukhuda to Natun Garukhuda	3.100
196	Nagaon	Kathiatali	AS-19-557	Tetelicharagrnt to Tetelichara Lalungaon	1.750
197	Nagaon	Odali	AS-19-619	Bhalukmari Kaki Road to Azarbari Dasbasti	1.120
Sub Total (Nagaon)			19		38.113
198	Sivasagar	Sapekhaiti	AS-21-277	Borhat Forest Road to Nagakata Bolomi	1.540
Sub Total (Sivasagar)			1		1.540
199	Sonitpur	Dhekiajuli	AS-22-175	Ghogra to Dhirai TE	1.342
200	Sonitpur	Dhekiajuli	AS-22-176	NH-52 to Gorbasti	0.816
201	Sonitpur	Dhekiajuli	AS-22-177	Saikia chuburi to NH 52	1.560
202	Sonitpur	Dhekiajuli	AS-22-178	Kamar Pather to Thelamara	2.068
203	Sonitpur	Dhekiajuli	AS-22-179	Kalakuchi to Bah bera ka L 38	1.200
204	Sonitpur	Dhekiajuli	AS-22-180	Hugrajuli TE No 1 to Naren kati	3.692
205	Sonitpur	Dhekiajuli	AS-22-181	Gormora to Gogngapur	3.134
206	Sonitpur	Dhekiajuli	AS-22-182	Ulubari to Bamunpukhuri	5.139
207	Sonitpur	Dhekiajuli	AS-22-183	Mazrowmari Kachari to Gohai Ali	3.390

S. No.	District	Block	Package No.	Road Name	Road length in Km
208	Sonitpur	Dhekiajuli	AS-22-193	Josephline to Akabil L 50	4.958
209	Sonitpur	Dhekiajuli	AS-22-196	Garubanha to Dighaldal	4.282
210	Sonitpur	Dhekiajuli	AS-22-198	Sopai bali gaon No 2 to Rakyasmari L48	2.628
211	Sonitpur	Dhekiajuli	AS-22-199	Amtolbaligaon to Mazbaligaon	1.657
212	Sonitpur	Dhekiajuli	AS-22-200	Dhankhanda to Bandarhagi Pathar ka	3.388
213	Sonitpur	Dhekiajuli	AS-22-201	Thelamora to Erasuti	1.615
214	Sonitpur	Dhekiajuli	AS-22-202	Rakyashmari to Sopai Jhargaoon	3.270
215	Sonitpur	Barchola	AS-22-204	Arun Bagen No 4 to Singri L29	2.577
216	Sonitpur	Barchola	AS-22-207	Balijan to Natunjamuguri	1.973
217	Sonitpur	Chaiduar	AS-22-214	Pashim Tokobari to Purani Gerage	8.069
218	Sonitpur	Chaiduar	AS-22-215	Magoni Paken Road	8.613
219	Sonitpur	Chaiduar	AS-22-217	Jalukbari to Itapara	2.787
220	Sonitpur	Pub Chaiduar	AS-22-219	Mornoiguri to Kalmouguri	4.155
221	Sonitpur	Pub Chaiduar	AS-22-220	Rajabari to Charaibari	5.187
222	Sonitpur	Pub Chaiduar	AS-22-222	NH52 to Badal Pathar	1.534
223	Sonitpur	Pub Chaiduar	AS-22-224	NH-52 (Santipur) to Bijaypu	3.266
224	Sonitpur	Pub Chaiduar	AS-22-225	NEC Road to Uttar Sonapur	3.839
225	Sonitpur	Balipara	AS-22-228	Pakbil to Angsumai	5.490
226	Sonitpur	Balipara	AS-22-229	Sonai Nepali to Bharali Basti	1.750
227	Sonitpur	Balipara	AS-22-230	Panbari to Goroimari L 39	2.625
228	Sonitpur	Balipara	AS-22-235	Dhekerigaon to Border road	1.550
229	Sonitpur	Balipara	AS-22-236	Gudamghatmiri to NH 52 18 mile	3.500
230	Sonitpur	Balipara	AS-22-237	Berajan to Tinkharia	4.500
231	Sonitpur	Balipara	AS-22-238	Dayalpur to Gamani	12.758
232	Sonitpur	Gabharu	AS-22-240	Tezpur Jamuguri road to Jahajduba Khanamukh	2.840
233	Sonitpur	Rangapara	AS-22-245	Vellowater to Rangapara Missamari road	1.750
234	Sonitpur	Rangapara	AS-22-248	No 3 Rupajali TE to Rangapara Missamari Road	2.980
235	Sonitpur	Rangapara	AS-22-252	Bidukuri Rangapara Road to Dhulapadang TE No.3 Road	2.822
236	Sonitpur	Rangapara	AS-22-254	Rupajali to Bindukuri Rangapara road	3.500
237	Sonitpur	Sakomatha	AS-22-255	Balisang Kamarjan Road	6.036
238	Sonitpur	Sakomatha	AS-22-256	Borpukhuri to Missamari Road	5.855
239	Sonitpur	Naduar	AS-22-264	Hatinga to Tengabasti	3.018
240	Sonitpur	Sootia	AS-22-268	Sapekhata to Diplonga	1.443
241	Sonitpur	Sootia	AS-22-270	Barabhuyan gaon to Tatipara	2.538
242	Sonitpur	Sootia	AS-22-272	Diplonga to Sonapur Road	4.586
243	Sonitpur	Behali	AS-22-274	Sialmari to Kulaguri pather	6.956
244	Sonitpur	Behali	AS-22-275	Thanbehali to Telengonia	1.902
245	Sonitpur	Behali	AS-22-277	Nasbor to Lalpukhuri	3.057
246	Sonitpur	Biswanath	AS-22-283	Nabazar to Goroimari via Sadharu Panibharal Road	1.750
Sub Total (Sonitpur)			48		169.345
247	Tinsukia	Kakopathar	AS-23-314	Bormaithong Road (04TS45)	4.300
248	Tinsukia	Kakopathar	AS-23-315	NH-52 to Upar Kuli Pather (VR70)	6.700
249	Tinsukia	Kakopathar	AS-23-349	NH52 to Jengoni	2.550
250	Tinsukia	Sadiya	AS-23-106	Borgorah Kalani Miri to Borgorah Deopani Miri No.2 (VR27)	4.000
251	Tinsukia	Kakopathar	AS-23-125	Hullung Gutibari to Betoni (VR59)	4.824
252	Tinsukia	Margherita	AS-23-294	POWAI BONGAON ROAD	2.700
253	Tinsukia	Itakhuli	AS-23-357	Sukhani Langkashi Road to Bherbheri Gaon (VR23)	2.500
Sub Total (Tinsukia)			7		27.574
254	Baksa	Goreswar	AS-24-77	Haradutta Birdutta Road (L032 to Sunmahari)	4.000
255	Baksa	Tamulpur	AS-24-95	Hortla to Sukanjuli	1.000
256	Baksa	Tamulpur	AS-24-103	T02 to Geruapar (Suhagpur to Bonguri)	3.486
257	Baksa	Tamulpur	AS-24-140	Barkhata to Jarkona	4.930
258	Baksa	Tamulpur	AS-24-98	Kumarikata Nagrijuli Road	3.980
259	Baksa	Gobardhana	AS-24-198	Nimua to Kalpani (Rajdhakmal)	2.980

S. No.	District	Block	Package No.	Road Name	Road length in Km
260	Baksa	Gobardhana	AS-24-199	Sukrungbari Pathar to Sukrungbari Gaon	3.600
261	Baksa	Nagriajuli	AS-24-227	T06 to Dowamakha	4.500
262	Baksa	Nagriajuli	AS-24-228	T10 to Khusumjuli No.1	6.800
263	Baksa	Tamulpur	AS-24-229	Barangabari to Baregaon	2.100
264	Baksa	Nagriajuli	AS-24-230	Ahiabari (T06) to Bhalukmari	4.700
265	Baksa	Tamulpur	AS-24-231	T01 to Sapkata	5.350
266	Baksa	Tamulpur	AS-24-232	T08 to Balahati	10.430
267	Baksa	Nagriajuli	AS-24-233	T10 to Kaulipar No. 1	7.000
268	Baksa	Nagriajuli	AS-24-234	T10 to Paharpur	7.000
Sub Total (Baksa)			15		71.856
269	Chirang	Borobajar	AS-25-151	Panbari Chowrangi road to Barpathar II	4.060
270	Chirang	Sidli Chirang	AS-25-222	Bilaspur to Silpota	2.247
Sub Total (Chirang)			2		6.307
271	Udalguri	Udalguri	AS-26-72	Ghagrapara to U.T. Road (Sensua Naharani Ali)	6.000
272	Udalguri	Udalguri	AS-26-108	Nasonoli to Tongla Town Road	10.500
273	Udalguri	Udalguri	AS-26-179	Chamtabari to Rongagora Uttar Road	5.410
274	Udalguri	Udalguri	AS-26-76	Borbhogiyapara to Nalkhamara	2.340
275	Udalguri	Udalguri	AS-26-84	Majuli No. 3 to Badagaon	3.290
276	Udalguri	Udalguri	AS-26-85	Tarabari to Nalbari	6.220
277	Udalguri	Bhergaon	AS-26-95	Uttar Goraijhar to Rongajuli TE	0.689
278	Udalguri	Khoirabari	AS-26-102	Mahaliapara to MPK Road	4.720
279	Udalguri	Khoirabari	AS-26-105	Mahiyakhat to Khairabari Road	5.330
280	Udalguri	Bhergaon	AS-26-109	Bura-Puja Chali to Tongla Dimakuchi Road	3.790
281	Udalguri	Udalguri	AS-26-113	Simaluguri No. 2 to Peneri	3.254
282	Udalguri	Mazbat	AS-26-116	Merabil to Dhansirighat	2.490
283	Udalguri	Mazbat	AS-26-118	Chuba Chuburi to Geruabari Road	3.680
284	Udalguri	Mazbat	AS-26-121	Bengaligaon No. 1 to NH-52	6.550
285	Udalguri	Udalguri	AS-26-122	Dudigaon to Mohendrapur via Pakribari	3.170
286	Udalguri	Udalguri	AS-26-123	Khumabari No. 2 to RU Road	5.374
287	Udalguri	Udalguri	AS-26-131	Daifamgaon to RU road	5.365
288	Udalguri	Bhergaon	AS-26-133	Khairagrang Grant Andherighat to Atherighat TE	9.850
289	Udalguri	Bhergaon	AS-26-136	Dingdong para to Tongla Dimakuchi Road	5.744
290	Udalguri	Udalguri	AS-26-138	Alikash No.1 to Phutkibari Road	2.825
291	Udalguri	Udalguri	AS-26-142	Udalguri Nepali gaon Ulubari No. 1 Road	3.662
292	Udalguri	Rowta Charali	AS-26-143	Padumpukhuri to Ekrabari	3.850
293	Udalguri	Udalguri	AS-26-144	Dholakata to Bhoiraguri	1.090
294	Udalguri	Udalguri	AS-26-145	Nalbari to RU road	4.400
295	Udalguri	Mazbat	AS-26-150	Pasnoikhuti OMR Road	12.439
296	Udalguri	Mazbat	AS-26-153	Garogaon to OMR	8.000
297	Udalguri	Udalguri	AS-26-163	Goroimari No.1 to Badagaon	5.500
298	Udalguri	Udalguri	AS-26-164	Nepalipara Grazing to Sunapur	4.600
299	Udalguri	Udalguri	AS-26-168	Lissing No. 1 to Borigaon No.4	5.850
300	Udalguri	Udalguri	AS-26-169	Lissing no. 3 to Mohendrapur	5.020
301	Udalguri	Udalguri	AS-26-170	Rongagarh to Niz Harisinga	4.100
302	Udalguri	Udalguri	AS-26-175	Kolajhar to Sapangaon	4.500
303	Udalguri	Udalguri	AS-26-176	Majuli No. 5 to Nalbari	6.360
Sub Total (Udalguri)			33		165.962
Total			303		992.914

APPENDIX 2: SAMPLE RURAL ROAD: ENVIRONMENTAL CHECKLIST

RURAL ROADS: ENVIRONMENTAL CHECKLIST

1. **Road Name** : Paltan Bazar to Holloguri Road
2. **Block Name** : Dangtol
3. **District Name** : Bongaigaon
4. **Total Length of the Road** : 4.150 km

A. Climatic Conditions

Temperature	High: <u>32⁰c</u> Low: <u>13⁰c</u>
Humidity	High: : <u>81%</u> Low: <u>74%</u>
Rainfall	2616.6mm/year
Rainy Season	june to September

B. Location of the Road and Generic Description of Environment

No.	Type of Ecosystem	Yes	No	Explanation																							
1.	Coastal area Mangrove (along roadside)		✓	Distance from Coastline: km () more than 50% () less than 20%																							
2.	Type of Terrain-(Plain/Hilly/ Mountainous etc.) <i>(Explain the topography of the area and how many km of the road are located in the hilly area)</i>	✓		Topography of terrain – Plain Altitude: 60.6m (average) The entire section of the alignment fall in the plain terrain																							
4.	Forest Area <i>(Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?</i>		✓	Type of Vegetation: Legal Status of the Forest Area: <i>(Reserved, National Park, Sanctuaries, Unclassified, etc.</i>																							
5.	Wildlife <i>(Explain whether there are any wildlife species in the project area)</i>		✓	Name of animals: Endangered species (if any):																							
6.	Inhabited Area	✓		<table><tr><th colspan="2">Chainage</th><th rowspan="2">Side</th></tr><tr><th>From</th><th>To</th></tr><tr><td>0+000</td><td>0+400</td><td>LHS</td></tr><tr><td>0+650</td><td>0+710</td><td>LHS</td></tr><tr><td>1+000</td><td>1+200</td><td>LHS</td></tr><tr><td>1+410</td><td>1+520</td><td>LHS</td></tr><tr><td>1+910</td><td>2+120</td><td>LHS</td></tr><tr><td>2+250</td><td>2+700</td><td>LHS</td></tr></table>	Chainage		Side	From	To	0+000	0+400	LHS	0+650	0+710	LHS	1+000	1+200	LHS	1+410	1+520	LHS	1+910	2+120	LHS	2+250	2+700	LHS
Chainage		Side																									
From	To																										
0+000	0+400	LHS																									
0+650	0+710	LHS																									
1+000	1+200	LHS																									
1+410	1+520	LHS																									
1+910	2+120	LHS																									
2+250	2+700	LHS																									

No.	Type of Ecosystem	Yes	No	Explanation		
				2+800	3+520	LHS
				3+690	3+800	LHS
				3+890	3+960	LHS
				0+000	0+290	RHS
				0+560	0+690	RHS
				1+690	1+800	RHS
				1+900	2+150	RHS
				2+320	2+670	RHS
				3+280	3+630	RHS
				3+680	3+800	RHS
				4+030	4+110	RHS
7.	Agricultural Land	✓		Chainage		Side
				From	To	
				0+400	0+650	LHS
				0+710	1+000	LHS
				1+200	1+410	LHS
				1+800	1+910	LHS
				2+120	2+250	LHS
				2+700	2+800	LHS
				3+800	3+890	LHS
				3+960	4+160	LHS
				0+290	0+480	RHS
				0+800	1+690	RHS
				1+800	1+900	RHS
				2+150	2+320	RHS
				2+670	3+280	RHS
				3+880	4+030	RHS
4+110	4+160	RHS				
8.	Grazing grounds		✓			
9.	Barren Land		✓			

C. Specific Description of the Road Environment

(Note: Questions number 1, 4, 5, 7 and 8 must be answered after discussions with the local community people)

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? <i>(If yes, indicate the location (right or left side) and the chainage)</i>		✓	() No Secondary Information is available and Local Community is not aware of this matter
2.	Are there any lakes/swamps beside the road? <i>(If yes, list them indicating the location (right or left side) and the chainage)</i>		✓	

No.	Parameter/ Component	Yes	No	Explanation
3.	Are there any nallas/streams/rivers etc. along/crossing the road? <i>(If yes, list them indicating the location (right, left or crossing) and the chainage)</i>	✓		There is a river called Gutni which flows along the road starting at chainage 3+630.
4.	Are there problems of water stagnation and other drainage issues on or near the road? <i>(If yes, mention chainage)</i>		✓	
5.	Is the area along the project road prone to flooding? <i>(If yes, mention flood level and frequency)</i>		✓	
6.	Are there any trees with a dbh of 30 cm or more within 10 m on either side from the center line of the road alignment? <i>(If yes attach list of trees indicating the location (right or left side)and the chainage)</i>	✓		109 trees are located within 10 m on either side of the CL. Out of these, one tree located along the proposed alignment will be affected due to the project. [Refer E.1].
7.	Along the road and within 100m of the road shoulder, are there any faunal habitat areas, faunal breeding ground, bird migration area, or other similar areas? <i>(If yes, specify details of habitat with chainage)</i>		✓	 () No Secondary Information is available and Local Community is not aware of this matter
8.	Along the road and within 100m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		✓	 () No Secondary Information Available and Local Community is not aware of this matter
9.	Are there any utility structures ¹⁴ within 10 m on either side from the center line of the road alignment? <i>(If yes, attach list with chainage)</i>	✓		53 utility structures are located within 10 m on either side of the CL of the road non of them will be affected by the project..[Refer E.2]
10.	Are there any religious, cultural or community structures/buildings ¹⁵	✓		1 Community hall, 1 schools and 1 temples are located within 10 m on

¹⁴ Water tap, hand pump, electric pole, telephone pole, water pipe and other similar structures

No.	Parameter/ Component	Yes	No	Explanation
	within 10 m on either side from the center line of the road alignment? <i>(If yes attach list with chainage)</i>			either side of the CL of the road. None of the community structures will be affected due to the project [Refer E.3]

D. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. <i>(Attach list of people met and dates)</i>	✓		A consultation was held with the local community members, it was attended by 39 persons. The list of participants is attached in Annexure E6 .
2.	Any suggestion received in finalizing the alignment	✓		Road safety measures at school, curves and road intersections locations.
3.	If suggestions received, were they incorporated into the design?	✓		

E. Annexures

E-1. List of trees indicating location (left or right side of the road) and chainage (as required under C. 6)

Chainage	Side	Particulars	DCL (m)
0+040	LHS	Kothal Tree	4
0+060	LHS	Uriam Tree	4
0+100	LHS	Ajar Tree	4
0+400	LHS	Sirish Tree	3
0+410	LHS	Kothal Tree	3.5
0+520	LHS	Mango Tree	3.5
0+550	LHS	Sirish Tree	3.5
0+590	LHS	Sirish Tree	3
0+680	LHS	Botgos Tree	3.6
0+690	LHS	Sirish Tree	3.5
0+700	LHS	Kothal Tree	3.2
0+740	LHS	Simalu Tree	4
0+900	LHS	Neem Tree	3.2
1+200	LHS	Simalu Tree	5
1+430	LHS	Gomari Tree	3.5
1+440	LHS	Kothal Tree	3.5
1+450	LHS	Kothal Tree	3.5
1+460	LHS	Kothal Tree	3.5
1+470	LHS	Kothal Tree	3.5
1+480	LHS	Kothal Tree	3.5
1+490	LHS	Kothal Tree	3.5
1+500	LHS	Coconut Tree	4
1+510	LHS	Gomari Tree	3.5

¹⁵ Mandir, Masjid, Church, religious/cultural/historical monuments, school, health center, public toilet and other similar structures

Chainage	Side	Particulars	DCL (m)
1+520	LHS	Kothal Tree	3.5
1+780	LHS	Simalu Tree	4
1+910	LHS	Krishnasura Tree	4
1+930	LHS	Gakul Tree	4.5
1+960	LHS	Ahat Tree	3.7
1+990	LHS	Sirish Tree	4
2+080	LHS	Kadam Tree	4
2+100	LHS	Simalu Tree	4
2+250	LHS	Jamu Tree	3.5
2+260	LHS	Silikha Tree	3.3
2+290	LHS	Krishnasura Tree	3.2
2+330	LHS	Mango Tree	3
2+340	LHS	Kothal Tree	3
2+350	LHS	Kothal Tree	3
2+360	LHS	Kothal Tree	3.2
2+390	LHS	Coconut Tree	4
2+400	LHS	Sirish Tree	3.5
2+410	LHS	Kothal Tree	3.5
2+430	LHS	Mango Tree	3.2
2+460	LHS	Kothal Tree	3.3
2+500	LHS	Kothal Tree	3.5
2+530	LHS	Segun Tree	3.2
2+560	LHS	Kothal Tree	3.2
2+630	LHS	Goha Tree	3.2
3+000	LHS	Simalu Tree	3
3+190	LHS	Palak Tree	3.5
3+240	LHS	Sirish Tree	3
3+350	LHS	Kothal Tree	3.5
3+410	LHS	Coconut Tree	3.5
3+560	LHS	Segun Tree	3
3+610	LHS	Bhel Tree	4
3+720	LHS	Botgos Tree	3.5
3+920	LHS	Ahat Tree	4
0+060	RHS	Tokow Tree	4
0+100	RHS	Segun Tree	4
0+110	RHS	Segun Tree	4
0+130	RHS	Gomari Tree	4
0+160	RHS	Kothal Tree	4
0+200	RHS	Gomari Tree	3.8
0+230	RHS	Gomari Tree	3.7
0+570	RHS	Kothal Tree	3.5
0+620	RHS	Kothal Tree	3.2
0+640	RHS	Gomari Tree	3
0+670	RHS	Gomari Tree	3.2
0+690	RHS	Neem Tree	5
0+940	RHS	Kodam Tree	2.9
1+090	RHS	Ahat Tree	3
1+150	RHS	Gomari Tree	3.2
1+200	RHS	Gomari Tree	3.2
1+300	RHS	Sirish Tree	4.5
1+910	RHS	Sotiona Tree	5
1+960	RHS	Ajar Tree	4.5

Chainage	Side	Particulars	DCL (m)
1+990	RHS	Segun Tree	4
2+000	RHS	Kothal Tree	4
2+020	RHS	Kothal Tree	4
2+060	RHS	Gomari Tree	4
2+100	RHS	Tokow Tree	3.7
2+140	RHS	Mango Tree	3.2
2+250	RHS	Kothal Tree	3.5
2+450	RHS	Kothal Tree	3.2
2+470	RHS	Mango Tree	3.2
2+500	RHS	Kothal Tree	3.3
2+510	RHS	Mango Tree	4
2+560	RHS	Kothal Tree	3.2
2+570	RHS	Mango Tree	3.2
2+670	RHS	Ahat Tree	4
2+850	RHS	Bhel Tree	4
2+990	RHS	Bhel Tree	4
3+080	RHS	Simalu Tree	3.5
3+110	RHS	Gomari Tree	4
3+220	RHS	Bhel Tree	3.5
3+330	RHS	Gomari Tree	3.2
3+440	RHS	Koras Tree	4
3+550	RHS	Segun Tree	3.2
3+560	RHS	Segun Tree	3.2
3+570	RHS	Segun Tree	3.2
3+580	RHS	Segun Tree	3.2
3+590	RHS	Segun Tree	3.2
3+600	RHS	Segun Tree	3.2
3+610	RHS	Bhel Tree	4
3+750	RHS	Gomari Tree	4
3+800	RHS	Kodam Tree	4
3+810	RHS	Goha Tree	4
3+820	RHS	Segun Tree	4.2
4+030	RHS	Goha Tree	4
4+050	RHS	Bhel Tree	4

Note: Areca palms and bamboo bushes within 10 m either side from centreline have not been considered in tree enumeration as dbh is less than 30cm (Refer C.6)

E-2. List of utility structures indicating location (left or right side of the road) and chainage (as required under C. 9)

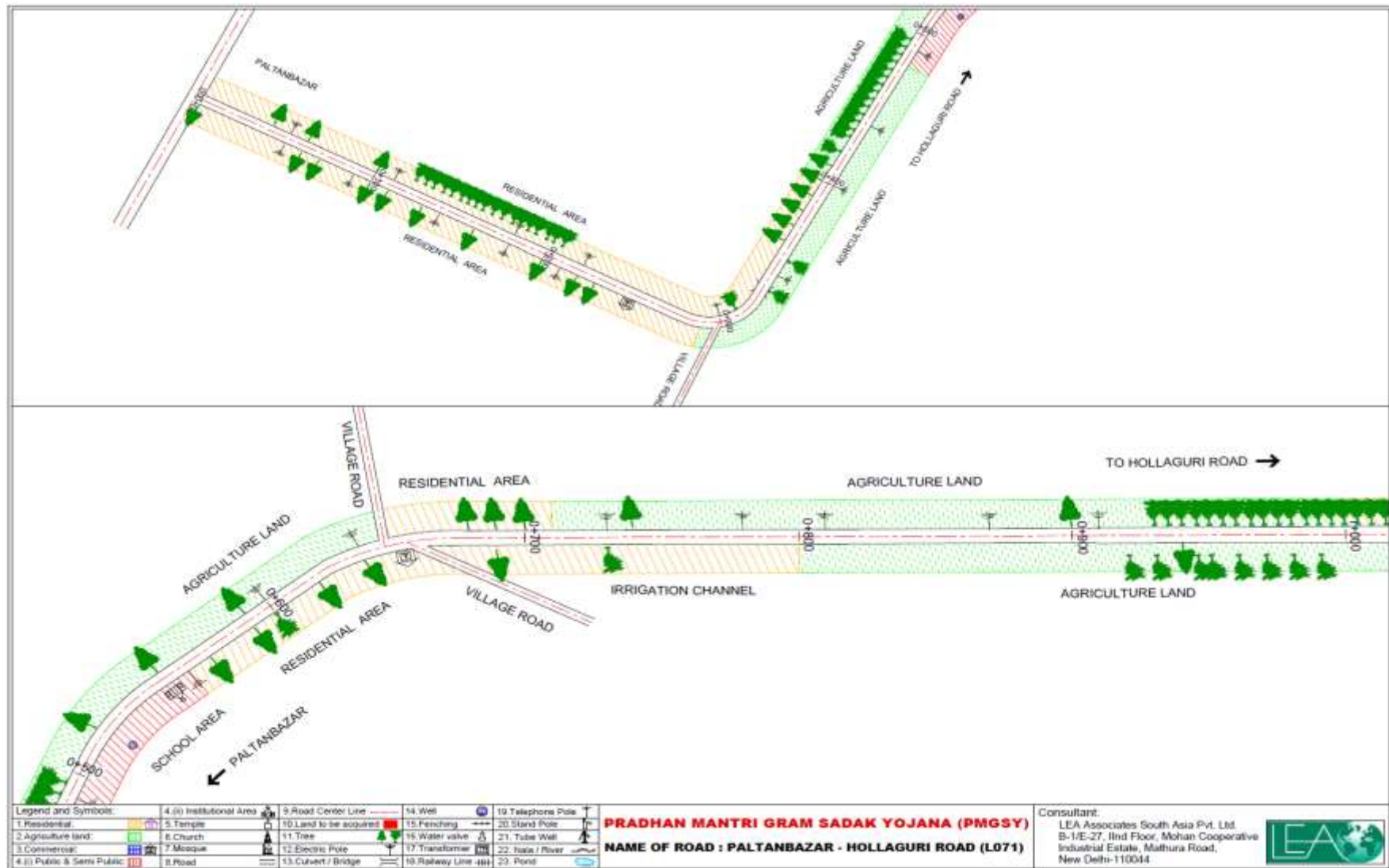
Chainage	Side	DCL (m)	Particulars
0+050	LHS	3.5	Electric pole
0+110	LHS	3.5	Electric pole
0+180	LHS	3.5	Electric pole
0+220	LHS	3.7	Electric pole
0+300	LHS	3.8	Telephone Pole
0+600	LHS	3	Electric pole
0+640	LHS	3	Electric pole
0+730	LHS	3	Electric pole
0+780	LHS	3	Electric pole
0+810	LHS	3	Electric pole

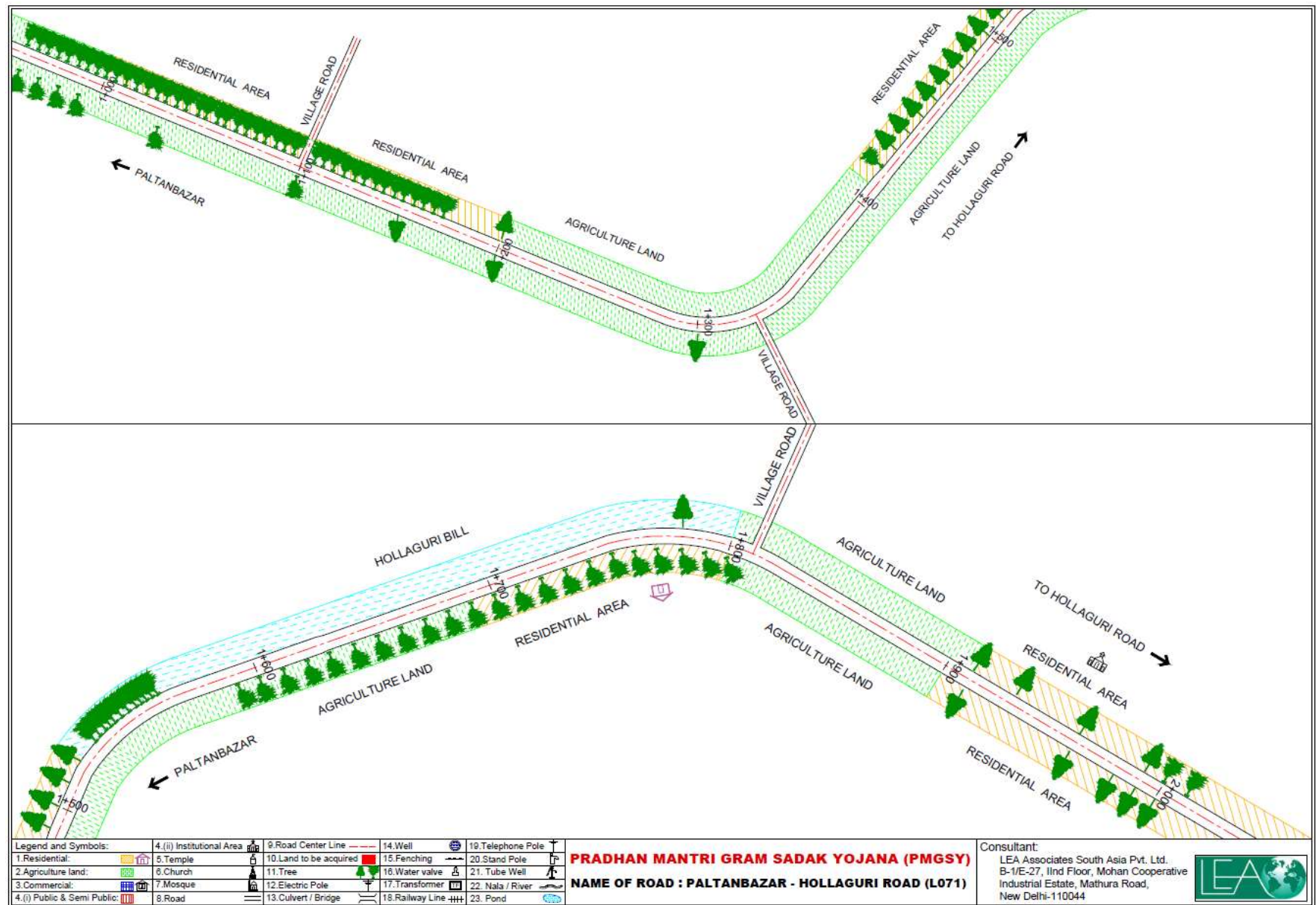
Chainage	Side	DCL (m)	Particulars
0+870	LHS	3	Electric pole
0+910	LHS	3	Electric pole
2+480	LHS	3	Electric pole
2+520	LHS	3	Electric pole
2+810	LHS	4.5	Electric pole
2+890	LHS	4.5	Electric pole
2+990	LHS	3.2	Electric pole
3+030	LHS	3	Electric pole
3+120	LHS	3	Electric pole
3+390	LHS	3	Electric pole
3+600	LHS	3	Electric pole
4+010	LHS	4.5	Electric pole
4+150	LHS	4.3	Electric pole
0+050	RHS	3.7	Electric pole
0+090	RHS	3.7	Electric pole
0+140	RHS	3.7	Electric pole
0+180	RHS	3.5	Electric pole
0+210	RHS	3.5	Electric pole
0+340	RHS	3.5	Electric pole
0+400	RHS	3.2	Electric pole
0+440	RHS	3.1	Electric pole
0+490	RHS	3.2	Electric pole
0+520	RHS	10	Well
0+560	RHS	3.5	Electric pole
2+130	RHS	3	Electric pole
2+190	RHS	3	Electric pole
2+230	RHS	3	Electric pole
2+280	RHS	3	Electric pole
2+330	RHS	3	Electric pole
2+370	RHS	3	Electric pole
2+590	RHS	3	Electric pole
2+630	RHS	3.3	Electric pole
2+680	RHS	3	Electric pole
2+720	RHS	3	Electric pole
2+780	RHS	3	Electric pole
3+210	RHS	3.5	Electric pole
3+280	RHS	3.2	Electric pole
3+340	RHS	3	Electric pole
3+410	RHS	3	Electric pole
3+460	RHS	5	Electric pole
3+540	RHS	3.3	Electric pole
3+760	RHS	3.2	Electric pole
3+930	RHS	4	Electric pole
3+990	RHS	4	Electric pole

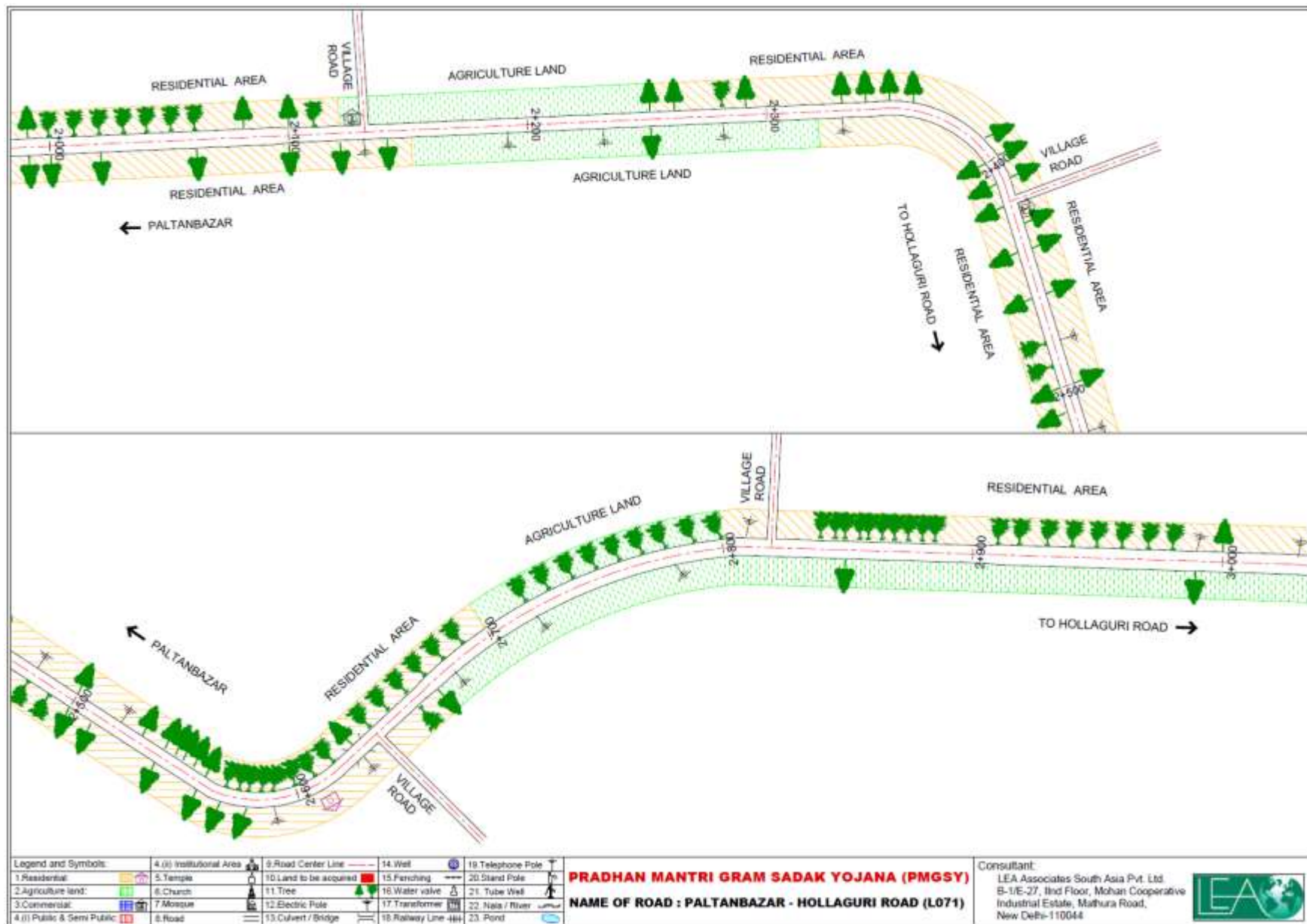
E-3 List of community structures indicating location (left or right side of the road) and chainage (as required under C. 10):

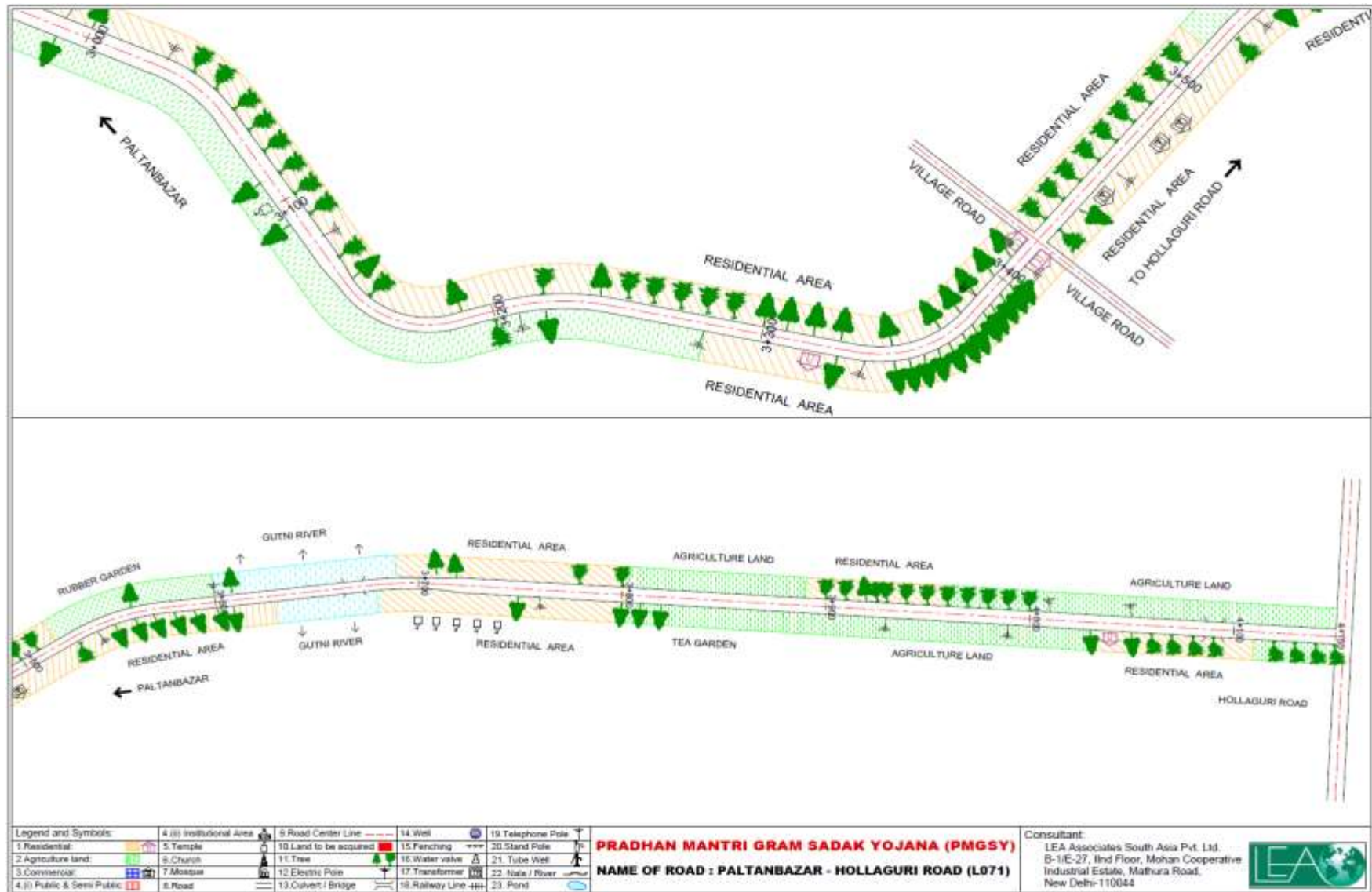
S. No	Chainage	Side	Sensitive Locations	DCL
1	0+250 to 0+280	LHS	Community Hall	7
3	0+550	RHS	L.P School	5
4	3+090	RHS	Temple	6

E-4 Sketch of strip map of the road covering details of at least 10 m on either side from the center line of the road









E-5. Photographs of the project area showing at least 10 m on either side from center line of road alignment. Every 2 km or less of road must have at least 1 photograph.



Corridor at ch.0+320 km



Corridor at ch. 1+300 km



Corridor at ch. 1+800 km



Corridor at ch. 2+400 km



Corridor ch. at 3+000 km



Corridor ch. at 4+000 km

APPENDIX 3: GUIDELINES FOR BORROW AREAS MANAGEMENT

1. SELECTION OF BORROW AREAS

1. Location of borrow areas shall be finalized as per IRC: 10-1961 guidelines. The finalization of locations in case of borrow areas identified in private land shall depend upon the formal agreement between landowners and contractor. If, agreement is not reached between the contractor and landowners for the identified borrow areas sites, arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environment requirements in respect of excavation and borrow areas as stipulated from time to time by the Ministry of Environment and Forests, Government of India, and local bodies, as applicable shall be the sole responsibility of the contractor.

2. The contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations.

- (1) The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available.
- (2) The borrow pits preferably should not be located along the roads.
- (3) The loss of productive and agriculture soil should be minimum.
- (4) The loss of vegetation is almost nil or minimum.
- (5) The Contractor will ensure that suitable earth is available.

2. CONTRACTOR'S RESPONSIBILITY

3. The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing program approved by the Engineer. It shall be ensured that the sub-grade material when compacted to the density requirements shall yield the design CBR value of the sub-grade. Contractor shall begin operations keeping in mind following;

- (i) Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plants is operating at the place of deposition.
- (ii) No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from the site to suit his operational procedure, then shall make consequent deficit of material arising there from.
- (iii) Where the excavation reveals a combination of acceptable and un-acceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.

3. BORROWING FROM DIFFERENT LAND-FORMS

A. Borrow Areas located in Agricultural Lands

- (1) The preservation of topsoil will be carried out in stockpile.
- (2) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).

- (3) Borrowing of earth will be carried out up to a depth of 1.5m from the existing ground level.
- (4) Borrowing of earth will not be done continuously through out the stretch.
- (5) Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
- (6) Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- (7) The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).
- (8) The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

B. Borrow Areas located in Elevated Lands

- (1) The preservation of topsoil will be carried out in stockpile.
- (2) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (3) At location where private owners desire their fields to be levelled, the borrowing shall be done to a depth of not more than 1.5m or up to the level of surrounding fields

C. Borrow Areas near River side

- (1) The preservation of topsoil will be carried out in stockpile.
- (2) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (3) Borrow area near to any surface water body will be at least at a distance of 15m from the toe of the bank or high flood level, whichever is maximum.

D. Borrow Areas near Settlements

- (1) The preservation of topsoil will be carried out in stockpile.
- (2) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (3) Borrow pit location will be located at least 0.75 km from villages and settlements. If un-avoidable, the pit will not be dug for more than 30 cm and drains will be cut to facilitate drainage.
- (4) Borrow pits located in such location will be re-developed immediately after borrowing is completed. If spoils are dumped, that will be covered with a layers of stockpiled topsoil in accordance with compliance requirements with respect MOEF/SPCB guidelines.

E. Borrow Pits along the Road

4. Borrow pits along the road shall be discouraged and if deemed necessary and permitted by the Engineer; following precautions are recommended

- (1) The preservation of topsoil will be carried out in stockpile.

- (2) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- (3) Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
- (4) Small drains shall be cut through the ridges of facilitate drainage.
- (5) The depth of the pits shall be so regulated that there bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of bank, the maximum depth of any case being limited to 1.5m.
- (6) Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10m.

4. REHABILITATION OF BORROW AREAS

5. The objective of the rehabilitation program is to return the borrow pit sites to a safe and secure area, which the public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit floor to approximately the access road level.

6. Re-development plan shall be prepared by the Contractor before the start of work inline with the owners will require and to the satisfaction of owner. The Borrow Areas shall be rehabilitated as per following;

- Borrow pits shall be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation sloped will be smoothed and depression will be filled in such a way that it looks more or less like the original round surface.
- Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such borrow area will be photographed after their post use restoration and Environment Expert of Supervision Consultant will certify the post use redevelopment.

7. The Contractor will keep record of photographs of various stages i.e., before using materials from the location (pre-project), for the period borrowing activities (construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.

APPENDIX 4: ENVIRONMENTAL MANAGEMENT PLAN

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
	Measures common to all sample roads						
	Design and Pre Construction Stage						
1.	Climate Change Consideration and Vulnerability screening	<ul style="list-style-type: none"> Compliance to climate change vulnerability check point given under EARF and adoption of necessary mitigative measures as may be required Efforts shall be made to plant additional trees for increasing the carbon sink. The tree may be planted with help of PRI (Panchyati Raj Institution) 	All through the alignment of each rural road	Pre Construction Phase	Part of Project Cost	Project Preparation Consultant/ design consultant	PIU/ ASRRDA
2.	Finalization of alignment	<ul style="list-style-type: none"> The road will be part of district core network and will comply with PMGSY guidelines Subproject shall not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance. Subproject will not pass through any designated wild life sanctuaries, national park, notified Eco sensitive areas or area of international significance such as protective wet land designated under Wetland Convention, and reserve forest area.. Subproject to comply with local and National legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement 2009. Alignment finalization considering 	<ul style="list-style-type: none"> All through the alignment of each rural road 	Pre Construction Phase	Part of Project Cost	Project Preparation Consultant/ design consultant	PIU/ ASRRDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		availability of right of way and in consultation with local people. <ul style="list-style-type: none"> ○ ROW may be reduced in built up area or constricted areas to minimize land acquisition as per PMGSY Guidelines. ○ Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure. ○ The road shall follow natural topography to avoid excessive cut and fill. 					
3.	Land acquisition	<ul style="list-style-type: none"> ○ Avoid or minimize land acquisition. ○ Land acquisition, compensation packages, resettlement and rehabilitation, poverty alleviation programs for affected people and all other related issues are addressed through Social Impacts and Resettlement & Rehabilitation report. 	<ul style="list-style-type: none"> ○ All through the alignment of each rural road 	Pre Construction Phase	Land to be made available by the state Government	PIU, Govt. of Madhya Pradesh , and other	Environmental officer under the PIC will also coordinate and ensure implementation
4.	Biological environment - Tree planting	<ul style="list-style-type: none"> ○ All efforts shall be taken to avoid tree cutting wherever possible. ○ Requisite permission from forest department shall be obtained for cutting of roadside trees. ○ Provision of Compensatory Afforestation shall be made on 1:3.ratio basis. ○ Permission shall be taken for diversion of any forest land if involved. Provision shall be made for additional compensatory tree plantation. 	Throughout the project section of the road. (Highlight Tree cutting locations & proposed likely plantation location)				
	Planning for land clearing	<ul style="list-style-type: none"> ○ The road land width shall be clearly demarcated on the ground. 	All through the Rural roads	Pre Constru	Necessary cost	PIC, PIU, Forest Department NGOs	Environmental officer under

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
5.		<ul style="list-style-type: none"> The utility and community structure shifting shall be planned in consultations and concurrence of the community. Tree felling shall be limited to those, which could not be saved even by design measures. The tree shall be cut with a prior permission of Forest department. The vegetable cover shall be removed and disposed in consultation with community. All public utilities shifting shall be planned with prior concurrence of respective agencies/authority and to the adjacent location approved by them 	excepting in stretches of habitations (Attach or Refer to specific sections of DPR for the utilities to be shifted along with chainages for the location of such structures)	ction Phase	provisions have been made. All other costs are included under project cost.	(shifting of utilities shall be carried out by respective governmental bodies at cost to be reimbursed by project, implementing agency). To increase survival rate of new saplings, a core Tree Management Committee is to be created to ensure complete retrieval of vegetative cover and timely replacement of perished plantations. implementation Unit (PIU) of ASRRDA,	the PIC will coordinate and ensure Officials of Forest Department, Contractor and local NGOs and coordinated by Environmental officer of Construction Supervision Consultant for specific package.
8.	Shifting on Common Properties Resources	<ul style="list-style-type: none"> All efforts are made to minimize shifting of common utilities and community structures. The community structures/utilities which can not be saved will be shifted to adjacent area with the concurrence and in consultation with community. 	As determined by contractor under approval of PIC /PIU (Attach or Refer to specific sections of DPR for community structures to be shifted along with chainages for	Constru ction Phase	Borne by Contractor	Contractor is responsible for ensuring provision of facilities under approval by PIC / PIU	Environmental officer and other team members of PIC will monitor and ensure appropriate implementation Environmental officer will regularly interact with the local people who are likely to

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
			<i>the location of such structures)</i>				be affected to ensure that their interests are protected and no social resentment sets in.
6.	Cut and Fill and Embankment Construction design & planning	<ul style="list-style-type: none"> ○ The alignment design shall consider options to minimize excessive cuts and fills. ○ The cut and fill quantities shall be used for embankment to minimize borrow earth requirement. ○ The design shall be as per relevant IRC provisions for cut and fill, slope protection and drainage. ○ Adequate provision shall be made for cross drainage structure for maintaining natural drainage pattern in the subproject area and preventing soil erosion. ○ Side drain for channelizing water to nearby natural drain in water stagnation /logging prone area. ○ The top soil of the cut and fill area shall be used for embankment slope protection ○ Embankment will be designed above High Flood Level (HFL) wherever, area is prone to flood. 	<p>All through the alignment of each rural road</p> <p><i>(Highlight the high flood level, chainage for action and linkages to DPR section)</i></p>	Pre Construction Phase	Part of Project Cost	Project Preparation Consultant/ design consultant	PIU/ ASRRDA
7.	Hydrology and Drainage	<ul style="list-style-type: none"> ○ Provision of adequate cross drainage structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. The discharge capacity of the CD structure shall be designed accordingly. 	Near all drainage crossing , nalas and river crossings etc.				

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> Provision of adequate side drainage shall be made in water stagnant/logging areas. The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. Elaborate drainage system shall be provided to drain the storm water from the roadway and embankment to ensure minimum disturbance to natural drainage of surface and subsurface water of the area. Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides. Provision of concrete road construction in habitat area with drainage of both side of the road shall be made as per the design provision and with adequate slope to prevent any water logging. Road level shall be fixed above HFL. Embankment slope stabilization measures shall be planned. Stabilization measures may include vegetative treatment, stone pitching, retaining wall where feasible, low cost options such as bamboo / eucalyptus tree pilling . 	<i>(indicate HFL Level and Highlight the chainage for action and linkages to DPR section)</i>				
8.	Establishment of Construction Camp, temporary office and	<ul style="list-style-type: none"> Construction camp sites shall be located away from any local human settlements (minimum 0.5 km 	As determined by contractor under	Pre-construction and	To be included in contractor'	All facilities are to be planned and implemented by	PIU

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
	storage area	<p>away) and preferably located on lands, which are not productive barren/waste lands presently.</p> <ul style="list-style-type: none"> ○ Similarly temporary office and storage areas shall be located away from human settlement areas (minimum 500 m). ○ The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. ○ The construction camps shall be located at a minimum 0.5 km from forest land/areas to deter the construction labour in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 0.5 km from forest land/areas. ○ The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. ○ All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided completely to the extent possible. ○ The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. ○ Personal Protective Equipments 	<p>approval of PIC/PIU/ (ref- Labelled: WASTE OIL; and hazardous sign be displayed at oil handling areas and sold off to SPCB/ MoEF authorized re-refiners).</p> <p>(Contractor to specify the cost provision made for PPE and other environmental sanitation measures required per construction camp / temporary office / storage area)</p>	construction stage	s cost	contractor under approval by PIU / PIC	

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<p>(PPEs) like helmet, boots, earplugs for workers, first aid and fire fighting equipments shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire.</p> <ul style="list-style-type: none"> ○ Provision shall be made for domestic solid waste disposal in a control manner. The recyclable waste shall be sold off and non-saleable and biodegradable waste shall be disposed through secured land filling. ○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage. 					
9.	Traffic Movement	<ul style="list-style-type: none"> ○ The contractor will identify the areas where temporary traffic diversion may be required. He would prepare appropriate traffic movement plan for ensuring continued flow of traffic during construction phase. This may include movement of the traffic from the site of the construction area. This kind of a temporary diversion shall be finalized with the concurrence of respective PIU. ○ Wherever, cross drainage structure work requires longer construction time and road is to be blocked for longer duration, the PIU / DPR Consultant shall define appropriate measures for traffic diversion before the start of the construction. 	As proposed under DPR and determined by contractor and approved by PIC/PIU/ (Highlight the chainages which may require traffic diversions)	Pre-construction and construction stage	To be included in contractor's cost	All facilities are to be planned and implemented by contractor under approval by PIU / PIC	PIU

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> The diversion plan should ensure smooth flow of traffic, minimize accidents to road users during construction works. Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and retro reflective in nature for good visibility in day and night both. 					
10.	Occupational Health and Safety	<ul style="list-style-type: none"> Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp curves design and bends where the curve design speed is less than 40 km per hour in plain and rolling terrain. Speed breakers shall also be provided at a threshold of habitation (as per NRRDA guidelines) at regular intervals (150-200 m) through habitation and near schools or religious places. The speed breakers shall be provided and directional sign boards installed at sites where reverse horizontal curves are closely spaced and speed reduction is required. Provision shall be made for Hazard markers at each end of all box culverts, river crossing causeways and similar CD structures Shoulder side slopes shall not be steeper than 2h:1V unless stone pitching of the slopes is provided. Cement concrete pavement and V-shaped drain shall be constructed 	<p>Throughout the project section at the location determined by contractor and approved by PIU</p> <p>(Highlight the location with chainage for such requirements)</p>				

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<p>to the full width of the available roadway within densely populated habitation and as per feasibility.</p> <ul style="list-style-type: none"> ○ Provision shall be made for Directional sight board shall be installed on all sharp curves and bends ○ At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. ○ It is proposed to approach railways for adequate safety at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both side of the railway crossing 					
Construction Stage							
11.	Sourcing and transportation of construction material (aggregates , earth)	<p>Borrow Earth:</p> <ul style="list-style-type: none"> ○ The borrow earth shall be obtained from identified locations and with prior permission for landowner and clear understanding for its rehabilitation. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed. ○ Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. ○ A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated 	<p>As Borrow sites and quarries (if required) location.</p> <p>(List the probable locations for borrow areas. Highlight the identified quarries, if already identified. Contractors should also indicate the</p>	During Design and construction Stage	Engineering cost	<p>The selection of quarries and material selection will be the responsibility of contractor under approval of PIC /PIU/TSC Environmental officer and other team members of PIC will ensure appropriate implementation of mitigation actions.</p>	<p>PIC /PIU/TSC Environmental officer and other team members of PIC will monitor</p>

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<p>area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).</p> <ul style="list-style-type: none"> ○ Borrowing of earth will not be done continuously through out the stretch. ○ Ridges of not less than 8m widths will be left at intervals not exceeding 300m. ○ Small drains will be cut through the ridges, if necessary, to facilitate drainage. ○ The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). ○ The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside. ○ Fly ash will also be used in road embankment as per IRC guidelines wherever thermal power plant is located within 100 km of the road alignment. ○ The borrow area shall be rehabilitated as per the understanding arrived with the land-owner. The re-habilitation plan may include the following: <ul style="list-style-type: none"> ▪ Borrow pits shall be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation sloped will be smoothed and depression will be filled in such a way that it looks more or less like the original ground surface. 	<i>quarry they are likely to use if not already identified at DPR stag)</i>				

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> ▪ Borrow areas might be used for aquaculture in case landowner wants such development. <p>Aggregate :</p> <ul style="list-style-type: none"> ○ The stone aggregate shall be sourced from existing licensed quarries ○ Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU. ○ Topsoil to be stockpiled and protected for use at the rehabilitation stage <p>Transportation of Construction Material</p> <ul style="list-style-type: none"> ○ Existing tracks / roads are to be used for hauling of materials to the extent possible. ○ Prior to construction of roads, topsoil shall be preserved or at least shall be used for any other useful purposes like using in turfing of embankment rather than allowing its loss by construction activities. ○ The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. In any case, the transportation links are to be inspected at least twice daily to clear accidental spillage, if any. 					
	Loss of Productive Soil, erosion and land use change	<ul style="list-style-type: none"> ○ It shall be ensured that the land taken on lease for access road, construction camp and temporary 	Thought out the road section	During the Constru	Included in project cost	Design Consultant and Contractor	PIU / ASRRDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
12.		<p>office of the storage facilities is restored back to its original land use before handing it over back to land owner.</p> <ul style="list-style-type: none"> ○ The top soil from the productive land (borrow areas, road widening areas etc.) shall be preserved and reused for plantation purposes. ○ It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. ○ Cut and fill shall be planned as per IRC provisions and rural road manual. ○ All steep cuts shall be flattened and benched. ○ Shrubs shall be planted in loose soil area. ○ IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration. ○ Soil erosion shall be visually checked on slopes and embankment areas. In case soil erosion is found, suitable measures shall be taken to control the soil erosion 	(The contractor shall include the cost for the measures as part of the construction cost)	ction stage			
13.	Compaction and Contamination of Soil	<ul style="list-style-type: none"> ○ To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. ○ The productive land shall be reclaimed after construction activity. 	<p>Throughout the project section of the road s</p> <p>(The contractor shall include</p>	<ul style="list-style-type: none"> • Design and construction stage 	<ul style="list-style-type: none"> • Project preparation cost and construction cost • 	<ul style="list-style-type: none"> • Design consultant and Contractor, 	PIU

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. The non-biodegradable and recyclable waste shall be sold off. Fuel and lubricants shall be stored at the predefined storage location. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fuelling areas, "oil interceptors" shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners. 	<i>the cost for the measures as part of the construction cost)</i>				
	Construction Debris and waste	<ul style="list-style-type: none"> All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. 	<ul style="list-style-type: none"> Throughout the project section of the road 	<ul style="list-style-type: none"> Design and construction stage 	<ul style="list-style-type: none"> Project preparation cost and construction 	<ul style="list-style-type: none"> Design consultant and Contractor, 	PIU

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
14.		<ul style="list-style-type: none"> Unusable debris material should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in secure manner at designated landfill sites only in an environmentally accepted manner. For removal of debris, wastes and its disposal MOSRTH guidelines should be followed. <p>Unproductive/wastelands shall be selected with the consent of villagers and Panchayat for the same. The dumping site should be of adequate capacity. It should be located at least 500 m away from the residential areas. Dumping sites should be away from water bodies to prevent any contamination of these bodies.</p>			tion cost		
15.	Air and Noise Quality	<ul style="list-style-type: none"> Vehicles delivering loose and fine materials like sand and aggregates shall be covered. Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas. Mixing plants and asphalt (hot mix) plants shall be located at least 0.5 km away and in downwind direction of the human settlements. Material storage areas shall also be located downwind of the habitation 	<ul style="list-style-type: none"> Near all drainage crossing , nalas and river crossings etc. <p>(The contractor shall include the cost for the measures as part of the construction)</p>	<ul style="list-style-type: none"> During Construction stage 	<ul style="list-style-type: none"> Included in engineering cost 	Contractor	PIU/ ASRRDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<p>area.</p> <ul style="list-style-type: none"> Hot mix plant shall be fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. Consent to establish and operate shall be obtained from State Pollution Control Board and comply with all consent conditions. Diesel Generating (DG) sets shall also be fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5 KVA and about 0.7 m for 10 KVA DG sets, above top of sound proofing enclosure of the Dg set). . Low sulphur diesel shall be used in DG sets and other construction machineries. Construction vehicles and machineries shall be periodically maintained. The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers. Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. 	cost)				
16.	Biological environment - Tree planting	<ul style="list-style-type: none"> Compensatory Afforestation shall be made on 1:3.ratio basis as per the planning. Additional trees shall be planted wherever feasible. 	Throughout the project section of the road (Highlight Tree cutting locations &	during the design and Construction stage	Part of engineering work cost included	ASRRDA	PIU and ASRRDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
			<i>proposed likely plantation location)</i>				
17.	Ground Water and Surface Water Quality and Availability	<ul style="list-style-type: none"> ○ Requisite permission shall be obtained for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority if applicable. ○ The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. ○ Water intensive activities shall not be undertaken during summer period to the extent feasible. ○ Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible ○ Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. ○ Preventive measures like slop stabilisation, etc shall be taken for prevention of siltation in water bodies. 	Throughout the project section of the road (The contractor shall include the cost for the measures as part of the construction cost)	construction stage	construction cost	Contractor,	PIC/PIU
19.	Occupational Health and Safety	<ul style="list-style-type: none"> ○ Verification of implementation of provision made at planning stage. ○ Each worker is provided with requisite PPE ○ Directional sight board shall be installed on all sharp curves and bends ○ At a main road, intersection or 					

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. ○					
	Operation Stage						
19.	Air and Noise Quality	<ul style="list-style-type: none"> ○ Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due vehicle movement.. Speed limitation and honking restrictions may be enforced near sensitive locations. 	Throughout the project section at the location determined by contractor and approved by PIU	Operation stage	construction cost	Contractor,	PIC/PIU
	Site restoration	<ul style="list-style-type: none"> ○ All construction camp/temporary office/material storage areas are to be restored to its original conditions. ○ The borrow areas rehabilitation will be ensured as per the agreed plan with the landowner. ○ Obtained clearance from PIU before handing over the site to SRRDA. ○ PIC to undertake survivability assessment and report to PIU the status of compensatory tree plantation at a stage of completion of construction with recommendation for improving the survivability of the tree if required 	(The contractor shall include the cost for the measures as part of the construction cost)				
20.	Hydrology and Drainage	<ul style="list-style-type: none"> ○ Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. ○ Rejuvenation of the drainage system by removing encroachments/ congestions shall 	Throughout the project section at the location determined by contractor and approved by	Operation stage	construction cost	Contractor,	PIC/PIU

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		be regularly conducted	PIU				
21.	Occupational Health and Safety	<ul style="list-style-type: none"> Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. 	Throughout the project section at the location determined by contractor and approved by PIU	Operation stage	construction cost	Contractor,	PIC/PIU

Note :

- Road specific measures may vary depending on its location and environmental setting around. The exact extent of activities and related measures requires will depend on final alignment selection. Table 1 provides the list of common utilities, ponds, or community structures falling within 2-4 M of the road and may require shifting. Efforts shall be made to adopt the mitigative measures listed under respective section above including measures of aligning road on one end to save the the structures/trees as much as possible. The PIU will update this EMP before attaching it with the DPR and either list or refer to the section of DPR for highlighting the exact location with chainage of action areas (regarding shifting of common utilities, community structures, location of CD structures, embankment height in the flood prone areas, slope stabilization measures with locations near ponds or water bodies, tree cutting locations)
- The information to be updated in the standard EMP before attaching it with DPR is highlighted under location column of the standard EMP.

APPENDIX 5: ENVIRONMENTAL MONITORING PLAN

I. ENVIRONMENTAL MONITORING DURING DESIGN AND PRE-CONSTRUCTION STAGE

Monitoring Responsibility: PIU with Support from PIC

Monitoring Frequency: Once prior to start of construction

Road Name with Block and District Name:.....

Road Length:

Report No.:

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Climate Change Consideration and Vulnerability screening	<ul style="list-style-type: none"> Compliance to climate change vulnerability check point given under EARF and adoption of necessary mitigative measures as may be required Efforts shall be made to plant additional trees for increasing the carbon sink. The tree may be planted with help of PRI (Panchyati Raj Institution) 	All through the alignment	No. of Additional Tree plantation Proposed		
2.	Finalization of alignment	<ul style="list-style-type: none"> The road will be part of district core network and will comply with PMGSY guidelines Subproject shall not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance. Subproject will not pass through any designated wild life sanctuaries, national park, notified Eco sensitive areas or area of international significance such as protective wet land designated under Wetland Convention, and reserve forest area.. Subproject to comply with local and National legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement 2009. Alignment finalization considering availability of right of way and in consultation with local people. ROW may be reduced in built up area or constricted areas to minimize land acquisition as per PMGSY Guidelines. 	All through the alignment of each rural road	Compliance to Conditions of Forest Clearance if applicable		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure. The road shall follow natural topography to avoid excessive cut and fill. 				
3.	Land acquisition	<ul style="list-style-type: none"> Avoid or minimize land acquisition. Land acquisition, compensation packages, resettlement and rehabilitation, poverty alleviation programs for affected people and all other related issues are addressed through Social Impacts and Resettlement & Rehabilitation report. 	All through the alignment of each rural road			
4.	Biological environment - Tree planting	<ul style="list-style-type: none"> All efforts shall be taken to avoid tree cutting wherever possible. Requisite permission from forest department shall be obtained for cutting of roadside trees. Provision of Compensatory Afforestation shall be made on 1:3.ratio basis. Permission shall be taken for diversion of any forest land if involved. Provision shall be made for additional compensatory tree plantation. 	Throughout the project section of the road			
5.	Planning for land clearing	<ul style="list-style-type: none"> The road land width shall be clearly demarcated on the ground. The utility and community structure shifting shall be planned in consultations and concurrence of the community. Tree felling shall be limited to those, which could not be saved even by design measures. The tree shall be cut with a prior permission of Forest department. The vegetable cover shall be removed and disposed in consultation with community. All public utilities shifting shall be planned with prior concurrence of respective agencies/authority and to the adjacent location approved by them 	All through the Rural roads excepting in stretches of habitations	Tree cutting permission from Forests or Revenue department as applicable Permission of concerned utility Authorities No and proposed location of compensatory trees plantation, Concurrence from community for utility, community		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
				structure, and vegetation cover removal		
6.	Shifting on Common Properties Resources	<ul style="list-style-type: none"> ○ All efforts are made to minimize shifting of common utilities and community structures. ○ The community structures/utilities, which can not be saved, will be shifted to adjacent area with the concurrence and in consultation with community. 	As determined by contractor under approval of PIC /PIU			
7.	Cut and Fill and Embankment Construction design and planning	<ul style="list-style-type: none"> ○ The alignment design shall consider options to minimize excessive cuts and fills. ○ The cut and fill quantities shall be used for embankment to minimize borrow earth requirement. ○ The design shall be as per relevant IRC provisions for cut and fill, slope protection and drainage. ○ Adequate provision shall be made for cross drainage structure for maintaining natural drainage pattern in the subproject area and preventing soil erosion. ○ Side drain for channelizing water to nearby natural drain in water stagnation /logging prone area. ○ The top soil of the cut and fill area shall be used for embankment slope protection ○ Embankment will be designed above High Flood Level wherever, area is prone to flood. 	All through the alignment of each rural road			
8.	Hydrology and Drainage	<ul style="list-style-type: none"> ○ Provision of adequate cross drainage structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. The discharge capacity of the CD structure shall be designed accordingly. ○ Provision of adequate side drainage shall be made in water stagnant/logging areas. ○ The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. ○ Elaborate drainage system shall be provided to drain the storm water from the roadway and embankment to ensure minimum disturbance to natural drainage of surface and subsurface water of the area. 	Near all drainage crossing nalas and river crossings etc.			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> ○ Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides. ○ Provision of concrete road construction in habitat area with drainage of both side of the road shall be made as per the design provision and with adequate slope to prevent any water logging. ○ Road level shall be fixed above HFL. Embankment slope stabilization measures shall be planned. Stabilization measures may include vegetative treatment, stone pitching, retaining wall where feasible, low cost options such as bamboo / eucalyptus tree pilling . 				
9.	Establishment of Construction Camp, temporary office and storage area	<ul style="list-style-type: none"> ○ Construction camp sites shall be located away from any local human settlements (minimum 0.5 km away) and preferably located on lands, which are not productive barren/waste lands presently. ○ Similarly temporary office and storage areas shall be located away from human settlement areas (minimum 500 m). ○ The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. ○ The construction camps shall be located at a minimum 0.5 km from forest land/areas to deter the construction labour in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 0.5 km from forest land/areas. ○ The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. ○ All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided completely to the extent possible. ○ The construction camps, office and storage areas shall 	As determined by contractor under approval of PIC/PIU/ (ref- Labelled: WASTE OIL; and hazardous sign be displayed at oil handling areas and sold off to SPCB/ MoEF authorized re-refiners).	Location of Construction camp with planning of requisite facilities and making provision of such facilities prior to start of construction. Availability of consent to establish from pollution control board for setting up the camp.		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<p>have provision of health care facilities for adults, pregnant women and children.</p> <ul style="list-style-type: none"> Personal Protective Equipments (PPEs) like helmet, boots, earplugs for workers, first aid and fire fighting equipments shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire. Provision shall be made for domestic solid waste disposal in a control manner. The recyclable waste shall be sold off and non-saleable and biodegradable waste shall be disposed through secured land filling. Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage. 				
10.	Traffic Movement	<ul style="list-style-type: none"> The contractor will prepare appropriate traffic diversion scheme approved by respective PIU. This shall be implemented prior to start of construction to avoid any inconvenience to the present road users. This shall be implemented in other stretches of the road as per the progress of the construction work. The diversion plan should ensure smooth flow of traffic, minimize accidents to road users during construction works. Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and retro reflective in nature for good visibility in day and night both. 	As proposed under DPR and determined by contractor and approved by PIC/PIU/			
11.	Occupational Health and Safety	<ul style="list-style-type: none"> Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp curves design and bends where the curve design speed is less than 40 km per hour in plain and rolling terrain. Speed breakers shall also be provided at a threshold of habitation (as per NRRDA guidelines) at regular intervals (150-200 m) through habitation. The speed breakers shall be provided and directional sign boards installed at sites where reverse horizontal curves are closely spaced and speed reduction is required. Provision shall be made for Hazard markers at each end 	Throughout the project section at the location determined by contractor and approved by PIU			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<p>of all box culverts, river crossing causeways and similar CD structures</p> <ul style="list-style-type: none"> ○ Shoulder side slopes shall not be steeper than 2h:1V unless stone pitching of the slopes is provided. ○ Cement concrete pavement and V-shaped drain shall be constructed to the full width of the available roadway within densely populated habitation and as per feasibility. ○ Provision shall be made for Directional sight board shall be installed on all sharp curves and bends ○ At a main road, intersection or crossing “STOP” sign and ‘T-intersection’ warning sign shall be installed on the village road. ○ It is proposed to approach railways for adequate safety at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both side of the railway crossing 				
	Grievance Redress	<ul style="list-style-type: none"> ○ Obtaining information from Village level Grievance redress committee, PIU as applicable 	Each Sample road once.			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.

II. ENVIRONMENTAL MONITORING DURING CONSTRUCTION STAGE

Monitoring Responsibility : PIU with Support from PIC

Monitoring Frequency : (First Report after third month of start of construction or 25% construction . Second report after ninth month of construction or 75% construction).

Project Details:.....

Road Stretch Name :

Monitoring Report Quarter No.:

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Sourcing and transportation of construction material (aggregates , earth)	Borrow Earth: <ul style="list-style-type: none"> ○ The borrow earth shall be obtained from identified locations and with prior permission for landowner and clear understanding for its rehabilitation. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed. ○ Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. ○ A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal). ○ Borrowing of earth will not be done continuously through out the stretch. ○ Ridges of not less than 8m widths will be left at intervals not exceeding 300m. ○ Small drains will be cut through the ridges, if necessary, to facilitate drainage. ○ The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). ○ The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside. ○ Fly ash will also be used in road embankment as per 	At Borrow sites and quarries (if required) location.	Compliance to IRC guidelines and stated criteria, Permission from land owners, Rehabilitation of borrow areas Availability of valid consent of quarries		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<p>IRC guidelines wherever thermal power plant is located within 100 km of the road alignment.</p> <ul style="list-style-type: none"> ○ The borrow area shall be rehabilitated as per the understanding arrived with the land-owner. The rehabilitation plan may include the following: <ul style="list-style-type: none"> ▪ Borrow pits shall be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation sloped will be smoothed and depression will be filled in such a way that it looks more or less like the original ground surface. ▪ Borrow areas might be used for aquaculture in case landowner wants such development. <p>Aggregate :</p> <ul style="list-style-type: none"> ○ The stone aggregate shall be sourced from existing licensed quarries ○ Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU. ○ Topsoil to be stockpiled and protected for use at the rehabilitation stage <p>Transportation of Construction Material</p> <ul style="list-style-type: none"> ○ Existing tracks / roads are to be used for hauling of materials to the extent possible. ○ Prior to construction of roads, topsoil shall be preserved or at least shall be used for any other useful purposes like using in turfing of embankment rather than allowing its loss by construction activities. ○ The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. In any case, the transportation links are to be inspected at least twice daily to clear accidental spillage, if any. 				
	Loss of Productive Soil, erosion and	<ul style="list-style-type: none"> ○ It shall be ensured that the land taken on lease for access road, construction camp and temporary office 	Thought out the road			

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2.	land use change	<p>of the storage facilities is restored back to its original land use before handing it over back to land owner.</p> <ul style="list-style-type: none"> ○ The top soil from the productive land (borrow areas, road widening areas etc.) shall be preserved and reused for plantation purposes. ○ It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. ○ Cut and fill shall be planned as per IRC provisions and rural road manual. ○ All steep cuts shall be flattened and benched. ○ Shrubs shall be planted in loose soil area. ○ IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration. ○ Soil erosion shall be visually checked on slopes and embankment areas. In case soil erosion is found, suitable measures shall be taken to control the soil erosion 	section			
3.	Compaction and Contamination of Soil	<ul style="list-style-type: none"> ○ To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. ○ The productive land shall be reclaimed after construction activity. ○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. ○ Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. ○ The non-biodegradable and recyclable waste shall be sold off. ○ Fuel and lubricants shall be stored at the predefined storage location. ○ The storage area shall be paved with gentle slope to 	<ul style="list-style-type: none"> • Throughout the project section of the road s 			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<p>a corner and connected with a chamber to collect any spills of the oils.</p> <ul style="list-style-type: none"> ○ All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. ○ To avoid soil contamination at the wash-down and re-fuelling areas, "oil interceptors" shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners. 				
4.	Construction Debris and waste	<ul style="list-style-type: none"> ○ All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. ○ Unusable debris material should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority. ○ The bituminous wastes shall be disposed in secure manner at designated landfill sites only in an environmentally accepted manner. ○ For removal of debris, wastes and its disposal MOSRTH guidelines should be followed. Unproductive/wastelands shall be selected with the consent of villagers and Panchayat for the same. The dumping site should be of adequate capacity. It should be located at least 500 m away from the residential areas. Dumping sites should be away from water bodies to prevent any contamination of these bodies. 	<ul style="list-style-type: none"> • Throughout the project section of the road 			
5.	Air and Noise Quality	<ul style="list-style-type: none"> ○ Vehicles delivering loose and fine materials like sand and aggregates shall be covered. ○ Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and 	<ul style="list-style-type: none"> • Near all drainage crossing , nalas and river 			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		asphalt mixing areas. <ul style="list-style-type: none"> ○ Mixing plants and asphalt (hot mix) plants shall be located at least 0.5 km away and in downwind direction of the human settlements. ○ Material storage areas shall also be located downwind of the habitation area. ○ Hot mix plant shall be fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. Consent to establish and operate shall be obtained from State Pollution Control Board and comply with all consent conditions. ○ Diesel Generating (DG) sets shall also be fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5 KVA and about 0.7 m for 10 KVA DG sets, above top of sound proofing enclosure of the Dg set). . Low sulphur diesel shall be used in DG sets and other construction machineries. Construction vehicles and machineries shall be periodically maintained. ○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers. ○ Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. 	crossings etc.			
6.	Biological environment - Tree planting	<ul style="list-style-type: none"> ○ Compensatory Afforestation shall be made on 1:3.ratio basis as per the planning. ○ Additional trees shall be planted wherever feasible. 	Throughout the project section of the road			
7.	Ground Water and Surface Water Quality and Availability	<ul style="list-style-type: none"> ○ Requisite permission shall be obtained for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority if applicable. ○ The contractor shall arrange for water required during construction in such a way that the water 	Throughout the project section of the road			

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		<p>availability and supply to nearby communities remains unaffected.</p> <ul style="list-style-type: none"> Water intensive activities shall not be undertaken during summer period to the extent feasible. Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. Preventive measures like silt stabilisation, etc shall be taken for prevention of siltation in water bodies. 				
8.	Occupational Health and Safety	<ul style="list-style-type: none"> Verification of implementation of provision made at planning stage. Each worker is provided with requisite PPE Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. 	Throughout the project section at the location determined by contractor and approved by PIU			
9.	Grievance Redress	<ul style="list-style-type: none"> Obtaining information from Village level Grievance redress committee, PIU as applicable 	Each Sample road once.			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.

III. ENVIRONMENTAL MONITORING DURING OPERATION STAGE

Monitoring Responsibility: PIU with Support from PIC

Monitoring Frequency: (On completion of construction and after one month of first and second year of maintenance period)
construction

Project Details :.....

Road Stretch Name:

Monitoring Report No.:

SL. No.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Air and Noise Quality	<ul style="list-style-type: none"> Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due vehicle movement.. Speed limitation and honking restrictions may be enforced near sensitive locations. 	Throughout the project section at the location determined by contractor and approved by PIU			
2.	Site restoration	<ul style="list-style-type: none"> All construction camp/temporary office/material storage areas are to be restored to its original conditions. The borrow areas rehabilitation will be ensured as per the agreed plan with the landowner. Obtained clearance from PIU before handing over the site to SRRDA. PIC to undertake survivability assessment and report to PIU the status of compensatory tree plantation at a stage of completion of construction with recommendation for improving the survivability of the tree if required 	Throughout the road stretch	Survivability report, land owner concurrence of land reversal		
	Hydrology and Drainage	<ul style="list-style-type: none"> Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions shall be regularly conducted 	Throughout the project section at the location determined by contractor and approved by PIU			
3.	Occupational Health and Safety	<ul style="list-style-type: none"> Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. 	Throughout the project section at the location determined by contractor and approved by PIU			

SL. No.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
4.	Grievance Redress	<ul style="list-style-type: none"> Obtaining information from Village level Grievance redress committee, PIU as applicable 	Each Sample road once.			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.