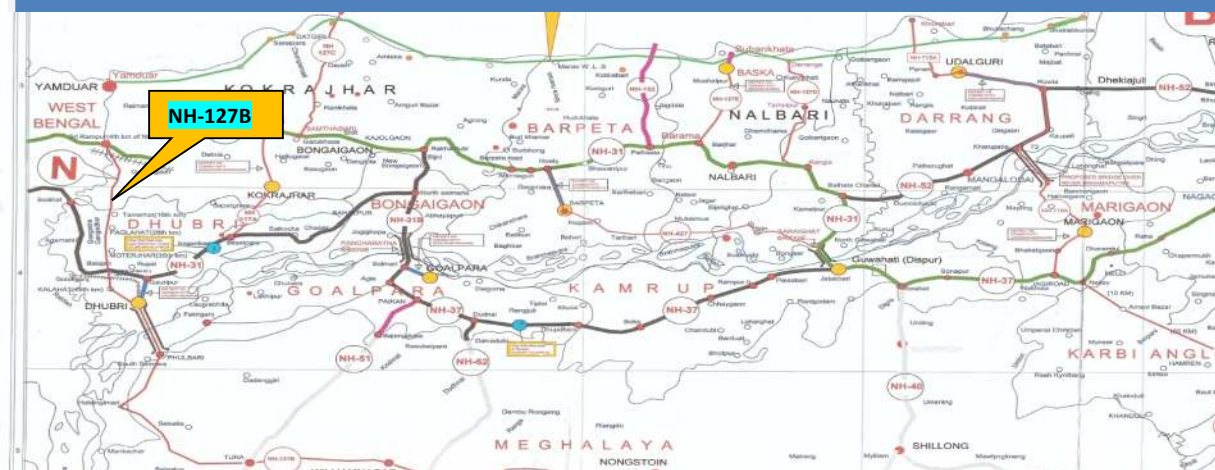


Feasibility Study and preparation of Detailed Project Report for Construction & up-gradation of the newly declared NH-127 B (Assam portion) starting from Srirampur on NH-27(old NH-31 C) at Chainage 0.00 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km to NH standard

**NH-127B**

**Final Detailed Project Report**

**Volume-I:  
Main Report**



*Submitted To*  
**National Highways & Infrastructure  
Development Corporation Ltd.**  
4, Parliament Street,  
New Delhi-110001



*Consultant*  
**C. E. Testing Company Pvt. Ltd.**  
124-A, NSC Bose Road, Kolkata 700092

## **CHAPTER -1**

### **EXECUTIVE SUMMARY**

#### **1.1 Introduction**

Assam PWD NH Works acting as an executing agency of MoRT&H, New Delhi has decided to implement the work of Consultancy Services for Feasibility Study and preparation of Detailed Project Report for Construction & up-gradation of the newly declared NH-127 B (Assam portion) starting from Srirampur on NH-27(old NH-31 C) at Chainage 0.00 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km (as per TOR) to NH standard.

Assam PWD NH Works is the employer and executing agency for the consultancy services and the standards of output required from the appointed consultants are of international level both in terms of quality and adherence to the agreed time schedule.

The road project is to provide NH standard connectivity to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 54.154 km (As per design chainage) from Srirampur on NH-27(old NH-31 C) at Chainage 0.00. The total length of the road is about 54.154 km (as per Design length). The instant proposal is to carryout feasibility study and preparation of DPR of the above mentioned road.

Assam PWD, NH Works appointed C.E. Testing Company Pvt. Ltd. (CETEST) as consultant to prepare the Detailed Project Report for the proposed improvement and up-gradation of the roadway vide Letter of Acceptance No. vide Assam PWD, NH Works's letter no. NHR.9/2012/Pt/25 dated 03.11.2015.

Pursuant to Clause 10.7 of the Terms of Reference, this Draft detailed project report is being submitted.

After obtaining the LoA, the consultant met Chief Engineer, P.W.D. (N.H. WORKS), Guwahati and Executive Engineer P.W.D. (N.H. WORKS), Abhayapuri Construction Division, Abhayapuri. Accordingly, a joint site visit was done with PWD, Assam Officials. (Joint site visit date- 07/11/2015, 08/11/2015, 09/11/2015 & 11/11/2015). After that the team carried out a Reconnaissance Survey & Site Inventory of the project stretch. This feasibility Report is the outcome of the above inspection and it has been drafted to meet all the various provisions of the TOR.

## 1.2 Scope of the Project

The Scope of Consultancy Services shall comprise

- Traffic surveys and demand assessment
- Engineering surveys and investigations
- Location and layout of Road side immunities and road furniture
- Environment impact assessment & Environment Clearance (if necessary)
- Preliminary designs of road, bridges, structures, etc.
- Preparation of Land Plan Schedules and Utility Relocation Plans (if necessary)
- Preparation of indicative BOQ and rough Cost Estimates of fair degree of correctness
- Preparation of Schedules A, B, C, D, H and I of the Contract Agreement. (as per EPC Agreement) (refer to EPC documents of MORT&H )
- Preparation of Bid Document of the project as per EPC document or EPC Contract Agreement.
- Assisting Assam PWD NH Works by furnishing clarifications as required for obtaining approval from MORT & H.
- Suggestion for overall improvement of the stretch for improvement and better operational efficiency. Interaction with local administration and Assam PWD NH works/MoRT&H before finalizing feasibility report.
- Preparation of land acquisition details as per revenue records/maps for further processing of land acquisition. Preparation of details utility shifting required in consultation of concern departments / authorities and submit estimate for pre-construction activities including land acquisition, shifting of utilities etc.
- Environmental Impact Assessment, Environmental Management Plan and Rehabilitation and Resettlement Studies shall be carried out by the Consultant meeting the requirements of existing regulations.

## 1.3 Project Background

The road name as per TOR/Contract is NH-127B starting from Srirampur on NH-27(old NH-31 C) to the immediate approach of proposed bridge over river Brahmaputra near Dhubri in the state of Assam. The Project Road starts from Srirampur(in the state of Assam) and passes through village / localities, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, DebduttaHazdaha 1, Kachari Hat,

DebduttaHazardaha 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari and ends at immediate approach of proposed bridge over river Brahmaputra near Dhubri.

The project road lies in Kokrajhar and Dhubri district of Assam. The road runs through five Police Stations namely, Srirampur, Tamarhat, Dhubri, Gouripur and Gossaigaon Police Station. The length of the road is 54.154 km (As per Design length).

The project road is of significant importance as the road connecting two National Highways (NH31C and NH-31), one proposed bridge over river Brahmaputra and connects to important nearby villages Srirampur, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, DebduttaHazardaha 1, Kachari Hat, DebduttaHazardaha 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari.

The main objective of the Consultancy Services is to establish Detailed Project Reports for rehabilitation and up-gradation of the existing Single lane/ Intermediate (from Km 0 to Km 54.154 as per Design length) to 2 Lane with paved shoulder carriageway of National Highway configuration.

The Detailed Project Report would inter-alia include Detailed Highway Design, Design of Pavement and overlay with options for flexible or rigid pavements, Design of bridges and cross-drainage structures and grade separated structures, design of service roads, quantities of various items, detailed cost estimates, Environmental Impact Assessments (EIA) and Social Impact Assessment (SIA), Tender documents for EPC implementation.

## **1.4 Socio Economic Profile of Project Location**

The project road passes through Kokrajhar and Dhubri District of Assam.

Kokrajhar is one of the 27 (twenty-seven) districts of Assam with 2.85% of the state population and is the gateway to Northeast India. Both the rail and road network touch this district at Srirampur on the way to the rest of the region. The district is located on the north bank of the mighty Brahmaputra and stretches to the international border with the Kingdom of Bhutan. It is bounded on the north by Bhutan and by West Bengal on the west; the district of Dhubri in the south and in the east by Chirang district. Champamati River, Gaurang River, Tipkai River, Sankosh River are passes through the Kokrajhar.



In 2011, Kokrajhar had population of 8, 86,999 of which male and female were 4, 52,965 and 4, 34,034 respectively. The initial provisional data released by census India 2011, shows that density of Kokrajhar district for 2011 is 269 people per sq. km. With regards to Sex Ratio in Kokrajhar, it stood at 959. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 913 girls per 1000 boys compared to figure of 926 girls per 1000 boys of 2001 census data.

Dhubri District is bounded both by inter-state and international border i.e. West Bengal and Bangladesh in the west, Goalpara and Bogaigoan district of Assam and Garo Hills district of Meghalaya in the east, Kokrajhar district in the north, Bangladesh and state of Meghalaya in the south. Covering an area of 2,838 Sq. Kms. including forests, riverine, hills etc.

In 2011, Dhubri had population of 1,949,258 of which male and female were 997,848 and 951,410 respectively. The initial provisional data released by census India 2011, shows that density of Dhubri district for 2011 is 896 people per sq. km. With regards to Sex Ratio in Dhubri, it stood at 953. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 913 girls per 1000 boys compared to figure of 926 girls per 1000 boys of 2001 census data.

Dhubri district is primarily dependent on agriculture and forest products. Main source of income is paddy with surplus production than its requirement. Jute and mustard seed occupy the major share of cash crops. From forest mainly timber and bamboo add to the income though boulder and sand also available. Fish, milk, meat and egg have small contribution to the economy.

## **1.5 Deficiencies and Issues**

The following major deficiencies have been identified and addressed in terms of traffic operation, safety, road conditions and maintenance. A few other issues which contribute to operational deficiencies and safety concerns and which prevent the optimum utilization of the highway capacity to a desirable level of service, e.g. driving discipline and compliance, traffic surveillance, corridor security and management, level of regular road maintenance, maintenance and its road worthiness etc. are beyond the scope of this study.

### ***a) Operation***

- ✓ *Road capacity augmentation*

- ✓ *No access control*
- ✓ *Fast Moving Vehicles competing with slow moving vehicles for bad pavement condition*
- ✓ *Deficient road surface conditions (roughness)*
- ✓ *No proper Geometry of road alignment*
- ✓ *Uncontrolled roadside developments and encroachments*
- ✓ *Culvert requiring rehabilitation and reconstruction*

**b) Safety**

- ✓ *Shoulder drop-off at places*
- ✓ *Exposed roadside hazards.*
- ✓ *Inadequate traffic signs.*
- ✓ *Blind Curve on the project road*

**c) Road**

- ✓ *Poor pavement condition and structurally inadequate*
- ✓ *Shoulder functionally and structurally inadequate*
- ✓ *Cross drainage - poor condition and inadequate*
- ✓ *Curve radii less than what is required for the ruling Design speed of 100 km / hr. in roads for plain terrain*
- ✓ *Deficient curves and reverse curves in roads in plain terrain without transition length for safe reversal of elevation.*

## **1.6 Project Description**

This relates to the most suitable alignment for 2-laning of road sections and for optimum upgrading of existing road based on field data and detail study involving traffic, geo-technical, topographic, pavement and road condition and socio-economic aspects. Special attention has been given for augmentation of capacity for intended level of service in design period. A few appropriate design applications have been considered for operational efficiency and road safety.

Horizontal alignment has been done as per 80-100 km/hr design speed except at few stretches where the design speed has been reduced to 65kmph with proper road safety measures.

Pavement design has been done for flexible and rigid pavement wherever applicable as per standard guidelines prescribed in IRC. All major and minor junctions/intersections have been analyzed with respect to vehicular movements and vehicular turning movements based on traffic study for providing appropriate grade / grade separated intersections for cross / turning traffic.

Salient features of the improvement proposal in comparison to the existing conditions are mentioned below.

### Salient Features of the Proposed Road

| Descriptions | Existing                                                          | Proposed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terrain      | Plain                                                             | Plain                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Length       | Existing Length = 55.060 Km<br>(as per Survey)                    | Package-I: 0.00 to 10.90 km<br>Package-II: 10.90 to 27.65 km<br>Package-III: 27.65 to 36.50 km<br>Package-IV: 36.50 to 43.30 km<br>Package-V: 43.30 to 54.154 km<br>Proposed Length = 54.154 Km                                                                                                                                                                                                                                                                                            |
| Alignment    | The existing Alignment is almost straight except at few locations | <b>Bypass has been proposed in the project</b> road is given below.<br>i. From km 20.300 to km 23.100<br>ii. From km 28.450 to km 30.400<br>iii. From km 39.100 to km 41.200<br><b>Realignment has been proposed in the</b><br>Project road is given below.<br>i. From km 42.600 to km 43.300<br>ii. From km 44.450 to km 44.800<br>iii. From km 45.650 to km 46.350<br>iv. From km 47.750 to km 49.450<br>v. From km 51.800 to km 54.154<br>Realignment has been proposed due to proposed |

| Descriptions   | Existing                                                                                                                                                                                                                                           | Proposed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |                                                                                                                                                                                                                                                    | bridge, curve and geometric improvement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Design Speed   | Avg. 25Kmph                                                                                                                                                                                                                                        | 100Kmph to 80 kmph, in few locations has been designed 65kmph where speed limit sign has been proposed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Cross-Section  | <p>Carriageway: 3.70 - 6.00m</p> <p>Earthen Shoulder: 0.50 – 1.5m</p> <p>Total Formation Width: 4.70 – 9.00m</p>                                                                                                                                   | <p><b>Road Cross Sections:</b></p> <p><b>For flexible pavement</b></p> <p><b>4 lane in Rural area :26m</b></p> <ul style="list-style-type: none"> <li>i. Carriageway width=2x7.0m</li> <li>ii. Median= 1x4m</li> <li>iii. Kerb signage =2x0.500 m</li> <li>iv. Paved shoulder =2x1.5m</li> <li>v. Earthen shoulder= 2x2.0m</li> </ul> <p><b>4 lane in Built up area :24.50m</b></p> <ul style="list-style-type: none"> <li>i. Carriageway width=2x7.0m</li> <li>ii. Median= 1x1.50m</li> <li>iii. Kerb signage=2x0.500m</li> <li>iv. Paved shoulder =2x2.0m</li> <li>v. Drain= 2x2.0m</li> </ul> <p><b>For rigid pavement</b></p> <p><b>4 lane in Built up area :24.50m</b></p> <ul style="list-style-type: none"> <li>i. Carriageway width=2x7.0m</li> <li>ii. Median= 1x1.50m</li> <li>iii. Kerb signage=2x0.500m</li> <li>iv. Paved shoulder =2x2.0m</li> <li>v. Drain= 2x2.0m</li> </ul> |
| Design CBR     | -                                                                                                                                                                                                                                                  | 8%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Traffic (2015) | <p>On basis of base year (2015) traffic,</p> <p><b>BASE YEAR TRAFFIC ON NH-127B + DIVERTED TRAFFIC FROM NH-31+DIVERTED TRAFFIC FROM NH-31C</b></p> <p>Motorized Vehicle in no. = 5214</p> <p>Total PCU per day = 9523</p> <p>Total CVPD = 1794</p> | <p>After 15years of design life of the road (2034)</p> <p><b>TRAFFIC ON NH-127B + DIVERTED TRAFFIC FROM NH-31+DIVERTED TRAFFIC FROM NH-31C</b></p> <p>Motorized Vehicle in no. = 13176</p> <p>Total PCU per day = 24064</p> <p>Total CVPD = 4534</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Descriptions                                                      | Existing                                                                                                                                                                                                                                                      | Proposed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pavement Design Life                                              | Nil                                                                                                                                                                                                                                                           | Flexible Pavement-15 Years<br>Rigid Pavement-30 Years                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Design msa                                                        | Nil                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>MSA of 1<sup>st</sup> &amp; 2<sup>nd</sup> homogeneous section 6 msa &amp; 23 msa,</li> </ul> <p>But Adopted MSA = 20msa as per IRC SP 84 2014 clause no. 5.4.1.</p>                                                                                                                                                                                                                                                                                                      |
| Flexible Pavement Crust Thickness for widening & new construction | <p>Thk. Varies from 100mm to 680mm</p> <p>Length of BT surface = 29.200 Km (from Km 0.000 to km 6.500, km 7.500 to km 14.000 &amp; km 41.550 to 57.750)</p> <p>Length of WBM surface = 28.550 Km (from Km 6.500 to km 7.500 &amp; km 14.000 to km 41.550)</p> | <p>1<sup>st</sup> homogeneous section <b>Km 0.00 to Km 39.000</b> &amp; 2<sup>nd</sup> homogeneous section <b>Km 39.000 to Km 54.154</b></p> <p><b>Pavement Thickness:</b></p> <p>Package-I: 0.00 to 10.90 km<br/>Package-II: 10.90 to 27.65 km<br/>Package-III: 27.65 to 36.50 km<br/>Package-IV: 36.50 to 43.30 km<br/>Package-V: 43.30 to 54.154 km</p> <ul style="list-style-type: none"> <li>BC – 40mm</li> <li>DBM – 85mm</li> <li>WMM – 250mm</li> <li>GSB – 200mm</li> </ul> <p><b>Total – 575mm</b></p> |
| Length of New Construction                                        |                                                                                                                                                                                                                                                               | <p>New Construction = 9.534km</p> <p>Package-I: 0.000 km<br/>Package-II: 2.750 km<br/>Package-III: 1.900 km<br/>Package-IV: 0.970 km<br/>Package-V: 3.914 km</p>                                                                                                                                                                                                                                                                                                                                                 |
| Bridges                                                           | Major Bridge – 1 No<br>Minor Bridge – 8 Nos.                                                                                                                                                                                                                  | <p><b>Total Bridge=12 nos.</b></p> <p><b>Minor Bridge=11 nos.</b></p> <p>Reconstruction=5 nos.<br/>New proposal=4 nos.<br/>Additional 2 lane bridge=2 nos.</p> <p><b>Major Bridge=1 no.</b></p> <p>Additional 2 lane bridge=1 no.</p>                                                                                                                                                                                                                                                                            |
| Culverts                                                          | <p><b>Total Culvert = 55 Nos.</b></p> <p>Pipe Culvert = 28 Nos<br/>Slab Culvert =25 Nos.<br/>Box Culvert =1 No.<br/>Fully Chocked Culvert =1 No.</p>                                                                                                          | <p><b>Total Culvert = 152 Nos.</b></p> <p><b>Package-I: (30 Nos.)</b></p> <p><b>Reconstruction (10 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 10 Nos.</li> </ul> <p><b>New proposal (20 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 20 nos.</li> </ul> <p><b>Package-II: (50 Nos.)</b></p> <p><b>Reconstruction (16 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 16 Nos.</li> </ul>                                                            |



| Descriptions    | Existing | Proposed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |          | <p><b>New proposal (34 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 34 nos.</li> </ul> <p><b>Package-III: (20 Nos.)<br/>Reconstruction (7 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 7 Nos.</li> </ul> <p><b>New proposal (13 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 13 nos.</li> </ul> <p><b>Package-IV: (25 Nos.)<br/>Reconstruction (6 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 6 Nos.</li> </ul> <p><b>New proposal (19 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 19 nos.</li> </ul> <p><b>Package-V: (27 Nos.)<br/>Reconstruction (9 nos.)</b></p> <ul style="list-style-type: none"> <li>Box culvert= 9 Nos.</li> </ul> <p><b>New proposal (18nos.)</b><br/>Box culvert= 18 nos.</p> |
| Protection Work | Nil      | <p>Length of Toe Wall = 1297 m<br/> Package-I: 307 m<br/> Package-II: 388 m<br/> Package-III: 488 m<br/> Package-IV: Nil<br/> Package-V: 114 m<br/> Length of Retaining Wall = 3717 m (2m Height)<br/> Package-I: Nil<br/> Package-II: 849 km<br/> Package-III: 460 m<br/> Package-IV: 923 m<br/> Package-V: 1485 m<br/> Length of Retaining Wall = 401 m (3.5m Height)<br/> Package-I: Nil<br/> Package-II: 401 m<br/> Package-III: Nil<br/> Package-IV: Nil<br/> Package-V: Nil<br/> Length of Retaining Wall = 155 m (6m Height)<br/> Package-I: Nil<br/> Package-II: Nil<br/> Package-III: 155 m<br/> Package-IV: Nil<br/> Package-V: Nil<br/> Stone Pitching = 8434 m</p>                                                                                                                                     |

| Descriptions                               | Existing             | Proposed                                                                                                                                                                                                                                                             |
|--------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                            |                      | Package-I: Nil<br>Package-II: 5651 m<br>Package-III: 155 m<br>Package-IV: Nil<br>Package-V: 2628 m                                                                                                                                                                   |
| Longitudinal Drains                        | Nil                  | Total Length = 19178m<br>(Both side of the road)<br>Package-I: 3557 m<br>Package-II: 8526 m<br>Package-III: 3443 m<br>Package-IV: 1652 m<br>Package-V: 2000 m                                                                                                        |
| Bus – Bay                                  | Nil                  | 9 Nos. (both side)<br>Package-I: 1 No.<br>Package-II: 3 No.<br>Package-III: 1 No.<br>Package-IV: 3 No<br>Package-V: 1 No.                                                                                                                                            |
| Truck Lay Bye                              | Nil                  | 1 No. (both side)<br>Package-I: Nil<br>Package-II: 1 No.<br>Package-III: Nil<br>Package-IV: Nil<br>Package-V: Nil                                                                                                                                                    |
| ROW                                        | About 20m to 30m     | Proposed ROW is 30m to 60m                                                                                                                                                                                                                                           |
| Land to be acquired                        | Available 144.76 Ha. | Additional 142.688 Ha.                                                                                                                                                                                                                                               |
| Major Intersection                         | 2 Nos.               | 2 Nos.<br>Package-I: 1 No.<br>Package-II: Nil<br>Package-III: Nil<br>Package-IV: 1 No.<br>Package-V: Nil                                                                                                                                                             |
| Minor Intersection                         | 159 Nos.             | 158 Nos. (3 Legged-126 Nos<br>and 4 Legged-32 Nos)<br>Package-I: 38 No. (3L-33No ,4L-5 No.)<br>Package-II: 49 No. (3L-41No ,4L-8 No.)<br>Package-III: 27 No. (3L-22No ,4L-5 No.)<br>Package-IV: 19 No. (3L-16No ,4L-3 No.)<br>Package-V: 25 No. (3L-14No ,4L-11 No.) |
| Flyover                                    | Nil                  | Nil                                                                                                                                                                                                                                                                  |
| Underpasses<br>(VUP<br>Cattle/Pedestrians) | Nil                  | VUP-3 No and LVUP-1 Nos.<br>Package-I: Nil<br>Package-II: Nil<br>Package-III: Nil<br>Package-IV: 1 No. VUP                                                                                                                                                           |

| Descriptions           | Existing | Proposed                                                                                                                                                                           |
|------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |          | Package-V: 2 No. VUP & 1 No. LVUP                                                                                                                                                  |
| ROBs                   | Nil      | 3 nos.<br>Package-I: 1 No.<br>Package-II: Nil<br>Package-III: 1 No.<br>Package-IV: 1 No.<br>Package-V: Nil                                                                         |
| RUBs                   | Nil      | Nil                                                                                                                                                                                |
| Service Road           | Nil      | Total length= 11.770 km<br>Package-I: 2.720 km (B/S)<br>Package-II: Nil<br>Package-III: 2.850 km (B/S)<br>Package-IV: 1.100 km (B/S)<br>Package-V: 5.100 km (B/S)                  |
| Toll Plaza             | Nil      | Package-I: Nil<br>Package-II: Nil<br>Package-III: Nil<br>Package-IV: Nil<br>Package-V: 1 NO.                                                                                       |
| Total Civil Cost (Rs.) | -        | Rs. 901.76 Cr. (Rs. 16.65 Cr / Km)<br>Package-I: Rs. 178.23 Cr<br>Package-II: Rs. 196.82 Cr<br>Package-III: Rs. 168.73 Cr<br>Package-IV: Rs. 186.19 Cr<br>Package-V: Rs. 171.78 Cr |

## 1.8 Cost Estimates for Recommended Alignment

Project estimate has been prepared as per PWD Nh Schedule-2013-14 with 17.62% Escalation except Steel and Bitumen. The Price of Steel and Bitumen are taken as current rate. The rate analysis has been as per MORT&H's Standard Data Book. The priced B.O.Q. made accordingly is enclosed. Abstract of Cost Estimate is given below.

**GENERAL ABSTRACT OF COST ( SOR 2013-14)**  
**NH-127-B (FROM 0.000KM-54.154KM)**

|                                            |   |        |
|--------------------------------------------|---|--------|
| Length of Road (km)                        | : | 54.154 |
| Length of CD & Bridge works (km)           | : | 2.992  |
| Length of Pavement excluding CD works (km) | : | 51.162 |

|           | DESCRIPTION OF WORKS                                  | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM<br>(IN<br>LAKHS.) | % of Total<br>Civil Works<br>Cost |
|-----------|-------------------------------------------------------|---------------------------|----------------------------------|-----------------------------------|
| <b>A.</b> | <b>ROAD WORKS</b>                                     |                           |                                  |                                   |
| 1         | Site Clearance                                        | 563.18                    | 10.40                            | 0.62%                             |
| 2         | Earthwork, Erosion control and Drainages              | 8,054.06                  | 148.73                           | 8.93%                             |
| 3         | Sub-Base, Base                                        | 11,999.69                 | 221.58                           | 13.31%                            |
| 4         | Bituminous surface                                    | 11,598.69                 | 214.18                           | 12.86%                            |
| 5         | Rigid Pavement                                        | 1,521.36                  | 28.09                            | 1.69%                             |
| 6         | Traffic signs, Road marking & other road appurteances | 1,906.98                  | 35.21                            | 2.11%                             |
| 7         | Drain & Protection Works                              |                           |                                  |                                   |
| a)        | Drain                                                 | 4,105.43                  | 75.81                            | 4.55%                             |
| b)        | RE Wall                                               | 10,559.98                 | 195.00                           | 11.71%                            |
| c)        | Retaining Wall                                        | 2,159.68                  | 39.88                            | 2.39%                             |
| d)        | Toe Wall                                              | 156.18                    | 2.88                             | 0.17%                             |
| e)        | Stone Pitching                                        | 1,911.05                  | 35.29                            | 2.12%                             |
| 8         | Project Facilities                                    |                           |                                  |                                   |
| a)        | Bus Bay With Passenger Shelter                        | 643.04                    | 11.87                            | 0.71%                             |
| b)        | Truck lay Bye                                         | 83.25                     | 1.54                             | 0.09%                             |
| 9         | Service Road                                          | 3,173.86                  | 58.61                            | 3.52%                             |
| 10        | Junction                                              | 2,361.72                  | 43.61                            | 2.62%                             |
| 11        | Grade Separater                                       | 1,097.50                  | 20.27                            | 1.22%                             |
|           | <b>TOTAL FOR ROAD WORKS =</b>                         | <b>61,551.44</b>          | <b>1,142.96</b>                  |                                   |
| <b>B.</b> | <b>BRIDGES &amp; CULVERTS</b>                         |                           |                                  |                                   |
| 12        | Major Bridges                                         | 867.78                    | 16.02                            | 0.96%                             |
| 13        | Minor Bridges                                         | 5,482.29                  | 101.24                           | 6.08%                             |
| 14        | VUP                                                   | 1,528.10                  | 28.22                            | 1.69%                             |
| 15        | ROB                                                   | 12,698.43                 | 234.49                           | 14.08%                            |
| 16        | Culvert                                               | 6,522.35                  | 120.44                           | 7.23%                             |
| 17        | Repairing & Rehabilitation                            | 25.56                     | 0.47                             | 0.03%                             |
|           | <b>TOTAL FOR BRIDGE WORKS =</b>                       | <b>27,124.51</b>          | <b>500.88</b>                    |                                   |
| <b>C.</b> | <b>TOLL PLAZA</b>                                     |                           |                                  |                                   |
|           | Toll Plaza                                            | 1,500.00                  | 27.70                            | 1.66%                             |
| <b>D.</b> | <b>COST OF CIVIL WORKS (IN LAKHS)</b>                 | <b>90,175.95</b>          | <b>1,665.18</b>                  |                                   |

|    | DESCRIPTION OF WORKS                                                          | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM<br>(IN<br>LAKHS.) | % of Total<br>Civil Works<br>Cost |
|----|-------------------------------------------------------------------------------|---------------------------|----------------------------------|-----------------------------------|
| E. | GST @ 12% on (D)                                                              | 10,821.00                 |                                  |                                   |
| F. | Add Contingencies @ 2.8% over Civil Cost (D)                                  | 2,525.00                  |                                  |                                   |
| G. | Supervision Consultancy Charges @ 3% of (D)                                   | 2,705.00                  |                                  |                                   |
| H. | Agency Charges @3% of (D)                                                     | 2,705.00                  |                                  |                                   |
| I. | Escalation Cost @ 5% during Construction Period(For 1 Years)                  | 4,509.00                  |                                  |                                   |
| J. | Maintenance Charges @ 2.5% of Civil Works( D)                                 | 2,254.00                  |                                  |                                   |
| K. | <b>TOTAL PROVISION FOR GST/ CONTIGENCIES &amp; CENTAGES<br/>(E+F+G+H+I+J)</b> | <b>25,519.00</b>          | <b>471.23</b>                    |                                   |
| L. | <b>PRE CONSTRUCTION ACTIVITIES</b>                                            |                           |                                  |                                   |
|    | LA cost with solatium (Approx.)                                               | 23,698.30                 | 437.61                           |                                   |
|    | R & R cost with solatium (Approx.)                                            | 11,236.32                 | 207.49                           |                                   |
|    | Utility Shifting cost                                                         | 338.70                    | 6.25                             |                                   |
|    | Environmental cost                                                            | 1,776.77                  | 32.81                            |                                   |
|    | <b>Sub Total (L)</b>                                                          | <b>37,050.09</b>          | 684.16                           |                                   |
| M. | <b>GRAND TOTAL (M=K+L)</b>                                                    | <b>1,52,745.04</b>        | <b>2,820.57</b>                  |                                   |

## CHAPTER-2

### PROJECT DESCRIPTION

#### 2.1 Existing Scenario

##### 2.1.1 General

The project road is currently a single lane/ Intermediate road. The road starts from Srirampur on NH-27(old NH-31C )and ends to the immediate approach of proposed bridge over river Brahmaputra near Dhubri, covering a distance of 55.700 km.(As per TOR) The entire road stretch passes through Plain terrain.

The project road stretch passes through Kokrajhar and Dhubri district of Assam.

From field survey, the following are observed:

|                                                                                    |    |                                                                                                                         |
|------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------|
| ➤Junction improvement required                                                     | :: | 2 locations (At Chainage 0+000 Km & 40+637 Km)                                                                          |
| ➤Township and Densely built up areas, where local traffic may require service road | :: | 4 Locations (From 0+420Km to 1+780Km, From 34+750Km to 35+950Km, From 40+700Km to 41+250Km & From 52+370Km to 53+210Km) |
| ➤Heavy built up township requiring by pass                                         | :: | 3 locations (From 20+300Km to 23+100Km, From 28+450Km to 30+400Km & From 39+100Km to 41+200Km)                          |
| ➤Built-up areas requiring rigid pavement                                           | :: | 4 Locations (From 0+000Km to 0+450Km, From 15+350Km to 17+000Km, From 26+550Km to 27+350Km & From 32+550Km to 33+050Km) |

### **2.1.2 Terrain**

The project road passes through Plain terrain. The topography is mostly rural in nature.

### **2.1.3 Land Use Pattern**

The land use of the project road stretch is mainly road side plantation, agricultural area. Some of stretches have settlement and residential structures having Rural / semi-urban character.

### **2.1.4 Right of Way (ROW)**

The existing ROW width along the project road has been observed to be around 20m to 30m. However, the existing ROW does not cater to the codal provision of 60m ROW for plain road and hence land is required to be acquired to adhere to the codal provision.

### **2.1.5 Alignment**

The horizontal alignment of the existing road has some sub-standard and sharp curves including reverse S-curves. Also, there is no proper transition length for most of the horizontal curves including the reverse ones to provide for required super elevation reversal for riding safety and comfort. These deficiencies have been corrected in fixing the horizontal alignment for the entire project road to conform to MoRT&H standards.

### **2.1.6 Pavement**

The existing bituminous road surface has been classified into poor, and failed on visual inspection and BBD test. Pavement has been found to poor with absolutely cracking, raveling, rutting and potholes almost the full stretch and some proportion DBM and WBM layer fully exposed. Existing pavement thickness has been found to vary from 60 mm to 1000 mm. The detailed of existing pavement thickness from trial pit is given on **Appendix to Main Report**.

### **2.1.7 Roadway Drainage**

The project section is in predominantly plain terrain. Side drains are almost non-existent throughout the project road which cause major drainage problem on the existing stretch, hence proper drainage system has to be developed during up gradation of the project stretch.

### **2.1.8 Traffic**

The Traffic on the road is mixed in character. As per the traffic survey conducted as a part of this Feasibility Report

**On basis of base year (2015) traffic,**



BASE YEAR TRAFFIC ON NH-127B + DIVERTED TRAFFIC FROM NH-31+DIVERTED TRAFFIC FROM NH-31C

Motorized Vehicles in no = 5214

Total PCU per day = 9523

Total CVPD = 1794

**After 15years of design life of the road (2034)**

TRAFFIC ON NH-127B + DIVERTED TRAFFIC FROM NH-31+DIVERTED TRAFFIC FROM NH-31C

Motorized Vehicle in no = 13176

Total PCU per day = 24064

Total CVPD = 4534

As the road is newly declared NH, no data related to traffic could be made available. Traffic Surveys covering all aspects as per TOR have been carried out. The detailed report has been presented in **Chapter 6**. However, as and when the road is completed, more volume of traffic is expected to be using this road for connecting between two state Meghalaya and Assam by proposed bridge over Brahmaputra at Dhubri.

### **2.1.9 Topographic Survey**

Topographic Survey of the entire road stretch under report has been carried out following the stipulations in the TOR as well as to meet the requirements of the relevant Codes and Manual.

GPS stations were established at suitable locations on the project road, based on which traverse stations were fixed on the road side embankment to capture Topographic Survey data for developing the geometric features of the existing road. Details of GPS, Traverse stations etc. has been submitted with Draft Feasibility Report.

### **2.1.10 Road Geometrics**

The formation width of the existing road is 4.70m to 9.00m throughout the road section. The carriageway width is generally 3.70m to 6.00m. The geometric of existing alignment was reviewed based on survey drawing and data showing the existing road alignment and it is revealed that horizontal alignment and vertical profile at most of the places are deficient in geometrics. Deficient horizontal curves have been revised to ruling 100kmph and minimum of 80kmph as per codal provisions. In some cases, the speed is reduced to 65kmph.

Vertical profile has been designed keeping the sub grade formation as per codal provision. Deficient vertical curves have been smoothened out at the intersections of different grades to ease off changes in gradients for the fast-moving vehicles.

### 2.1.10 Typical Cross Section Details

| Package | Proposed Chainage |       | Length (m) | TCS      | TCS Details                                                                                                             |
|---------|-------------------|-------|------------|----------|-------------------------------------------------------------------------------------------------------------------------|
|         | From              | To    |            |          |                                                                                                                         |
| I       | 0                 | 420   | 420        | TCS -1B  | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (With New Sub-Grade)                   |
|         | 420               | 1780  | 1360       | TCS - 5A | 4-Lane Carriageway for flexible pavement with Both side RE Wall & Service Road                                          |
|         | 1780              | 10900 | 9120       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
| II      | 10900             | 12700 | 1800       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 12700             | 14650 | 1950       | TCS-1A   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (dismantling upto Existing GSB Layer ) |
|         | 14650             | 15550 | 900        | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 15550             | 17000 | 1450       | TCS-4A   | Reconstruction of 4-Lane carriageway Rigid Pavement with both side Drain (dismantling upto Existing GSB Layer )         |
|         | 17000             | 20300 | 3300       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 20300             | 23050 | 2750       | TCS - 3  | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |
|         | 23050             | 23200 | 150        | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 23200             | 23550 | 350        | TCS-1B   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (with New Sub-Grade)                   |
|         | 23550             | 26705 | 3155       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 26705             | 27226 | 521        | TCS-4B   | Reconstruction of 4-Lane carriageway Rigid Pavement with both side Drain (with New Sub-Grade)                           |
|         | 27226             | 27650 | 424        | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
| III     | 27650             | 27870 | 220        | TCS-1B   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (with New Sub-Grade)                   |
|         | 27870             | 28450 | 580        | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 28450             | 30350 | 1900       | TCS-3    | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |

| Package | Proposed Chainage |       | Length (m) | TCS      | TCS Details                                                                                                             |
|---------|-------------------|-------|------------|----------|-------------------------------------------------------------------------------------------------------------------------|
|         | From              | To    |            |          |                                                                                                                         |
|         | 30350             | 34300 | 3950       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 34300             | 34450 | 150        | TCS-1B   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (with New Sub-Grade)                   |
|         | 34450             | 34645 | 195        | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 34645             | 36070 | 1425       | TCS - 5A | 4-Lane Carriageway for flexible pavement with Both side RE Wall & Service Road                                          |
|         | 36070             | 36500 | 430        | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         |                   |       |            |          |                                                                                                                         |
| IV      | 36500             | 36900 | 400        | TCS-1A   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (dismantling upto Existing GSB Layer ) |
|         | 36900             | 39150 | 2250       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 39150             | 39370 | 220        | TCS-3    | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |
|         | 39370             | 40700 | 1330       | TCS-5B   | 4-Lane Carriageway for flexible pavement with Both Side RE Wall                                                         |
|         | 40700             | 41250 | 550        | TCS - 5A | 4-Lane Carriageway for flexible pavement with Both side RE Wall & Service Road                                          |
|         | 41250             | 42550 | 1300       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 42550             | 43300 | 750        | TCS-3    | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |
| V       | 43300             | 45650 | 2350       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 45650             | 46350 | 700        | TCS-3    | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |
|         | 46350             | 47750 | 1400       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 47750             | 48400 | 650        | TCS-3    | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |
|         | 48400             | 49400 | 1000       | TCS - 5A | 4-Lane Carriageway for flexible pavement with Both side RE Wall & Service Road                                          |
|         | 49400             | 51590 | 2190       | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 51590             | 52000 | 410        | TCS-7    | New construction of 4-Lane carriageway for flexible Pavement with High Embankment                                       |
|         | 52000             | 53550 | 1550       | TCS-6    | New construction of 4-Lane carriageway for flexible Pavement with Both Side Service Road & Retaining Wall.              |

| Package | Proposed Chainage |       | Length (m) | TCS   | TCS Details                                                                       |
|---------|-------------------|-------|------------|-------|-----------------------------------------------------------------------------------|
|         | From              | To    |            |       |                                                                                   |
|         | 53550             | 54154 | 604        | TCS-7 | New construction of 4-Lane carriageway for flexible Pavement with High Embankment |

## 2.1.12 BRIDGES AND CULVERTS

### 2.1.12.1 Introduction

Bridges, culverts form a vital link between the road sections and are basic infrastructure elements in any highway network. Hence it is imperative that they are carefully planned, adequately designed, constructed qualitatively and regularly and meticulously maintained, both for safety of the Highway users and also to retain the viability of the Highway. Bridges, in India, are categorized as follows:

Major Bridge : Total length exceeding 60 m

Minor Bridge : Total length upto 60 m, but exceeding 6 m

Culverts : C D Works of length upto 6 m.

H L Bridge : Bridges with the minimum vertical clearance above design HFL

Submersible Bridge : Bridges designed to cater to normal flow, but submerged under flood conditions

The main focus of this section of consultancy is:

- ✓ To make an inventory of the existing structures and assess their condition,
- ✓ Identify the existing structures that have to be abandoned, that can be upgraded and retained as per the latest design standards and loading requirements of the traffic, present and projected,
- ✓ Identify locations where new structures will be required.

### 2.1.12.2 Bridges

There are 9 Nos. of bridges in the project stretch out of which 1 no minor bridge locations has been omitted due to realignment. 3 nos of existing minor bridges (Including 2nos wooden bridges) have been proposed for reconstruction, while widening with new 2 lane bridge 5 Nos. (4 nos. Minor Bridge+1 no. Major Bridge) has been proposed. Additional 4 no new minor bridges have been included in the project road considering smooth traffic flow & safety issue, 1no VUP, 2nos LVUP & 3 nos. ROB is also proposed.

**List of omitted bridges due to realignment**

| Sl No. | Existing Chainage (km) | Existing          |                             |                                  |
|--------|------------------------|-------------------|-----------------------------|----------------------------------|
|        |                        | Type of Water Way | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) |
| 1      | 29.200                 | Nala              | RCC Slab Bridge             | 2 x 12m                          |

● **Details of Minor bridges with additional two lane: 5 Nos.**

| Sl No. | Survey Chainage (km) | Proposed Chainage (km) | Existing          |                             |                                  | Proposal                    |                               |
|--------|----------------------|------------------------|-------------------|-----------------------------|----------------------------------|-----------------------------|-------------------------------|
|        |                      |                        | Type of Water Way | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) | Type of Structures (Bridge) | Span Arrangement (No.xSpan) m |
| 1      | 7+300                | 7+241                  | Open Land         | Bridge(RCC Box)             | 4x4m                             | Minor Bridge                | Box Bridge 4mx4.066m x 4cell  |
| 2      | 24+400               | 23+999                 | Nala              | RCC Slab Bridge             | 2 nos. x 12m span                | Minor Bridge                | 2x 12m (Integral Slab)        |
| 3      | 31+500               | 30+408                 | Nala              | Bridge (T-Beam Girder)      | 1 x 19.6m                        | Minor Bridge                | 1x 21m (T-Beam)               |
| 4      | 44+000               | 43+010                 | Open Land         | (RCC Box)                   | 4.0X3.0X2.0                      | Minor Bridge                | Box Bridge 4mx3m x 2cell      |
| 5      | 45+800               | 44+645                 | Water Logged      | Bridge (PSC T-Beam Girder)  | 40.80m                           | Minor Bridge                | 1x 41m (PSC)                  |

● **Details of Minor bridges New Construction: 4 Nos.**

| Sl No. | Survey Chainage (km) | Proposed Chainage (km) | Existing         |                             |                                 | Proposal                    |                               |
|--------|----------------------|------------------------|------------------|-----------------------------|---------------------------------|-----------------------------|-------------------------------|
|        |                      |                        | Type of WaterWay | Type of Structures (Bridge) | Span Arrangement (No.xSpan) (m) | Type of Structures (Bridge) | Span Arrangement (No.xSpan) m |
| 1      |                      | 21+140                 | Gadadhar Rvier   |                             |                                 | Minor Bridge                | 2x 18m (T-Beam)               |
| 2      |                      | 21+871                 | Gadadhar Rvier   |                             |                                 | Minor Bridge                | 2x 18m (T-Beam)               |
| 3      |                      | 28+974                 | Gadadhar Rvier   |                             |                                 | Minor Bridge                | 2x 24m (T-Beam)               |
| 4      |                      | 30+050                 | Gadadhar Rvier   |                             |                                 | Minor Bridge                | 3x 18m (T-Beam)               |

● **Minor Bridges Reconstruction as 4 lane: 2 Nos.**

| Sl No. | Survey Chainage (km) | Proposed Chainage (km) | Existing          |                                                                   |                                     | Proposal                    |                                 |
|--------|----------------------|------------------------|-------------------|-------------------------------------------------------------------|-------------------------------------|-----------------------------|---------------------------------|
|        |                      |                        | Type of Water Way | Type of Structures (Bridge)                                       | Span Arrangement (No x Span) (m)    | Type of Structures (Bridge) | Span Arrangement (No. x Span) m |
| 1      | 48+750               | 47+286                 | Water Logged      | Wooden Bridge with newly constructed bridge in realigned portion  | Wooden Bridge + 2 x 15 m_RCC T-Beam | Minor Bridge                | 2x 15m (T-Beam)                 |
| 2      | 49+700               | 48+167                 | Water Logged      | Wooden Bridge with newly constructed bridge on existing alignment | Wooden Bridge + 1 x 24 m_RCC T-Beam | Minor Bridge                | 1x 24m (T-Beam)                 |

● **Details of Major bridges with additional 2 lane: 1 No.**

| Sl No. | Proposed Chainage (km) | Existing                |                             |                                  | Proposal                    |                                |
|--------|------------------------|-------------------------|-----------------------------|----------------------------------|-----------------------------|--------------------------------|
|        |                        | Type of Water Way       | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) | Type of Structures (Bridge) | Span Arrangement (No x Span) m |
| 1      | 51+536                 | Redundant part of River | (T-Beam Girder)             | 2 span 42m                       | Major Bridge                | 2x 41m (PSC)                   |

● **Vehicular Underpass/Light Vehicular Underpass**

3 Vehicular Underpass and 1 Light Vehicular Underpasses are proposed at the following locations mentioned below.

**Location of Vehicular/Light Vehicular Underpass (VUP/LVUP)**

| Sl. No. | Design Chainage (km) | Type of Structure | Span Arrangement (No. x Span) m |
|---------|----------------------|-------------------|---------------------------------|
| 1       | 39.700               | VUP               | 1x15m (Integral Slab)           |
| 2       | 48.810               | VUP               | 1x15m (Integral Slab)           |
| 3       | 52.353               | VUP               | 1x15m (Integral Slab)           |
| 4       | 53.191               | LVUP              | 1x15m (Integral Slab)           |

## ● Road Over Bridges(ROB)

3nos. ROB is proposed at the following location mentioned below.

### Location of ROB

| Sl. No. | Design Chainage (km) | Type of Structure        | Span Arrangement (No. x Span) m                           |
|---------|----------------------|--------------------------|-----------------------------------------------------------|
| 1       | 1.044                | ROB                      | 3 x 36m RDSO + 1 x 72m BOWSTRING + 3 x 36m RDSO           |
| 2       | 35.355               | ROB                      | 1X24 T-BEAM+(1X24+1X36+1X24) COMPOSITE+1X24 T-BEAM        |
| 3       | 40.637               | ROB With grade separator | 1X21_TBEAM+1X72.M_BOW STRING+(2X36) COMPOSITE+1X24_T BEAM |

### 2.1.12.3 Culverts

#### a) Types of Existing Structures

There are 55 nos. of existing culverts out of which 28 nos. are Pipe culverts, 1 no. is RCC Box culvert, 25 nos. are RCC slab culverts, and 1 no. Remaining culverts is fully choked. Reconstruction has been proposed for 49 no. existing culverts and additional 69 no. new culverts are also proposed in the project road.

#### Width of Carriageway:

From inventory survey of culverts (**Appendix to Main Report**) it appears that all culverts do not have sufficient width to satisfy the minimum codal stipulations. These culverts will require reconstruction to make them suitable for 2-lane standards as per typical cross section of roads.

#### b) Linear waterway and Clearance:

The data collected from the site reveals that most of the existing cross drainage structures possess inadequate waterway and available clearance is less than codal stipulations.

#### c) Condition of Structure:

The conditions of all culverts are generally poor and have been proposed for reconstruction. The condition of structural concrete in Pipe, Deck slab, RR Masonry, RR Masonry/PCC in substructure and foundation was found to be poor to bad and the following distress observed during inspection.

- Most of the culverts have served the service life.
- Protection work is not observed in any culvert.

➤ In many cases, condition of parapet wall is fair to poor.

The Inventory and Condition Survey of Culverts were generally carried as stipulated in IRC SP:35. The observation made has been presented in tabular form in **Appendix to Main Report**.

#### d) Design Standard Culverts:

The Indian Road Congress (IRC) codes shall be the basis for design of culverts.

Grade of concrete for superstructure shall be as per MORT&H specifications and IRC standard. The grade shall be M 25 for Box culvert.

In substructure & foundation, grade of concrete shall not be lower than M 20.

Total width of culvert will be different from road width i.e. total width of road is 14m including shoulder and total width of culvert is 16m. Safety kerbs including parapet will be provided as 500 mm on either side.

The deck will have 2.50% camber/cross fall on either side as shown and the wearing course will be uniform thickness of 65 mm mastic and asphalt concrete. It is proposed to provide this cross fall by suitably adjusting thickness of capping beams in case of deck slab without bearings.

In general, it has been observed during the condition study, the open type foundation for the existing culverts have not suffered any distress even after more than 20 years of service and accordingly open type foundations are proposed for new culverts.

#### e) Planning of new culverts:

It is revealed from the Inventory & Condition Survey for culverts that provisions of culverts are much less than required. Details of the existing culvert & their development proposals are given as below.

##### Details of Existing Culverts

| SI No. | Package   | Existing Chainage(km) | Type of Structures (Pipe/Slab/Box/Arch) | Span Arrangement (No. x Length) (m) | Width of Culvert (m) |
|--------|-----------|-----------------------|-----------------------------------------|-------------------------------------|----------------------|
| 1      | Package-1 | 1.943                 | SC                                      | 1 X 2.0                             | 5.600                |
| 2      |           | 2.997                 | HP                                      | 3 Nos. 1000 Dia                     | 12.900               |
| 3      |           | 3.384                 | SC                                      | NOT VISIBLE                         | 5.600                |
| 4      |           | 4.325                 | SC                                      | NOT VISIBLE                         | 5.700                |
| 5      |           | 4.328                 | HP                                      | 2 Nos.1000 Dia                      | 10.000               |
| 6      |           | 5.768                 | HP                                      | 2 Nos. 1000 Dia                     | 9.700                |
| 7      |           | 6.080                 | HP                                      | 2 Nos. 1000 Dia                     | 9.900                |
| 8      |           | 6.231                 | HP                                      | 2 Nos. 1000 Dia                     | 7.700                |



| SI No. | Package   | Existing Chainage(km) | Type of Structures (Pipe/Slab/Box/Arch) | Span Arrangement (No. x Length) (m) | Width of Culvert (m) |
|--------|-----------|-----------------------|-----------------------------------------|-------------------------------------|----------------------|
| 9      |           | 6.731                 | HP                                      | 2 Nos. 1000 Dia                     | 10.000               |
| 10     |           | 6.735                 | HP                                      | 2 Nos. 1000 Dia                     | 7.200                |
| 11     |           | 7.860                 | SC                                      | 1 X 1.7                             | 6.800                |
| 12     |           | 8.068                 | HP                                      | 2 Nos.1000 Dia                      | 7.200                |
| 13     | Package-2 | 10.921                | HP                                      | 1 No. 1000 Dia                      | 9.800                |
| 14     |           | 11.838                | HP                                      | 2 Nos. 800 Dia                      | 10.200               |
| 15     |           | 12.170                | SC                                      | 1 X 1.5                             | 8.400                |
| 16     |           | 12.248                | HP                                      | 2 Nos.1000 Dia                      | 10.300               |
| 17     | Package-2 | 12.745                | HP                                      | 2 Nos.1000 Dia                      | 10.300               |
| 18     |           | 12.922                | HP                                      | 2 Nos. 1000 Dia                     | 10.300               |
| 19     |           | 13.825                | SC                                      | 1 X 1.3                             | 8.200                |
| 20     |           | 14.814                | SC                                      | 1 X 0.7                             | 6.500                |
| 21     |           | 16.288                | SC                                      | 1 X 2.3                             | 7.400                |
| 22     |           | 16.447                | SC                                      | 1 X 1.0                             | 8.900                |
| 23     |           | 17.816                | SC                                      | 1 X 2.1                             | 12.800               |
| 24     |           | 21.436                | SC                                      | 1 X 1.2                             | 10.300               |
| 25     |           | 25.545                | HP                                      | 1 No. 600 Dia                       |                      |
| 26     |           | 25.763                | SC                                      | 1 X 0.8                             | 10.800               |
| 27     |           | 26.538                | SC                                      | 1 X 0.9                             | 11.100               |
| 28     |           | 27.181                | SC                                      | 1 X 0.9                             | 8.200                |
| 29     | Package-3 | 27.895                | HP                                      | 1 Nos. 800 Dia                      | 12.400               |
| 30     |           | 28.270                | SC                                      | 1 x 0.8                             |                      |
| 31     |           | 32.181                | BC                                      | 1X2.0X1.5                           | 10.400               |
| 32     |           | 32.743                | HP                                      | 1 Nos. 800 Dia                      | 10.000               |
| 33     |           | 33.849                | SC                                      | 1 X 0.9                             | 5.600                |
| 34     |           | 34.548                | SC                                      | 1 X 0.9                             | 6.300                |
| 35     |           | 34.643                | SC                                      | 1 X 1.0                             | 10.600               |
| 36     | Package-4 | 37.191                | HP                                      | 1 Nos. 1000 Dia                     | 10.000               |
| 37     |           | 38.435                | HP                                      | 1 Nos. 800 Dia                      | 10.100               |
| 38     |           | 39.973                | HP                                      | 1 Nos. 900 Dia                      | 10.100               |
| 39     |           | 40.379                | SC                                      | 1 X 1.3                             | 9.400                |
| 40     |           | 41.792                | SC                                      | 1 X 1.5                             | 5.70                 |
| 41     |           | 42.904                | HP                                      | 1 Nos. 1000 Dia                     | 9.30                 |
| 42     |           | 43.195                | HP                                      | 2 Nos. 800 Dia                      | 7.80                 |
| 43     | Package-5 | 43.983                | SC                                      | 1 X 2.8                             | 5.50                 |
| 44     |           | 44.502                | SC                                      | 1 X 1.5                             | 5.50                 |
| 45     |           | 44.688                | SC                                      | 1 X 1.5                             | 5.30                 |
| 46     |           | 44.936                | SC                                      | 1 X 3.0                             | 5.50                 |
| 47     |           | 46.041                | SC                                      | 1 X 2.5                             | 5.60                 |
| 48     |           | 46.081                | HP                                      | 1 Nos. 800 Dia                      | 10.30                |

| SI No. | Package | Existing Chainage(km) | Type of Structures (Pipe/Slab/Box/Arch) | Span Arrangement (No. x Length) (m) | Width of Culvert (m) |
|--------|---------|-----------------------|-----------------------------------------|-------------------------------------|----------------------|
| 49     |         | 47.666                | HP                                      | 1 Nos. 800 Dia                      | 9.60                 |
| 50     |         | 50.849                | FULLY CHOCKED                           |                                     |                      |
| 51     |         | 49.473                | HP                                      | 1 Nos. 800 Dia                      | 10.30                |
| 52     |         | 50.090                | HP                                      | 2 Nos. 1000 Dia                     | 10.60                |
| 53     |         | 51.329                | HP                                      | 1 Nos. 900 Dia                      | 9.90                 |
| 54     |         | 51.455                | HP                                      | 1 Nos. 900 Dia                      | 10.20                |
| 55     |         | 51.326                | HP                                      | 1 Nos. 900 Dia                      |                      |

**Details of Proposed culverts in project road**

**Reconstruction:**

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 1      | Package-1 | 1.946              | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 2      |           | 2.992              | HP Culvert                                          | 4Lane | Box with SE | 1 X 3.0M X 3.0M |
| 3      |           | 3.378              | Slab Culvert                                        | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 4      |           | 4.322              | Slab Culvert                                        | 4Lane | Box with SE | 1 X 3.0M X 3.0M |
| 5      |           | 5.760              | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 6      |           | 6.059              | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 7      |           | 6.221              | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 8      |           | 6.723              | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 9      |           | 7.850              | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 10     |           | 8.058              | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 11     | Package-2 | 10.909             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 12     |           | 11.825             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 13     |           | 12.099             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 14     |           | 12.177             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 15     |           | 12.675             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 16     |           | 12.851             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 17     |           | 13.800             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 18     |           | 14.837             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 19     |           | 16.310             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 3.0M X 2.0M |
| 20     |           | 16.469             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 21     |           | 17.538             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 22     |           | 25.156             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 23     |           | 25.374             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 24     |           | 26.147             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 25     |           | 26.785             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 26     |           | 27.494             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 27     | Package-3 | 27.870             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 28     |           | 31.339             | Box Culvert                                         | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 29     |           | 31.902             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 30     |           | 33.013             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 31     |           | 33.717             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 32     |           | 33.809             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 33     |           | 36.382             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 34     | Package-4 | 37.626             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 35     |           | 39.172             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 36     |           | 39.505             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 37     |           | 42.191             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 38     |           | 42.482             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 39     |           | 43.268             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 3.0M X 3.0M |
| 40     | Package-5 | 43.788             | Slab Culvert                                        | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 41     |           | 43.974             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 42     |           | 44.222             | Slab Culvert                                        | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 43     |           | 45.325             | Slab Culvert                                        | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 44     |           | 45.370             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 45     |           | 46.856             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 46     |           | 49.250             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 47     |           | 50.485             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 48     |           | 50.611             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |

**New Construction:**

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 1      | Package-1 | 0.350              | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 2      |           | 2.300              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 3      |           | 2.550              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 4      |           | 2.800              | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 5      |           | 3.530              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 6      |           | 3.835              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 7      |           | 4.475              | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 8      |           | 4.800              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 9      |           | 4.950              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 10     |           | 5.400              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 11     |           | 6.450              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 12     |           | 6.940              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 13     |           | 7.600              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 14     |           | 8.450              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 15     |           | 8.700              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 16     |           | 8.950              | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 17     |           | 9.229              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 18     |           | 9.850              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 19     |           | 10.250             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 20     |           | 10.500             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 21     | Package-2 | 11.220             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 22     |           | 11.550             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 23     |           | 12.450             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 24     |           | 13.390             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 25     |           | 14.300             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 26     |           | 14.650             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 27     |           | 15.483             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 28     |           | 15.980             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 29     |           | 17.020             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 30     |           | 17.573             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 31     | Package-2 | 18.050             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 32     |           | 18.250             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 33     |           | 18.650             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 34     |           | 19.000             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 35     |           | 19.300             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 36     |           | 19.650             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 37     |           | 20.000             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 38     |           | 20.450             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 39     |           | 20.750             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 40     |           | 20.882             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 41     |           | 21.425             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 42     |           | 21.675             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 43     |           | 22.250             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 44     |           | 22.575             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 45     |           | 22.900             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 46     |           | 23.220             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 47     |           | 23.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 48     |           | 23.800             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 49     |           | 24.100             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 50     |           | 24.450             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 51     |           | 24.900             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 52     |           | 25.600             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 53     |           | 25.930             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 54     |           | 26.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 55     | Package-3 | 28.170             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 56     |           | 28.525             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 57     |           | 29.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 58     |           | 29.750             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 59     |           | 30.800             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 60     |           | 30.925             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 61     |           | 31.625             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 62     |           | 32.150             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 63     |           | 32.450             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 64     |           | 32.870             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 65     |           | 33.450             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 66     |           | 34.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 67     |           | 36.150             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 68     | Package-4 | 36.750             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 69     |           | 37.150             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 70     | Package-4 | 38.000             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 71     |           | 38.350             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 72     |           | 38.550             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 73     |           | 38.850             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 74     |           | 39.795             | Balancing                                           | 4Lane | Box         | 1 X 3.0M X 4.0M |
| 75     |           | 40.250             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 76     |           | 41.083             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 77     |           | 41.400             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 78     |           | 41.800             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 79     |           | 42.605             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X3.0M  |
| 80     |           | 42.810             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X2.0M  |
| 81     | Package-5 | 43.650             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 82     |           | 45.094             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 83     |           | 45.825             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 84     |           | 46.200             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 85     |           | 46.490             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 86     |           | 47.500             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 87     |           | 47.750             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 88     |           | 47.950             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 89     |           | 48.390             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 90     |           | 49.630             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 91     |           | 50.100             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 92     |           | 50.900             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 93     |           | 52.030             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 94     |           | 52.600             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 95     |           | 52.930             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 96     |           | 53.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 97     |           | 53.736             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 98     |           | 53.976             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |

**Culvert on Road B (Package-4)**

|   |       |           |        |     |                            |
|---|-------|-----------|--------|-----|----------------------------|
| 1 | 39.50 | Balancing | 2-Lane | Box | 2mx3m x1cell with 4.54M EC |
|---|-------|-----------|--------|-----|----------------------------|

|   |       |           |        |             |                             |
|---|-------|-----------|--------|-------------|-----------------------------|
| 2 | 39.80 | Balancing | 2-Lane | Box         | 3mx4m x1cell with 4.932M EC |
| 3 | 40.19 | Balancing | 2-Lane | Box with SE | 2mx3m x1cell with 2.119M EC |

**Culvert on Road C(Package-4)**

|   |        |           |        |     |                             |
|---|--------|-----------|--------|-----|-----------------------------|
| 4 | 39.500 | Balancing | 2-Lane | Box | 2mx3m x1cell with 4.546M EC |
| 5 | 39.800 | Balancing | 2-Lane | Box | 3mx4m x1cell with 4.932M EC |
| 6 | 40.310 | Balancing | 2-Lane | Box | 2mx3m x1cell with 5M EC     |

**Types of Structures proposed in NH-127B**

| Structure Type           | Existing structure | Proposed Structure |
|--------------------------|--------------------|--------------------|
| VUP                      | 0                  | 3                  |
| LVUP                     | 0                  | 1                  |
| ROB with Grade Separator | 0                  | 0                  |
| ROB                      | 0                  | 3                  |
| Major                    | 1                  | 1                  |
| Minor                    | 9                  | 11                 |
| Culverts                 | 55                 | 152                |
| Total                    | 65                 | 171                |

**f) Span Arrangement and Type of structure:**

Considering the large number of culverts, a modular approach has been adopted wherein span lengths and heights of the substructure for the culverts and the culvert openings have been standardized which will substantially reduce the cost of construction.

**g) Conclusions from Inventory and Condition Study (Bridges / ROB)**

The data collected from the inventory shows that all major, minor bridges are bad condition, so reconstruction is to be proposed for all type of bridges. No ROB exists in the entire stretch.

**i) Minor Repairs**

Some of the existing bridges/culverts are required for repairing work. The retained structures are required to undergo some minor repairing works like repairing in railing & kerb, cleaning the drainage spouts, plastering, painting etc. However, it is to be provided case to case basis. In addition, few structures on existing corridor are also required minor repairing works to serve till the construction of the project stretch commence

**j) Major Repairs**

No major repairing works is proposed.

**k) Demolition / New construction:**

If found structurally / functionally or both ways unsound or inadequate, the structure needs be

demolished and new structure is to be constructed in replacement.

### **I) Design Standards**

The Indian Road Congress (IRC) codes shall be the basis of design of Culverts, Bridges, underpasses, flyovers and ROBs. For items not covered in the above, provisions of Special Publications and Specification for Roads and Bridges published by IRC shall be followed. Various codes of IS, BS/AASHTO and other national codes in this order of precedence shall be used for further reference. Moderate Exposure condition has been considered.

Grades of concrete for superstructure shall be as per MOSRT&H specification and IRC standard plans for Highway Bridges. The grade of concrete for different structure will be as follows:

PSC Box : M45 Integral Slab : M30 PSC T-Girder : M45 Box Bridge : M30 RC T-Girder : M30

The width of the bridges will be as follows:

#### **A. Reconstruction/ New construction:**

Total width = 16.0 m( carriageway width = 11.00m, footpath= 1.5m either side, crash barrier = 0.5m either side , kerb+ railing= 0.5m either side).

#### **B. Existing Bridge is retained, additional 2 lane bridge is proposed:**

Total width = 12.50 m( carriageway width = 9.5m, footpath= 1.5m one side, crash barrier = 0.5m either side, kerb+ railing= 0.5m on side).

#### **C. VUP:**

Total width = 12.0m (Carriageway width = 11.0m, crash barrier = 0.5m on either side).

Locations of new Minor Bridges will generally be guided by the alignment of the Highway. But, for major bridges, bridge location and its alignment shall over ride the Highway requirement in that portion.

On grounds of economy and smooth ride, wherever possible for the new bridges the layout of the existing bridges/culverts having number of small spans will be modified by decreasing the number of spans, maintaining pier parallel and in line with those of the existing structures.

The deck will have 2.5% bidirectional camber/cross fall and the wearing course will be uniform thickness of 25 mm Mastic and 20 mm BC in 2 layers. It is proposed to provide this cross fall by suitably adjusting pedestal heights or thickness of capping beams in case of deck slab without bearings.

In general Pile Foundations will be adopted for bridges, however in general pile foundations will be



adopted for bridges, however this foundation proposal will be finalized based on Geotechnical Investigation Report.

**m) Planning of New Structures:**

- Planning for new Bridges and Structures, in general, and for the present study in particular, invites attention of the under mentioned criteria.
- Proper crossing of Bridge and alignment and approaches
- Liner waterway and min. vertical clearance
- Satisfactory geological conditions
- Matching with existing structures, both in respect of span arrangement and formation levels
- Minimum distance from the existing structure consistent with construction requirements and also hydraulic consideration.
- Modular approach in Design of both superstructure and sub-structure
- Minimum number of spans consistent with Road Deck levels and minimum vertical clearance above Design HFL
- Lastly, but not of least importance, Economy consistent with optimum construction time, quality assurance, environmental and aesthetic requirements.
- But of the aforesaid criteria, the most vital for this project is that since existing and new corridors run parallel and adjacent to each other, the linear waterways and span arrangements should match with each other. At widening locations, the new bridges have been proposed at a distance of 15m to avoid any overlapping in foundation. Hence span arrangements for all new structures are compatible with very micro adjustments to suit the concept of modular design approach.
- None of the Bridges has shown any foundation problem by way of tilting or settlement which amply proves the adequacy of the foundation bearing structure geologically. Hence, similar types of foundations are tentatively suggested for the corresponding new bridges. Geology can vary at even very small distances and depths, and as a basic pre- requisite. Boring will be done for all bridges as per IRC, MOSRT&H and TOR guidelines. Tentative boring plans have already been finalized as per requisite standards and soil investigation completed accordingly.

**2.1.13 Junction Improvement**



The existing project road has a number of junctions mainly with village roads. Junctions have been classified into “Major” and “Minor” junctions according to functional importance and future prospects. At most of “Major” junctions channelized at-grade junction improvement has been proposed. Traffic island and rotary have been provided wherever necessary to channelize flow of traffic and minimize collision points and increase road safety. There are 2 nos. major junctions in the project road, among them 1 no location is proposed to be improved at grade and improvement of other location is done with a provision of 1 no ROB with grade separator of span 1x18m T-Beam + 4x36m RDSO +1x16m T-Beam at the following locations in the table below.

| SI No | Package   | Existing Chainage (Km) | Proposed Chainage (Km) | Type     | Location                                | Improvement Proposal                                            |
|-------|-----------|------------------------|------------------------|----------|-----------------------------------------|-----------------------------------------------------------------|
| 1     | Package-1 | 0                      | 0                      | 4-legged | Intersection With NH-31C & Village Road | At-grade 4-Legged Junction with turning radius, traffic islands |
| 2     | Package-4 | 42.25                  | 40.600                 | 3-legged | Intersection with NH-31                 | ROB at Ch. 40.600 km                                            |

#### 2.1.14 Service Roads

Service Roads have been proposed in the project stretch. The details of the service road are given below.

##### Details of Service Road

| Sl. No.                      | Package   | Design Chainage(m) |       | Length (m) | Both Sides | Net Length (m) |
|------------------------------|-----------|--------------------|-------|------------|------------|----------------|
|                              |           | From               | To    |            |            |                |
| 1                            | Package-1 | 420                | 1780  | 1360       | 2          | 2720           |
| 2                            | Package-3 | 34645              | 36070 | 1425       | 2          | 2850           |
| 3                            | Package-4 | 40700              | 41250 | 550        | 2          | 1100           |
| 4                            | Package-5 | 48400              | 49400 | 1000       | 2          | 2000           |
| 5                            |           | 52000              | 53550 | 1550       | 2          | 2500           |
| Total Length of Service Road |           |                    |       |            |            | 11170          |

#### 2.1.15 Footpath and Covered Drains.

Provision of footpath with cover drain has been proposed in built up area. The cover drain is proposed on both side of the project road. Details of the cover drain are given below.

##### Both Side Covered Drain (Main Road):

| Package   | Chainage (m) |     | Side | Length(m) |
|-----------|--------------|-----|------|-----------|
|           | From         | To  |      |           |
| Package-1 | 0            | 420 | Both | 840       |

| Package   | Chainage<br>(m) |       | Side          | Length(m)    |
|-----------|-----------------|-------|---------------|--------------|
|           |                 |       |               |              |
| Package-2 | 12700           | 14650 | Both          | 3900         |
|           | 15550           | 17000 | Both          | 2900         |
|           | 23200           | 23550 | Both          | 700          |
|           | 26705           | 27226 | Both          | 1042         |
| Package-3 | 27650           | 27870 | Both          | 440          |
|           | 34300           | 34450 | Both          | 300          |
| Package-4 | 36500           | 36900 | Both          | 800          |
|           |                 |       | <b>Total=</b> | <b>10922</b> |

**Covered Drain for Service Road:**

| Package   | Chainage<br>(m) |       | LENGTH      | BOTH SIDE LENGTH |
|-----------|-----------------|-------|-------------|------------------|
|           | From            | To    |             |                  |
| Package-1 | 420             | 1780  | 1360        | 2720             |
| Package-3 | 34645           | 36070 | 1425        | 2850             |
| Package-4 | 40700           | 41250 | 550         | 1100             |
| Package-5 | 48400           | 49400 | 1000        | 2000             |
| TOTAL     |                 |       | <b>4335</b> | <b>8670</b>      |

**Total Length of the Cover Drain= 17924 m (both side)**

**2.1.16 Road Markings/Signed/Road Furniture**

Retro-reflective signed as per IRC standard mounted on post or overhead gantry, required for safety and traffic control will be provided at suitable locations. Thermoplastic road markings, road studs, delineators, crash barriers etc. will be provided at required locations to ensure adequate safety of the road users.

**2.1.17 Bus Bay**

Bus Bay with passenger shelter is provided near village area at 9 locations (both side) in the project road. The details of Bus Bay locations are given below

**Location of Proposed Bus Bay**

| Sl no | Package   | Design chainage (km) | Side |
|-------|-----------|----------------------|------|
| 1     | Package-1 | 9+300                | Both |
| 2     | Package-2 | 12+350               | Both |
| 3     |           | 18+300               | Both |
| 4     |           | 22+450               | Both |
| 5     | Package-3 | 29+300               | Both |
| 6     | Package-4 | 37+650               | Both |
| 7     |           | 38+550               | Both |
| 8     |           | 41+600               | Both |
| 9     | Package-5 | 45+500               | Both |

There is no existing truck lay bye on project road. 1 no Truck lay bye is proposed at location mentioned below.

| Sl No | Package   | Design Chainage (km) | Side |
|-------|-----------|----------------------|------|
| 1     | Package-2 | 14+750               | Both |

### 2.1.18 Protection Work

Proper Retaining Wall has been proposed for road safety issues. The details of Protection work is given below.

#### ➤ Retaining Wall (RCC)

| Retaining Wall (RCC-Height :2m) |         |             |       |      |           |           |
|---------------------------------|---------|-------------|-------|------|-----------|-----------|
| Sl. No.                         | Package | Chainage(m) |       | side | Height(m) | Length(m) |
|                                 |         | From        | To    |      |           |           |
| 1                               | II      | 12210       | 12250 | RHS  | 2.00      | 40        |
| 2                               |         | 12447       | 12487 | RHS  | 2.00      | 40        |
| 3                               |         | 15964       | 15995 | LHS  | 2.00      | 31        |
| 4                               |         | 17321       | 17329 | RHS  | 2.00      | 8         |
| 5                               |         | 17380       | 17424 | RHS  | 2.00      | 44        |
| 6                               |         | 17715       | 17763 | LHS  | 2.00      | 48        |
| 7                               |         | 18038       | 18071 | LHS  | 2.00      | 33        |
| 8                               |         | 19607       | 19638 | RHS  | 2.00      | 31        |
| 9                               |         | 19708       | 19783 | RHS  | 2.00      | 75        |
| 10                              |         | 19779       | 19821 | LHS  | 2.00      | 42        |
| 11                              |         | 19828       | 19886 | RHS  | 2.00      | 58        |
| 12                              |         | 19917       | 19950 | RHS  | 2.00      | 33        |
| 13                              |         | 19940       | 19971 | LHS  | 2.00      | 31        |
| 14                              |         | 20060       | 20076 | LHS  | 2.00      | 16        |
| 15                              |         | 20106       | 20124 | RHS  | 2.00      | 18        |

| Retaining Wall (RCC-Height :2m) |         |             |       |      |           |           |
|---------------------------------|---------|-------------|-------|------|-----------|-----------|
| Sl. No.                         | Package | Chainage(m) |       | side | Height(m) | Length(m) |
| 16                              |         | 22090       | 22140 | RHS  | 2.00      | 50        |
| 17                              |         | 22145       | 22180 | LHS  | 2.00      | 35        |
| 18                              |         | 23440       | 23470 | RHS  | 2.00      | 30        |
| 19                              |         | 23607       | 23672 | LHS  | 2.00      | 65        |
| 20                              |         | 23622       | 23642 | RHS  | 2.00      | 20        |
| 21                              |         | 25100       | 25135 | LHS  | 2.00      | 35        |
| 22                              |         | 25320       | 25360 | LHS  | 2.00      | 40        |
| 23                              |         | 25920       | 25946 | RHS  | 2.00      | 26        |
| 24                              |         | 30298       | 30353 | LHS  | 2.00      | 55        |
| 25                              | III     | 30370       | 30390 | LHS  | 2.00      | 20        |
| 26                              |         | 31030       | 31050 | RHS  | 2.00      | 20        |
| 27                              |         | 32075       | 32110 | LHS  | 2.00      | 35        |
| 28                              |         | 32128       | 32150 | RHS  | 2.00      | 22        |
| 29                              |         | 32250       | 32310 | LHS  | 2.00      | 60        |
| 30                              |         | 33050       | 33080 | RHS  | 2.00      | 30        |
| 31                              |         | 33140       | 33180 | LHS  | 2.00      | 40        |
| 32                              |         | 33360       | 33390 | LHS  | 2.00      | 30        |
| 33                              |         | 34160       | 34182 | LHS  | 2.00      | 22        |
| 34                              |         | 34930.00    | 34998 | RHS  | 2.00      | 68        |
| 35                              |         | 35638.00    | 35674 | LHS  | 2.00      | 36        |
| 36                              |         | 35994.00    | 36016 | RHS  | 2.00      | 22        |
| 37                              | IV      | 37184.00    | 37201 | LHS  | 2.00      | 17        |
| 38                              |         | 37640.00    | 37682 | RHS  | 2.00      | 42        |
| 39                              |         | 37650.00    | 37720 | LHS  | 2.00      | 70        |
| 40                              |         | 37960.00    | 37987 | RHS  | 2.00      | 27        |
| 41                              |         | 38050.00    | 38082 | RHS  | 2.00      | 32        |
| 42                              |         | 38093.00    | 38110 | RHS  | 2.00      | 17        |
| 43                              |         | 38130.00    | 38157 | RHS  | 2.00      | 27        |
| 44                              |         | 38235.00    | 38292 | RHS  | 2.00      | 57        |
| 45                              |         | 38390.00    | 38415 | RHS  | 2.00      | 25        |
| 46                              |         | 38475.00    | 38515 | RHS  | 2.00      | 40        |
| 47                              |         | 39675.00    | 39770 | LHS  | 2.00      | 95        |
| 48                              |         | 41345.00    | 41400 | LHS  | 2.00      | 55        |
| 49                              |         | 41633.00    | 41661 | LHS  | 2.00      | 28        |
| 50                              |         | 42350.00    | 42570 | RHS  | 2.00      | 220       |
| 51                              |         | 42836.00    | 42967 | LHS  | 2.00      | 131       |
| 52                              |         | 43100.00    | 43140 | LHS  | 2.00      | 40        |
| 53                              | V       | 43532.00    | 43550 | RHS  | 2.00      | 18        |
| 54                              |         | 43780.00    | 43808 | RHS  | 2.00      | 28        |

| Retaining Wall (RCC-Height :2m)         |         |             |       |           |           |           |
|-----------------------------------------|---------|-------------|-------|-----------|-----------|-----------|
| Sl. No.                                 | Package | Chainage(m) |       | side      | Height(m) | Length(m) |
| 55                                      |         | 44260.00    | 44318 | RHS       | 2.00      | 58        |
| 56                                      |         | 44550.00    | 44750 | BOTH SIDE | 2.00      | 200       |
| 57                                      |         | 44850.00    | 44990 | BOTH SIDE | 2.00      | 140       |
| 58                                      |         | 45180.00    | 45214 | RHS       | 2.00      | 34        |
| 59                                      |         | 45730.00    | 45750 | LHS       | 2.00      | 20        |
| 60                                      |         | 46014.00    | 46026 | LHS       | 2.00      | 12        |
| 61                                      |         | 46085.00    | 46110 | LHS       | 2.00      | 25        |
| 62                                      |         | 46375.00    | 46400 | LHS       | 2.00      | 25        |
| 63                                      |         | 46795.00    | 46836 | LHS       | 2.00      | 41        |
| 64                                      |         | 46870.00    | 46902 | LHS       | 2.00      | 32        |
| 65                                      |         | 47175.00    | 47305 | RHS       | 2.00      | 130       |
| 66                                      |         | 47650.00    | 47688 | LHS       | 2.00      | 38        |
| 67                                      |         | 47910.00    | 47960 | LHS       | 2.00      | 50        |
| 68                                      |         | 49412.00    | 49437 | RHS       | 2.00      | 25        |
| 69                                      |         | 50060.00    | 50102 | RHS       | 2.00      | 42        |
| 70                                      |         | 50279.00    | 50300 | LHS       | 2.00      | 21        |
| 71                                      |         | 50660.00    | 50690 | LHS       | 2.00      | 30        |
| 72                                      |         | 50744.00    | 50792 | RHS       | 2.00      | 48        |
| 73                                      |         | 51620.00    | 51670 | RHS       | 2.00      | 50        |
| 74                                      |         | 51867.00    | 51909 | RHS       | 2.00      | 42        |
| 75                                      |         | 52628.00    | 52650 | LHS       | 2.00      | 22        |
| 76                                      |         | 52602.00    | 52616 | RHS       | 2.00      | 14        |
| Total-Retaining Wall (RCC- Height:2m) = |         |             |       |           |           | 3377      |

| Retaining Wall (RCC-Height :3.50m)                |         |             |       |      |           |            |
|---------------------------------------------------|---------|-------------|-------|------|-----------|------------|
| Sl. No.                                           | Package | Chainage(m) |       | side | Height(m) | Length(m)  |
|                                                   |         | From        | To    |      |           |            |
| 1                                                 | I       | 26549       | 26950 | LHS  | 3.50      | 401        |
|                                                   |         |             |       |      |           |            |
| <b>Total-Retaining Wall (RCC- Height:3.50m) =</b> |         |             |       |      |           | <b>401</b> |

| <b>Retaining Wall (RCC- Height:6.00m)=</b>        |         |             |       | 155m |           |            |
|---------------------------------------------------|---------|-------------|-------|------|-----------|------------|
| Sl. No.                                           | Package | Chainage(m) |       | side | Height(m) | Length(m)  |
|                                                   |         | From        | To    |      |           |            |
| 1                                                 | III     | 30630       | 30785 | Both | 5         | 155        |
|                                                   |         |             |       |      |           |            |
| <b>Total-Retaining Wall (RCC: Height:6.00m) =</b> |         |             |       |      |           | <b>155</b> |

➤ Reinforced earth Retaining Wall

|                  | Package   | Chainage |               | Length(m)   |
|------------------|-----------|----------|---------------|-------------|
|                  |           | From     | To            |             |
| <b>Main Road</b> | <b>I</b>  | 420      | 1780          | 1360        |
|                  | <b>II</b> | 34645    | 36070         | 1425        |
|                  | <b>IV</b> | 39370    | 40700         | 1330        |
|                  |           | 40700    | 41250         | 550         |
|                  |           | 39370    | 39462         | 92          |
|                  |           | 41094    | 41250         | 156         |
|                  |           |          | <b>Total=</b> | <b>4913</b> |

| At Grade Separator |    |       |        |      |
|--------------------|----|-------|--------|------|
| Road-A1            | IV | 39713 | 39770  | 57   |
|                    |    | 39920 | 40180  | 260  |
| Road-A2            |    | 39715 | 39740  | 25   |
|                    |    | 39990 | 40170  | 180  |
| Road-B             |    | 39370 | 40463  | 1093 |
| Road-C             |    | 39310 | 40621  | 1311 |
|                    |    |       | Total= | 2926 |

➤ Toe Wall

| Sl. No. | Package | Chainage |       | Side | Length(m) |
|---------|---------|----------|-------|------|-----------|
|         |         | From     | To    |      |           |
| 1       | I       | 8700     | 8800  | RHS  | 100       |
| 2       |         | 8700     | 8725  | LHS  | 25        |
| 3       |         | 8908     | 8925  | RHS  | 17        |
| 4       |         | 8950     | 9000  | RHS  | 50        |
| 5       |         | 9111     | 9201  | RHS  | 90        |
| 6       |         | 9100     | 9125  | LHS  | 25        |
| 7       | II      | 11490    | 11551 | RHS  | 61        |
| 8       |         | 15454    | 15500 | RHS  | 46        |
| 9       |         | 20150    | 20200 | RHS  | 50        |
| 10      |         | 24749    | 24890 | RHS  | 141       |
| 11      |         | 24825    | 24890 | LHS  | 65        |
| 12      |         | 24900    | 24925 | LHS  | 25        |
| 13      | III     | 28720    | 28740 | LHS  | 20        |
| 14      |         | 29125    | 29160 | LHS  | 35        |
| 15      |         | 30380    | 30430 | RHS  | 50        |
| 16      |         | 30442    | 30457 | LHS  | 15        |
| 17      |         | 30590    | 30615 | LHS  | 25        |
| 18      |         | 32550    | 32576 | LHS  | 26        |
| 19      |         | 32925    | 33050 | RHS  | 125       |
| 20      |         | 32875    | 32950 | LHS  | 75        |

| Sl. No.         | Package | Chainage |       | Side | Length(m) |
|-----------------|---------|----------|-------|------|-----------|
| 21              |         | 32988    | 33025 | LHS  | 37        |
| 22              |         | 33180    | 33238 | RHS  | 58        |
| 23              |         | 34160    | 34182 | LHS  | 22        |
| 24              | IV      | 52250    | 52324 | RHS  | 74        |
| 25              |         | 52310    | 52350 | LHS  | 40        |
| Total-Toe Wall= |         |          |       |      | 1297      |

Total Length of Toe Wall= 1297 m

#### ➤ Stone pitching with Spur

| Sl. No.               | Package | Chainage(m) |       | side               | Length(m) | No. of Chute Drain @15m c/c |
|-----------------------|---------|-------------|-------|--------------------|-----------|-----------------------------|
|                       |         | From        | To    |                    |           |                             |
| 1                     | II      | 17500       | 19250 | Right (river side) | 1750      | 117                         |
| 2                     |         | 17500       | 19250 | Both               | 3500      | 233                         |
| 3                     |         | 26549       | 26950 | LHS                | 401       | 27                          |
| 4                     | III     | 30630       | 30785 | LHS                | 155       | 10                          |
| 5                     | V       | 51590       | 52000 | Both               | 820       | 55                          |
| 6                     |         | 52000       | 52150 | Both               | 300       | 20                          |
| 7                     |         | 53400       | 53550 | Both               | 300       | 20                          |
| 8                     |         | 53550       | 54154 | Both               | 1208      | 81                          |
| Total-Stone Pitching= |         |             |       |                    |           | 563                         |

Stone pitching with spur has been proposed on Gangadhar River Bank from Chainage 17.500 km to 19.250 km and 53.210 km to 54.523 km to protect the river bank and road embankment.

## 2.2 Soil & Material Investigation:

### 2.2.1 Introduction

The Feasibility Study Report furnishes the report on soil and material survey and investigation work for the proposed road stretch.

The survey & investigation was conducted through site visits, discussions with local PWD officials, collection of representative samples of material, testing of the samples both in the field and laboratory.

The work was done in accordance with the Terms of Reference (TOR) of the project following the guidelines contained in the relevant IRC and BIS Codes. All the field and laboratory tests were conducted by a group of experienced personnel under the guidance of the qualified and experienced Geo-technical and Material engineer. Compilation of soil and material investigation test results is given in Appendix to this Volume.

### 2.2.2 Purpose and Scope

The purpose and scope of the soil and material investigation are as follows:

(a) To determine the characteristics and strength of the sub grade along the existing road as well as along the proposed alignment for 2-laning. The following tests were done:

- In-situ density of the sub grade.
- Field moisture content to determine Field Dry Density.
- DCP (Dynamic Cone Penetration) tests as per TRRL (UK) Road No. 8 to correlate the results of penetration data with field CBR.
- Modified Proctor tests to determine maximum dry density and optimum moisture content of the sub grade soil in the laboratory.
- Classification (grain size and Atterberg Limits) of sub grade soil.
- Laboratory CBR (both un-soaked and 4-day soaked) at three energy levels.

(b) Determination of Pavement Composition i.e. material type and corresponding thickness of different layers / composition of the existing road pavement. The sides of the test pits were cleaned properly and thickness of each individual layers of pavement were measured and recorded in the field.

(c) To evaluate the suitability of borrow material for use in construction of embankment and/or sub grade and locations of borrow areas will be given in FFSR.

The laboratory tests conducted to establish the suitability of the borrow areas are as follows:

- Grain size
- Modified proctor test
- Liquid and plastic limits
- CBR at three energy levels

(d) To locate the quarries and testing of stone aggregate as available to evaluate their suitability for use in construction of Pavement, such as Wet Mix Macadam (WMM), Dense Bituminous Macadam (DBM), Bituminous Concrete and Cement Concrete.

**AGGREGATE & SAND QUARRY**

| SL. | QUARRY   | LOCATION                                                       | MATERIAL AVAILABLE |
|-----|----------|----------------------------------------------------------------|--------------------|
| 1   | Haraputa | 6Km. by road on starting point of the project road (Srirampur) | Crushed Stone      |
| 2   | Haraputa | 6Km. by road on starting point of the project road (Srirampur) | Stone Metal        |



|   |          |                                                         |             |
|---|----------|---------------------------------------------------------|-------------|
| 3 | Koraghat | 26Km. by road on end point of the project road (Dhubri) | Coarse Sand |
|---|----------|---------------------------------------------------------|-------------|

The tests included were as follows:

- Sieve Analysis
- Flakiness and Elongation index
- Specific gravity and water absorption
- Aggregate impact value

Testing of available sand in the close proximity of the existing highway was done for use in bituminous mixtures and cement concrete work. The following tests were done to determine the suitability of fine aggregates:

- Sieve analysis
- Fineness Modulus
- Specific gravity
- Deleterious content

The following field and laboratory tests have been conducted:

- Laboratory Tests of sub grade soil
- Laboratory Tests of borrow pit soil
- Field Density and O.M.C
- Grain Size Distribution Curve
- Atterberg Limits
- Modified Proctor Test
- Dynamic Cone Penetration Test
- Laboratory CBR Tests

### **2.2.3 Geo-technical Investigations and Sub-soil Exploration**

Geo-technical Investigations and sub-soil explorations as per Terms of Reference have been conducted and submitted in Draft Detailed Project Report Stage.

## EXECUTIVE SUMMARY

- I. Assam is the largest state among the North Eastern states of India and acts as gateway for the entire North Eastern (NE) states i.e. Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal and two countries viz. Bangladesh and Bhutan. Its fiscal and economic situation has been improving since last decade, efforts of the government has helped the state to accelerate its Gross State Domestic Product (GSDP).
- II. The improvement of NH-127B is partially newly constructing, improving and widening of 2 or 4 lane roads (including bridges, drainage channel bypass etc.) from Srirampur to Dhubri in Assam (approximately 56 km). It is a part of the project that Government of India is proposing JICA for yen loan. The objective of the project is to newly establish and improve roads in Northeast India, from Khowai to Sabroom in Tripura state and from Srirampur to Dhubri in Assam state as well as Fakirganj to Tura in Meghalaya state in order to improve connectivity and contribute to the promotion of economic development of the area. For the improvement of NH-128 Assam portion, DPR was prepared in Mar. 2020, which includes EIA and SIA. For the improvement of NH-127B in Assam, in compliance with the National Highway Act, 1956, survey by CALA (Competent Authority for Land Acquisition) and 3A notification has also been made.
- III. In terms of density of surfaced road Assam is way behind India and the gap is increasing. However, the density of national highways is higher in Assam and more have been added in recent years. This would imply that the state government has invested on extending the road network rather than on improving the quality of roads. Recent improvement and initiation of new projects will add even more national highways. The road project is to provide up-gradation of the newly declared NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) at chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km to NH standard. The total length of the road is about 57.750 km.
- IV. The project will have multiple benefits as it will provide all-weather high-speed National Highway. The road is a crucial artery connecting with the shortest distance for commuter travelling between Srirampur and Dhubri. As the area (Dhubri) is bounded by the international border of Bangladesh, the project road has strategic importance too. This road will provide connectivity to the proposed bridge to be constructed on River Brahmaputra. The project road is of significant importance as the road connecting two National Highways (NH31C and NH-31), one proposed bridge over River Brahmaputra and linking to the important nearby villages such as Srirampur, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, Mudha Petla, Alokjhari, Madha Petla, Bhati Petla, Satsaura, Kachakana, Pagla Hat, and Barun Danga.
- V. The primary PIA is the area within 5km radius of the proposed road alignment. The road runs about 12 km in the district of Kokrajhar and the rest in the district of Dhubri. The district of Kokrajhar & Dhubri are the secondary PIA as the entire road falls under those districts. The state of Assam is considered as the tertiary PIA.
- VI. For preparation of the Social Impact Assessment arising out of acquisition of land and other assets, eviction of squatters and removal of encroachments resulting in social and/or economic displacement to Families/ individuals/ community, either direct or indirect and is in compliance with JICA 's

requirement and as per RFCTLARR Act 2013 and Assam RFCTLARR Rules, 2015. A Social impact assessment based on JICA Standards include collection of comprehensive baseline information to enable an analysis of potential impacts and the preparation of appropriate and comprehensive social management plans to address social impact assessment, land acquisition resulting in economic displacement, and on-going community engagement through public consultation and disclosure.

- VII. After identifying the proposed corridor, the Consultant Team have made a reconnaissance survey on the site with the representatives of PIU simultaneously the stakeholder mapping was done with review of the secondary data and literature available. Public Consultation and Key Informant Interview were conducted throughout the corridor to get the essence of the same. After finalization of the road design, stretch wise, Census survey of the structures and land were started for the impacted area identified from the CAD drawing lying between the ERoW and PROW shared from the engineering team. The total number of Project Affected Families (PAFs) is 1396 and the total number of Project Affected Person (PAP) living within these 1396 Families is 7262 persons. Out of the total Census population of 1396, SES was performed on 743 Families comprising of 3864 persons which is about 53% of the total PAFs.
- VIII. Reconnaissance survey was done June, 2020. Census Survey Started from 30th June to 30th July, 2020 and is nearly completed. The SES was done on June, 2020 - July 2020 and also consultation was done from June, 2020 - July 2020, further the second round of consultation is proposed in the month of August, 2020.
- IX. The socio-economic profile of project area, the socio-economic information of PAPs was collected through the Socio-Economic Survey (SES). It includes 51% males and 49% females. The social stratification of the project area shows dominance of General population with 44% Families followed by Schedule Tribe at 19%. The third and fourth stratum of the social grouping in the PIA is of Other Backward Class and Schedule Caste comprising of 12% and 5% respectively. Hinduism (39%) is the predominant religion followed by Muslim (36%).
- X. All the families surveyed have an average annual income more than Rs. 30000/-. About 28 % PAHs are having average annual income in the range of Rs. 30000-50000, while 43% of the families are earning between Rs. 50000-100000. It has been observed that about 29% PAHs have annual income more than Rs. 1,00,000. About 25% PAHs have Below Poverty Line (BPL) Card. The occupational status of PAPs reveals that 37% Population are depending on business and this includes the business they are carrying out along the road, mainly shops. About 13% Population are having agriculture as their source of income and 10% are engaged in government jobs. The educational profile of the area is not encouraging with 30% illiterate but with the introduction of Midday Meal scheme by the Government the number of dropouts at pre-primary and primary has reduced drastically. The dropout at the PIA is even less than 2%.
- XI. A Social Management Plan (SMP) is prepare to mitigate all such unavoidable negative impacts caused due to the project and resettle the Project Affected Persons and restores their livelihoods. This (SMP) Plan is prepared on the basis of project census survey findings and consultation with various stakeholders. The plan complies with PWRD, Assam State Laws and Regulations and JICA's

Safeguard Policy for involuntary resettlement in accordance of World Bank Operational Manual 4.12 and 4.10. The impacts identified as follows:

**Table E. 1 Summary Project Impacts**

| Sl. No. | Impacts                                                    | Number with Supplementary SIA | Previous SIA |
|---------|------------------------------------------------------------|-------------------------------|--------------|
| 1.      | Total Private land acquisition requirements (in ha)        | 142.688 ha                    |              |
| 2.      | Persons losing only land                                   | 466                           | NA           |
| 3.      | Total affected Private Structure Numbers                   | 1081                          | 67           |
| 4.      | Total number of CPRs affected (Community and Religious)    | 33                            | 33           |
| 5.      | Owners losing structures                                   | 684                           | Nil          |
| 6.      | Owners losing Cattle shed                                  | 3                             | Nil          |
| 7.      | Tenant without formal document                             | 94                            | NA           |
| 8.      | Kiosk                                                      | 59                            | NA           |
| 9.      | Employees to commercial structures and agricultural labour | 90                            | NA           |
| 10..    | Total No. of Affected Families                             | 1396                          | 67           |
| 11.     | Total Number of Vulnerable household Families affected     | 698                           | 21           |
| 12.     | Total number of Project Affected Persons (PAPs)            | 7262                          | 387          |

Source: Census Survey, Jan-Mar 2020

- XII. As per JICA's guidelines of Categorization for Involuntary Resettlement this sub project is categorized as Category A. Thus, a Full Resettlement Plan will be prepared on the possible impacts identified and measured in SIA and mitigation measures as provisioned in the Entitlement Matrix created from the RFCTLARR Act, 2013, Assam RFCTLARR Rules, 2015 and will be as per the JICA's Guideline in accordance of World Bank's OP 4.12 and OP 4.10. The Resettlement Plan will be disclosed and implemented in the project and the compensation and R&R assistances will be released to the PAFs before the Civil Construction starts. The Resettlement Plan will be implemented, and the Monitoring of the Resettlement Plan will be guided by the Policy and Guidelines of JICA and World Bank which is discussed in this Report.
- XIII. As per JICA's guidelines of Categorization for Indigenous People Impact this sub project is categorized as sensitive. As per World Bank Operational Manual 4.10 there will be specific action favourable to indigenous peoples/ethnic minority in related plans such as a Resettlement Plan, a Gender Action Plan or a general Community Participatory Plan.
- XIV. Socio-economic mitigation measures will consist of policies and actions taken before the implementation of the project with the intention of minimizing the extent of impact after land acquisition along the existing road. The first step of such mitigation will be to avoid unnecessary acquisition and then decide about the mitigation for the damage which is unavoidable. Mitigation is a long-term effort for reduction of socio-economic impacts on the affected population. In order to conduct socio-economic mitigation, it is necessary to acknowledge the grievance/dis-satisfaction among the affected persons, identify the genuine grievances, finding the facts behind the grievances, and finally finding out ways to

address those grievances. Grievance settlement will provide the opportunity to come closer to the affected persons and therefore success of the acquisition process. The mitigation measures should be followed up on regular basis. In order to have a successful mitigation mechanism it is important to have a detailed and accurate social impact assessment report.

- XV. The PIU at the apex level will have overall responsibility for policy guidance, coordination, and contingency planning, monitoring and overall reporting during RP implementation. A NGO will be recruited for day to day work of Resettlement Plan Implementation. The NGO, in this sense, will have to ensure that due entitlements flow to the PAPs in the most effective and transparent manner. Other involved agencies are expected to collaborate with Project, based on instructions from the EA, in accordance with the policy framework and the RP. These arrangements have to be made during the first month of Project implementation in order to set up the various committees and implementation mechanisms required for the project.
- XVI. In order to make the RP preparation and implementation process transparent, salient features of RP shall be translated in Assamese and Bengali which is widely spoken and understood in the project area and disclosed on the Project Authority's website. The documents available in the public domain will include Entitlement Matrix and RP (summary in Assamese, Bengali) and the list of affected persons eligible for compensation and R&R assistance. Copy of all documents will be kept in PMU for ready reference. As per Access to Information Policy of the JICA, all safeguard documents will also be disclosed and available at the NHIDCL's Portal.
- XVII. The resettlement cost estimate for this project includes eligible compensation, resettlement assistance and support cost for RP implementation. The support cost, which includes staffing requirement, monitoring and reporting, involvement of NGO in project implementation and other administrative expenses are part of the overall project cost. The unit cost for structures and other assets in this budget has been derived through field survey, consultation with affected families, relevant local authorities and reference from old practices. Contingency provisions have also been made to take into account variations from this estimate.
- XVIII. Grievance Redressal Mechanism is an integral part of the institutional arrangement in relation to social safeguard issues. Consultation with the PAPs does not reveal the need of GRC but social safeguards related grievances are expected from affected persons and other interested groups during the project implementation and therefore, it is important to set up a GRM at PMU level for resolution of such grievances. Complaint boxes will be placed at every major junctions locations which would be collected once a week by PMU. Grievances received through other modes (postal, email, or over the phone) will be compiled. A dedicated email and toll free phone number will be provided for receiving grievances/complaints through these methods. GRC at site level should be maintained by the contractor.
- XIX. The estimate budget for Resettlement and Rehabilitation for this project is based on rates vide Entitlement Matrix as per the norms of RTFCLARR Act, 2013, Assam RFCTLARR Rules, 2015 and in accordance with World Bank and JICA's Policies. The total R&R budget with Land Acquisition is estimated at Rs.349.35 crore.

XX. Monitoring is an integral part of successful implementation of the RP activities. Internal monitoring will be carried out by any designated Assistant Manager or above under the supervision of Deputy General Manager, NHIDCL. Data collected for monitoring activities shall be suitably analysed for project management and learning. There should be an External Monitoring appointed by the EA to look into the total progress of the RP Implementation of the project.

XXI. As the proposed road passes through the Bodoland Territorial Authority (Administrative Control under Sixth Schedule of the Constitution) the RP will be implemented through District Level Committees that will be established in the districts of Dhubri and Kokrajhar in Assam. The functions of the DLC is to (i) to meet regularly to review the progress of land acquisition/ R&R; (ii) approval of the micro-plan on the basis of methodology defined in the RP; and (iii) facilitate the implementation of the RP programs in the project-affected area.

XXII.

### 3.5 INTRODUCTION

1. Assam is well connected by a network of national highways, state highways and other roads to important places within the state and other major cities in the country. Assam comprises of approximately 40,342km of road network including 2841km of national highway.
2. The improvement of NH-127B is partially newly constructing, improving and widening of 2 or 4 lane roads (including bridges, drainage channel bypass etc.) from Srirampur to Dhubri in Assam (approximately 54 km). It is a part of the project that Government of India is proposing JICA for yen loan. The objective of the project is to newly establish and improve roads in Northeast India, from Khowai to Sabroom in Tripura state and from Srirampur to Dhubri in Assam state as well as Fakirganj to Tura in Meghalaya state in order to improve connectivity and contribute to the promotion of economic development of the area. For the improvement of NH-128 Assam portion, DPR was prepared in Mar. 2020, which includes EIA and SIA. For the improvement of NH-127B in Assam, in compliance with the National Highway Act, 1956, survey by CALA (Competent Authority for Land Acquisition) and 3A notification has also been made.
3. Assam is the largest state among the North Eastern states of India and acts as gateway for the entire North Eastern (NE) states i.e. Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal and two countries viz. Bangladesh and Bhutan. Its fiscal and economic situation has been improving since last decade, efforts of the government has helped the state to accelerate its Gross State Domestic Product (GSDP).
4. The capital Assets of road agencies in Assam comprised of the road network and assets created thereon such as pavements, bridges, culverts etc. The current road assets in the state are represented in the table. While the National Highways (3,197 km) is managed by a number of agencies (NHAI, PWD-NH & Buildings, BRO, Railways), the Public Works Road Department (PWRD) in Government of Assam manages secondary and tertiary state road network of 44,862 km. The secondary network is classified into State Highways, SH, 3,134 km; and Major District Roads, MDR, 4,413 km, Urban Road 1,409 km and Rural Roads, 36,544 km. The length of rural roads is expected to be around 47,000 km as per RAMS consultant's estimate, thereby making the total road network under PWRD to about 56,400 km to be managed by the RAMS. About 604 km of SH and 34 km of MDR are taken-up as NH post 2012-13, thereby making total NH as 3835 km.
5. Roads are mostly publicly owned and unlike property assets, will not have a value if sold on the open market unless the buyer is permitted to recover their investment through mechanisms such as tolling. These assets are therefore not generally used for the purpose of revenue generation. Hence, the method to be adopted for asset valuation should not be based on market value or revenue stream. Exceptions may include concessions, toll roads, and the refinancing of design, build, and operate contracts, where roads operate more as a utility.



6. However, in terms of density of surfaced road Assam is way behind India and the gap is increasing. However, the density of national highways is higher in Assam and more have been added in recent years. This would imply that the state government has invested on extending the road network rather than on improving the quality of roads. Recent improvement and initiation of new projects will add even more national highways. The road project is to provide up-gradation of the newly declared NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km to NH standard. The total length of the road is about 57.750 km.

### 3.5.1 Introduction of JICA

7. After the approval of the project PAPR by NHIDCL in 2019, the Government of India requested Japan International Co-operation Agency (JICA), the solely aid agency of Japan, to provide a project finance for the NH-127B improvement and Widening Project. As per the JICA's guidelines for environmental and social considerations<sup>1</sup> (2010), this SIA is prepared to disclose the primary points of the SIA before the intended stakeholder meetings, expected to be from 06.08.2020.
8. The JICA Guidelines require both EIA and RAP surveys due to the proposed project's "Category A" status. Processes of EIA and RAP preparation in the JICA Guidelines are different from that of Indian EIA Notification. In order to evaluate the project's environmental impacts in accordance with the JICA Guidelines, the Supplemental survey for EIA and RAP should complement the Project.

### 3.5.2 Objective of the Project

9. The objective of the study is to portray the present demographic and socio-economic condition of the habitations of the villages along the proposed road, which will be acquired and also to study the impact of the project on the inhabitants, specially, the vulnerable section of the people there mainly the Indigenous population. In the present SIA, particular attention should be given to impacts of the project on indigenous people, considering the project site overlaps with the area under Bodoland Territorial Council. In case of Scheduled Tribes in the Project site are identified, as "Indigenous People" defined by World Bank's Operational Policy 4.10, an Indigenous People Plan (IPP) including elements laid out in World Bank's Operational Policy 4.10 must be submitted in addition to RAP for projects. They are required as measures for safeguarding the indigenous peoples subject to resettlement within the framework of the Project.
10. The study would primarily concentrate on base line survey and impact assessment to prepare a proper planning structure for resettlement and sustainable development. Supplementary Social Impact Assessment (SIA) is based on complete enumeration of PAFs (DFs) and socioeconomic data/ information of impacted PAHs generated through

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<sup>1</sup>[https://www.jica.go.jp/english/our\\_work/social\\_environmental/guideline/index.html](https://www.jica.go.jp/english/our_work/social_environmental/guideline/index.html)



sample socio-economic surveys. The SIA of the PAHs has been taken up for the proposed Road to determine the magnitude of displacement and potential losses and identify vulnerable groups.

11. As per JICA's guidelines of Categorization for Involuntary Resettlement this project is categorized as Category A. Thus, a review of the country's Legal Framework and JICA requirement of the Resettlement Plan will be developed and the possible impacts identified and measured in SIA and mitigation measures as provisioned in the Entitlement Matrix.

### 3.5.3 Sub-project Location

12. The project road starts from Srirampur on NH-27(old NH-31 C) at Chainage 0.00 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km to NH standard. Approximately lies between 28°0' and 24°8' latitude, North of Equator and between the longitudinal lines 89°43'E and 96°1'E. The land use of the road stretch is mainly road side plantation, agricultural area, small hutment area and light jungle area along the project corridor. An Index Map showing the sub project road is presented in Figure 1.1

**Figure 1. 1 Road Alignment on Satellite Imagery**



Source: Google Maps

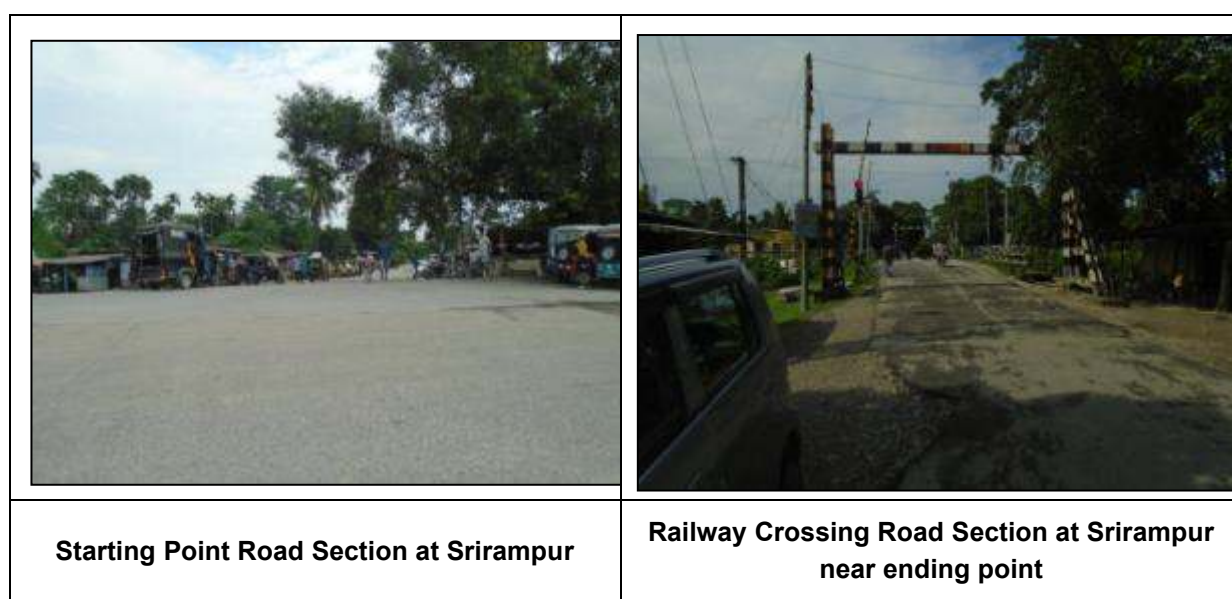
### 3.5.4 Sub-project Description

14. The Project Road is a connection between two National Highways (NH31C and NH-31) and Connecting with Meghalaya state with proposed bridge over river Brahmaputra in Assam. This Road has been passing through Villages Srirampur, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, Mudha Petla, Alokjhari, Bhati Petla, Satsaura, Kachakana, Pagla Hat, Barun Danga, Morterjhar, Baniyamari,

Balajan, Dhepdheoi, Debdutta Hazdaha 1, Kachari Hat, Debdutta Hazdaha 2, Raja Katli, Kachua Kash, Chanda Khol, and Ada Bari

15. The existing ROW width along the project road has been observed to be around 20m to 30m. However, the existing ROW does not cater to the codal provision of 60m ROW for plain road and hence land is required to be acquired to adhere to the codal provision. The geometrics, site distance and road safety are also very poor. The main roadside land use is agriculture with some stretches of habitations/ commercial use with an average congested stretch of about 150 m to 400 m. There are a good number of religious places, educational institutions, health institutions and local administrative offices beside the project road.

**Figure 1. 2 Pictures from the Road Site**



### 3.5.5 Terrain & Land Use

16. The project section is in predominantly Plain terrain. The topography is rural in nature.
17. The land use of the project road stretch is mainly road side plantation, agriculture area. Some of stretches have settlement & residential structures having rural/ Semi urban character.

### 3.5.6 Minimizing Resettlement

18. Adequate attention has been given during the feasibility and detailed project design phases of the project preparation to minimize the adverse impacts on land acquisition and resettlement impacts. However, technical and engineering constraints were one of the major concerns during exploration of various alternative alignments. With the available options, best engineering solution have been adopted to avoid large scale land acquisition and resettlement impacts. The specific measures adopted for minimizing the resettlement impacts for the sub project is as follows:

- ❖ Exploration of several alternate alignments in consultation with engineering team, concerned government departments and local community
- ❖ Following proposed local roads as much as possible to minimize the land acquisition in the bypass alignments.
- ❖ Avoiding major settlements and urban areas to minimize the large-scale physical displacement.
- ❖ Avoiding productive agricultural land to minimize the adverse economic displacement;
- ❖ Diverting the alignment towards the available unused government land to minimize impact on private property.
- ❖ It is to be noted that the private land requirement has been decreased. This may be considered as the major event for minimizing resettlement impact.

### 3.5.7 Study of alternative alignment

19. The alignment for this proposed road is finalized as per the DPR is completed on March, 2020.

### 3.5.8 Final Alignment option

20. About 12km of the proposed road lies within the Kokrajhar district and rest in Dhubri district. The detail of the Final Alignment is depicted in Table 1.2

**Table 1. 1 Details of the Alignment of the Proposed Road**

| Sl. | Chainage in Km. | Name of Habitation  |
|-----|-----------------|---------------------|
| 1   | 0.000           | Srirampur Village   |
| 2   | 2.000           | Jakobpur Village    |
| 3   | 6.000           | Kambilpur Village   |
| 4   | 7.000           | Malkapur Village    |
| 5   | 9.000           | Kathalguri Village  |
| 6   | 11.000          | Grampur Village     |
| 7   | 11.500          | Bashantipur Village |
| 8   | 14.000          | Auxiguri Village    |
| 9   | 18.000          | Uzanpetla Village   |
| 10  | 19.000          | Mudha Petla Village |
| 11  | 21.000          | Alokjhari Village   |
| 12  | 22.000          | Madha Petla Village |
| 13  | 23.000          | Bhati Petla Village |
| 14  | 24.000          | Satsaura Village    |
| 15  | 25.000          | Kacha kana Village  |
| 16  | 26.000          | Pagla Hat Village   |

NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km.

| Sl. | Chainage in Km. | Name of Habitation         |
|-----|-----------------|----------------------------|
| 17  | 29.000          | Barun Danga Village        |
| 18  | 36.000          | Morterjhar Village         |
| 19  | 40.000          | Baniyamari Village         |
| 20  | 42.250          | Balajan Village            |
| 21  | 43.250          | Dhepdheoi Village          |
| 22  | 46.250          | Debdutta Hazdaha 1 Village |
| 23  | 47.250          | Kachari Hat Village        |
| 24  | 48.250          | Debdutta Hazdaha 2 Village |
| 25  | 51.250          | Raja Katli Village         |
| 26  | 52.250          | Kachua Kash Village        |
| 27  | 54.250          | Chanda Khol Village        |
| 28  | 56.750          | Motirchor Village          |

## 3.5 APPROACH & METHODOLOGY

### 3.5.1 Approach and Methodology Adopted

21. The supplementary social impact assessment tries to (a) develop profiles of PAPs and communities affected by the project. (b) Identify the nature and types of losses and (c) tries close the gap of the previous SIA study.
22. A Social impact assessment based on JICA Standards include collection of comprehensive baseline information to enable an analysis of potential impacts and the preparation of appropriate and comprehensive social management plans to address social impact assessment, land acquisition resulting in economic displacement, and on-going community engagement through public consultation and disclosure. The following paragraphs briefly describe the methods used to ascertain various types of methods to categorize and quantify the impacts.
23. For preparation of the Social Impact Assessment arising out of acquisition of land and other assets, eviction of squatters and removal of encroachments resulting in social and/or economic displacement to Families/ individuals/ community, either direct or indirect and is in compliance with JICA 's requirement and as per RFCTLARR Act, 2013 and Assam RFCTLARR Rules, 2015. A Social impact assessment based on JICA's Standards and as per World Bank's Operational Manual 4.12 and 4.10 comprehensive baseline information collected to enable an analysis of potential impacts and the preparation of appropriate and comprehensive social management plans to address social impact assessment, land acquisition resulting in economic displacement, and on-going community engagement through public consultation and disclosure.
24. After identifying the proposed corridor, the Consultant Team have made a reconnaissance survey on the site with the representatives of PIU simultaneously the stakeholder mapping was done with review of the secondary data and literature available. Public Consultation and Key Informant Interview were conducted throughout the corridor to get the essence of the same. Specific messages that evolved from Public Consultation and Key Informant Interview were shared with the PIU. Census survey of the structures and land were started for the impacted area identified from the CAD drawing lying between the ERoW and PRow shared from the engineering team. Then the Socio-Economic-Survey was conducted along the proposed alignment of the road on probable PAFs proportionally as per there socio-economic condition such that they are represented properly. The data collected is digitalized, cleaned and analysis was performed. Simultaneously there was also consultation at individual level are conducted as during this period assemble of more than 15 persons are not allowed.

### 3.5.2 Secondary Data

25. Secondary data from District Primary Census Abstract, 2011 Census and District Statistical Abstract in respect of population, occupational structure and infrastructure facilities available in the villages and at Tehsil level were considered dependable sources.

Rights of records, data of the land holdings, Mouza maps etc are collected from the district authority as well as from the Land Revenue and Disaster Management Office at Guwahati. These data are used for preparation of Social Impact Assessment and also create an idea of the socio-economic background of the area.

### 3.5.3 Primary Data

#### Socio-Economic Survey

26. The Socio-Economic Survey was carried out in the month of June - July 2020 by a team of trained enumerators. The objectives of the Socio Economic was to identify the social profile of the project affected people, their poverty, their views about the project and also their views on various social needs and preferential livelihood. A common questionnaire for NH127B was used to collect detailed socio-economic information on affected Families/business for a full understanding of the background and the impacts for the project. The SES was carried out on proportional representation of the affected families.

#### The Census Survey

27. The census survey was carried out in the month of June 2020 – July, 2020 by a team of trained enumerators. The objectives of the census survey were to generate an inventory of social impacts on the people affected by the project, their structures affected and their views on various options of rehabilitation and resettlement. A questionnaire was used to collect detailed information on affected Families/business for a full understanding of impacts in order to develop mitigation measures and resettlement plan for the PAPs. One structured census questionnaire was used to collect detailed information on affected Families/ properties for a full understanding of impacts in order to develop mitigation measures and resettlement plan for the PAPs. The census survey includes the following: -

- ❖ Inventory of the affected assets
- ❖ Categorization and measurements of potential loss
- ❖ Physical measurements of the affected assets/structures
- ❖ Identification of trees and crops
- ❖ Families characteristics, including social, economic and demographic profile
- ❖ Identification of Non-titleholders
- ❖ Assessment of potential economic impact

28. Reconnaissance survey was done June, 2020. Census Survey Started from 30th June to 30th July, 2020 and is nearly completed. The SES was done on June, 2020 - July 2020 and also consultation was done from June, 2020 - July 2020, further the second round of consultation is proposed in the month of August, 2020. The total numbers of SES and Census survey conducted in this road is given in the Table 2.1. The SES and Census Blank format is annexed as **Annexure 3**.



**Table 2. 1 Type of Consultations**

| Sl. No. | Type of Consultation | Number | No. of Attendant |
|---------|----------------------|--------|------------------|
| 1       | FGD                  | 9      | 67               |
| 2       | FGD-Female           | 2      | 11               |
| 3       | KII                  | 4      | 16               |
| 4       | SES                  | 743    |                  |
| 5       | Census Survey        | 1396   |                  |

*Source: Stakeholder Consultation, SES, Census Survey, Jun-Jul 2020*

### 3.5.4 Stakeholders Consultation

29. Stakeholder Consultation & interview with key persons of the villages and surrounding area were other major sources of primary data, apart from sample Families surveys to appraise existing condition and proper perspective of Government's development schemes in operation in the area.
30. The stakeholders are all the people getting affected by the project or are responsible for the project, whether directly or indirectly. The community participation programmes in social impact assessment ensured that information is disseminated to all the PAPs and other stakeholders in appropriate ways. The information dissemination has taken place in vernacular, detailing about the main project features and the entitlement framework. Due consideration has also been given to address the views of the women and vulnerable groups.
31. Both primary and secondary stakeholders were identified, based on the above criteria. They were invited to take part in the consultation series and were solicited to participate in planning and implementation of the R&R programme.
32. Primary stakeholders included those affected negatively or positively by the project, like the PAPS, project beneficiaries and project implementing agencies. Secondary stakeholders included other individuals and groups, with an interest in the project.
33. The details of the Public Consultation with the attendance sheet are annexed as **Annexure 2**

**Figure 2. 1 Pictures from the Road Site**

|                                                                                                                       |                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
|                                      |                                 |
| <p>Public Consultation and Socio-Economic Survey was held with the Affected People of Paglahat at Dhubri district</p> | <p>Gathering information from the Project Affected Person.</p>                                                    |
|                                     |                                |
| <p>Socio-Economic Survey was held with the commercial PAPs of Srirampur Market.</p>                                   | <p>Socio-Economic Survey and one to one consultation was held with the residential PAPs of Kachakana.</p>         |
|                                    |                               |
| <p>Socio-Economic Survey was held with the commercial PAPs of Baniamari Market</p>                                    | <p>Socio-Economic Survey and one to one consultation was held with the residential PAPs of Paglaghat Village.</p> |



|                                                                                     |                                                                                                  |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|    |                |
| <p>Socio-Economic Survey was held with the commercial PAPs of Srirampur Market</p>  | <p>Socio-Economic Survey was held with the commercial PAPs at the waiting shed at Bhatipeta.</p> |
|   |               |
| <p>Present condition of Propose Road At Srirampur Market</p>                        | <p>Railway Crossing in the Project Road.</p>                                                     |
|  |              |
| <p>Affected Agriculture on the Proposed Project Road f Baniamari Village</p>        | <p>Affected Fishery on the Proposed Project Road of Moterjhar Village.</p>                       |

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|    |    |
| Affected Temple at Srirampur in Kokrajhar District.                                 | Affected Temple at Paglahat in Dhubri District                                       |
|   |   |
| Affected Waiting Shed at Agomoni in Dhubari District.                               | Affected Structure at Ujanpeta in Dhubari District.                                  |
|  |  |
| Affected School at Matarjhar in Dhubari District.                                   | Affected Idgah at Bhatipetla in Dhubari District.                                    |

### 3.5.5 Data Interpretation

35. The analysis of socio-economic data will portray existing scenario in terms of quality of life for the people living in the PIA vis-à-vis their perceived needs which helped to formulate Social impact assessment plan. The data from the field were collected with the help of

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Android based Tablet with the help of specially designed software and digitalized in excel format for preparation of Tables. Data interpretation done by the following the procedures below-

36. **Step 1** Data collected by the enumerators with the help of android device in software as per the given questionnaire.
37. **Step 2** The data collected by the Android device are transferred and complied on computers in MS- Excel Format.
38. **Step 3** Data Clearance was done for proper representation.
39. **Step 4** Data analysed and presented in summarized Table format in MS –Excel.

## 3.5 SOCIO ECONOMIC PROFILE

### 3.5.1 Introduction

40. The definition of socioeconomic is relating to both economic and social factors. The socio-economic profile is the various social factors including caste, age, religion, marital status, education, and control on economic activities, economic status and occupation. Socioeconomic status is considered to be a major social basis for inequalities and an important predictor of the socio-economic need. Socioeconomic deprivation appears to predispose to a wide range of social issues, from social backwardness to access to civic infrastructures which is the outcomes of road projects.
41. The project road starting from Srirampur on NH-27 (old NH-31 C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km). The entire road falls under Kokrajhar & Dhubri district of Assam. The existing length of the project stretch is 55.700 km.

### 3.5.2 Project Influence Area (PIA)

42. The primary PIA is the area within 10km radius of the proposed road alignment. The district of Kokrajhar and Dhubri are the secondary PIA as the entire road falls under these districts. The state of Assam is considered as the tertiary PIA. The Socioeconomic profiles of the secondary and tertiary PIA are presented in this chapter (Chapter 3) and that of the primary PIA is presented at Chapter 4.

### 3.5.3 Profile of Assam, the tertiary PIA

43. Assam, the gateway to the North East India is the largest State in the North East is bordering seven states viz. Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and West Bengal and two countries viz. Bangladesh & Bhutan. The State is endowed with abundant fertile land and water resources with total geographical area of 78,438 sq.km. of which 98.4 % area is rural. Assam shares about 2.4 % of the country's total geographical area and provides shelter to 2.6 % population of the country. Most of the state population lives in the lush valleys of its two major river system in the 30 districts of the Brahmaputra valley & 3 districts of the Barak valley. Less densely populated three hill districts viz. Karbi-Along, West Karbi-Along & Dima Hasao, set in the low-laying hills that separate the two valleys. For administrative and revenue purposes, the state has 33 districts including four districts Under the Bodoland Territorial Council (BTC) area viz. Kokrajhar, Dhubri, Baska & Udalguri and 6 newly created districts viz., Biswanath, Charaideo, Hojai, South Salmara-Macachar, West Karbi-Anglong and Majuli.
44. The State has been blessed bountiful by nature. The mighty Brahmaputra truncating the state, the Barak river in the south and their tributaries provide abundant water resource; the dense forest cover is home to a wide range of valuable timber, bamboo & medical plants; the state reserve of oil and natural gas; the fertile valleys & hills lopes nourish tea



gardens and horticultural crops while the rich and fertile soil lend itself to raising vital food-grains.

45. Assam is administratively divided into 33 districts with 80 sub-division, 219 Development Blocks and 2202 Gaon Panchayats, out of which 3 districts with 4 sub-divisions & 16 Development Blocks are under three hill districts of Karbi-Along, East Karbi-Along & Dima Hasao. Further, four districts with eight sub-divisions are under Bodoland Territorial Council (BTC) area viz Kokrajhar, Dhubri, Baska & Udalguri. The Brahmaputra valley consists of North Bank Plains Zone (NBPZ), Upper Brahmaputra valley Zone (UBVZ), Central Brahmaputra valley Zone (CBVZ) and Lower Brahmaputra Valley Zone (LBVZ), whereas the Barak Valley Zone mainly consists of plain area of three districts, viz. Cachar, Karimganj & Hailakandi.
46. Assam has heterogeneous population with socio-cultural & ethnic diversity. According to the Census of India, 2011 the population of Assam stands at 312.05 lakh of which 159.39 lakh are male and 152.66 lakh are female. The decadal growth of the State's population works out at 17.07 percent during the decade 2001-2011 as against 17.68 percent for the country as a whole. Out of the total 312.05 lakh population, 86 percent population live in rural areas & 14 percent population live in urban areas of the State. The density of the population of Assam has increased to 398 persons in 2011 from 340 persons in 2001 Census or on an average, 58 more people inhabit every square kilometre in the State as compared to a decade ago.<sup>2</sup>

### 3.5.4 State Income

47. The State Domestic Product (SDP) and its related aggregates are the main components of Planning and Policy making which is also considered as important indicators of development process of the State. The estimates of SDP reveal the extent and direction of changes in the levels of economic development of the State over a period of time. The fiscal reform measures adopted by the State of Assam started yielding favourable results since 2005-06 and have been recognized to be a key factor for attaining higher economic growth eventually leads to improvement to the well-being of people.
48. In the new series (base-2011-12) estimates, the annual average growth rate of the GSDP at current prices for the years 2011-12 to 2015-16 (P) is 12.5 % and the rate of NSDP at the current prices for the same period is 11.6 %. In terms of the constant (2011-12) prices the annual average growth rate during the period 2011-12 to 2015-16 (PQ) is estimated at 5.8 % for GSDP and 5.6 % for NSDP.
49. GSDP at constant (2011-12) prices for the year 2016-17 (Quick Estimates) is estimated at Rs. 195496.93 Crore as against Rs. 178929.64 crore for 2015-16 (Provisional Estimates) registering a growth of 9.26 %. The annual growth rate in respect of GSDP at constant price (2011-12) in Agriculture and its allied sector has declined from 3.28% in 2014-15 to 1.04% in 2015-16. The 'Industry' sector which comprises Mining & Quarrying,

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<sup>2</sup><https://des.assam.gov.in/information-services/state-profile-of-assam>

Manufacturing, Electricity, Gas, Water Supply & Other Utility Services and Construction sectors is estimated at 8.33 % growth in 2016-17 (Q) as against 7.31% in the 2014-15 (P). The Services sector comprises of Trade, Repair, Hotels & Restaurants, Transport, Storage, Communication & Services related to Broadcasting, Financial Services, Real Estate, and Ownership of Dwelling & Professional Services, Public Administration and Other Services and its annual growth rate of GSDP at constant price (2011-12) is calculated at 13.10 % during 2016-17 as compared to 9.67% in 2015-16.

### 3.5.5 Occupational Structure

50. The state's economy is based mostly on agriculture, plantation and oil. In the agriculture sector, tea and silk are the main products of agriculture production. Assam is the largest economy in the northeast region. But the scenario of the job market in Assam is not too impressive. Unemployment is the one of the significant problems in Assam. The report from the North Eastern Development Finance Corporation Limited (NEDFL) published in October 2017 stated that over 1.75 lakh jobs will be required by the state annually till 2020. This requirement is usually for blue collard jobs. However, the report didn't include employment in agriculture and plantation farm sectors and government offices, which will add more jobs to the projection. Assam, at present, is facing the twin challenges of increasing unemployment and a mushrooming young population. Assam tea blends are famous in entire India and also worldwide. About a quarter of India's oil in the Assam-Arakan basin.

### 3.5.6 Comparison of the state of Assam

51. Assam is predominantly a rural based state, almost 86 per cent of its population still living in rural areas. The socio-economic position among the people in rural areas is very pathetic compare to urban area & all India figures. Rural poverty is more than twice that of urban poverty. The population growth in Assam also implied that there has hardly been any reduction in the absolute number of the poor over the years. Demographically, the state Assam is characterized by with her population, which is 31 million compare to all India total 1210 million as per 2011 census. Population density of Assam is calculated as 397 per sq. km which is little high compare to national figure 382 per sq. km.

**Table 3. 1 Comparison of the state of Assam with National Average**

| Sl. No. | Category                                         | Assam, 2011 | India, 2011 |
|---------|--------------------------------------------------|-------------|-------------|
| 1.      | Percentage contribution to National Population   | 2.58        | 100         |
| 2.      | Population Density (per sq km)                   | 397         | 382         |
| 3.      | Sex Ratio (Females per 1000 males)               | 954         | 940         |
| 4.      | Under 6 years Sex Ratio (Females per 1000 males) | 957         | 914         |
| 5.      | Literacy Rate                                    | 73.18       | 74.04       |
| 6.      | Male literacy rate                               | 78.18       | 82.14       |
| 7.      | Female literacy rate                             | 67.27       | 65.46       |
| 8.      | Human Development Index Value (HDI) 2007-08      | 0.444       | 0.467       |

52. The above Table -3.1 reveals that sex ratio which shows slight better picture of state Assam than national figure. In category of sex ratio among children, below 6 years, performance of Assam is better compared to all India figure. It also reveals that the female literacy rate of Assam is better than that of the national average. The state of Assam ranks 16 (out of 23) in regard to the HDI.

### 3.5.7 Profile of Kokrajhar, the secondary PIA

53. Kokrajhar district occupies an area of 3,129 square kilometers comparatively equivalent to Russia's Waigeo Island. Kokrajhar district is located on the northern bank of the Brahmaputra River. It forms the gateway to the Seven Sister States. Kokrajhar shares its boundary with Chirang, Dhubri, West Bengal, Barpeta and Bhutan.
54. Kokrajhar is one of the 27 (twenty-seven) districts of Assam with 2.85% of the state population and is the gateway to Northeast India. Both the rail and road network touch this district at Srirampur on the way to the rest of the region. It is bounded on the north by Bhutan and by West Bengal on the west; the district of Dhubri in the south and in the east by Chirang district.
55. Kokrajhar town is the headquarter of Bodoland Territorial Council, created on 10th February, 2003 comprising of four districts viz. Kokrajhar, Chirang, Baska, Udalguri on the north bank of Brahmaputra within Assam. The Kingdom of Bhutan is intricately linked with the district in many vital aspects of life. There is hassle free movement across the international border with Bhutan.
56. The kingdom of Bhutan is intricately linked with the district of Kokrajhar in many vital aspects of life of the people living both in the Bhutan hills and the plains of Kokrajhar. There is hassle-free movement of the people across the international border for the purpose of business and tours. The Bhutanese town of Gelephu is a nice place to visit from Kokrajhar as it is just across the international boundary. There is a fine road leading from the Shyamthaibari point on the National Highway 31(C) to Gelephu. Further on, inside Bhutanese territory, there is the town of Sarbhang that also can be visited via Gelephu. Kokrajhar was originally a part of the undivided Goalpara district.
57. In 1957 it was carved out as a Civil Sub-division from the then Dhubri Sub-division of Goalpara district. Kokrajhar District, with population of about 7.4 lakh is Assam's 11th least populous district. Total geographical area of Kokrajhar district is 1093 km<sup>2</sup> and it is the 3rd smallest district by area in the state. Population density of the district is 676 persons per square km. There are 5 sub districts in Kokrajhar, among them Srijangram is the most populous sub district with population of about 2.7 lakh and Sidli (Pt) is the least populous sub district with population of about 58,000. There is only one city in the district that comes under the district administration of Kokrajhar Municipal Board. In Census 2011, detail of Kokrajhar, a district of Assam has been released by Directorate of Census Operations.



**Table 3. 2 Socio- Economic Profile of Kokrajhar District**

| Description                      | 2011       | 2001       |
|----------------------------------|------------|------------|
| Population                       | 8.87 Lakhs | 8.43 Lakhs |
| Actual Population                | 887,142    | 843,243    |
| Male                             | 452,905    | 433,360    |
| Female                           | 434,237    | 409,883    |
| Population Growth                | 5.21%      | 14.49%     |
| Area Sq. Km                      | 3,296      | 3,296      |
| Density/km2                      | 269        | 266        |
| Proportion to Assam Population   | 2.84%      | 3.16%      |
| Sex Ratio (Per 1000)             | 959        | 946        |
| Child Sex Ratio (0-6 Age)        | 954        | 955        |
| Average Literacy                 | 65.22      | 52.29      |
| Male Literacy                    | 71.89      | 61.01      |
| Female Literacy                  | 58.27      | 43.06      |
| Total Child Population (0-6 Age) | 136,924    | 151,341    |
| Male Population (0-6 Age)        | 70,085     | 77,398     |
| Female Population (0-6 Age)      | 66,839     | 73,943     |
| Literates                        | 489,305    | 4,797,838  |
| Male Literates                   | 275,220    | 2,703,912  |
| Female Literates                 | 214,085    | 2,093,926  |
| Child Proportion (0-6 Age)       | 15.43%     | 17.95%     |
| Boys Proportion (0-6 Age)        | 15.47%     | 17.86%     |
| Girls Proportion (0-6 Age)       | 15.19%     | 18.04%     |

Source: <https://www.census2011.co.in>

58. As per 2011 census, 85.14% population of Kokrajhar districts lives in rural areas of villages. The total Kokrajhar district population is 887,142 of which males and females are 452,905 and 434,237 respectively. In Kokrajhar district, sex ratio is 959 females per 1000 males. The native language of Kokrajhar is Bodo but Assamese and Bengali are also spoken.

### 3.5.8 Profile of Dhubri, the secondary PIA

59. Dhubri district is situated in the extreme western corner of Assam. This district is located on the globe between 89.42 to 90.12-degree east longitude and 26.22 to 25.28-degree north latitude. The district is situated at 30 meters above the sea level on average. The river Brahmaputra flows through the district.
60. On the Northern side of the river Dhubri and Bilasipara Sub-Divisions are situated and on the Southern side with Southa Salmara Mankachar Sub-Division. The district of Dhubri is surrounded by the Kokrajhar district in the north, Meghalaya & Bangladesh in the south, Bongaigaon & Goalpara district in the east, West Bengal and Bangladesh in the west.
61. The total area of Dhubri district is 2838 sq. km. having a distance of 290 km from the State capital, Dispur. It has four urban areas [Dhubri (Sadar), Bilasipara, South Salmara and Mankachar] covering an area of 27.24 sq. km., with a total urban population of 190546. There was a change of 11.34 percent in the population compared to population as per 2001. In the previous census of India 2001, Dhubri District recorded increase of -0.08 percent to its population compared to 1991.
62. The geographical area of the district is 236126 ha out of which 61% (144152 ha) is cultivable area (net sown area + culturable waste + current fallow). Out of the total cultivable area 90% (130034 ha) is at present under cultivation (net sown area).
63. Based on soil texture, soil problems like erosion, undulation, siltation, water table and productivity, the land holdings have been categorized into different classes of land capability. Because of proneness to flood, soil erosion, siltation etc. only 4.2% of the total land holding belongs Class I land. However, 36% and 33% of land holdings belong to Class II and Class III respectively.
64. The District favoured by desirable soil and climatic condition grows a wide range of crops. Paddy is the main crop of the district, grown mainly as summer and winter paddy. The other major crops are Mustard, Jute, Potato, Wheat, Lentil, Black gram and different vegetables like Brinjal, Cabbage, Cauliflower, Lady's finger, Radish, Tomato, Cucumber, Carrot and Guards. Onion, Garlic, Chilly, Zinger and Turmeric are also grown in small areas in all the Dev. Blocks. Some other minor crops are pea, sesamum, Niger, Cucurbits, Pineapple, Tapioca etc. Important plantation crops are Banana, Coconut, arecanut, guava, mango, lemon, bamboo etc. At present cropping intensity of the district is 203%. 18% of the net sown area is under mono cropping, 61% under double cropping and 21% under triple cropping.

**Table 3. 3 Socio- economic profile of Dhubri District**

| Description                    | 2011        | 2001        |
|--------------------------------|-------------|-------------|
| Population                     | 19.49 Lakhs | 15.66 Lakhs |
| Actual Population              | 1,949,258   | 1,566,396   |
| Male                           | 997,848     | 804,999     |
| Female                         | 951,410     | 761,397     |
| Population Growth              | 24.44%      | 22.97%      |
| Area Sq. Km                    | 2,176       | 2,176       |
| Density/km <sup>2</sup>        | 896         | 941         |
| Proportion to Assam Population | 6.25%       | 5.88%       |
| Sex Ratio (Per 1000)           | 953         | 946         |
| Child Sex Ratio (0-6 Age)      | 968         | 965         |

Source: <https://www.census2011.co.in>

65. In 2011, the literacy rate of Dhubri was 58.34% of which male and female literacy rate was 63.10% and 53.33% respectively

66. . The native language of Dhubri is Assamese, Bengali & Bodo. As per 2011 census population data of Dhubri district, Hindus are a majority here. Total population of Dhubri district is 3,20,647 as per 2011 census. Hindus constitutes 22.66% of Dhubri population

### 3.5.9 Comparisons of Districts with the State

**Table 3. 4 Comparison of District of Kokrajhar &Dhubri with the State of Assam**

| Description                | Districts of Assam 2011 |           | State 2011 |
|----------------------------|-------------------------|-----------|------------|
|                            | Dhubri                  | Kokrajhar | Assam      |
| Actual Population          | 887,142                 | 1,949,258 | 312,05,576 |
| Male                       | 452,905                 | 997,848   | 159,39,443 |
| Female                     | 434,237                 | 951,410   | 152,66,133 |
| Population Growth          | 5.21%                   | 24.44%    | 17.07%     |
| Area                       | 3,296                   | 2,176     | 78,438     |
| Density                    | 269                     | 896       | 398        |
| Sex Ratio                  | 954                     | 968       | 958        |
| Child Sex Ratio (0-6 Age)  | 959                     | 953       | 962        |
| Average Literacy           | 58.54%                  | 65.22%    | 72.19%     |
| Male Literacy              | 65.22%                  | 58.34%    | 77.85%     |
| Female Literacy            | 71.89%                  | 63.1%     | 66.27%     |
| Literates                  | 66,839                  | 181,170   | 191,77,977 |
| Male Literates             | 489,305                 | 922,341   | 105,68,639 |
| Female Literates           | 275,220                 | 511,551   | 86,09,338  |
| Child Proportion (0-6 Age) | 214,085                 | 410,790   | 14.86%     |

Source: <https://www.census2011.co.in>

67. The decadal growth rate for the state is about three times that of the district. The sex ratio of the state (958) and the district (959) is nearly same. The density of population in the Kokrajhar district is much lower than that of the state though the percentage of the urban population is nearly same.
68. The presence of Schedule Tribe (31.41%) population in Kokrajhar district is much higher than that of the state (7.15%) as a whole. It should be noted that the literacy rate of the district (65.22%) is much lower than that of the state (72.19%).

### 3.5.10 Migration Pattern

69. This paper examines various aspects of illegal migration into Assam from Bangladesh. We first attempt to define an illegal immigrant in Assam by discussing the parameters set by history and polity of the state over a long period of time. Various estimates put the number of illegal immigrants anywhere between a few hundred thousands to 4 millions. The study finds that environmental crisis caused by population pressure in Bangladesh and relatively greater economic opportunities in terms of higher lifetime income, acquisition of land and assets in Assam, have been the primary motivations behind large scale migration. Among the beneficial effects, the immigrants have contributed to the rise of agricultural productivity by introducing better techniques, crop diversity, and multiple cropping. The supply of cheap labor by the immigrants in the informal labor market have benefitted the consumers and producers alike.
70. Seasonal migration is a common phenomenon in Assam, particularly in draught affected rural areas. It is a well known fact that livelihood of poor families often depends on forced migration to urban areas and even beyond state boundary. However, the PIA did not record any significant impact of migration during the period 2013-14. There are families whose members had settled permanently in foreign countries.
71. Migration pattern in the PIA of NH-127 B has a different dimension. There are instances of people migrating in the region from various districts in Assam and other adjoining states as contractual labourers and other profession. The prospect of additional earning gets them to repeat their annual visit to work place even at the cost of homely comfort. A few have settled temporarily in PIA to work in clerical jobs. Absence of enough work opportunity within the neighboring district and even in the state has reported to be the main reason of migrating further away from their home. The project area has prospect of resources within its influence. It is expected that the proposed improvement work of NH 50 will open up prospect for the local people and there will be better road connectivity to venture to areas within accessible distance for livelihood.

## 3.5 SOCIAL IMPACT ASSESSMENT

### 3.5.1 Introduction

72. To understand the socio-economic profile of project area, the socio-economic information of Project Affected Persons (PAPs) was collected through the Socio-Economic Survey (SES) and Census survey which held in the primary PIA from the month of June to July, 2020.
73. In the context of JICA 's Policy of Involuntary Resettlement, Project Affected Persons are those who are physically displaced (relocation, loss of residential land, or loss of shelter) and/or economically displaced (loss of land, assets, access to assets, income sources, or means of livelihood) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas<sup>3</sup>. The project will have three types of Project Affected Persons i.e., (i) persons with formal legal rights to land lost in its entirety or in part; (ii) persons who lost the land they occupy in its entirety or in part who have no formal legal rights to such land, but who have claims to such lands that are recognized or recognizable under national laws; and (iii) persons who lost the land they occupy in its entirety or in part who have neither formal legal rights nor recognized or recognizable claims to such land. PAF means a Family in which each member, or whose sole member, is a person displaced.

### 3.5.2 Social Screening

74. The NH127B project is in line with JICA's desire to undertake projects that have targeted poverty reduction components and promote inclusive growth. As per JICA's guidelines of Categorization for Involuntary Resettlement this sub project is categorized as Category A. In accordance with World Bank Operational Manual 4.12, a Full Resettlement Plan will be prepared on the possible impacts identified and measured in SIA and mitigation measures as provisioned in the Entitlement Matrix of the Resettlement Framework and will be as per the Guideline and Template of Resettlement Framework.
75. As per JICA's guidelines of Categorization for Indigenous People Impact this sub project is categorized as sensitive. As per World Bank Operational Manual 4.10 there will be specific action favourable to indigenous peoples/ethnic minority in related plans such as a Resettlement Plan, a Gender Action Plan or a general Community Participatory Plan.

### 3.5.3 Habitations/Settlements along the Existing Road Alignment

76. The project Road is a connection between two National Highways (NH31C and NH-31) and Connecting with Meghalaya state with proposed bridge over river Brahmaputra in Assam. This Road has been passing through Villages Srirampur, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, Mudha Petla, Alokjhari, Bhati Petla, Satsaura, Kachakana, Pagla Hat, Barun Danga, Morterjhar, Baniyamari,

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<sup>3</sup><https://www.World Bank.org/sites/default/files/institutional-document/32827/files/ir-good-practices-sourcebook-draft.pdf>

Balajan, Dhepdheoi, Debdutta Hazdaha 1, Kachari Hat, Debdutta Hazdaha 2, Raja Katli, Kachua Kash, Chanda Khol, and Ada Bari).

### 3.5.4 Projects Impacts

77. The road project is associated with some adverse impacts as well as some benefits. The major impacts of the road project include loss of agricultural land due to acquisition of land all along the project corridor and in Bypasses and Realignment. Reconnaissance survey was done 30th June 2020. Census Survey started from 30th June and continues till 30th July. The SES was done on June 2020 -July 2020 and consultation done on June 2020 to July 2020 both of which are completed for the present design phase. The blank questionnaire of SES and Census Survey are attached as **Annexure 3**.

### 3.5.5 Positive Impact

- ❖ Road network will not only link the village communities to better markets, but also open up wider work opportunities in distant places. People can shuttle to distant worksites and engage in construction, mining, factories, business as well as domestic works.
  - ❖ The immediate benefits of road construction and improvement will come in the form of direct employment opportunities for the roadside communities and specially those who are engaged as wage labourers, petty contractors and suppliers of raw materials.
  - ❖ Effective drainage system to ensure that there will be no pooling of water
  - ❖ Safety measures for Highway signs, Pavement marking, Traffic signals, Truck lay byes, Bus stops and Bus bays
  - ❖ Rectification of geometric deficiencies (both Horizontal & Vertical).
  - ❖ Provision of Pedestrian passes.
  - ❖ Provision of ROBs to fly over the traffic and minimize the traffic congestion.
  - ❖ Provision of ROBs over railway crossings.
  - ❖ Slope protection.
  - ❖ Provision of crash barrier at Bridge approaches.
  - ❖ Improvement of all Major and Minor Intersections.
  - ❖ Facilities for public amenities such as Restrooms, Telephone booths, Toilets, shops and Trauma Centres.
78. Other benefits: -
- ❖ It will give a major fillip to the quest for all weather connectivity.
  - ❖ It will reduce travel time between metros by 50% to 60%.

- ❖ It will enhance the spirit of enterprise.
- ❖ Help the locals to ply their trade.
- ❖ Provide direct employment in road construction and allied activities.
- ❖ Lower accident and provide quick accessibility to services like hospital, market, office etc.
- ❖ Will help in growth of tourism activities immensely.

### 3.5.6 Impact on Land

79. The alignment was finalized as per the detailed engineering design. Initially, the numbers of affected villages were identified as per the alignment. All the village maps were collected from the local revenue offices. The village maps were digitized by the consultant. Following the digitization of village maps, the engineering design of the alignment was superimposed in the digitized cadastral map in order to identify the number of land parcels and their demarcation including the quantification. The superimposition of alignment on the village map provided all the plot numbers. A Land Acquisition Plan (LAP) has been prepared accordingly.
80. As discussed earlier also the scope of land acquisition is quite significant in the project because of availability of limited ROW and construction of four Bypasses. According to the Land Acquisition Plan (LAP) prepared as a part of Project Report, 159.071 Ha (private land 142.688 ha and Govt/others land 16.383 ha detail at *Annexure 5*) of land will be acquired for the sub-project. The area is excluding the area that already lies with Road Construction Department in terms of proposed roads falling in the alignment. A project census survey was carried out to identify the persons who would be displaced by the project and to make an inventory of their assets that would be lost to the project, which would be the basis of calculation of compensation. The major findings of the land acquisition estimate and census of 100% affected structures are discussed in the following sections which will be further updated after completion of landholder's data collection.

### 3.5.7 Impact on Structures

81. During the census survey in addition to structures belong to titleholders, large number of encroachers and squatters were also enumerated along the proposed road. Based on the social survey data of the title and non-title holders, a total of 1114 structures would be affected due to the improvement of the project road within the proposed ROW. Out of 1114 affected structures, 667 are private structures of title holders, 355 are structures are of non-title holders and there are 33 CPRs & 59 kiosks as detailed in (Table 4.1).



**Table 4. 1 Loss of Structure in the Sub-Project**

| SL. No.      | Type of Ownership                                          | No of Affected Household Families | No. of Structures |
|--------------|------------------------------------------------------------|-----------------------------------|-------------------|
| 1.           | Title Holder                                               | 556                               | 767               |
| 2.           | Encroacher                                                 | 87                                | 183               |
| 3.           | Squatter                                                   | 44                                | 72                |
| 4.           | Kiosk                                                      | 59                                | 59                |
| 5.           | Tenants                                                    | 94                                | -                 |
| 6.           | Employees to Commercial Structures/<br>Agricultural Labour | 90                                | -                 |
| 7.           | Persons losing only land                                   | 466                               | -                 |
| 8.           | Common Property Resources                                  | -                                 | 33                |
| <b>Total</b> |                                                            | <b>1396</b>                       | <b>1114</b>       |

Source: Census Survey, June - July 2020

82. The construction type of structures being affected in the project area is of various types such as temporary, semi-permanent and permanent. Structures have been classified as permanent, Semi permanent or Temporary based on the type of material use in construction of wall and roof. Structures having roof made of substantial material such as stone, brick, cement, concrete etc. is considered as permanent structure. A structure that has at least two fixed walls or structures made up of permanent material but roof is made up of the material other than those used for pucca or permanent structure are considered as semi-permanent. A temporary structure neither have two fixed walls or structures made up of permanent material nor roof is made up of the material that of the pucca or permanent structure More than 30% of the structures are temporary. The details of type and area of constructions of the affected Private structures are summarized in the (Table 4.2).

**Table 4. 2 Type and area of Construction of Affected Private Structures**

| Sl. No       | Type of Holding          | Number of Structures | Total Area (Sq m/ Rm) | Affected Area (Sq m/ Rm) | Percentage of Area Composition |
|--------------|--------------------------|----------------------|-----------------------|--------------------------|--------------------------------|
| 1.           | Compound Wall            | 93                   | 4560.6                | 2728.7                   | 14.26%                         |
| 2.           | Permanent                | 13                   | 553.6                 | 156.7                    | 0.82%                          |
| 3.           | Semi-Permanent           | 488                  | 17342.5               | 8354                     | 43.66%                         |
| 4.           | Temporary                | 332                  | 8539.8                | 5756.9                   | 30.09%                         |
| 5.           | Tin/ Bamboo etc. Fencing | 81                   | 2276.2                | 1711.9                   | 8.95%                          |
| 6.           | Under Construction       | 15                   | 816.6                 | 364.8                    | 1.91%                          |
| 7.           | Kiosk                    | 59                   | 179.6                 | 160.5                    | 0.32%                          |
| <b>Total</b> |                          | <b>1081</b>          | <b>34168.9</b>        | <b>19133.5</b>           | <b>100%</b>                    |

Source: Census Survey, June - July 2020

83. The details of the scale of Impact of the structures are depicted in the Table 4.3

**Table 4. 3 Intensity of Impact**

| Sl. No.      | Scale of Impact                              | Numbers     | % Age       |
|--------------|----------------------------------------------|-------------|-------------|
| 1.           | Category A (more than 40%)                   | 811         | 73%         |
| 2.           | Category B (less than 40% but more than 25%) | 115         | 10%         |
| 3.           | Category C (less than 25% more than 10%)     | 99          | 9%          |
| 4.           | Category D (less than 10%)                   | 89          | 8%          |
| <b>Total</b> |                                              | <b>1114</b> | <b>100%</b> |

Source: Census Survey, June - July 2020

84. As per census survey, out of 1114 structures affected in the sub-project, out of 1114 affected structures, 767 are private structures of title holders, 255 are structures are of non-title holders and there are 33 CPRs & 59 structures are kiosk. Out of 767 Title holder's structure 314 (TH) structures are of residential type, 361 (TH) are of commercial type, 11 (TH) are of residential-cum-commercial type, 69 compound walls of residential structures, 2 are cattle shed and there are 10 structures which are under construction. Out of the 314 structures of the NTH, there are 104 (NTH) residential structures, 119 commercial structures (NTH), residential cum commercial are 2 structures, 24 Compound walls of residential structures, under construction 5 and 1 cattle shed. There are also 59 Kiosk, who are considered as non-title holders, would be affected. The details of structures are given in the (Table 4.4).

**Table 4. 4 Use of Private Properties**

| Sl. No.      | Use of Private Property of Title Holders | Total Title Holder | Total Non-Title Holder | Total       |
|--------------|------------------------------------------|--------------------|------------------------|-------------|
| 1.           | Residential                              | 314                | 104                    | 418         |
| 2.           | Commercial                               | 361                | 178                    | 539         |
| 3.           | Compound wall of residential structure   | 69                 | 24                     | 93          |
| 4.           | Res-cum-commercial                       | 11                 | 2                      | 13          |
| 5.           | Under Construction                       | 10                 | 5                      | 15          |
| 6.           | Cattle Shed                              | 2                  | 1                      | 3           |
| <b>Total</b> |                                          | <b>767</b>         | <b>314</b>             | <b>1081</b> |

Source: Census Survey, June - July 2020

### 3.5.8 Impact on Community Structures

85. During census, it was observed that presence of community property resources including community, religious and government properties within the proposed right of way as well as proposed ROW. About of 33 such properties belong to community structures, religious structures and government structures. The detail of number of community properties, which may face relocation, has been mentioned in (Table 4.5).

**Table 4. 5 Loss of Community Property Resources**

| Sl. No. | Type of Properties | Number | Percentage |
|---------|--------------------|--------|------------|
| 1       | Temple             | 13     | 39.4%      |
| 2       | Mosque             | 2      | 6.1%       |
| 3       | Waiting Shade      | 11     | 33.3%      |

|              |              |           |                |
|--------------|--------------|-----------|----------------|
| 4            | Chabutara    | 2         | 6.1%           |
| 5            | School       | 3         | 9.1%           |
| 6            | Idgah        | 1         | 3.0%           |
| 7            | Union Office | 1         | 3.0%           |
| <b>Total</b> |              | <b>33</b> | <b>100.00%</b> |

Source: Census Survey, June - July 2020

### 3.5.9 Project Affected Persons (PAFs)

86. As per World Bank's definition, PAF (DF) means all members of a sub-project affected family/household residing under one roof and operating as a single economic unit or any of its components; may consist of a single nuclear family or an extended family group who are adversely affected by the Project or physically relocate from its homestead or commercial structure and Project Affected Persons (PAP) means in the context of involuntary resettlement, Project Affected Persons are those who are physically displaced (relocation, loss of residential land, or loss of shelter) and/or economically displaced (loss of land, assets, access to assets, income sources, or means of livelihood) as a result of (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Categories of PAFs are many types such as (a) Owners with Legal or formal title, b) Tenants and Leaseholders, c) Non-Titled Project Affected Persons (Encroacher and Squatter), d) Economically PAFs (Livelihood Losers e.g., Employees, Business Owner, Kiosks etc.

### 3.5.10 Impacts on PAFs

87. During the census survey in addition to structures belong to titleholders, large number of encroachers and squatters were also enumerated along the proposed road. Based on the social survey data a total of 1396 Families would be affected due to the improvement of the project road within the proposed ROW. Out of 1396 PAHs, 466 PAHs are Title Holders losing only land, 737 PAHs are losing private structures, 59 PAHs are losing Kiosk and Cattle sheds of three PAHs. There are 94 tenants in the proposed alignment without any formal documents and 32 mobile vendors who will be temporarily impacted. About 90 Employees to the Commercial structures and agricultural labourer are identified by the surveyor as there is no formal document. The agricultural labourer have seasonal job for around 5 to 7 months a year and usually works in more than one farm on daily basis. The details of the loss to the sub-project is depicted in the table 4.6.

**Table 4. 6 Loss in the Sub-project**

| SL. No. | Type of Ownership                                        | No of Affected Household |
|---------|----------------------------------------------------------|--------------------------|
| 1.      | Title Holder losing only Land                            | 466                      |
| 2.      | Owners losing structures                                 | 684                      |
| 3.      | Owners losing Cattle shed                                | 3                        |
| 4.      | Tenant without formal document                           | 94                       |
| 5.      | Kiosk                                                    | 59                       |
| 6.      | Employees to commercial structures / Agricultural Labour | 90                       |

Source: Census Survey, June - July 2020

### 3.5.11 Demography of PAFs

88. Socioeconomic survey was carried out for 743 sample families with 3864 number of total populations. The sample was selected among the PAHs such that there is proportional representation of the socio-economic parameters of the primary PIA. The sample population is around 53% of the total PAHs. Thus, the surveyor usually collects the detail socio economic data of one PAH out of two PAHs surveyed<sup>4</sup>. The sample survey data reveals that average family size of the sample family is (5.2). The age group break-up of the PAF is depicted in the **Table 4.7**

**Table 4. 7 Demography of PAFs**

| Sl. No       | Age           | Persons     |
|--------------|---------------|-------------|
| 1.           | 0-6 Yrs.      | 543         |
| 2.           | 6-14 Yrs.     | 246         |
| 3.           | 15-17 Yrs.    | 189         |
| 4.           | 18-60 Yrs.    | 2232        |
| 5.           | Above 60 Yrs. | 654         |
| <b>Total</b> |               | <b>3864</b> |

Source: Census & SES Survey, June - July 2020

### 3.5.12 Religious Stratification

89. Hinduism is the predominant religion in the primary PIA followed by Muslims. The detail presence of religion in the PIA is depicted in the **Table 4.8**

**Table 4. 8 Religious Stratification**

| Sl. No.      | Category  | Percentage  |
|--------------|-----------|-------------|
| 1            | Hindu     | 39%         |
| 2            | Muslim    | 36%         |
| 3            | Christian | 23%         |
| 4            | Others    | 2%          |
| <b>Total</b> |           | <b>100%</b> |

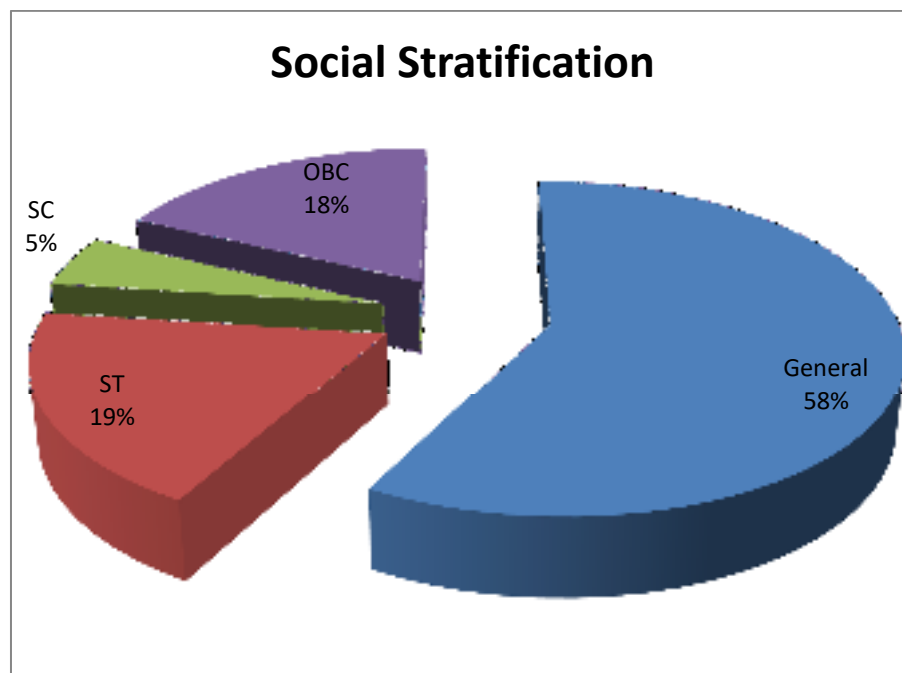
Source: Census & SES Survey, June - July 2020

### 3.5.13 Social Stratification

90. The social stratification of the project area shows dominance of General population with 58% Families followed by Schedule Tribe at 19%. The third and fourth stratum of the social grouping in the PIA is of Other Backward Class and Schedule Caste comprising of 18% and 5% respectively. The detail of social grouping in the project area is presented in the Figure 4.1

<sup>4</sup> The Survey was conducted in the month of June, 2020 with several guidelines including Lockdown issued by the Government to control the COVID-19 Pandemic. 100% Census survey was performed to all the PAFs. SES took twice the time of interaction with the PAFs than that of Census Survey, thus the SES sample was reduced to 50% of the Census. Wherever there is a single PAF, SES with Census was done.

**Figure 4. 1 Social Categories of PAHs along the Project Road**

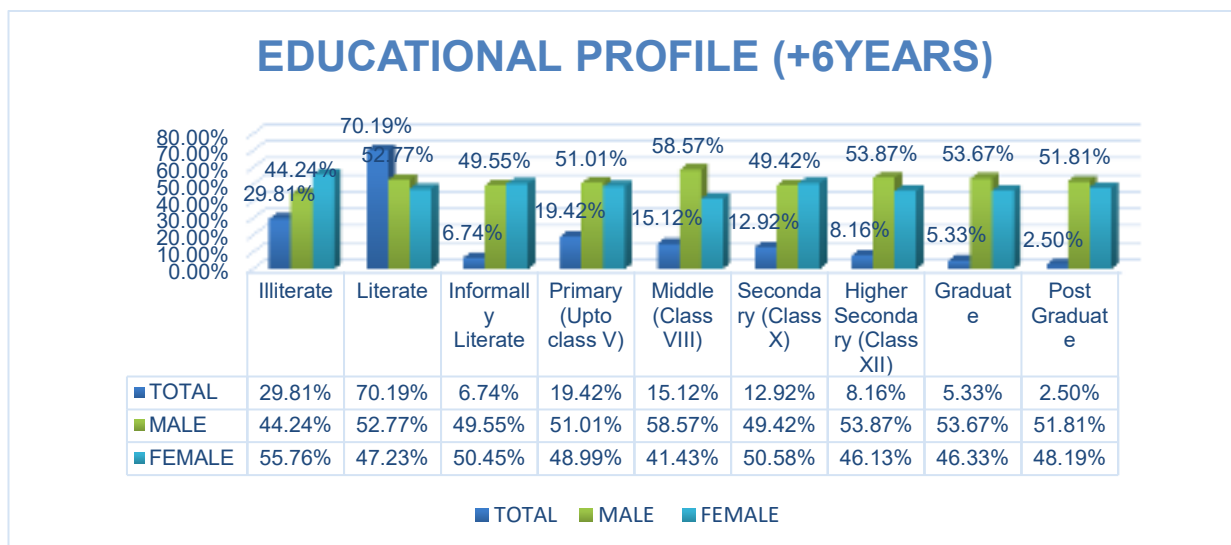


Source: Census & SES Survey, June - July 2020

### 3.5.14 Educational Status of PAPs

91. The educational status of the PAPs, above 6 years of age, reveals that overall scenario of literacy level is not encouraging in the project area. Out of total sample population 3864 the number of child population (0-6 yrs.) is 543 which are kept out. Significant percentage of population, i.e., 30% is still illiterate. About 19% has attained the education up to elementary level. Again about 5% PAPs are graduates; while very few (2%) have degree of master and above. For better understanding of the male female distribution each category of education is given. Thus the male and female distribution within the secondary level of education appropriately depicts that there are more females (51%) than the males 49%. The educational status is presented in the Figure 4.2. It should be noted that with the introduction of Midday Meal scheme by the Government the number of dropouts at pre-primary and primary has reduced drastically. The dropout at the PIA is even less than 2%.

**Figure 4. 2 Educational Status of PAPs**



Source: Census & SES Survey, June - July2020

### 3.5.15 Occupation of PAPs

92. The occupational status of PAPs reveals that 37% Population are depending on business and this includes the business they are carrying out along the road, mainly shops. About 13% Population are having agriculture as their source of income and 10% are engaged in government jobs. The details of occupations by the PAPs are presented in the (Table 4.9).

**Table 4. 9 Occupational Status of PAPs (14-60 Years)**

| Sl. No | Type of Occupation              | Percentage |
|--------|---------------------------------|------------|
| 1      | Agriculture & Allied Activities | 13%        |
| 2      | Government & Private Services   | 10%        |
| 3      | Trade & Business                | 37%        |
| 4      | Self Employed                   | 7%         |
| 5      | Casual Labour                   | 4%         |
| 6      | Others                          | 29%        |

Source: Census & SES Survey, June - July2020

93. The total number of persons is 3864 and the number of persons within the active age group of 15 to 60 years is 2421. Thus, the dependency ratio is about 59.6 which is quite high.

### 3.5.16 Income and Expenditure Profile of DHs

94. All the families surveyed have an average annual income more than Rs. 30000/-. About 28 % PAHs are having average annual income in the range of Rs. 30000-50000, while 43% of the families are earning between Rs. 50000-100000. It has been observed that about 29% PAHs have annual income more than Rs. 1,00,000. About 25% PAHs have Below Poverty Line (BPL) Card. The average income level of PAH in the project area is summarized in the (Table 4.10).

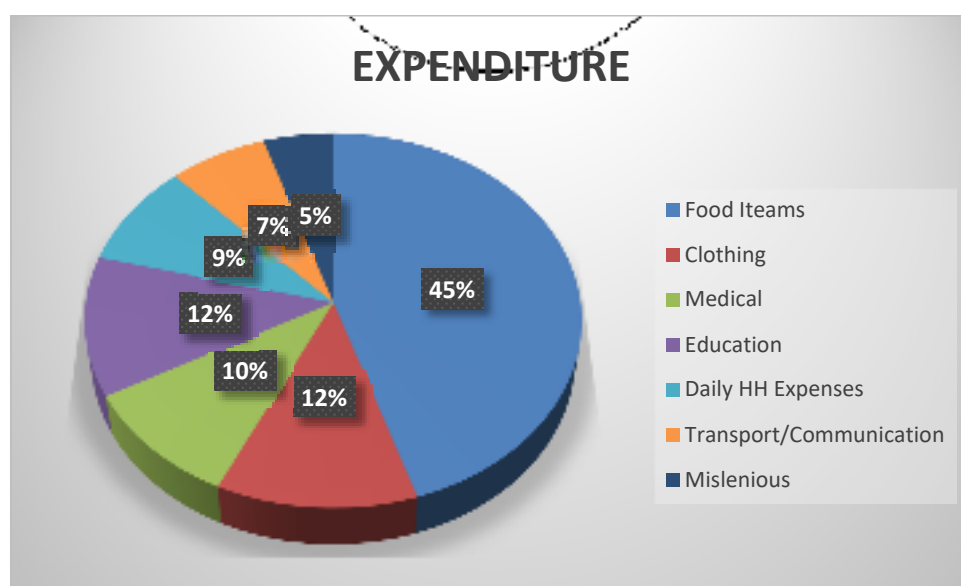
**Table 4. 10 Annual Income Level of the Affected Families**

| Sl. No.      | Annual Income Categories in (Rs)                 | % Age          |
|--------------|--------------------------------------------------|----------------|
| 1            | More than 30000 but less than or equal to 50000  | 28%            |
| 2            | More than 50000 but less than or equal to 100000 | 43%            |
| 3            | More than 100000                                 | 29%            |
| <b>Total</b> |                                                  | <b>100.00%</b> |

Source: Census & SES Survey, June - July2020

95. The expenditure pattern of the families surveyed revealed that about 42% of the average expenditure incurred by the PAHs is on the food items. The detail of the same is presented in graphical format in Figure 4.3.

**Figure 4. 3 Annual Expenditure Level of the Affected Families**



Source: Census & SES Survey, June - July2020

### 3.5.17 Vulnerability

96. Vulnerable Families are defined as affected families who are either: (i) below poverty line (BPL); or (ii) women headed household (WHH); or (iii) differently able households (DAH); or (iv) elderly (60 years and above) living alone; or (v) scheduled tribes (ST); or (vi) scheduled caste (SC). It shall be noted here that though there are multiple categories of vulnerability groups exist in the project road, we have taken single impact of single vulnerable category for the authentication. For example, the number of BPL/DA/Aged Person/WHH mentioned in the below table does not include those who fall under SC and ST category to avoid the repetition of data and vice-versa.
97. The census survey finding reveals that there is 19% PAHs along the roadside who belong to the ST community and 5% PAHs belong to SC category. As per the survey 25% of the population (excluding the SCs and STs) in the PIA are very poor having annual per capita



income less than Rs. 12,000<sup>5/</sup> and possess BPL Card. There is less than 1% of the PAHs are headed by Female. The Vulnerability is calculated of the Census Survey which is amounted to 50% of the PAHs in the PIA.

**Table 4. 11 Vulnerability Category Affected Families**

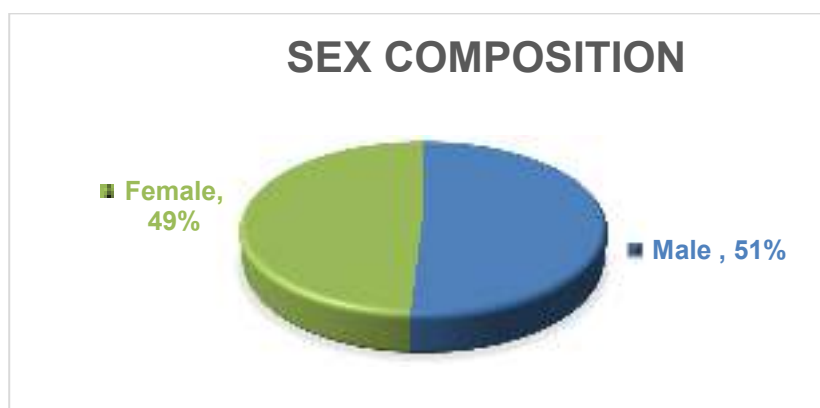
| Sl. No.                      | Vulnerability Categories    | Number      | % Age to total population |
|------------------------------|-----------------------------|-------------|---------------------------|
| 1                            | Schedule Tribe              | 265         | 19%                       |
| 2                            | Schedule Caste              | 70          | 5%                        |
| 3                            | Below Poverty Line          | 349         | 25%                       |
|                              | Women Headed Households     | 14          | 1%                        |
|                              | Senior Citizen living alone | 0           | 0%                        |
| <b>Total Vulnerable PAHs</b> |                             | <b>698</b>  | <b>50%</b>                |
| <b>Total PAHs</b>            |                             | <b>1396</b> | <b>100%</b>               |

Source: Census & SES Survey, June - July 2020

### 3.5.18 Impact on Gender

98. Out of total PAFs 1396 the total population is 7262. Out of 7262 population 997 are child population. The gender composition of PAPs shows that the male accounts for 51% and female accounts for 49%. The total Displaced population 7262 consists 3700 Male Population, 3562 Population are Female. The gender disparity is visible in lower sex ratio among PAPs i.e. 968 against state level statistic having 963 as per provisional census data of India, 2011. The literacy among the female is slightly higher than of the male counterparts at secondary level. There is less than 1% (14 in Numbers) of the PAHs are Women Headed Households.

**Figure 4. 4 Gender Ratio in Study Area**



Source: Census & SES Survey, June - July 2020

99. The Gender Development Index (GDI) value for India is very low and the socio-economic profile of the project area shows much lower socio-economic standing for women. They are largely involved in domestic work and have very low economic participation rate (i.e.

<sup>5</sup>The state specific poverty line was calculated on the basis of a monthly per capita income of Rs 691.7 in rural areas and Rs 871 in urban areas of Assam in the year 2012.

productive or gainful employment). In the project, women are affected in a variety of ways. From the past experience it reveals that the women folk faces hardship and stress and continue to suffer during the transition period until the time the project -affected households are able to regain their lost income and livelihood. Often, the duration of this process is lengthened due to delays in payment of compensation, rehabilitation assistance and implementing the R&R, reconstructing the livelihood systems. The longer the transition period, more are the miseries for women. The census identified 1% women headed households. The vulnerability of women headed households has been addressed in the RAP with social attention and gender specific attention. During project implementation, project affected women will receive preferential treatment for the civil work in the project.

### 3.5.19 Women Headed Family

100. In this road section out of 1396 PAF only 14 number of women headed family are being affected. From the survey 14 women headed family consists 59 Project Affected Person. Among 59 number of Project Affected Persons, the 4 are belongs to child category & 55 are categorized in the age group of above 6 years.

**Table 4. 12 Occupational Profile of the Women Headed Households**

| Sl.          | Occupational Pattern            | Male      | Female    | Total Number of Person | Percentage  |
|--------------|---------------------------------|-----------|-----------|------------------------|-------------|
| 1            | Agriculture & Allied Activities | 3         | 1         | 4                      | 7%          |
| 2            | Government & Private Services   | 0         | 1         | 1                      | 2%          |
| 3            | Trade & Business                | 3         | 12        | 15                     | 27%         |
| 4            | Self Employed                   | 2         | 3         | 5                      | 9%          |
| 5            | Casual Labour                   | 5         | 1         | 6                      | 11%         |
| 6            | Others                          | 10        | 14        | 24                     | 44%         |
| <b>Total</b> |                                 | <b>23</b> | <b>32</b> | <b>55</b>              | <b>100%</b> |

Source: Census & SES Survey, June - July 2020

**Table 4. 13 Educational Profile of Women Headed Household**

| Sl. No       | Educational Pattern          | Male      | Female    | Total Number of Person | Percentage  |
|--------------|------------------------------|-----------|-----------|------------------------|-------------|
| 1            | Illiterate                   | 4         | 7         | 11                     | 20%         |
| 2            | Literate                     | 19        | 25        | 44                     | 80%         |
| 3            | Informally Literate          | 5         | 9         | 14                     | 25%         |
| 4            | Primary (Up to class V)      | 6         | 10        | 16                     | 29%         |
| 5            | Middle (Class VIII)          | 5         | 4         | 9                      | 16%         |
| 6            | Secondary (Class X)          | 2         | 1         | 3                      | 5%          |
| 7            | Higher Secondary (Class XII) | 1         | 1         | 2                      | 4%          |
| 8            | Graduate                     | 0         | 0         | 0                      | 0%          |
| 9            | Post Graduate                | 0         | 0         | 0                      | 0%          |
| <b>Total</b> |                              | <b>23</b> | <b>32</b> | <b>55</b>              | <b>100%</b> |

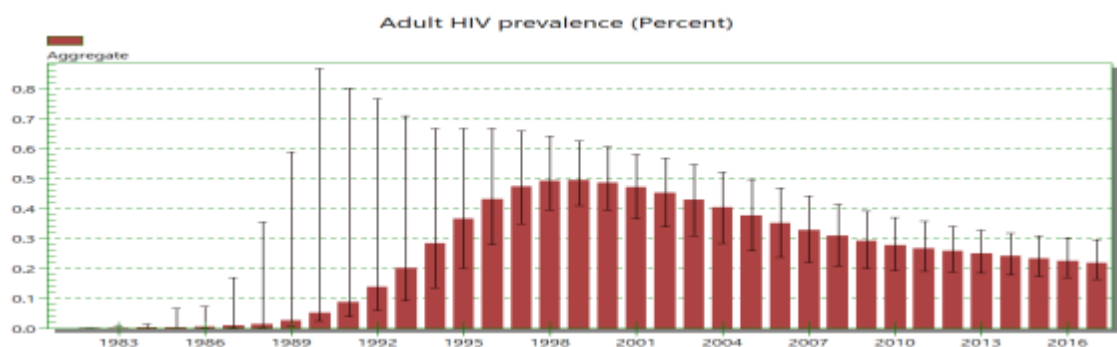
Source: Census & SES Survey, June - July 2020

101. Payments will be made directly to these women and the RP implementing NGO/Agency will ensure that they have bank accounts opened in their names. They will also receive additional financial assistance and be eligible to the livelihood training, as they are considered as vulnerable as per the entitlement matrix.
102. Each field team of the RAP implementation agencies/partner agencies shall include at least one-woman investigator/facilitator. The PIU will ensure that the women are consulted and invited to participate in group-based activities to gain access and control over the resource as a part of the RAP. The monitoring and evaluation team(s) shall include woman. Further, during RAP implementation, NGO's will make sure that women are actually taking part in issuance of identity cards, opening accounts in the bank, receiving compensation amounts by cheque in their names. This will further widen the perspective of participation by the women in the project implementation. The implementing agencies will provide training for upgrading women's skill for alternative livelihoods and income restoration.

### 3.5.20 HIV/ AIDS and Health Risks

103. HIV/ AIDS are major development challenges in India. Given the epidemic nature of the problem, it may reverse India's achievements in health and development. According to National AIDS Control Organization (NACO) HIV estimates for 2017, National adult (15–49 years) HIV prevalence in India is estimated at 0.22% (0.16% – 0.30%) in 2017 and in the state of Assam it is 0.06% only.
104. In 2017, adult HIV prevalence is estimated at 0.25% (0.18-0.34) among males and at 0.19% (0.14-0.25) among Females. The adult HIV prevalence at national level has continued its steady decline from an estimated peak of 0.38% in 2001-03 through 0.34% in 2007, 0.28% in 2012 and 0.26% in 2015 to 0.22% in 2017.

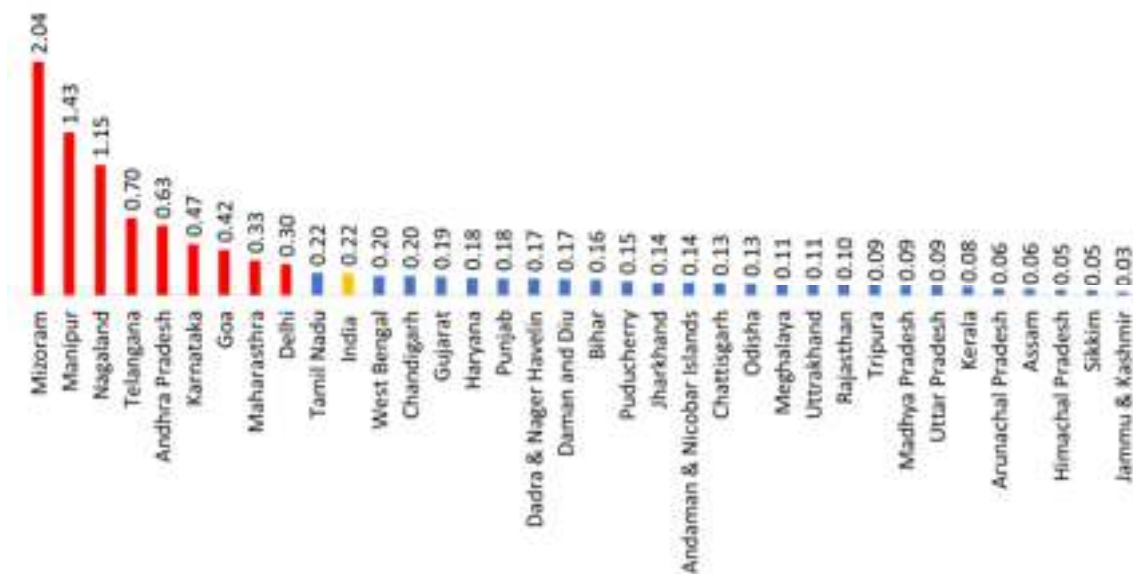
**Figure 4. 5 Adult HIV Prevalence in India during 1990 to 2017, HIV Estimations 2017 (NACO)**



- 105.
106. Among the States/UTs, in 2017, Mizoram has shown the highest estimated adult HIV prevalence of 2.04% (1.57-2.56), followed by Manipur (1.43%, 1.17-1.75), Nagaland (1.15%, 0.92-1.41), Telangana (0.70%, 0.50-0.95) and Andhra Pradesh (0.63%, 0.47-

0.85). Besides these States, Karnataka (0.47%, 0.37-0.63), Goa (0.42%, 0.21-0.79), Maharashtra (0.33%, 0.25-0.45) and Delhi (0.30%, 0.18-0.47) have shown estimated adult HIV prevalence greater than the national prevalence (0.22%), while Tamil Nadu (0.22%, 0.14-0.31) had a point prevalence like the national average. All other States/UTs have levels of adult HIV prevalence below 0.22%.

**Figure 4. 6 State wise Adult HIV Prevalence in 2017, HIV Estimations 2017 (NACO)**



107.

108. FGDs that took place at the roadside eateries reveals that particularly the truckers drive the HIV/AIDS epidemic and many studies indicate that infection is spreading rapidly to the general population. Recently, the Government of India (GOI) has shown increasing commitment to HIV/AIDS control. GOI established a consortium like collaboration of external partners (UNAIDS, USAID, DFID, CIDA and others) to provide technical and financial assistance to NACO to design and help implement GOI's national policy on HIV/AIDS control before mass spread into general community.

109. There is need to improve awareness level in the state, particularly in the project area. In recognition of the importance of HIV/AIDS issue, EA should carry out HIV/AIDS Awareness Campaign under this project through the use of NGOs. Information and education campaign on HIV/AIDS and other sexually transmitted diseases (STDs) will be conducted by a qualified NGO during project implementation. The campaign will target the project construction workers at campsites, truckers at truck stops and dhabas<sup>6</sup> and the public at large along the alignment. The NGO will work closely with the relevant state agencies and other proposed networks dedicated to prevention work for further building up of awareness programs in the project area. HIV/AIDS awareness brochures would also be developed for distribution to local communities, local markets, truck/bus stations and other appropriate places to increase awareness about risks/dangers of HIV/AIDS. This

<sup>6</sup> Roadside Eateries and sometimes stopover and night stay

would ultimately lead to lowering the risk for the general community in the project affected area.

110. The Project Area is not much affected by HIV/AIDS as per NACO reports on 2011 on the study for 2005, 2006 and 2007. The district of Dhubri and Kokrajhar lies in the Category C of HIV/AIDS affected districts of India. As disclosure of the names of the AIDS victim is not permissible the actual numbers of the victims in the PIA present is not available.

### **3.5.21 Impact on Access to Services Amenities**

#### **3.5.21.1 Transport facility**

111. Transport facility is considered as the most basic of all civic amenities as this is the life line to access any kind of social services. Most of the clusters in the PIA have adequate road transport facility but it fails to cater its benefit due to bad condition of the road. In the project area the nearest express railway stations are Kokrajhar, Dhubri & New Bongaigaon all are accessible by bus or shared vehicle.

#### **3.5.21.2 Other Services**

112. The proposed project road does not hindrance the Natural flow of water. About 2 more bridges are proposed at the proposed road. As the chainage is low lying flood prone the height of the road is raised. During the construction there might some temporary restrictions in access which have to be taken care in the Resettlement Plan.
113. There is no temporary or permanent impact regarding the limited access to services or amenities are envisaged in the process of development of the proposed project.

### **3.5.22 Impact on Indigenous People**

#### **3.5.22.1 Impact on Land & Structure of IP**

114. About 18% of structures impacted by the proposed project belong to the Indigenous people. Most of the impacted area presently falls under the cadastral land holding system the RoR (Right of Records) is available for the title holders at the Land & Revenue Department of the District Council. Any kind of impact on land of the ST community and Non-Cadastral land requirement in the project road will be analysed after the finalisation of LAP of the proposed road. The final status will be updated in the final Resettlement Plan. Again, an IPP will be prepared to mitigate any impacts that might occur during or post construction activities.

**Table 4. 14 Impact of ST PAHs**

| SL. No.      | Type of Ownership                                             | No of Affected Household Families | No. of Structures |
|--------------|---------------------------------------------------------------|-----------------------------------|-------------------|
| 1            | Title Holder                                                  | 177                               | 55                |
| 2            | Encroacher                                                    | 30                                | 31                |
| 3            | Squatter                                                      | 14                                | 14                |
| 4            | Kiosk                                                         | 15                                | 15                |
| 5            | Tenants                                                       | 13                                |                   |
| 6            | Employees to Commercial Structures and agricultural labourers | 16                                |                   |
| <b>Total</b> |                                                               | <b>265</b>                        | <b>115</b>        |

Source: Census & SES Survey, Jan-Mar 2020

**Table 4. 15 Impact on Structure of ST PAHs**

| Sl. No.      | Use of Structures  | Numbers    |
|--------------|--------------------|------------|
| 1            | Residential        | 55         |
| 2            | Commercial         | 49         |
| 3            | Compound wall      | 3          |
| 4            | Res-cum-commercial | 1          |
| 5            | Under Construction | 2          |
| 6            | Kiosk              | 4          |
| 7            | Cattle Shed        | 1          |
| <b>Total</b> |                    | <b>115</b> |

Source: Census & SES Survey, Jan-Mar 2020

### 3.5.22.2 Impact on Socio Economic Profile of IP

115. The proposed subproject can be viewed as boosting economic growth and poverty reduction, which will bring substantial social and economic development in the region. About 19% of the PAHs is ST who are mostly in the lower income group of Rs.30,000 to Rs. 50,000 annually.

**Table 4. 16 Annual Income Level**

| Sl. No.      | Annual Income Categories in (Rs)                 | % Age          |
|--------------|--------------------------------------------------|----------------|
| 1            | More than 30000 but less than or equal to 50000  | 59%            |
| 2            | More than 50000 but less than or equal to 100000 | 26%            |
| 3            | More than 100000                                 | 15%            |
| <b>Total</b> |                                                  | <b>100.00%</b> |

Source: Census & SES Survey, June - July 2020

### 3.5.22.3 Impact on Community of IP

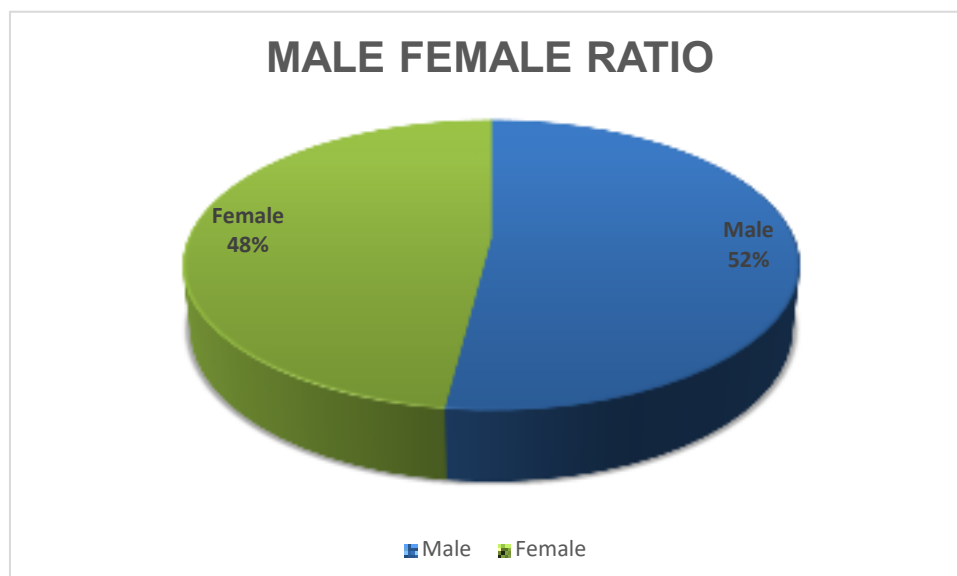
116. This subproject has ensured that the designed and implementation will be in such a way that it fosters full respect for IP identity, dignity, human rights, livelihood systems, and cultural uniqueness as they define them. There is no impact on the community structure or community land of cultural or religious sentiment of the tribal Population in the Primary PIA. The proposed project will ensure that IPs receive culturally appropriate social and economic benefits, do not suffer adverse impacts as a result of projects, and can participate actively in projects that affect them.

### 3.5.22.4 Impact on Gender of IP

117. A culturally appropriate and gender-sensitive assessment was carried out for social impacts to assess the potential project impacts, both positive and adverse, on IP's Gender issues. It was identified that social and economic benefits for affected IPs which are culturally appropriate, gender and inter-generationally inclusive and develop measures to avoid, minimize, and/or mitigate adverse impacts on IPs. Suggestion of noise barrier, reduction of dust, providing employment of the female members as unskilled labourers during construction were the results of the focus group discussions.

118. The gender composition of PAPs in Indigenous People shows that the male accounts for 52% and female accounts for 48%. The gender disparity is visible in lower sex ratio among PAPs i.e. 929 against total project area having 968 as per Socio Economic Survey June- July2020.

Figure 4. 7 Male Female Ratio



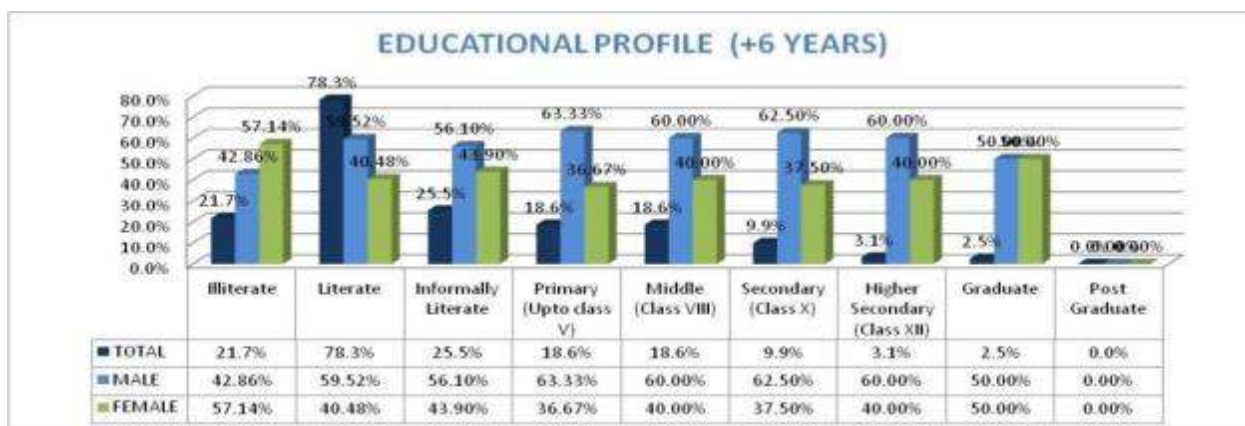
Source: Census & SES Survey, Jan-Mar 2020



### 3.5.22.5 Educational Status of PAPs of IP

119. The educational status of PAPs above 6 years of age reveals that overall scenario of literacy level is not encouraging among the IP communities. Significant percentage of population, i.e., 21% are still illiterate. Around 25.5% has attained the education up to elementary level. Out of this 25.5% of the PAPs attained the education at primary level 56.1 % is male and the rest 43.9% is female. The educational status is presented in the Figure 4.8

Figure 4. 8 Educational Profile



Source: Census & SES Survey, Jan-Mar 2020

### 3.5.22.6 Occupation Profile of PAPs of IP

120. The occupational status of PAPs reveals that 20% PAPs are depending on business and this includes the business they are carrying out along the road, mainly shops. About 26% PAPs are having agriculture as their source of income and 8% are engaged in government jobs. The details of occupations by the PAPs are presented in the (Table 4.16).

Table 4. 17 Occupational Profile (14-60 Yrs.)

| Sl. No | Type of Occupation              | Percentage |
|--------|---------------------------------|------------|
| 1      | Agriculture & Allied Activities | 26%        |
| 2      | Government & Private Services   | 8%         |
| 3      | Trade & Business                | 20%        |
| 4      | Self Employed                   | 10%        |
| 5      | Casual Labour                   | 15%        |
| 6      | Student                         | 6%         |
| 7      | Housewife                       | 7%         |
| 8      | Unemployed                      | 8%         |
| Total  |                                 | 100%       |

Source: Census & SES Survey, Jan-Mar 2020

### 3.5.23 Access to Social Services

#### 3.5.23.1 Educational service

121. All the clusters have primary schools and Anganwaris<sup>7</sup> located mostly within the clusters or within a distance of 1 km. There are primary schools mainly private in very clusters. High schools are also situated within accessible distance where the students can reach either on foot or by cycle. Attendance of girl students up to high school level is encouraging. As reported there at least 96 primary schools and 60 high schools in the PIA. However, institutional facility beyond high secondary level of education is impeded by lack of frequent public transport system and bad traffic condition, especially during peak hours. The higher education for girls is adversely affected as journey to far off colleges becomes restricted for some of them. There are 13 colleges in the PIA.

#### 3.5.23.2 Health care service

122. There is 11 primary health centre (PHC) and three referral Govt. hospitals in the project influence area. Majority of the people in the PIA avail of the facility of the private health clinics which are available nearby. In case of severity of ailment the referral hospital at accessible distance provides the necessary service. Besides, critical patients are also brought to private hospital at Hyderabad. The government primary health centres are however, constrained by poor health infrastructure and absence of suitable number of doctors. The common mode of transport to a health centre or referral hospital is bus and/or three wheeler or private vehicles. Average travel time to these health care centres is approximately 30 minutes, while journey to Private hospital takes around 15 minutes. The average cost of one round trip journey to the frequently visited Govt. health centres / referral hospital is Rs.30 for about 50% clusters. The same costs about Rs.20 for visit to private hospital.

123. On 1st April, 2008 Ministry of Labour and Employment, Govt. of India has launched a new health insurance scheme, Rashtriya Swasthya Bima Yojana (RSBY)<sup>8</sup> for the BPL families in order to protect them from financial liabilities arising out of health issues necessitating hospitalization. The beneficiaries are entitled to hospitalization coverage up to Rs.30,000. The coverage extends up to five members of the family and the beneficiaries need to pay Rs.30 only as registration fee. It has targeted intervention for about 5 to 6 lakhs BPL families in the district. So far about 4 lakhs beneficiary families of the district have been enrolled under this scheme. Six private hospitals in the PIA are empanelled to cater to the need of these poor families in order to ensure their

<sup>7</sup> Pre-nursery schools within villages under Integrated Child Development Schemes, GOI, which provide some preliminary education and midday nutritious meals.

<sup>8</sup> Rashtriya Swasthya Bima Yojana is a health insurance scheme initiated by Min. Labour & Employment, GOI on 1 April, 2008

hospitalization coverage. It is expected that once this subproject is implemented the poor people within PIA will be able to get the benefit of quality treatment in recognized hospitals under RSBY scheme. There are also some schemes provided by some private health care service providers.

### **3.5.23.3 Marketing facility**

124. There is unlimited number of markets within the PIA. Amongst them, most frequently visited major market centre is at Dhubri and Khorajhar, at the project road section. For majority of the clusters the market is located within a distance of 5 km and is accessible by bus and auto. The average travel time is 15 – 30 minutes with round trip travel cost of less than Rs 30 for each person. The wholesale markets are located at Guwahati, Assam. However, many traders and businessmen also travel by bus and jeep to the market to avail of wholesale market facility. The traders of the clusters within PIA buy consumer goods at a reasonable rate to be resold at retail market in the clusters. The travel time to the wholesale market increases even up to 5 hours during rainy months when cost of travel too is raised with an upper limit of Rs 140- 250 by shared vehicle.

### **3.5.23.4 Community Development Block service**

125. Community Development Blocks (CD Block) would be established as part of development plan of Govt. of India in order to provide assistance, subsidies, agricultural inputs and expertise and extension service to the rural people for all round development of an area within jurisdiction of a CD Block. The PIA is spread over nine CD Blocks. All the concerned clusters are within a distance of 5 km of their respective CD Block head quarters. Average travel time to most of the block offices is about half an hour with cost of round trip journey up to Rs.20. People can avail of necessary information on various Govt. sponsored schemes like NREGS, low cost housing grant (VAMBAY)<sup>9</sup>, grant for sanitary toilet, free or subsidized agricultural inputs etc.

## **3.5.24 Access to Civic Amenities**

### **3.5.24.1 Transport facility**

126. Transport facility is considered as the most basic of all civic amenities as this is the life line of access to any kind of social services. Most of the clusters in the PIA have adequate road transport facility but it fails to cater its benefit due to traffic congestion. The nearest big railway station at Khokrajhar Junction and is accessible by bus or shared vehicle. Bus service is available near PIA. While 50% of the clusters have access to bus service within 20 km of their places, rest of the locals has to travel up to 30 km. Travel cost to bus service point is Rs 30 for those living within 10 km while rest of the people have to pay up to Rs 50 and time taken to reach such place is about one hour. The local bus services and three wheeler services, most commonly used mode of transport, are

<sup>9</sup> Valmiki Awas Yojana, housing grant for the poor

available for all the clusters which pass along the project road section. People mostly avail of bus service to visit CD Block offices, Govt. and private offices or whole sale markets. The most common difficulty faced by the people is irregular movement of traffic. Apart from that, ill maintained road network, potholes that remain unattended result in increase in travel time and cost, particularly during peak hours. Attendance at schools, particularly for the young children from poor families is very low during rainy months.

### **3.5.24.2 Sanitation facility**

127. The PIA is growing every day. There is tremendous population pressure now beyond the National Highways. The existing sanitation facilities had been choking out. Also the sanitation facility is not at par with the standard of the modern cities. Solid waste management facilities are lacking most. There is reluctance as well as lack of awareness among the people regarding usefulness of proper sanitation facility, although Govt. encourages people to maintain hygienic sanitation system in house. Local Government Authorities, within the town, had employed large contingent of labour, both male and female, for cleanness of the road and collection of solid waste. However proper implementation of this procedure is absent in the outer fringes. C.D. Blocks, however, provide information on low cost sanitation system through IEC materials like posters and pamphlets to create awareness towards benefit of sanitation.

### **3.5.24.3 Drinking water facility**

128. About 25% of the clusters have pipeline water supply. Neither there is a regular and sufficient water supply is done nor there is any proper water purification facility installed by the Government. People of most of the clusters do not have access to clean drinking water and have to buy drinking water. Most of the rich households have also their own water purification system as well. There are few residential as well as commercial complexes in the PIA, where they had installed deep tube wells for their drinking as well as other purposes. There is no record of adverse scarcity of drinking water in summer season. Two fresh water reservoir (tank), are the prime source of drinking water of PIA.

### **3.5.24.4 Other Services**

129. The PIA though is in close proximity to the state capital lacks in many essential services. The most important is the electricity. There is frequent load shedding in the PIA and the supply is irregular and insufficient. There about 2 to 4 hours power failure or load shedding during the office hours.

## 3.6 CONSULTATIONS

### 3.6.1 Introduction

130. Public consultations or community participation is an integral part and process of any project which involves resettlement or rehabilitation issues. It helps to incorporate valuable indigenous suggestions and perceptions of development. In the process, stakeholders get the opportunity to address issues, which are resolved after making appropriate changes in design and alternative finalization. The stakeholders become aware of the development schemes and at the same time influence and share the control over these initiatives, decisions and resources. Community consultations also help to avoid opposition to the project, which is otherwise likely to occur.
131. During the course of the social impact assessment, consultation meetings were held to inform the communities and population about the positive as well as negative impacts of the road improvement scheme. Public Consultations were held along the subproject with the displaced households, local persons who will be benefitted from the project and other stakeholders of the sub project. Focus group discussions were held with the youth's group, women's group, farmers, shopkeepers, tenants, interest groups and organisation. Key Informant Interview took place with the village head men, gram panchayat members, head of households and important personalities. There was special consultation with the individual women, vulnerable affected persons and tribal persons. These meetings were used to get wider public input from both the primary and secondary stakeholders.

### 3.6.2 Identification of the stakeholders

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

### 3.6.3 Consultation during Project Preparation

134. The field work starts from the month of June, 2020 during the Pandemic of Covid-19. It was advised by the Block Development Officer to organize Public Consultation with less than 15 persons at any point of time. The community participation programmes in social impact assessment ensured that information is disseminated to all the PAPs and other stakeholders in appropriate ways. The information dissemination has taken place in vernacular, giving details about the main project features and the entitlement framework.

135. Due consideration has also been given to address the views of the vulnerable groups. The Census/Survey Team carried out preliminary consultations through Focus Group Discussions (FGDS) and meetings with the PAPs as well as the general public in the project area. The local Panchayat leaders were informed through the PIU and the date and venue of the Public Consultation were fixed.
136. About 9 informal FGDs were conducted primarily in settlements with problems of traffic congestion, dense informal/squatter settlement, close junctions and road intersections, and concentration of PAPs. During the survey, intensive discussion and consultation meetings were conducted with the individual PAPs in every affected village wherein policy related issues; displacements and other related issues were discussed. Suggestions and comments by PAPs were incorporated in the project road design as well as the policy measures for resettlement management.
137. Second round of Public Consultations will be conducted at important points, where people could assemble in large numbers. Panchayat members will be contacted to inform the people beforehand. The PIU will be informed to organize formal consultations and the consultant team will also organize informal meetings with village people and other distinguishes persons, leaders of local level organization /association, trucker's association, and village women's groups. The consultation methods will be followed to elicit required information (their views & opinions), are detailed below in Table 5.1.

**Table 5. 1 Consultation Methods adopted**

| Stakeholders                                                              | Methods                                       | Status                        |
|---------------------------------------------------------------------------|-----------------------------------------------|-------------------------------|
| Individual Household Interview of Displaced Households.                   | 100% Survey of the total displaced households | Completed                     |
| Village Headmen & Gram Panchayat members (local elected representatives). | Key Informant Interview                       | Completed                     |
| Women's belonging to various socioeconomic groups.                        | Focus Group Discussions (FGDs)                | Completed also to be Continue |
| Other vulnerable groups (ST and those BPL).                               | Focus Group Discussions (FGDs)                | Completed also to be Continue |
| Government Stakeholders (BDO, CMOs, ANMs, Teachers etc.).                 | Semi-structured interviews                    | Completed                     |

Source: Socio-Economic Survey on June- July2020

**Table 5. 2 Consultations Performed at Stage I**

| Sl. No. | Type of Consultation | Number | No. of Attendant |
|---------|----------------------|--------|------------------|
| 1       | FGD                  | 9      | 67               |
| 2       | FGD-Female           | 2      | 11               |
| 3       | KII                  | 4      | 16               |

Source: Socio-Economic Survey on June- July2020

### 3.6.4 Proceedings and Outcome at Stage - I

138. A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. The main point of discussions were minor realignments to save certain structures, compensation and assistance, road safety etc. It has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing Agency, to take care of the implementation of the project to bring about promised benefits with proper safety measures.
139. The information and recommendations gathered from the various stakeholder consultations has been incorporated into the design of the project to ensure that the investments align with local priorities and development plans, and that they will deliver equitable socio-economic benefits to the intended project beneficiaries.
140. Due to the extreme Pandemic situation in the whole world, the PIA is not an exception. There is lockdown, social distancing and various conditions that are not conducive for Public Consultation. As per the guidelines only five persons could be called for Consultation at Panchayat Office thus those are the Public Representatives and the Public Consultation is rather Key Informant Interview in Nature. Informal FGDs have been done at the villages, market place and other common places to gather and disseminate information about the proposed project.
141. Still there might be persons who could not be informed or not satisfied with the present information, for them a special system is introduced by the survey team. One email address and one dedicated mobile number which is shared with the leaflets for satisfying mainly the PAPs and the locals regarding any queries or complain.
142. Any call at the mobile would be answered by the surveyors, if the caller is not satisfied then call could be transfer to some senior positions or the caller number and queries is recorded and passed on to some senior positions for satisfying the caller. This email and mobile number will be shared/handed over to the PIU for future.

Mobile No: +91 8876608242

Email: [information.nh127@gmail.com](mailto:information.nh127@gmail.com)



**Table 5. 3 Brief Description of some sample Public Consultation**

| Date / Place                                     | No of Participants              | Major Issues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Agreed upon                                                                                                                                                                      | Mitigation Measures - Input to technical Design                                                                                                                                                                                                                         |
|--------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place: Srirampur Bazar, 20/07/2020               | Total-13<br>Male-13<br>Female-0 | The existing alignment passes through the town area. It is also a junction town and many Goods vehicles passes through the town. There are both commercial and residential establishments along the alignment. It has been revealed from the Public consultations that the people on both side of the road, considering future potential in development, but afraid of road accident and menace like trafficking and HIV. Some of them also put the issue of construction of concrete drains for the development of the sewage system of the town. | Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for development.                        | The local authorities also assured that they would help in development of roads project. Road safety awareness campaign should be made at schools                                                                                                                       |
| Place: Malkapur, 20/07/2020<br><b>Female FGD</b> | Total-3<br>Male-0<br>Female-3   | During discussion it has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing Agency, to take care of the implementation of the project to bring about promised benefits and the traffic safety.<br><br>Simultaneously a focus group discussion with all female participants was held in the same area.                                                                                                                                                                       | The female participants apprehend about the increase in the number of road accidents and would be dangerous to the children and students who usually not careful using the roads | It has been suggested to make traffic safety awareness campaign at the schools and localities.<br><br>It is also learnt that a NGO would be recruited for developing the awareness of the people of PIA regarding, trafficking, gender issues and other social stigmas. |
| Place: Majadabri-2, 20/07/2020                   | Total-6<br>Male-6<br>Female-0   | If the existing road is to be improved, there is loss of residential & commercial and religious structure. The livelihood loss of the people is apprehended. Therefore, the local people had trade of this loss for future development. The local were positive about development. As per the suggestions received through public consultation, the proposed project and its benefits is the only feasible option for development of the area. The main point of discussion was to keep safe two religious structures.                             | The proposed road project is the only feasible option for development.                                                                                                           | The people agreed to cooperate and help in all possible ways for the successful of the project. As the people are very much against the demolishing the religious structures some less PRoW would be acquired                                                           |

| Date / Place                         | No of Participants            | Major Issues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Agreed upon                                                                                                                                                                                                          | Mitigation Measures - Input to technical Design                                                                                                                                                                              |
|--------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place :<br>Kayarappur,<br>20/07/2020 | Total-7<br>Male-7<br>Female-0 | The town is basically a trading hub. The cultivators as well as the traders are concern of selling their agricultural and industrial output at proper price Though the town lacks in many infrastructural facilities, but they think that with better communication there would be economic development their prosperity. All other issues would be solved automatically. As this proposed road is the only communication to the outer world they want the road to be completed within schedule time. | The road after constructed would have major impact on both the economic and social life of the locals of the area.                                                                                                   | The road is expected to be completed by two years.                                                                                                                                                                           |
| Place :<br>Uzanpetla,<br>21/07/2020  | Total-8<br>Male-8<br>Female-0 | The livelihood loss of the people is apprehended. The local people want some jobs of unskilled labour and petty supplier to the Civil Contractor. The local were positive about development. As per the suggestions received through public consultation, the proposed project and its benefits is the only feasible option for development of the area.                                                                                                                                              | The proposed road project is the only feasible option for development.                                                                                                                                               | The people agreed to cooperate and help in all possible ways for the successful of the project. The PWD assure to provide jobs and petty contract as many as possible to the local people.                                   |
| Place :<br>Baniyamari,<br>22/07/2020 | Total-5<br>Male-5<br>Female-0 | The existing alignment passes through the town area. It is also a junction town and many Goods vehicles passes through the town. There are both commercial and residential establishments along the alignment. As the proposed road will allure the motorist to drive fast there would be increase in road accident                                                                                                                                                                                   | Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for development. Road Safety will be look after                             | The local authorities also assured that they would help in development of road project. Road safety awareness campaign should be made at schools. There would ample signage and other road furniture to reduce the accident. |
| Place :<br>Bhatipetla,<br>22/07/2020 | Total-7<br>Male-6<br>Female-1 | A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. The most important topic of discussion was the alignment which passes through the two-market complex, which is fully affected. The residents with their representatives all disagree in demolishing of the market complex, partially or fully.                                  | The local people had agreed in the view of the proposed road project which will bring some hope to the movement of the heavy vehicles and development of the area but against any damages to the market structures.. | The PWD officials had agreed to take special care for traffic movement and road safety.                                                                                                                                      |

| Date / Place                                                                                                                                                                                                                                                                                         | No of Participants              | Major Issues                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Agreed upon                                                                                                                                               | Mitigation Measures - Input to technical Design                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place : Paglahat,<br>23/07/2020<br><b>Female FGD</b>                                                                                                                                                                                                                                                 | Total-8<br>Male-0<br>Female-8   | Focus Group discussion with the Female population reveals that there is need for training of the locals in handicrafts mainly weaving. During discussion it has been observed that skills of weaving, tailoring, making of small artefacts of bamboo are almost at a dead end. The local females want the Executing Agency to take care of the proper training and marketing of the same. The female participants apprehend about the increase in the number of road accidents.. | The female agree to form Self Help Group at the localities to jointly produce and market the handicrafts of the PIA.                                      | A NGO would be recruited for developing the awareness of the people of PIA regarding road safety, trafficking, gender issues and other social stigmas. The NGO would also entrusted to train and to do market survey for marketing of the handicraft products. |
| Place : Paglahat,<br>23/07/2020                                                                                                                                                                                                                                                                      | Total-14<br>Male-14<br>Female-0 | It is also a junction town and many Goods vehicles passes through the town. There are both commercial and residential establishments along the alignment. Some of them also put the issue of construction of concrete drains for the development of the sewage system of the town.                                                                                                                                                                                               | Combined effort of the local authorities with the Government officials as well as the other stake holders would remove all the obstacles for development. | The local authorities also assured that they would help in development of roads project. Road safety awareness campaign should be made at schools                                                                                                              |
| Place :<br>Dumardaha,<br>24/07/2020                                                                                                                                                                                                                                                                  | Total-6<br>Male-5<br>Female-1   | If the existing road is to be improved, there is loss of residential & commercial and religious structure. But the local were positive about development. The main point of discussion was health and education which is poor in the area due to lack of communication.                                                                                                                                                                                                          | The proposed road project is the only feasible option for development.                                                                                    | The people agreed to cooperate and help in all possible ways for the successful of the project.                                                                                                                                                                |
| Place : Kachari Hat,<br>20/07/2020                                                                                                                                                                                                                                                                   | Total-8<br>Male-8<br>Female-0   | The town is basically a trading hub. The cultivators as well as the traders are concern of selling their agricultural and industrial output at proper price Though the town lacks in many infrastructural facilities, but they think that with better communication there would be economic development their prosperity. All other issues would be solved automatically.                                                                                                        | The road after constructed would have major impact on both the economic and social life of the locals of the area.                                        | The road is expected to be completed by two years and being look as a positive step to future..                                                                                                                                                                |
| In addition to the above specific public consultations and FGDs the peoples were also consulted. In the villages the impact of social and economic are more. In all the villages the access to the market would increase and based on this the valuation of land and properties would also increase. |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |                                                                                                                                                                                                                                                                |

143. Some photographs of the FGDs and KII are revealed as exhibits.

**Figure 5. 1 Pictures of First Stage Consultations**

|                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                             | <p>Focus Group Discussion with the distinguish personalities at the Panchayat Office at Dumardaha Dhubri District on dated 24/07/2020. The detail alignment of the proposed road was discussed and also the benefits of the proposed road were discussed at a length. The persons attend the meeting have put forward some suggestions which was conveyed to the local PWD.</p> <p>About six persons all are male attended the meeting of which five are male and one female.</p>                                                                                                                                                                    |
| <p>Focus group discussion at Majadabri-2 Market Of Kokrajhar District on dated 20/07/2020 was held with the land owners and agricultural labourers (six persons all male). The PAPs were aware of the project but anxious to know the benefits (compensation and assistance) the project would provide them in lieu of land acquisition.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                           | <p>Focus group discussion maintaining social distance was held with the land owners and agricultural labourers (five persons all male) who would be affected by the project and the alignment were explained in detail. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were developed and the affected peoples' views on the project were recorded. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development at Baniyamari village on dated 22/07/2020.</p> |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Focus Group Discussion with about fourteen persons (all male) was held maintaining social distancing. The Panchayat Member of the village, in presence of the Survey Coordinator, explains the local people about the detail of the project. All the queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded</p> <p>Place: Paglahat at Dhubri District</p> <p>Dated 23/07/2020.</p>                    |                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>Meetings were held with the affected people. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development.</p> <p>Place: Sriram Pur Bazar At Kokrajhar District</p> <p>Date: 20/07/2020</p> <p>About thirteen persons attended the meeting of which no are female.</p> |
| <p>FGD with the female members (eight members all female) of the PAHs at Paglahat on dated 23/07/2020 is being carried on the proposed project road. The Affected persons were also explained in detail about the projects and their entitlements. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. The conception and myths regarding the developmental works were also noted.</p> |                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                              |

|                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                 | <p>Informal consultation with the youths at Kyarappur Market areas being done on dated 20/07/20 on the proposed project road to understand their views and needs. The youths were also explained in detail about the projects and their entitlements about trainings. The conception and myths regarding the developmental works were also noted. About seven persons all are male attended the meeting.</p>                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                | <p>Detailed discussion in front of a community structure being held to understand the requirement of the affected community and their vision for the rehabilitation of the same. The perceived benefits and losses in relation to the project were also discussed and the views of the local people regarding the project were recorded. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. Place: Kachari Hat at Dhubri District Date: 25/07/2020, About eight persons all are male attended the meeting.</p> |
| <p>The work was progress on affected people and collected the data from the villagers. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. <b>About three persons attended the meeting of which all are female.</b> Place: Malkapur in Kokrajhar District Date: 20/07/2020</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            | <p>Conducting information of the affected people is being done on the proposed project road. The Affected persons were also explained in detail about the projects and their entitlements. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. The conception and myths regarding the developmental works were also noted. About eight persons attended the meeting of which all are male.</p> <p>Place: Uzanpetla at Dhubri District<br/>Date: 21/07/2020</p> |
|                           | <p>Meetings were held with the affected people. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About seven persons attended the meeting of which six are male and one female. Place: Bhatipetla at Dhubri District Date: 22/07/2020</p>                                       |
| <p>Key Informant Interview was Held On Balajan Panchayat Office At Dhubri District on dated 21/07/2020.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



|                                                                                                                                                                                    |                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|                                                                                                   | <p>Key Informant Interview On Modhusulmari Panchyat Office At Dhubri District on dated 25/07/2020.</p> |
| <p>Key Informant Interview At Golakganj BDO office in Agomani area At Dhubri District on dated 23/07/2020.</p> <p>BDO Name Mr. Parthapratim Barman</p> <p>Phone No.9654056847.</p> |                     |
|                                                                                                 | <p>Key Informant Interview At Tiymari Pradhan Office At Dhubri District on Dated 21/07/2020.</p>       |

|                                                                                                      |                                                                                    |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <p>Key Informant Interview At Paglahat Panchayet Pradhan At Dhubri District on Dated 23/07/2020.</p> |  |
|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|

### 3.6.5 Community Perceptions about the Project/ Alignment

- The stakeholders become much aware of the development schemes.
- At the same time influence and share the control over these initiatives, decisions and resources.
- A major outcome of consultation during the initial stage of project implementation can be noted in terms of assessment of the affected area having PWD land and the private land.
- Community consultations will help to avoid opposition to the project, which is otherwise likely to occur at any stage or time.
- The Community were ready to support the project implementing authority as they understood that the project will improve local infrastructures and businesses as well as establish improved connection with other parts of the state in terms of education, health care, trade and commerce and tourism etc.

### 3.6.6 Proceedings and Outcome at Stage – II

144. The second stage Public Consultations have been conducted in eight locations from 16.08.2020 to 24.08.2020 after informing stakeholders as per JICA guidelines. The second stage public consultations were planned from 06.08.2020 but due to the pandemic situation social gatherings were prohibited by the state government so the public consultations were delayed. The Assam Government order is annexed as Annexure 6.

**Table 5.4 Consultations Performed at Stage I**

| Sl. No. | Type of Consultation | Number | No. of Attendant |
|---------|----------------------|--------|------------------|
| 1       | FGD                  | 8      | 71               |
| 2       | FGD-Female           | 2      | 18               |
| 3       | KII                  | 3      | 8                |

*Source: Socio-Economic Survey on June- July2020*

**Table 5.5 : Questions/opinions and response by NHIDCL or Local authority during Public consultation**

| S.No. | Questions/opinions                                                                                                                                                                | Response by NHIDCL or Local authority                                                                                                                                                                                                                                                          |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.    | Have no title documents but have standing crop, Plants & Fish farming what will be the compensation process?                                                                      | NHIDCL officials and PWD explained him the provisions of the Right to fair compensation and transparency in land acquisition, rehabilitation and resettlement act, 2013 (RFCTLARR 2013) and Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA will be applicable for livelihood impact. |
| 2.    | My farmland may get impacted by road construction due to dumping of soil and other construction material, can it be avoided? Is there compensation for such damage if they occur? | PWD mentioned that any such damage will be covered by the NHIDCL and the provisions of Right to fair compensation and transparency in land acquisition, rehabilitation and resettlement act, 2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA will be applicable.                |
| 3.    | Is there any provision for training the ST being impacted                                                                                                                         | Yes, as per RFCTLARR-2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA there is a provision for resettlement & rehabilitation. BTC also has elaborate programs for Rehabilitation and upgradation of ST.                                                                          |
| 4.    | My livelihood is being impacted, will I get regular job?                                                                                                                          | RFCTLARR-2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA has provisions for training/skill development and also it's possible to work at the project site if you're qualified.                                                                                                  |
| 5.    | Request from Dhubri market people was to highlight the road alignment. They want the alignment to shift as to minimise the impact on structures at market.                        | The selected alignment does not affect Dhubri market. The impact assessments considering all related aspects were conducted before arriving a best possible alignment.                                                                                                                         |
| 6.    | My House is getting impacted, please tell me know the resettlement and rehabilitation plan.                                                                                       | As per the provisions of RFCTLARR-2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA will be applicable and necessary compensation will be provided to the affected people                                                                                                         |
| 7.    | Can you please share the details about compensation for structure for various categories that will get impacted? Can it be made available through SDM office to all               | The compensation will be done as per RFCTLARR-2013, Assam RFCTLARR Rules, 2015 and Policy guidelines of JICA for the complete structure.                                                                                                                                                       |

|     | PAP's                                                                                                                                                    |                                                                                                                                                                                                                  |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.  | Why are you following an outdated act of 2013 in the year 2019. Why not update the act as per today?                                                     | NHIDCL officials clarified that RFCTLARR-2013 act is same however, the market rates for compensation and rehabilitation are subject to the local current average market rates.                                   |
| 9.  | What is the plan for training and reskilling of effected people?                                                                                         | NHIDCL conducts multiple training from time to time for local PAP in conjunction with local administration and contractors.                                                                                      |
| 10. | Temple is being impacted by the road widening. Request you to change the alignment to save the structure and respect the religious sentiments of locals. | NHIDCL officials mentioned that local administration is sensitive to all such requests and will do whatever necessary for smooth transition/movement and redevelopment of any impacted structure due to project. |

### 3.6.7 Methodology of Consultation at BTC Area

1. Planned discussion was arranged with the Executive Engineer of Boroland Territorial Council was arranged.
2. Resource persons from each cluster/village/ habitation were invited in the meeting on 04.08.2020 at the office of the Mr. Jagmohan Basumathari, Executive Engineer of Boroland Territorial Council at Kokrajhar.
3. Resource persons/ Village Chairman were given the printed leaflets and the meeting dates were fixed.
4. The writing of the leaflets were explained to the Resource Persons so that they could disseminate the information at the individual DP level.
5. These resource persons informed local people about the dates of the meeting and regularly update the information.
6. ST population were also informed through the District Council.
7. Local Persons were inducted in the Team to facilitate consultation.
8. Schedule of the meetings were changed and it was updated through the resource persons.
9. Resource persons were discussed for finalization of the place of the meeting.

10. On the appointed date and time, the consultants' team carried out the consultations and focus group discussions (FGDs) with the Schedule Tribe Population, mainly their representatives.
11. ST people eager to join were entertained.
12. Leaflets were distributed among all the ST persons available.
13. Dedicated Mobile Number and Email Address printed in the leaflets were shared with all the ST population for further queries and explanation.
14. However, in order to document the issues raised by the potential DPs, public consultations at this stage were not conducted by using structured formats.
15. Due to Pandemic situation large gatherings were avoided and the consultations with the representatives were carried out at some places.
16. The female ST members and leaders of the groups were explained in details for subsequently disclosing the same in simpler language to the local female residents.

### 3.6.8 Brief Description of some sample Public Consultation

| Date / Place                                 | No of Participants              | Issues Discussed                                                                                                                                                                                                                                                                                                                                                               | Mitigation Measures Adopted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place:<br>Kyarappur<br>Village<br>17.08.2020 | Total 4<br>persons both<br>Male | <ol style="list-style-type: none"> <li>1. The Church Pastor Mr. Suleman Mochahary is not pleased with the present alignment as the proposed road enters the ground in front of the Church.</li> <li>2. There should be parking place in front of the Church.</li> <li>3. The Pastor apprehends that the development will bring evil with it in the present society.</li> </ol> | <ol style="list-style-type: none"> <li>1. It was assured that the Church will be safe and there would be no damage of any of the Church area/property. Only the part of the ground outside the Church boundary would be impacted.</li> <li>2. The ERoW would be at least 30m in front of the Church which will not hamper the parking facilities.</li> <li>3. It is also explained that a NGO would be recruited for developing the awareness of the people of PIA regarding, trafficking, gender issues and other social stigmas.</li> </ol> |

| Date / Place                              | No of Participants           | Issues Discussed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Mitigation Measures Adopted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place: Anandapur Village Date: 18.08.2020 | Total 9 persons all are male | <ol style="list-style-type: none"> <li>1. With the proposed alignment of the existing road, there will be loss of residential, commercial and religious structures. The people want to know the compensation, assistance and other benefits that would be provided by the project.</li> <li>2. The livelihood loss of the people is apprehended. The measure that the project is proposing to restore their loss in livelihoods.</li> <li>3. The other point of discussion was health and education which is poor in the area. The Local people want a PHC/HWC (Primary Health Centre/ Health and Wellness Centre) in the area.</li> </ol> | <ol style="list-style-type: none"> <li>1. It was assured that there will be proper compensation and assistance to all the impacted persons as per the Assam RFCTLARR Rules, 2015 and as per the guidelines of JICA. All the CPRs would also be reconstructed or restored. The Entitlement Matrix is shared.</li> <li>2. The project would provide training to upgrade/acquire skills to restore livelihoods. There would be also support from the projects in various ways to restore the livelihoods of the impacted persons.</li> <li>3. It was assure by the PWD that there demand of PHC would be forwarded as it is beyond the scope of this project.</li> </ol> |
| Place: BCDC Office, 17.08.2020            | Total 4 persons all are Male | <ol style="list-style-type: none"> <li>1. Mr. Deobar Iswary, village Chairman propose to provide employment of a few locals in the project.</li> <li>2. Also proposes to provide petty contracts to the local youths</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                            | <ol style="list-style-type: none"> <li>1. Providing permanent employment is beyond the scope of this project. But the Civil Contractor will be advised to employ as many as local youths as possible.</li> <li>2. The Civil Contractor will also be advised to provide petty contracts to the local youth.</li> </ol>                                                                                                                                                                                                                                                                                                                                                 |

| Date / Place                              | No of Participants                                     | Issues Discussed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Mitigation Measures Adopted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place: Naisapur, Kokrajhar<br>18.08.2020  | Three male and three female land owners                | <ol style="list-style-type: none"> <li>1. There is very mild impact of the residential structures at the Villages and the people are mostly interested in construction of the road.</li> <li>2. Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss.</li> <li>3. The road accident will increase</li> <li>4. There should be a waiting shed at the area.</li> <li>5. There should be a proper drainage facilities</li> <li>6. The people are anxiously waiting for the completion of the road and the project should not be kept in waiting for years.</li> </ol> | <ol style="list-style-type: none"> <li>1. The EA assured to minimize the impact on the structures during actual implementation.</li> <li>2. The Compensation and assistance as per the laws and policies they are eligible was discussed.</li> <li>3. It was assured that the design will ensure safer movement of traffic</li> <li>4. There would be waiting shed as per the design.</li> <li>5. Road drains are part of the design.</li> <li>6. The project is expected to be completed by two and half years</li> </ol> |
| Place: Kembolpur, Kokrajhar<br>18.08.2020 | Five female land owners including the Panchayat Member | <ol style="list-style-type: none"> <li>1. Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss.</li> <li>2. There should be a waiting shed at the area.</li> <li>3. There should be street lighting throughout the alignment.</li> </ol>                                                                                                                                                                                                                                                                                                                           | <ol style="list-style-type: none"> <li>1. The Compensation and assistance as per the laws and policies they are eligible was discussed.</li> <li>2. There would be waiting shed as per the design.</li> <li>3. Street Lighting will be provided as per the IRC codes.</li> </ol>                                                                                                                                                                                                                                           |



### 3.6.9 Special Consultation for Schedule Tribe Population at the PIA

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>Second Stage Public consultation Started with the meeting with the Mr. Jagmohan Basumathari, Executive Engineer of Boroland Territorial Council at his Kokrajhar Office on 04/08/2020 with the Village Chairman/representatives of the area regarding the fixation of the date of meeting for discussion regarding the details of compensation, assistance, training and other benefits of the project.</p> <p>The dates were fixed from 06.08.2020 but delayed for the Pandemic situation and started on 16.08.2020</p> |
| <p>Group Discussion at Anandapur at Kokrajhar on 18.08.2020.</p> <p>Meetings were held with the affected people. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were developed and the affected peoples' views on the project were recorded. People are aware about the about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development.</p> <p>The affected people were provided with the details about the financial compensation / assistance that to be provided against their losses in commercial and residential structures.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

|                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                       | <p>Second Stage Public consultation was held at Kyarappur Church at Kokrajhar District on 17/08/2020. The Pastor of the Church and elected representatives of the area were consulted regarding the detail compensation, assistance, training and other benefits of the project.</p> |
| <p>Second Stage Public consultation was held at Jacobpur Panchayat Office of Dhubri District on 17/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.</p> |                                                                                                                                                                                                   |
|                                                                                                                                                                     | <p>Second Stage Public consultation was held at BCDC Office at Jacobpur at Kokrajhar District on 17/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.</p>                              |

|                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Focus Group Discussion with about eighteen persons (all male) was held maintaining at Naisapur village of Kokrajhar District on 19/08/2020. All the queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded.</p> |                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                  | <p>The women panchayat member is made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About three persons attended the meeting of which all are female.</p> <p>Place: Kembolpur 2No in Kokrajhar District</p> <p>Date: 19/08/2020</p> |
|                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                             |

### 3.6.10 Methodology of Consultation at other Area

1. Planned discussion was arranged with the Block Development Officer was arranged.
2. Resource persons from each cluster/village/ habitation were invited in the meeting on 03.08.2020 at the office of the BDO of Hatidura, Golukganj and Gouripur at Dhubri District.
3. The meetings with the Panchayat of Tamarhat, Tiymari-Madhusuimari and Madhusuimari.
4. Resource persons/ Village Head/ Gaon Bura were given the printed leaflets and the meeting dates were fixed.
5. The writing of the leaflets was explained to the Resource Persons so that they could disseminate the information at the individual DP level.
6. These resource persons informed local people about the dates of the meeting and regularly update the information
7. Local Persons were inducted in the Team to facilitate consultation.
8. Schedule of the meetings were changed and it was updated through the resource persons.
9. Resource persons were discussed for finalization of the place of the meeting.
10. On the appointed date and time, the consultants' team carried out the consultations and focus group discussions (FGDs) with the local population, mainly their representatives.
11. However, in order to document the issues raised by the potential DPs, public consultations at this stage were not conducted by using structured formats.
12. Dedicated Mobile Number and Email Address printed in the leaflets were shared with all the population for further queries and explanation.
13. Due to Pandemic situation large gatherings were avoided and the consultations with the representatives were carried out at some places.
14. The female Panchayat members were explained in details to disseminate the information to the local female residents.
15. The Leaders of the female Self Help Groups (SHG) were consulted and explained the same in details for subsequently disclosing the same in simpler language to the local female members.

NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km.

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### 3.6.11 Brief Description of some sample Public Consultation

| Date / Place                                          | No of Participants                                  | Issues Discussed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Mitigation Measures Adopted                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place:<br>Kalyanpur,<br>17.08.2020                    | Total 7<br>persons 5<br>male and 2<br>female        | <ol style="list-style-type: none"> <li>1. The people are enthusiast about development of the road as this is the only mode of communication to the outer world but worried about the safety of the students coming to the school by foot or bicycle as they frequently have to go to earthen shoulder with the movements of heavy vehicles.</li> <li>2. The teacher demanded speed breaker on both the side of the school.</li> <li>3. To increase awareness about the road safety measures as the area witness high and heavy traffic</li> </ol> | <ol style="list-style-type: none"> <li>1. The PWD assures that there would be paved shoulders and also the black top would be more 7.5m at this place</li> <li>2. It was agreed to put traffic calming measures all along the school zone.</li> <li>3. It was also agreed that Road Safety Campaign would be undertaken in collaboration with the schools.</li> </ol>                                                                               |
| Place:<br>Barundanga on<br>17/08/2020<br>(Female FGD) | Total 10<br>persons<br>female is 9<br>and male is 1 | <ol style="list-style-type: none"> <li>1. Most of the women are petty shopkeepers or customers and they want a proper market to be constructed by the Authority.</li> <li>2. There is no permanent shade for bus stop/auto stand.</li> <li>3. The condition of the road is very bad during monsoon.</li> <li>4. There is no Government transport facility available at this area.</li> </ol>                                                                                                                                                      | <ol style="list-style-type: none"> <li>1. The PWD assure to inform the Authority for construction of the Market as this is beyond the scope of this project.</li> <li>2. Proper Bus Stop/Auto Stand is proposed in the design.</li> <li>3. The proposed road will be all weather road and the condition would be much better.</li> <li>4. It would be proposed to the Transport Department to provide transport facilities in this area.</li> </ol> |

| Date / Place                             | No of Participants           | Issues Discussed                                                                                                                                                                                                                                                                                                                                                                                                 | Mitigation Measures Adopted                                                                                                                                                                                                                                                             |
|------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place: Paglahat Village Date: 17.08.2020 | Total 8 persons all are male | <p>1.A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss.</p> <p>2. There is huge movement of heavy vehicle carrying river bed materials/sands from the river during summer which causes major problem for the local traffic and residents.</p> | <p>1. The local people were assured that there would be proper compensation and assistance as per the legal provision of the state of Assam as well as per the guidelines of ADB.</p> <p>2. The PWD officials had agreed to take special care for traffic movement and road safety.</p> |



| Date / Place                                                           | No of Participants                                                              | Issues Discussed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Mitigation Measures Adopted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place:<br>Uzanpetla at<br>Dhubri District<br>18.08.2020                | Total 10 male and 7 female members of the locality who are going to be impacted | <ol style="list-style-type: none"> <li>1. With the proposed alignment of the existing road, there will be loss of residential, commercial and religious structures. The people want to know the compensation, assistance and other benefits that would be provided by the project.</li> <li>2. The livelihood loss of the people is apprehended. The measure that the project is proposing to restore their loss in livelihoods.</li> <li>3. The other point of discussion was health and education which is poor in the area. The Local people want a higher secondary school at their area.</li> </ol> | <ol style="list-style-type: none"> <li>1. It was assured that there will be proper compensation and assistance to all the impacted persons as per the Assam RFCTLARR Rules, 2015 and as per the guidelines of JICA. All the CPRs would also be reconstructed or restored. The Entitlement Matrix is shared.</li> <li>2. The project would provide training to upgrade/acquire skills to restore livelihoods. There would be also support from the projects in various ways to restore the livelihoods of the impacted persons.</li> <li>3. It was assure by the PWD that there demand of Higher Secondary School would be forwarded as it is beyond the scope of this project.</li> </ol> |
| Place:<br>Madhusulmari,<br>BDO Office<br>Dhubri District<br>18.08.2020 | Total 4 persons all are Male                                                    | <ol style="list-style-type: none"> <li>1. BDO was interested with the project and appraise about the Village Members about the details of the project</li> <li>2. Requested to provide petty contracts to the local youths</li> </ol>                                                                                                                                                                                                                                                                                                                                                                    | <ol style="list-style-type: none"> <li>1. The Compensation and Assistance would be provided as per the Entitlement Matrix.</li> <li>2. The Civil Contractor will also be advised to provide petty contracts to the local youth.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Date / Place                                                   | No of Participants           | Issues Discussed                                                                                                                                                                                                                                                                                                                                                                                                      | Mitigation Measures Adopted                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place: Paglahat, BDO Office Dhubri District<br>16.08.2020      | Total 5 persons all are Male | 1.The main point of discussion was to save a temple or reconstruct the temple. The temple committees chairman Sujit Mondal also agreed to provide land for new construction of the temple.<br>2.A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss. | 1. It was assured that all the CPRs that might be impacted will be restored/reconstruct /resettle/ rehabilitated.<br>2. The local people were assured that there would be proper compensation and assistance as per the legal provision of the state of Assam as well as per the guidelines of JICA. |
| Place: Balajan, Panchayat Office Dhubri District<br>16.08.2020 | Total 6 persons all are Male | 1.A detailed public consultation was organized with the representatives of the potential project affected persons, people's regarding the project benefits and vis-à-vis estimated loss.                                                                                                                                                                                                                              | 1. The elected representatives of the area were explained the detail compensation, assistance, training and other benefits of the project.                                                                                                                                                           |

| Date / Place                                                         | No of Participants                                        | Issues Discussed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Mitigation Measures Adopted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place: Srirampur at Kokrajhar District                               | Three male and three female land owner family and friends | <ol style="list-style-type: none"> <li>1. There is very mild impact of the residential structures at the Villages and the people are mostly interested in construction of the road.</li> <li>2. Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss.</li> <li>3. The road accident will increase</li> <li>4. There should be a waiting shed at the area.</li> <li>5. There should be a proper drainage facilities</li> <li>6. The people are anxiously waiting for the completion of the road and the project should not be kept in waiting for years.</li> </ol> | <ol style="list-style-type: none"> <li>1. The EA assured to minimize the impact on the structures during actual implementation.</li> <li>2. The Compensation and assistance as per the laws and policies they are eligible was discussed.</li> <li>3. It was assured that the design will ensure safer movement of traffic</li> <li>4. There would be waiting shed as per the design.</li> <li>5. Road drains are part of the design.</li> <li>6. The project is expected to be completed by two and half years</li> </ol> |
| Place: Baniyamari Panchayat Pradhan at Dhubri District on 17/07/2020 | Panchayat Pradhan                                         | The person was keen to know the details of the eligibility and entitlement of the project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | The Panchayat Pradhan explained in details the eligibility and entitlement of the project and was assured that there would be proper compensation and assistance as per the legal provision of the state of Assam as well as per the guidelines of JICA.                                                                                                                                                                                                                                                                   |

| Date / Place                                       | No of Participants                                                 | Issues Discussed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Mitigation Measures Adopted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place: Kumargang Dhubri<br>18.08.2020              | Total 17 male members of the locality who are going to be impacted | <ol style="list-style-type: none"> <li>1. With the proposed alignment of the existing road, there will be loss of residential, commercial and religious structures. The people want to know the compensation, assistance and other benefits that would be provided by the project.</li> <li>2. The livelihood loss of the people is apprehended. The measure that the project is proposing to restore their loss in livelihoods.</li> <li>3. The other point of discussion was health and education which is poor in the area due to lack of communication.</li> </ol> | <ol style="list-style-type: none"> <li>4. It was assured that there will be proper compensation and assistance to all the impacted persons. All the CPRs would also be reconstructed or restored.</li> <li>5. The project would provide training to upgrade/acquire skills to restore livelihoods. There would be also support from the projects in various ways to restore the livelihoods of the impacted persons.</li> <li>6. It was assure by the PWD that there demand of PHC would be forwarded as it is beyond the scope of this project.</li> </ol> |
| Place: Vatipetlla in Dhubri District<br>18.08.2020 | 18 members all are female                                          | <ol style="list-style-type: none"> <li>1. During discussion it has been observed that the benefits of the proposed project area acknowledged by the local people but they want the Executing Agency, to take care of the implementation of the project to bring about promised benefits and the traffic safety.</li> <li>2. The most important topic of discussion was the increase of the numbers of strangers.</li> </ol>                                                                                                                                            | <ol style="list-style-type: none"> <li>1. The road could be widening by avoiding any major impact on both the settlement. It has been suggested to make traffic safety awareness campaign at the schools and localities.</li> <li>2. It is also learnt that a NGO would be recruited for developing the awareness of the people of PIA regarding, trafficking, gender issues and other social stigmas.</li> </ol>                                                                                                                                           |

| Date / Place                                                                                        | No of Participants         | Issues Discussed                                                                                                                                                                                                                                                                                                                                   | Mitigation Measures Adopted                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Place: Tamarhat in Dhubri District<br>12.08.2020<br><i>(This was held as per pre schedule date)</i> | 14 males and 4 females     | 1.Public consultation was organized with the potential project affected persons, regarding the project benefits and vis-à-vis estimated loss.<br>2.There would be no impact to the structures and the people are anxiously waiting for the completion of the road.                                                                                 | 1. The Compensation and assistance as per the laws and policies they are eligible was discussed.<br>2. The project is expected to be completed by two and half years.        |
| Place: Basantpur in Dhubri District<br>18.08.2020                                                   | Eight Persons all are male | 1.A detailed public consultation was organized with the potential project affected persons, people's representatives, shopkeepers, businessmen, and others regarding the project benefits and vis-à-vis estimated loss.<br>2.The local residents with their representatives demanded proper road safety structures to be introduced in the design. | 1. The Compensation and assistance as per the laws and policies they are eligible was discussed,<br>2. It was assured that the design will ensure safer movement of traffic. |

**Figure 5. 2 Pictures of Second Stage Consultations**

|                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                           | <p>Focus Group Discussion with about eighteen persons (all male) was held maintaining at Naisapur village of Kokrajhar District on 19/08/2020. The Survey Coordinator, explains the local people about the detail of the project. All the queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded.</p>   |
| <p>Handing over the leaflet as part of the disclosure process at Majadabri-2 Village Of Kokrajhar District on 19/08/2020 was held with the land owners and agricultural labourers (six persons of them three are male and three female). The PAPs were aware of the project but anxious to know the benefits (compensation and assistance) the project would provide them in lieu of land acquisition.</p> |                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                         | <p>Focus group discussion maintaining social distance was held with the land owners and agricultural labourers who would be affected by the project and the alignment were explained in detail. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development at Kalyanpur village on 17/08/2020.</p> |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Focus Group Discussion with about eight persons (all male) was held maintaining social distancing. At the residence of Village Headman and local Panchayat representatives as part of the disclosure and explains the local people about the detail of the project benefit and compensation. All the queries of the villagers were answered. Place: Paglahat at Dhubri District</p> <p>Dated 17/08/2020.</p>                                                                                                                            |                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <p>Meetings were held maintaining social distancing with the affected persons and also the women member of the village panchayat.</p> <p>Place: Srirampur at Kokrajhar District</p> <p>Date: 19/08/2020</p> <p>About six persons attended the meeting of them five are female and two male and the details of the compensation, training and other benefits of the project is discussed as part of the project disclosure.</p> |
| <p>FGD with the female members (eight members all female) at Barundanga on 17/08/2020 is being carried on the proposed project road. The Affected persons were also explained in detail about the projects and their entitlements as part of the project disclosure. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. The conception and myths regarding the developmental works were also noted.</p> |                                                                                                                                                                                                                                                                                                                                            |



|                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                            | <p>Informal consultation on 19/08/20 with the village artisans at Kyarappur village area is carried out as a part of the disclosure to understand their need and ambition. The youths were also explained in detail about the projects and their entitlements about trainings. The conception and myths regarding the developmental works were also noted. About four persons attended the meeting all are female.</p>                                                                                                                                       |
|                                                                                                                                                                                                                                                                           | <p>Informal consultation with the affected people from the villages. The perceived benefits and losses in relation to the project were also discussed and the views of the local people regarding the project were recorded as a part of the disclosure. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. Place: Kachari Hat at Dhubri District Date: 18/08/2020, About eight persons all are male attended the meeting.</p> |
| <p>The women panchayat member is made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About three persons attended the meeting of which all are female.</p> <p>Place: Kembolpur 2No in Kokrajhar District</p> <p>Date: 19/08/2020</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                  | <p>Conducting a formal Public Consultation at the Residence of the Village Chairman as a part of second stage consultation. The information of the meeting was given on 12.08.2020 and the affected people had attended the meeting on 18.08.2020. The Affected persons were explained in detail about the projects and their entitlements. The conception and myths regarding the developmental works were also noted. About eighteen persons attended the meeting of which eight are male and ten are female.</p> <p>Place: Uzanpetla at Dhubri District</p> <p>Date: 18/08/2020</p> |
|                                                                                                                                                                                                                                                                                                 | <p>Informal meeting were held with the affected people. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About five persons attended the meeting of which all male.</p> <p>.Place: Bhatipetla at Dhubri District</p> <p>Date: 18/08/2020</p>                          |
| <p>Informal meetings were held with the affected people On Anandapur of Kokrajhar District on 19/08/2020. People are made aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development. About six persons attended the meeting of which five are female and one male.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                       | <p>Focus group discussion at KamalarJhar Village Of Dhubri District on 19/08/2020 was held with the land owners and agricultural labourers (six persons of them three are male and three female). The PAPs were aware of the project but anxious to know the benefits (compensation and assistance) the project would provide them in lieu of land acquisition.</p> |
|                                                                                                                                                                      | <p>Second Stage Public consultation was held at Madhusulmari Panchayat Office of Dhubri District on 18/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.</p>                                                                                                          |
| <p>Second Stage Public consultation was held at Paglahat Panchayat Office of Dhubri District on 16/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.</p> |                                                                                                                                                                                                                                                                                 |



|                                                                                                                             |                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                            | <p>Second Stage Public consultation was held at Balajan Panchayat Office of Dhubri District on 16/08/2020 with the elected representatives of the area regarding the detail compensation, assistance, training and other benefits of the project.</p> |
| <p>Leaflet was pasted as a part of the information disclosure at Barundanga AP School at Dhubri District on 16/07/2020.</p> |                                                                                                                                                                    |
|                                          | <p>Leaflet was pasted as a part of the information disclosure at the Waiting shed at Matarjhar of Dhubri District on 16/07/2020</p>                                                                                                                   |

|                                                                                                                                         |                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <p>Leaflet was pasted as a part of the information disclosure at the Baniyamari Panchayet Pradhan at Dhubri District on 16/07/2020.</p> |                             |
|                                                       | <p>Formal second stage consultation with the Baniyamari Panchyat Pradhan at Dhubri District on 17/07/2020</p> |
| <p>Submitting the detail entitlements to the Panchayat Secretary of Paglahat Panchyat at Dhubri District on 17/08/2020</p>              |                           |

|                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               | <p>Distributing Leaflets at Barundanga to a local person of Dhubri District on 17/07/2020</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <p>Distributing Leaflets to a local person at Sreerampur, Kokrajhar District on 19/08/2020</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|             | <p>Formal meeting was held with the affected people shopkeepers and their representatives at Kumargang, Dhubri District on 17.08.2020. People are aware about the positive impacts of the project in terms of the improved road infrastructure and other benefits in relation to the overall communication development but anxious about the entitlements and support the project would provide. They agreed to move their structures only after getting the compensation and assistance. About twenty five persons attended the meeting of which all are shopkeepers or traders.</p> |



|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Formal discussions with women panchayat representatives and women members of SHG (Self Help Group) regarding the training and alternative livelihood options especially for the women of the area. About eighteen persons attended the meeting of which all are female.</p> <p>Place: Vatipetlla in Dhubri District</p> <p>Date: 17/08/2020</p> |                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                  | <p>Formal Focus Group Discussion with about eighteen persons (four female and fourteen male) was held maintaining at Tamar Hat village of Dhubri District on 12/08/2020. As a part of the disclosure all queries of the villagers were answered. Detailed understandings regarding the affected peoples' perceived benefits and losses in relation to the project were recorded.</p> |
| <p>Meetings with the traders were held at Basantapur, Dhubri District on 18.08.2020. The traders were made aware about the positive impacts of the and also the project benefits.</p> <p>About eight persons attended the meeting all are male.</p>                                                                                                |                                                                                                                                                                                                                                                                                                  |

### 3.6.12 Plan for further Consultation in the Project

145. The effectiveness of the R&R program is directly related to the degree of continuing involvement of those affected by the Project. Several additional rounds of consultations with DPs will form part of the further stages of project preparation and implementation. A

local NGO will be entrusted with the task of conducting these consultations during RP implementation, which will involve agreements on compensation, assistance options, and entitlement package and income restoration measures suggested for the sub-project. The consultation will continue throughout the project implementation. The following set of activities will be undertaken for effective implementation of the Plan:

146. In case of any change in engineering alignment planning the DPs and other stakeholders will be consulted in selection of road alignment for minimization of resettlement impacts, development of mitigation measures etc.
147. Together with the NGO, the Project Implementation Unit (PIU) will conduct information dissemination sessions in the project area and solicit the help of the local community/ leaders and encourage the participation of the DP's in Plan implementation.
148. During the implementation of RP, NGO will organize public meetings, and will appraise the communities about the progress in the implementation of project works, including awareness regarding road construction.
149. Consultation and focus group discussions will be conducted with the vulnerable groups like women, SC, ST, and OBC's to ensure that the vulnerable groups understand the process and their needs are specifically taken into consideration.
150. To make reasonable representation of women in the project planning and implementation they will be specifically involved in consultation.

### 3.6.13 Information Disclosure

151. To keep more transparency in planning and for further active involvement of DPs and other stakeholders the project information will be disseminated through disclosure of resettlement planning documents. The EA will submit the following documents to NHIDCL for disclosure on NHIDCL's website:

- ❖ the final resettlement plan endorsed by the EA after the census of Affected persons has been completed;
- ❖ a new resettlement plan or an updated resettlement plan, and a corrective action plan prepared during project implementation, if any; and
- ❖ The resettlement monitoring reports.

152. The EA will provide relevant resettlement information, including information from the above mentioned documents in a timely manner, in an accessible place and in a form and language(s) understandable to affected persons and other stakeholders. A resettlement information leaflet containing information on compensation, entitlement and resettlement management adopted for the project will be made available in local language (Assamese/Bengali) and distributed to DPs.

## 3.7 SOCIAL IMPACT MANAGEMENT PLAN

### 3.7.1 Social Impact Assessment

153. The Socio-Economic Survey was carried out in the month of June -July, 2020 by a team of trained enumerators. A common questionnaire for NH127B Assam and NH127B Meghalaya was used to collect detailed information on affected households/business for a full understanding of impacts in order to develop mitigation measures and resettlement framework for the project. Socio-Economic Survey and Census Survey was carried out on 743 PAHs and 1396 PAHs respectively to collect detailed information of affected households/ properties and for a full understanding of impacts in order to develop mitigation measures and resettlement plan for the PAPs.

154. About 11 informal but structural consultation & interview with key persons of the villages and surrounding area undertaken, apart from sample household surveys to appraise existing condition and proper perspective of Government's development schemes in operation in the area.

**Table 6. 1 Summary Project Impacts in comparison of previous SIA**

| Sl. No. | Impacts                                                    | Number with Supplementary SIA | Previous SIA |
|---------|------------------------------------------------------------|-------------------------------|--------------|
| 1.      | Total Private land acquisition requirements (in ha)        | 142.688 ha                    |              |
| 2.      | Persons losing only land                                   | 466                           | NA           |
| 3.      | Total affected Private Structure Numbers                   | 1081                          | 67           |
| 4.      | Total number of CPRs affected (Community and Religious)    | 33                            | 33           |
| 5.      | Owners losing structures                                   | 684                           | Nil          |
| 6.      | Owners losing Cattle shed                                  | 3                             | Nil          |
| 7.      | Tenant without formal document                             | 94                            | NA           |
| 8.      | Kiosk                                                      | 59                            | NA           |
| 9.      | Employees to commercial structures and agricultural labour | 90                            | NA           |
| 10..    | Total No. of Affected Families                             | 1396                          | 67           |
| 11.     | Total Number of Vulnerable household Families affected     | 698                           | 21           |
| 12.     | Total number of Project Affected Persons (PAPs)            | 7262                          | 387          |

Source: Census Survey, Jan-Mar 2020

### 3.7.2 Social Management Plan (SMP)

155. The aim of this Social Management Plan (SMP) is to mitigate all such unavoidable negative impacts cause due to the project and resettle the Project Affected Persons and restore their livelihoods. This (SMP) Plan will be prepared on the basis of project census survey findings and consultation with various stakeholders. The plan complies with NHAI, Assam State Laws and Regulations and World Bank's Operational Manual 4.12 and 4.10

in accordance with JICA's Safeguard Policy for Involuntary Resettlement and Indigenous People.

156. Socio-economic mitigation measures will consist of policies and actions taken before the implementation of the project with the intention of minimizing the extent of impact after land acquisition along the existing road. The first step of such mitigation will be to avoid unnecessary acquisition and then decide about the mitigation for the damage which is unavoidable. Mitigation is a long-term effort for reduction of socio-economic impacts on the affected population. The outcome of SIA will be guided by the Resettlement Plan (RP) of the project as per the provisions of Rules and Regulations of the State and National Government in accordance with JICA's safeguard policies.
157. The RP will focus on three generic areas in implementation of mitigation measures, institutional strengthening and training and monitoring. The RP will include proposed work programme, budget estimates, schedules, staffing and training requirements and other necessary support services to implement the mitigation measures. Institutional arrangements required for implementing this management plan will be provided in the RP. The cost of implementing the monitoring and evaluation including staffing, training and institutional arrangements will also be specified where monitoring and evaluation requires inter-agency collaboration/association.
158. In order to conduct socio-economic mitigation, it is necessary to acknowledge the grievance/dis-satisfaction among the affected persons, identify the genuine grievances, finding the facts behind the grievances, and finally finding out ways to address those grievances.
159. The main responsibilities of the GRC at both the levels will be to: (i) provide support to PAPs on problems arising from land/property acquisition; (ii) record PAP grievances, categorize, and prioritize grievances and resolve them; (iii) immediately inform the EA of serious cases; and (iv) report to PAPs on developments regarding their grievances and decisions of the GRC. Other than disputes relating to ownership rights under the court of law, GRC will review grievances involving all resettlement benefits, compensation, relocation, replacement cost and other assistance.

### **3.7.3 Resettlement Plan**

160. As per JICA's guidelines of Categorization for Involuntary Resettlement this sub project is categorized as Category A. Thus, a Full Resettlement Plan will be prepared on the possible impacts identified and measured in SIA and mitigation measures as provisioned in the Entitlement Matrix created from the RFCTLARR Act, 2013, Assam RFCTLARR Rules, 2015 and will be as per the JICA's Guideline in accordance of World Bank's OP 4.12. The Resettlement Plan will be disclosed and implemented in the project and the compensation and R&R assistances will be released to the PAFs before the Civil Construction starts. The Resettlement Plan will be implemented, and the Monitoring of the Resettlement Plan will be guided by the Policy and Guidelines of JICA and World Bank which is discussed in this Report.

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### 3.7.4 Indigenous People Plan

161. As per JICA's guidelines of Categorization for Indigenous People Impact this sub project is categorized as sensitive. As per World Bank Operational Manual 4.10 there will be specific action favourable to indigenous peoples/ethnic minority in related plans such as a Resettlement Plan, a Gender Action Plan or a general Community Participatory Plan.

### 3.8 APPLICABLE LEGAL AND REGULATORY FRAMEWORK

162. Brief description of the legal provisions of relevant acts, policies and their applicability to the project is discussed below in Table 7.1.

**Table 7. 1: Legal Framework and Applicability**

| Sl. No.                                     | Acts, Notifications and Policies                                                                                   | Relevance to this Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Applicability                                                 |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| <b>National and State Acts and Policies</b> |                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                               |
| 1                                           | Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013         | The act extends to the whole of India. The act provides for a transparent process and fair compensation in land acquisition for public purpose and provides for rehabilitation and resettlement of land owners and those affected by land acquisition. It comprises four schedules that provide the minimum applicable norms for compensation based on market value, multiplier and solatium; resettlement and rehabilitation (R&R) entitlements to land owners and livelihood losers; and facilities at resettlement sites for Project Affected Persons, besides providing flexibility to states and implementing agencies to provide higher norms for compensation and R&R. | Applicable but not used for acquisition in the state of Assam |
| 2                                           | Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015 | State Government and also the Central Government department(s) or its organization (s) based on merit of its project may go in for the direct purchase of land for public purpose mainly involving the early commissioning of infrastructure projects like roads, railways, bridges, food go downs, drinking water, flood protection works and other similar projects, as the Government may consider, in rural and / or urban areas through Zilla Parishad/ Municipality/Municipal Corporation/other Government bodies and parastatals, as the case may be, by adopting, the following given procedures.                                                                     | Applicable                                                    |
| 3                                           | The Right to Information Act, 2005                                                                                 | The Act provides for setting out the practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, the constitution of a Central Information Commission and State Information Commissions and for matters connected therewith or incidental thereto.                                                                                                                                                                                                                                                           | Applicable                                                    |
| 4                                           | Minimum Wages Act, 1948                                                                                            | . An Act to provide for fixing minimum rates of wages in certain employments. WHEREAS it is expedient to provide for fixing minimum rates of wages in certain employments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Applicable                                                    |
| 5                                           | Equal Remuneration                                                                                                 | An act to provide for the payment of equal remuneration to men and women workers and for the prevention of discrimination, on the ground of sex, against                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Applicable                                                    |



| Sl. No. | Acts, Notifications and Policies                                                                | Relevance to this Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Applicability |
|---------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|         | Act, 1976                                                                                       | women in the matter of employment and for matters connected therewith or incidental thereto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               |
| 6       | The Child and Adolescent Labour (Prohibition and Regulation) Act, 1986                          | An Act to prohibit the engagement of children in any occupations and to prohibit the engagement of adolescents in hazardous occupations and processes and the matters connected herewith or incidental thereto                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Applicable    |
|         | Scheduled Castes and Scheduled Tribes Orders (Amendment) Act 2002                               | This act provides the inclusion in the lists of Scheduled Tribes, of certain tribes or tribal communities or parts of or groups within tribes or tribal communities, equivalent names or synonyms of such tribes or communities, removal of area restrictions and bifurcation and clubbing of entries; imposition of area restrictions in respect of certain caste in the list of Schedule Castes and exclusion of certain castes and tribes from the list of Schedule Castes and Schedule Tribes, in relation to the states of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Goa, Gujrat, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, .Maharashtra, Manipur, Mizoram, Orissa, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal. | Applicable    |
|         | The Constitution (Eighty-Ninth Amendment) Act, 2003                                             | The Constitution (Eighty-Ninth Amendment) Act, 2003 amend the article 338 by insert article 338A on 28th September 2003. Thus the National Commission for Scheduled Castes and Scheduled Tribes was bifurcated into the National Commission for Scheduled Castes and the National Commission for Scheduled Tribes                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Applicable    |
|         | Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 | This act has been enacted to recognize and vest the forest rights and occupation of forest land in forest dwelling Scheduled Tribes and other traditional forest dwellers, who have been residing in such forests for generations, but whose rights could not be recorded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Applicable    |
|         | Schedule VI Sixth Schedule, Tribal Areas and Autonomous District/ Regional                      | The Constitution of India makes special provisions for the administration of the tribal dominated areas in four states viz. Assam, Meghalaya, Tripura and Mizoram. As per article 244 and 6th Schedule, these areas are called "Tribal Areas", which are technically different from the Scheduled Areas under 5th schedule. Only the Governor is empowered to increase or decrease the areas or change the names of the autonomous districts. The Autonomous District Council (ADC) is the district within a state to which central government has given varying degrees of autonomy within the state legislature.                                                                                                                                                | Applicable    |

| Sl. No. | Acts, Notifications and Policies                    | Relevance to this Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Applicability |
|---------|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|         | Councils                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |               |
|         | <i>National Tribal Policy in 2006.</i>              | Ministry of Tribal Affairs had prepared a draft National Tribal Policy in 2006. This became out of context in view of certain legislative and policy changes and these necessitated further revision of the draft policy. Meanwhile, a High Level Committee (HLC) was constituted on 14.08.2013 to prepare a position paper on socio-economic status of STs and suggest a way forward. The Committee submitted its Report on 29.05.2014 which contains 108 recommendations cutting across various Central Ministries/Departments as well as State Governments.                                                         | Applicable    |
| 7       | World Bank OP/BP 4.12 – Involuntary Resettlement    | The project may involve land acquisition though, at a low scale for widening, realignments, junction improvements, bypasses etc. It would also adversely affect structures used for various purposes, livelihood of people (mainly earning their livelihood by means of petty shops and providing various services). Many of them have been operating from the government land. Thus both title holders and non-title holders alike would be affected as a consequence of the project.                                                                                                                                 | Applicable    |
| 8       | Indigenous Peoples OP/BP 4.10                       | In the context of India Indigenous Peoples may be referred to "scheduled tribes". The area is under the administrative control of Bodoland Territorial Council. The policy on Indigenous People will not be triggered as the presence of tribal groups with close attachment to land in the project area is not established as there was already a Highway was passing and the project is only upgrading the same.. Further, this policy is not triggered in terms of "collective attachment to geographically distinct habitats" and "institutions that are separate from those of the dominant society and culture". | Applicable    |
| 9       | World Bank Policy – Access to Information           | The policy governs the public accessibility of information in the Bank's possession. The Bank allows access to any information in its possession that is not on a list of exceptions. Documents such as RPF, all SIA and ARAPs will be disclosed both by the borrower and Bank.                                                                                                                                                                                                                                                                                                                                        | Applicable    |
| 10      | JICA's Policy on Environmental and Social Safeguard | JICA encourages host country governments, including local governments, borrowers, and project proponents, to implement the appropriate measures for environmental and social considerations when engaging in cooperation activities. At the same time, JICA provides support for and examinations of environmental and social considerations in accordance with the guidelines. The detail have available at the link below.<br><a href="https://www.jica.go.jp/english/our_work/social_environmental/guideline/index.html">https://www.jica.go.jp/english/our_work/social_environmental/guideline/index.html</a>      | Applicable    |

### 3.8.1 Comparison between Legal Framework & OP 4.12

163. The provisions of the RFCTLARR Act, 2013 are broadly aligned with the World Bank's OP 4.12. The following section provides a comparison between the legal framework and the World Bank policies and gap-filling measures.

164. The Act provides for a market value of land by following the stipulated methods under section 26 of the Act. The compensation amount of land is worked out by taking into

consideration the factor and solatium @ 100%, which is the replacement cost of land. In effect, the compensation amount with multiplication factor and solatium works out to be enough to replace the lost land and assets.

165. The compensation for structures shall be calculated without applying depreciation based on the current year schedule of rates (SoR) with 100% solatium will help arrive at a replacement cost of structures. The Act does not mention the application of depreciation which is in line with World Bank's policy.

166. The land compensation or base price of the land (under Direct Land Purchase Policy, Govt. of) is determined by taking into account the assessed value of land or set forth value of land, whichever is higher. Incentive on the price of the land finally determined will be given to the land owner if land registration is done as follows:

- (a) Within 30 days – 50%,
- (b) Within 31 to 60 days –10%, from the date of publication /communication of land price to the landowners.

167. This is not in accordance with the Bank's Policy as the compensation amount against the land purchased works out to be less than the compensation amount as per the national act (First Schedule of the RFCTLARR Act, 2013) and also there is no provision of resettlement and rehabilitation assistance (Second Schedule of the RFCTLARR Act, 2013).

168. The Act mandates conducting Social Impact Assessment (SIA) and preparation of R&R Scheme which is in accordance with the Bank's policy.

169. The Act at every stage of the land acquisition process mandates consultations and disclosure of information to affected persons which is once again in accordance with the Bank's policy.

170. The Act similar to the World Bank requires compensation to be paid, prior to project taking possession of any land and provide R&R assistance including subsistence, resettlement and shifting allowances.

171. Also similar to provisions laid down in RFCTLARR Act, 2013; World Bank safeguards' policy requires consultation with PAPs during planning and implementation of the resettlement action plan, and public disclosure of draft and final documents.

### 3.8.2 Key differences Act and Policy

172. The Act recognizes persons who have been dependent on the private land acquired for their livelihood preceding the date of land acquisition notification. The Act provides for resettlement and rehabilitation of those people whose livelihood is primarily dependent on the acquired land. As per the World Bank policy, the date of the census survey is applicable to those persons whose livelihood is primarily dependent on the land acquired.

173. The Act does not recognize people living on public land or earning a livelihood from public lands (by way of establishing shops/ kiosks, etc.) and hence not entitled for any rehabilitation assistance. Thus, informal settlers (squatters, encroachers, and others) on

public lands are excluded from the purview of the Act. The Bank policy does not differentiate between the title holders and persons without title to land except for the payment of compensation of land. The entitlement matrix covers informal settlers (squatters, encroachers, and others) for resettlement and rehabilitation assistance.

174. Act in its computation of compensation for structures is not explicit about providing replacement cost of structures. However the value of the structure determined is based on the current schedule of rates without depreciation and with provision of 100% solatium will help arrive at the replacement cost of structures.
175. Cut-off date for determining the compensation and entitlements and assistance to all those who are affected by the project irrespective of the ownership of titles. According to the RFCTLARR Act, the cut-off date for assistance to those depending on affected private lands preceding the acquisition and for the titleholders it is the date of notification under the said Act. To bring this RP in line with World Bank requirements, RP mandates that while in the case of land acquisition, the date of issue of public notice of intended acquisition under Section 4(1) under the Act will be treated as the cut-off date for title holders. In case of non-titleholders such as squatters and encroachers, the cut-off date will be the start date of the census survey.

### 3.8.3 Difference between the World Bank OP 4.12 and, RFCTLARR

176. As per the Assam RFCTLARR Rules, 2015 the value of land purchased is less as it does not take into account:
- (a) The multiplier,
  - (b) Solatium @ 100% of the market value determined,
  - (c) The mandatory interest applicable @ 12% per annum on the market value determined, and
  - (d) Resettlement and rehabilitation entitlements. It does not provide solatium @ 100% on the value determined for structures/buildings and other properties and assets affected on land purchased. Further, it does not provide an exemption from an income tax deduction on the value of land and structure/building received.
177. As per World Bank's policy replacement value shall be provided for lost land, structure and other properties and assets. To bridge the above gaps, the replacement value along with R&R allowances as in case of land acquisition through national Act shall be applicable even if the land required for the project is directly purchased with mutual consent.
178. In the event of any conflict or inconsistency between the provisions of this RP and the provisions of World Bank's Operational Policy, 4.12 on Involuntary Resettlement, the provisions of the World Bank policy shall prevail.

### 3.8.4 Comparison of the Acts for ST and OP 4.10

179. These Act not only recognizes the rights to hold and live in the forest land under the individual or common occupation for habitation or for self-cultivation for livelihood, but also grants several other rights to ensure their control over forest resources which, inter-alia, include right of ownership, access to collect, use and dispose of minor forest produce, community rights such as nistar; habitat rights for primitive tribal groups and pre-agricultural communities; right to protect, regenerate or conserve or manage any community forest resource which they have been traditionally protecting and conserving for sustainable use.
180. These Act also provides for diversion of forest land for public utility facilities managed by the Government, such as schools, dispensaries, fair price shops, electricity and telecommunication lines, water tanks, etc. with the recommendation of Gram Sabhas. In addition, several schemes have been implemented by the Ministry of Tribal Affairs for the benefit of tribal people, including those in the forest areas such as "Mechanism for marketing of Minor Forest Produce (MFP) through Minimum Support Price (MSP) and development of Value Chain for MFP". Funds are released out of Special Central Assistance to Tribal Sub Plan for infrastructure work relating to basic services and facilities viz. approach roads, healthcare, primary education, minor irrigation, rainwater harvesting, drinking water, sanitation, community halls, etc. for development of forest villages.
181. The World Bank's Operational Policy on Indigenous Peoples (OP 4.10) aims at ensuring that the development process fosters full respect for the dignity, human rights and cultures of indigenous peoples, thereby contributing to the Bank's mission of poverty reduction and sustainable development. To achieve this objective, Bank-assisted projects which affect indigenous peoples provide them a voice in design and implementation, avoid adverse impacts where feasible, or minimize and mitigate them, and ensure that benefits intended for them are culturally appropriate.
182. The Bank recognizes that indigenous peoples are commonly among the poorest and most vulnerable segments of society and in many countries they have not fully benefited from the development process. It also recognizes that the identities, cultures, lands and resources of indigenous peoples are uniquely intertwined and especially vulnerable to changes caused by development programs. Because of this, issues related to indigenous peoples and development are complex and require special measures to ensure that indigenous peoples are not disadvantaged and that they are included in and benefit from these programs as appropriate.

## 3.9 INSTITUTIONAL FRAMEWORK

### 3.9.1 Introduction

183. Institutions for planning & implementation of RP vary substantially in terms of their respective roles & capacity. Timely establishment & involvement of appropriate R&R institutions would significantly facilitate achievement of objectives of the R&R program. The main R&R institution would include:

- Executing Agency (EA)
- Local Administration
- Line departments
- Non-Government Organization (NGO)
- District Level Committee (DLC)/ Grievance Redressal Committee (GRC)
- Training Institutions
- Monitoring & Evaluation (M&E) Agency

### 3.9.2 The Process

184. EA will initiate the following activities to commence and implement the RP:

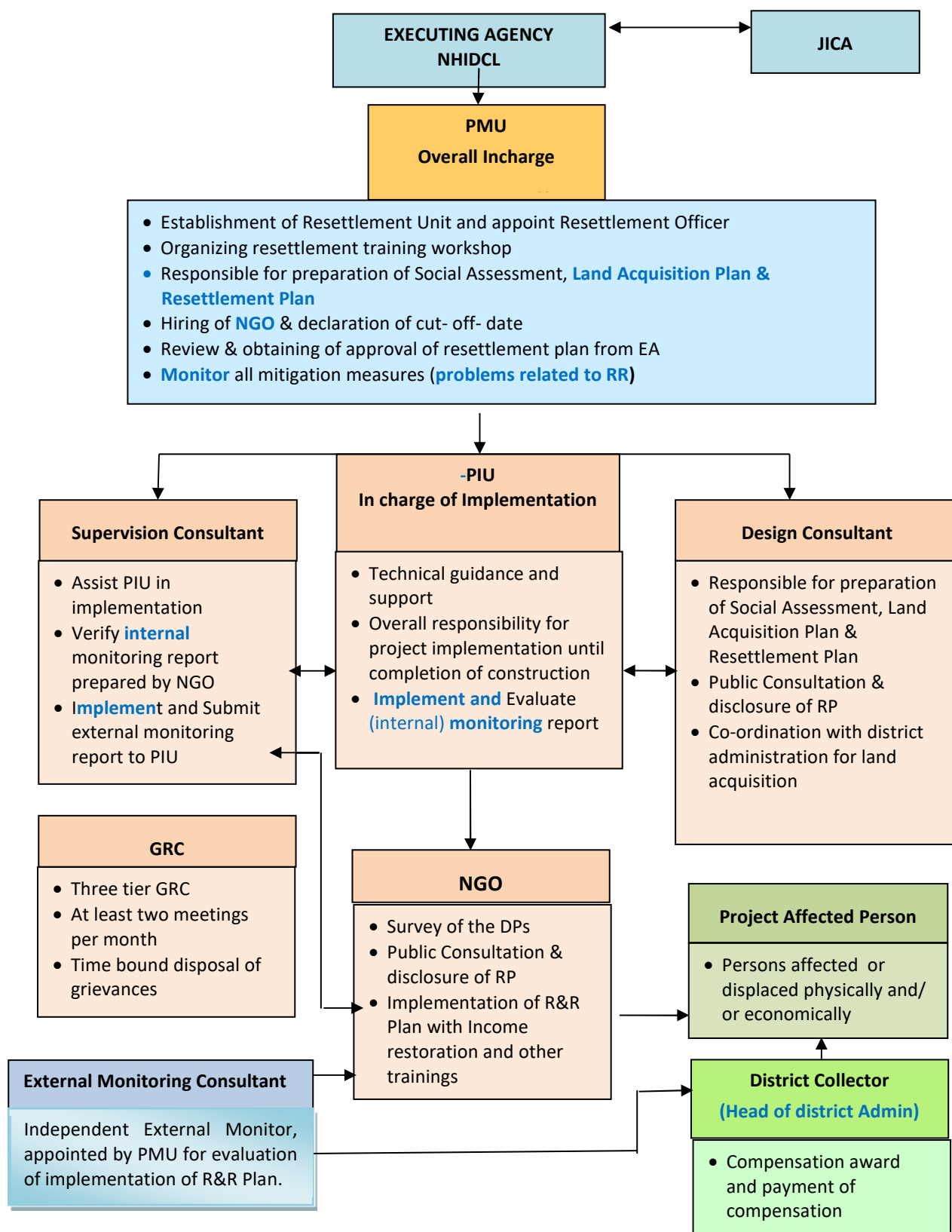
- ❖ Establish PIU and field offices.
- ❖ Select NGO with proven track records for the smooth implementation of R&R activities as stated.
- ❖ Orientation and awareness seminars for Project Implementation Unit (PIU).
- ❖ Appointment of external monitoring and evaluation consultants.

185. Effective RP implementation will require institutional relationships & responsibilities, rapid organizational development & collaborative efforts by EA, State Govt. & partnering NGO. The PIU will establish operational links within EA (for e.g. finance for release of money on approval of micro plan) & with other agencies of govt. involved in project induced settlement. It will provide means & mechanism for coordinating the delivery of the compensation & assistance entitled to those who will suffer loss. On behalf of EA, PIU will assume the responsibility for representing the social impact & resettlement component of the project. The PIU will also be responsible for disseminating the information to the public & providing additional opportunities for public comment.

186. The PIU at the apex level will have overall responsibility for policy guidance, coordination, and contingency planning, monitoring and overall reporting during RP implementation.



Figure 10. 1 Institutional arrangement for RAP



### 3.9.3 Roles and Responsibilities

187. The role and responsibilities of the various offices in R&R implementation are presented below:

#### 3.9.3.1 At Corporate Level

##### **The General Manager: -**

- ❖ In-charge of overall project activities.
- ❖ Participate in the State Level Committees to facilitate land acquisition, pre- construction activities and implementation of R&R activities.

##### **Executing Agency: -**

- ❖ Co-ordinate the implementation of R&R activities with corporate and field staff.
- ❖ Appoint NGO for R&R implementation and M&E consultants for monitoring and evaluation.
- ❖ Plan and conduct training programs for staff capacity building as well as capacity of field level NGOs and partner agencies.
- ❖ Review the micro plans prepared by the NGO.
- ❖ Review monthly progress report.
- ❖ Monitor the progress on R&R and land acquisition.
- ❖ Advice PIU/NGO/M&E Agency on policy related issues during implementation.
- ❖ Ensure early release of money to PIUs for R&R activities.

#### 3.9.3.2 Project Implementation Unit (PIU)

188. This unit will coordinate the process for land acquisition. Relocation and rehabilitation, distribution of project provided assistance and PAPs access to government programs. NGO would be selected who would be working in close association with the Project Implementation Unit.

### 3.9.4 RP Implementation Field Offices and Tasks

189. The PD-PIU will be responsible to carry out the following tasks concerning resettlement of the project:

- ❖ Overall responsibility of Implementation of R&R activities of RP.
- ❖ Responsible for land acquisition and R&R activities in the field.
- ❖ Ensure availability of budget for R&R activities.
- ❖ Liaison with District Administration for support for land acquisition and implementation of R&R.
- ❖ Participate in the district level committees.

### 3.9.4.1 Competent Authority for Land Acquisition (CALA)

- ❖ Overall responsibility for Land Acquisition
- ❖ Co-ordinate with District Administration and NGO for land acquisition and R&R.
- ❖ Translation of R&R policy in local language.
- ❖ Ensure development of resettlement sites, wherever required.
- ❖ Participate in the allotment of residential, commercial and agricultural plots.
- ❖ Liaison with District Administration for dovetailing government's income generating and developmental programs for the DPs.
- ❖ Ensure the inclusion of those PAPs who may have not been covered during the census survey;
- ❖ Monitor physical and financial progress on land acquisition and R&R activities.
- ❖ Participate in regular meetings.
- ❖ Organize Bi-monthly meetings with the NGO to review the progress on R&R.

### 3.9.4.2 NGO will be principally responsible for the day-to-day implementation work.

- ❖ Survey and verification of the DPs.
- ❖ Verification of land records followed by verification on the spot related to identified plots and owners.
- ❖ Develop rapport with the DPs.
- ❖ Verify and Photograph of each PAP for ID cards.
- ❖ Assist to issue identity cards to the DPs.
- ❖ Co-ordinate with the DRO to implement R&R activities.
- ❖ Conduct market feasibility study.
- ❖ Valuation of properties/assets for finalization of replacement value.
- ❖ Participate with the DRO to undertake public information campaign at the commencement of the projects.
- ❖ Distribute the pamphlets of R&R policy to the DPs.
- ❖ Assist the PAPs in receiving the compensation.
- ❖ Facilitate the process of arranging loans for DPs.
- ❖ Facilitate the opening of joint accounts.
- ❖ Generate awareness about the alternate economic livelihood and enable the PAPs to make informed choice.

- ❖ Prepare micro-plans for R&R.
- ❖ Enable the PAPs to identify the alternate sites for agriculture, residential and commercial plots.
- ❖ Participate in the consultation on allotment of shops and residential plots.
- ❖ Ensure the PAPs have received their entitlements.
- ❖ Ensure the preparation of rehabilitation sites.
- ❖ Participate in the meetings organized by the PIU.
- ❖ Submit monthly progress reports.
- ❖ Identify training needs and institutions for the PAPs for income generating activities.
- ❖ Participate in the disbursement of cheques for the assistance at public places.
- ❖ Coordinate the training programs of the PAPs for income generating activities.
- ❖ Coordinate the meeting of District Level Committees.
- ❖ Accompany PAP to GRC.
- ❖ Awareness campaigns for highway related diseases.
- ❖ Ensure the PAP judiciously uses compensation and R&R assistance.

### 3.9.5 District Level Committee (DLC)

190. At the Bodoland Territorial Authority, the RP will be implemented through District Level Committees that will be established in the districts of Kokrajhar in Assam. The committee would include District Magistrate or his representative, District Land Acquisition Officer, Representatives from the District Council, Pradhans of Panchayat Samities, representative of affected villages including women, representative of Revenue Department, Line Departments, PWD, Mining Departments, people's representatives, NGO and representatives of affected population. The formation of DLCs would be facilitated by NGOs. The functions of the DLC will be as follows: (i) to meet regularly to review the progress of land acquisition/ R&R; (ii) approval of the micro-plan on the basis of methodology defined in the RP; and (iii) facilitate the implementation of the RP programs in the project-affected area.

191. The DLC would also: (i) meet regularly at pre-decided dated specifically for grievance redressing purpose at the District Council Office; (ii) help in amicable settlement of disputes at community level; (iii) carry forward the ones which are not reconciled at the Grievance Redressal Committee (iv) coordination with local govt. authorities & field offices.

#### 3.9.5.1 Coordination with Other Agencies and Organizations

192. CALA or DLC will establish networking relationships with line departments and other Govt. & non-Govt. organizations. The Revenue Department has an influencing role in land acquisition proceedings, and initiation of resettlement process. Unless the compensation

process is prompt and efficient, implementation process will get delayed. R&R Cell will coordinate with the Project Land Acquisition Officer to expedite the land acquisition process.

193. Income restoration will be sole responsibility of the Project Authority. NGO will facilitate linkages to be established with the agencies implementing centrally sponsored poverty alleviation programs to restore the income of PAPs.
194. Restoration of community assets such as hand pumps, bore wells will require help from PHED. EA will extensively work on developing lateral linkages for mobilization of resources to benefit the PAPs and to achieve the desired results expected from implementation of RP.
195. The CALA or District Council is responsible for providing land records, acquiring land and other properties and handing them over to the proper authorities. The District Rural Development Agency (DRDA) will extend the IRDP and other developmental schemes to include the DPs.

### 3.9.6 NGO Participation

196. This will be required by the PIU. A good rapport with the affected community will facilitate a satisfactory R&R of the PAPs and minimize disturbance particularly physical and economic. To overcome this deficiency, experienced and well-qualified NGO in this field will be engaged to assist the EA in the implementation of the RP. NGO hired for RP implementation will also be responsible for HIV/AIDS, trafficking of women and children, child labour, etc. The NGO should have experience of addressing such social issues.
197. The NGO, in this sense, will have to ensure that due entitlements flow to the PAPs in the most effective and transparent manner. The success of the NGO inputs will largely depend on their liaison with the PAPs and other concerned government agencies. Other involved agencies are expected to collaborate with Project, based on instructions from the EA, in accordance with the policy framework and the RP. These arrangements have to be made during the first month of Project implementation in order to set up the various committees and implementation mechanisms required for the project. (TOR of NGO attached as **Annexure 4**).
- 198.

### 3.10 ELIGIBILITY & ENTITLEMENT MATRIX

199. This Resettlement Plan (RP) has been developed based on the legal provisions (national and state), government memorandum/notification and World Bank Operational Policy on Involuntary Resettlement (OP 4.12). The following sections provide an overview of the legal provisions governing the land acquisition and resettlement and rehabilitation.
200. **Principles:** Based on the above analysis of Government statutes and the JICA's policy, the following resettlement principles will be adopted for this project:
201. Screen the project early on to identify, present, and future involuntary resettlement impacts and risks. Determine the scope of involuntary impacts using a screening checklist for each ferry and ro-ro service locations, access roads, etc.
202. Ensure that affected persons with or without recognizable legal rights to land are eligible for replacement value for loss of non-land assets and resettlement and rehabilitation assistance. Where displacement is unavoidable in such cases, improve, or at least restore the livelihoods of all Project Affected Persons by providing resettlement and rehabilitation assistance.
203. Improve the standards of living of affected persons particularly, poor and vulnerable groups, to national minimum standards or standard before displacement whichever is higher.
204. Carry out meaningful consultations with affected persons, local communities, and concerned agencies/departments. Inform all affected persons of their entitlements and resettlement options. Ensure their participation in planning, implementation, and monitoring and evaluation of resettlement programs. Pay attention to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and those without ownership to land, and ensure their participation in consultations.
205. Conduct census and socio-economic surveys, consultations, etc and prepare a Social Impact Assessment (SIA) report and also prepare an Abbreviated Resettlement Action Plan (ARAP) or Resettlement Action Plan (RAP), as the case may be, depending upon the magnitude of impacts.
206. Identify vulnerable groups for additional support in their efforts to improve their living standards.
207. Disclose draft and final RP, including documentation of the consultation process in a timely manner, in an accessible place and a form and language(s) understandable to affected persons and other stakeholders.
208. Pay compensation and provide resettlement and rehabilitation assistance as per entitlements before clearing the affected area for the commencement of project activities.
209. Establish an accessible Grievance Redressal Mechanism (GRM) to receive and facilitate the resolution of the concerns of affected persons within a specified time frame.



210. Monitor and assess resettlement outcomes, their impacts on the standard of living of affected persons, and whether the objectives of the resettlement plan have been achieved by considering the baseline conditions and the results of resettlement monitoring.
211. **Eligibility:** Persons affected by the proposed project may belong to either of the following two categories and will be eligible for compensation and resettlement and rehabilitation assistance in accordance with the principles of this RPF:
- Those who have ownership to land
  - Those who have no recognizable legal right or claim to the land they are occupying (informal settlers on public land at site – encroachers and squatters).
212. **Definitions:** In this Resettlement Policy Framework, following terms shall mean as described below, unless the context requires otherwise,
213. **Affected area:** Means such area as may be notified by the appropriate government for the purposes of land acquisition/purchase;
214. **Assistance:** All support mechanisms such as monetary help, services, trainings or assets given to Project Affected Persons/Project Affected Families constitute assistance in this project.
215. **Below poverty line (BPL) or BPL family:** means below poverty line families as defined by the Planning Commission of India, from time to time and those included in the BPL list by the State Government for the time-being in force;
216. **Compensation:** Compensation for land taken under RFCTLARRA, 2013 Or direct land purchase from land owners in fair and transparent manner based on mutual consent;
217. **Corridor of impact (COI):** Refers to the minimum land width required for development/upgrading of access roads to ro-ro service locations;
218. **Cut-off date:** For title holders, the date of notification under Section 4(1) of the RFCTLARR Act, 2013 (if the land is acquired is acquired as per the Act) or
219. the date of local notice of land intended for direct purchase from land owners in the public offices and local newspaper(s)
220. **Direct land purchase** from land owners, Land & Land Reforms Department, Govt. of and for non-titleholders the cut-off date will be the date on which census survey begins in the project area,
221. **Displaced family:** means a family, who on account of acquisition or purchase of land needs to be relocated and resettled from the affected area to the resettlement area or elsewhere;
222. **Encroacher:** A person/family, who transgresses into the public land (i.e., extended their building, agricultural lands, business premises or work places into public land), adjacent to his/her own land or other immovable assets and derives his/her additional source of shelter, livelihood, etc.;

223. **Family:** includes a person, his or her spouse, minor children, minor brothers and minor sisters' dependent on him. Widows, divorcees, and women deserted by families shall be considered separate families;
224. **Petty shop/Kiosk:** It could be cubicle/booth/stall/cabin made of wood or iron or any other building material which could be shifted to another location as a single unit without much damage and is used for carrying out petty business, commercial activities and has been in operation/existence prior to cut off date;
225. **Land acquisition" or "acquisition of land":** means acquisition of land as per RFCTLARR, Act 2013 for the time being in force
226. **Marginal farmer:** Means a cultivator with an un-irrigated land holding up to one hectare or irrigated land holding up to one-half hectare;
227. **Market value:** Means the value of land determined in accordance with Section 26 of the RFCTLARR, Act 2013 or the base price of land determined taking into account the assessed value of land or set forth value of land whichever is higher;
228. **Minimum Wages:** means the minimum wage of a person for his/her services/labour by type of trade per day as stipulated by Department of Labour of the project state;
229. **Non-agricultural labourer:** means a person who is not an agricultural labourer but is primarily residing in the affected area immediately before the declaration of the affected area and who does not hold any land under the affected area but who earns his livelihood mainly by manual labour or as a rural artisan immediately before such declaration and who has been deprived of earning his livelihood mainly by manual labour or as such artisan in the affected area;
230. **Non-titleholder:** Affected persons/families/ households with no legal rights to the land, structures and other assets adversely affected by the project. Non-titleholders include encroachers, squatters, etc.;
231. **Notification:** Means a notification published in the Gazette of India or, as the case may be, Gazette of a State and the expression "notify" shall be construed accordingly;
232. **Persons losing their livelihood:** Persons losing their livelihood are individual members of the PAFs/households, who are at least 18 years of age and are impacted by loss of primary occupation or source of income;
233. **Permanent buildings or Pucca structure:** Buildings of a permanent construction type with reinforced concrete;
234. **Project affected area:** Refers to the area of village or locality under a project for which land will be acquired as per the provisions of the RFCTLARR Act, 2013 through declaration by Notification in the Official Gazette by the appropriate Government.
235. **Project affected person (PAP):** Any tenure holder, tenant, Government lessee or owner of other property, or non-titleholder who on account of the project has been affected from

such land including plot in the abadi or other property in the affected area will be considered as PAP;

236. **Project affected household (PAH):** A social unit consisting of a family and or non-family members living together, and is affected by the project negatively and or positively;
237. **Replacement cost:** A replacement cost/value of any land or other asset is the cost/value equivalent to or sufficient to replace/purchase the same land or other asset;
238. **Semi-permanent building or structure:** Buildings of a semi-permanent type with tiled roof and walls not of concrete or permanent brickwork;
239. **Squatter:** A person/family who has settled on public/government land, land belonging to institutions, trust, etc. and or someone else's land without permission for residential, business and or other purposes or has been occupying public building without authority prior to the cut-off date and is depending for his or her shelter or livelihood and has no other source of shelter or livelihood;
240. **Tenant:** A person who holds/occupies land/structure of another person and (but for a special contract) would be liable to pay rent for that land/structure. This arrangement includes the predecessor and successor-in-interest of the tenant but does not include mortgage of the rights of a landowner or a person to whom holding has been transferred; or an estate/holding has been let in farm for the recovery of an arrear of land revenue; or of a sum recoverable as such an arrear or a person who takes from Government a lease of unoccupied land for subletting it;
241. **Temporary building/Kutcha structure:** Temporary building or structure means a temporary type of structure, which includes buildings with roofs constructed of thatch, galvanized iron or corrugated cement sheet or asbestos;
242. **Titleholder:** A person who has legal rights of the land acquired/purchased by the project;
243. **Women Headed Household (WHH):** A household that is headed by a woman and does not have an adult male earning member is a Woman Headed Household. This woman may be a widowed, separated or deserted person;
244. **Vendor:** A vendor is someone who sells things such as newspapers, tea, cigarettes, or food and other miscellaneous items from a small stall or cart etc.;
245. **Agricultural Labourer** is the person depends on the agricultural land for their livelihoods.
246. **Vulnerable group:** Includes Scheduled Caste, Scheduled Tribe, family/household headed by women/female, widows, physically challenged (disabled person), BPL, and land less. The vulnerable group will also include those land owners who after acquisition or purchase of their land due to project become landless. For such cases, the total land holding of the landowner in that particular revenue village will be considered in which the land has been acquired or purchased;

### 3.10.1 Entitlement Matrix

247. The entitlements of different categories of eligible persons are presented in a matrix form indicating the type of loss, category of entitled person, unit of entitlements, etc. Affected families will be eligible for compensation and R&R assistance or specific R&R assistance depending upon the status of ownership rights and type of loss. The entitlement matrix is presented below in Table 8.1

**Table 8. 1 Entitlement Matrix**

| Sl. No. | Type of loss                                                                                                                                        | Eligible category  | Entitlements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                | Implementation Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                                                                     |                    | Compensation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | R&R Assistance |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 1       | Private land                                                                                                                                        | Titleholder family | Compensation for land as per the First Schedule of the RFCTLARR Act, 2013 with the Assistance as per Second Schedule of RFCTLARR Act, 2013:<br>One-time payment of Rs. 5 lakhs per affected family<br>Subsistence grant @ Rs. 3000/-per month for a period of one year<br>Stamp duty and other fees payable for registration of land, if allotted to the affected families.<br><br><b>Or</b><br>As per the provisions of Govt. of Assam under Assam RFSTLARR Rules, 2015, whichever is higher.                                                                                                      |                | Factor applicable in shall be considered for multiplication with market value of land determined as per Section 26 of the Act.<br><br>Stamp duty and other fees payable shall be borne by the Requiring Body.<br><br>RFCTLARR First schedule includes:<br>Market value of land as per Section 26 of the Act, Factor by which the market value is to be multiplied (rural and urban areas)<br>Solatium @ 100% of the market value of land multiplied by applicable factor<br>Mandatory interest on compensation amount @ 12% per annum from the date of publication of SIA notification under sub-section 2 of Section 4, till the date of the award of the Collector or the date of taking possession of the land, whichever is earlier.. |
|         | Structure (Residential, Commercial, Residential cum commercial) & structures used for other purposes and or assets attached to the land or building | -do-               | Compensation for land as per the First Schedule of the RFCTLARR Act, 2013<br>Provision of housing unit (a constructed house as per PMAY specifications) or the equivalent cost of the house for the displaced.<br>One time financial assistance of Rs. 50,000/- as transportation cost to PAFs.<br>One time resettlement allowance of Rs. 50,000/- to PAFs.<br>Right to salvage affected materials.<br>The stamp duty and other fees payable for registration of house allotted to the affected families.<br><b>Or</b><br>As per the provisions of Assam RFCTLARR Rules, 2015, whichever is higher. | -              | Provision of housing unit shall be applicable for physically PAFs losing only residential & residential cum commercial structure.<br>Transport allowance and resettlement allowance shall be applicable in case of physical displacement from residential & residential cum commercial structure only.<br>Market value of structure/building will be estimated as per the current year Schedule of Rates and without depreciation.<br>Stamp duty and other fees payable shall be borne by the Requiring Body.                                                                                                                                                                                                                             |
| 2       | Trees, Plants and Standing Crops                                                                                                                    | -do-               | Compensation for trees, plants, and standing crops damaged as per the First Schedule of the RFCTLARR Act, 2013<br>Or any existing state                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -              | The value of trees and plants attached to the land acquired to be determined by Forest Department for timber trees and Horticulture and or Agriculture Department for fruit bearing trees/plants & Agriculture Department for standing crops                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km.

| Sl. No. | Type of loss                                                                                                                           | Eligible category                   | Entitlements                                                                                                                                                                                            |                                                                                                                                                                                                                                                                            | Implementation Guidance                                                                                                                                                                                                         |
|---------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                                                                                        |                                     | Compensation                                                                                                                                                                                            | R&R Assistance                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                 |
|         |                                                                                                                                        |                                     | Act, whichever is higher<br>Or,<br>Allow the land owner to cut and take away trees, in case the land owner willingly opts for this option (in writing) and without claiming compensation for trees cut. |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                 |
| 3       | Workshop, work-shed, cattle shed, petty shop, Kiosk, etc.                                                                              | TH & NTH                            | Not applicable                                                                                                                                                                                          | A minimum of Rs. 25,000/- to each PAF (artisan, small trader or self-employed person or the family).                                                                                                                                                                       | One time financial assistance.                                                                                                                                                                                                  |
| 4       | Tenants (Residential, commercial, Residential cum commercial, storage, office, etc.)                                                   | TH & NTH                            | Not applicable                                                                                                                                                                                          | Rental Assistance of Rs.5,000/- per month for 3 months .                                                                                                                                                                                                                   | One month prior notice to vacate the rental premises.                                                                                                                                                                           |
| 5       | Structure (Residential, Commercial, Residential cum commercial) & other immovable structure or assets attached to the land or building | NTH (Encroacher, Squatter & others) | Not applicable                                                                                                                                                                                          | Value of structure determined (without depreciation and without application of solatium).<br>Right to salvage affected materials<br>The stamp duty and other fees payable for registration of house allotted to the affected families shall be borne by the requiring body | Value of buildings/structures would be assessed by the Executive Engineer PWD, / District Engineer/Executive Engineer, or by such agency as the administrative department may decide as per the current year Schedule of Rates. |
| 6       | Livelihood                                                                                                                             | TH & NTH                            | Not applicable                                                                                                                                                                                          | A minimum wage of Rs.8,471.40 <sup>10</sup> /- per month to each affected commercial structures for the number of months it loses its livelihood, provided that there should be loss of livelihood more than 10 days. However, for losses less than 10                     | One time financial assistance.<br>One month notice to vacate the affected area.                                                                                                                                                 |

<sup>10</sup> Minimum Wage for unskilled Labourer in Assam till June, 2020.

| Sl. No. | Type of loss                                                   | Eligible category           | Entitlements   |                                                                                                                                                                                                                                                                                                                                                                                                                     | Implementation Guidance                                                                                                                      |
|---------|----------------------------------------------------------------|-----------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
|         |                                                                |                             | Compensation   | R&R Assistance                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                              |
|         |                                                                |                             |                | days, the wage would be calculated on a pro-rata basis                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                              |
| 7       | Vendors                                                        | NTH                         | Not Applicable | Should be relocated such that he/she can cater the same number of passenger/customer or a minimum wage of Rs.8,471.4/- per month to each affected vendors for the number of days it loses its livelihood, provided that they should obtain a vending license and there should be loss of livelihood for more than 10 days. However, for losses less than 10 days, the wage would be calculated on a pro-rata basis. | Fifteen days' notice to vacate the affected area                                                                                             |
| 8       | Vulnerable Households                                          | TH & NTH (Vulnerable group) | Not applicable | Additional assistance of Rs. 25000/- per family                                                                                                                                                                                                                                                                                                                                                                     | This assistance will be applicable only for type of loss at Sl. No.1, 2 & 7                                                                  |
| 8       | Religious structure, well, and other facilities on public land | Community                   | Not applicable | To be reconstructed/ rehabilitated at project cost in consultation with local communities and ULBs/ Gram Panchayat, as the case may be.                                                                                                                                                                                                                                                                             | The cost of reconstruction or rehabilitation may be transferred in installments to ULBs/ Gram Panchayat account linked to progress of works. |
| 9       | Unforeseen impacts                                             | Community                   | Not applicable | -                                                                                                                                                                                                                                                                                                                                                                                                                   | Unforeseen impacts encountered during implementation will be addressed in accordance with the principles of RPF.                             |

248. . These allowances may be adjusted by considering 2014 as the base year.



## 3.11 VALUATION OF AND COMPENSATION OF LOSSES

### 3.11.1 Introduction

249. The resettlement cost estimate for this project includes eligible compensation, resettlement assistance and support cost for RP implementation. The support cost, which includes staffing requirement, monitoring and reporting, involvement of NGO in project implementation and other administrative expenses are part of the overall project cost. The unit cost for structures and other assets in this budget has been derived through field survey, consultation with affected families, relevant local authorities and reference from old practices. Contingency provisions have also been made to take into account variations from this estimate. Some of the major items of this R&R cost estimate are outlined below:

- ❖ Compensation for agricultural, residential and commercial land at their replacement value
- ❖ Compensation for structures (residential/ commercial) and other immovable assets at their replacement cost
- ❖ Compensation for crops and trees
- ❖ Assistance in lieu of the loss of business/ wage income/ employment and livelihood
- ❖ Assistance for shifting of the structures
- ❖ Resettlement and Rehabilitation Assistance in the form of Training allowance
- ❖ Special assistance to vulnerable groups for their livelihood restoration
- ❖ Cost for implementation of RP.

### 3.11.2 Compensation

#### Private Agricultural Land:

250. The unit rate for agricultural land has been estimated as per Right to Fair Compensation and Transparency in Land Acquisition Resettlement and Rehabilitation Act, 2013, Assam RFCTLARR Rules, 2015 and National Highway Act, 1956. To meet the replacement cost of land compensation will be calculated over updated land rate with additional as registration cost plus 100% solatium with the multiplier effect as per the distance from the nearest municipality. It may be noted that the District Magistrate have the discretionary power in valuation of land in his jurisdiction. The State Government may also announce packages for Land Acquisition or can initiate a direct purchase procedure.

#### Residential/ Commercial and other structures:

251. The compensation cost of structures are arrived at by assessment of market value, consultation with DPs and data collected from building contractors and property agents this meets the replacement cost of the structures. The R & R budget has been calculated on the following basis:-

- The R & R budget is calculated on the basis of DLC rates.
- The budget for the compensation of affected structures is based on the rates of various types as described in Basic Schedule Rates (BSR), PWD, Govt. Of Assam, 2013.

252. The average estimated rate for permanent structures without land has been calculated at Rs. 14,744/m<sup>2</sup>, semi-permanent structures have been calculated at Rs. 11,317/m<sup>2</sup>, and temporary structures have been calculated at the rate of Rs. 3,427/m<sup>2</sup>. The compensation for boundary walls at per running metre is Rs. 5,677/ metre. Solatium amounting to 100% is added to the cost of the structures for the Title Holders.

### **3.11.3 Assistance**

253. Shifting allowance: Shifting allowance will be provided to all the affected households losing structures and tenants. The unit cost has been derived on a lump sum basis of Rs. 50,000/-.

254. Rehabilitation Assistance to DPs Losing Business Establishment: Title holders losing their business establishment due to displacement will be provided with a lump sum transitional allowance of Rs. 50,000/-. This rate has been fixed based on the estimates of average income for a period of three months.

255. Rehabilitation Assistance to Employees in Structure: Wage earning employees indirectly affected due to displacement of commercial structure will be provided assistance as per the prevailing local wage rate for 3 plus months i.e. @ Rs. 8,471.40 per month.

256. Rehabilitation Assistance to Agricultural Labourers/Sharecroppers: Agricultural Labourers/ Sharecroppers will be provided with assistance as per the prevailing local wage rate for 3 plus months i.e. @ Rs. 8,471.40 per month.

257. Assistance to Vulnerable Households: One time lump sum assistance of Rs. 25,000/- will be paid to each vulnerable households. (This will be paid above and over the other assistance(s) as per the entitlement matrix).

### **3.11.4 Compensation for Community and Government Property**

258. Religious and Community Structures: The religious and community structures are being partially affected and do not require full replacement. However a lump sum provision of Rs. 2,50,000/- per structure is made in the budget to rebuild and enhance the ambience of these structures. However any religious or community structure requires full relocation will be compensated in replacement rate.

### **3.11.5 RP Implementation and Support Cost**

259. The unit cost for hiring of the implementing NGO has been calculated on a lump sum basis for Rs. 94,50,000/-. This is based on the similar earlier project experiences and informal consultation and feedback received from the local staff and keeping in consideration two year duration of NGO's involvement. Costs will be updated during implementation.

260. A 10% contingency has been added in order to adjust any escalation.

261. For grievance redress process a lump sum of Rs 4,80,000/- is provided for two years and cost of other RP implementation and administrative activities will be a part of proposed

departmental expenditure. The separate fund for grievance redressal for this project is made based on intensity of impacts. In addition the process will involve interdepartmental arrangement and include participation by representatives of DPs, particularly of vulnerable DPs, local government representatives, representative of local NGOs and other interest groups besides PIU and implementing NGO.

### 3.12 RESETTLEMENT MEASURES

262. The procedure mentioned in this chapter shall be followed for declaration of the affected area, carrying out survey and census of affected persons, assessment of government land available and land to be arranged for rehabilitation and resettlement, declaration of the resettlement area or areas, preparation of the draft rehabilitation and resettlement scheme or plan and its final publication.

263. Where the appropriate Government is of the opinion that there is likely to be involuntary displacement of four hundred or more families enmasse in plain areas, or two hundred or more families enmasse in tribal or hilly areas, DDP blocks or areas mentioned in the Schedule V11 or Schedule VI to the Constitution due to acquisition of land for any project or due to any other reason, it shall, declare, by notification in the Official Gazette, area of villages or localities as an affected area.

264. Every declaration made in our policy shall be published in at least three daily newspapers, two of which shall be in the local vernacular having circulation in villages or areas which are likely to be affected, and also by affixing a copy of the notification on the notice board of the concerned gram panchayats or municipalities and other prominent place or places in the affected area and the resettlement area, and/or by any other method as may be prescribed in this regard by the appropriate Government.

265. Once the declaration is made, the Administrator for Rehabilitation and Resettlement shall undertake a baseline survey and census for identification of the persons and families likely to be affected.

266. Every such survey shall contain the following village-wise information of the affected families:-

- ❖ Members of the family who are permanently residing engaged in any trade, business, occupation or vocation in the affected area.
- ❖ families who are likely to lose, or have lost, their house, agricultural land, employment or are alienated wholly or substantially from the main source of their trade, business, occupation or vocation.
- ❖ Agricultural labourers and non-agricultural labourers.
- ❖ Families belonging to the Scheduled Caste or Scheduled Tribe categories.
- ❖ Vulnerable persons such as the disabled, destitute, orphans, widows, unmarried girls, abandoned women, or persons above sixty years of age; who are not provided or cannot immediately be provided with alternative livelihood, and who are not otherwise covered as part of a family.

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<sup>11</sup> As per the **Constitutional** provision under Article 244 (1) of the **Constitution of India**, the '**Scheduled Areas**' are defined as 'such areas as the President may by order declare to be **Scheduled Areas**' – as per paragraph 6(1) of the Fifth **Schedule** of the **Constitution of India**.

- ❖ families that are landless (not having homestead land, agricultural land, or either homestead or agricultural land) and below poverty line, but residing continuously in the affected area preceding the date of declaration of the affected area.
- ❖ Scheduled Tribes families who are or were having possession of forest lands in the affected area prior to the LA Notice Publication date.
- ❖ Every survey undertaken under shall be completed within a period of ninety days from the date of declaration.

267. On completion of the above surveyor on expiry of a period of ninety days, whichever is earlier, the Administrator for Rehabilitation and Resettlement shall, by notification, and also in such other manner so as to reach all persons likely to be affected, publish a draft of the details of the findings of the survey conducted by him and invite objections and suggestions from all persons likely to be affected thereby. This draft shall be made known locally by wide publicity in the affected area.

268. On the expiry of thirty days from the date of publication of the draft of the details of survey and after considering the objections and suggestions received by him in "this behalf, the Administrator for Rehabilitation and Resettlement shall submit his recommendations thereon along with the details of the survey to the appropriate Government.

269. Within forty-five days from the date of receipt of the details of the survey and recommendations of the Administrator for Rehabilitation and Resettlement, the appropriate Government shall publish the final details of survey in the Official Gazette. The appropriate Government shall, by notification, declare any area (or areas) as a resettlement area (or areas) for rehabilitation and resettlement of the affected families.

270. The Administrator for Rehabilitation and Resettlement shall ensure that the affected families may be settled, wherever possible, in a group or groups in such resettlement areas. However, it has to be ensured that the affected families may be resettled with the host community on the basis of equality and mutual understanding, consistent with the desire of each group to preserve its own identity and culture.

271. The Administrator for Resettlement and rehabilitation shall draw up a list of lands that may be available for rehabilitation and resettlement of the affected families.

272. The lands drawn up shall consist of:-

- ❖ Land available or acquired for the project and earmarked for this purpose
- ❖ Government wastelands and any other land vesting in the Government available for allotment to the affected families.
- ❖ Lands that may be available for purchase or acquisition for the purposes of rehabilitation and resettlement scheme or plan.
- ❖ A combination of one or more of the above.

273. However, the Administrator for Rehabilitation and Resettlement should ensure that such acquisition of land does not lead to another set of physically Affected families. The Administrator for Rehabilitation and Resettlement, on behalf of the appropriate Government, may either purchase land from any person through consent award and may enter into an agreement for this purpose, or approach the state Government concerned for acquisition of land for the purposes of rehabilitation and resettlement scheme or plan.

274. After completion of baseline survey and census of the affected families and assessment of the requirement of land for resettlement, the Administrator for Rehabilitation and Resettlement shall prepare a draft scheme or plan for the rehabilitation and resettlement of the affected families after consultation with the representatives of the affected families including women and the representative of the requiring body.

275. The draft rehabilitation and resettlement scheme or plan shall contain the following particulars, namely:-

- (a) The extent of land to be acquired for the project and the name(s) of the affected village(s);
- (b) A village-wise list of the affected persons, family-wise, and the extent and nature of land and immovable property owned or held in their possession in the affected area, and the extent and nature of such land and immovable property which they are likely to lose or have lost, indicating the survey numbers thereof;
- (c) A list of agricultural laborers in such area and the names of such persons whose livelihood depends on agricultural activities;
- (d) A list of persons who have lost or are likely to lose their employment or livelihood or who have been or likely to be alienated wholly or substantially from their main sources of trade business, occupation or vocation consequent to the acquisition of land for the project or involuntary displacement due to any other cause; .
- (e) A list of non-agricultural laborers, including artisans;
- (f) A list of affected landless families, including those, without homestead land and below poverty line families;
- (g) A list of vulnerable affected persons.
- (h) A list of occupiers, if any;
- (i) A list of public utilities and government buildings which are affected or likely to be affected;
- (j) Details of public and community properties, assets and infrastructure;
- (k) A list of benefits and packages which are to be provided to the affected families;
- (l) Details of the extent of land available in the resettlement area for resettling and for allotment of land to the affected families.



- (m) Details of the amenities and infrastructural facilities which are to be provided for resettlement.
- (n) The time schedule for shifting and resettling the Affected persons in the resettlement area or areas.
- (o) Such other particulars as the Administrator for Rehabilitation and Resettlement may consider necessary.

276. The draft scheme or plan may be made known locally by wide publicity in the affected area and the resettlement area (or areas) in such manner as may be prescribed by the appropriate Government.

277. The draft rehabilitation and resettlement scheme or plan shall also be discussed in gram sabhas in rural areas and in public hearings in urban and rural areas where gram sabhas don't exist.

278. The draft rehabilitation and resettlement scheme or plan shall also be discussed in gram sabhas in rural areas and in public hearings in urban and rural areas where gram sabhas don't exist.

279. The consultation with the gram sabha or the panchayats at the appropriate level in the Scheduled Areas under' Schedule V of the Constitution shall be in accordance with the provisions of the Provisions of the Panchayats (Extension to the Scheduled Areas) Act 12, 1996 (40 of 1996).

280. In cases of involuntary displacement of two hundred or more Scheduled Tribes families from the non-Scheduled Areas, the concerned Tribes Advisory Councils may also be consulted.

281. While preparing a draft scheme or plan, the Administrator for Rehabilitation and Resettlement shall ensure that the entire estimated cost of the rehabilitation and resettlement scheme or plan forms an integral part of the cost of the project for which the land is being acquired. The entire expenditure on rehabilitation and resettlement benefits and the expenditure for rehabilitation and resettlement of the affected families are to be borne by the requiring body for which the land is being acquired. The Administrator for Rehabilitation and Resettlement shall ensure that the entire estimated cost of rehabilitation and resettlement benefits and other expenditure for rehabilitation and resettlement of the affected families is communicated to the requiring body for incorporation in the project cost.

282. The Administrator for Rehabilitation and Resettlement shall submit the draft scheme or plan for rehabilitation and resettlement to the appropriate Government for its approval. In case of a project involving land acquisition on behalf of a requiring body, it shall be the responsibility of the appropriate Government to obtain the consent of the requiring body,

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<sup>12</sup> <https://pesadarpan.gov.in/en>

to ensure that the necessary approvals as required under this policy have been obtained, and to make sure that the requiring body has agreed to bear the entire cost of rehabilitation and resettlement benefits and other, expenditure for rehabilitation and resettlement of the affected families as communicated by the Administrator for Rehabilitation and Resettlement, before approving it. After approving the rehabilitation and resettlement scheme or plan, the appropriate Government shall publish the same in the Official Gazette. On final notification of the rehabilitation and resettlement scheme or plan, it shall come into force.

283. It shall be the responsibility of the requiring body to provide sufficient funds to the Administrator for Rehabilitation and Resettlement for proper implementation of the rehabilitation and resettlement scheme or plan. As soon as the rehabilitation and resettlement scheme or plan is finalized, the requiring body shall deposit one-third cost of the rehabilitation and resettlement scheme or plan with the Administrator for Rehabilitation and Resettlement. The administrator for Rehabilitation and Resettlement shall keep proper books of accounts and records of the funds placed at his disposal and submit periodic returns to the appropriate Government in this behalf.

284. In case of a project involving land acquisition on behalf of a requiring body, an exercise for fast-track updating of land records shall be undertaken on currently with the land acquisition proceedings. Persons who have acquired any right prior to the date of issue of the notification under sub-section (1) of section 24 of the RTFCLARR Act, 2013 (or such notification under any other Act of the Union or a State for the time being in force under which land acquisition is being undertaken) as per the updated' records shall also have right to proportionate compensation along with the original landowners referred to in the notification.

(a) The compensation award shall be declared well in time before displacement of the affected families. Full payment of compensation as well as adequate progress in resettlement shall be ensured in advance of the actual displacement of the affected families.

(b) The compensation award shall take into account the market value of the property being acquired, including the location-wise minimum price per unit area fixed (or to be fixed) by the State Government.

(c) Conversion to the intended category of use of the land being acquired (for example, from agricultural to non-agricultural) shall be taken into account in advance of the acquisition, and the compensation award shall be determined as per the intended land use category.

(d) The applicable conversion charges for the change in the land use category shall be paid by the requiring body, and no reduction shall be made in the compensation award on this account.

285. In case of a project involving land acquisition on behalf of a requiring body, and if the requiring body is a company authorized to issue shares and debentures, the affected

families who are entitled to get compensation for the land or other property acquired, shall be given the option to take up to twenty percent of the compensation amount due to them in the form of shares or debentures or both of the requiring body, as per the guidelines to be notified by the Central Government: Provided that the appropriate Government, at its discretion, may raise this proportion up to fifty percent of the compensation amount.

286. Land compulsorily acquired for a project cannot be transferred to any other purpose except for a public purpose, and after obtaining the prior approval of the appropriate Government.

287. If land compulsorily acquired for a project or part thereof, remains unutilized for the project for a period of five years from the date of taking over the possession by the requiring body, the same shall revert to the possession and ownership of the appropriate Government without payment of any compensation or remuneration to the requiring body. Whenever any land acquired for a public purpose is transferred to an individual or organization (whether in private sector, public sector or joint sector) for a consideration, eighty percent of any net unearned income so accruing to the transferor, shall be shared amongst the persons from whom the lands were acquired or their heirs, in proportion to the value at which the lands were acquired. The fund shall be kept in a separate account which shall be administered in such manner as may be prescribed.

### 3.13 SITE SELECTION, SITE PREPARATION AND RELOCATION

288. In all cases of involuntary displacement of four hundred families or more enmasse in plain areas, or two hundred families or more enmasse in tribal or hilly areas, DDP blocks or areas mentioned in the Schedule V or Schedule VI to the Constitution, comprehensive infrastructural facilities and amenities notified by the appropriate Government shall be provided in the resettlement area (such facilities and amenities shall, inter alia, include roads, public transport, drainage, sanitation, safe drinking water, drinking water for cattle, community ponds, grazing land, land for fodder, plantation (social forestry or agro forestry), Fair Price shops, panchayat grams, Cooperative Societies, Post Offices, seed-cum-fertilizer storage, irrigation, electricity, health centers, child and mother supplemental nutritional services, children's playground, community centers, schools, institutional arrangements for training, places of worship, land for traditional tribal institutions, burial / cremation grounds, and security arrangements.

289. In cases of involuntary displacement of less than four hundred families enmasse in plain areas, or less than two hundred families or more enmasse in tribal or hilly areas, DDP blocks or areas mentioned in the Schedule V or Schedule VI to the Constitution, all affected families shall be provided basic infrastructural facilities and amenities at the resettlement site(s) as per the norms specified by the appropriate Government. It would be desirable that provision of drinking water, electricity, schools, dispensaries, and access to the resettlement sites, amongst others, be included in the resettlement plan approved by the appropriate Government.

290. If relocation takes place in a proposed settlement area, the same infrastructure shall also be extended to the host community.

291. While shifting the population of the affected area to the resettlement area, the Administrator for Rehabilitation and Resettlement shall, as far as possible, ensure that:

a) In case the entire population of the village or area to be shifted belongs to a particular community, such population or families may, as far as possible, be resettled en masse in a compact area, so that socio-cultural relations and social harmony amongst the shifted families are not disturbed.

b) In the case of resettlement of the Scheduled Caste affected families, it may, as far as possible, be ensured that such families are resettled in the areas close to the villages.

The appropriate Government shall ensure that a resettlement area forms part of a gram panchayat or municipality.

#### 3.13.1 Indexation of Rehabilitation grant and other benefits

292. The rehabilitation grant and other benefits expressed in monetary terms in this policy shall be indexed to the Consumer Price Index (CPI) with the first day of April following the date of coming into force of this policy as the reference date, and the same shall also be revised by the appropriate Government at suitable intervals.

### 3.13.2 Periphery Development

293. In case of a project involving land acquisition on behalf of a requiring body, the requiring body will be responsible for development of the defined geographic area on the periphery of the project site as decided by the appropriate Government, and will be required to contribute to the socio-economic development of the areas contiguous to its area of operation. For this purpose, the requiring body will earmark a percentage of its net profit or, in case no profit is declared by the requiring body in a particular year, for that year, such minimum alternative amount as may be determined by the appropriate Government after consultation with the requiring body, to be spent within the specified zone. The requiring body will carry out the developmental activity within this zone in close coordination with the Commissioner for Rehabilitation and Resettlement. The State Governments will be free to frame their own rules and guidelines for this purpose.

### 3.13.3 Legal provision and Guidelines for Schedule Areas

294. There are Government of India policies and Constitutional Acts that safeguard the interest of the scheduled tribes in India. A Scheduled Tribe (ST) is identified by the Constitution of India taking into consideration various factors, like, (i) primitive traits, (ii) distinctive culture, (iii) geographical isolation, (iv) social and economic backwardness, etc. But identification of tribes is a State subject. Therefore, a ST is judged by one or combination of these factors by the respective state. For example, tribes notified for Assam State are Schedule Tribes in Assam only and their category may vary in other States.

#### 3.13.3.1 Constitution of India

295. Under Constitution of India a number of Articles have been included for the protection of the STs in particular. These are:

- i. Article 14 confers equal rights and opportunities to all;
- ii. Article 15 prohibits discrimination against any citizen on grounds of sex, religion, race, caste etc.
- iii. Article 15(4) enjoins upon the State to make special provisions for the advancement of any socially and educationally backward classes;
- iv. Article 16(4) empowers the State to make provisions for reservation in appointments or posts in favour of any backward class of citizens;
- v. Article 46 enjoins upon the State to promote with special care the educational and economic interests of the weaker sections of the people and, in particular, the STs and promises to protect them from social injustice and all forms of exploitation;
- vi. Article 275(1) promises grant-in-aid for promoting the welfare of STs and for raising the level of administration of the Scheduled Areas;

- vii. Articles 330, 332 and 335 stipulate reservation of seats for STs in the Lok Sabha and in the State Legislative Assemblies and in services;
- viii. Article 340 empowers the State to appoint a Commission to investigate the conditions of the socially and educationally backward classes;
- ix. Article 342 specifies those Tribes or Tribal Communities deemed to be as Scheduled Tribe (STs)

296. The Constitutional amendment (Twenty-seventh Amendment) Act, 1971 inserted a new article, Article 371 C. The hill areas in the state of Assam largely inhabited by tribal communities are not covered by the 6th Schedule. The special provision envisages the constitution of Hill Areas Committee of State legislature. The Governor is mandated to report to the President regarding the administration of 'hill areas'.

#### **3.13.4 National Commission for Scheduled Tribes**

297. The bifurcation of the National Commission for Scheduled Tribes from the National Commission for Scheduled Castes and Scheduled Tribes is under the 94th Amendment Act of the Constitution. Although, the National Commission for Scheduled Tribes has been created in August 2003, little measures in terms of budgetary and staff allocations have been made to make the Commission functional. One of the duties assigned to the National Commission for Scheduled Tribes and Scheduled Castes is to submit reports to the President annually or at such other time as the Commission may deem fit, upon the working of the safeguards.

#### **3.13.5 The SCs/STs Prevention of Atrocities Act, 1989**

298. The objectives of the Act are to deliver justice to these communities through proactive efforts to enable them to live in society with dignity and self-esteem and without fear or violence or suppression from the dominant castes. The practice of untouchability, in its overt and covert form was made a cognizable and non-compoundable offence, and strict punishment is provided for any such offence. The Act outlines certain actions (by non SCs and STs) against SCs or STs to be treated as offences, such as: force a member of SC/ST to drink or eat any inedible or obnoxious substance; wrongfully occupies or cultivates any land owned by, or allotted to SC/ST member, institute false, malicious or vexatious suit or criminal or other legal proceedings; intentionally insults or intimidates with intent to humiliate; acts to cause injury, insult or annoyance to SC/ST members, forces or intimidates a SC/ST to vote for or against a particular candidate, preventing them from entering into a place of worship, a health or educational institution, using a common property resource, assaulting or sexually exploiting a SC/ST or woman.

#### **3.13.6 Panchayat Extension to the Scheduled Areas Act (PESA), 1996**

299. The Parliament of India passed the Provisions of the PESA, to extend the provisions of the 73rd Constitutional Amendment to the Schedule V Areas of the country. This Act accords statutory status to the Gram Sabhas in Schedule V areas with wide-ranging



powers and authority. This aspect was missing from the provisions of the 73rd Constitutional Amendment. The Act has recognized the prevailing traditional practices and customary laws besides providing the management and control of all the natural resources - land, water and forest in the hands of people living in the Schedule Areas. The Act empowers people in the tribal areas through self-governance.

300. One of the important provisions of this act states “the Gram Sabha or the Panchayats at the appropriate level shall be consulted before making the acquisition of land in the Scheduled Areas for development projects and before re-settling or rehabilitating persons affected by such projects in the Scheduled Areas

### **3.13.7 The STs and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006**

301. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006, recognizes and vests the forest rights and occupation in forest land to Scheduled Tribes and other traditional forest dwellers who have been residing in such forests for generations but whose rights are not recorded.

302. This law provides for recognition of forest rights to Scheduled Tribes in occupation of the forest land prior to 131 December 2005 and to other traditional forest dwellers who are in occupation of the forest land for at least 3 generations i.e. 75 years, up to maximum of 4 hectares. These rights are heritable but not alienable or transferable.

### **3.13.8 The National Policy on Tribals, 2006**

303. The success of the National Policy on Tribals of the Government of India to a large extent will depend on strengthening of the National Commission for Scheduled Tribes, implementation of the Civil Rights Act and the Scheduled Castes and Scheduled Tribes (Prevention of Atrocities) Act, 1989 and making necessary budgetary allocations. However, the Draft National Policy fails to make any reference to these issues.

### **3.13.9 Special Provisions for BTC Area**

304. The Rehabilitation and Resettlement mechanism for BTC area is similar to that of the Non – BTC area with some additional requirements which are stated below:

1. There is a provision of additional Compensation to affected persons of Rs.50,000 per Household.
2. The process of Land Acquisition is monitored by the District Council or BTC.
3. The District Council or the BTC may suggest or participate in the process of Land Acquisition by the CALA office.
4. The BTC or the District Council may issue occupational rights/ownership documents to the customary right holder.

5. There should be proper representative of the District Council or BTC in the Grievance Redressal Committee.
6. The District Council or the BTC may intervene in any dispute regarding the process of Land Acquisition.
7. If there is any loss of Community Property, the BTC supervise that identical property is to be constructed or compensation to be paid to the District /Village Council.

### 3.13.10 Requirement of Resettlement Site

305. The project involves linear acquisition of land and linear impacts on structures throughout the alignment. The details of the scale of Impact of the structures are depicted in the Table 12.1

**Table 12.1 Intensity of Impact**

| Sl. No.      | Scale of Impact                              | Numbers | % Age |
|--------------|----------------------------------------------|---------|-------|
| 1.           | Category A (more than 40%)                   | 811     | 73%   |
| 2.           | Category B (less than 40% but more than 25%) | 115     | 10%   |
| 3.           | Category C (less than 25% more than 10%)     | 99      | 9%    |
| 4.           | Category D (less than 10%)                   | 89      | 8%    |
| <b>Total</b> |                                              | 1114    | 100%  |

Source: Census Survey, June - July 2020

306. The land owners are eligible of identical land at the same district but it is very hard to find the land in same position with easy accessibility. Thus the land owners opted for cash compensation during the survey so that they could purchase the land as per their suitability or will.

307. It is expected that 811 structures will be impacted (major) or have to be relocated or displaced. Out of 811 structures 33 structures are CPR. There are 59 kiosks, 72 squatters and 183 are encroachers. Thus the total number of Non-title holders are either doing business on government land or utilizing the government land for their residential or commercial purpose.

308. Thus as per requirement of the Entitlement Matrix both the impacted title holders and the non-title holders will be compensated adequately. Thus both the title holders and non-title holders like to have the cash compensation so that they could reconstruct their structures as per their preference and will.

309. The CPRs will be reconstructed by the project.

**310. Thus there is no movement of en-masse of community outside the impacted area and thus there is no requirement of i) Community participation, involvement of re-settlers and host community and ii) Integration with host populations.**

### 3.14 HOUSING INFRASTRUCTURES AND SOCIAL SERVICES

311. The rehabilitation and resettlement benefits shall be extended to all the affected families who are eligible as affected families on the date of publication of the declaration under as stated above, and any division of assets in the family after the said date may not be taken into account.
312. Any affected family owning house and whose house has been acquired or lost, may be allotted free of cost house site to the extent of actual loss of area of the acquired house but not more than two hundred and fifty square metre of land in rural areas, or one hundred and fifty square metre of land in urban areas, as the case may be, for each nuclear family Provided that, in urban areas, a house of up to one hundred square meter' carpet area may be provided in lieu thereof. Such a house, if necessary, may be offered in a multi-storied building complex
313. Each affected below poverty line family which is without homestead land and which has been residing in the affected area continuously preceding the date of declaration of the affected area and which has been involuntarily Affected from such area, shall be entitled to a house of minimum one hundred square metre carpet area in rural areas, or fifty square metre carpet area in urban areas (which may be offered, where applicable, in a multi-storied building complex), as the case may be, in their settlement area:
314. Provided that any such affected family which opts not to take the house offered, shall get a suitable one-time financial assistance for use construction, and the amount shall not be less than what is given under any programme of house construction by the Government of India.
315. Each affected family owning agricultural land in the affected area and whose entire land has been acquired or lost, may be allotted in the name of the khatedar(s) in the affected family, agricultural land or cultivable wasteland to the extent of actual land loss by the khatedar(s) in the affected family subject to a maximum of one acres of irrigated land or two acres of irrigated land or cultivable wasteland, if Government land is available in the resettlement area. This benefit shall also be available to the affected families who have, as a consequence of the acquisition" or loss of land, been reduced to the status of marginal farmers.
316. In the case of irrigation or hydel projects, the affected families shall be given preference in allotment of land-for-land in the command area of the project, to the extent possible. Such lands may be consolidated, and plots of suitable sizes allotted to the affected families who could be settled their in-groups. In case a family cannot be given land in the command area of the project or the family opts not to take land there, such a family may be given monetary compensation on replacement cost basis for their lands lost, for purchase of suitable land elsewhere.
317. In the case of irrigation or hydel projects, the State Governments may formulate suitable schemes for providing land to the affected families in the command areas of the projects

by way of pooling of the lands that may be available or, otherwise, could be made available in recommended areas of such projects.

318. (a) In the case of irrigation or hydel projects, fishing rights in the reservoirs shall be given to the affected families, if such rights were enjoyed by them in the affected area; (b) In other cases also, unless there are special reasons, fishing rights shall be given preferentially to the affected families.
319. In case of a project involving land acquisition on behalf of a requiring body, the stamp duty and other fees payable for registration of the land or house allotted to the affected families shall be borne by the requiring body.
320. The land or house allotted to the affected families under this policy shall be free from all encumbrances.
321. The land or house allotted to the affected families under this policy may be in the joint names of wife and husband of the affected family.
322. In case of allotment of wasteland or degraded land in lieu of the acquired land, each khatedar in the affected family shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than fifteen thousand rupees per acres for land development.
323. In case of allotment of agricultural land in lieu of the acquired land, each khatedar in the affected family shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than ten thousand rupees, for agricultural production.
324. Each affected family that is Affected and has cattle, shall get financial assistance of such amount as the appropriate Government may decide but not less than fifteen thousand rupees, for construction of cattle shed. Each affected family that is Affected shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than ten thousand rupees, for shifting of the family, building materials belongings and cattle.
325. Each affected person who is a rural artisan, small trader or self-employed person and who has been Affected shall get a one-time financial assistance of such amount as the appropriate Government may decide but not less than twenty-five thousand rupees, for construction of working shed or shop.

In case of a project involving land acquisition on behalf of a requiring body, -

- ❖ The requiring body shall give preference to the affected families – at least one person per nuclear family - in providing employment in the project, subject to the availability of vacancies and suitability of the affected person for the employment.
- ❖ Wherever necessary, the requiring body shall arrange for training of the affected persons, so as to enable such persons to take on suitable jobs.
- ❖ The requiring body shall offer scholarships and other skill development

opportunities to the eligible persons from the affected families as per the criteria as may be fixed by the appropriate Government.

- ❖ The requiring body shall give preference to the affected persons or their groups or cooperatives in the allotment of outsourced contracts, shops or other economic opportunities coming up in or around the project site.
- ❖ The requiring body shall give preference to willing landless labourers and unemployed affected persons while engaging labour in the project during the construction phase.

326. The affected persons shall be offered the necessary training facilities for development of entrepreneurship, technical and professional skills for self-employment.

327. In case of a project involving land acquisition on behalf of a requiring body, the affected families who have not been provided agricultural land or employment shall be entitled to a rehabilitation grant equivalent to seven hundred fifty days minimum agricultural wages or such other higher amount as may be prescribed by the appropriate Government: Provided that, if the requiring body is a company authorized to issue shares and debentures, such affected families shall be given the option of taking up to twenty percent of their rehabilitation grant amount in the form of shares or debentures of the requiring body, in such manner as may be prescribed provided further that the appropriate Government may, at its discretion, raise this proportion up to fifty per cent of the rehabilitation grant amount.

328. In cases where the acquisition of agricultural land or involuntary displacement takes place on account of land development projects, in lieu of land-for-land or employment, such affected families would be given site(s) or apartment(s) within the development project, in proportion to the land lost, but subject to such limits as may be defined by the appropriate Government.

329. In case of a project involving land acquisition on behalf of a requiring body, each affected family which is involuntarily Affected shall get a monthly subsistence allowance equivalent to twenty-five days minimum agricultural wages per month for a period of one year from the date of displacement.

330. The project authorities shall, at their cost, arrange for annuity policies that will pay a pension for life to the vulnerable affected persons, of such amount as may be prescribed by the appropriate Government subject to a minimum of five hundred rupees per month.

331. If land is acquired in cases of urgency under the RTFCLARR Act, 2013 or similar provision of any other Act of the Union or a State for the time being in force, each affected family which is Affected shall be provided with transit and temporary accommodation, pending rehabilitation and resettlement scheme or plan, in addition to the monthly subsistence allowance and other rehabilitation and resettlement benefits due to them under this policy.

332. In case of linear acquisitions, in projects relating to railway lines, highways, transmission lines, laying of pipelines and other such projects wherein only an arrow stretch of land is acquired for the purpose of the project or is utilized for right of way, each khatedar in the affected family shall be offered by the requiring body an ex-gratia payment of such amount as the appropriate Government may decide but not less than twenty thousand rupees, in addition to the compensation or any other benefits due under the Act or programme or scheme under which the land, house or other property is acquired provided that, if as a result of such land acquisition, the land-holder becomes landless or is reduced to the status of a "small" or "marginal" farmer, other rehabilitation and resettlement benefits available under this policy shall also be extended to such affected family.

#### **3.14.1 Rehabilitation and Resettlement benefits for Vulnerable**

333. In case of a project involving land acquisition on behalf of a requiring body which involves involuntary displacement of two hundred or more Scheduled Tribes families, a Tribal Development Plan shall be prepared, in such form as may be prescribed, laying down the detailed procedure for settling land rights due but not settled and restoring titles of tribal on alienated land by undertaking a special drive together with land acquisition. The Plan shall also contain a programme or development of alternate fuel, fodder and non-timber forest produce (NTFP) resources on non-forest lands within a period of five years sufficient to meet requirements of tribal communities who are denied access to forests.

334. The concerned gram sabha or the panchayats at the appropriate level in the Scheduled Areas under Schedule V of the Constitution or as the case may be, Councils in the Schedule VI Areas shall be consulted in all Cases of land acquisition in such areas including land acquisition in cases of urgency, before issue of a notification under the RTFCLARR Act, 2013 or any other Act of the Union or a State for the time being in force under which land acquisition is undertaken, and the consultation shall be in accordance with the provisions of the provisions of the Panchayats (Extension to the Scheduled Areas) Act, 1996 and other relevant laws. Further, in cases of involuntary displacement of two hundred or more Scheduled Tribes families from the Scheduled Areas, the concerned Tribes Advisory Councils (TACs) may also be consulted.

335. Each affected family of Scheduled Tribe followed by Scheduled Caste categories shall be given preference in allotment of land-for-land, if Government land is available in the resettlement area.

336. In case of land being acquired from members of the Scheduled Tribes, at least one-third of the compensation amount due shall be paid to the affected families at the outset as first installment and the rest at the time of taking over the possession of the land.

337. In case of a project involving land acquisition on behalf of a requiring body, each Scheduled Tribe affected family shall get an additional one-time financial assistance equivalent to five hundred days minimum agricultural wages for loss of customary rights or usages of forest produce.



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338. The Scheduled Tribes affected families will be re-settled, as far as possible, in the same Schedule Area in a compact block, so that they can retain their ethnic, linguistic and cultural identity. Exceptions would be allowed only in rare cases where the requiring body in case of a project involving land acquisition, or the State Government in other cases of involuntary displacement is unable to offer such land due to reasons beyond its control.
339. The resettlement areas predominantly inhabited by the Scheduled Tribes shall get land free of cost for community and religious gatherings, to the extent decided by the appropriate Government.
340. In case of a project involving land acquisition on behalf of a requiring body, the Scheduled Tribes affected families resettled out of the district will get twenty-five percent higher rehabilitation and resettlement benefits in monetary terms in respect of the items specified in
341. Any alienation of tribal lands in violation of the laws and regulations for the time being in force shall be treated, as null and void. In the case of acquisition of such lands, the rehabilitation and resettlement benefits would be available to the original tribal land-owners.
342. In the case of irrigation or hydel projects, the affected Scheduled Tribes, 'other, traditional forest dwellers and the Scheduled Castes families having fishing rights in a river or pond, or' dam in the affected area shall be given fishing rights in the reservoir area of the irrigation or hydel projects.
343. The Scheduled Tribes and Scheduled Castes affected families enjoying reservation benefits in the affected area shall be entitled to get the reservation benefits at the resettlement area(s).
344. The affected Scheduled Tribes families, who were in possession of forest / lands in the affected area prior to January, 2013, shall also be eligible for the rehabilitation and resettlement benefits under this policy.

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### 3.15 ENVIRONMENTAL PROTECTION

345. During construction, additional dust, noise and toxic fumes from construction traffic and plant and machinery could cause health problems to the residents. During operation, concentration of trucks at one place will increase about threefold, and this will lead to increased concentrations of toxic gases in the ambient air. Presently, dust levels in the towns and villages along the project road are not high as estimated by visual observation. However, concentration of fugitive dust will be lessened by paving of the parking area and access roads.
346. The details of the same are available in the EMP of the project.

## 3.16 INCOME RESTORATION MEASURES

### 3.16.1 Introduction

347. The Development projects have an adverse impact on the income of project-affected persons. They also have a negative impact on the socio- cultural systems of affected communities. Restoration of pre-project levels of income is an important part of rehabilitating socio-economic and cultural systems in affected communities.

348. As indicated by the Income Restoration Study in road sector projects, income restoration interventions are much more complex due to occupational diversity of DPs. For example, there may be a mix of a large number of land title holders (big, small and marginal farmers) and share croppers due to bypass option and non-title holders engaged in small business enterprises (vehicle repairing shops, small hotels, other rural/semi urban small activity based shops, commercial squatters etc.) as Affected people. This complex nature of occupational diversity poses a problem for mitigation measures in the context of economic rehabilitation. The task becomes even more challenging due to the inherent pressure of completion of road construction work in a time bound manner.

349. However, the R&R framework proposed for the project has adequate provisions for restoration of livelihood of the affected communities. Attempts have been made towards improving the Income restoration strategies. The focus of restoration of livelihood is to ensure that the Affected Persons (DPs) are able to at least "regain their previous living standards". To restore and enhance the economic conditions of the DPs, certain income generation and income restoration programs are incorporated in the RP. To begin with, providing employment to the local people during construction phase will enable them to participate in the benefits of the project, reduce the size of intrusive work forces & keep more of the resources spent on the project in the local economy. It will also give the local communities a greater stake & sense of ownership in the project.

350. The R&R framework of the project provides that the loss of livelihood which would mainly result from the loss of land will be compensated by way of:

- ❖ Alternate economic rehabilitation support and training for up-gradation of skills or imparting new skills; and various R&R assistance such as Transportation Allowance, Economic rehabilitation grant for vulnerable.
- ❖ Preference of providing employment through the contractors for road works specially to those belonging to vulnerable groups.
- ❖ In BTC Area the District Council or The Village Council may be consulted in preparation of prospective skill development or employment schedule.

351. Alternate village income sources such as village based industries will be promoted by the project in association with the local NGOs/CBOs. Villagers will be supported & encouraged to develop industries that are suited to their resources, skills and interests. Support in the form of technical assistance and training, marketing, business management

and coordination will be provided by the appointed NGOs. The project affected families eligible for Income Restoration is shown in table below:

**Table 15.1: Income Restoration for Affected persons**

| Sl. No. | Type of Ownership                                          | Total      |
|---------|------------------------------------------------------------|------------|
| 1.      | Commercial PAFs                                            | 482        |
| 2.      | Employees to Commercial Structures and Agricultural Labour | 90         |
| 3.      | Kiosk                                                      | 59         |
| 4.      | Commercial Tenant                                          | 80         |
|         |                                                            | <b>711</b> |

**Source:** Census Survey, June- July 2020

352. The project will assist the DPs in liaison with NGO, to encourage the DPs to work in the road construction services. The project will:

- ❖ Assist to establish contact with the construction contractors for road works;
- ❖ Encourage to enlist labour for work to handle road related contract services;
- ❖ Compensate them for the loss of livelihood and income resulting from land acquisition;
- ❖ Identify training needs & modules;
- ❖ Assist access to poverty alleviation programs of the Govt. such as Swarnjayanti Gram Swa Rojgar Yojna especially for those below poverty line.
- ❖ Also assist to identify self-employment options.

### 3.16.2 Self-Employment Generation Scheme

353. PAPs will be encouraged to take up training for income generating activities, with active support from the project through the NGO, in self-employment schemes.

354. Besides the land losers, other DPs namely homestead losers; daily wage labourers and DP in the vulnerable category are eligible for enrolment into the training program. For training and upgradation of skills Rs. 5000 per family has been worked out as per the entitlement matrix. The NGOs will take the initiative to make necessary arrangements for providing infrastructure and other institutional support that will be required, to assist the DP to get financial support through local bank and Government program. The said activities will be facilitated in collaboration with the PIU. The NGO would generate awareness among the DPs about the different income earning opportunities and facilitate and training among DPs. The PIU-R&R cell will not only take the initiative for self

employment generating schemes and also arrange for appropriate training programmes so that the trained DPs will be eligible for others jobs.

355. The principles governing the resettlement and rehabilitation will take into consideration:

- ❖ Rehabilitation assistance in the form of shop space if opted by 50 people or more;
- ❖ Transportation allowance.
- ❖ Women, handicapped and BPLs will be in the vulnerable category, will be given priority in allotment of shops.
- ❖ Only occupiers at the time of eviction will be considered for assistance for squatters.
- ❖ Compensation for those who don't want shop space, these DPs will be assisted for alternate livelihood scheme. Till then, the amount paid for assistance will be kept in banks as joint account with the Project Authority.
- ❖ Only one shop per DP will be considered, multiple occupations will not be considered.
- ❖ Only those DPs will be eligible for such compensation whose primary source of income is from shops that will be lost.
- ❖ Conditions for shop allotment to DPs will be laid down which will include formation of market committees with DP participation, representative of this committee for smooth operation and maintenance of the complex. A nominal license fee will be charged.
- ❖ Access to loans will be facilitated by the Project Authority.
- ❖ Shops will be allotted based on the type of business carried out prior to eviction.

### 3.16.3 Option of self-employment and EA's Assistance

356. It is perceived that the EA will be unable to provide direct employment to the DPs. Hence, an alternative programmes are proposed as outlined in the above sections. Training for self-employment and assistance in setting up micro-enterprises is the primary vehicle of rehabilitation.

357. The following order of priority would be considered for the DPs entitled for self-employment:

- ❖ Have the requisite educational qualification.
- ❖ Have taken training in some micro-enterprise scheme and appeals to the EA for assistance; and
- ❖ Possess previous experience in running micro-enterprises.

358. However, relaxation will be made for women, those below poverty line, and minorities and vulnerable DPs who have taken training, but may not have requisite educational

qualifications and experience. In both cases, the R&R cell in consultation with the NGO and the DLCs will vet appeals.

359. The key parameters of the EA level of assistance in setting up of micro-enterprises are as follows:

- ❖ Survey of marketing opportunities by the NGO and information on DPs under the supervision of R&R Cell.
- ❖ Identification of training needs and modules that matches market opportunities. This will be done by the NGO.
- ❖ NGO to assist the DPs to form groups/cooperatives that can bid for contracts tendered by the construction contractors or its sub-contractors. Activity to be supervised by R&R Cell.
- ❖ R&R cell through the NGO will assist the DPs to get access to capital by facilitating formation of a credit window affordable to the DPs as individuals or groups in the local bank.
- ❖ EA will co-ordinate with the local bank to extend credit to the DPs. EA will extend a letter of introduction to the bank.
- ❖ Encourage the DPs to service loans and through awareness generation and training programmes by the NGO.
- ❖ R&R cell in collaboration with the NGO will also facilitate the DPs access to poverty alleviation programmes of the Government.
- ❖ R&R cell will monitor the ventures established and incomes derived from these programmes. The information will be fed into the R&R database. The ventures and incomes derived will again be monitored by an independent agency and the Lending Institute vets the reports submitted by the PIU-R&R cell.

### 3.16.4 Market Feasibility Study

360. No business enterprise or income restoration program will sustain until and unless it is based on the market need and demand. Hence, EA through its PIU and contracted NGO who will undertake the detailed market feasibility study to clearly prepare the list of all viable and feasible enterprises. The scope of this study covers service and non-service based enterprises, the raw material availability and assured consumer market. The findings of the study will also be matched with the profile of the DPs and accordingly the options will be offered to the DPs. However, R&R consultants in the local district and village markets to make reconnaissance of the proposed demand and supply situation conducted rapid market survey. The local district markets comprise of all types of shops; hardware, construction materials, general store, vegetable markets, cloth stores, auto repair shops etc. The development of the project is expected to increase urbanization and commercialization of the society in particular along the project corridor. Demand for



consumer goods in the area would consequently increase. Initiation of road construction activities will also result in a heavy spree of construction activities in and around the project area. This would consequently increase cash flow in the area.

361. Co-operatives of women markets can be set up for preparation of jams and pickles, basket making and moulding of leaf cups and plates. Poultry and animal husbandry units can also be set up in villages. Nursery to raise plants could also be quite viable since EA is committed to plant trees, as they would be felling many for the project. PIU through NGO will facilitate marketing facilities support through backward and forward linkages in order to make the self-employment schemes successful. The NGO will conduct periodical monitoring of these units over the implementation period and will take midterm correction measures if required. For marketing purposes, the NGO may tie these units up with khadi and village industries cooperatives (KVIC) or with the export promotion board or similar organizations. After establishment of the initial marketing linkages, the NGO will have to be gradually phase out their involvement.

### 3.16.5 Training Needs of DPs

362. Very few DPs possess any professional skills in the project area. Hence, a large scale and intensive training programme need to be undertaken. The DPs eligible for training will either be trained in the Training Institutes identified by NGOs. Training will be provided to vulnerable DPs as per the entitlement matrix. It is expected that such training will be organized within 12 months of property acquisition. NGO shall carry out the detail exercise of skill mapping and training need assessment before finalization of any training schemes.

### 3.16.6 Comprehensive Training Policy

363. Training is an important part of RP. Following training modules will be developed;

### 3.16.7 Training for NGO Personnel

364. The NGO will be trained to upgrade their skills so as to deliver the R&R components more effectively. Since reporting and documentation is an essential component of NGO activity, NGO will be provided with EA Guidelines to prepare the formats etc. during orientation, which will be conducted just after signing of the contract.

### 3.16.8 Training of DPs

365. The training imparted will be essentially of two types: a technical training relevant for jobs and the other for non-land and land based self-employment and skill development schemes. The policy is devised under the following parameters:

- ❖ Eligible DPs will get training assistance.
- ❖ Provision for training has already been made in the RP budget. This amount is not redeemable in cash. It is based on an estimate of a minimum of 6 weeks of training per person, which may be stretched to :
- ❖ Maximum of one year, which could allow daily allowance to EP, cost of experts,

trainers and other incidental expenses. In case where the type of training requested by the DPs exceeds the budgeted amount, the EA will review the request on a case-by-case basis through the R&R cell or the shortfall will be met from ERG in case DP is eligible for that.

- ❖ DPs will have the right to participate in institutional form of training at proposed institutions facilitated by NGO.
- ❖ DPs will have the right to transfer his/her training entitlement to his/her immediate family member if the DP desires to do so. The nodal NGO will coordinate the process.
- ❖ DPs shall request the EA for participation in a particular training in consultation with the NGO. The EA will approve and pay the Training Institution directly and the cost will be deducted from the DPs training entitlement.
- ❖ Eligibility criteria for training will feature on the ID card.
- ❖ On completion of training DPs will receive an introductory letter/certificate from the EA. This will assist the DPs in approaching the bank for loans to start micro enterprises.

### 3.16.9 Training Mechanism

366. The implementation of the training procedure would involve the following DPs:

- ❖ R&R cell in consultation with the Rehabilitation officers will prepare TOR for the NGO vis-à-vis its role in the training program. Facilitation training for DPs will be in the TOR of NGOs.
- ❖ Once the NGO is selected, it will map all relevant proposed institutions/programs in the area that would impart training.
- ❖ Regular survey of perceived training needs of DPs by NGO in collaboration with the R&R cell and Panchayat level committees will lead to prioritizing and selection of schemes for training.
- ❖ Identification of Training Institutes/individuals/experts by the NGO can be subcontracted to conduct relevant training demanded by DPs within the financial means of the entitlement and preparation of TOR for the same by the NGO.
- ❖ Preparation of list of trainees (phase wise) by the NGO in collaboration with the DLCs and R&R Cell.
- ❖ Awareness generation and information dissemination on the schemes by the NGO to the selected trainees to ensure transparency about the training schemes and the entitled amounts.
- ❖ Registration of the DPs, payment of courses and maintenance of all records,

regarding portion of entitlement used by DP for a particular course, will be done by the NGO. The NGO will submit the information to the R&R cell, for inclusion in the R&R database.

367. The PIU, EA will co-ordinate with the different recognized training organization, including professionals who will be engaged by the EA, to impart training in different trades to the DPs either in the project area or any other place fixed by the institutes. Care shall be taken by the R&R cell and NGO that the funds for training are utilized in best possible ways.

### 3.16.10 Women's Needs & Participation

368. In the process of R&R, women require special attention. Change caused by relocation does not have equal implications for members of both the sexes and may result in greater inconvenience to women. Due to disturbance in production system, reduction in assets like land and livestock, women may have to face the challenge of running a large household in limited income and resources. This in turn may force woman as well as children to participate in work for supplementing the household income. In contrast to this, due to changes that are likely to take places for any development project, especially changes in environment and land labour ratio, those women who at present are engaged in activities like agriculture labour, or collection and sale of forest produce may find themselves unemployed and dependent.

369. EA would, therefore, make efforts to maintain the social support network for women headed households as far as possible so that they remain closer to their locations and /or provide special services at the new sites. Special assistance would consist of the following:

- ❖ Allowing them priority in site selection
- ❖ Relocating them near site wherever possible
- ❖ Arranging with the contractor to construct their houses
- ❖ Providing assistance with dismantling salvageable materials from their original home
- ❖ Providing them priority access to all other mitigation and development assistance, and
- ❖ Monitoring their nutritional & health status.

**Some examples of meeting practical needs of women that will be implemented by EA through NGO are:-**

- ❖ Reduce women's workloads by providing standpipes, toilet facilities, and the likes.
- ❖ Improve health services by providing safe drinking water, family planning and HIV/AIDS counselling, sanitation training, immunization, etc.

- ❖ Assist in childcare services for wage earning mothers, primary schools, inputs in kitchen gardening etc.
- ❖ Increase access to productive resources.
- ❖ Promote equal opportunities for women's employment.

370. Encouraging women's participation in development projects is a policy being followed by GOI. There are several ways in which women will be able to participate in the implementation programme:-

- ❖ At least 50 percent of the NGO personnel involved must be women and recruited from the local area specifically from among the DPs.
- ❖ The independent agency for monitoring and evaluation will have 33% representation of women key professionals and technical support team.

#### **3.16.11 Measures towards income restoration and uplift of vulnerable people**

371. EA has evolved a number of measures towards resettlement and rehabilitation of the vulnerable families including the women headed households, SC/ST below poverty line and the poor (BPL in general) getting affected by its projects. The considerations therein have been compiled as follows:

- ❖ All the affected families falling under the vulnerable category including the BPL are going to be assisted to uplift their economic status irrespective of their ownership status. Thus, it implies that whether they do or do not possess legal title of the lands/assets, whether they are tenants or encroachers or squatters, they will be assisted in restoring their livelihood.
- ❖ Additional grant for severance of land, residual plots, expenses on fees, taxes, etc. and alternative economic rehabilitation support and training for up-gradation of the skills.
- ❖ In case of loss of non-agricultural private property, option for residential/commercial plot at resettlement site will be provided free of cost to vulnerable families if so opted by a group of them apart from all other considerations like compensation at replacement value, Transportation allowance, shifting allowance, rental allowance for disruption caused to BPL tenants, compensation for advance rental deposits, right to salvage materials for the demolished site, etc.
- ❖ Even in case of illegal use of the ROW, the vulnerable encroachers and all squatters are to be assisted in accordance with the entitlement matrix by considering relevant facts on family income and proposed assets only in the case of the person being under the poverty line. A vulnerable person in this case is eligible to receive assistance for structures at replacement cost. He/she will also have the right to salvage materials for the demolished structure.

- ❖ There is a provision for additional support to the vulnerable people who have been affected by the loss of livelihood / primary source of income. The assistance will be the economic rehabilitation grant supported with vocational training of DPs choice. The training will include starting of a suitable production or service activity. In case the money is not spent on the training program, the equivalent amount is to be paid as per DPs choice.
- ❖ Inter agency linkages for income restoration.

372. Majority of the eligible families for income restoration earn their livelihood from marginal agriculture or petty businesses, and it is imperative to ensure that the DPs are able to reconstruct their livelihood. Based on the market feasibility study, the list of livelihood schemes will be developed, and based on felt needs of the target group population the activities will be prioritized through people's participation. Further, these options will be tested for their viability against availability of skill, raw material and available appropriate technology. Suitable alternative livelihood schemes will be finally selected, where training on skill up gradation, capital assistance and assistance in the form of backward-forward linkages (with respect to the selected livelihood schemes) can be provided for making these pursuits sustainable for the beneficiaries, of the target group. Income generation schemes will be developed in consultation with the project affected/Affected families. The grants received for such purpose for the project, will be used for the skill development training to upgrade their proposed skill, purchase of small scales capital assets etc. While developing the enterprise development or the income generation activities, the NGOs will contact the local financial institutions for financing the economic ventures. The marketing and milk federations will also be contacted for planning sustainable economic development opportunities.

### 3.16.12 Short-Term Income Restoration Activities

373. Short term IR activities mean restoring DPs' income during periods immediately before and after relocation. Such activities will focus on the following:

- ❖ Ensuring that adequate compensation is paid before relocation.
- ❖ Transit allowances.
- ❖ Providing short term, welfare based grants and allowances such as:
- ❖ One time relocation allowance or free transport to resettlement areas or assistance for transport.
- ❖ Free or subsidized items.
- ❖ Special allowance for vulnerable groups as per entitlement framework capacity.

374. Timely establishment & involvement of appropriate R&R institutions would significantly facilitate achievement of objectives of the R&R program. The main R&R institution would include:

- EA
- Local Administration
- Line departments
- NGO
- DLC/GRC
- Training Institutions
- M&E Agency

### 3.16.13 The Process

375. EA will initiate the following activities to commence and implement the RP:

- ❖ Establish PIU and field offices
- ❖ Select NGO with proven track records for the smooth implementation of R&R activities as stated.
- ❖ Orientation and awareness seminars for Project Implementation Unit (PIU).
- ❖ Appointment of external monitoring and evaluation consultants

376. Effective RP implementation will require institutional relationships & responsibilities, rapid organizational development & collaborative efforts by EA, State Govt. & partnering NGO. The ESDU will establish operational links within EA (for e.g. finance for release of money on approval of micro plan) & with other agencies of Govt. involved in project induced settlement. It will provide means & mechanism for coordinating the delivery of the compensation & assistance entitled to those who will suffer loss. On behalf of EA, ESDU will assure the responsibility for representing the social impact & resettlement component of the project. The ESDU will also be responsible for disseminating the information to the public & providing additional opportunities for public comment.



### 3.17 GRIEVANCE REDRESSAL MECHANISM

377. Grievance Redressal Mechanism is an integral part of the institutional arrangement in relation to social safeguard issues. At present, there is no established grievance redressal mechanism in PMU. Grievances related to employees and others are dealt on a case to case basis depending upon the nature of grievances. Consultation with the PAPs does not reveal the need of GRC but social safeguards related grievances are expected from affected persons and other interested groups during the project implementation and therefore, it is important to set up a GRM at PMU level for resolution of such grievances. Anticipated grievances could be:

- non-payment of resettlement and rehabilitation assistance,
- name of affected persons missing,
- affected persons missed out/ not enumerated during the survey,
- social category and vulnerability incorrect,
- difference in land area acquired/purchased and measured at site,
- type and use of land acquired/purchased not considered correctly,
- wrong measurement of structure/building affected,
- wrong valuation of structure/building,
- damage to adjoining property,
- Construction activities at the site, quality of works, safety, etc.
- Behavior of staffs and other Officials engaged with the project
- Road Safety
- Environmental Hazards like dust, noise, air pollution
- Security of Women and girl both workers and locals.

378. In view of the above, a Grievance Redressal Committee (GRC) will be constituted by the Project Authority with the aim to resolve as many grievances as possible related to resettlement and rehabilitation and land acquisition/purchase through consultations and negotiation. The GRC will comprise seven (7) members. The committee will comprise the following officials:

- i. General Manager/ Deputy General Manager, NHIDCL – Chairperson
- ii. Representative of District Commissioner - Member
- iii. Dedicated Person of NHIDCL, Assam- Convener-Member
- iv. Representation of District Council/CALA- Convener-Member
- v. Executive Engineer or his/her representative (from the concerned department - PWD/Irrigation, Municipal Engineering Directorate/KMC, District Engineer- Zilla Parishad) – Member
- vi. Municipal Corporator/Councilor or Representative of Gram Panchayat of the concerned area – Member
- vii. Any other Female Representation as nominated by District Council/CALA

379. Complaint boxes will be placed at every major junctions locations which would be collected once a week by PMU. Grievances received through other modes (postal, email, or over the phone) will be compiled. A dedicated email and toll free phone number will be provided for receiving grievances/complaints through these methods. Toll free phone

number, email, and address of PMU shall also be suitably displayed. Additionally, PMU will provide support to illiterate, physically challenged and other vulnerable PAPs to record their grievances. Any illiterate or other vulnerable persons over the toll free phone or physically can record the complaints which will be registered and a complain registration number will be given to the complainant. The physically challenged person can use the email, toll free phone or physically come to the Jetty or PMU to lodge any complain. He/she will be helped to make understand the complaint and registration of the same. Any physically challenged person can authorize any other person to register complain on his/her behalf.

380. At the PIU level there will be a dedicated person who will be responsible for the daily management of the GRM. He would also take the major responsibility to register the complain of the illiterate, physically challenged and other vulnerable PAPs. Grievances received by the PIU would be acknowledged by the PIU within seven days from the date of receipt of grievances. The GRC meeting will be convened once in a month or as per the requirements. Aggrieved persons will be duly intimated about the scheduled GRC meeting in sufficient advance time. On the day of GRC meeting, aggrieved persons will be given an opportunity to present his/her case before the committee in a free and fair manner. The decision of GRC will be intimated to the aggrieved person within 21 days from the date of the GRC meeting. In case the decision of the GRC is not acceptable to the aggrieved person in such case he/she may approach the court of law, if he/she so desires. Broad functions of GRC are as under:

- document all grievances received through different modes,
- undertake site visit (if required), ask for further information from aggrieved persons,
- co-ordinate and collect relevant information/data from concerned department/agencies (e.g. District Magistrate, DL& LRO, PWD, Zilla Parishad, etc.) area,
- fix a time frame for next hearing in case additional information is required from aggrieved persons and other agencies,
- inform PAPs about the status of their case and the decision of GRC

381. The GRC will be constituted within a month before the implementation of activities during the first year of investment starts. A draft format for monitoring of grievances (received, type of grievances, grievances redressed, time required for resolving the grievances, etc.) must be provided.

382. Besides, a field level grievance redressal mechanism will be established to resolve grievances/complaints received mainly during the implementation of project activities. It is expected that majority of grievances will be related to the following:

- indirect impact of project activities on adjoining structure/building,
- project execution area not suitably barricaded, inadequate safety arrangements and signage in the project area,
- closure to access/street roads,
- loss of business,
- non-availability of project information board,

- un-certainty regarding timeline for resuming the normal operation, etc.

383. Majority of the site-specific grievances/complaints can be resolved by the site engineer through the contractor as per the provisions of the contract. In case the damage to the structure/building is caused due to the negligence of the contractor, then the contractor will be responsible for reinstating/ repairing the damaged structure/building otherwise, it will be resolved as per the provisions of the RP.

384. A field-level GRC comprising Assistant Manager/AE (designated as Site Engineer) of PIU, Social Development Expert of NGO and representative of Contractor shall be constituted for redressal of grievances/complaints at the site itself. One employee of the PIU/Contractor will be assigned to register the grievances and he/she will be responsible for the daily work of the GRC at the field level. This person at field level will provide support to illiterate, physically challenged and other vulnerable PAPs to record their grievances. The Committee will meet twice a week at the project site office at a fixed time so that aggrieved persons from surrounding areas can approach and lodge their complaints. A complaint box shall be placed at the project site for the collection of complaints/grievances. Wide publicity of GRM (at field level and PIU level) shall be made in the surrounding areas by adopting suitable publicity methods. Grievances/complaints not resolved at the site shall be escalated to the PMU level for redressal.

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

- [https://www.jica.go.jp/english/our\\_work/social\\_environmental/objection/index.html](https://www.jica.go.jp/english/our_work/social_environmental/objection/index.html)
- <https://nhidcl.com/grievance-redressal/>

### 3.18 ORGANIZATIONAL RESPONSIBILITIES

386. For the implementation of RAP, there will be a set of institutions involved at various levels and stages of the project. As per Indian acts and regulations, land acquisition, resettlement and rehabilitation activities must be executed by the state government. In practice, the state government entrusts tasks to the district government headed by the DC. Therefore, all activities will be implemented by the district government and the decision-making power lies within the DC. For Meghalaya state, being under jurisdiction of the sixth schedule of the constitution, Autonomous District Councils (ADC) will also be involved in the approval of project.

387. The primary institutions who will be involved in this implementation process are follows. The proposed institutional arrangement with their roles and responsibilities are shown in Table 15.1.

- National Highway and Infrastructure Development Corporation Ltd (NHIDCL)
- NHIDCL Regional Office
- Autonomous District Councils (ADC)
- Deputy Commissioner / District Collector (DC)
- Non-Government Organization (NGO)
- Grievance Redress Committee (GRC)

**Table : Implementation Institute and Their Roles**

| Name                                                           | Members and Roles                                                                                                                                                                                                             |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Central Level Institution</b>                               |                                                                                                                                                                                                                               |
| NHIDCL                                                         | <ul style="list-style-type: none"> <li>• Project Implementation Agency</li> <li>• Ensure availability of budget for R&amp;R activities</li> <li>• Responsible for coordination and monitoring of overall processes</li> </ul> |
| <b>State Government</b>                                        |                                                                                                                                                                                                                               |
| Revenue and Disaster Management Department                     | <ul style="list-style-type: none"> <li>• Confirm notification of procedure for Land Acquisition</li> </ul>                                                                                                                    |
| Meghalaya Institute of Governance (MIG)                        | <ul style="list-style-type: none"> <li>• SIA Implementation agency for Meghalaya</li> </ul>                                                                                                                                   |
| <b>District Government</b>                                     |                                                                                                                                                                                                                               |
| West Garo Hills Autonomous District Council (ADC)              | <ul style="list-style-type: none"> <li>• Issue No Objection Certificate for Land Acquisition</li> </ul>                                                                                                                       |
| District Collector / Deputy Commissioner (DC) of each District | <ul style="list-style-type: none"> <li>• Responsible for Land Acquisition, Resettlement and Rehabilitation</li> </ul>                                                                                                         |
| Land Acquisition Officers of each District                     | <ul style="list-style-type: none"> <li>• Implementation land acquisition and resettlement</li> </ul>                                                                                                                          |
| <b>Other Implementation Agencies</b>                           |                                                                                                                                                                                                                               |

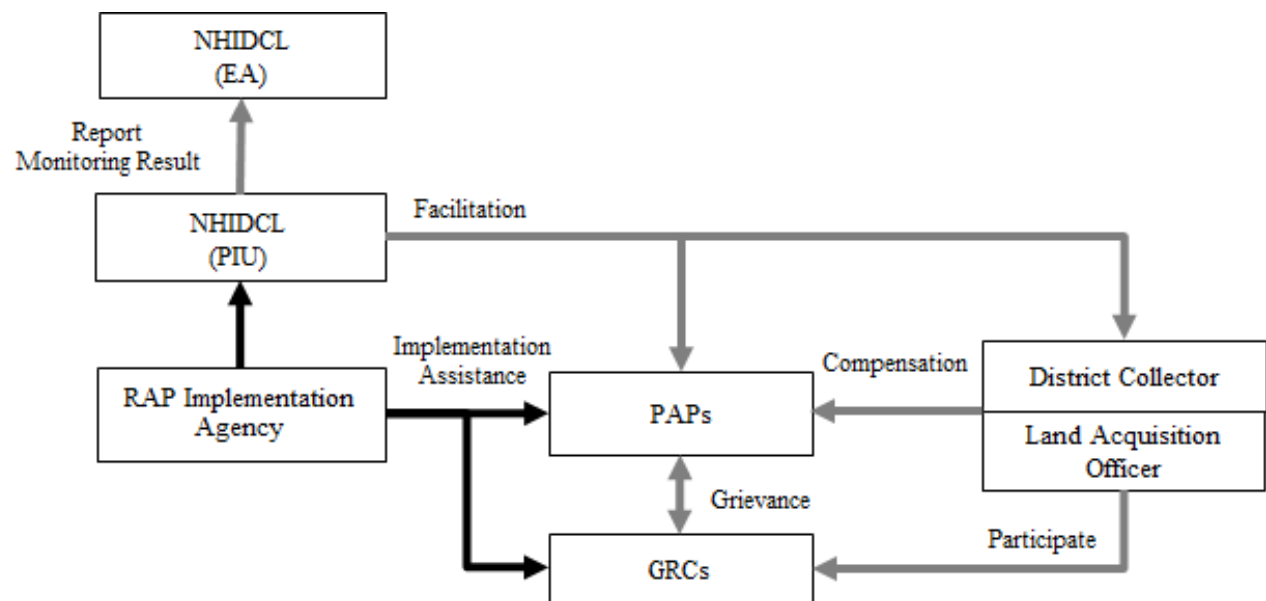
Source: JICA Study Team

**Figure : Institutional Arrangements for RAP Implementation**



388. Implementation of RAP will be supported by RAP Implementation agency as shown below.

**Figure: Support Arrangement for RAP Implementation**



Source: JICA Study Team



## 3.19 IMPLEMENTATION SCHEDULE

### 3.19.1 Introduction

389. Implementation of RP mainly consists of compensation to be paid for affected structures and rehabilitation and resettlement activities. The time for implementation of resettlement plan will be scheduled as per the overall project implementation. All activities related to the land acquisition and resettlement must be planned to ensure that compensation is paid prior to displacement and commencement of civil works. Public consultation, internal monitoring and grievance redress will be undertaken intermittently throughout the project duration.
390. However, the schedule is subject to modification depending on the progress of the project activities. The civil works contract for each project will only be awarded after all compensation and relocation has been completed for project and rehabilitation measures are in place.

### 3.19.2 Schedule for Project Implementation

391. The proposed project R&R activities are divided in to three broad categories based on the stages of work and process of implementation. The details of activities involved in these three phases i.e. Project Preparation phase, RP Implementation phase, Monitoring and Reporting period are discussed in the following paragraphs.

### 3.19.3 Project Preparation Phase

392. The major activities to be performed in this period include establishment of PMU and PIU at project and project level respectively; submission of RP for approval from NHIDCL appointment of NGO and establishment of GRC etc. The information campaign & community consultation will be a process initiated from this stage and will go on till the end of the project.

### 3.19.4 RP Implementation Phase

393. After the project preparation phase the next stage is implementation of RP which includes issues like compensation of award by EA; payment of all eligible assistance; relocation of DPs; initiation of economic rehabilitation measures; site preparation for delivering the site to contractors for construction and finally starting civil work.

### 3.19.5 Monitoring and Reporting Period

394. As mentioned earlier the internal monitoring will be the responsibility of PMU, PIU and implementing NGO and will start early during the project when implementation of RP starts and will continue till the complementation of the sub-project. The independent monitoring and reporting will be the responsibility of Construction Supervision Consultant (CSC) to be hired for the sub project.

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### 3.19.6 R&R Implementation Schedule

395. A composite implementation schedule for R&R activities in the project including various sub tasks and time line matching with civil work schedule is prepared and presented in the form of Table. The cut-off date will be notified formally for titleholder as the date of LA notification and for non-titleholders as the date of census survey. However, the sequence may change or delays may occur due to circumstances beyond the control of the Project and accordingly the time can be adjusted for the implementation of the plan. The implementation schedule can also be structured through package wise. The entire stretch can be divided in to various contract packages and the completion of resettlement implementation for each contract package shall be the pre-condition to start of the civil work at that particular contract package.

NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km.

Supplementary Social Impact  
Assessment Stage – I and Stage - II

**Table14. 1 Implementation Schedule of NH-127B**

|                                               | 2020 |   |   |    |   |   |    |   |   |    |    |    | 2021 |   |   |    |   |   |    |   |   |    |    |    | 2022 |   |   |    |   |   |    |   |   |    |    |    |
|-----------------------------------------------|------|---|---|----|---|---|----|---|---|----|----|----|------|---|---|----|---|---|----|---|---|----|----|----|------|---|---|----|---|---|----|---|---|----|----|----|
|                                               | 1Q   |   |   | 2Q |   |   | 3Q |   |   | 4Q |    |    | 1Q   |   |   | 2Q |   |   | 3Q |   |   | 4Q |    |    | 1Q   |   |   | 2Q |   |   | 3Q |   |   | 4Q |    |    |
|                                               | 1    | 2 | 3 | 4  | 5 | 6 | 7  | 8 | 9 | 10 | 11 | 12 | 1    | 2 | 3 | 4  | 5 | 6 | 7  | 8 | 9 | 10 | 11 | 12 | 1    | 2 | 3 | 4  | 5 | 6 | 7  | 8 | 9 | 10 | 11 | 12 |
| <b>Project Preparation Stage</b>              |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Screen project impact                         |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Public Consultation on alignment              |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Prepare Land Acquisition Plan                 |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Carry out Census Survey                       |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Prepare Resettlement Plan (RP)                |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| <b>RP Implementation Stage</b>                |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Obtain RP approval from WB                    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Disclosure of RP                              |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Hiring NGO for RP Implementation              |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Formation of GRC (Grievance Mechanism)        |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Implementation of GRC                         |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Public Consultation                           |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Co-ordination with district authority for LA  |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Submission of LA proposals to DC              |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Declaration of cut-off date (LA notification) |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Payment of compensation                       |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Taking procession of acquired land            |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Handling over the acquired land to contractor |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Notify the date of construction start to DPs  |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Income Restoration Program                    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Awareness Training                            |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Rehabilitation of DPs                         |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| <b>Monitoring and Reporting Period</b>        |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Internal monitoring and reporting             |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| Hiring Construction Supervision Consultant    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |
| External monitoring and reporting             |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |      |   |   |    |   |   |    |   |   |    |    |    |

## 3.20 RESETTLEMENT AND REHABILITATION BUDGET

### 3.20.1 Source of Funding and Fund Flow Management

396. The cost related to land acquisition and resettlement cost will be borne by the EA. EA will ensure allocation of funds and availability of resources for smooth implementation of the project R&R activities. The EA will, in advance, initiate the process and will try to keep the approval for the R&R budget in the fiscal budget through the ministry of finance. In the case of assistance and other rehabilitation measures, the EA will directly pay the money or any other assistance as stated in the RP to DPs. The implementing NGO will be involved in facilitating the disbursement process and rehabilitation program.

### 3.20.2 R&R Budget

397. The total R&R budget with Land Acquisition is estimated at Rs.349.35 crore. A detailed indicative R&R cost is given in Table 13.1

**Table 13.1: Estimates of Entitlements**

| Table 16.1: Estimates of Entitlements                                                        |                 |                        |                  |
|----------------------------------------------------------------------------------------------|-----------------|------------------------|------------------|
| Item                                                                                         | Rate            | Total Area (Ha)/Number | Cost             |
|                                                                                              | (in Rs. Per Ha) |                        | (in Rs.)         |
| I. Compensation for loss of Private Property                                                 |                 |                        |                  |
| 1. Loss of Land (agricultural, homestead, commercial or otherwise)                           |                 |                        |                  |
| Land Acquisition Cost for 142.688 Ha                                                         |                 | 142.688                | 2,369,800,000.00 |
|                                                                                              | Sub Total (A)   |                        | 2,369,800,000.00 |
| 2. Loss of Structure (house, shop, building or immovable property or assets attached to land |                 |                        |                  |
| Type of Structure                                                                            | Rs. Per Sqm     | Area Sqm               |                  |
| Pucca                                                                                        | 14744.00        | 1156.70                | 17,054,384.80    |
| Semi Pucca                                                                                   | 11317.00        | 8354                   | 94,542,218.00    |
| Kutchcha                                                                                     | 3427.00         | 5757                   | 19,729,239.00    |
| Boundary wall (in M)                                                                         | 5677.00         | 2728                   | 15,486,856.00    |
| Subtotal (B)                                                                                 |                 |                        | 146,812,697.80   |
| 100% Solatium for Structure (C)                                                              |                 |                        | 146,812,697.80   |
| 4. Loss of Residence                                                                         |                 |                        |                  |
| Special Cash Assistance of Rs. 5 lakhs already decided with land                             | 500,000.00      |                        | -                |
| Shifting Assistance to DPs                                                                   | 50,000.00       | 394                    | 19,700,000.00    |
| Transitional Allowance                                                                       | 50,000.00       | 394                    |                  |

**Table 16.1: Estimates of Entitlements**

| Item                                                             | Rate            | Total Area<br>(Ha)/Number | Cost                 |
|------------------------------------------------------------------|-----------------|---------------------------|----------------------|
|                                                                  | (in Rs. Per Ha) |                           | (in Rs.)             |
|                                                                  |                 |                           | 19,700,000.00        |
| One Time Resettlement Allowance                                  | 50,000.00       | 394                       | 19,700,000.00        |
| <b>Subtotal (E)</b>                                              |                 |                           | <b>59,100,000.00</b> |
| <b>5. Loss of Shop/trade/commercial structure</b>                |                 |                           |                      |
| Special Cash Assistance of Rs. 5 lakhs already decided with land | 500,000.00      |                           | -                    |
| Subsistence Allowance                                            | 50,000.00       | 371                       | 18,550,000.00        |
| Transitional Allowance                                           | 50,000.00       | 371                       | 18,550,000.00        |
| One Time Resettlement Allowance                                  | 50,000.00       | 371                       | 18,550,000.00        |
| <b>Subtotal (F)</b>                                              |                 |                           | <b>55,650,000.00</b> |
| <b>III. Impact to Squatters/ Encroachers</b>                     |                 |                           |                      |
| <b>1. Loss of Residence</b>                                      |                 |                           |                      |
| House Construction Assistance of Rs. 50,000                      | 50,000.00       | 130                       | 6,500,000.00         |
| Shifting Assistance to DPs                                       | 10,000.00       | 130                       | 1,300,000.00         |
| Subsistence Allowance for 3 months                               | 25,414.20       | 130                       | 3,303,846.00         |
| <b>Subtotal (G)</b>                                              |                 |                           | <b>11,103,846.00</b> |
| <b>2. Loss of Shop/trade/commercial structure</b>                |                 |                           |                      |
| Shop Construction Assistance of Rs. 20,000                       | 20,000.00       | 124                       | 2,480,000.00         |
| Shifting Assistance to DPs                                       | 10,000.00       | 124                       | 1,240,000.00         |
| Subsistence Allowance for 3 months                               | 25,414.20       | 124                       | 3,151,360.80         |
| <b>Subtotal (H)</b>                                              |                 |                           | <b>6,871,360.80</b>  |
| <b>3. Loss of commercial Kiosk/vendor</b>                        |                 |                           |                      |
| Special one time Assistance of Rs. 18,000                        | 18,000.00       | 59                        | 1,062,000.00         |
| Subsistence Allowance for 3months including 32 Mobile Vendor     | 25,414.20       | 91                        | 2,312,692.20         |
| <b>Subtotal (I)</b>                                              |                 |                           | <b>3,374,692.20</b>  |
| <b>IV. Impact to Vulnerable Household</b>                        |                 |                           |                      |
| One time Assistance who have to relocate                         | 25,000.00       | 698                       | 17,450,000.00        |
| <b>Subtotal (J)</b>                                              |                 |                           |                      |

| Table 16.1: Estimates of Entitlements          |                   |                        |                  |
|------------------------------------------------|-------------------|------------------------|------------------|
| Item                                           | Rate              | Total Area (Ha)/Number | Cost             |
|                                                | (in Rs. Per Ha)   |                        | (in Rs.)         |
|                                                |                   |                        | 17,450,000.00    |
| V. Imapct during Construction                  |                   |                        |                  |
| Subtotal (K)                                   |                   |                        | -                |
| VI. Common Property Resource                   |                   |                        |                  |
| Religious Structures (Temple & Mosque)         | 250,000.00        | 18                     | 4,500,000.00     |
| School/Community Property                      | 500,000.00        | 3                      | 1,500,000.00     |
| Govt./ Panchayat Buildings                     | 300,000.00        | 12                     | 3,600,000.00     |
| Subtotal (L)                                   |                   |                        | 9,600,000.00     |
| VIII. Unforeseen Impacts                       |                   |                        |                  |
| Contingency of 10%                             | Total of (A to L) | 10%                    | 282,657,529.46   |
| Subtotal (M)                                   |                   |                        | 282,657,529.46   |
| IX. Implementation of RAP                      |                   |                        |                  |
| Support for implementation of RAP (lumpsum)[9] | 9,450,000         | 1                      | 9,450,000.00     |
| M & E consultant (lumpsum)                     | 480,000           | 1                      | 480,000.00       |
| Subtotal (N)                                   |                   |                        | 9,930,000.00     |
| Total(O) = (AtoN)                              |                   |                        | 3,119,162,824.06 |

The above estimate is based on rates vide Entitlement Matrix (April 2016) as per the norms of RTFCLARR Act, 2013, Assam RFCTLARR Rules, 2015 and in accordance with World Bank and JICA's Policies. As escalation of 12% on the said matrix is – allowed to arrive at the current cost of R&R =  $1.12 \times \text{Rs } 3,119,162,824.06 = \text{Rs } 3,493,462,362.95$  say Rs. 349.35 Cr.

## 3.21 INTERNAL MONITORING AND EVALUATION

398. Monitoring is an integral part of successful implementation of the RP activities. Internal monitoring will be carried out by any designated Assistant Manager or above under the supervision of Deputy General Manager, NHIDCL. Data collected for monitoring activities shall be suitably analysed for project management and learning. Key progress indicators (indicative) for monitoring RP implementation are as given below:

- disbursement of compensation and assistance to PAPs,
- establishment of grievance redressal mechanism (including processes and timeline for redressal of grievances),
- consultation meetings with PAPs and communities regarding resettlement and rehabilitation issues,
- other monitoring indicators will be considered as per the requirement.

399. Evaluation of the impact of resettlement activities will be conducted twice: once during the implementation of RP (mid-term) and the other at the end of the completion of RP implementation activities. For this purpose, PMU will engage an external agency. The evaluation will focus on:

- land acquisition or direct purchase of land (success, timeline, constraints, etc.),
- implementation of various RP activities,
- income restoration of affected persons,
- grievance handling mechanism, etc.

### 3.21.1 Stakeholders Consultation Workshop

400. A consultation workshop must be held at the site level. Detailed presentation on Resettlement Policy should be made which was followed by discussion and suggestions by the participants. The suggestions will be noted and incorporated suitably.

### 3.21.2 Disclosure

401. In order to make the RP preparation and implementation process transparent, salient features of RP shall be translated in Assamese/Bengali which is widely spoken and understood in the project area and disclosed on the Project Authority's website. The documents available in the public domain will include Entitlement Matrix and RP (summary in Assamese, Bengali) and the list of affected persons eligible for compensation and R&R assistance. Copy of all documents will be kept in PMU for ready reference. As per Access to Information Policy of the JICA, all safeguard documents will also be disclosed and available at the NHIDCL Portal.

402. Further to the web disclosure of the Draft RP on Project Authority's website, wide publicity would be given through newspaper advertisements about the disclosure and seeking public views and suggestions. Executive summary of the RP translated in Assamese, Bengali would be distributed to the stakeholders. A consultation meeting on draft Resettlement Plan shall be organized by the PIU for inviting comments/suggestions/feedback from participants/stakeholders. The outcome of the consultation meeting shall be included, wherever feasible, in the final Resettlement Plan and disclosed on the Project Authority's website. The final RP incorporating given comments, if any, shall be forwarded to the JICA for its review and clearance and subsequent disclosure on the JICA's portal.



## 3.22 INDIGENOUS PEOPLE PLAN

### 3.22.1 Introduction

403. World Bank uses the following characteristics in varying degrees to define indigenous people (i) maintenance of cultural and social identities separate from dominant societies and cultures; (ii) self-identification and identification by others as being part of a distinct cultural group; (iii) linguistic identity different from that of dominant society; (iv) social, cultural, economic, and political traditions and institutions distinct from dominant culture; (v) economic systems oriented more towards traditional production systems rather than mainstream; and (vi) unique ties and attachments to traditional habitats and ancestral territories.
404. Likewise, the President of India under Article 342 of the Constitution uses the following characteristics to define indigenous peoples [Scheduled Tribes (ST)], (i) tribes' primitive traits; (ii) distinctive culture; (iii) shyness with the public at large; (iv) geographical isolation; and (v) social and economic backwardness before notifying them as a Scheduled Tribe. Essentially, indigenous people have a social and cultural identity distinct from the 'mainstream' society that makes them vulnerable to being overlooked or marginalized in the development processes. In the context of the project areas, STs who have no modern means of subsistence, with distinctive culture and are characterized by socio-economic backwardness could be identified as Indigenous Peoples.
405. The Constitution of India, as per Article 244, makes special provisions for the administration of the tribal dominated areas in four states viz. Assam, Meghalaya, Tripura. In January 2019, Cabinet approved amendment to Article 280 and Sixth Schedule of the Constitution to increase autonomy, financial resources and powers of the autonomous district councils in Assam, Meghalaya, Mizoram and Tripura.
406. According to the Census of India 2011, 8.61 percent of the Indian population is classified as ST. In comparison to the national figure, Assam has 12.45 percent of its populations classified as ST. According to census survey of India, 2011, The STs in Assam comprised 3.88 million of the total State population of 31.21 million. The major tribes of Assam are (i) The Bodo Kachari Tribes, (ii) The Mishing Tribe, (iii) The Deori Tribes, (iv) The Rabha Tribes, (v) The Tiwa or Lalung Tribes, (vi) The khamti Tribe, (vii) The Sonowal Kachari Tribes, (viii) The Tai\_Phake or Phakial Tribes, (ix) The Dimasa Kachari Tribes, (x) The Karbi Tribes, (xi) The Barmans of Cachar, (xii) The Hmar Tribe, (xiii) The Kuki Tribe, (xiv) The Rengma Naga Tribes, (xv) Zeme Nagas, (xvi) The Hajong Tribe, (xvii) The Garo Tribe, (xviii) The Khasi Tribe, (xix) The Jaintia Tribe and (xv) The Mech Tribe. Summary profile of ST population in comparison to total population is described in Table-9.1.

**Table 21. 1 Summary profile of ST population**

| Name                               | Total Household (Million) | Total Population (Million) | Total Male (Million) | Total Female (Million) | Total ST Population (Million) | Male ST Population (Million) | Female ST Population (Million) | Percentage of ST Population compared to Total Population |
|------------------------------------|---------------------------|----------------------------|----------------------|------------------------|-------------------------------|------------------------------|--------------------------------|----------------------------------------------------------|
| India                              | 249.45                    | 1210.57                    | 623.12               | 587.45                 | 104.28                        | 52.41                        | 51.87                          | 8.61                                                     |
| Assam                              | 6.41                      | 31.21                      | 15.94                | 15.27                  | 3.88                          | 1.96                         | 1.93                           | 12.45                                                    |
| <b>Names of Districts in Assam</b> |                           |                            |                      |                        |                               |                              |                                |                                                          |
| Kokrajhar                          | 0.18                      | 0.89                       | 0.45                 | 0.43                   | 0.28                          | 0.14                         | 0.14                           | 31.41                                                    |
| Dhubri                             | 0.41                      | 1.95                       | 1.00                 | 0.95                   | 0.01                          | 0.00                         | 0.00                           | 0.32                                                     |
| Goalpara                           | 0.20                      | 1.01                       | 0.51                 | 0.49                   | 0.23                          | 0.12                         | 0.12                           | 22.97                                                    |
| Barpeta                            | 0.34                      | 1.69                       | 0.87                 | 0.83                   | 0.03                          | 0.01                         | 0.01                           | 1.61                                                     |
| Morigaon                           | 0.18                      | 0.96                       | 0.49                 | 0.47                   | 0.14                          | 0.07                         | 0.07                           | 14.29                                                    |
| Nagaon                             | 0.56                      | 2.82                       | 1.44                 | 1.38                   | 0.12                          | 0.06                         | 0.06                           | 4.08                                                     |
| Sonitpur                           | 0.39                      | 1.92                       | 0.98                 | 0.94                   | 0.23                          | 0.12                         | 0.11                           | 12.07                                                    |
| Lakhimpur                          | 0.20                      | 1.04                       | 0.53                 | 0.51                   | 0.25                          | 0.13                         | 0.12                           | 23.93                                                    |
| Dhemaji                            | 0.13                      | 0.69                       | 0.35                 | 0.33                   | 0.33                          | 0.17                         | 0.16                           | 47.45                                                    |
| Tinsukia                           | 0.27                      | 1.33                       | 0.68                 | 0.65                   | 0.08                          | 0.04                         | 0.04                           | 6.18                                                     |
| Dibrugam                           | 0.28                      | 1.33                       | 0.68                 | 0.65                   | 0.10                          | 0.05                         | 0.05                           | 7.76                                                     |
| Sivasagar                          | 0.25                      | 1.15                       | 0.59                 | 0.56                   | 0.05                          | 0.02                         | 0.02                           | 4.26                                                     |
| Jorhat                             | 0.24                      | 1.09                       | 0.56                 | 0.54                   | 0.14                          | 0.07                         | 0.07                           | 12.81                                                    |
| Golaghat                           | 0.23                      | 1.07                       | 0.54                 | 0.52                   | 0.11                          | 0.06                         | 0.06                           | 10.48                                                    |
| Karbi Anglong                      | 0.18                      | 0.96                       | 0.49                 | 0.47                   | 0.54                          | 0.27                         | 0.27                           | 56.33                                                    |
| Dima Hasao                         | 0.04                      | 0.21                       | 0.11                 | 0.10                   | 0.15                          | 0.08                         | 0.08                           | 70.92                                                    |
| Cachar                             | 0.38                      | 1.74                       | 0.89                 | 0.85                   | 0.02                          | 0.01                         | 0.01                           | 1.01                                                     |
| Karimganj                          | 0.25                      | 1.23                       | 0.63                 | 0.60                   | 0.00                          | 0.00                         | 0.00                           | 0.16                                                     |
| Hailakandi                         | 0.14                      | 0.66                       | 0.34                 | 0.32                   | 0.00                          | 0.00                         | 0.00                           | 0.10                                                     |
| Bongaigaon                         | 0.15                      | 0.74                       | 0.38                 | 0.36                   | 0.02                          | 0.01                         | 0.01                           | 2.55                                                     |
| Chirang                            | 0.10                      | 0.48                       | 0.24                 | 0.24                   | 0.18                          | 0.09                         | 0.09                           | 37.06                                                    |
| Kamrup                             | 0.31                      | 1.52                       | 0.78                 | 0.74                   | 0.18                          | 0.09                         | 0.09                           | 12.00                                                    |
| Kamrup Metropolitan                | 0.29                      | 1.25                       | 0.65                 | 0.61                   | 0.08                          | 0.04                         | 0.04                           | 5.99                                                     |
| Nalbari                            | 0.16                      | 0.77                       | 0.40                 | 0.38                   | 0.02                          | 0.01                         | 0.01                           | 3.03                                                     |
| Baksa                              | 0.19                      | 0.95                       | 0.48                 | 0.47                   | 0.33                          | 0.17                         | 0.17                           | 34.84                                                    |
| Darrang                            | 0.19                      | 0.93                       | 0.48                 | 0.45                   | 0.01                          | 0.00                         | 0.00                           | 0.91                                                     |
| Udalguri                           | 0.17                      | 0.83                       | 0.42                 | 0.41                   | 0.27                          | 0.13                         | 0.13                           | 32.15                                                    |

Source: [assam.gov.nic.in](http://assam.gov.nic.in)

### 3.22.2 Sixth Schedule of Constitution of India

407. The Sixth Schedule of the Constitution makes separate arrangements for the tribal areas of Assam, Meghalaya, Mizoram, and Tripura. Article 244A was added to the constitution through the 22nd Constitutional Amendment Act, 1969. It empowers Parliament to establish an autonomous State comprising certain tribal areas of Assam and for local Legislature or Council of Ministers or both can create.

408. Autonomous districts and autonomous regions.—(1) Subject to the provisions of this paragraph, the tribal areas in each item of 3 [4 [Parts I, II and IIA] and in Part III] of the table appended to paragraph 20 of this Schedule shall be an autonomous district. (2) If there are different Scheduled Tribes in an autonomous district, the Governor may, by public notification, divide the area or areas inhabited by them into autonomous regions. (3) The Governor may, by public notification,— (a) include any area in

3 [any of the Parts] of the said table, (b) exclude any area from 3 [any of the Parts] of the said table, (c) create a new autonomous district, (d) increase the area of any autonomous district, (e) diminish the area of any autonomous district, (f) unite two or more autonomous districts or parts thereof so as to form one autonomous district, 5 [(ff) alter the name of any autonomous district,] (g) define the boundaries of any autonomous district:

### **3.22.3 The Bodoland Autonomous Council (Repeal) Act, 2003**

409. Whereas it is expedient to provide for the establishment of a Bodoland Autonomous Council within the State of Assam with maximum autonomy within the framework of the Constitution comprising contiguous geographical areas between the river Sankosh and Mizhat /the river Pasnoi, for social, economic, educational, ethnic and cultural advancement of the Bodos residing therein.

### **3.22.4 Bodoland Territorial Region**

410. Bodoland, (also Boroland), officially the Bodoland Territorial Region, is an autonomous region in India. It made up of four districts on the north bank of the Brahmaputra River, by the foothills of Bhutan and Arunachal Pradesh. It is administered by an elected body known as the Bodoland Territorial Council which came into existence under the terms of a peace agreement signed in February 2003 and its autonomy was further extended by an agreement signed in January 2020. The region covers an area of over eight thousand square kilometres and is predominantly inhabited by the Bodo people and other indigenous communities of Assam. The districts are Kokrajhar, Chirang, Baksa and Udalguri.

### **3.22.5 The Study Area**

411. About 12 km of the proposed road lies in the Kokrajhar district under the administrative control of Bodoland Territorial Council. The ST population affected in the proposed alignment follow the tribal lifestyle, culture and language.

### **3.22.6 Impacts on the STs**

412. As per government of India's guidelines of the ST population in the PIA are considered as the IP. Categorization for Indigenous People (IP) Impact this sub project is categorized as sensitive as ST population among the PAHs is 19%. Bodo is the major tribe identified among the ST population in the PIA.

413. The proposed project would impact about 115 structures and 265 ST Families. The detail of which is depicted in the Table 21.2

**Table 21. 2 Impact of ST PAHs**

| SL. No.      | Type of Ownership                                             | No of Affected Household Families | No. of Structures |
|--------------|---------------------------------------------------------------|-----------------------------------|-------------------|
| 1            | Title Holder                                                  | 177                               | 55                |
| 2            | Encroacher                                                    | 30                                | 31                |
| 3            | Squatter                                                      | 14                                | 14                |
| 4            | Kiosk                                                         | 15                                | 15                |
| 5            | Tenants                                                       | 13                                |                   |
| 6            | Employees to Commercial Structures and agricultural labourers | 16                                |                   |
| <b>Total</b> |                                                               | <b>265</b>                        | <b>115</b>        |

*Source: Census & SES Survey, Jan-Mar 2020*

414. There is no community structure impacted by the proposed project road.

### 3.22.7 Mitigation Plan

415. From Chainage 0+000 km to 10+905 km and 28+960 km to 29+960 km lies in the district of Kokrajhar which is under the administrative control of Bodoland Territorial Council as per the Sixth Schedule of Constitution of India. The rest of the road lies in the Dhubri district. The IP or the ST population is mainly settled at the Kokrajhar district.

416. This proposed road is not a new project or a green field alignment but an existing alignment. The project involves only in widening and upgrading the existing road. The ST population among the PAHs in the PIA are mostly living in the towns and villages along the highway and in the due course of time became the part of the mainstream population. Presently the impacted IP population does not follow any customs that are attached to their land or natural habitat which will be impacted. Thus, there will be no culturally or socially impact on the IP population.

417. It should be noted that there are 75 tribal groups have been categorized by Ministry of Home Affairs as Particularly Vulnerable Tribal Groups (PVTG)s. PVTGs reside in 18 States and UT of A&N Islands. The Ministry of Tribal Affairs implements the Scheme of “Development of Particularly Vulnerable Tribal Groups (PVTGs)” exclusively for them . Under the scheme, Conservation-cum-Development (CCD)/Annual Plans are to be prepared by each State/UT for their PVTGs based on their need assessment, which are then appraised and approved by the Project Appraisal Committee of the Ministry. Activities for development of PVTGs are undertaken in Sectors of Education, Health, Livelihood and Skill Development , Agricultural Development , Housing & Habitat, Conservation of Culture etc.

418. The Bodo are not within these PVTGs.

419. The 19% of ST population present in the primary PIA that might be impacted does not follow customs that are attach to their land and also not attached to their natural habitat for their living. The ST in the PIA is living in the towns and villages and became the part of the mainstream population and thus would not considered as the IP population as per the definition of IP of World Bank.

420. There is no cultural heritage site which comes in the way of the proposed road alignment. This subproject has ensured that the designed and implementation will be in such a way that it fosters full respect for IP identity, dignity, human rights, livelihood systems, and cultural uniqueness as they define them. There is no impact on the community structure or community land of cultural or religious sentiment of the tribal Population in the Primary PIA.
421. As per the Entitlement Matrix the ST or the IP Population will receive a special vulnerable assistance of Rs.25,000 over and above all other compensation and assistance that they are eligible for. The proposed project will also ensure that IPs receive culturally appropriate social and economic benefits, do not suffer adverse impacts as a result of projects, and can participate actively in projects that affect them.
422. Meaningful focus group discussions with the ST women and affected ST communities and concerned ST organizations were carried out to solicit their participation (i) in designing, implementing, and monitoring measures to avoid adverse impacts or, when avoidance is not possible, to minimize, mitigate, or compensate for such effects; and (ii) in tailoring project benefits for affected ST communities in a culturally appropriate manner. To enhance STs' active participation, projects affecting them will provide appropriate and gender inclusive capacity development. Establish a culturally appropriate and gender inclusive grievance mechanism to receive and facilitate resolution of the ST Peoples' concerns.
423. The proposed subproject can be viewed as boosting economic growth and poverty reduction, which will bring substantial social and economic development in the region. The social benefits arising due to the subproject will be triggered off due to improved accessibility to various services such as easy access to markets, health facilities, schools, and workplace which in turn increases the income of the locals, and ultimately elevating their standard of living. With the available options, best engineering solution have been adopted to minimize land acquisition and resettlement impacts to the extent possible and keeping the objective of road connectivity of the interior area in view. The alignment has followed existing roads as feasible from engineering point of view to avoid impacts.
424. The STs are yet to foresee any serious adverse impact for the area in general, apart from obvious loss of land, properties, trees, structures, and increase of traffic accidents. Being situated at roadside within the developed area, the people in general are accustomed with the probable risk of development in highway sector, such as spread of HIV/AIDS and STD, drug abuse that can trap the youth and trafficking of women and children. According to the people these hazards are already faced and conquered by them. The issues, however were discussed during FGD sessions, and the participants agreed to discuss the matter among the villagers with due seriousness. The Village Authority and specially the Women's and Youth organizations asserted that at appropriate time they will take awareness generation initiatives. The project will provide HIV/AIDS, trafficking, and road safety awareness sessions for all communities. The NGO will provide orientation and sensitization workshops that will include awareness programmes on HIV/AIDS/Drug abuse and trafficking.

## ANNEXURE 1: SCREENING CHECKLIST

| Category             | Env. Item        | Check Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Yes: Y<br>No: N                                                                                                                 | Confirmation of Env. Considerations<br>(Reasons, Mitigation Measures)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 Social Environment | (1) Resettlement | <p>(a) Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement?</p> <p>(b) Is adequate explanation on compensation and resettlement assistance given to affected people prior to resettlement?</p> <p>(c) Is the resettlement plan, including compensation with full replacement costs, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement?</p> <p>(d) Are the compensations going to be paid prior to the resettlement?</p> <p>(e) Are the compensation policies prepared in document?</p> <p>(f) Does the resettlement plan pay particular attention to vulnerable groups or people, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples?</p> <p>(g) Are agreements with the affected people obtained prior to resettlement?</p> <p>(h) Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan?</p> <p>(i) Are any plans developed to monitor the impacts of resettlement?</p> <p>(j) Is the grievance redress mechanism established?</p> | <p>(a) Y</p> <p>(b) Y</p> <p>(c) Y</p> <p>(d) Y</p> <p>(e) Y</p> <p>(f) Y</p> <p>(g) Y</p> <p>(h) Y</p> <p>(i) Y</p> <p>(j)</p> | <p>Resettlement Plan, Option Study during DPR</p> <p>1<sup>st</sup> Round Public Consultation Completed, 2<sup>nd</sup> round will be held</p> <p>Entitlement Matrix depicts the eligibility and entitlements.</p> <p>Compensation to be paid before mobilizing the Civil Contractor</p> <p>The Entitlement Matrix is prepared from Legal and Policy Framework</p> <p>Special Vulnerable assistance of Rs. 25,000 will be given above other assistance</p> <p>Agreement with the Title Holders are in process</p> <p>Organizational Framework already discussed with appoint of NGO for implementation</p> <p>Plans are there for both Internal and External Monitoring</p> <p>Plans are there for establishing Grievance Redressal Mechanism.</p> |



| Category             | Env. Item                 | Check Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Yes: Y<br>No: N                                                                 | Confirmation of Env. Considerations<br>(Reasons, Mitigation Measures)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | (2) Living and Livelihood | <p>(a) Where roads are newly installed, is there a possibility that the project will affect the existing means of transportation and the associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Are adequate measures considered for preventing these impacts?</p> <p>(b) Is there any possibility that the project will adversely affect the living conditions of the inhabitants other than the target population? Are adequate measures considered to reduce the impacts, if necessary?</p> <p>(c) Is there any possibility that diseases, including infectious diseases, such as HIV will be brought due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary?</p> <p>(d) Is there any possibility that the project will adversely affect road traffic in the surrounding areas (e.g., increase of traffic congestion and traffic accidents)?</p> <p>(e) Is there any possibility that roads will impede the movement of inhabitants?</p> <p>(f) Is there any possibility that structures associated with roads (such as bridges) will cause a sun shading and radio interference?</p> | <p>(a)No</p> <p>(b) No</p> <p>(c)No</p> <p>(d)No</p> <p>(e)No</p> <p>(f) No</p> | <p>Engineering Team visited and noted the natural flow of water. Culverts have been provided for the natural flow of water. There is no impacts both temporary or permanent regarding the hindrance of accessibility.</p> <p>There will be positive impact of the project other than the target population</p> <p>Awareness campaign about HIV/AIDS and STDs will be taken up by the NGO</p> <p>The widening and upgrading of the road will reduce the traffic congestion and road accident</p> <p>There will provide places to cross over at all major and minor junctions</p> <p>Possibility is very less</p> |
| 4 Social Environment | (3) Heritage              | (a) Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage? Are adequate measures considered to protect these sites in accordance with the country's laws?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (a) No                                                                          | Care had been taken so that no archaeological, historical, cultural, and religious heritage are impacted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                      | (4)                       | (a) Is there a possibility that the project will adversely affect the local landscape? Are necessary measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (a) No                                                                          | Local landscape beyond the road will                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



| Category | Env. Item                                    | Check Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Yes: Y<br>No: N                                     | Confirmation of Env. Considerations<br>(Reasons, Mitigation Measures)                                                                                                                                                                                                                                                                                        |
|----------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | Landscape                                    | taken?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                     | remain same                                                                                                                                                                                                                                                                                                                                                  |
|          | (5) Ethnic Minorities and Indigenous Peoples | (a) Are considerations given to reduce impacts on the culture and lifestyle of ethnic minorities and indigenous peoples?<br>(b) Are all of the rights of ethnic minorities and indigenous peoples in relation to land and resources to be respected?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | (a) Yes<br>(b) Yes                                  | Special Plan for Indigenous is being developed and no land or structure is impacted which is associated with the beliefs of the IP community                                                                                                                                                                                                                 |
|          | (6) Working Conditions                       | (a) Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project?<br><br>(b) Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials?<br><br>(c) Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public health) for workers etc.?<br><br>(d) Are appropriate measures being taken to ensure that security guards involved in the project not to violate safety of other individuals involved, or local residents? | (a) No<br><br>(b) Yes<br><br>(c) Yes<br><br>(d) Yes | None of the Country's Law is Violated<br><br>Country's Acts, Rules and Policies and regarding safety to be followed<br><br>Heath and Road Safety campaign are to organised by the NGO. Safety Campaign and training will be the part of the Contractor<br><br>Security guard who will be recruited should be trained to give respect to the local community. |

Supplementary Social Impact  
Assessment Stage – I and Stage - II[illegible]

Supplementary Social Impact  
Assessment Stage – I and Stage - II

Date - 22.07.2020 .

[illegible]

Supplementary Social Impact  
Assessment Stage – I and Stage - II

[illegible]



Supplementary Social Impact  
Assessment Stage – I and Stage - II[illegible]

NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km.

---

Supplementary Social Impact  
Assessment Stage – I and Stage - II





Supplementary Social Impact  
Assessment Stage – I and Stage - II

Date - 24.07.2020

[illegible]

Supplementary Social Impact  
Assessment Stage – I and Stage - II

Project Name: Uzarpetta

Date - 21.07.2020.

[illegible]

Project Name: Paqlahat

# ATTENDANCE SHEET

Date - 23.07.2020

| Sl. No. | Name                | Contact Number | Signature     |
|---------|---------------------|----------------|---------------|
|         | Noor Uddin Sekh     | 7896 551578    |               |
|         | Kasem Ali           | 9954 6636 95   | কাসেম আলি     |
|         | Md Jainaluddin Sekh |                |               |
|         | Imran Ali Sekh      |                |               |
|         | Hemendra Das        |                | Hemendra Das  |
|         | Nattalush Murreu    |                |               |
|         | Paritosh Dutta      |                |               |
|         | Ushman Gani         | 7896417764     | উশমান গনি     |
|         | Ganesh Prasad       | 7896833178     |               |
|         | Bishnu Roy          | 9678777903     | বিশ্বনাথ রায় |
|         | Rakhal Kar          | 9932808960     |               |
|         | Abul Haque          | 9434326207     | আবুল হাকিম    |
|         | Asraf Ali           | 8404016236     | আসরাফ আলি     |
|         | Majibar Ali         | 7990873413     |               |
|         |                     | 6000787511     |               |
|         |                     |                |               |
|         |                     |                |               |
|         |                     |                |               |
|         |                     |                |               |
|         |                     |                |               |
|         |                     |                |               |
|         |                     |                |               |



Supplementary Social Impact  
Assessment Stage – I and Stage - II

Date - 22.07.2020.

Project Name: Bhafipetla



Project Name: Srirampur Bazar **ATTENDANCE SHEET**

Date - 20.07.2020.

| Name               | Phone Number | Signature         |
|--------------------|--------------|-------------------|
| Sujit Chandra      | 7086695455   |                   |
| Sujit Biswas       | 8972453712   | Sujit Biswas      |
| Safur Rahman       | 7086854386   | P                 |
| Robinson Murmu     | 6002068304   |                   |
| Goutam Kumar Saha  | 8011995111   | Goutam Kumar Saha |
| Bhola Harjari      | 8811927245   |                   |
| Dayal Chandra Saha | 9954649100   |                   |
| Dinesh Mandi       | 8134015609   | Dinesh Mandi      |
| Sujit Pal          | 9678728954   | Sujit Pal         |
| Jiten Saha         | 9957440338   | Jiten Saha        |
| Ajit Kumar Dey     | 9954849362   |                   |
| Ananta Saha        | 8486945497   |                   |
| Anjad Sekh         | 9864723662   | Anjad Sekh        |
|                    |              |                   |
|                    |              |                   |
|                    |              |                   |
|                    |              |                   |
|                    |              |                   |
|                    |              |                   |
|                    |              |                   |
|                    |              |                   |

Supplementary Social Impact  
Assessment Stage – I and Stage - II

Golder  
Engineering Consultants

## ANNEXURE 3: SES & CENSUS BLANK FORMAT

### Census & Socio-Economic Survey

Unique Identification No. (UIN) : 

|   |   |   |   |       |     |   |   |   |   |
|---|---|---|---|-------|-----|---|---|---|---|
|   |   |   | - |       |     | - |   |   |   |
| C | C | C |   | L/R/B | L/S |   | H | T | O |

Date of Survey : 

|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
|   |   | / |   |   | / | 2 | 0 |   |   |
| d | d |   | m | m |   | y | y | y | y |

Name of the Investigator \_\_\_\_\_

#### 1.0 GENERAL IDENTIFICATION

1.1 Sub-project Road Name :

1.2 Chainage & Side : Km 

|  |  |  |   |  |  |  |
|--|--|--|---|--|--|--|
|  |  |  | - |  |  |  |
|--|--|--|---|--|--|--|

 Side 

|  |  |
|--|--|
|  |  |
|--|--|

  
01 LHS 02 RHS 03 Both

1.3 Name of the Mouza/Village :

1.4 Name of Panchayat :

1.5 Block/ Municipality :

1.6 Name of District :

1.7 Name of the Present HOH :

1.8 Father's/ Husband's Name : 

|   |   |
|---|---|
| F | H |
|---|---|

1.9 Name of the Respondent : 

|   |   |
|---|---|
| M | F |
|---|---|

1.10 Relation with Present HOH : 

|  |  |
|--|--|
|  |  |
|--|--|

 Use Code from Code List of Column 3 of Demography

1.11 Number of Family Members : Male 

|  |  |
|--|--|
|  |  |
|--|--|

 Female 

|  |  |
|--|--|
|  |  |
|--|--|

 Total 

|  |  |
|--|--|
|  |  |
|--|--|

1.12 Usage of the Property : 

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

 Years

1.13 Mother Tongue :

1.14 Social Category :

1.15 Religious Category :



1.16 Vulnerability Status of the HH

|   |                      |                      |                      |
|---|----------------------|----------------------|----------------------|
| : | <input type="text"/> | <input type="text"/> | <input type="text"/> |
|   | 01 BPL               |                      | 02 WHH               |
|   | 03 PCH               |                      | 04 Lonely Oldage     |

1.17 Monthly income of HH

: Rs.

## 2.0 DETAILS OF LAND

2.1 Ownership of the Land

|   |                      |               |
|---|----------------------|---------------|
| : | <input type="text"/> |               |
|   | 01 Private           | 02 Government |
|   | 03 Religious         | 04 Community  |

2.2 Use of Land

|   |                      |                      |                               |
|---|----------------------|----------------------|-------------------------------|
| : | <input type="text"/> | <input type="text"/> | <input type="text"/>          |
|   | 01 Cultivation       |                      | 02 Residential                |
|   | 03 Commercial        |                      | 04 Residential cum Commercial |
|   | 05 Orchard           |                      | 06 No Use/Barren              |

2.3 If Cultivation, then Type of Land

|   |                      |                  |
|---|----------------------|------------------|
| : | <input type="text"/> |                  |
|   | 01 Irrigated         | 02 Non-Irrigated |
|   | 03 Barren            | 04 Forest        |

2.4 Affected area of Land (sqm)

:

2.5 Total Area of Land (sqm)

:

2.6 Land Holding (acre)

:

2.7 Market Rate of Land (Rs./ sqm)

:

2.8 Status of Ownership

|   |                             |                    |
|---|-----------------------------|--------------------|
| : | <input type="text"/>        |                    |
|   | 01 Titleholder (Pvt. Owner) | 02 Customary Right |
|   | 03 Encroacher               | 04 Squatter        |
|   | 05 Tenant                   | 99 Others          |

2.9 If Tenant, Owner Name

:

2.10 Any of the following people associated with the Land

A. Agricultural Labourer

|   |                      |                      |
|---|----------------------|----------------------|
| : | <input type="text"/> | <input type="text"/> |
|   | 01 Yes               | 02 No                |

(i) If yes, then how many

|   |                      |                      |
|---|----------------------|----------------------|
| : | <input type="text"/> | <input type="text"/> |
|---|----------------------|----------------------|

B. Sharecropper

|   |                      |                      |
|---|----------------------|----------------------|
| : | <input type="text"/> | <input type="text"/> |
|   | 01 Yes               | 02 No                |

(ii) If yes, then how many

|   |                      |                      |
|---|----------------------|----------------------|
| : | <input type="text"/> | <input type="text"/> |
|---|----------------------|----------------------|

2.1

1 Trees within the affected area

|   |                      |                      |                      |                      |
|---|----------------------|----------------------|----------------------|----------------------|
| : | <input type="text"/> | <input type="text"/> | <input type="text"/> | <input type="text"/> |
|   |                      | Fruit                | Non-Fruit            | Total                |

### 3.0 DETAILS OF AFFECTED STRUCTURES

3.1. Structure in affected Land

: ☐ ☐

01 Yes

02 No

3.2. Affected area of structure

: Floor

sqm

: Length along the road

m

: Width perpendicular to the road

m

3.3. Total Area of the structure

: Floor

sqm

: Length along the road

m

: Width perpendicular to the road

m

3.4 Distance from road center

:

m

3.5 Type of Construction

: ☐ ☐

01 Temporary

02 Semi-permanent

03 Permanent

3.6 Market Value of the Structure

:

3.7 Use of the Structure

: ☐ ☐

01 House

☐ ☐

02 Hut

☐ ☐

A. Residential Structure

B. Commercial Structure

: 03 Shops

04 Hotel

05 Small Eatery

06 Kiosk

07 Farm House

08 Petrol Pump

09 Clinic

10 STD Booth

11 Workshop

12 Vendors

13 Commercial Complex

14 Industry

15 Restaurant

C. Mixed Structure

: 16 Residential-cum-Commercial

D. Community Structure

: 17 Commercial Centre

18 Club

19 Trust

20 Memorials

E. Religious Structure

: 21 Mosque

22 Shrine

23 Burial Ground

24 Temple

F. Government Structure

: 25 Govt. Office

26 Hospital

27 School

28 College

G. Other Structure

: 29 Boundary Wall

30 Foundation

31 Cattle Shed

32 Well/ Tube

### 3.8 Status of Ownership

:

01 Titleholder (Pvt. Owner) 02 Customary Right  
03 Encroacher 04 Squatter 05 Tenant

### 3.9 If Tenant, Owner Name

: \_\_\_\_\_

#### A. Tenure Status

:

01 Rented 02 Leasehold

#### B. Monthly Rent

: Rs. \_\_\_\_\_

#### C. Utility

:

01 Electricity 02 Water  
03 Sewerage 99 Others

### 3.10 Any of the following people associated with the Structure?

#### A. Any Employee

:

01 Yes 02 No

#### (i) If yes, then how many

:

#### B. Tenant in residence

:

01 Yes 02 No

#### (ii) If yes, then how many

:

### 3.11 Trees within the affected area

:   Fruit   Non-Fruit   Total

## 4.0 RESETTLEMENT AND REHABILITATION OPTION

### 4.1 Willing to shift

:

01 Voluntarily 02 In Voluntarily

### 4.2 Assistance option

:

01 Self-Relocation 02 Cash for Landless  
03 Cash for House/ Shop loss 04 Project Assistance

### 4.3 Income Restoration Assistance

:

01 Employment Opportunities in Construction Work  
02 Assistance from other ongoing development schemes  
03 Vocational Training

### 4.4 Other Supports from Project

: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Code List for Demography****Column 3 Relation with the Head of the Household**

- 01 Self  
 04 Brother/ Sister  
 07 Nephew/ Niece  
 10 Grand Father/ Grand Mother  
 13 Grandson/ Grand Daughter in law

- 02 Spouse  
 05 Son/ Daughter  
 08 Grand Son/ Grand Daughter  
 11 Father/ Mother-in-law

- 03  
 06  
 09  
 12  
 99

**Column 4 Sex**

- 01 Male

- 02 Female

☐
**Column 6 Marital status**

- 01 Married

- 02 Unmarried

☐

03

**Column 7 Education**

- 01 Illiterate  
 04 Middle Educated (upto Class 8)  
 07 Graduate  
 10 Professional Degree (Doctor, Engineer etc.)

- 02 Informally Literate (without attending school)  
 05 Secondary Educated (upto Class 10)  
 08 Post Graduate  
 11 Child (< 6 yrs.)

- 03  
 06  
 09  
 99

**Column 8 Differently Able**

- 01 Physically

- 02 Mentally

**Column 9 Occupation**

- 01 Cultivation  
 04 Unskilled Labour (daily waged)  
 07 Skilled Labour  
 10 Trade & Business  
 13 Masonry  
 16 Household Maid/Assistants  
 19 Pension/ Earnings from remittances  
 22 Housewife

- 02 Agricultural Labour  
 05 Government/ Panchayat/ Municipal Service  
 08 Self Employed/ Professional (mention)  
 11 Employee in Mining Sector  
 14 Computer Hardware/ Software  
 17 Private Tuition  
 20 Unemployed (>18 Yrs.)

- 0  
 0  
 0  
 1  
 1  
 1  
 2

5.0 Demography

| 0   | 2                                                       | 3                    | 4    | 5    | 6                 | 7             | 8                   | Occupational S |           |
|-----|---------------------------------------------------------|----------------------|------|------|-------------------|---------------|---------------------|----------------|-----------|
| Sl. | Name of the members of the Family<br>(IN BLOCK CAPITAL) | Relation<br>with HOH | Sex  | Age  | Marital<br>status | Educa<br>tion | Differently<br>able | Main           | Subs<br>1 |
|     |                                                         |                      |      |      |                   |               |                     | Code           | Code      |
| No  | Name                                                    | Code                 | Code | Yrs. | Code              | Code          | Code                | Code           | Code      |
| 1.  |                                                         | 01                   |      |      |                   |               |                     |                |           |
| 2.  |                                                         |                      |      |      |                   |               |                     |                |           |
| 3.  |                                                         |                      |      |      |                   |               |                     |                |           |
| 4.  |                                                         |                      |      |      |                   |               |                     |                |           |
| 5.  |                                                         |                      |      |      |                   |               |                     |                |           |
| 6.  |                                                         |                      |      |      |                   |               |                     |                |           |
| 7.  |                                                         |                      |      |      |                   |               |                     |                |           |
| 8.  |                                                         |                      |      |      |                   |               |                     |                |           |
| 9.  |                                                         |                      |      |      |                   |               |                     |                |           |
| 10. |                                                         |                      |      |      |                   |               |                     |                |           |
| 11. |                                                         |                      |      |      |                   |               |                     |                |           |
| 12. |                                                         |                      |      |      |                   |               |                     |                |           |
| 13. |                                                         |                      |      |      |                   |               |                     |                |           |
| 14. |                                                         |                      |      |      |                   |               |                     |                |           |
| 15. |                                                         |                      |      |      |                   |               |                     |                |           |

Please see Clarifications & the Codes for different Columns in the previous page

**6.0 Possession of Material/ Assets (Please Record Numbers)**

| TV | Tape Recorder | Radio | Refrigerator | Telephone | Vehicles |             |               |              |            | LPG | Others |
|----|---------------|-------|--------------|-----------|----------|-------------|---------------|--------------|------------|-----|--------|
|    |               |       |              |           | Cycles   | Two Wheeler | Three Wheeler | Four Wheeler | Bus/ Truck |     |        |
|    |               |       |              |           |          |             |               |              |            |     |        |

**7.0 Live Stock Assets**

| Cows | Buffaloes | Sheep | Goats | Pig | Poultry | Others |
|------|-----------|-------|-------|-----|---------|--------|
|      |           |       |       |     |         |        |

**8.0 Likely Loss of Other Assets**

| Tree/ Orchard |         | Well |      | Personal Assets |      |
|---------------|---------|------|------|-----------------|------|
| No.           | Species | No.  | Type | No.             | Name |
|               |         |      |      |                 |      |

**9.0 Participation in economic activities of family members**

| Sl. | Economic/Non-economic Activities       | Male | Female | Both |
|-----|----------------------------------------|------|--------|------|
| 1   | Cultivation                            |      |        |      |
| 2   | Allied Activities                      |      |        |      |
| 3   | Collection and Sale of forest products |      |        |      |
| 4   | Trade & business                       |      |        |      |
| 5   | Agricultural Labour                    |      |        |      |
| 6   | Non-Agricultural Labour                |      |        |      |
| 7   | HH Industries                          |      |        |      |
| 8   | Service                                |      |        |      |
| 9   | Household Work                         |      |        |      |
| 10  | Collection of Water                    |      |        |      |
| 11  | Collection of Fuel                     |      |        |      |
| 12  | Others (Specify)                       |      |        |      |

**10. Decision making and participation at Household Level (Please Tick)**

| Sl. | Subject                          | Male | Female | Both |
|-----|----------------------------------|------|--------|------|
| 1   | Financial Matter                 |      |        |      |
| 2   | Education of Child               |      |        |      |
| 3   | Healthcare of Child              |      |        |      |
| 4   | Purchase of assets               |      |        |      |
| 5   | Day to day household activities  |      |        |      |
| 6   | On social function and marriages |      |        |      |
| 7   | Women to Earn for Family         |      |        |      |
| 8   | Land and property                |      |        |      |



**11. Women Participation at Community level**

11.1 Do women participate in Community decisions :

01 Yes

02 No

11.2 Any women works as Anganwadi Worker or ANM :

01 Yes

02 No

11.3 Any member of any active Self Help Group (SHG) :

01 Male

02 Female

03 Both

04 None

11.4 Any office bearer of Village/ Block/ Zilla Panchayat :

01 Male

02 Female

03 Both

04 None

**12. Do family members migrate for Work?**
 

01 Yes

02 No

12.1 If, Yes

| Sl. | Type of Work                                                 | Annual Income (Rs.) | Migrate for work outside the village |        |
|-----|--------------------------------------------------------------|---------------------|--------------------------------------|--------|
|     |                                                              |                     | Male                                 | Female |
| 1   | Agriculture                                                  |                     |                                      |        |
| 2   | Shopkeeper/Business (including petty business)               |                     |                                      |        |
| 3   | Employer (industrialist/Factory/Mill owner, etc)             |                     |                                      |        |
| 4   | Government Service                                           |                     |                                      |        |
| 5   | Private Service                                              |                     |                                      |        |
| 6   | Wage Labour (Agriculture)                                    |                     |                                      |        |
| 7   | Wage Labour (Non-Agriculture)                                |                     |                                      |        |
| 8   | Self employed (Insurance, Finance, Doctor, Engineer, Lawyer) |                     |                                      |        |
| 9   | Transfer Earnings(Retired, Remittance, Rent, Interest etc.)  |                     |                                      |        |
| 10  | Household work                                               |                     |                                      |        |
| 11  | Others                                                       |                     |                                      |        |
|     | <b>Total</b>                                                 |                     |                                      |        |

**Code:** Daily 01, Seasonal 02, Long term 03, No 04**13. Household Expenditure (Expenditure of total household for various items during the last year)**

| Sl. | Items of expenses           | Annual Expenditure (Rs.) | Remarks |
|-----|-----------------------------|--------------------------|---------|
| 1.  | Food                        |                          |         |
| 2.  | Clothing                    |                          |         |
| 3.  | Medical                     |                          |         |
| 4.  | Education                   |                          |         |
| 5.  | Other Household Expenditure |                          |         |
| 6.  | Social Functions (L/S)      |                          |         |
| 7.  | Durable Assets Creation     |                          |         |
| 8.  | Agriculture inputs          |                          |         |
| 9.  | Drinking water carriage     |                          |         |

|     |                                    |  |  |
|-----|------------------------------------|--|--|
| 10. | Transport & Communication          |  |  |
| 11. | Smoking/ Pan/ Tobacco/ Liquor etc. |  |  |
| 12. | Miscellaneous                      |  |  |
|     | Total                              |  |  |

**14. Loan and Indebtedness (for last one year)**

14.1 Have you taken any loan in last year

 : 

01 Yes

02 No

14.2 If yes, who has taken the loan

 : 

Use Code from Code List of Column 3 of Demography

14.3 If yes, the source of the loan

 : 

01 Bank

02 Cooperative

03 NGO

04 SHG

05 Pvt. Money Lender

06 Relative/ Friend

14.4 The purpose of the Loan

 : 

01 Productive Investment

02 Purchasing durables

03 Emergency

04 Social Events

05 Paying off other loans

99 Others

**15. Access to Facilities**

| Sl. | Amenities                             | Distance (km) | Mode to access | Frequency | Nos. of Trips |
|-----|---------------------------------------|---------------|----------------|-----------|---------------|
| 1   | Primary School                        |               |                |           |               |
| 2   | Secondary School                      |               |                |           |               |
| 3   | College                               |               |                |           |               |
| 4   | Regular Market                        |               |                |           |               |
| 5   | Commonly visited health service place |               |                |           |               |
| 6   | Hospital                              |               |                |           |               |
| 7   | District Office                       |               |                |           |               |
| 8   | Block Office                          |               |                |           |               |

**16. Health seeking behaviour**

16.1 Any member suffered critical disease in last year

 : 

01 Yes

02 No

03 Don't Know

99 Others

16.2 If yes, who suffered

 : 

01 Males

02 Females

03 Boy Children

04 Girl Children

05 Adults

06 Children both Boys &amp; Girls

07 Adults &amp; Children

99 Others

16.3 If yes, which disease

 :

16.4 Type of treatment taken

 : 

- 01 Govt. Allopathic  
03 Homeopathy  
05 Quacks  
07 No Treatment

- 02 Pvt. Allopathic  
04 Ayurvedic  
06 Faith Healers  
99 Others

16.5 Nearest available formal Medical Facility

 : 

- 01 Primary Health Centre  
03 District Hospital  
05 Pvt. Hospital/ Nursing Home

- 02 Community Health Centre  
04 Private Clinic  
99 Others

16.6 Any medical facility availed in last pregnancy

 : 

- 01 Yes  
03 Not pregnant yet

- 02 No  
99 Others

16.7 If no, who attended during giving birth

 : 

- 01 Female Neighbours  
03 Mother-in-law  
05 Husband

- 02 Relative & Friends  
04 Sister-in-law  
99 Others

16.8 Have you heard about HIV/ AIDS

 : 

- 01 Yes

- 02 No

16.9 If yes, what is the source of knowledge

 : 

- 01 Newspaper  
03 Radio  
05 Govt. Publicity

- 02 TV  
04 NGO Camp  
99 Others

**17. Remarks,**

## ANNEXURE 4: TOR of NGO

### Selection of NGO

It is extremely important for the success of the RP to select NGO that are capable, genuine and committed to the tasks assigned. Key quality criteria include:

- ❖ Experience in direct implementation of programs in local, similar and/or neighbouring districts.
- ❖ Availability of trained staff capable of including DPs into their programs.
- ❖ Competence, transparency and accountability based on neutral evaluations, internal reports, and audited accounts.
- ❖ Integrity to represent vulnerable groups against abuses; experience in representing vulnerable groups, demonstrable mandate to represent local groups.

In addition to above, taking into consideration the risks of HIV/AIDS during the project period and road safety and anti-trafficking issues, specialized NGOs will be invited to undertake activities related to their core competencies. The focus will be more on prevention as well as referral services on curative aspects. The major activities of such NGO will include awareness generation, information dissemination and mobilization of communities to act on the issues towards safer behaviour.

The NGO chosen will have to agree to the terms and conditions under the RP. Hence, the selection of a committed NGO is very crucial for implementation of the Project. The selection process and TORs will be reviewed by the ESDU.

The NGO will be involved through mutually agreed terms and conditions with specific responsibilities and in-built accountability. A contract will be signed with the NGO indicating the tasks to be performed and the amount to be paid for their services. The payment to the NGO will be linked to performance of the tasks assigned and the time period. Their payment will be arranged as per contract agreement. The NGO will submit a monthly progress report to the project level PIU-R&R Cell, which in turn will send the summarized version of their reports with comments to the EA HQ. The monitoring and evaluation component of the RRP will include the performance of the contracted NGO. The NGO services will be required for 36 months for which provision has been made in the budget.

### NGO Staffing and Personnel

The NGO shall have offices at one district for implementation for duration of 36 months. The NGO, therefore, shall have adequate support staff for carrying out the R&R activities. One Key Professional (Social) for the district and also one Key Professional (Technical) for the district will be required. Overall supervision will be under a Team Leader assigned specifically for this project.

#### ❖ Team Leader

The Team Leader should be post-graduate, preferably in social sciences, and should have experience of implementing R&R activities for linear projects. She/he should have at least 5 years experience in implementation of R&R and rural development works. She/he should have held responsible position in the previous assignments should possess participatory management skills and should have good knowledge of the region and the local language.

#### ❖ Key Professionals (Technical – Authorised Valuer)

Should be at least a Degree holder in civil engineering. She/he should have at least 10 years experience in fieldwork. She/he should have participated in at least one project involving R&R activities, should have participatory knowledge of land measurement, and should be conversant with land/structure valuation methods. Knowledge of local language is a necessary qualification.

❖ **Key Professional (Social)**

Should be at least a graduate in social sciences. She/he should have at least 5 years of working experience of which at least 2 years in R&R or rural development projects. Should have sound understanding of the land acquisition process, experience in developing, implementing vocational training and participatory management. Knowledge of local language is a necessary qualification.

❖ **Key Professional (HIV/AIDS)**

Since HIV/AIDS will be one of the major implementation concerns, the team will have professional with expertise to work on issues of HIV/AIDS with an objective to generate awareness on the issue and work towards its prevention. Professional with at least 3-5 years of experience on HIV/AIDS awareness and communication techniques will be qualified to fill up the position.

❖ **Technical Support Professionals**

Should be graduate or equivalent in social sciences. Knowledge of local language and experience of working in the region is desired.

Additionally, the following conditions shall apply to the team proposed by the NGO:

- That the proposal should accompany a personnel deployment schedule, clearly indicating whether the deployment is home-office based or in the field.
- That the NGO must propose at least one woman as part of the key personnel. The person-month deployment of the woman key personnel shall constitute at least 33% of the assignment.
- That the women key persons, if selected for the contract, may be replaced during the period of contract, only with women key persons of equivalent qualifications and experience.
- That the NGO will depute a 'technical support' team to work at the site, which will consist of women members. Junior support personnel and / or administrative staff will not be considered as 'technical support' professionals, as far as this condition is concerned.

❖ **Scope of Work**

- ❖ Survey and verification of the DPs.
- ❖ Verification of land records followed by verification on the spot related to identified plots and owners.
- ❖ Develop rapport with the DPs.
- ❖ Verify and Photograph of each DP for ID cards.
- ❖ Assist to issue identity cards to the DPs.
- ❖ Co-ordinate with the DRO to implement R&R activities.

- ❖ Conduct market feasibility study.
- ❖ Valuation of properties/assets for finalization of replacement value.
- ❖ Participate with the DRO to undertake public information campaign at the commencement of the projects.
- ❖ Distribute the pamphlets of R&R policy to the DPs.
- ❖ Assist the DPs in receiving the compensation.
- ❖ Facilitate the process of arranging loans for DPs.
- ❖ Facilitate the opening of joint accounts.
- ❖ Generate awareness about the alternate economic livelihood and enable the DPs to make informed choice.
- ❖ Prepare micro-plans for R&R.
- ❖ Enable the DPs to identify the alternate sites for agriculture, residential and commercial plots.
- ❖ Participate in the consultation on allotment of shops and residential plots.
- ❖ Ensure the DPs have received their entitlements.
- ❖ Ensure the preparation of rehabilitation sites.
- ❖ Participate in the meetings organized by the PIU.
- ❖ Submit monthly progress reports.
- ❖ Identify training needs and institutions for the DPs for income generating activities.
- ❖ Participate in the disbursement of cheques for the assistance at public places.
- ❖ Coordinate the training programs of the DPs for income generating activities.
- ❖ Coordinate the meeting of District Level Committees.
- ❖ Accompany DP to GRC.
- ❖ Awareness campaigns for highway related diseases.
- ❖ Ensure the DP judiciously uses compensation and R&R assistance.



## ANNEXURE 5: LAND SCHEDULE

| Land Schedule on NH 127 B<br>(from KM 0.00 to KM 54.523) |                             |                      |                     |                    |                     |                   |               |                            |                                |                                    |                     |                                   |
|----------------------------------------------------------|-----------------------------|----------------------|---------------------|--------------------|---------------------|-------------------|---------------|----------------------------|--------------------------------|------------------------------------|---------------------|-----------------------------------|
| Sl. No.                                                  | Name of The Village         | Name of The District | Start Chainage (Km) | End Chainage. (Km) | Private land (Hec.) | Govt. land (Hec.) | in (Hec.)     | Road side Open area (Hec.) | Road side Built-up area (Hec.) | Bypass built-up & agg. Area (Hec.) | Total Cost (In Cr.) | Total Cost with solatium (In Cr.) |
| 1                                                        | Vairiguri                   | Kokrajhar            | 0.000               | 0.608              | 1.280               | 0.650             | 1.930         | 0.050                      | 1.230                          |                                    | 0.98                | 1.96                              |
| 2                                                        | Srirampur 1No               | Kokrajhar            | 0.608               | 3.155              | 3.930               | 1.980             | 5.910         | 0.360                      | 3.570                          |                                    | 3.10                | 6.20                              |
| 4                                                        | Kembolpur 1No               | Kokrajhar            | 4.973               | 6.132              | 1.917               | 0.036             | 1.953         | 1.277                      | 0.640                          |                                    | 2.01                | 4.01                              |
| 5                                                        | Kembolpur 2No               | Kokrajhar            | 6.132               | 7.163              | 1.350               | 0.230             | 1.580         | 0.216                      | 1.134                          |                                    | 1.11                | 2.21                              |
| 6                                                        | Naisapur                    | Kokrajhar            | 7.163               | 7.761              | 0.250               |                   | 0.250         | 0.247                      | 0.003                          |                                    | 0.30                | 0.60                              |
| 7                                                        | Mallikapur 1No              | Kokrajhar            | 7.761               | 8.082              | 0.290               | 0.115             | 0.405         | 0.266                      | 0.024                          |                                    | 0.34                | 0.67                              |
| 8                                                        | Anandapur                   | Kokrajhar            | 8.082               | 8.461              | 0.380               | 0.107             | 0.487         | 0.223                      | 0.157                          |                                    | 0.38                | 0.77                              |
| 9                                                        | Kyarappur                   | Kokrajhar            | 8.461               | 9.241              | 0.076               | 0.590             | 0.666         | 0.027                      | 0.049                          |                                    | 0.07                | 0.14                              |
| 10                                                       | Grehempur                   | Kokrajhar            | 9.241               | 10.905             | 2.830               | 0.266             | 3.096         | 1.355                      | 1.475                          |                                    | 2.72                | 5.45                              |
|                                                          |                             |                      |                     |                    |                     |                   |               |                            |                                |                                    | 0.00                | 0.00                              |
| PACKAGE-I                                                |                             |                      |                     |                    | <b>14.023</b>       | <b>4.594</b>      | <b>18.617</b> |                            |                                |                                    | <b>12.85</b>        | <b>25.69</b>                      |
| 11                                                       | Musalmanpara                | Dhubri               | 10.905              | 12.750             | 2.054               | 0.049             | 2.1027262     | 0.224                      | 1.830                          |                                    | 1.64                | 3.27                              |
| 12                                                       | 1.Dhaturamari<br>2. Oxiguri | Dhubri               | 12.750              | 14.950             | 0.797               | 0.533             | 1.3301696     | 0.101                      | 0.696                          |                                    | 0.64                | 1.28                              |
| 13                                                       | Natabari                    | Dhubri               | 14.950              | 16.550             | 0.385               | 1.096             | 1.4805162     | 0.102                      | 0.283                          |                                    | 0.33                | 0.67                              |
| 14                                                       | Ujanpetla                   | Dhubri               | 16.550              | 19+358             | 4.444               | 0.360             | 4.8040919     | 1.765                      | 2.679                          |                                    | 4.11                | 8.23                              |
| 15                                                       | Madhyapetla                 | Dhubri               | 19.358              | 20+460             | 1.422               | 0.378             | 1.8001223     | 0.858                      | 0.564                          |                                    | 1.45                | 2.90                              |
| 16                                                       | Madhyapetla                 | Dhubri               | 20.460              | 21.175             | 2.612               | 0.378             | 2.9900346     |                            |                                | 2.612                              | 1.87                | 3.75                              |

| Land Schedule on NH 127 B<br>(from KM 0.00 to KM 54.523) |                                 |                      |                     |                    |                     |                   |               |                            |                                |                                    |                     |                                   |
|----------------------------------------------------------|---------------------------------|----------------------|---------------------|--------------------|---------------------|-------------------|---------------|----------------------------|--------------------------------|------------------------------------|---------------------|-----------------------------------|
| Sl. No.                                                  | Name of The Village             | Name of The District | Start Chainage (Km) | End Chainage. (Km) | Private land (Hec.) | Govt. land (Hec.) | in (Hec.)     | Road side Open area (Hec.) | Road side Built-up area (Hec.) | Bypass built-up & agg. Area (Hec.) | Total Cost (In Cr.) | Total Cost with solatium (In Cr.) |
| 17                                                       | Alokjhari                       | Dhubri               | 21.175              | 21.905             | 2.808               | 0.255             | 3.0627842     |                            |                                | 2.808                              | 2.02                | 4.03                              |
| 18                                                       | Bhatipetla                      | Dhubri               | 21.905              | 23.950             | 3.597               | 3.110             | 6.7071991     | 0.337                      | 3.260                          |                                    | 2.84                | 5.68                              |
| 19                                                       | Bhatipetla                      |                      | 22.690              | 24.180             | 0.240               |                   | 0.2396524     | 0.240                      | 0.000                          |                                    | 0.29                | 0.57                              |
| 20                                                       | Uttar Kachukhana                | Dhubri               | 23.950              | 26.350             | 1.775               | 1.183             | 2.9581503     | 1.775                      |                                |                                    | 2.12                | 4.25                              |
| 21                                                       | Kachukhana Harinchara Paglaganj | Dhubri               | 26.350              | 27.650             | 1.548               | 0.304             | 1.8517617     | 1.550                      |                                |                                    | 1.85                | 3.71                              |
| PACKAGE-II                                               |                                 |                      |                     |                    | <b>21.681</b>       | <b>7.646</b>      | <b>29.327</b> |                            |                                |                                    | <b>19.16</b>        | <b>38.33</b>                      |
| 22                                                       | Kachukhana Harinchara Paglaganj | Dhubri               | 27.650              | 28.150             | 0.595               | 0.117             | 0.7122160     | 0.600                      |                                |                                    | 0.72                | 1.44                              |
| 23                                                       | Bahakahi                        |                      | 28.150              | 28.960             | 2.348               | Bypass            | 2.3477016     |                            | 0.170                          | 2.1777016                          | 1.69                | 3.38                              |
| 24                                                       | Moramari 1st part               | Kokrajhar            | 28.960              | 29.960             | 3.981               | Bypass            | 3.9811487     |                            |                                | 3.981                              | 2.86                | 5.71                              |
| 25                                                       | Barundanga                      | Dhubri               | 29.960              | 30.950             | 3.397               | 0.398             | 3.795127      |                            | 0.367                          | 3.030                              | 2.45                | 4.90                              |
| 26                                                       | Barundanga                      |                      | 30.950              | 32.625             | 4.491               | 0.068             | 4.5586607     | 1.601                      | 2.890                          |                                    | 4.07                | 8.15                              |
| 27                                                       | Barundanga                      |                      | 32.625              | 33.432             | 0.571               | 0.012             | 0.5834348     | 0.158                      | 0.413                          |                                    | 0.50                | 1.00                              |
| 28                                                       | Kamalar Jhar                    | Dhubri               | 33.432              | 35.312             | 1.281               | 0.340             | 1.6205865     | 0.492                      | 0.789                          |                                    | 1.18                | 2.36                              |
| 29                                                       | Barundanga( Chapar)             | Dhubri               | 34.805              | 35.325             | 0.657               | 0.129             | 0.7855742     | 0.010                      | 0.647                          |                                    | 0.50                | 0.99                              |
| 30                                                       | Debottar Barundanga             | Dhubri               | 35.325              | 36.080             | 1.300               | 0.089             | 1.3894404     | 0.064                      | 1.236                          |                                    | 1.00                | 2.00                              |
| 31                                                       | Matarjhar                       |                      | 36.080              | 36.500             | 0.123               | bypass            | 0.1228912     | 0.050                      | 0.070                          |                                    | 0.11                | 0.22                              |
| PACKAGE-III                                              |                                 |                      |                     |                    | <b>18.744</b>       | <b>1.153</b>      | <b>19.897</b> |                            |                                |                                    | <b>15.07</b>        | <b>30.14</b>                      |
| 32                                                       | Matarjhar                       |                      | 36.500              | 37.270             | 0.225               | bypass            | 0.2253005     | 0.090                      | 0.130                          |                                    | 0.20                | 0.41                              |

| Land Schedule on NH 127 B<br>(from KM 0.00 to KM 54.523) |                     |                      |                     |                    |                     |                   |               |                            |                                |                                    |                     |                                   |
|----------------------------------------------------------|---------------------|----------------------|---------------------|--------------------|---------------------|-------------------|---------------|----------------------------|--------------------------------|------------------------------------|---------------------|-----------------------------------|
| Sl. No.                                                  | Name of The Village | Name of The District | Start Chainage (Km) | End Chainage. (Km) | Private land (Hec.) | Govt. land (Hec.) | in (Hec.)     | Road side Open area (Hec.) | Road side Built-up area (Hec.) | Bypass built-up & agg. Area (Hec.) | Total Cost (In Cr.) | Total Cost with solatium (In Cr.) |
| 33                                                       | Naichar khuti       |                      | 37.270              | 37.960             | 0.489               | bypass            | 0.489414      | 0.340                      | 0.149                          |                                    | 0.52                | 1.04                              |
| 34                                                       | Balajan (Chapar)    | Dhubri               | 37.675              | 37.960             | 0.256               | bypass            | 0.2564327     | 0.256                      | 0.000                          |                                    | 0.31                | 0.61                              |
| 35                                                       | Baniamari           | Dhubri               | 37.960              | 39.800             | 10.089              | bypass            | 10.0890636    |                            | 1.473                          | 8.616                              | 7.28                | 14.57                             |
| 36                                                       | Balajan             |                      | 39.800              | 41.010             | 18.402              | bypass            | 18.4018916    |                            |                                | 18.402                             | 13.21               | 26.41                             |
| 37                                                       | Batuatuli           | Dhubri               | 41.010              | 41.998             | 5.162               | 0.039             | 5.2008097     | 3.422                      | 1.740                          |                                    | 5.39                | 10.79                             |
| 38                                                       | Debottar Hasdaha    | Dhubri               | 41.998              | 42.630             | 1.310               | 1.477             | 2.7867175     | 0.327                      | 0.983                          |                                    | 1.13                | 2.25                              |
| 39                                                       | Debottar Hasdaha    | Dhubri               | 42.630              | 43.480             | 2.062               | 0.149             | 2.2107807     | 1.032                      | 1.030                          |                                    | 2.00                | 4.01                              |
| 40                                                       | Khekseali           | Dhubri               | 43.050              | 43.300             | 1.134               | 0.091             | 1.2249359     | 0.300                      | 0.830                          |                                    | 0.98                | 1.96                              |
| PACKAGE-IV                                               |                     |                      |                     |                    | <b>39.129</b>       | <b>1.756</b>      | <b>40.885</b> |                            |                                |                                    | <b>31.02</b>        | <b>62.04</b>                      |
| 41                                                       | Khekseali           | Dhubri               | 43.300              | 44.308             | 4.572               | 0.367             | 4.9389417     | 1.230                      | 3.340                          |                                    | 3.97                | 7.94                              |
| 42                                                       | Debottar Hasdaha    | Dhubri               | 43.487              | 46.932             | 7.325               | 0.289             | 7.6144975     | 3.452                      | 3.873                          |                                    | 7.02                | 14.05                             |
| 43                                                       | Kismat Hasdaha      | Dhubri               | 46.932              | 47.025             | 0.522               | Bypass            | 0.5216348     | 0.175                      | 0.347                          |                                    | 0.47                | 0.94                              |
| 44                                                       | Kismat Hasdaha      | Dhubri               | 47.025              | 47.750             | 3.225               | Bypass            | 3.2246078     | 1.755                      | 1.470                          |                                    | 3.20                | 6.39                              |
| 45                                                       | Kismat Hasdaha      | Dhubri               | 47.750              | 48.170             | 2.283               | Bypass            | 2.283049      |                            | 0.196                          | 2.100                              | 1.65                | 3.31                              |
| 46                                                       | Debottar Hasdaha    | Dhubri               | 48.170              | 49.342             | 5.099               | Bypass            | 5.0991998     |                            | 0.000                          | 5.099                              | 3.66                | 7.32                              |
| 47                                                       | Kismat Hasdaha      | Dhubri               | 49.342              | 50.220             | 4.371               | Bypass            | 4.3705523     | 1.209                      | 3.162                          |                                    | 3.81                | 7.62                              |
| 48                                                       | Kismat Hasdaha      | Dhubri               | 50.163              | 50.806             | 1.661               | Bypass            | 1.6611794     | 0.875                      | 0.786                          |                                    | 1.63                | 3.27                              |
| 49                                                       | Kacharkhas          | Dhubri               | 50.220              | 51.610             | 3.955               | 0.578             | 4.5331938     | 1.017                      | 2.938                          |                                    | 3.41                | 6.83                              |
| 50                                                       | Adabari             | Dhubri               | 51.610              | 51.932             | 1.807               | Bypass            | 1.8068116     |                            | 0.347                          | 1.460                              | 1.31                | 2.61                              |
| 51                                                       | Adabari             | Dhubri               | 51.932              | 53.345             | 8.647               | Bypass            | 8.6473449     |                            |                                | 8.647                              | 6.21                | 12.41                             |
| 52                                                       | Adabari             | Dhubri               | 53.345              | 54.154             | 5.643               | Bypass            | 5.6434245     |                            |                                | 5.643                              | 4.05                | 8.10                              |
| PACKAGE-V                                                |                     |                      |                     |                    | <b>49.110</b>       | <b>1.234</b>      | <b>50.344</b> |                            |                                |                                    | <b>40.39</b>        | <b>80.78</b>                      |

| Land Schedule on NH 127 B<br>(from KM 0.00 to KM 54.523)                      |                     |                      |                     |                    |                     |                   |           |                            |                                |                                    |                     |                                   |
|-------------------------------------------------------------------------------|---------------------|----------------------|---------------------|--------------------|---------------------|-------------------|-----------|----------------------------|--------------------------------|------------------------------------|---------------------|-----------------------------------|
| Sl. No.                                                                       | Name of The Village | Name of The District | Start Chainage (Km) | End Chainage. (Km) | Private land (Hec.) | Govt. land (Hec.) | in (Hec.) | Road side Open area (Hec.) | Road side Built-up area (Hec.) | Bypass built-up & agg. Area (Hec.) | Total Cost (In Cr.) | Total Cost with solatium (In Cr.) |
|                                                                               |                     |                      |                     |                    | 142.688             | 16.383            | 159.071   | 30.677                     | 47.440                         | 64.577                             | 118.49              | 236.98                            |
| Total Land required for construction Dhubri & Kokrajhar District = 159.071 Ha |                     |                      |                     |                    |                     |                   |           |                            |                                |                                    |                     |                                   |
| Total existing govt. land or available for start construction = 16.383 Ha     |                     |                      |                     |                    |                     |                   |           |                            |                                | 142.694                            |                     |                                   |
| Total Private land to be acquired = 142.688 Ha                                |                     |                      |                     |                    |                     |                   |           |                            |                                |                                    |                     |                                   |

## ANNEXURE 6: Order of Government of Assam

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>GOVERNMENT OF ASSAM</b><br><b>ASSAM STATE DISASTER MANAGEMENT AUTHORITY</b><br><b>ANCILLARY BLOCK, JANATA BHAWAN, DISPUR, GUWAHATI-781006</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                     |
| <b>ORDER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| No. ASDMA.24/2020/Part-1/96                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Dated 2 <sup>nd</sup> August, 2020. |
| <p>After due consideration of the COVID situation as it prevails in the state of Assam and taking into consideration latest directives issued by the Ministry of Home Affairs, Government of India vide No. 40-3/2020-DM-I(A) dated the 29<sup>th</sup> July, 2020, the following modifications of order No. ASDMA.24/2020/Part-1/92 &amp; 93 dated 18<sup>th</sup> July, 2020 are allowed in the entire State of Assam:-</p> <p><b>This order shall come into force with effect from 7 PM (1900 hrs) of 2<sup>nd</sup> August, 2020 and remain valid till 7 PM (1900 Hrs) of 14<sup>th</sup> August, 2020.</b></p> <ol style="list-style-type: none"> <li>I. All permitted activities mentioned in our earlier orders shall continue to be allowed between 7 AM and 5 PM between Monday and Friday, subject to opening of only one side of the street.</li> <li>II. Malls and Gymnasiums are allowed to operate between Monday and Friday on the same side of the street on which other shops are allowed in Kamrup Metropolitan District and both sides in case of all other Districts.</li> <li>III. Restaurants and other hospitality services are allowed to function on all days except Saturday and Sunday with maintenance of COVID protocol of social distancing.</li> <li>IV. Hotels are allowed to operate with strict maintenance of COVID protocols;</li> <li>V. Inter District movement of people is allowed on Monday and Tuesday only. No separate permission/approval/e-permit will be required for inter-District movement.</li> <li>VI. All Central and State Government offices including Banks, Insurance Companies, NBFCs etc shall operate with 100% attendance except pregnant women. Point to point buses will be operated for the staff.</li> <li>VII. Non-contact sports in open space with social distancing shall be allowed;</li> <li>VIII. <b>Cinema Halls, Swimming Pools, Entertainment Parks, Theatres, Bars, Auditoriums, Assembly Halls and similar places of public gathering shall remain closed;</b></li> <li>IX. <b>Social/ Political/ Sports/ Entertainment/ Academic/ Religious functions and other large congregations shall remain closed.</b></li> <li>X. <b>Movement of individuals shall remain strictly prohibited between 6 PM (1800Hrs) and 6AM (0600 Hrs).</b></li> <li>XI. <b>No movement of individuals shall be allowed on Saturday and Sunday at any time all over the State;</b></li> </ol> <p style="padding-left: 40px;">Persons above 65 years of age and children below the age of ten years are advised to stay indoors except for unavoidable health reasons.</p> <p style="padding-left: 40px;">Wearing of face cover is compulsory in public places, in workplaces and during transport etc. Violation will attract a fine of Rs. 1000/- for the first offence;</p> <div style="text-align: right; margin-top: 20px;"> <br/>       (KUMAR SANJAY KRISHNA)<br/>       Chief Secretary, Assam     </div> |                                     |

## ANNEXURE 7: Presentation for 2nd stage Disclosure

# SUPPLEMENTARY SOCIAL IMPACT ASSESSMENT OF NATIONAL HIGHWAY 127B IN THE STATE OF ASSAM

EXECUTING AGENCY: NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT  
CORPORATION LIMITED (NHIDCL)  
FUNDED BY: JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

### EXECUTIVE SUMMARY

The project road is of significant importance as the road connecting two National Highways (NH31C and NH-31) and linking to the important habitations such as Srirampur, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pagla Hat, and Barun Danga.

The entire road falls under districts of Kokrajhar & Dhubri in the state of Assam. The Road provides all weather connectivity in the flood prone areas on the right bank of Brahmaputra River. After the completion of the bridge on the Brahmaputra River near Dhubri it will provide a through connectivity to Tura in Meghalaya and Bangladesh through Dalu.

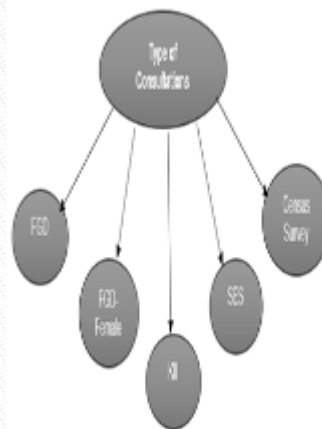


## ROAD ALIGNMENT ON SATELLITE IMAGERY



## APPROACH & METHODOLOGY

- The Consultant have made a reconnaissance survey at the proposed corridor with the representatives of PIU simultaneously the stakeholder mapping was done with review of the secondary data and literature available.
- Public Consultation, Key Informant Interview and Stakeholders Consultations were conducted throughout the corridor to get the essence of the same.
- Specific messages that evolved from Public Consultation and Key Informant Interview were noted and shared with the PIU.
- Census survey of the structures and land were conducted for the impacted area.
- Then the Socio-Economic-Survey was conducted along the proposed alignment of the road.
- The details were noted to formulate the Social Impacts and the mitigation methods in form of Resettlement Plan is also prepared.



## IMPACTS ON STRUCTURE

### OWNERSHIP

- ▶ Title Holder
- ▶ Encroacher
- ▶ Squatter
- ▶ Kiosk
- ▶ Tenants
- ▶ Employees to Commercial Structures / Agricultural Labour
- ▶ Persons losing only land
- ▶ Common Property Resources

### USE OF STRUCTURE

- ▶ Residential
- ▶ Commercial
- ▶ Compound wall of residential structure
- ▶ Res-cum-commercial
- ▶ Under Construction
- ▶ Cattle Shed

### TYPE OF STRUCTURE

- ▶ Compound Wall
- ▶ Permanent
- ▶ Semi-Permanent
- ▶ Temporary
- ▶ Tin/ Bamboo etc. Fencing
- ▶ Under Construction
- ▶ Kiosk

### TYPE OF PROPERTIES– CPR

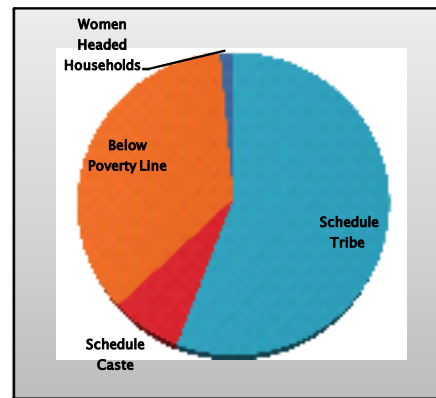
- ▶ Temple
- ▶ Mosque
- ▶ Waiting Shade
- ▶ Chabutara
- ▶ School
- ▶ Idgah
- ▶ Union Office

## VULNERABILITY SS11

Vulnerable Families are defined as affected families who are :

- (i) below poverty line (BPL);
- (ii) women headed household (WHH)
- (iii) differently able households (DAH)
- (iv) elderly (60 years and above) living alone
- (v) scheduled tribes (ST)
- (vi) scheduled caste (SC)

It shall be noted here that though there are multiple categories of vulnerability groups exist in the project road, we have taken single impact of single vulnerable category for the authentication.



Additional R&R assistance of Rs. 25000/- per family.

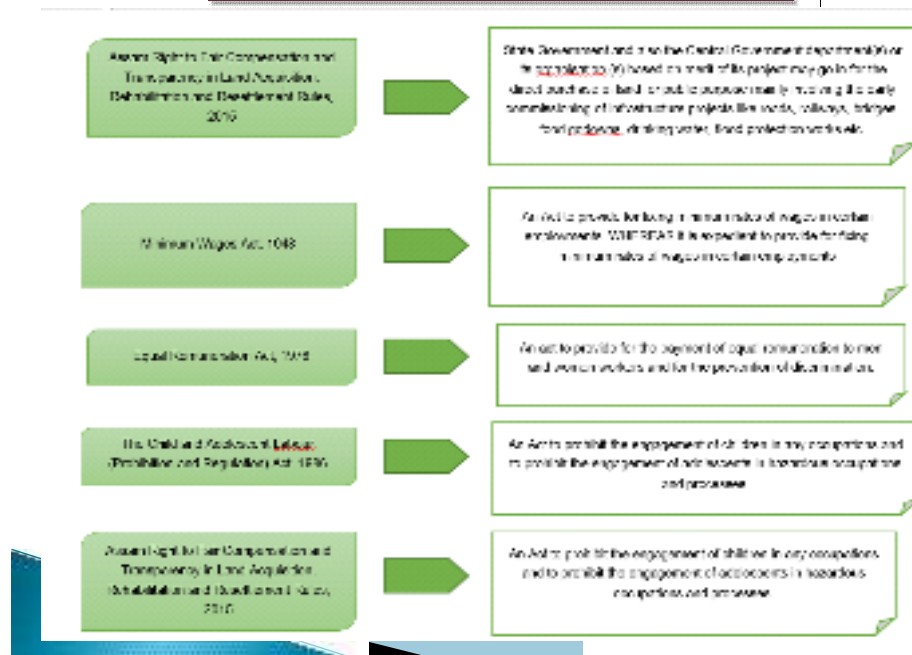


## SOCIAL IMPACT ASSESSMENT

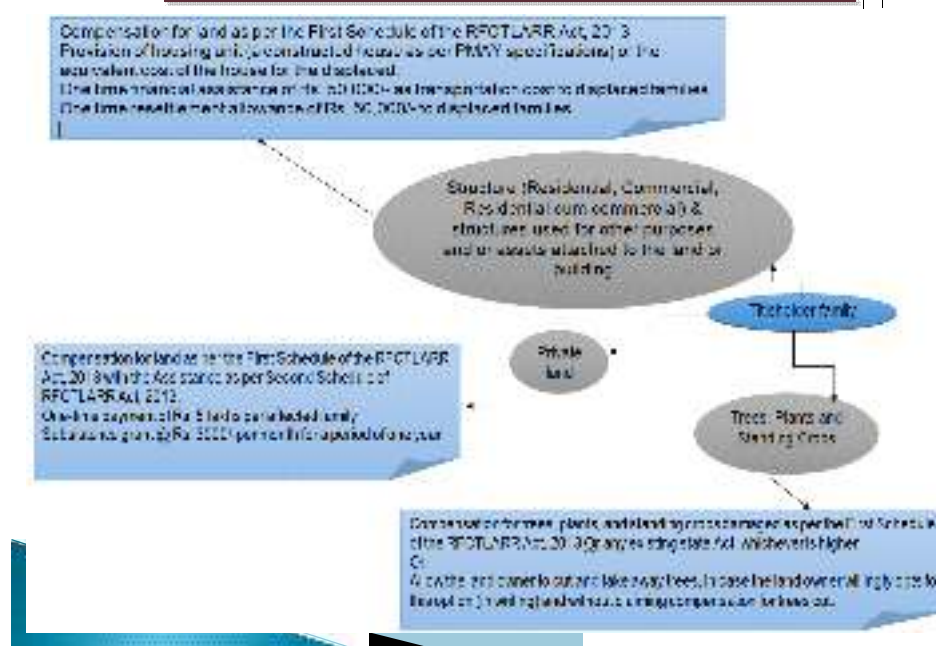
### Summary of Project Impacts in comparison of previous SIA

| S/N | Item                                               | Number of respondents | Percent (%) |
|-----|----------------------------------------------------|-----------------------|-------------|
| 1.  | Female Prisoners and Prisoners of War (POW) (n=10) | 102,000               | 100%        |
| 2.  | Female Foreign War Bond                            | 400                   | 1%          |
| 3.  | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 4.  | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 5.  | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 6.  | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 7.  | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 8.  | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 9.  | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 10. | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 11. | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |
| 12. | Female Prisoners of War (POW) (n=10)               | 100                   | 1%          |

## APPLICABLE LEGAL FRAMEWORK

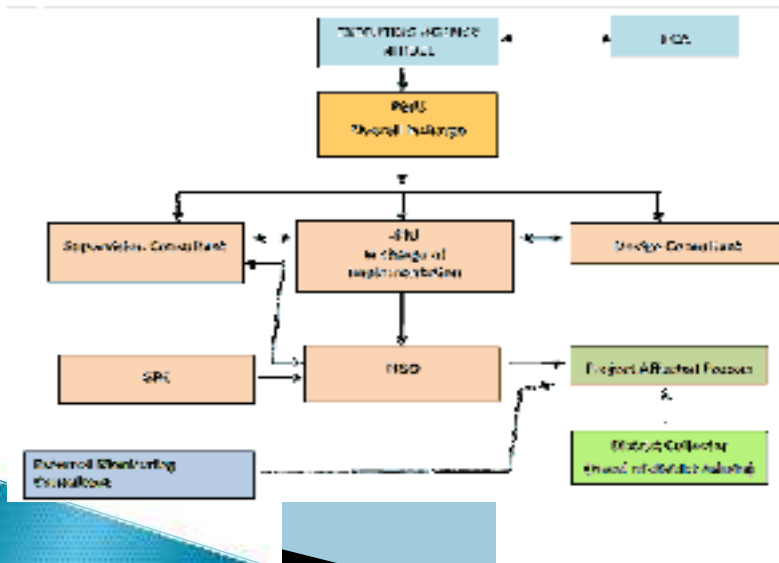


## ENTITLEMENT MATRIX - TITLE HOLDERS





## INSTITUTIONAL ARRANGEMENT FOR RAP



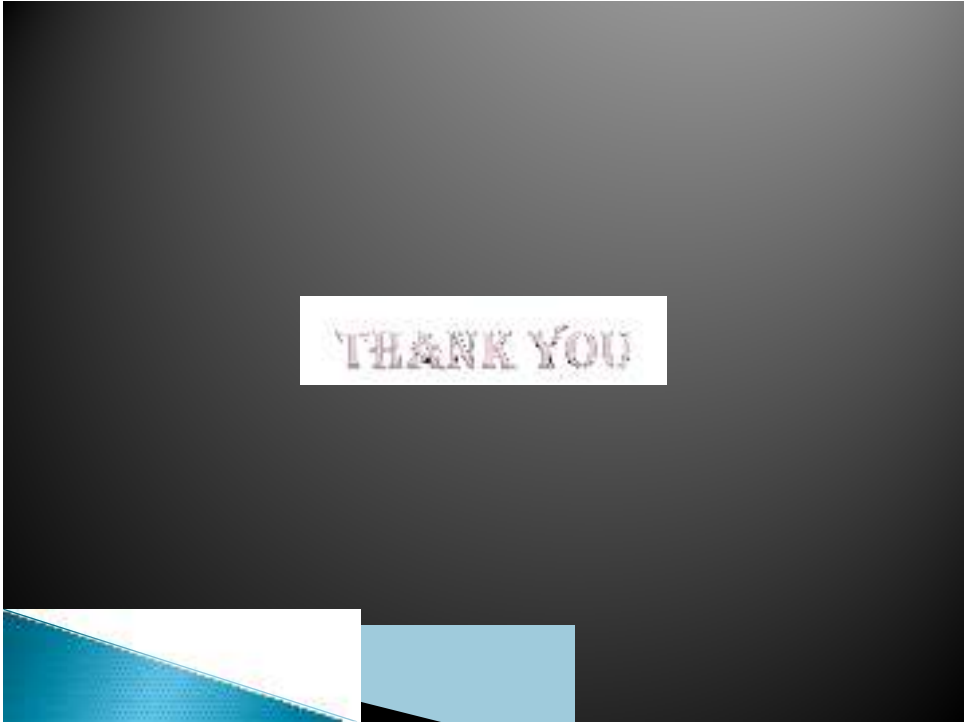
## GRIEVANCE REDRESSAL MECHANISM

**The GRC will comprise seven (7) members. The committee will comprise the following officials:**

1. General Manager/ Deputy General Manager, NHIDCL – – Chairperson
2. Representative of District Commissioner – Member
3. Dedicated Person of NHIDCL, Assam– Convener–Member
4. Representation of District Council/CALA– Convener–Member
5. Executive Engineer or his/her representative (from the concerned department – PWD/Irrigation, Municipal Engineering Directorate/KMC, District Engineer– Zilla Parishad) – Member
6. Municipal Corporator/Councilor or Representative of Gram Panchayat of the concerned area – Member
7. Any other Female Representation as nominated by District Council/CALA

## RESSETTLEMENT AND REHABILITATION BUDGET

|                                               |                        |
|-----------------------------------------------|------------------------|
| ▶ Compensation for Land Acquisition           | Rs. 236.98 Crore       |
| ▶ Compensation for Structure                  | Rs. 29.36 Crore        |
| ▶ Assistance to Residential Households (TH)   | Rs. 5.91 Crore         |
| ▶ Assistance to Commercial Households(TH)     | Rs. 5.57 Crore         |
| ▶ Assistance to Residential Households (NTH)  | Rs. 1.11 Crore         |
| ▶ Assistance to Commercial Households(NTH)    | Rs. 0.69 Crore         |
| ▶ Assistance to Commercial KIOSK (NTH)        | Rs. 0.26 Crore         |
| ▶ Special Assistance to Vulnerable Households | Rs. 1.75 Crore         |
| ▶ Compensation for CPRs                       | Rs. 0.96 Crore         |
| ▶ Implementation Cost                         | Rs. 2.93 Crore         |
| ▶ Inflation and Other Component               | Rs. 37.42 Crore        |
| ▶ <b>Total R&amp;R Cost</b>                   | <b>Rs.349.25 Crore</b> |





## **ANNEXURE 8: Leaflets for distribution**

## **CHAPTER - 4**

### **SURVEY AND INVESTIGATION**

#### **4.1 Objective**

The main aim of the consultancy service is to establish the technical, economical and financial viability of the project and prepare detailed methodology adopted while preparing detailed Project Report for Construction & up-gradation of the newly declared NH-127B (Assam Portion) starting from Srirampur on NH-27(old NH-31 C) at Chainage 0.00 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km to NH standard. Feasibility of the project has been established on the requirements with regard to rehabilitation, up gradation and improvement of road based on the following activities:-

- Highway Design,
- Pavement Design,
- Design of Service Roads (if required),
- Type of Intersections & development,
- CD & Bridge design
- Rehabilitation & Widening of Existing CD Works & Bridges,
- Road Safety Feature,
- Quantities and Cost Estimates.
- Social & Environmental Impacts

#### **4.2 Parameter of Services**

The road name as per TOR/Contract is NH-127B starting from Srirampur on NH-27(old NH-31 C) to the immediate approach of proposed bridge over river Brahmaputra near Dhubri in the state of Assam. The Project Road starts from Srirampur(in the state of Assam) and passes through village / localities, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pglā Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, DebduttaHazardaha 1, Kachari Hat, DebduttaHazardaha 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari and ends at immediate approach of proposed bridge over river Brahmaputra near Dhubri.

The project road lies in Kokrajhar and Dhubri district of Assam. The road runs through five Police Stations namely, Srirampur, Tamarhat, Dhubri, Gouripur and Gossaigaon Police Station. The length of the road is 54.523 km (As per Design length).

The project road is of significant importance as the road connecting two National Highways (NH31C and NH-31), one proposed bridge over river Brahmaputra and connects to important nearby villages

Srirampur, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, DebduttaHazarda 1, Kachari Hat, DebduttaHazarda 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari.

The main objective of the Consultancy Services is to establish Detailed Project Reports for rehabilitation and up-gradation of the existing Single lane/ Intermediate (from Km 0 to Km 54.523 as per Design length) to 2 Lane with paved shoulder carriageway of National Highway configuration.

The Detailed Project Report would inter-alia include Detailed Highway Design, Design of Pavement options for flexible or rigid pavements, Design of bridges and cross-drainage structures and grade separated structures, design of service roads, quantities of various items, detailed cost estimates, Environmental Impact Assessments (EIA) and Social Impact Assessment(SIA), Tender documents for EPC implementation.

### **4.3 General**

As per requirements of the study, the consultants have carried out different types of field studies, engineering surveys and investigations to gather data and information necessary for Feasibility Study (FS). The aim of investigation is to develop adequate supportive database for selecting and preparing the most appropriate proposal to meet the functional and structural efficiency and safety requirements. The engineering investigations and surveys have been carried out in line with the specifications laid out in the Quality Assurance Plan submitted.

A competent team of suitably qualified key professionals as per the requirements of TOR and other supporting staff has been selected for carrying out the services and moved to site from time to time.

The major aspects of surveys and investigations relevant to the present study cover the following:

### **4.4 Topographic Survey**

- Fixing of GPS pillars and Benchmark pillars
- Carrying the benchmark levels from GTS benchmarks
- Traversing to transfer the coordinates to traverse stations
- Collecting the details and making drawing.
- Data processing and drawing in presentable format and checking at site.

#### **❖ General**

As per the TOR the Consultants have carried out detailed topographic survey along the project corridor. It includes carrying out control point survey using DGPS at every 2/3 Km intervals and fixing of Benchmark pillars at every 250m interval with reference to GTS Benchmark.

The survey covered a strip of 60m width, broadly 30m either side of the existing centerline of carriageway. Cross sections covering the carriageway have been taken at 25m interval and full cross sections for 60m width have been collected at every 50m interval to form Digital Terrain Model (DTM). Longitudinal section levels along centre line at at-least every 25 m interval, at the locations of curve points, small streams, and intersections and at the locations of change in elevation has been obtained. Cross sections at every 50 m interval in full extent of survey corridor covering sufficient number of spot levels on existing carriageway and adjacent ground for profile correction course and earth work calculations has been taken. At curves, cross sections have been taken at closer intervals. Longitudinal section for cross roads for length adequate for design and quantity estimation purposes has been captured. For Longitudinal and cross sections for streams as per recommendations contained in IRC Special Publication No. 13 and IRC:5-1998 data has been captured.

#### ❖ **Control Survey**

Control survey includes following:

- Establishment of horizontal control network using GPS.
- Traverse control along the road using total station
- Elevation control of all the above control points using auto level

GPS control points were marked on cement concrete pillars embedded in the ground. In order to ensure a high degree of survey accuracy, control points at an approximate interval of 2/3 km were established along the length of the road. Each GPS control pillar is supplemented by one Additional inter-visible pillar of same specification within the vicinity of 200 to 300 m. The co-ordinates of all these control points were observed using GPS receivers in differential mode. The twin pillars facilitate the checking of bearings and are being used for the starting of independent survey in any 2/3 km stretch. The concrete pillars were suitably numbered and their description has been prepared, to ensure easy identification and accessibility in future.

Total station traverse has been carried out to establish Additional secondary control points, 250 m apart, starting with one pair of GPS control point and closing on to the next GPS control point. These traverse control points are used for further detailed survey.

The elevations of all control points have been established using auto levels. The elevation of the control points has been established with respect to the GTS (geodetic triangulation survey) benchmarks established by Survey of India.

## ❖ **Survey**

Based on the above control network (both for plan and elevation), topographical survey using total station equipment has been carried out in order to collect co-ordinate data (x, y, z) of all the topographical points as required for the preparation of strip plan submitted as part of the interim report. In general, these include:

- road centre line
- pavement edges
- outer shoulder edges
- toe lines of fills and cuts
- longitudinal and transverse drains / ditches

**All man-made and natural topographical features have been surveyed, including:**

- water sources
- structures
- buildings
- utilities etc. as visible, falling inside the corridor

Additional surveys for geometric improvements, Bypasses/realignments, bridge sites and junctions were also undertaken. At locations, where the existing alignment crosses other roads, the survey was extended to a minimum of 100m on either side of the road centre and of sufficient width to allow for the improvements to be designed. Surveys for longitudinal and cross-sections for major and minor streams as required for preliminary design were also carried out.

## ❖ **Details of Utility Services & other Physical Features**

While continuing the topographic survey and also with the road inventory survey, details of all important utility services and other physical features will be collected along the project road. The utility services include buildings and structures, monuments, places of worship, stream/canal, water mains, gas/oil pipelines and crossings, trees, electric and telephone lines (overhead and underground) poles of optical fiber cables (OFC) etc. which may require shifting at the time of execution.

The information collected during field surveys have been shown on a strip plan so that the proposed improvements can be appreciated and the extent of land acquisition with L.A. schedule utility removals of each type can be assessed and suitable action can be initiated.

### ❖ **Data Processing**

Computers systems, with requisite software, have been established in the field. All data from the total stations, and other field records, was downloaded regularly on to the field computer to ensure completion of data processing in the field itself. Further processing, for production of requisite outputs, was carried out using other software in the field or at headquarters, as required. Data were supplied to the design team in a format suitable for the preparation of drawings and road design alignment.

### ❖ **Methodology for Surveying, Data Collection and Analysis**

Field studies covering topographic field surveys, traffic (classified volume, movement pattern and vehicle loading characteristics), investigations for culvert, bridges and structures, environmental aspects, socio-economic conditions and construction materials are the essential tasks for the assignment. The field studies were performed as per the stipulations of the TOR which are quite elaborate and self-explanatory.

The Consultants used the Total Station and digital/automatic levels while carrying out the topographic field surveys. The data collected in the site downloaded to the electronic computers for further processing and analysis after pre-processing and validation. The processing of the field survey data and the generation of the road drawings are based on “digital terrain modeling” using INROADS and MX Road software. The data analysis for the design of bridges and structures have been done using sophisticated structural design software such as STADD PRO, ADAPT, GT Strudl and in-house software prepared in conformity to MORT&H/IRC specifications.

The traffic data is analyzed using the proven methods as per the IRC guidelines. Traffic demand estimates are based on economic indicators besides the time-series data and seasonal correction factor has been calculated by fuel sale data analysis.

The team of senior surveyors with supporting staff has carried out topographical survey, arresting all features on road side in the month of December-2015/January-2016. Plan profile and design work commenced simultaneously in the main office.

## **4.5 Road Inventory**

A detailed inventory of the project road has been prepared through dimensional measurements and visual inspection to assess the existing status as per IRC SP: 19 and also keeping in mind that these will become part of concession agreement as Scheduled. Features like chainage, terrain, land use, width of pavement and shoulders, height of embankment, geometric deficiencies, important road junctions, utilities etc. were recorded in the prescribed format. The road inventory data for the



project road length was collected for each kilometer and part thereof as warranted by appreciable change in the physical features as mention below: -

- Terrain (plain, rolling, mountainous).
- Land-use (agricultural, commercial, forest, residential etc.) @ every kilometer.
- Carriageway width, surfacing type, @ every 500m or change of feature whichever is earlier
- Shoulder surfacing type and width @ every 500m or change of feature whichever is earlier
- Sub-grade, local soil type @ every 500m or change of feature whichever is earlier
- Horizontal and vertical curve
- Road intersection type and details
- Retaining structure details, height of embankment or cut
- Location of water bodies and other utility services
- Existing Right of Way
- Culverts, bridges and other structures
- General drainage conditions

The team of Highway Engineer & supporting staff carried out road inventory covering the above detail on roads in the month of November-2015 and the data has been computerized in main office.

#### **4.6 Pavement Surveys and Investigations**

Pavement condition survey has been carried out by the Pavement Engineer with supporting staff and following pavement distress has been noted along the entire project stretch. All the data has been compiled in the main office.

- Cracking (as a percentage of paved carriageway area)
- Raveling (as a percentage of paved carriageway area)
- Pothole (as a percentage of paved carriageway area)
- Patch Works (as a percentage of paved carriageway area)
- Rut depth, mm
- Edge drop, mm

#### **4.7 Pavement Investigations**

Pavement Investigation has been done by means of BBD Survey and trial pit excavation @500m interval at pavement shoulder interface. The survey was carried out to determine the following.

- Pavement Structural Evaluation with BBD equipment
- Pavement composition
- Sub-grade Characteristics and Strength

## 4.8 Drainage

Existing drainage pattern along the corridor has been surveyed and following information have been noted by Bridge Engineer and his site team. The information is regarding:

- Road side Drainage
- Inventory of Cross Drainage Works and Bridges
- Condition and Structural Adequacy
- Hydraulic adequacy

The above details have been included in Appendix of main report.

## 4.9 Sequence of Activities

Based on an in-depth study of the scope of services contained in the TOR for the project, the consultants have evolved a methodology wherein the work has been divided into a set of Task Series that are listed below

### Task Series and Individual Task Elements

- **Initial Activities**
  - Project Start-Up and Inception
  - Team Mobilization & Start-up Meeting
  - Secondary Data Collection and review
  - Reconnaissance Survey
  - Standards and Code of Practices
  - Finalization of Traffic Survey Stations and Locations
  - Preparation of Inception Report & Quality Assurance Plan
- **Engineering Survey**
  - Engineering Surveys/Investigations
  - Reconnaissance and Alignment
  - Topographic survey
  - Longitudinal & Cross Sections
  - Details of utility services & other physical features
- **Traffic Survey**
  - Traffic Survey and Analysis
  - Classified Traffic Volume Count
  - Origin Destination and Commodity Movement Survey
  - Turning Movement Survey
  - Axle Load Survey

- Traffic Demand Estimates
- **Pavement Survey**
  - Road and Pavement Investigations
  - Road Inventory Survey
  - Pavement Investigation
  - Sub-grade Characteristics and Strength
  - Roughness Survey
  - Strengthening of flexible road pavement using Benkelman beam deflection technique.
- **Cross Drainage Survey**
  - Investigations for Bridges and Structures
  - Inventory of Bridges, Culverts and Structures
  - Hydraulic and Hydrological Investigation
  - Condition Survey for Bridges, Culverts and Structures
  - Geotechnical Investigations and Sub-soil explorations
- **Material Survey**
  - Material Investigations
- **Design Work Desk Study**
  - Detailed Engineering Design
  - Design Standard
  - Geometric Design
  - Pavement Design
  - Design of High Embankments (If Required)
  - Design of Bridges & Structures
  - Drainage Design
  - Traffic Safety features, Road Furniture and Road Markings
  - Arboriculture and Landscaping
- **Miscellaneous Engineering work**
  - Bus bay
  - Truck Lay bye
  - Protection work & traffic safety
- **Environment & Social Study**
  - Environmental & Social Screening
  - Environmental Impact Assessment
  - Social Impact Assessment

- Reporting Requirements of EIA & EMP
- Reporting Requirements of RAP
- **Cost Estimate**
  - Estimation of Quantities and Project Costs
  - Rate Analysis
  - Detailed Estimates for Quantities and Project Cost

All the above survey/collection of information have been carried out and used against respective design of project road.

#### **4.10 Detailed Methodology Adopted**

The methodology evolved for the assignment has been structured into a set of inter-related but distinctive 'Task' elements, which are designed to carry out specific tasks. The output of each 'Task' element or activity in the network of various 'Tasks' is either an input to another 'Task' or a distinct output as per scope of works. The details concerning objectives and work assigned to each 'Task Series' and individual 'Task' elements are discussed in this section.

#### **4.11 Secondary Data Collection and Review**

During the project several secondary data have been collected/in the process of procurement and they are as follows:

- Drawings and details of existing bridges
- Fuel sales Data

The data thus collected are reviewed and taken up further for necessary action.

.

#### **4.12 Reconnaissance Survey**

The following documents and data have been collected the process of procurement during the reconnaissance survey by the team:

- Climate of the area surrounding the project road
- Road inventory and condition
- Year of original construction, year and type of major maintenance /rehabilitation works.
- Condition of bridges and cross-drainage structures
- Type and location of existing utility services
- Hydraulic data
- Survey and evaluation of locally available construction materials

### **4.13 Standards & Codes of Practice**

All activities related to field studies, design and documentation have been done as per the latest guidelines/circulars of the MORT&H and relevant publications of the Indian Roads Congress (IRC) and Bureau of Indian Standards (BIS).

### **4.14 Finalization of Traffic Survey Stations and Locations**

After the reconnaissance survey and desk studies of the maps available of the project area, Traffic survey stations and their locations have been finalized by discussing with local PWD official.

### **4.15 Traffic Demand Estimates**

The traffic demand estimates for the passenger as well as freight have been made by the consultants keeping in view the past and existing traffic levels, operational characteristics, divertible traffic from other road forecasts made for similar roads. Data on population and economic performance, and forecasts made for similar roads in the country has been used for assessing the future growth rate. The growth rates were also be compared with the trends observed in historical traffic volume data for the last few years. The projections from annual vehicle productions in India has also been kept in view while analysis and forecasting of the growth rates of traffic.

Traffic projections were carried out using the growth rates derived above. The projections were done vehicle type-wise. The projected volumes were incorporated / utilized to obtain the total cumulative number of standard axles expected for 15 years period.

### **4.16 Preparation of Quality Assurance Plan**

Immediately upon the award of the consultancy work, based on our extensive experience in this field and our knowledge of the project, a detailed draft Quality assurance Plan (QAP) has been prepared which covers all aspects of field studies, investigations, analysis, design and documentation. The system also ensures responsibilities to be shared by concerned key personnel.

The Consultants have used the system recently completed / on-going projects of similar nature and ensured effective implementation of procedures, checks, calibrators and control networks outlined in the system for traffic surveys, engineering surveys and investigations, design of road, pavement, bridges and structures, environmental and social impact assessment, economic and financial analysis and documentation.

The QAP has been provided to all the team personnel and to MORT&H, to control and monitor the quality of work and project deliverables.

### **4.17 Hydraulic and Hydrological Investigation**

Hydrological investigation has been carried out for those structures, whose waterways were found to be inadequate from local inquiry and records of pasts flooding patterns and drainage patterns.

The task was preceded by desk study of available data on topography (topographic maps), storm duration, rainfall statistics, top soil characteristics, vegetative cover etc. so as to assess the catchment areas for all proposed drainage provisions. The findings of the desk study were further supplemented and augmented by a reconnaissance along the area. All-important hydrological features have been noted during this field reconnaissance.

The information on high flood level (HFL), low water levels (LWL) (if available) are collected from past records, local inquiries and visible signs, if any, on the banks of streams and structures existing. Local inquiries were also made with regard to the sections getting water logged/flooded during heavy rains.

The existing stream checked for the adequacy of their waterway and the proposed bridge has been provided accordingly. Wherever they are inadequate, the hydrological studies have been made to bring out the pertinent data required for design covering the following parameters:

- Catchment area;
- Rainfall;
- Run-off duration and intensity relationship
- Catchment run-off characteristics; and
- Channel slopes and discharge characteristics.

The hydrological studies have been performed using widely accepted procedures. For culvert and bridge locations where the stream channels are established, the discharge will be computed using the standard procedure adopting the Area – Velocity method. For other locations where the stream channels are not well defined, the flow has been estimated using widely used empirical methods.

#### **4.18 Condition Survey for Bridges, Culverts and structures**

The consultant inspected the existing structures and their condition and structural assessment survey conducted by the senior experts. There are 1 no major bridge, 8 nos minor bridge & 55 nos culvert on the project road. All the existing bridges and culverts are already catering for the present-day heavy traffic and loading and hence load tests may not be needed as could be judged from preliminary reconnaissance survey.

#### **4.19 Geotechnical Investigations and Pavement Investigations**

Geo-technical Investigations and sub-soil explorations as per Terms of Reference have been conducted for proposed bridge locations.

The strength of Sub-grade layers has been evaluated in the field using DCPT tests and Laboratory samples from Trial Pits. Trial pits have been dug at every 500m on alternate side of road of 1m x 1m x 1m size and 500mm on either side of carriageway edge. The laboratory testing of soil samples includes:

- Soil characterization (grain size distribution and Atterberg Limits);
- Moisture content, natural density;
- Laboratory CBR (Un-soaked and 4-day soak compacted at three energy levels) and swell

The parameters for design have been selected after careful consideration of the engineering strength values and geological information. The investigations for high embankment have been carried out as per IRC Special Publications No.75.

#### **4.20 Material Investigation**

The borrow areas adjacent to the right of way and off-road locations has been explored. However, the soil / earth generated from cutting were sufficient for the filling purpose and soil from borrow area wouldn't be required.

The investigation for Stone aggregate and sand comprises of qualitative and quantitative assessment of potential quarries and determination of their suitability for use in:

- Graded crushed stone base and sub-base
- Bituminous base and wearing courses; and,
- Concrete works.

**The potential sources of hard stone samples for ascertaining their suitability in road construction and concrete works includes:**

- Specific gravity;
- water absorption;
- Los Angeles Abrasion Value (LAV)/Aggregate impact value (AIV);
- Bitumen affinity and stripping value;
- Chemical tests (total soluble salts, chloride content, sulphate content, alkali-silica reaction); and,
- Sodium sulphate soundness.

**Potential source of sand has been identified. The testing for sand samples in the laboratory includes.**

- Grain size analysis;
- Sand equivalent; and,
- Chemical tests (sulphate and chloride)

#### **4.21 Pavement Design**

The pavement design for the road has been done on the basis of cumulative number of standard axles and the CBR of the sub-grade. The composition of pavement has been recommended keeping



in view the construction and maintenance costs. The design life of the Flexible pavement is taken as 15 years. Rigid pavement has been considered for congested built up area for a design life period of 30 years.

## **4.22 Design of Embankments**

Final design for high embankments has been done based on the profile and terrain model developed from the topographical survey using available design software. The design has been provided for maximum utilization of locally available materials consistent with economy

## **4.23 Design of Bridges and Structures**

According to the conceptual design of various improvement proposals, the consultant has identified the tentative structural arrangement of bridges and other structures like VUP etc for all the improvement alternatives. The Consultant has also carried out the preliminary design for these structures for sizing of various components of structures and prepared general arrangement drawings of all structures. The structure has been designed taking into account:

- use of modern construction technologies, such as precasting, composite constructions etc,
- adequate diversion facility during construction,
- minimal maintenance costs,
- topographical and geotechnical characteristics of the embankments,
- aesthetic requirement, and
- cost considerations

Consideration has been given as far as possible to the possibilities of standardization of structures and adoption of the construction methods to the practices in India, in accordance with acceptable international practice.

General arrangement drawings have been prepared and shall be suitable for preliminary quantity estimates. The Consultant has also proposed the scheme of various phases of construction for all the structures.

The consultant has reviewed the preliminary design of all structural components of various structures and formulated the final design standards for each of the structures proposed in the improvement scheme. During finalization of the standards, a close liaison has been assured with MORT&H.

The consultant has carried out the structural design for the flyover, subways, and other structures including design of foundations, geometric features and typical sections. The detailed engineering design includes the following:

- general plans and layout
- design of superstructure

- design of sub-structure
- design of foundations
- reinforcement schedules
- construction schedules

Detailed drawings have been prepared and are suitable for estimating, bidding and construction purposes.

The Bill of Quantities will allow the tenderers to properly price the works with prices for each type of formwork, concrete, pre stressing units, reinforcing steel etc.

The General Arrangement Drawings (GAD) has been prepared accordance with design, the relevant IRC and Bureau of Indian Standards Codes:

- Geometry;
- Structural design of Bridges components;

**The following types of loading have been generally considered while evolving GADs**

- Dead load;
- Superimposed dead loads;
- Live loads with impacts
- Wind loads and seismic effects;
- Temperature forces;
- Water current forces if any; and
- Earth pressures

The bridges have been designed for the live load which gives the worst effects at the point under consideration. Appropriate relationships for earth pressure effects have been taken into consideration. The coefficients for active and passive earth pressure have been calculated based on properties of soil used for backfilling behind abutments and wing walls. Continuous structures have been designed to accommodate a differential settlement (at least 10mm) of supports. The type of foundations, either open or pile has been decided taking into consideration, the properties of soil and the type of foundations for the nearby structures.

#### **4.24 Drainage Design**

The requirements for adequate drainage both along and across the project have been studied and determined. This has established which of the existing culverts are adequate. Hydrologic and hydraulic studies have been performed to determine the additional drainage facilities required and the appropriate improvements to existing culverts. The study has also reported on the adequacy of existing embankment heights. The drainage design has been established through a cost/benefit analysis and recommendations made.

Within each catchment area the design of existing bridges, in respect of scour, flooding width, stream velocity etc. have been supported by the results of hydrologic and hydraulic studies that extend a sufficient distance upstream. This analysis has been augmented by discussion with local, informed sources.

Side drainage has been designed through an appraisal of local practice and the economic construction methods. Particular attention has been given to the need for scour protection within embankments and the discharge point of new drainage into existing drainage channels.

#### **4.25 Traffic Safety Features, Road Furniture and Road Markings**

Suitable designs have been furnished for traffic safety features and road furniture including traffic signals in urban areas, signs, markings, overhead sign boards, crash barriers, delineators, fencing in selected stretches etc. Generally, IRC guidelines and MORT&H Specifications have been followed. The locations of these features has been given in the reports and also shown in the drawings.

#### **4.26 Miscellaneous Works**

The Consultant has made suitable designs and layouts for miscellaneous road works items and project facilities like bus bays, truck lay bye etc, wherever appropriate.

#### **4.27 Estimation of Quantities and Project Costs**

##### **Rate Analysis**

The NH wing of the Assam PWD has been prepared the schedule of rates for Roads, Bridge and culvert works for National highways under Assam PWD, for the year 2013-14 on the basis of Standard data Book for analysis of Rate for National Highways Published by Indian road congress on behalf of the Ministry of Road Transport and Highways. This SOR is followed for determination of rates for various items of works.

##### **Detailed Estimates for Quantities and Project Costs**

Based on the designs and drawings, bill of quantities has been prepared by the consultants as under:

- Detailed and general items;
- site clearance and earthworks;
- sub-base, base and surfacing courses;
- drains, culverts and protection works;
- bridges and culverts;
- road furniture;
- ancillary works; and
- miscellaneous items of works

The format for bill of quantities adopted by the consultants was of similar type of National Highway projects in India and as agreed by MORT&H.

Project base costs for all the construction package has been prepared with the unit costs derived as explained above and the quantities developed by detailed engineering design activity.

After discussion with MORT&H, suitable allowances for physical and price contingencies have been made to produce final engineering estimates for the contract package.

## CHAPTER - 5

### ANALYSIS AND INTERPRETATION OF SURVEY AND INVESTIGATION DATA

#### 5.1 Objective

The main aim of the consultancy service is to establish the technical, economical and financial viability of the project and prepare detailed methodology adopted while preparing detailed Project Report for Construction & up-gradation of the newly declared NH-127B (Assam Portion) starting from Srirampur on NH-27(old NH-31 C) at Chainage 0.00 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 55.700 km to NH standard..Feasibility of the project has been established on the requirements with regard to rehabilitation, up gradation and improvement of road based on the following activities:-

- Highway Design,
- Pavement Design,
- Design of Service Roads (if required),
- Type of Intersections & development,
- CD & Bridge design
- Rehabilitation & Widening of Existing CD Works & Bridges,
- Road Safety Feature,
- Quantities and Cost Estimates.
- Social & Environmental Impacts
- 

#### 5.2 Initial Activities: -

##### 5.2.1 Secondary Data Collection and review

During the project several secondary data have been collected/in the process of procurement and they are as follows:

- Average Fuel sales Data of **Quality Petrol & Diesel and Refuel Point.**

| Month | Avg. Sales (Lt.) |        |
|-------|------------------|--------|
|       | Petrol           | Diesel |
| Jan   | 146,326          | 71,878 |
| Feb   | 149,243          | 40,893 |
| Mar   | 166,528          | 35,749 |

| Month                      | Avg. Sales (Lt.) |               |
|----------------------------|------------------|---------------|
|                            | Petrol           | Diesel        |
| Apr                        | 152,907          | 22,476        |
| May                        | 167,636          | 37,342        |
| Jun                        | 153,417          | 37,227        |
| Jul                        | 146,722          | 22,058        |
| Aug                        | 156,307          | 22,249        |
| Sep                        | 123,550          | 31,235        |
| Oct                        | 122,789          | 27,112        |
| Nov                        | 70,794           | 27,570        |
| Dec                        | 152,744          | 32,505        |
| <b>Avg. Sale per Month</b> | <b>142,413</b>   | <b>34,024</b> |

The data thus collected are reviewed and taken up further AADT calculations.

### 5.2.2 Reconnaissance Survey

The following documents and data have been collected the process of procurement during the reconnaissance survey by the team:

- Climate of the area surrounding the project road
- Year of original construction, year and type of major maintenance/rehabilitation works.
- Type and location of existing utility services
- Hydraulic data
- Survey and evaluation of locally available construction materials

### 5.2.3 Standards and Code of Practices

All activities related to field studies, design and documentation have been done as per the latest guidelines/circulars of the MORT&H and relevant publications of the Indian Roads Congress (IRC).

### 5.2.4 Finalization of Traffic Survey Stations and Locations

After the reconnaissance survey and desk studies of the maps available of the project area, Traffic survey stations and their locations have been finalized by discussing with local PWD official.

| Sl. No. | Type of Survey and Duration                     | Location / Chainage                           | Survey Dates             | Duration (Hours/Day) |
|---------|-------------------------------------------------|-----------------------------------------------|--------------------------|----------------------|
| 1       | Classified Traffic Volume Counts for seven days | On NH-31C near Srirampur at chainage 0+000Km. | 18/12/2015 to 24/12/2015 | 24 Hour x 7 days     |
|         |                                                 | Near Tamarhat at CH.-15+500Km                 | 17/12/2015 to 23/12/2015 |                      |
|         |                                                 | On NH 31 Near CH. 40+000Km                    | 17/12/2015 to 23/12/2015 |                      |

| Sl. No.                                                          | Type of Survey and Duration        | Location / Chainage                                         | Survey Dates             | Duration (Hours/Day) |
|------------------------------------------------------------------|------------------------------------|-------------------------------------------------------------|--------------------------|----------------------|
|                                                                  |                                    | Near Chowmore at CH. 57+000Km                               | 17/12/2015 to 23/12/2015 |                      |
| 2                                                                | O-D Surveys for one day (24 hours) | On NH 31C Near Srirampur at CH 0+000Km                      | 21/12/2015               | 24 Hour x 1 days     |
|                                                                  |                                    | 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM of NH-127B | 19/12/2015               | 24 Hour x 1 day      |
| 3                                                                | Axle load surveys                  | On NH-31C near Srirampur at chainage 0+000Km.               | 21/12/2015               | 24 Hour x 1 days     |
|                                                                  |                                    | Near Tamarhat P.S CH 15+200 KM                              | 23/12/2015               | 24 Hour x 1 day      |
|                                                                  |                                    | 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM            | 19/12/2015               | 24 Hour x 1 day      |
| 4                                                                | Turning movement count             | Srirampur (CH. - 0.000 Km) , 4-legged.                      | 24/12/2015               | 12 Hour x 1 day      |
|                                                                  |                                    | On NH 31, at CH. 40+000km, 3-legged.                        | 18/12/2015               | 12 Hour x 1 day      |
| *** All the Traffic Survey locations are as per survey Chainage. |                                    |                                                             |                          |                      |

## 5.3 Engineering Survey

### 5.3.1 Topographic survey

#### GPS LIST

| SL NO. | NAME      | EASTING    | NORTHING    | RL     |
|--------|-----------|------------|-------------|--------|
| 1      | GPS-10+8  | 786241.019 | 2917374.486 | 40.162 |
| 2      | GPS-10+8A | 786145.974 | 2917333.584 | 39.995 |
| 3      | GPS-15A   | 785037.925 | 2913792.136 | 37.413 |
| 4      | GPS-15B   | 785009.157 | 2913624.313 | 36.561 |
| 5      | GPS-20    | 785315.036 | 2909106.993 | 34.930 |
| 6      | GPS-20A   | 785430.888 | 2909103.163 | 35.148 |
| 7      | GPS-25    | 785261.558 | 2904999.720 | 35.207 |
| 8      | GPS-25A   | 785327.330 | 2905033.840 | 31.832 |
| 9      | GPS-30    | 785759.906 | 2899573.948 | 32.842 |
| 10     | GPS-30    | 785759.906 | 2899573.948 | 32.842 |
| 11     | GPS-30A   | 785659.477 | 2899487.043 | 32.869 |
| 12     | GPS-35    | 786891.205 | 2895259.459 | 31.365 |



| SL NO. | NAME      | EASTING    | NORTHING    | RL     |
|--------|-----------|------------|-------------|--------|
| 13     | GPS-35A   | 787019.658 | 2895112.249 | 31.987 |
| 14     | GPS-40    | 787587.866 | 2890751.259 | 31.029 |
| 15     | GPS-40A   | 787614.979 | 2890663.832 | 29.609 |
| 16     | GPS-45    | 787016.705 | 2887666.149 | 30.089 |
| 17     | GPS-45A   | 786912.905 | 2887704.163 | 29.613 |
| 18     | GPS-5+350 | 787193.337 | 2922677.367 | 44.000 |
| 19     | GPS-5+5   | 787124.947 | 2922506.576 | 42.774 |
| 20     | GPS-51    | 791852.928 | 2883372.991 | 33.410 |
| 21     | GPS-51A   | 791984.837 | 2883370.406 | 30.907 |
| 22     | PGPS-0A   | 789615.510 | 2927398.154 | 49.731 |
| 23     | PGPS10+8  | 786244.755 | 2917358.958 | 40.344 |
| 24     | PGPS-15B  | 784997.088 | 2913511.016 | 37.110 |
| 25     | PGPS-20   | 785308.812 | 2909107.951 | 35.143 |
| 26     | PGPS-30   | 785791.872 | 2899544.006 | 33.115 |
| 27     | PGPS-5+0  | 787365.461 | 2922971.319 | 44.917 |
| 28     | PGPS-5+0A | 787319.597 | 2922915.131 | 43.428 |

#### **REFERENCE PILLARS LIST**

| SL NO. | NAME  | EASTING    | NORTHING    | RL     |
|--------|-------|------------|-------------|--------|
| 1      | P0+0  | 789607.254 | 2927289.458 | 48.826 |
| 2      | P0+1  | 789561.420 | 2927132.625 | 48.753 |
| 3      | P0+2  | 789499.403 | 2926896.772 | 47.805 |
| 4      | P0+3  | 789370.513 | 2926695.664 | 47.798 |
| 5      | P1+0  | 789242.914 | 2926475.793 | 48.075 |
| 6      | P1+1  | 789128.996 | 2926244.128 | 47.400 |
| 7      | P1+2  | 788991.534 | 2926038.011 | 46.675 |
| 8      | P1+3  | 788874.680 | 2925808.319 | 46.711 |
| 9      | P10+0 | 786505.049 | 2918145.667 | 40.808 |
| 10     | P10+1 | 786471.596 | 2917887.496 | 40.363 |
| 11     | P10+2 | 786392.799 | 2917655.689 | 40.757 |
| 12     | P10+3 | 786285.811 | 2917422.781 | 40.581 |
| 13     | P11+0 | 786181.133 | 2917207.009 | 40.187 |
| 14     | P11+1 | 786027.331 | 2916995.022 | 40.302 |
| 15     | P11+2 | 785870.630 | 2916800.455 | 39.324 |
| 16     | P11+3 | 785747.452 | 2916590.368 | 38.905 |

| SL NO. | NAME  | EASTING    | NORTHING    | RL     |
|--------|-------|------------|-------------|--------|
| 17     | P12+0 | 785650.458 | 2916395.055 | 38.898 |
| 18     | P12+1 | 785524.068 | 2916178.204 | 39.170 |
| 19     | P12+2 | 785414.648 | 2915960.847 | 38.480 |
| 20     | P12+3 | 785288.389 | 2915742.987 | 38.885 |
| 21     | P13+0 | 785145.390 | 2915480.459 | 38.514 |
| 22     | P13+1 | 785073.638 | 2915242.333 | 38.490 |
| 23     | P13+2 | 785037.736 | 2914996.949 | 38.283 |
| 24     | P13+3 | 785013.844 | 2914739.428 | 37.899 |
| 25     | P14+0 | 785062.892 | 2914459.272 | 38.075 |
| 26     | P14+1 | 785108.072 | 2914194.423 | 37.936 |
| 27     | P14+2 | 785074.168 | 2913916.595 | 37.345 |
| 28     | P15+0 | 784987.779 | 2913462.393 | 37.248 |
| 29     | P15+1 | 784964.314 | 2913206.016 | 36.957 |
| 30     | P15+2 | 784925.409 | 2912962.936 | 37.018 |
| 31     | P15+3 | 784830.428 | 2912730.551 | 36.907 |
| 32     | P16+0 | 784710.494 | 2912497.290 | 36.993 |
| 33     | P16+1 | 784616.041 | 2912270.830 | 36.934 |
| 34     | P16+2 | 784567.369 | 2912031.852 | 36.855 |
| 35     | P17+0 | 784659.364 | 2911860.225 | 36.857 |
| 36     | P17+1 | 784762.296 | 2911641.671 | 36.733 |
| 37     | P17+2 | 784872.761 | 2911394.343 | 36.446 |
| 38     | P17+3 | 785003.481 | 2911125.689 | 37.443 |
| 39     | P18+0 | 785004.565 | 2911043.605 | 36.450 |
| 40     | P18+1 | 785029.608 | 2910798.096 | 36.282 |
| 41     | P18+2 | 785068.668 | 2910550.740 | 36.042 |
| 42     | P18+3 | 785111.134 | 2910302.081 | 36.138 |
| 43     | P19+0 | 785159.995 | 2910043.958 | 34.991 |
| 44     | P19+1 | 785191.290 | 2909805.582 | 35.858 |
| 45     | P19+2 | 785240.470 | 2909565.417 | 35.447 |
| 46     | P19+3 | 785267.892 | 2909311.594 | 35.553 |
| 47     | P2+0  | 788754.779 | 2925597.487 | 46.026 |
| 48     | P2+1  | 788628.139 | 2925390.757 | 45.675 |
| 49     | P2+2  | 788511.400 | 2925168.657 | 46.006 |
| 50     | P2+3  | 788406.370 | 2924945.815 | 45.524 |
| 51     | P20+0 | 785309.444 | 2909056.307 | 35.184 |
| 52     | P20+1 | 785212.270 | 2908843.716 | 35.889 |
| 53     | P20+2 | 785116.608 | 2908605.064 | 34.753 |
| 54     | P20+3 | 785009.372 | 2908387.271 | 35.480 |
| 55     | P21+0 | 784908.915 | 2908157.601 | 35.310 |
| 56     | P21+1 | 784832.726 | 2907968.991 | 34.383 |
| 57     | P21+2 | 784711.643 | 2907684.928 | 34.618 |
| 58     | P21+3 | 784648.730 | 2907438.507 | 34.568 |
| 59     | P22+0 | 784582.871 | 2907218.685 | 35.208 |

| SL NO. | NAME  | EASTING    | NORTHING    | RL     |
|--------|-------|------------|-------------|--------|
| 60     | P22+1 | 784600.230 | 2906964.224 | 34.467 |
| 61     | P22+2 | 784602.258 | 2906718.880 | 35.589 |
| 62     | P22+3 | 784613.744 | 2906471.472 | 35.396 |
| 63     | P23+0 | 784629.308 | 2906208.612 | 35.159 |
| 64     | P23+1 | 784648.760 | 2905946.465 | 34.799 |
| 65     | P23+2 | 784792.704 | 2905701.489 | 34.861 |
| 66     | P23+3 | 784904.449 | 2905526.698 | 34.931 |
| 67     | P24+0 | 785041.742 | 2905343.360 | 34.595 |
| 68     | P24+1 | 785174.352 | 2905134.606 | 34.452 |
| 69     | P24+2 | 785336.967 | 2904888.690 | 34.469 |
| 70     | P24+3 | 785385.628 | 2904682.151 | 34.364 |
| 71     | P25+0 | 785421.719 | 2904466.614 | 34.354 |
| 72     | P25+1 | 785473.162 | 2904177.217 | 34.453 |
| 73     | P25+2 | 785520.091 | 2903942.498 | 34.368 |
| 74     | P25+3 | 785557.900 | 2903688.440 | 33.876 |
| 75     | P26+0 | 785600.846 | 2903452.223 | 33.647 |
| 76     | P26+1 | 785650.571 | 2903218.902 | 33.538 |
| 77     | P26+2 | 785726.610 | 2902976.694 | 33.327 |
| 78     | P26+3 | 785839.445 | 2902754.771 | 33.218 |
| 79     | P27+0 | 785998.253 | 2902561.049 | 33.516 |
| 80     | P27+1 | 786147.160 | 2902365.448 | 33.574 |
| 81     | P27+2 | 786319.472 | 2902170.020 | 34.034 |
| 82     | P27+3 | 786405.397 | 2901941.741 | 33.346 |
| 83     | P28+0 | 786370.638 | 2901727.347 | 32.786 |
| 84     | P28+1 | 786278.075 | 2901483.593 | 32.898 |
| 85     | P28+2 | 786187.933 | 2901251.290 | 33.163 |
| 86     | P28+3 | 786110.785 | 2901018.742 | 33.219 |
| 87     | P29/C | 785961.869 | 2900348.797 | 31.976 |
| 88     | P29/D | 786305.826 | 2899387.335 | 31.800 |
| 89     | P29+0 | 786016.927 | 2900760.077 | 33.420 |
| 90     | P29+1 | 785929.011 | 2900538.428 | 33.207 |
| 91     | P29+2 | 785844.635 | 2900294.633 | 33.069 |
| 92     | P29+3 | 785757.956 | 2900086.828 | 32.880 |
| 93     | P3+0  | 788336.632 | 2924701.084 | 46.599 |
| 94     | P3+1  | 788188.341 | 2924515.556 | 46.206 |
| 95     | P3+2  | 788061.434 | 2924303.691 | 45.049 |
| 96     | P3+3  | 787941.504 | 2924078.469 | 45.159 |
| 97     | P30+0 | 785668.383 | 2899838.418 | 32.963 |
| 98     | P30+1 | 785755.267 | 2899571.553 | 32.996 |
| 99     | P30+2 | 785943.129 | 2899439.881 | 32.886 |
| 100    | P30+3 | 786158.103 | 2899312.047 | 33.068 |
| 101    | P31+0 | 786404.524 | 2899222.159 | 32.938 |
| 102    | P31+1 | 786570.121 | 2899037.131 | 34.868 |

| SL NO. | NAME   | EASTING    | NORTHING    | RL     |
|--------|--------|------------|-------------|--------|
| 103    | P31+2  | 786648.543 | 2898809.504 | 32.462 |
| 104    | P31+3  | 786759.889 | 2898593.060 | 32.744 |
| 105    | P32+0  | 786822.448 | 2898342.723 | 32.455 |
| 106    | P32+1  | 786827.456 | 2898101.506 | 31.765 |
| 107    | P32+2  | 786808.813 | 2897834.463 | 32.429 |
| 108    | P32+3  | 786769.531 | 2897599.056 | 31.855 |
| 109    | P33+0  | 786686.695 | 2897368.536 | 32.633 |
| 110    | P33+1  | 786562.249 | 2897164.806 | 32.284 |
| 111    | P33+2  | 786529.183 | 2896903.616 | 32.525 |
| 112    | P33+3  | 786489.599 | 2896657.891 | 32.106 |
| 113    | P34+0  | 786464.930 | 2896407.560 | 32.509 |
| 114    | P34+1  | 786463.375 | 2896146.882 | 32.086 |
| 115    | P34+2  | 786447.025 | 2895911.735 | 32.163 |
| 116    | P34+3  | 786520.161 | 2895676.542 | 31.913 |
| 117    | P35+0  | 786681.735 | 2895460.524 | 31.481 |
| 118    | P35+0A | 786641.808 | 2895508.378 | 31.643 |
| 119    | P35+1  | 786861.725 | 2895264.519 | 31.893 |
| 120    | P35+2  | 787002.193 | 2895081.422 | 32.173 |
| 121    | P35+3  | 787165.137 | 2894895.402 | 31.814 |
| 122    | P36+0  | 787229.312 | 2894653.436 | 31.905 |
| 123    | P36+1  | 787266.477 | 2894427.438 | 32.228 |
| 124    | P36+2  | 787316.912 | 2894154.315 | 32.059 |
| 125    | P36+3  | 787346.035 | 2893901.931 | 32.046 |
| 126    | P37+0  | 787391.545 | 2893631.694 | 32.127 |
| 127    | P37+1  | 787329.498 | 2893401.541 | 32.218 |
| 128    | P37+2  | 787272.497 | 2893150.157 | 32.045 |
| 129    | P37+3  | 787188.639 | 2892907.581 | 32.082 |
| 130    | P38+0  | 787134.099 | 2892671.096 | 31.924 |
| 131    | P38+1  | 787107.279 | 2892454.069 | 31.334 |
| 132    | P38+2  | 787123.457 | 2892185.095 | 31.149 |
| 133    | P38+3  | 787130.002 | 2891941.501 | 31.693 |
| 134    | P39+0  | 787231.983 | 2891677.684 | 31.430 |
| 135    | P39+1  | 787329.475 | 2891432.139 | 31.083 |
| 136    | P39+2  | 787431.027 | 2891223.703 | 30.920 |
| 137    | P39+3  | 787516.577 | 2890987.195 | 30.722 |
| 138    | P4+0   | 787799.998 | 2923872.960 | 45.250 |
| 139    | P4+1   | 787692.090 | 2923644.442 | 43.701 |
| 140    | P4+2   | 787549.002 | 2923441.408 | 44.584 |
| 141    | P4+3   | 787465.080 | 2923201.020 | 43.926 |
| 142    | P40+0  | 787589.219 | 2890748.533 | 30.597 |
| 143    | P40A   | 787609.467 | 2890838.607 | 29.522 |
| 144    | P40B   | 787777.477 | 2890712.437 | 29.782 |
| 145    | P40C   | 787984.136 | 2890478.219 | 30.505 |

| SL NO. | NAME  | EASTING    | NORTHING    | RL     |
|--------|-------|------------|-------------|--------|
| 146    | P40D  | 788146.055 | 2890439.718 | 30.202 |
| 147    | P40E  | 788337.625 | 2890311.673 | 29.936 |
| 148    | P40F  | 788482.603 | 2890140.865 | 30.096 |
| 149    | P40G  | 788540.279 | 2889845.760 | 30.016 |
| 150    | P40H  | 788427.995 | 2889615.189 | 30.596 |
| 151    | P40J  | 788292.823 | 2889346.059 | 29.121 |
| 152    | P40K  | 788177.919 | 2889090.716 | 29.850 |
| 153    | P42+2 | 787998.371 | 2888815.357 | 30.141 |
| 154    | P42+3 | 787872.240 | 2888636.664 | 29.716 |
| 155    | P43+0 | 787726.804 | 2888441.963 | 29.469 |
| 156    | P43+1 | 787589.685 | 2888234.327 | 29.250 |
| 157    | P43A  | 787503.184 | 2888120.672 | 29.326 |
| 158    | P43B  | 787364.446 | 2887929.993 | 28.514 |
| 159    | P44+1 | 786929.750 | 2887495.522 | 29.993 |
| 160    | P44+2 | 786821.609 | 2887309.706 | 29.846 |
| 161    | P44+3 | 786715.380 | 2887051.326 | 29.753 |
| 162    | P45+0 | 786615.711 | 2886828.957 | 29.937 |
| 163    | P45+1 | 786563.023 | 2886569.407 | 29.770 |
| 164    | P45+2 | 786523.750 | 2886350.287 | 29.728 |
| 165    | P45+3 | 786484.118 | 2886082.693 | 30.032 |
| 166    | P46+0 | 786518.064 | 2885848.315 | 29.610 |
| 167    | P46+1 | 786544.862 | 2885621.911 | 29.365 |
| 168    | P46+2 | 786584.077 | 2885297.808 | 29.402 |
| 169    | P46A  | 786706.968 | 2885088.925 | 28.388 |
| 170    | P46B  | 786960.989 | 2884886.781 | 28.577 |
| 171    | P46C  | 787298.122 | 2884931.189 | 29.150 |
| 172    | P47+2 | 787390.562 | 2884954.021 | 29.253 |
| 173    | P47+3 | 787584.865 | 2885022.872 | 29.014 |
| 174    | P48+0 | 787889.558 | 2884973.148 | 29.465 |
| 175    | P48+1 | 788167.314 | 2884924.658 | 29.359 |
| 176    | P48+2 | 788406.647 | 2884886.425 | 29.245 |
| 177    | P48+3 | 788732.936 | 2884832.270 | 29.463 |
| 178    | P49+1 | 789207.674 | 2884830.289 | 29.234 |
| 179    | P49+2 | 789444.495 | 2884759.848 | 29.502 |
| 180    | P49+3 | 789655.439 | 2884665.378 | 29.704 |
| 181    | P5+1  | 787233.385 | 2922769.853 | 43.499 |
| 182    | P5+2  | 787121.510 | 2922538.830 | 42.736 |
| 183    | P5+3  | 787029.704 | 2922309.228 | 42.385 |
| 184    | P50+0 | 789866.553 | 2884533.435 | 29.356 |
| 185    | P50+1 | 790076.113 | 2884369.339 | 29.452 |
| 186    | P50+2 | 790277.865 | 2884222.693 | 29.554 |
| 187    | P50+3 | 790457.390 | 2884067.584 | 29.995 |
| 188    | P51+0 | 790630.950 | 2883899.626 | 29.055 |

| SL NO. | NAME  | EASTING    | NORTHING    | RL     |
|--------|-------|------------|-------------|--------|
| 189    | P51+2 | 791082.539 | 2883576.938 | 29.514 |
| 190    | P51+3 | 791278.156 | 2883502.117 | 29.407 |
| 191    | P52+0 | 791510.495 | 2883425.786 | 29.560 |
| 192    | P52+1 | 791782.303 | 2883358.924 | 33.410 |
| 193    | P6+0  | 786924.759 | 2922079.277 | 42.403 |
| 194    | P6+1  | 786882.058 | 2921835.587 | 42.969 |
| 195    | P6+2  | 786856.836 | 2921582.402 | 42.472 |
| 196    | P6+3  | 786808.665 | 2921319.433 | 42.143 |
| 197    | P7+0  | 786793.211 | 2921110.772 | 40.561 |
| 198    | P7+1  | 786751.616 | 2920859.792 | 43.329 |
| 199    | P7+2  | 786701.686 | 2920595.957 | 40.724 |
| 200    | P7+3  | 786674.574 | 2920340.770 | 41.293 |
| 201    | P8+0  | 786632.851 | 2920110.752 | 41.521 |
| 202    | P8+1  | 786597.719 | 2919869.553 | 41.182 |
| 203    | P8+2  | 786585.086 | 2919617.941 | 41.296 |
| 204    | P8+3  | 786540.279 | 2919368.831 | 40.469 |
| 205    | P9+0  | 786464.726 | 2919140.195 | 40.921 |
| 206    | P9+1  | 786463.970 | 2918877.663 | 41.065 |
| 207    | P9+2  | 786470.925 | 2918626.923 | 41.043 |
| 208    | P9+3  | 786485.445 | 2918381.851 | 41.033 |

**TBM PILLARS LIST**

| SL NO. | NAME     | EASTING    | NORTHING    | RL     |
|--------|----------|------------|-------------|--------|
| 1      | TBM0     | 789607.178 | 2927430.656 | 48.253 |
| 2      | TBM0A    | 789597.038 | 2927370.491 | 50.039 |
| 3      | TBM1     | 789207.873 | 2926430.946 | 49.046 |
| 4      | TBM11+2  | 785896.528 | 2916835.930 | 39.290 |
| 5      | TBM13+3  | 785022.693 | 2914671.237 | 38.522 |
| 6      | TBM14+0A | 785099.786 | 2914288.192 | 37.464 |
| 7      | TBM14+2  | 785060.254 | 2913824.267 | 37.367 |
| 8      | TBM15+2  | 784909.736 | 2912900.269 | 37.015 |
| 9      | TBM16+2  | 784608.272 | 2911935.357 | 37.076 |
| 10     | TBM17+2  | 784946.276 | 2911268.091 | 35.450 |
| 11     | TBM23+3  | 784955.480 | 2905491.653 | 34.142 |
| 12     | TBM26+2  | 785727.874 | 2902936.938 | 33.383 |
| 13     | TBM27+0  | 786107.972 | 2902426.363 | 33.634 |
| 14     | TBM27+3  | 786391.786 | 2901818.248 | 32.672 |
| 15     | TBM28+3  | 786076.889 | 2900972.317 | 32.490 |
| 16     | TBM29+D  | 786265.275 | 2899709.713 | 31.298 |
| 17     | TBM29+D1 | 786238.091 | 2899682.328 | 31.812 |
| 18     | TBM3+5   | 788052.236 | 2924290.153 | 45.015 |
| 19     | TBM32+0  | 786824.661 | 2898168.449 | 32.561 |
| 20     | TBM33+2  | 786508.920 | 2896724.454 | 32.514 |
| 21     | TBM34+2  | 786451.885 | 2895854.110 | 32.069 |
| 22     | TBM36+0  | 787258.296 | 2894516.355 | 32.431 |

| SL NO. | NAME    | EASTING    | NORTHING    | RL     |
|--------|---------|------------|-------------|--------|
| 23     | TBM37+1 | 787287.199 | 2893254.434 | 31.732 |
| 24     | TBM38+1 | 787122.725 | 2892243.852 | 31.238 |
| 25     | TBM40+0 | 787585.706 | 2890784.620 | 30.851 |

### 5.3.2 Cross Sections

| Road Cross Sections                            |                                                |
|------------------------------------------------|------------------------------------------------|
| For Flexible Pavement                          |                                                |
| <b>2 lane in Rural area: 14m</b>               | <b>2 lane in built up area: 14m</b>            |
| i. Carriageway width =7.0m                     | i. Carriageway width=7.0m                      |
| ii. Paved shoulder = 2x1.5m                    | ii. Paved shoulder = 2x2.5m                    |
| iii. Earthen shoulder = 2x2m                   | iii. Drain = 2x1m                              |
| <b>2 lane in Rural area : 12m VUP Approach</b> | <b>2 lane in Hill area: 10m</b>                |
| i. Carriageway width=10.0 m                    | i. Carriageway width=7.0 m                     |
| ii. Crash barrier with friction slab=2x1m      | ii. Paved shoulder = 2x1.5m                    |
| <b>4 lane in Rural area: 26m</b>               | <b>4 lane in Rural area : 26m ROB Approach</b> |
| i. Carriageway width=2x7.0m                    | i. Carriageway width=2x9.5m                    |
| ii. Median= 1x4m                               | ii. Median= 1x4m                               |
| iii. Kerb=2x0.500m                             | iii. Kerb=2x0.500m                             |
| iv. Paved shoulder =2x1.5m                     | iv. Crash barrier with friction slab=2x1m      |
| v. Earthen shoulder= 2x2.0m                    |                                                |
| For Rigid Pavement                             |                                                |
| <b>2 lane in Built up area : 14m</b>           |                                                |
| i. Carriageway width7.0m                       |                                                |
| ii. Paved shoulder = 2x2.5m                    |                                                |
| iii. Drain = 2x1m                              |                                                |

## 5.4 Traffic Survey

### 5.4.1 Classified Traffic Volume Count

| Vehicle Type | ON NH-127B<br>(Near Chowmore) | ON NH-31 | Probable diverted traffic from NH 31 to NH-127B | ON NH-31C | Probable diverted traffic from NH 31C to NH-127B | Expected traffic on NH-127B after completion |
|--------------|-------------------------------|----------|-------------------------------------------------|-----------|--------------------------------------------------|----------------------------------------------|
| Two-Wheeler  | 1535                          | 1477     | 0                                               | 1545      | 0                                                | 1535                                         |



| Vehicle Type                                 | ON NH-127B<br>(Near Chowmore) | ON NH-31     | Probable diverted traffic from NH 31 to NH-127B | ON NH-31C   | Probable diverted traffic from NH 31C to NH-127B | Expected traffic on NH-127B after completion |
|----------------------------------------------|-------------------------------|--------------|-------------------------------------------------|-------------|--------------------------------------------------|----------------------------------------------|
| Car/Jeep/Van/Taxi/Auto                       | 1070                          | 2344         | 703                                             | 1976        | 99                                               | 1872                                         |
| Mini Bus                                     | 0                             | 121          | 93                                              | 75          | 7                                                | 101                                          |
| Standard Bus                                 | 4                             | 145          | 112                                             | 116         | 12                                               | 127                                          |
| LCV                                          | 42                            | 52           | 396                                             | 115         | 0                                                | 42                                           |
| 2-Axle Truck                                 | 41                            | 671          | 531                                             | 329         | 39                                               | 476                                          |
| 3-Axle Truck                                 | 1                             | 932          | 441                                             | 322         | 10                                               | 542                                          |
| Multi-Axle                                   | 0                             | 658          | 0                                               | 767         | 23                                               | 464                                          |
| Tractor With Trailer                         | 41                            | 106          | 0                                               | 11          | 0                                                | 41                                           |
| Tractor Without Trailer                      | 13                            | 22           | 0                                               | 2           | 0                                                | 13                                           |
| Cycle                                        | 1374                          | 533          | 0                                               | 631         | 0                                                | 1374                                         |
| Cycle Rickshaw                               | 116                           | 89           | 0                                               | 100         | 0                                                | 116                                          |
| Hand Cart                                    | 6                             | 5            | 0                                               | 15          | 0                                                | 6                                            |
| Bullock Cart                                 | 0                             | 1            | 0                                               | 1           | 0                                                | 0                                            |
| Horse Cart                                   | 0                             | 5            | 0                                               | 1           | 0                                                | 0                                            |
| <b>Total Motorized Vehicles (Number)</b>     | <b>2747</b>                   | <b>6529</b>  | <b>2277</b>                                     | <b>5257</b> | <b>190</b>                                       | <b>5214</b>                                  |
| <b>Total Non Motorized Vehicles (Number)</b> | <b>1497</b>                   | <b>633</b>   | <b>0</b>                                        | <b>747</b>  | <b>0</b>                                         | <b>1497</b>                                  |
| <b>Total Commercial Vehicle per day</b>      | <b>142</b>                    | <b>2708</b>  | <b>1574</b>                                     | <b>1737</b> | <b>91</b>                                        | <b>1807</b>                                  |
| <b>Total PCU per day</b>                     | <b>3181</b>                   | <b>11429</b> | <b>5946</b>                                     | <b>8625</b> | <b>396</b>                                       | <b>9523</b>                                  |

#### 5.4.2 Origin-Destination survey:-

Origin-Destination survey is carried out to find out the travel pattern of different types of vehicles like MAV, 3-Axle, 2-Axle, Car, Bus, Jeep etc throughout the project road.

#### Zoning System Considered for the Study

##### On NH 31C Near Srirampur at CH 0+000Km

| Zone Code | Name of Zone                                                                                                                                                                                 |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | South and South-East side of project road (Guwahati, Dimapur, Shilchor, Shilong, Agartala, dhubri )                                                                                          |
| 2         | West side of project road (Patiala,Luckhnow,Panipath,Bhagalpur,Vijaywada,Chandigarh,Jaipur, Hyderabad,Indore,Patna,Jodhpur,Katihar,Mathura,Sambalpur,Benaras, Koderma,Kanpur,Udaipur, Delhi) |

| Zone Code | Name of Zone                                                                                                        |
|-----------|---------------------------------------------------------------------------------------------------------------------|
| 3         | North (Bhutan)                                                                                                      |
| 4         | East and North-East side of project road (Gossaigaon, New Bongaigaon, Phasighat, Tejpur, Jorat, Itanagar, Gouripur) |
| 5         | North West side of project road (Coochbihar, siliguri)                                                              |
| 6         | South west of project road (Kolkata, Nao gaon, Gazole, Malda, Panagarh, Haldia, Burdwan)                            |
| 7         | Near project Road (Dhubri)                                                                                          |

**2 Km Towards Dhubri Along NH 31 From CH 40.00 KM**

| Zone Code | Name of Zone                                                                                                                                                                                                                                                                                  |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | South and South-East of project road (Guwahati, Dimapur, Shilchor, Shilong, Agartala, Chandur, Nagaland, Ichapuram)                                                                                                                                                                           |
| 2         | West side of project road (Patiala, Lucknow, Panipath, Bhagalpur Vijaywada, Chandigarh, Jaipur, Hyderabad, Indore, Patna, Jodhpur, Katihar, Mathura, Sambalpur, Benaras, Koderma, Kanpur, Udaipur, Delhi, Baxirhat, Tufanganj, Ayodhya, Baripada, Chattisgarh, Jalandhar, Jogiapa, Chandipur) |
| 3         | North of project road (Tamarhat)                                                                                                                                                                                                                                                              |
| 4         | East and North-East of project road (Gossaigaon, New Bongaigaon, Phasighat, Tejpur, Jorat, Itanagar, Tinsukia, Hojai)                                                                                                                                                                         |
| 5         | North West of project road (Coochbihar, siliguri)                                                                                                                                                                                                                                             |
| 6         | South west of project road (Kolkata, Gazole, Malda, Farakka Panagarh, Haldia, Burdwan, Gholapak, Illambazar, Harirampur)                                                                                                                                                                      |
| 7         | Near project Road (Dhubri, Gouripur)                                                                                                                                                                                                                                                          |

**Combined Trip Matrix for all vehicles**

**On NH 31C Near Srirampur at CH 0+000Km**

|             |   | Destination Zone |    |   |    |   |    |   | Grand Total |
|-------------|---|------------------|----|---|----|---|----|---|-------------|
|             |   | 1                | 2  | 3 | 4  | 5 | 6  | 7 |             |
| Origin Zone | 1 | 0                | 31 | 0 | 0  | 0 | 44 | 1 | 76          |
|             | 2 | 37               | 0  | 0 | 5  | 0 | 1  | 0 | 43          |
|             | 3 | 0                | 0  | 0 | 0  | 0 | 0  | 0 | 0           |
|             | 4 | 0                | 5  | 0 | 0  | 5 | 4  | 6 | 20          |
|             | 5 | 2                | 0  | 1 | 6  | 0 | 0  | 0 | 9           |
|             | 6 | 34               | 0  | 0 | 2  | 0 | 0  | 0 | 36          |
|             | 7 | 0                | 0  | 0 | 9  | 0 | 0  | 0 | 9           |
| Grand Total |   | 73               | 36 | 1 | 22 | 5 | 49 | 7 | 193         |

**2 Km Towards Dhubri Along NH 31 From CH 40.00 KM**

|             |   | Destination Zone |    |   |    |    |    |    | Grand Total |
|-------------|---|------------------|----|---|----|----|----|----|-------------|
|             |   | 1                | 2  | 3 | 4  | 5  | 6  | 7  |             |
| Origin Zone | 1 | 0                | 25 | 0 | 0  | 13 | 45 | 0  | 83          |
|             | 2 | 52               | 0  | 1 | 1  | 0  | 3  | 7  | 64          |
|             | 3 | 0                | 0  | 0 | 0  | 0  | 0  | 2  | 2           |
|             | 4 | 0                | 0  | 0 | 0  | 1  | 0  | 4  | 5           |
|             | 5 | 26               | 4  | 0 | 1  | 0  | 0  | 26 | 57          |
|             | 6 | 86               | 6  | 0 | 8  | 0  | 0  | 11 | 111         |
|             | 7 | 0                | 13 | 1 | 2  | 17 | 6  | 0  | 39          |
| Grand Total |   | 164              | 48 | 2 | 12 | 31 | 54 | 50 | 361         |

### 5.4.3 Axle Load Survey

From axle load survey VDF (Vehicles damage factors) are calculated.

#### VDF of NH-127B

##### VDF OF PROJECT ROAD AFTER DIVERSION

| TRAFFIC ON NH-127B |       |           |       |           | DIVERTED TRAFFIC OF NH 31                |      |           |      |           | DIVERTED TRAFFIC OF NH 31C                |      |           |      |           |
|--------------------|-------|-----------|-------|-----------|------------------------------------------|------|-----------|------|-----------|-------------------------------------------|------|-----------|------|-----------|
| TYPE OF VEHICLES   | UP    |           | DOWN  |           | % DIVERTED VEHICLE FROM NH-31 TO NH-127B | UP   |           | DOWN |           | % DIVERTED VEHICLE FROM NH-31C TO NH-127B | UP   |           | DOWN |           |
|                    | VDF   | Frequency | VDF   | Frequency |                                          | VDF  | Frequency | VDF  | Frequency |                                           | VDF  | Frequency | VDF  | Frequency |
| 4 Axle truck       | 0.000 | 0         | 0.000 | 0         | 67%                                      | 3.04 | 22        | 2.95 | 14        | 3%                                        | 2.68 | 2         | 4.03 | 1         |
| 3 Axle truck       | 0.000 | 0         | 0.000 | 0         | 57%                                      | 3.91 | 43        | 4.02 | 31        | 3%                                        | 3.84 | 1         | 3.68 | 1         |
| 2 Axle truck       | 4.918 | 21        | 1.993 | 9         | 59%                                      | 4.05 | 36        | 4.40 | 25        | 12%                                       | 4.23 | 2         | 4.39 | 2         |
| Bus                | 0.446 | 14        | 0.532 | 13        | 77%                                      | 0.62 | 15        | 0.47 | 8         | 10%                                       | 0.68 | 1         | 0.55 | 0         |
| LCV                | 0.016 | 1         | 0.000 | 0         | 0%                                       | 0.00 | 0         | 0.01 | 0         | 0%                                        |      | 0         |      | 0         |
| TOTAL              |       | 36        |       | 22        |                                          |      | 117       |      | 79        |                                           |      | 6         |      | 5         |
| Maximum WT. VDF    | 3.04  |           |       |           |                                          | 3.57 |           |      |           |                                           | 3.87 |           |      |           |

|                                                           |             |
|-----------------------------------------------------------|-------------|
| VDF OF TRAFFIC ON NH-127B                                 | <b>3.04</b> |
| VDF OF DIVERTED TRAFFIC ON NH-127B FROM NH-31             | <b>3.57</b> |
| VDF OF DIVERTED TRAFFIC ON NH-127B FROM NH-31C            | <b>3.87</b> |
| Max. VDF AFTER DIVERSION OF VEHICLE FROM NH 31 AND NH 31C | <b>3.87</b> |

## 5.5 Design Work Desk Study

### 5.5.1 Design Standard

#### SIGHT DISTANCE

Stopping sight distance is the clear distance ahead needed by a driver to bring his vehicle to a stop before meeting a stationary object on his path. Intermediate sight distance is defined as twice the

stopping sight distance.

Design values for stopping sight distance and intermediate sight distance for various speeds:

| Speed (Km/hr) | Stopping Sight Distance (m) | Intermediate Sight Distance (m) | Overtaking Sight Distance (m) |
|---------------|-----------------------------|---------------------------------|-------------------------------|
| 100           | 180                         | 360                             | 640                           |
| 80            | 120                         | 240                             | 470                           |
| 60            | 90                          | 180                             | 340                           |
| 40            | 45                          | 90                              | 165                           |

### CROSS-SLOPE/CAMBER

For four lane provision the pavement in the straight reaches is to be provided with one side slope of 2% towards edge for rigid pavement and 2.5% for flexible pavement.

The cross fall of earth shoulders is to be at least 0.5% more than that of carriage way subject to a minimum of 3.0%. Paved shoulders and shoulders on super-elevated sections will have the same cross fall as the pavement.

### HORIZONTAL CURVES

Horizontal curves will be circular curve flanked by spiral transition curves at both ends.

No transition is required for curve radius and design speed as follows:

| <u>Design Speed (km/hr)</u> | <u>Curve Radius (m)</u> |
|-----------------------------|-------------------------|
| 100                         | 400                     |
| 80                          | 250                     |
| 65                          | 1                       |

## 5.5.2 Geometric Design

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Start          | 0                       | 319.092                 | 319.092               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 319.092                 | 414.092                 |                       | 95                              |                       |                            |                               |                         |                           |
| 1                                  | 789520.548     | 2926959.898     | Arc            | 414.092                 | 468.982                 |                       | 54.89                           | 500                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 468.982                 | 563.982                 |                       | 95                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 563.982                 | 1868.816                | 1304.834              |                                 |                       |                            |                               |                         |                           |
| 2                                  | 788800.504     | 2925694.741     | Arc            | 1868.816                | 1926.01                 |                       | 57.194                          | 2000                  | Left                       | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 1926.01                 | 2641.242                | 715.231               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 2641.242                | 2721.242                |                       | 80                              |                       |                            |                               |                         |                           |
| 3                                  | 788405.039     | 2924951.792     | Arc            | 2721.242                | 2757.001                |                       | 35.76                           | 600                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 2757.001                | 2837.001                |                       | 80                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 2837.001                | 2872.364                | 35.362                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 2872.364                | 2967.364                |                       | 95                              |                       |                            |                               |                         |                           |
| 4                                  | 788322.026     | 2924711.741     | Arc            | 2967.364                | 3019.096                |                       | 51.732                          | 500                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 3019.096                | 3114.096                |                       | 95                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 3114.096                | 3202.858                | 88.762                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 3202.858                | 3237.858                |                       | 35                              |                       |                            |                               |                         |                           |
| 5                                  | 788175.93      | 2924484.498     | Arc            | 3237.858                | 3289.141                |                       | 51.283                          | 1500                  | Left                       | 2.963                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 3289.141                | 3324.141                |                       | 35                              |                       |                            |                               |                         |                           |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 3324.141                | 4036.317                | 712.176               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 4036.317                | 4076.317                |                       | 40                              |                       |                            |                               |                         |                           |
| 6                                  | 787745.092     | 2923760.909     | Arc            | 4076.317                | 4134.962                |                       | 58.645                          | 1200                  | Right                      | 3.704                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 4134.962                | 4174.962                |                       | 40                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 4174.962                | 4270.406                | 95.445                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 4270.406                | 4365.406                |                       | 95                              |                       |                            |                               |                         |                           |
| 7                                  | 787590.243     | 2923534.176     | Arc            | 4365.406                | 4395.202                |                       | 29.796                          | 500                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 4395.202                | 4490.202                |                       | 95                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 4490.202                | 4528.809                | 38.606                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 4528.809                | 4568.809                |                       | 40                              |                       |                            |                               |                         |                           |
| 8                                  | 787508.532     | 2923336.509     | Arc            | 4568.809                | 4619.76                 |                       | 50.951                          | 1200                  | Right                      | 3.704                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 4619.76                 | 4659.76                 |                       | 40                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 4659.76                 | 5835.046                | 1175.287              |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 5835.046                | 5930.046                |                       | 95                              |                       |                            |                               |                         |                           |
| 9                                  | 786927.703     | 2922100.585     | Arc            | 5930.046                | 5990.066                |                       | 60.02                           | 500                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 5990.066                | 6085.066                |                       | 95                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 6085.066                | 6612.354                | 527.288               |                                 |                       |                            |                               |                         |                           |
| 10                                 | 786834.494     | 2921453.226     | Arc            | 6612.354                | 6616.147                |                       | 3.793                           | 2500                  | Left                       | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 6616.147                | 7066.022                | 449.876               |                                 |                       |                            |                               |                         |                           |
| 11                                 | 786772.865     | 2920990.932     | Arc            | 7066.022                | 7095.246                |                       | 29.223                          | 2000                  | Right                      | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 7095.246                | 7397.249                | 302.003               |                                 |                       |                            |                               |                         |                           |



| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
| 12                                 | 786723.585     | 2920658.433     | Arc            | 7397.249                | 7436.28                 |                       | 39.031                          | 2000                  | Right                      | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 7436.28                 | 7709.565                | 273.286               |                                 |                       |                            |                               |                         |                           |
| 13                                 | 786671.718     | 2920350.099     | Arc            | 7709.565                | 7749.293                |                       | 39.728                          | 2000                  | Left                       | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 7749.293                | 8110.491                | 361.198               |                                 |                       |                            |                               |                         |                           |
| 14                                 | 786607.788     | 2919917.719     | Arc            | 8110.491                | 8222.497                |                       | 112.006                         | 2000                  | Left                       | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 8222.497                | 8483.861                | 261.364               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 8483.861                | 8563.861                |                       | 80                              |                       |                            |                               |                         |                           |
| 15                                 | 786567.98      | 2919509.499     | Arc            | 8563.861                | 8589.519                |                       | 25.657                          | 600                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 8589.519                | 8669.519                |                       | 80                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 8669.519                | 8908.493                | 238.975               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 8908.493                | 9018.493                |                       | 110                             |                       |                            |                               |                         |                           |
| 16                                 | 786455.702     | 2919063.289     | Arc            | 9018.493                | 9055.643                |                       | 37.15                           | 450                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 9055.643                | 9165.643                |                       | 110                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 9165.643                | 9868.701                | 703.058               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 9868.701                | 9913.701                |                       | 45                              |                       |                            |                               |                         |                           |
| 17                                 | 786501.348     | 2918161.524     | Arc            | 9913.701                | 9966.798                |                       | 53.097                          | 500                   | Right                      | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 9966.798                | 10011.798               |                       | 45                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 10011.798               | 10253.602               | 241.803               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 10253.602               | 10328.602               |                       | 75                              |                       |                            |                               |                         |                           |
| 18                                 | 786444.753     | 2917766.996     | Arc            | 10328.602               | 10349.424               |                       | 20.822                          | 300                   | Right                      | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 10349.424               | 10424.424               |                       | 75                              |                       |                            |                               |                         |                           |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 10424.424               | 10945.634               | 521.209               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 10945.634               | 11035.634               |                       | 90                              |                       |                            |                               |                         |                           |
| 19                                 | 786133.206     | 2917129.042     | Arc            | 11035.634               | 11062.912               |                       | 27.279                          | 550                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 11062.912               | 11152.912               |                       | 90                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 11152.912               | 11430.183               | 277.271               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 11430.183               | 11490.183               |                       | 60                              |                       |                            |                               |                         |                           |
| 20                                 | 785840.397     | 2916749.167     | Arc            | 11490.183               | 11567.763               |                       | 77.58                           | 800                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 11567.763               | 11627.763               |                       | 60                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 11627.763               | 12980.414               | 1352.651              |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 12980.414               | 13100.414               |                       | 120                             |                       |                            |                               |                         |                           |
| 21                                 | 785089.166     | 2915350.066     | Arc            | 13100.414               | 13134.475               |                       | 34.061                          | 400                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 13134.475               | 13254.475               |                       | 120                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 13254.475               | 13597.833               | 343.358               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 13597.833               | 13677.833               |                       | 80                              |                       |                            |                               |                         |                           |
| 22                                 | 785018.298     | 2914754.392     | Arc            | 13677.833               | 13757.808               |                       | 79.975                          | 600                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 13757.808               | 13837.808               |                       | 80                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 13837.808               | 14188.286               | 350.477               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 14188.286               | 14283.286               |                       | 95                              |                       |                            |                               |                         |                           |
| 23                                 | 785100.05      | 2914164.378     | Arc            | 14283.286               | 14343.979               |                       | 60.694                          | 500                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 14343.979               | 14438.979               |                       | 95                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 14438.979               | 15052.669               | 613.69                |                                 |                       |                            |                               |                         |                           |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
| 24                                 | 784988.245     | 2913417.332     | Arc            | 15052.669               | 15085.653               |                       | 32.983                          | 2500                  | Left                       | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 15085.653               | 15430.177               | 344.524               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 15430.177               | 15525.177               |                       | 95                              |                       |                            |                               |                         |                           |
| 25                                 | 784914.413     | 2912942.576     | Arc            | 15525.177               | 15574.364               |                       | 49.187                          | 500                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 15574.364               | 15669.364               |                       | 95                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 15669.364               | 16290.937               | 621.572               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 16290.937               | 16365.937               |                       | 75                              |                       |                            |                               |                         |                           |
| 26                                 | 784551.308     | 2912104.632     | Arc            | 16365.937               | 16555.184               |                       | 189.248                         | 300                   | Left                       | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 16555.184               | 16630.184               |                       | 75                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 16630.184               | 17391.436               | 761.252               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 17391.436               | 17511.436               |                       | 120                             |                       |                            |                               |                         |                           |
| 27                                 | 784992.406     | 2911137.296     | Arc            | 17511.436               | 17531.499               |                       | 20.063                          | 400                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 17531.499               | 17651.499               |                       | 120                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 17651.499               | 17798.785               | 147.285               |                                 |                       |                            |                               |                         |                           |
| 28                                 | 785033.228     | 2910802.523     | Arc            | 17798.785               | 17919.214               |                       | 120.429                         | 2000                  | Left                       | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 17919.214               | 18923.836               | 1004.622              |                                 |                       |                            |                               |                         |                           |
| 29                                 | 785202.896     | 2909746.763     | Arc            | 18923.836               | 18932.739               |                       | 8.902                           | 2000                  | Right                      | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 18932.739               | 19508.878               | 576.14                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 19508.878               | 19598.878               |                       | 90                              |                       |                            |                               |                         |                           |
| 30                                 | 785300.484     | 2909055.602     | Arc            | 19598.878               | 19654.786               |                       | 55.908                          | 255                   | Right                      | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 19654.786               | 19744.786               |                       | 90                              |                       |                            |                               |                         |                           |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 19744.786               | 20222.996               | 478.21                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 20222.996               | 20312.996               |                       | 90                              |                       |                            |                               |                         |                           |
| 31                                 | 785020.555     | 2908356.249     | Arc            | 20312.996               | 20446.982               |                       | 133.986                         | 255                   | Left                       | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 20446.982               | 20536.982               |                       | 90                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 20536.982               | 20632.975               | 95.993                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 20632.975               | 20722.975               |                       | 90                              |                       |                            |                               |                         |                           |
| 32                                 | 785171.472     | 2907975.557     | Arc            | 20722.975               | 20852.447               |                       | 129.473                         | 255                   | Right                      | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 20852.447               | 20942.447               |                       | 90                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 20942.447               | 21208.39                | 265.942               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 21208.39                | 21263.39                |                       | 55                              |                       |                            |                               |                         |                           |
| 33                                 | 784986.129     | 2907480.785     | Arc            | 21263.39                | 21367.302               |                       | 103.912                         | 400                   | Left                       | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 21367.302               | 21422.302               |                       | 55                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 21422.302               | 22035.569               | 613.268               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 22035.569               | 22080.569               |                       | 45                              |                       |                            |                               |                         |                           |
| 34                                 | 784974.724     | 2906628.65      | Arc            | 22080.569               | 22252.627               |                       | 172.058                         | 500                   | Right                      | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 22252.627               | 22297.627               |                       | 45                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 22297.627               | 22722.81                | 425.182               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 22722.81                | 22792.81                |                       | 70                              |                       |                            |                               |                         |                           |
| 35                                 | 784664.197     | 2905909.475     | Arc            | 22792.81                | 23087.82                |                       | 295.01                          | 350                   | Left                       | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 23087.82                | 23157.82                |                       | 70                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 23157.82                | 23531.727               | 373.907               |                                 |                       |                            |                               |                         |                           |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
| 36                                 | 785001.499     | 2905391.634     | Arc            | 23531.727               | 23567.293               |                       | 35.566                          | 1200                  | Left                       | Normal Camber                 | 80                      | --NA--                    |
|                                    |                |                 | Straight       | 23567.293               | 23771.148               | 203.855               |                                 |                       |                            |                               |                         |                           |
| 37                                 | 785155.634     | 2905182.917     | Arc            | 23771.148               | 23846.768               |                       | 75.621                          | 1200                  | Right                      | Normal Camber                 | 80                      | --NA--                    |
|                                    |                |                 | Straight       | 23846.768               | 24045.094               | 198.326               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 24045.094               | 24120.094               |                       | 75                              |                       |                            |                               |                         |                           |
| 38                                 | 785328.998     | 2904904.617     | Arc            | 24120.094               | 24153.939               |                       | 33.845                          | 300                   | Right                      | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 24153.939               | 24228.939               |                       | 75                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 24228.939               | 24473.201               | 244.262               |                                 |                       |                            |                               |                         |                           |
| 39                                 | 785411.682     | 2904542.261     | Arc            | 24473.201               | 24544.553               |                       | 71.352                          | 2000                  | Right                      | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 24544.553               | 25671.278               | 1126.725              |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 25671.278               | 25721.278               |                       | 50                              |                       |                            |                               |                         |                           |
| 40                                 | 785626.564     | 2903329.19      | Arc            | 25721.278               | 25760.393               |                       | 39.115                          | 1000                  | Left                       | 4.445                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 25760.393               | 25810.393               |                       | 50                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 25810.393               | 26088.036               | 277.643               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 26088.036               | 26208.036               |                       | 120                             |                       |                            |                               |                         |                           |
| 41                                 | 785763.152     | 2902857.015     | Arc            | 26208.036               | 26257.591               |                       | 49.555                          | 400                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 26257.591               | 26377.591               |                       | 120                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 26377.591               | 27102.794               | 725.203               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 27102.794               | 27162.794               |                       | 60                              |                       |                            |                               |                         |                           |
| 42                                 | 786452.196     | 2901976.823     | Arc            | 27162.794               | 27513.042               |                       | 350.248                         | 380                   | Right                      | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 27513.042               | 27573.042               |                       | 60                              |                       |                            |                               |                         |                           |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 27573.042               | 27747.182               | 174.14                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 27747.182               | 27787.182               |                       | 40                              |                       |                            |                               |                         |                           |
| 43                                 | 786286.732     | 2901532.409     | Arc            | 27787.182               | 27810.643               |                       | 23.461                          | 1200                  | Left                       | 3.704                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 27810.643               | 27850.643               |                       | 40                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 27850.643               | 28366.513               | 515.87                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 28366.513               | 28486.513               |                       | 120                             |                       |                            |                               |                         |                           |
| 44                                 | 786055.392     | 2900840.861     | Arc            | 28486.513               | 28570.733               |                       | 84.22                           | 400                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 28570.733               | 28690.733               |                       | 120                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 28690.733               | 29448.842               | 758.109               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 29448.842               | 29488.842               |                       | 40                              |                       |                            |                               |                         |                           |
| 45                                 | 786239.01      | 2899726.032     | Arc            | 29488.842               | 29826.997               |                       | 338.155                         | 1200                  | Left                       | 3.704                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 29826.997               | 29866.997               |                       | 40                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 29866.997               | 30113.04                | 246.044               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 30113.04                | 30153.04                |                       | 40                              |                       |                            |                               |                         |                           |
| 46                                 | 786497.497     | 2899228.041     | Arc            | 30153.04                | 30282.611               |                       | 129.571                         | 1200                  | Right                      | 3.704                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 30282.611               | 30322.611               |                       | 40                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 30322.611               | 30576.802               | 254.19                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 30576.802               | 30626.802               |                       | 50                              |                       |                            |                               |                         |                           |
| 47                                 | 786645.822     | 2898822.396     | Arc            | 30626.802               | 30672.57                |                       | 45.768                          | 1000                  | Left                       | 4.445                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 30672.57                | 30722.57                |                       | 50                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 30722.57                | 30929.065               | 206.495               |                                 |                       |                            |                               |                         |                           |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 30929.065               | 30984.065               |                       | 55                              |                       |                            |                               |                         |                           |
| 48                                 | 786803.96      | 2898474.377     | Arc            | 30984.065               | 31079.586               |                       | 95.521                          | 400                   | Right                      | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 31079.586               | 31134.586               |                       | 55                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 31134.586               | 31359.254               | 224.669               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 31359.254               | 31414.254               |                       | 55                              |                       |                            |                               |                         |                           |
| 49                                 | 786831.948     | 2898083.891     | Arc            | 31414.254               | 31432.268               |                       | 18.014                          | 400                   | Right                      | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 31432.268               | 31487.268               |                       | 55                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 31487.268               | 31912.8                 | 425.532               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 31912.8                 | 31967.8                 |                       | 55                              |                       |                            |                               |                         |                           |
| 50                                 | 786756.797     | 2897480.814     | Arc            | 31967.8                 | 32093.578               |                       | 125.778                         | 400                   | Right                      | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 32093.578               | 32148.578               |                       | 55                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 32148.578               | 32305.355               | 156.777               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 32305.355               | 32395.355               |                       | 90                              |                       |                            |                               |                         |                           |
| 51                                 | 786564.902     | 2897157.406     | Arc            | 32395.355               | 32417.89                |                       | 22.536                          | 255                   | Left                       | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 32417.89                | 32507.89                |                       | 90                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 32507.89                | 32988.206               | 480.315               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 32988.206               | 33038.206               |                       | 50                              |                       |                            |                               |                         |                           |
| 52                                 | 786475.184     | 2896512.303     | Arc            | 33038.206               | 33078.51                |                       | 40.304                          | 1000                  | Left                       | 4.445                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 33078.51                | 33128.51                |                       | 50                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 33128.51                | 33607.631               | 479.121               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 33607.631               | 33727.631               |                       | 120                             |                       |                            |                               |                         |                           |



| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
| 53                                 | 786464.723     | 2895754.684     | Arc            | 33727.631               | 33903.682               |                       | 176.051                         | 400                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 33903.682               | 34023.682               |                       | 120                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 34023.682               | 34771.404               | 747.722               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 34771.404               | 34891.404               |                       | 120                             |                       |                            |                               |                         |                           |
| 54                                 | 787159.649     | 2894884.989     | Arc            | 34891.404               | 34966.331               |                       | 74.927                          | 400                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 34966.331               | 35086.331               |                       | 120                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 35086.331               | 35422.534               | 336.202               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 35422.534               | 35452.534               |                       | 30                              |                       |                            |                               |                         |                           |
| 55                                 | 787288.907     | 2894343.541     | Arc            | 35452.534               | 35519.46                |                       | 66.927                          | 1000                  | Right                      | 4.445                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 35519.46                | 35549.46                |                       | 30                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 35549.46                | 35709.566               | 160.105               |                                 |                       |                            |                               |                         |                           |
| 56                                 | 787320.842     | 2894079.109     | Arc            | 35709.566               | 35795.104               |                       | 85.539                          | 2000                  | Left                       | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 35795.104               | 36059.073               | 263.969               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 36059.073               | 36179.073               |                       | 120                             |                       |                            |                               |                         |                           |
| 57                                 | 787383.317     | 2893635.216     | Arc            | 36179.073               | 36222.916               |                       | 43.842                          | 400                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 36222.916               | 36342.916               |                       | 120                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 36342.916               | 36592.684               | 249.768               |                                 |                       |                            |                               |                         |                           |
| 58                                 | 787286.359     | 2893216.471     | Arc            | 36592.684               | 36669.73                |                       | 77.046                          | 2000                  | Right                      | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 36669.73                | 37058.238               | 388.508               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 37058.238               | 37103.238               |                       | 45                              |                       |                            |                               |                         |                           |
| 59                                 | 787109.532     | 2892606.449     | Arc            | 37103.238               | 37427.319               |                       | 324.081                         | 1150                  | Left                       | 3.865                         | 100                     | --NA--                    |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 37427.319               | 37472.319               |                       | 45                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 37472.319               | 37786.457               | 314.138               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 37786.457               | 37846.457               |                       | 60                              |                       |                            |                               |                         |                           |
| 60                                 | 787134.896     | 2891901.757     | Arc            | 37846.457               | 38090.573               |                       | 244.115                         | 800                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 38090.573               | 38150.573               |                       | 60                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 38150.573               | 38682.343               | 531.77                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 38682.343               | 38722.343               |                       | 40                              |                       |                            |                               |                         |                           |
| 61                                 | 787444.808     | 2891180.243     | Arc            | 38722.343               | 38783.428               |                       | 61.086                          | 1200                  | Right                      | 3.704                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 38783.428               | 38823.428               |                       | 40                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 38823.428               | 39049.61                | 226.182               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 39049.61                | 39144.61                |                       | 95                              |                       |                            |                               |                         |                           |
| 62                                 | 787615.943     | 2890720.114     | Arc            | 39144.61                | 39341.15                |                       | 196.54                          | 500                   | Left                       | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 39341.15                | 39436.15                |                       | 95                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 39436.15                | 39985.822               | 549.671               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 39985.822               | 40060.822               |                       | 75                              |                       |                            |                               |                         |                           |
| 63                                 | 788342.312     | 2890118.752     | Arc            | 40060.822               | 40297.501               |                       | 236.679                         | 300                   | Right                      | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 40297.501               | 40372.501               |                       | 75                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 40372.501               | 40951.453               | 578.952               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 40951.453               | 41046.453               |                       | 95                              |                       |                            |                               |                         |                           |
| 64                                 | 788231.932     | 2889181.282     | Arc            | 41046.453               | 41188.619               |                       | 142.166                         | 500                   | Right                      | 5                             | 80                      | --NA--                    |
|                                    |                |                 | Transition     | 41188.619               | 41283.619               |                       | 95                              |                       |                            |                               |                         |                           |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 41283.619               | 41628.065               | 344.446               |                                 |                       |                            |                               |                         |                           |
| 65                                 | 787943.963     | 2888743.903     | Arc            | 41628.065               | 41654.009               |                       | 25.944                          | 2000                  | Right                      | Normal Camber                 | 80                      | --NA--                    |
|                                    |                |                 | Straight       | 41654.009               | 42070.294               | 416.285               |                                 |                       |                            |                               |                         |                           |
| 66                                 | 787692.859     | 2888387.62      | Arc            | 42070.294               | 42083.537               |                       | 13.243                          | 2000                  | Left                       | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 42083.537               | 42504.866               | 421.329               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 42504.866               | 42584.866               |                       | 80                              |                       |                            |                               |                         |                           |
| 67                                 | 787387.643     | 2887954.128     | Arc            | 42584.866               | 42629.419               |                       | 44.554                          | 600                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 42629.419               | 42709.419               |                       | 80                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 42709.419               | 43043.126               | 333.707               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 43043.126               | 43093.126               |                       | 50                              |                       |                            |                               |                         |                           |
| 68                                 | 786908.784     | 2887491.485     | Arc            | 43093.126               | 43449.199               |                       | 356.072                         | 1000                  | Left                       | 4.445                         | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 43449.199               | 43499.199               |                       | 50                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 43499.199               | 43883.34                | 384.142               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 43883.34                | 43973.34                |                       | 90                              |                       |                            |                               |                         |                           |
| 69                                 | 786622.664     | 2886834.688     | Arc            | 43973.34                | 43998.314               |                       | 24.974                          | 550                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 43998.314               | 44088.314               |                       | 90                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 44088.314               | 44361.549               | 273.234               |                                 |                       |                            |                               |                         |                           |
| 70                                 | 786536.063     | 2886424.506     | Arc            | 44361.549               | 44448.687               |                       | 87.139                          | 1200                  | Left                       | Normal Camber                 | 80                      | --NA--                    |
|                                    |                |                 | Straight       | 44448.687               | 44697.056               | 248.369               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 44697.056               | 44752.056               |                       | 55                              |                       |                            |                               |                         |                           |
| 71                                 | 786492.034     | 2886058.362     | Arc            | 44752.056               | 44795.797               |                       | 43.74                           | 400                   | Left                       | 5                             | 80                      | --NA--                    |

| HORIZONTAL ALIGNMENT REPORT |            |             |            |              |              |            |                  |            |             |                    |              |                |
|-----------------------------|------------|-------------|------------|--------------|--------------|------------|------------------|------------|-------------|--------------------|--------------|----------------|
| HIP/CURVE NO.               | HIP        |             | ELEMENT    | START        | END          | LENGTH (m) | CHORD LENGTH (m) | RADIUS (m) | HAND OF ARC | SUPERELEVATION (%) | DESIGN SPEED | EXTRA WIDENING |
|                             | EASTING    | NORTHING    |            | CHAINAGE (m) | CHAINAGE (m) |            |                  |            |             |                    |              |                |
|                             |            |             | Transition | 44795.797    | 44850.797    |            | 55               |            |             |                    |              |                |
|                             |            |             | Straight   | 44850.797    | 45579.437    | 728.64     |                  |            |             |                    |              |                |
|                             |            |             | Transition | 45579.437    | 45699.437    |            | 120              |            |             |                    |              |                |
| 72                          | 786702.499 | 2884789.989 | Arc        | 45699.437    | 46289.346    |            | 589.909          | 400        | Left        | 5                  | 80           | --NA--         |
|                             |            |             | Transition | 46289.346    | 46409.346    |            | 120              |            |             |                    |              |                |
|                             |            |             | Straight   | 46409.346    | 46731.016    | 321.67     |                  |            |             |                    |              |                |
|                             |            |             | Transition | 46731.016    | 46806.016    |            | 75               |            |             |                    |              |                |
| 73                          | 787588.262 | 2885015.477 | Arc        | 46806.016    | 46878.15     |            | 72.134           | 300        | Right       | 5                  | 80           | 0.6            |
|                             |            |             | Transition | 46878.15     | 46953.15     |            | 75               |            |             |                    |              |                |
|                             |            |             | Straight   | 46953.15     | 47361.192    | 408.042    |                  |            |             |                    |              |                |
| 74                          | 788116.757 | 2884934.25  | Arc        | 47361.192    | 47392.717    |            | 31.524           | 2000       | Left        | Normal Camber      | 100          | --NA--         |
|                             |            |             | Straight   | 47392.717    | 47631.242    | 238.526    |                  |            |             |                    |              |                |
| 75                          | 788393.654 | 2884892.11  | Arc        | 47631.242    | 47682.832    |            | 51.59            | 2000       | Right       | Normal Camber      | 100          | --NA--         |
|                             |            |             | Straight   | 47682.832    | 48184.043    | 501.211    |                  |            |             |                    |              |                |
|                             |            |             | Transition | 48184.043    | 48259.043    |            | 75               |            |             |                    |              |                |
| 76                          | 788990.512 | 2884789.112 | Arc        | 48259.043    | 48266.662    |            | 7.619            | 300        | Left        | 5                  | 80           | 0.6            |
|                             |            |             | Transition | 48266.662    | 48341.662    |            | 75               |            |             |                    |              |                |
|                             |            |             | Straight   | 48341.662    | 48462.675    | 121.013    |                  |            |             |                    |              |                |
|                             |            |             | Transition | 48462.675    | 48537.675    |            | 75               |            |             |                    |              |                |
| 77                          | 789300.262 | 2884808.499 | Arc        | 48537.675    | 48609.086    |            | 71.411           | 300        | Right       | 5                  | 80           | 0.6            |
|                             |            |             | Transition | 48609.086    | 48684.086    |            | 75               |            |             |                    |              |                |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 48684.086               | 48891.266               | 207.18                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 48891.266               | 48961.266               |                       | 70                              |                       |                            |                               |                         |                           |
| 78                                 | 789711.661     | 2884643.593     | Arc            | 48961.266               | 49072.299               |                       | 111.033                         | 700                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 49072.299               | 49142.299               |                       | 70                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 49142.299               | 49687.783               | 545.485               |                                 |                       |                            |                               |                         |                           |
| 79                                 | 790327.818     | 2884182.002     | Arc            | 49687.783               | 49885.302               |                       | 197.519                         | 2000                  | Right                      | Normal Camber                 | 100                     | --NA--                    |
|                                    |                |                 | Straight       | 49885.302               | 50136.183               | 250.88                |                                 |                       |                            |                               |                         |                           |
| 80                                 | 790624.155     | 2883907.68      | Arc            | 50136.183               | 50244.304               |                       | 108.121                         | 1200                  | Left                       | Normal Camber                 | 80                      | --NA--                    |
|                                    |                |                 | Straight       | 50244.304               | 50515.705               | 271.401               |                                 |                       |                            |                               |                         |                           |
| 81                                 | 791027.966     | 2883596.385     | Arc            | 50515.705               | 50881.586               |                       | 365.881                         | 1200                  | Left                       | Normal Camber                 | 80                      | --NA--                    |
|                                    |                |                 | Straight       | 50881.586               | 51299.533               | 417.947               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 51299.533               | 51374.533               |                       | 75                              |                       |                            |                               |                         |                           |
| 82                                 | 791682.807     | 2883361.771     | Arc            | 51374.533               | 51411.533               |                       | 37                              | 300                   | Left                       | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 51411.533               | 51486.533               |                       | 75                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 51486.533               | 51625.696               | 139.163               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 51625.696               | 51715.696               |                       | 90                              |                       |                            |                               |                         |                           |
| 83                                 | 792060.384     | 2883349.349     | Arc            | 51715.696               | 51825.845               |                       | 110.149                         | 255                   | Right                      | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 51825.845               | 51915.845               |                       | 90                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 51915.845               | 52077.085               | 161.24                |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 52077.085               | 52132.085               |                       | 55                              |                       |                            |                               |                         |                           |
| 84                                 | 792394.521     | 2883059.919     | Arc            | 52132.085               | 52291.338               |                       | 159.252                         | 400                   | Left                       | 5                             | 80                      | --NA--                    |

| <b>HORIZONTAL ALIGNMENT REPORT</b> |                |                 |                |                         |                         |                       |                                 |                       |                            |                               |                         |                           |
|------------------------------------|----------------|-----------------|----------------|-------------------------|-------------------------|-----------------------|---------------------------------|-----------------------|----------------------------|-------------------------------|-------------------------|---------------------------|
| <b>HIP/CURVE<br/>NO.</b>           | <b>HIP</b>     |                 | <b>ELEMENT</b> | <b>START</b>            | <b>END</b>              | <b>LENGTH<br/>(m)</b> | <b>CHORD<br/>LENGTH<br/>(m)</b> | <b>RADIUS<br/>(m)</b> | <b>HAND<br/>OF<br/>ARC</b> | <b>SUPERELEVATION<br/>(%)</b> | <b>DESIGN<br/>SPEED</b> | <b>EXTRA<br/>WIDENING</b> |
|                                    | <b>EASTING</b> | <b>NORTHING</b> |                | <b>CHAINAGE<br/>(m)</b> | <b>CHAINAGE<br/>(m)</b> |                       |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 52291.338               | 52346.338               |                       | 55                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 52346.338               | 52537.753               | 191.416               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 52537.753               | 52612.753               |                       | 75                              |                       |                            |                               |                         |                           |
| 85                                 | 792856.444     | 2882932.736     | Arc            | 52612.753               | 52764.51                |                       | 151.757                         | 300                   | Right                      | 5                             | 80                      | 0.6                       |
|                                    |                |                 | Transition     | 52764.51                | 52839.51                |                       | 75                              |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 52839.51                | 52979.255               | 139.745               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 52979.255               | 53094.255               |                       | 115                             |                       |                            |                               |                         |                           |
| 86                                 | 793132.151     | 2882565.144     | Arc            | 53094.255               | 53199.622               |                       | 105.367                         | 400                   | Left                       | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 53199.622               | 53314.622               |                       | 115                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 53314.622               | 53753.795               | 439.173               |                                 |                       |                            |                               |                         |                           |
|                                    |                |                 | Transition     | 53753.795               | 53868.795               |                       | 115                             |                       |                            |                               |                         |                           |
| 87                                 | 793877.288     | 2882181.982     | Arc            | 53868.795               | 54096.812               |                       | 228.017                         | 400                   | Right                      | 5                             | 100                     | --NA--                    |
|                                    |                |                 | Transition     | 54096.812               | 54211.812               |                       | 115                             |                       |                            |                               |                         |                           |
|                                    |                |                 | Straight       | 54211.812               | 54230                   | 18.188                |                                 |                       |                            |                               |                         |                           |

| VERTICAL CURVE REPORT |           |        |               |              |         |           |        |           |        |          |        |
|-----------------------|-----------|--------|---------------|--------------|---------|-----------|--------|-----------|--------|----------|--------|
| CURVE NO.             | IP        |        | TYPE OF CURVE | CURVE LENGTH | M VALUE | START     |        | END       |        | GRADIENT |        |
|                       | CHAINAGE  | LEVEL  |               |              |         | CHAINAGE  | LEVEL  | CHAINAGE  | LEVEL  | IN       | OUT    |
| 1                     | 251.786   | 47.105 | Sag           | 360          | 1.739   | 71.786    | 49.568 | 431.786   | 51.598 | -1.368   | 2.496  |
| 2                     | 724       | 58.89  | Hog           | 340          | -1.061  | 554       | 54.647 | 894       | 58.89  | 2.496    | 0      |
| 3                     | 1364      | 58.89  | Hog           | 340          | -1.005  | 1194      | 58.89  | 1534      | 54.869 | 0        | -2.365 |
| 4                     | 1832.069  | 47.819 | Sag           | 240          | 0.698   | 1712.069  | 50.657 | 1952.069  | 47.773 | -2.365   | -0.038 |
| 5                     | 3284.196  | 47.267 | Hog           | 80           | -0.013  | 3244.196  | 47.282 | 3324.196  | 47.199 | -0.038   | -0.17  |
| 6                     | 4000.978  | 46.048 | Sag           | 60           | 0.011   | 3970.978  | 46.099 | 4030.978  | 46.043 | -0.17    | -0.019 |
| 7                     | 4645.971  | 45.923 | Hog           | 80           | -0.018  | 4605.971  | 45.931 | 4685.971  | 45.844 | -0.019   | -0.198 |
| 8                     | 5630.459  | 43.978 | Sag           | 60           | 0.012   | 5600.459  | 44.037 | 5660.459  | 43.965 | -0.198   | -0.044 |
| 9                     | 6375.582  | 43.651 | Hog           | 60           | -0.014  | 6345.582  | 43.664 | 6405.582  | 43.58  | -0.044   | -0.237 |
| 10                    | 6940.375  | 42.313 | Sag           | 120          | 0.119   | 6880.375  | 42.455 | 7000.375  | 42.648 | -0.237   | 0.558  |
| 11                    | 7156.03   | 43.517 | Hog           | 130          | -0.091  | 7091.03   | 43.154 | 7221.03   | 43.516 | 0.558    | -0.001 |
| 12                    | 7332.067  | 43.515 | Hog           | 150          | -0.119  | 7257.067  | 43.516 | 7407.067  | 43.038 | -0.001   | -0.637 |
| 13                    | 7554.68   | 42.098 | Sag           | 110          | 0.105   | 7499.68   | 42.448 | 7609.68   | 42.169 | -0.637   | 0.129  |
| 14                    | 7850.016  | 42.479 | Hog           | 60           | -0.01   | 7820.016  | 42.44  | 7880.016  | 42.476 | 0.129    | -0.008 |
| 15                    | 8345.991  | 42.438 | Hog           | 60           | -0.02   | 8315.991  | 42.44  | 8375.991  | 42.357 | -0.008   | -0.27  |
| 16                    | 8664.908  | 41.576 | Sag           | 60           | 0.023   | 8634.908  | 41.657 | 8694.908  | 41.587 | -0.27    | 0.037  |
| 17                    | 8866      | 41.65  | Hog           | 60           | -0.009  | 8836      | 41.639 | 8896      | 41.627 | 0.037    | -0.078 |
| 18                    | 8986      | 41.556 | Sag           | 60           | 0.022   | 8956      | 41.579 | 9016      | 41.619 | -0.078   | 0.209  |
| 19                    | 9077      | 41.746 | Hog           | 80           | -0.052  | 9037      | 41.662 | 9117      | 41.62  | 0.209    | -0.316 |
| 20                    | 9229      | 41.266 | Sag           | 80           | 0.081   | 9189      | 41.392 | 9269      | 41.464 | -0.316   | 0.495  |
| 21                    | 9407.983  | 42.151 | Hog           | 80           | -0.055  | 9367.983  | 41.954 | 9447.983  | 42.131 | 0.495    | -0.052 |
| 22                    | 10019.005 | 41.832 | Hog           | 60           | -0.001  | 9989.005  | 41.848 | 10049.005 | 41.813 | -0.052   | -0.063 |
| 23                    | 10340.842 | 41.631 | Sag           | 60           | 0.005   | 10310.842 | 41.65  | 10370.842 | 41.63  | -0.063   | -0.002 |
| 24                    | 10707.824 | 41.625 | Hog           | 60           | -0.009  | 10677.824 | 41.625 | 10737.824 | 41.59  | -0.002   | -0.115 |



| VERTICAL CURVE REPORT |           |        |               |              |         |           |        |           |        |          |        |
|-----------------------|-----------|--------|---------------|--------------|---------|-----------|--------|-----------|--------|----------|--------|
| CURVE NO.             | IP        |        | TYPE OF CURVE | CURVE LENGTH | M VALUE | START     |        | END       |        | GRADIENT |        |
|                       | CHAINAGE  | LEVEL  |               |              |         | CHAINAGE  | LEVEL  | CHAINAGE  | LEVEL  | IN       | OUT    |
| 25                    | 11063.95  | 41.215 | Hog           | 60           | -0.026  | 11033.95  | 41.249 | 11093.95  | 41.076 | -0.115   | -0.464 |
| 26                    | 11211     | 40.532 | Sag           | 60           | 0.009   | 11181     | 40.671 | 11241     | 40.43  | -0.464   | -0.339 |
| 27                    | 11411     | 39.854 | Sag           | 60           | 0.02    | 11381     | 39.956 | 11441     | 39.833 | -0.339   | -0.07  |
| 28                    | 11532.003 | 39.769 | Sag           | 60           | 0.008   | 11502.003 | 39.79  | 11562.003 | 39.781 | -0.07    | 0.041  |
| 29                    | 12176.306 | 40.03  | Hog           | 80           | -0.018  | 12136.306 | 40.014 | 12216.306 | 39.974 | 0.041    | -0.141 |
| 30                    | 12675.518 | 39.325 | Hog           | 60           | -0.016  | 12645.518 | 39.367 | 12705.518 | 39.218 | -0.141   | -0.356 |
| 31                    | 12873     | 38.622 | Sag           | 80           | 0.066   | 12833     | 38.764 | 12913     | 38.742 | -0.356   | 0.299  |
| 32                    | 13023     | 39.071 | Hog           | 60           | -0.029  | 12993     | 38.981 | 13053     | 39.044 | 0.299    | -0.089 |
| 33                    | 13872     | 38.312 | Sag           | 60           | 0.004   | 13842     | 38.339 | 13902     | 38.301 | -0.089   | -0.036 |
| 34                    | 14253     | 38.175 | Sag           | 60           | 0.004   | 14223     | 38.186 | 14283     | 38.182 | -0.036   | 0.022  |
| 35                    | 14595.241 | 38.251 | Sag           | 60           | 0.002   | 14565.241 | 38.245 | 14625.241 | 38.264 | 0.022    | 0.043  |
| 36                    | 14836.687 | 38.356 | Hog           | 60           | -0.009  | 14806.687 | 38.343 | 14866.687 | 38.332 | 0.043    | -0.081 |
| 37                    | 15028.218 | 38.201 | Sag           | 60           | 0       | 14998.218 | 38.226 | 15058.218 | 38.178 | -0.081   | -0.078 |
| 38                    | 15233.036 | 38.042 | Hog           | 60           | -0.022  | 15203.036 | 38.065 | 15263.036 | 37.93  | -0.078   | -0.371 |
| 39                    | 15483     | 37.115 | Sag           | 60           | 0.033   | 15453     | 37.226 | 15513     | 37.136 | -0.371   | 0.069  |
| 40                    | 15832     | 37.356 | Hog           | 60           | -0.009  | 15802     | 37.335 | 15862     | 37.34  | 0.069    | -0.054 |
| 41                    | 16102     | 37.211 | Sag           | 60           | 0.008   | 16072     | 37.227 | 16132     | 37.226 | -0.054   | 0.049  |
| 42                    | 16345     | 37.33  | Hog           | 60           | -0.028  | 16315     | 37.315 | 16375     | 37.233 | 0.049    | -0.323 |
| 43                    | 16473     | 36.916 | Sag           | 60           | 0.045   | 16443     | 37.013 | 16503     | 37     | -0.323   | 0.278  |
| 44                    | 16640     | 37.381 | Hog           | 60           | -0.022  | 16610     | 37.297 | 16670     | 37.378 | 0.278    | -0.008 |
| 45                    | 16771     | 37.37  | Hog           | 60           | -0.021  | 16741     | 37.373 | 16801     | 37.282 | -0.008   | -0.292 |
| 46                    | 16938     | 36.882 | Sag           | 90           | 0.098   | 16893     | 37.013 | 16983     | 37.142 | -0.292   | 0.578  |
| 47                    | 17062.966 | 37.605 | Hog           | 110          | -0.109  | 17007.966 | 37.287 | 17117.966 | 37.486 | 0.578    | -0.216 |
| 48                    | 17372.628 | 36.937 | Sag           | 60           | 0.037   | 17342.628 | 37.002 | 17402.628 | 37.019 | -0.216   | 0.271  |

| VERTICAL CURVE REPORT |           |        |               |              |         |           |        |           |        |          |        |
|-----------------------|-----------|--------|---------------|--------------|---------|-----------|--------|-----------|--------|----------|--------|
| CURVE NO.             | IP        |        | TYPE OF CURVE | CURVE LENGTH | M VALUE | START     |        | END       |        | GRADIENT |        |
|                       | CHAINAGE  | LEVEL  |               |              |         | CHAINAGE  | LEVEL  | CHAINAGE  | LEVEL  | IN       | OUT    |
| 49                    | 17536.852 | 37.383 | Hog           | 120          | -0.066  | 17476.852 | 37.22  | 17596.852 | 37.281 | 0.271    | -0.17  |
| 50                    | 17877.926 | 36.803 | Sag           | 70           | 0.009   | 17842.926 | 36.863 | 17912.926 | 36.78  | -0.17    | -0.067 |
| 51                    | 18382.519 | 36.466 | Sag           | 70           | 0       | 18347.519 | 36.489 | 18417.519 | 36.442 | -0.067   | -0.067 |
| 52                    | 18898.051 | 36.121 | Sag           | 60           | 0.003   | 18868.051 | 36.141 | 18928.051 | 36.114 | -0.067   | -0.024 |
| 53                    | 19406.149 | 36.002 | Hog           | 60           | -0.001  | 19376.149 | 36.009 | 19436.149 | 35.989 | -0.024   | -0.043 |
| 54                    | 19754.407 | 35.852 | Sag           | 60           | 0.013   | 19724.407 | 35.865 | 19784.407 | 35.892 | -0.043   | 0.133  |
| 55                    | 19940.551 | 36.1   | Hog           | 60           | -0.032  | 19910.551 | 36.06  | 19970.551 | 36.012 | 0.133    | -0.293 |
| 56                    | 20230     | 35.253 | Sag           | 60           | 0.015   | 20200     | 35.341 | 20260     | 35.226 | -0.293   | -0.09  |
| 57                    | 20882     | 34.669 | Sag           | 60           | 0.036   | 20852     | 34.696 | 20912     | 34.784 | -0.09    | 0.385  |
| 58                    | 21046.999 | 35.304 | Hog           | 60           | -0.029  | 21016.999 | 35.189 | 21076.999 | 35.304 | 0.385    | 0      |
| 59                    | 21247.198 | 35.304 | Hog           | 60           | -0.003  | 21217.198 | 35.304 | 21277.198 | 35.293 | 0        | -0.038 |
| 60                    | 21777.999 | 35.104 | Sag           | 60           | 0.003   | 21747.999 | 35.115 | 21807.999 | 35.104 | -0.038   | 0      |
| 61                    | 21964     | 35.104 | Sag           | 60           | 0.005   | 21934     | 35.104 | 21994     | 35.123 | 0        | 0.062  |
| 62                    | 22355     | 35.347 | Sag           | 60           | 0.001   | 22325     | 35.328 | 22385     | 35.369 | 0.062    | 0.074  |
| 63                    | 22593     | 35.524 | Hog           | 60           | -0.007  | 22563     | 35.502 | 22623     | 35.518 | 0.074    | -0.019 |
| 64                    | 23273     | 35.397 | Sag           | 60           | 0.001   | 23243     | 35.403 | 23303     | 35.396 | -0.019   | -0.003 |
| 65                    | 23662.696 | 35.386 | Hog           | 60           | -0.025  | 23632.696 | 35.386 | 23692.696 | 35.284 | -0.003   | -0.337 |
| 66                    | 23908.999 | 34.555 | Sag           | 60           | 0.025   | 23878.999 | 34.656 | 23938.999 | 34.555 | -0.337   | 0      |
| 67                    | 24091     | 34.555 | Sag           | 60           | 0.03    | 24061     | 34.555 | 24121     | 34.675 | 0        | 0.399  |
| 68                    | 24268.066 | 35.261 | Hog           | 60           | -0.033  | 24238.066 | 35.141 | 24298.066 | 35.25  | 0.399    | -0.036 |
| 69                    | 24598.442 | 35.141 | Hog           | 60           | -0.005  | 24568.442 | 35.152 | 24628.442 | 35.111 | -0.036   | -0.099 |
| 70                    | 24860.255 | 34.882 | Sag           | 60           | 0.005   | 24830.255 | 34.911 | 24890.255 | 34.87  | -0.099   | -0.037 |
| 71                    | 25595.845 | 34.609 | Hog           | 60           | -0.002  | 25565.845 | 34.621 | 25625.845 | 34.591 | -0.037   | -0.062 |

| VERTICAL CURVE REPORT |           |        |               |              |         |           |        |           |        |          |        |
|-----------------------|-----------|--------|---------------|--------------|---------|-----------|--------|-----------|--------|----------|--------|
| CURVE NO.             | IP        |        | TYPE OF CURVE | CURVE LENGTH | M VALUE | START     |        | END       |        | GRADIENT |        |
|                       | CHAINAGE  | LEVEL  |               |              |         | CHAINAGE  | LEVEL  | CHAINAGE  | LEVEL  | IN       | OUT    |
| 72                    | 25921.871 | 34.407 | Hog           | 60           | -0.004  | 25891.871 | 34.425 | 25951.871 | 34.373 | -0.062   | -0.113 |
| 73                    | 26146.521 | 34.154 | Hog           | 60           | -0.013  | 26116.521 | 34.188 | 26176.521 | 34.07  | -0.113   | -0.28  |
| 74                    | 26362     | 33.55  | Sag           | 60           | 0.026   | 26332     | 33.634 | 26392     | 33.57  | -0.28    | 0.067  |
| 75                    | 26911     | 33.92  | Sag           | 60           | 0.009   | 26881     | 33.9   | 26941     | 33.976 | 0.067    | 0.186  |
| 76                    | 27226     | 34.505 | Hog           | 60           | -0.033  | 27196     | 34.449 | 27256     | 34.43  | 0.186    | -0.251 |
| 77                    | 27875     | 32.876 | Sag           | 60           | 0.043   | 27845     | 32.951 | 27905     | 32.973 | -0.251   | 0.324  |
| 78                    | 28242.016 | 34.064 | Hog           | 60           | -0.017  | 28212.016 | 33.967 | 28272.016 | 34.092 | 0.324    | 0.095  |
| 79                    | 28649     | 34.451 | Hog           | 60           | -0.014  | 28619     | 34.422 | 28679     | 34.424 | 0.095    | -0.09  |
| 80                    | 28869.999 | 34.251 | Sag           | 60           | 0.007   | 28839.999 | 34.278 | 28899.999 | 34.251 | -0.09    | 0      |
| 81                    | 29085     | 34.251 | Sag           | 60           | 0.001   | 29055     | 34.251 | 29115     | 34.254 | 0        | 0.012  |
| 82                    | 29945     | 34.351 | Hog           | 60           | -0.001  | 29915     | 34.348 | 29975     | 34.351 | 0.012    | 0      |
| 83                    | 30155     | 34.351 | Sag           | 60           | 0.025   | 30125     | 34.351 | 30185     | 34.449 | 0        | 0.327  |
| 84                    | 30323     | 34.9   | Hog           | 60           | -0.025  | 30293     | 34.802 | 30353     | 34.9   | 0.327    | 0      |
| 85                    | 30493     | 34.9   | Sag           | 60           | 0.015   | 30463     | 34.9   | 30523     | 34.961 | 0        | 0.204  |
| 86                    | 30720.416 | 35.365 | Hog           | 180          | -0.227  | 30630.416 | 35.181 | 30810.416 | 34.641 | 0.204    | -0.804 |
| 87                    | 30922.425 | 33.741 | Sag           | 110          | 0.079   | 30867.425 | 34.183 | 30977.425 | 33.615 | -0.804   | -0.23  |
| 88                    | 31284.81  | 32.909 | Sag           | 60           | 0.02    | 31254.81  | 32.978 | 31314.81  | 32.92  | -0.23    | 0.037  |
| 89                    | 31902.169 | 33.14  | Sag           | 60           | 0.007   | 31872.169 | 33.128 | 31932.169 | 33.18  | 0.037    | 0.134  |
| 90                    | 32254     | 33.611 | Hog           | 60           | -0.025  | 32224     | 33.571 | 32284     | 33.551 | 0.134    | -0.2   |
| 91                    | 32715     | 32.69  | Sag           | 60           | 0.026   | 32685     | 32.75  | 32745     | 32.735 | -0.2     | 0.15   |
| 92                    | 32946     | 33.037 | Hog           | 60           | -0.008  | 32916     | 32.992 | 32976     | 33.05  | 0.15     | 0.043  |
| 93                    | 33343.063 | 33.207 | Hog           | 60           | -0.01   | 33313.063 | 33.194 | 33373.063 | 33.178 | 0.043    | -0.097 |
| 94                    | 33533.01  | 33.024 | Sag           | 60           | 0.009   | 33503.01  | 33.053 | 33563.01  | 33.029 | -0.097   | 0.018  |
| 95                    | 33717.845 | 33.057 | Hog           | 60           | -0.002  | 33687.845 | 33.051 | 33747.845 | 33.052 | 0.018    | -0.015 |

| VERTICAL CURVE REPORT |           |        |               |              |         |           |        |           |        |          |        |
|-----------------------|-----------|--------|---------------|--------------|---------|-----------|--------|-----------|--------|----------|--------|
| CURVE NO.             | IP        |        | TYPE OF CURVE | CURVE LENGTH | M VALUE | START     |        | END       |        | GRADIENT |        |
|                       | CHAINAGE  | LEVEL  |               |              |         | CHAINAGE  | LEVEL  | CHAINAGE  | LEVEL  | IN       | OUT    |
| 96                    | 34047.787 | 33.008 | Hog           | 60           | -0.023  | 34017.787 | 33.013 | 34077.787 | 32.912 | -0.015   | -0.32  |
| 97                    | 34317     | 32.146 | Sag           | 60           | 0.045   | 34287     | 32.242 | 34347     | 32.228 | -0.32    | 0.275  |
| 98                    | 34684.8   | 33.157 | Sag           | 210          | 0.584   | 34579.8   | 32.868 | 34789.8   | 35.782 | 0.275    | 2.5    |
| 99                    | 35095.766 | 43.43  | Hog           | 340          | -1.062  | 34925.766 | 39.181 | 35265.766 | 43.43  | 2.5      | 0      |
| 100                   | 35606     | 43.43  | Hog           | 330          | -1.008  | 35441     | 43.43  | 35771     | 39.4   | 0        | -2.442 |
| 101                   | 36030.555 | 33.06  | Sag           | 230          | 0.694   | 35915.555 | 35.869 | 36145.555 | 33.027 | -2.442   | -0.029 |
| 102                   | 36660.742 | 32.878 | Hog           | 60           | -0.002  | 36630.742 | 32.887 | 36690.742 | 32.863 | -0.029   | -0.049 |
| 103                   | 37110.706 | 32.655 | Hog           | 60           | -0.009  | 37080.706 | 32.67  | 37140.706 | 32.606 | -0.049   | -0.163 |
| 104                   | 37392.201 | 32.196 | Sag           | 60           | 0.017   | 37362.201 | 32.245 | 37422.201 | 32.215 | -0.163   | 0.063  |
| 105                   | 37898.39  | 32.516 | Hog           | 140          | -0.019  | 37828.39  | 32.472 | 37968.39  | 32.485 | 0.063    | -0.044 |
| 106                   | 38710.347 | 32.156 | Hog           | 60           | -0.01   | 38680.347 | 32.169 | 38740.347 | 32.101 | -0.044   | -0.183 |
| 107                   | 39297.153 | 31.082 | Sag           | 250          | 0.838   | 39172.153 | 31.311 | 39422.153 | 34.207 | -0.183   | 2.5    |
| 108                   | 39612.5   | 38.965 | Hog           | 150          | -0.469  | 39537.5   | 37.09  | 39687.5   | 38.965 | 2.5      | 0      |
| 109                   | 39787.5   | 38.965 | Hog           | 150          | -0.432  | 39712.5   | 38.965 | 39862.5   | 37.237 | 0        | -2.304 |
| 110                   | 40083.886 | 32.137 | Sag           | 350          | 2.068   | 39908.886 | 36.169 | 40258.886 | 36.377 | -2.304   | 2.423  |
| 111                   | 40467     | 41.42  | Hog           | 150          | -0.454  | 40392     | 39.603 | 40542     | 41.42  | 2.423    | 0      |
| 112                   | 40807     | 41.42  | Hog           | 150          | -0.468  | 40732     | 41.42  | 40882     | 39.549 | 0        | -2.495 |
| 113                   | 41254.608 | 30.251 | Sag           | 250          | 0.831   | 41129.608 | 33.37  | 41379.608 | 30.455 | -2.495   | 0.163  |
| 114                   | 41642.834 | 30.886 | Hog           | 60           | -0.017  | 41612.834 | 30.837 | 41672.834 | 30.866 | 0.163    | -0.067 |
| 115                   | 42605.359 | 30.242 | Sag           | 60           | 0.021   | 42575.359 | 30.262 | 42635.359 | 30.304 | -0.067   | 0.208  |
| 116                   | 42960.04  | 30.979 | Hog           | 60           | -0.016  | 42930.04  | 30.917 | 42990.04  | 30.979 | 0.208    | 0      |
| 117                   | 43085.04  | 30.979 | Hog           | 100          | -0.005  | 43035.04  | 30.979 | 43135.04  | 30.959 | 0        | -0.04  |
| 118                   | 43610     | 30.771 | Sag           | 60           | 0.007   | 43580     | 30.783 | 43640     | 30.787 | -0.04    | 0.054  |

| VERTICAL CURVE REPORT |           |        |               |              |         |           |        |           |        |          |        |
|-----------------------|-----------|--------|---------------|--------------|---------|-----------|--------|-----------|--------|----------|--------|
| CURVE NO.             | IP        |        | TYPE OF CURVE | CURVE LENGTH | M VALUE | START     |        | END       |        | GRADIENT |        |
|                       | CHAINAGE  | LEVEL  |               |              |         | CHAINAGE  | LEVEL  | CHAINAGE  | LEVEL  | IN       | OUT    |
| 119                   | 44218.899 | 31.101 | Sag           | 150          | 0.224   | 44143.899 | 31.06  | 44293.899 | 32.037 | 0.054    | 1.247  |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 120                   | 44480     | 34.358 | Hog           | 225          | -0.351  | 44367.5   | 32.955 | 44592.5   | 34.358 | 1.247    | 0      |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 121                   | 44810     | 34.358 | Hog           | 225          | -0.395  | 44697.5   | 34.358 | 44922.5   | 32.776 | 0        | -1.406 |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 122                   | 45094.191 | 30.363 | Sag           | 150          | 0.267   | 45019.191 | 31.417 | 45169.191 | 30.375 | -1.406   | 0.016  |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 123                   | 45787     | 30.472 | Sag           | 60           | 0.002   | 45757     | 30.467 | 45817     | 30.485 | 0.016    | 0.045  |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 124                   | 47200.769 | 31.105 | Hog           | 100          | -0.006  | 47150.769 | 31.083 | 47250.769 | 31.105 | 0.045    | 0      |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 125                   | 47365.986 | 31.105 | Sag           | 110          | 0.023   | 47310.986 | 31.105 | 47420.986 | 31.198 | 0        | 0.168  |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 126                   | 48077     | 32.303 | Hog           | 110          | -0.023  | 48022     | 32.21  | 48132     | 32.303 | 0.168    | 0      |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 127                   | 48212.012 | 32.303 | Hog           | 60           | -0.024  | 48182.012 | 32.303 | 48242.012 | 32.208 | 0        | -0.316 |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 128                   | 48388.896 | 31.744 | Sag           | 140          | 0.386   | 48318.896 | 31.965 | 48458.896 | 33.066 | -0.316   | 1.889  |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 129                   | 48660     | 36.865 | Hog           | 260          | -0.614  | 48530     | 34.409 | 48790     | 36.865 | 1.889    | 0      |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 130                   | 48965.751 | 36.865 | Hog           | 250          | -0.564  | 48840.751 | 36.865 | 49090.751 | 34.609 | 0        | -1.805 |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 131                   | 49305.927 | 30.724 | Sag           | 200          | 0.454   | 49205.927 | 32.529 | 49405.927 | 30.734 | -1.805   | 0.01   |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 132                   | 50185.746 | 30.811 | Hog           | 130          | -0.011  | 50120.746 | 30.805 | 50250.746 | 30.772 | 0.01     | -0.061 |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 133                   | 51113.937 | 30.248 | Sag           | 160          | 0.275   | 51033.937 | 30.296 | 51193.937 | 31.301 | -0.061   | 1.316  |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 134                   | 51380     | 33.75  | Hog           | 200          | -0.329  | 51280     | 32.434 | 51480     | 33.75  | 1.316    | 0      |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 135                   | 51689.988 | 33.75  | Hog           | 205          | -0.475  | 51587.488 | 33.75  | 51792.488 | 31.85  | 0        | -1.854 |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 136                   | 51963.695 | 28.675 | Sag           | 310          | 1.582   | 51808.695 | 31.549 | 52118.695 | 32.131 | -1.854   | 2.23   |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 137                   | 52269.114 | 35.485 | Hog           | 140          | -0.39   | 52199.114 | 33.924 | 52339.114 | 35.485 | 2.23     | 0      |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 138                   | 52436.671 | 35.485 | Hog           | 130          | -0.35   | 52371.671 | 35.485 | 52501.671 | 34.087 | 0        | -2.151 |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 139                   | 52725.518 | 29.272 | Sag           | 350          | 1.534   | 52550.518 | 33.036 | 52900.518 | 31.646 | -2.151   | 1.356  |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 140                   | 53068.928 | 33.93  | Hog           | 210          | -0.356  | 52963.928 | 32.506 | 53173.928 | 33.93  | 1.356    | 0      |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 141                   | 53316.514 | 33.93  | Hog           | 210          | -0.398  | 53211.514 | 33.93  | 53421.514 | 32.338 | 0        | -1.516 |
|                       |           |        |               |              |         |           |        |           |        |          |        |
| 142                   | 53563.087 | 30.193 | Sag           | 180          | 0.491   | 53473.087 | 31.557 | 53653.087 | 30.794 | -1.516   | 0.668  |

### 5.5.3 Pavement Design

#### Adopted Pavement Thickness for Flexible Pavement

| Design CBR (%) | Design Traffic (MSA) | GSB (mm) | WMM (mm) | DBM (mm) | BC (mm) | Total Thickness (mm) |
|----------------|----------------------|----------|----------|----------|---------|----------------------|
| 8              | 20                   | 200      | 250      | 85       | 40      | 575                  |

#### Adopted Pavement Thickness for Rigid Pavement

| PQC (mm) | DLC (mm) | GSB (mm) |
|----------|----------|----------|
| 250      | 150      | 150      |

### 5.5.4 Design of Bridges & Structures

#### Proposal of bridges

- Details of Minor bridges with additional two lane: 5 Nos.

| Sl No. | Survey Chainage (km) | Proposed Chainage (km) | Existing          |                             |                                  | Proposal                    |                               |
|--------|----------------------|------------------------|-------------------|-----------------------------|----------------------------------|-----------------------------|-------------------------------|
|        |                      |                        | Type of Water Way | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) | Type of Structures (Bridge) | Span Arrangement (No.xSpan) m |
| 1      | 7+300                | 7+241                  | Open Land         | Bridge(RCC Box)             | 4x4m                             | Minor Bridge                | Box Bridge 4mx4.066m x 4cell  |
| 2      | 24+400               | 23+999                 | Nala              | RCC Slab Bridge             | 2 nos. x 12m span                | Minor Bridge                | 2x 12m (Integral Slab)        |
| 3      | 31+500               | 30+408                 | Nala              | Bridge (T-Beam Girder)      | 1 x 19.6m                        | Minor Bridge                | 1x 21m (T-Beam)               |
| 4      | 44+000               | 43+010                 | Open Land         | (RCC Box)                   | 4.0X3.0X2.0                      | Minor Bridge                | Box Bridge 4mx3m x 2cell      |
| 5      | 45+800               | 44+645                 | Water Logged      | Bridge (PSC T-Beam Girder)  | 40.80m                           | Minor Bridge                | 1x 41m (PSC)                  |

● **Details of Minor bridges New Construction: 4 Nos.**

| SI No. | Survey Chainage (km) | Proposed Chainage (km) | Existing         |                             |                                 | Proposal                    |                               |
|--------|----------------------|------------------------|------------------|-----------------------------|---------------------------------|-----------------------------|-------------------------------|
|        |                      |                        | Type of WaterWay | Type of Structures (Bridge) | Span Arrangement (No.xSpan) (m) | Type of Structures (Bridge) | Span Arrangement (No.xSpan) m |
| 1      |                      | 21+140                 | GadadharR vier   |                             |                                 | Minor Bridge                | 2x 18m (T-Beam)               |
| 2      |                      | 21+871                 | GadadharR vier   |                             |                                 | Minor Bridge                | 2x 18m (T-Beam)               |
| 3      |                      | 28+974                 | GadadharR vier   |                             |                                 | Minor Bridge                | 2x 24m (T-Beam)               |
| 4      |                      | 30+050                 | GadadharR vier   |                             |                                 | Minor Bridge                | 3x 18m (T-Beam)               |

● **Minor Bridges Reconstruction as 4 lane: 2 Nos.**

| SI No. | Survey Chainage (km) | Proposed Chainage (km) | Existing          |                                                                   |                                     | Proposal                    |                               |
|--------|----------------------|------------------------|-------------------|-------------------------------------------------------------------|-------------------------------------|-----------------------------|-------------------------------|
|        |                      |                        | Type of Water Way | Type of Structures (Bridge)                                       | Span Arrangement (No x Span) (m)    | Type of Structures (Bridge) | Span Arrangement (No.xSpan) m |
| 1      | 48+750               | 47+286                 | Water Logged      | Wooden Bridge with newly constructed bridge in realigned portion  | Wooden Bridge + 2 x 15 m_RCC T-Beam | Minor Bridge                | 2x 15m (T-Beam)               |
| 2      | 49+700               | 48+167                 | Water Logged      | Wooden Bridge with newly constructed bridge on existing alignment | Wooden Bridge + 1 x 24 m_RCC T-Beam | Minor Bridge                | 1x 24m (T-Beam)               |



● **Details of Major bridges with additional 2 lane: 1 No.**

| Sl No. | Proposed Chainage (km) | Existing                |                             |                                  | Proposal                    |                                |
|--------|------------------------|-------------------------|-----------------------------|----------------------------------|-----------------------------|--------------------------------|
|        |                        | Type of Water Way       | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) | Type of Structures (Bridge) | Span Arrangement (No x Span) m |
| 1      | 51+536                 | Redundant part of River | (T-Beam Girder)             | 2 span 42m                       | Major Bridge                | 2x 41m (PSC)                   |

● **Vehicular Underpass/Light Vehicular Underpass**

3 Vehicular Underpass and 1 Light Vehicular Underpasses are proposed at the following locations mentioned below.

**Location of Vehicular/Light Vehicular Underpass (VUP/LVUP)**

| Sl. No. | Design Chainage (km) | Type of Structure | Span Arrangement (No. x Span)m |
|---------|----------------------|-------------------|--------------------------------|
| 1       | 39.700               | VUP               | 1x15m(Integral Slab)           |
| 2       | 48.810               | VUP               | 1x15m(Integral Slab)           |
| 3       | 52.353               | VUP               | 1x15m(Integral Slab)           |
| 4       | 53.191               | LVUP              | 1x15m(Integral Slab)           |

● **Road Over Bridges(ROB)**

3nos. ROB is proposed at the following location mentioned below.

● **Details of Proposed culverts in project road**

| Sl. No. | Design Chainage (km) | Type of Structure        | Span Arrangement (No. x Span)m                            |
|---------|----------------------|--------------------------|-----------------------------------------------------------|
| 1       | 1.044                | ROB                      | 3 x 36m RDSO + 1 x 72m BOWSTRING + 3 x 36m RDSO           |
| 2       | 35.355               | ROB                      | 1X24 T-BEAM+(1X24+1X36+1X24) COMPOSITE+1X24 T-BEAM        |
| 3       | 40.637               | ROB With grade separator | 1X21_TBEAM+1X72.M_BOW STRING+(2X36) COMPOSITE+1X24_T BEAM |

• **Reconstruction:**

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 1      | Package-1 | 1.946              | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 2      |           | 2.992              | HP Culvert                                          | 4Lane | Box with SE | 1 X 3.0M X 3.0M |
| 3      |           | 3.378              | Slab Culvert                                        | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 4      |           | 4.322              | Slab Culvert                                        | 4Lane | Box with SE | 1 X 3.0M X 3.0M |
| 5      |           | 5.760              | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 6      |           | 6.059              | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 7      |           | 6.221              | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 8      |           | 6.723              | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 9      |           | 7.850              | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 10     |           | 8.058              | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 11     | Package-2 | 10.909             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 12     |           | 11.825             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 13     |           | 12.099             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 14     |           | 12.177             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 15     |           | 12.675             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 16     |           | 12.851             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 17     |           | 13.800             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 18     |           | 14.837             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 19     |           | 16.310             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 3.0M X 2.0M |
| 20     |           | 16.469             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 21     |           | 17.538             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 22     |           | 25.156             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 23     |           | 25.374             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 24     |           | 26.147             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 25     |           | 26.785             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 26     |           | 27.494             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 27     | Package-3 | 27.870             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 28     |           | 31.339             | Box Culvert                                         | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 29     |           | 31.902             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 30     |           | 33.013             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 31     |           | 33.717             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 32     |           | 33.809             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 33     |           | 36.382             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 34     | Package-4 | 37.626             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 35     |           | 39.172             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 36     |           | 39.505             | Slab Culvert                                        | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 37     |           | 42.191             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 38     |           | 42.482             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 39     |           | 43.268             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 3.0M X 3.0M |
| 40     | Package-5 | 43.788             | Slab Culvert                                        | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 41     |           | 43.974             | Slab Culvert                                        | 4Lane | Box with SE | 1 X 2.0M X 2.0M |

| SI No. | Package | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|---------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 42     |         | 44.222             | Slab Culvert                                        | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 43     |         | 45.325             | Slab Culvert                                        | 4Lane | Box         | 1 X 3.0M X 3.0M |
| 44     |         | 45.370             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 45     |         | 46.856             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 46     |         | 49.250             | HP Culvert                                          | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 47     |         | 50.485             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 48     |         | 50.611             | HP Culvert                                          | 4Lane | Box         | 1 X 2.0M X 2.0M |

• **New Construction:**

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 1      | Package-1 | 0.350              | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 2      |           | 2.300              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 3      |           | 2.550              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 4      |           | 2.800              | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 5      |           | 3.530              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 6      |           | 3.835              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 7      |           | 4.475              | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 8      |           | 4.800              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 9      |           | 4.950              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 10     |           | 5.400              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 11     |           | 6.450              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 12     |           | 6.940              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 13     |           | 7.600              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 14     |           | 8.450              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 15     |           | 8.700              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 16     |           | 8.950              | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 17     |           | 9.229              | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 18     |           | 9.850              | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 19     |           | 10.250             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 20     |           | 10.500             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 21     | Package-2 | 11.220             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 22     |           | 11.550             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 23     |           | 12.450             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 24     |           | 13.390             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 25     |           | 14.300             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 26     |           | 14.650             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 27     |           | 15.483             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 28     |           | 15.980             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 29     | Package-2 | 17.020             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 30     |           | 17.573             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 31     |           | 18.050             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 32     |           | 18.250             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 33     |           | 18.650             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 34     |           | 19.000             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 35     |           | 19.300             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 36     |           | 19.650             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 37     |           | 20.000             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 38     |           | 20.450             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 39     |           | 20.750             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 40     |           | 20.882             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 41     |           | 21.425             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 42     |           | 21.675             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 43     |           | 22.250             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 44     |           | 22.575             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 45     |           | 22.900             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 46     |           | 23.220             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 47     |           | 23.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 48     |           | 23.800             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 49     |           | 24.100             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 50     |           | 24.450             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 51     |           | 24.900             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 52     |           | 25.600             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 53     |           | 25.930             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 54     |           | 26.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 55     | Package-3 | 28.170             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 56     |           | 28.525             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 57     |           | 29.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 58     |           | 29.750             | New Balancing                                       | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 59     |           | 30.800             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 60     |           | 30.925             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 61     |           | 31.625             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 62     |           | 32.150             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 63     |           | 32.450             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 64     |           | 32.870             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 65     |           | 33.450             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 66     |           | 34.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 67     |           | 36.150             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 68     | Package-4 | 36.750             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 69     |           | 37.150             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 70     |           | 38.000             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 71     |           | 38.350             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 72     |           | 38.550             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 73     |           | 38.850             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |

| SI No. | Package   | FDPR Chainage (km) | Existing Type of Structures (Pipe/ Slab/ Box/ Arch) | Lane  | TYPE        | Proposal        |
|--------|-----------|--------------------|-----------------------------------------------------|-------|-------------|-----------------|
| 74     | Package-4 | 39.795             | Balancing                                           | 4Lane | Box         | 1 X 3.0M X 4.0M |
| 75     |           | 40.250             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 76     |           | 41.083             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 3.0M |
| 77     |           | 41.400             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 78     |           | 41.800             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 79     |           | 42.605             | New                                                 | 4Lane | Box with SE | 1 X 2.0M        |
| 80     |           | 42.810             | New                                                 | 4Lane | Box         | 1 X 2.0M        |
| 81     | Package-5 | 43.650             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 82     |           | 45.094             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 83     |           | 45.825             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 84     |           | 46.200             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 85     |           | 46.490             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 86     |           | 47.500             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 3.0M |
| 87     |           | 47.750             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 88     |           | 47.950             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 89     |           | 48.390             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 90     |           | 49.630             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 91     |           | 50.100             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 92     |           | 50.900             | New Balancing                                       | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 93     |           | 52.030             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 94     |           | 52.600             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 95     |           | 52.930             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |
| 96     |           | 53.500             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 97     |           | 53.736             | Balancing                                           | 4Lane | Box         | 1 X 2.0M X 2.0M |
| 98     |           | 53.976             | Balancing                                           | 4Lane | Box with SE | 1 X 2.0M X 2.0M |

• **Culvert on Road B (Package-4)**

|   |       |           |        |             |                             |
|---|-------|-----------|--------|-------------|-----------------------------|
| 1 | 39.50 | Balancing | 2-Lane | Box         | 2mx3m x1cell with 4.54M EC  |
| 2 | 39.80 | Balancing | 2-Lane | Box         | 3mx4m x1cell with 4.932M EC |
| 3 | 40.19 | Balancing | 2-Lane | Box with SE | 2mx3m x1cell with 2.119M EC |

• **Culvert on Road C(Package-4)**

|   |        |           |        |     |                             |
|---|--------|-----------|--------|-----|-----------------------------|
| 4 | 39.500 | Balancing | 2-Lane | Box | 2mx3m x1cell with 4.546M EC |
| 5 | 39.800 | Balancing | 2-Lane | Box | 3mx4m x1cell with 4.932M EC |
| 6 | 40.310 | Balancing | 2-Lane | Box | 2mx3m x1cell with 5M EC     |

• **Types of Structures proposed in NH-127B**

| Structure Type | Existing structure | Proposed Structure |
|----------------|--------------------|--------------------|
| VUP            | 0                  | 3                  |

| Structure Type           | Existing structure | Proposed Structure |
|--------------------------|--------------------|--------------------|
| LVUP                     | 0                  | 1                  |
| ROB with Grade Separator | 0                  | 0                  |
| ROB                      | 0                  | 3                  |
| Major                    | 1                  | 1                  |
| Minor                    | 9                  | 11                 |
| Culverts                 | 55                 | 152                |
| Total                    | 65                 | 171                |

## **CHAPTER - 6**

### **TRAFFIC SURVEYS AND ANALYSIS**

#### **6. Project Description**

The project road lies in Kokrajhar and Dhubri district of Assam. The road runs through five Police Stations namely, Srirampur, Tamarhat, Dhubri, Gouripur and Gossaigaon Police Station. The length of the road is 54.523 km (As per Design Ch.). The road name as per TOR/Contract is NH-127B starting from Srirampur on NH-27(old NH-31 C) to the immediate approach of proposed bridge over river Brahmaputra near Dhubri in the state of Assam. The Project Road starts from Srirampur(in the state of Assam) and passes through village / localities, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, Mudha Petla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, Debdutta Hazdaha 1, Kachari Hat, Debdutta Hazdaha 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari and ends at immediate approach of proposed bridge over river Brahmaputra near Dhubri.

The project road is of significant importance as the road connecting two National Highways (NH31C and NH-31), one proposed bridge over river Brahmaputra and connects to important nearby villages Srirampur, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, Mudha Petla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, Debdutta Hazdaha 1, Kachari Hat, Debdutta Hazdaha 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari.

#### **6.1 Objective & Scope**

The objective of the traffic studies carried out as part of this assignment is for technical understanding and assessment of the project. In order to assess the project, volume of traffic that uses the corridor and the future traffic demand were estimated with various types of traffic surveys as stipulated in the TOR.

The detailed scope of services is as follows:

- To carry out 7 days continuous 24 hrs Classified Traffic Volume Count Survey at locations approved by Client.
- To carry out O-D Surveys and Commodity Survey on the project road as well as in the influence Zone if required, to establish traffic viability



- To analyze the data collected through possible leakage points and study of travel pattern to determine through traffic for important segments of the route
- Determination of possible leakage points and alternative diversion routes by detailed reconnaissance of the study area network.
- To carry out Axle Load survey
- Calculation of MSA values based on Traffic volume for use in the pavement design.

The details of the data collection, primary as well as secondary, results from its analysis are presented in the following sections.

## **6.2 Traffic Surveys**

In order to understand the characteristics and the volume of traffic using the project road, data on existing road network, traffic volume and origin-destination of trips of vehicles plying on the project road were collected through primary surveys. For this purpose, a detailed reconnaissance survey was conducted to identify appropriate locations for primary traffic surveys. The details on the types of primary traffic surveys carried out on the Project Road and their locations are given in the following sections, followed by findings from the analysis of this data.

### **6.2.1 Survey Locations**

At the beginning of the study, a detailed reconnaissance survey has been carried out to identify traffic homogeneous sections so that each homogeneous section will have similar traffic volume and composition. Based on the above, the length of total project road has been considered two homogeneous sections.

Homogeneous Section I: Km 0+000(start) to Km 38+990

Homogeneous Section II: Km 38+990 to Km 54+523 (end)

### **6.2.2 Origin – Destination Survey Locations**

Two locations along the road stretch were identified for O-D survey. The identified locations are at:

- **On NH-31C near Srirampur (0.500 Km Along NH 31C Towards Gossaigaon from 0.000Km of NH-127B) (as per Survey chainage).**
- **2 Km Towards Dhubri Along NH 31 From CH 40.00 KM of NH127B (as per Survey chainage).**

### **6.2.3 Classified Traffic Volume Count Locations**

Four locations have been considered for classified Traffic volume counts. The locations are

- On NH-31C near Srirampur at chainage 0+000Km of NH 127B
- Near Tamarhat (CH – 15+500Km of NH 127B) (as per Survey chainage).
- On NH 31 Near chainage 40+000 Km (as per Survey chainage).
- Near Chowmore (CH. -57+000 KM) (as per Survey chainage).

The above locations were (i) on a straight stretch for clear visibility and identification of vehicles, (ii) outside urban/built-up area to avoid local traffic.

## 6.2.4 Axle Load Survey Location

Axle Load survey has been conducted at two points along the road stretch which are as follows:

- Near Srirampur (0.500 Km Along NH 31C Towards Gossaigaon From CH. 0.000Km of NH 127B)
- Near Tamarhat P.S CH 15+200 KM of NH 127B
- 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM of NH 127B.

The details of the above survey locations are provided in **Table 6.1**

## 6.2.5 Turning Movement Survey Locations

A total of 2 major intersections were identified on the project road corridor. Intersection turning movements at all the identified three major junctions on the project road were carried out. The intersection points taken into consideration are as follows:

- Srirampur (CH.- 0.000 Km of NH 127B) , 4-legged.
- On NH 31, Near CH. 40+000km of NH 127B, 3-legged.

**Table 6.1: Traffic Survey Details**

| Sl. No. | Type of Survey and Duration                     | Location / Chainage                                         | Survey Dates             | Duration (Hours/Day) |
|---------|-------------------------------------------------|-------------------------------------------------------------|--------------------------|----------------------|
| 1       | Classified Traffic Volume Counts for seven days | On NH-31C near Srirampur at chainage 0+000Km.               | 18/12/2015 to 24/12/2015 | 24 Hour x 7 days     |
|         |                                                 | Near Tamarhat at CH.-15+500Km                               | 17/12/2015 to 23/12/2015 |                      |
|         |                                                 | On NH 31 Near CH. 40+000Km                                  | 17/12/2015 to 23/12/2015 |                      |
|         |                                                 | Near Chowmore at CH. 57+000Km                               | 17/12/2015 to 23/12/2015 |                      |
| 2       | O-D Surveys for one day (24 hours)              | On NH 31C Near Srirampur at CH 0+000Km                      | 21/12/2015               | 24 Hour x 1 days     |
|         |                                                 | 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM of NH-127B | 19/12/2015               | 24 Hour x 1 day      |
| 3       | Axle load surveys                               | On NH-31C near Srirampur at chainage 0+000Km.               | 21/12/2015               | 24 Hour x 1 days     |

| Sl. No.                                                          | Type of Survey and Duration | Location / Chainage                              | Survey Dates | Duration (Hours/Day) |
|------------------------------------------------------------------|-----------------------------|--------------------------------------------------|--------------|----------------------|
|                                                                  |                             | Near Tamarhat P.S CH 15+200 KM                   | 23/12/2015   | 24 Hour x 1 day      |
|                                                                  |                             | 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM | 19/12/2015   | 24 Hour x 1 day      |
| 4                                                                | Turning movement count      | Srirampur (CH. - 0.000 Km), 4-legged.            | 24/12/2015   | 12 Hour x 1 day      |
|                                                                  |                             | On NH 31, at CH. 40+000km, 3-legged.             | 18/12/2015   | 12 Hour x 1 day      |
| *** All the Traffic Survey locations are as per survey Chainage. |                             |                                                  |              |                      |

Trained enumerators were used for counting traffic under the supervision of qualified and experienced transport planners/supervisors. The data collected from the traffic surveys was coded and entered into the computer for its analysis and interpretation of results with respect to existing traffic, travel pattern and for forecasting purposes. The details from the analysis of survey data are presented in the following sections.

## 6.2.6 Origin Destination Survey

### A. Road Side Interviews for O-D

To understand the travel demand pattern in the region, Origin and Destination (O-D) Survey was carried out for one day (24 hours) at two locations. The locations of the Origin Destination survey, as given earlier, were on **NH 31C Near Srirampur near CH 0+000Km of NH 127B and 2 Km Towards Dhubri along NH 31 From CH 40.00 KM of NH 127B.**

The O-D surveys on the project road were carried out based on the roadside interview method as per IRC: 102-1988. Both passenger and commercial vehicles plying on the project road were stopped on a random sampling basis and

interviewed. Police assistance was arranged at the survey locations for successfully carrying out these surveys. The travel characteristics obtained by O-D survey facilitate the identification of the traffic characteristics based on its origin and destination.

Trained enumerators under the supervision of transport planners collected the trip characteristics using the survey forms designed for this purpose. The O-D survey elicited characteristics like origin, destination, frequency, length of trip, etc., both for passenger and goods vehicles. The information



collected during roadside interviews was analyzed to obtain the trip distribution based on a zoning system suitably designed in the study.

Before presenting the travel pattern, the sample size considered for O-D surveys are presented first in the following section.

## **B. Sample Size Considered for O-D Surveys**

As described earlier, the vehicles for the OD survey were interviewed on a random sample basis.

**Tables 6.2 and 6.3** show the ADT and the sample size (both in absolute numbers and in percentage terms) captured during the survey on **NH 31C Near Srirampur at CH 0+000 Km of NH 127B and 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM of NH 127B.**

**Table 6.2: On NH 31C Near Srirampur at CH 0+000Km**

| Road Name: NH 127B                    |                  |               | 21.12.2015-22.12.2015 |
|---------------------------------------|------------------|---------------|-----------------------|
| Location: At Km 0+000, near Srirampur |                  |               | 8.00am to 8.00 am     |
| Vehicle Type                          | Sample Collected | Actual Volume | Sample Size %         |
| Bus                                   | 10               | 170           | 6%                    |
| 2 - Axle                              | 34               | 216           | 16%                   |
| 3 - Axle                              | 72               | 223           | 32%                   |
| 4 - Axle                              | 77               | 694           | 11%                   |
| Total                                 | <b>193</b>       | <b>1303</b>   | <b>15%</b>            |

**Table 6.3: 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM of NH 127B**

| Road Name: NH 127B |                  |               | 19.12.2015    |
|--------------------|------------------|---------------|---------------|
| Vehicle Type       | Sample Collected | Actual Volume | Sample Size % |
| LCV                | 1                | 10            | <b>10%</b>    |
| Bus                | 30               | 221           | <b>14%</b>    |
| 2 - Axle           | 103              | 583           | <b>18%</b>    |
| 3 - Axle           | 175              | 889           | <b>20%</b>    |
| 4 - Axle           | 52               | 638           | <b>8%</b>     |
| Total              | <b>361</b>       | <b>2341</b>   | <b>15%</b>    |

## **C. Zoning System**

For understanding the spatial dimensions of the trip characteristics of the vehicles interviewed during the O-D survey, a scientifically derived zoning system was adopted.

The Zoning System considered in this study has been presented in **Table 6.4 & 6.5**

**Table 6.4: On NH 31C Near Srirampur at CH 0+000Km**

| <b>Zoning System Considered for the Study</b> |                                                                                                                                                                                                              |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Zone Code</b>                              | <b>Name of Zone</b>                                                                                                                                                                                          |
| 1                                             | South and South-East side of project road (Guwahati, Dimapur, Shilchor, Shilong, Agartala, dhubri )                                                                                                          |
| 2                                             | West side of project road (Patiala, Luckhnow, Panipath, Bhagalpur Vijaywada, Chandigarh, Jaipur, Hyderabad, Indore, Patna, Jodhpur, Katihar, Mathura, Sambalpur, Benaras, Koderma, Kanpur, Udaipur, Delhi, ) |
| 3                                             | North ( Bhutan )                                                                                                                                                                                             |
| 4                                             | East and North-East side of project road( Gossaigaon, New Bongaigaon, Phasighat, Tejpur, Jorat,Itanagar, Gouripur)                                                                                           |
| 5                                             | North West side of project road (Coochbihar, siliguri)                                                                                                                                                       |
| 6                                             | South west of project road( Kolkata, Nao gaon, Gazole, Malda, Panagarh, Haldia, Burdwan)                                                                                                                     |
| 7                                             | Near project Road ( Dhubri)                                                                                                                                                                                  |

**Table 6.5: 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM**

| <b>Zoning System Considered for the Study</b> |                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Zone Code</b>                              | <b>Name of Zone</b>                                                                                                                                                                                                                                                                             |
| 1                                             | South and South-East of project road (Guwahati, Dimapur, Shilchor, Shilong, Agartala, Chandur, Nagaland, Ichapuram)                                                                                                                                                                             |
| 2                                             | West side of project road( Patiala, Luckhnow, Panipath, Bhagalpur Vijaywada, Chandigarh, Jaipur, Hyderabad, Indore, , Patna, Jodhpur, Katihar, Mathura, Sambalpur, Benaras, Koderma, Kanpur, Udaipur, Delhi,Baxirhat, Tufanganj, Ayoddha, Baripada, Chattisgarh, Jalandhar, Jogiapa, Chandipur) |
| 3                                             | North of project road ( Tamarhat )                                                                                                                                                                                                                                                              |
| 4                                             | East and North-East of project road ( Gossaigaon, New Bongaigaon, Phasighat, Tejpur, Jorat,Itanagar, Tinsukia, Hojai)                                                                                                                                                                           |
| 5                                             | North West of project road (Coochbihar, siliguri)                                                                                                                                                                                                                                               |
| 6                                             | South west of project road ( Kolkata, Gazole, Malda, Farakka Panagarh, Haldia, Burdwan, Gholapak, Illambazar, Harirampur)                                                                                                                                                                       |
| 7                                             | Near project Road ( Dhubri, Gouripur)                                                                                                                                                                                                                                                           |

## **D. Travel Pattern**

The origins and destinations of various types of vehicles observed at the O-D survey locations have been analyzed for O-D Matrices as per the Zoning System presented above. Details OD calculations are given in a separate volume field investigation report (Appendix).

**Table 6.6: On NH 31C Near Srirampur at CH 0+000Km**

| Combined Trip Matrix for All vehicle |   |                  |    |   |    |   |    |   |             |
|--------------------------------------|---|------------------|----|---|----|---|----|---|-------------|
|                                      |   | Destination Zone |    |   |    |   |    |   | Grand Total |
|                                      |   | 1                | 2  | 3 | 4  | 5 | 6  | 7 |             |
| Origin Zone                          | 1 | 0                | 31 | 0 | 0  | 0 | 44 | 1 | 76          |
|                                      | 2 | 37               | 0  | 0 | 5  | 0 | 1  | 0 | 43          |
|                                      | 3 | 0                | 0  | 0 | 0  | 0 | 0  | 0 | 0           |
|                                      | 4 | 0                | 5  | 0 | 0  | 5 | 4  | 6 | 20          |
|                                      | 5 | 2                | 0  | 1 | 6  | 0 | 0  | 0 | 9           |
|                                      | 6 | 34               | 0  | 0 | 2  | 0 | 0  | 0 | 36          |
|                                      | 7 | 0                | 0  | 0 | 9  | 0 | 0  | 0 | 9           |
| Grand Total                          |   | 73               | 36 | 1 | 22 | 5 | 49 | 7 | 193         |

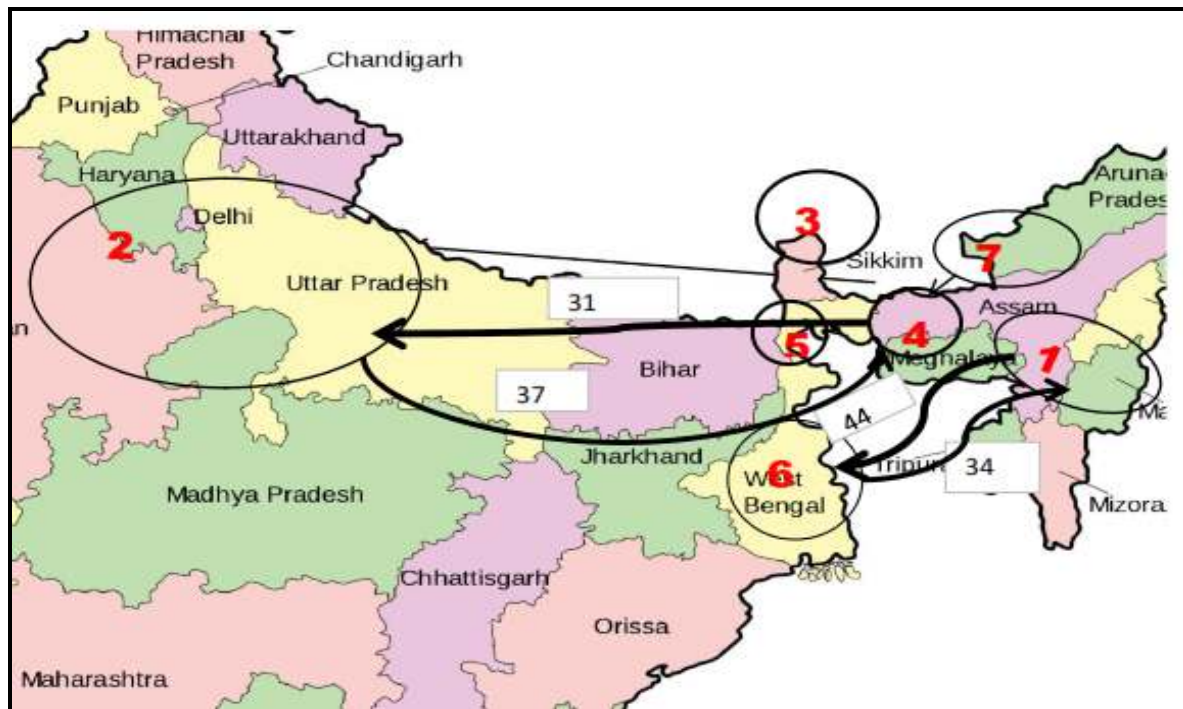




Fig 6.1(a):Zone Diagram for O-D at NH 31C

Table 6.7: 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM

| Combined Trip Matrix for All vehicle |   |                  |    |   |    |    |    |    |             |
|--------------------------------------|---|------------------|----|---|----|----|----|----|-------------|
|                                      |   | Destination Zone |    |   |    |    |    |    |             |
|                                      |   | 1                | 2  | 3 | 4  | 5  | 6  | 7  | Grand Total |
| Origin Zone                          | 1 | 0                | 25 | 0 | 0  | 13 | 45 | 0  | 83          |
|                                      | 2 | 52               | 0  | 1 | 1  | 0  | 3  | 7  | 64          |
|                                      | 3 | 0                | 0  | 0 | 0  | 0  | 0  | 2  | 2           |
|                                      | 4 | 0                | 0  | 0 | 0  | 1  | 0  | 4  | 5           |
|                                      | 5 | 26               | 4  | 0 | 1  | 0  | 0  | 26 | 57          |
|                                      | 6 | 86               | 6  | 0 | 8  | 0  | 0  | 11 | 111         |
|                                      | 7 | 0                | 13 | 1 | 2  | 17 | 6  | 0  | 39          |
| Grand Total                          |   | 164              | 48 | 2 | 12 | 31 | 54 | 50 | 361         |

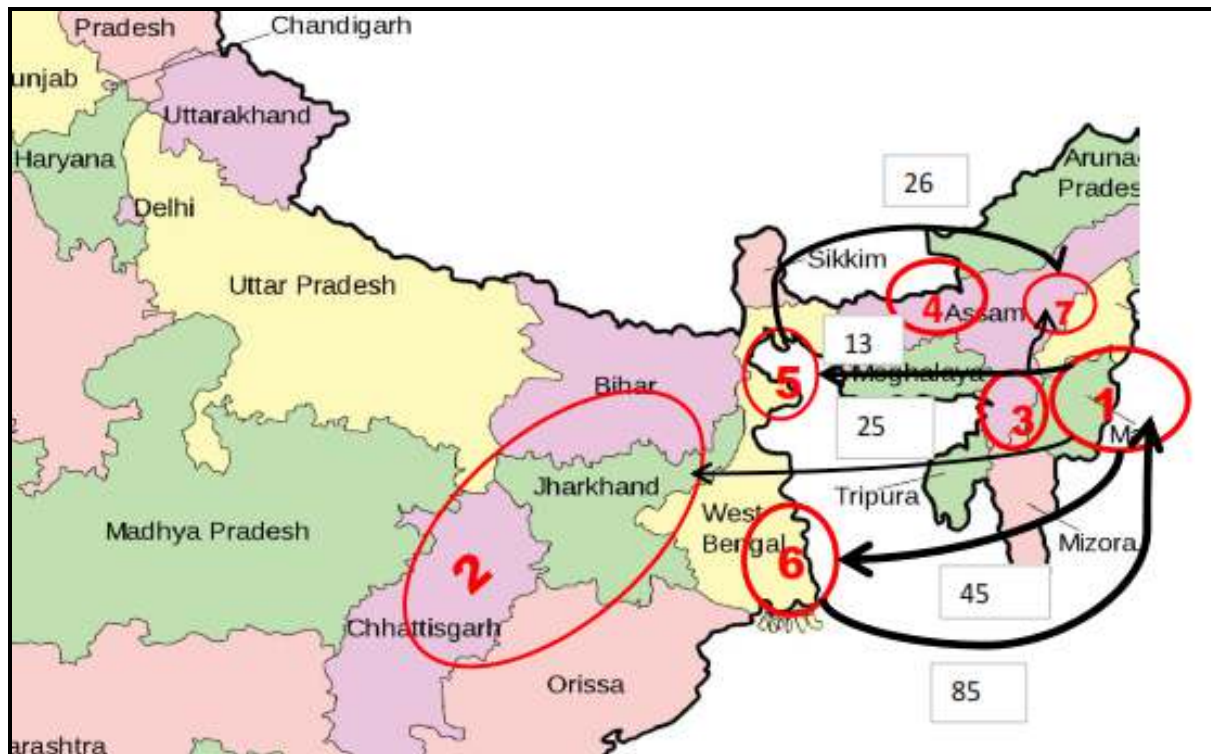


Fig 6.1(b):Zone Diagram for OD at NH 31

## E. Diverted traffic.

From the origin Destination survey and site verification it has been viewed that the traffic between Zone 1 and Zone-2, zone-3, zone-6 will follow the few portion of our project road (from Km 40+000 to



Km 57+000). The percentage of diverted vehicle is calculated from OD analysis. The percentage of vehicles is given below in table 6.8(a)- table 6.8(e) and table 6.9(a)- table 6.9(e).

**Table 6.8(a): NH 31C**

| Combined trip matrix for 2 Axle |   |                  |   |   |   |   |   |   |             |
|---------------------------------|---|------------------|---|---|---|---|---|---|-------------|
|                                 |   | Destination Zone |   |   |   |   |   |   |             |
| Origin Zone                     |   | 1                | 2 | 3 | 4 | 5 | 6 | 7 | Grand Total |
|                                 | 1 | 0                | 4 | 0 | 0 | 0 | 4 |   | 8           |
|                                 | 2 | 2                | 0 | 0 | 1 | 0 | 0 | 0 | 3           |
|                                 | 3 | 0                | 0 | 0 | 0 | 0 | 0 | 0 | 0           |
|                                 | 4 | 0                | 0 | 0 | 0 | 3 | 2 | 4 | 9           |
|                                 | 5 | 0                | 0 | 0 | 2 | 0 | 0 | 0 | 2           |
|                                 | 6 | 7                | 0 | 0 | 1 | 0 | 0 | 0 | 8           |
|                                 | 7 | 0                | 0 | 0 | 4 | 0 | 0 | 0 | 4           |
| Grand Total                     |   | 9                | 4 | 0 | 8 | 3 | 6 | 4 | 34          |

|                                         |     |
|-----------------------------------------|-----|
| THE PERCENTAGE OF THE DIVERTED VEHICLES | 12% |
|-----------------------------------------|-----|

**Table 6.8(b)**

| Combined trip matrix for 3 Axle         |   |                  |    |   |   |    |    |   |             |
|-----------------------------------------|---|------------------|----|---|---|----|----|---|-------------|
|                                         |   | Destination Zone |    |   |   |    |    |   |             |
| Origin Zone                             |   | 1                | 2  | 3 | 4 | 5  | 6  | 7 | Grand Total |
|                                         | 1 | 0                | 14 | 0 | 0 | 0  | 21 | 0 | 35          |
|                                         | 2 | 17               | 0  | 0 | 0 | 0  | 0  | 0 | 17          |
|                                         | 3 | 0                | 0  | 0 | 0 | 0  | 0  | 0 | 0           |
|                                         | 4 | 0                | 4  | 0 | 0 | 0  | 1  | 0 | 5           |
|                                         | 5 | 1                | 0  | 0 | 1 | 0  | 0  | 0 | 2           |
|                                         | 6 | 12               | 0  | 0 | 1 | 0  | 0  | 0 | 13          |
|                                         | 7 | 0                | 0  | 0 | 0 | 0  | 0  | 0 | 0           |
| Grand Total                             |   | 30               | 18 | 0 | 2 | 0  | 22 | 0 | 72          |
| THE PERCENTAGE OF THE DIVERTED VEHICLES |   |                  |    |   |   |    |    |   |             |
|                                         |   |                  |    |   |   | 3% |    |   |             |

**Table 6.8(c)**

| Combined trip matrix for Bus |  |                  |  |
|------------------------------|--|------------------|--|
|                              |  | Destination Zone |  |

| Origin Zone |   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Grand Total |
|-------------|---|---|---|---|---|---|---|---|-------------|
|             | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0           |
|             | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0           |
|             | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0           |
|             | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 3           |
|             | 5 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2           |
|             | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0           |
|             | 7 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 5           |
| Grand Total |   | 0 | 0 | 0 | 7 | 2 | 0 | 1 | 10          |

|                                         |     |
|-----------------------------------------|-----|
| THE PERCENTAGE OF THE DIVERTED VEHICLES | 10% |
|-----------------------------------------|-----|

**Table 6.8(d)**

| Combined trip matrix for 4-Axle         |   |                  |    |   |   |    |    |   |             |
|-----------------------------------------|---|------------------|----|---|---|----|----|---|-------------|
| Origin Zone                             |   | Destination Zone |    |   |   |    |    |   |             |
|                                         |   | 1                | 2  | 3 | 4 | 5  | 6  | 7 | Grand Total |
|                                         | 1 | 0                | 13 | 0 | 0 | 0  | 19 | 0 | 33          |
|                                         | 2 | 18               | 0  | 0 | 4 | 0  | 1  | 0 | 23          |
|                                         | 3 | 0                | 0  | 0 | 0 | 0  | 0  | 0 | 0           |
|                                         | 4 | 0                | 1  | 0 | 0 | 0  | 1  | 1 | 3           |
|                                         | 5 | 1                | 0  | 1 | 1 | 0  | 0  | 0 | 3           |
|                                         | 6 | 15               | 0  | 0 | 0 | 0  | 0  | 0 | 15          |
|                                         | 7 | 0                | 0  | 0 | 0 | 0  | 0  | 0 | 0           |
| Grand Total                             |   |                  |    |   |   |    |    |   |             |
| THE PERCENTAGE OF THE DIVERTED VEHICLES |   |                  |    |   |   | 3% |    |   |             |

**Table 6.8(e): Diverted Vehicle on NH 127B from NH-31C**

| Types of vehicles | Total | Nos Traffic Diverted FROM NH 31C | % of vehicles towards NH 127B |
|-------------------|-------|----------------------------------|-------------------------------|
| 2-Axle            | 34    | 4                                | 12%                           |

|        |     |   |     |
|--------|-----|---|-----|
| 3-Axle | 72  | 2 | 3%  |
| 4-Axle | 77  | 2 | 3%  |
| BUS    | 10  | 1 | 10% |
| ALL    | 193 | 9 | 5%  |

**Table 6.9(a): NH31**

| Combined trip matrix for 2 Axle         |   |                  |    |   |   |     |    |    |             |
|-----------------------------------------|---|------------------|----|---|---|-----|----|----|-------------|
| Origin Zone                             |   | Destination Zone |    |   |   |     |    |    |             |
|                                         |   | 1                | 2  | 3 | 4 | 5   | 6  | 7  | Grand Total |
|                                         | 1 | 0                | 9  | 0 | 0 | 3   | 13 | 0  | 25          |
|                                         | 2 | 9                | 0  | 0 | 1 | 0   | 0  | 4  | 14          |
|                                         | 3 | 0                | 0  | 0 | 0 | 0   | 0  | 0  | 0           |
|                                         | 4 | 0                | 0  | 0 | 0 | 1   | 0  | 1  | 2           |
|                                         | 5 | 10               | 1  | 0 | 1 | 0   | 0  | 5  | 17          |
|                                         | 6 | 25               | 1  | 0 | 1 | 0   | 0  | 2  | 29          |
|                                         | 7 | 0                | 8  | 0 | 0 | 7   | 1  |    | 16          |
| Grand Total                             |   | 44               | 19 | 0 | 3 | 11  | 14 | 12 | 103         |
| THE PERCENTAGE OF THE DIVERTED VEHICLES |   |                  |    |   |   | 59% |    |    |             |

**Table 6.9(b)**

| Combined trip matrix for 3 Axle |   |                  |    |   |   |    |    |     |             |
|---------------------------------|---|------------------|----|---|---|----|----|-----|-------------|
| Origin Zone                     |   | Destination Zone |    |   |   |    |    |     |             |
|                                 |   | 1                | 2  | 3 | 4 | 5  | 6  | 7   | Grand Total |
|                                 | 1 | 0                | 9  | 0 | 0 | 6  | 21 | 0   | 36          |
|                                 | 2 | 35               | 0  | 1 | 0 | 0  | 3  | 1   | 40          |
|                                 | 3 | 0                | 0  | 0 | 0 | 0  | 0  | 0   | 0           |
|                                 | 4 | 0                | 0  | 0 | 0 | 0  | 0  | 0   | 0           |
|                                 | 5 | 11               | 1  | 0 | 0 | 0  | 0  | 9   | 21          |
|                                 | 6 | 50               | 4  | 0 | 5 | 0  | 0  | 6   | 65          |
|                                 | 7 | 0                | 1  | 0 | 1 | 6  | 5  | 0   | 13          |
| Grand Total                     |   | 96               | 15 | 1 | 6 | 12 | 29 | 16  | 175         |
| THE PERCENTAGE OF THEVEHICLES   |   |                  |    |   |   |    |    | 57% |             |

**Table 6.9(c)**

| Combined trip matrix for Bus |  |                  |   |   |   |   |   |   |             |
|------------------------------|--|------------------|---|---|---|---|---|---|-------------|
| Origin Zone                  |  | Destination Zone |   |   |   |   |   |   |             |
|                              |  | 1                | 2 | 3 | 4 | 5 | 6 | 7 | Grand Total |

|                                         |   |   |   |   |   |     |   |    |    |
|-----------------------------------------|---|---|---|---|---|-----|---|----|----|
|                                         | 1 | 0 | 1 | 0 | 0 | 0   | 0 | 0  | 1  |
|                                         | 2 | 0 | 0 | 0 | 0 | 0   | 0 | 2  | 2  |
|                                         | 3 | 0 | 0 | 0 | 0 | 0   | 0 | 2  | 2  |
|                                         | 4 | 0 | 0 | 0 | 0 | 0   | 0 | 3  | 3  |
|                                         | 5 | 3 | 0 | 0 | 0 | 0   | 0 | 9  | 12 |
|                                         | 6 | 1 | 0 | 0 | 0 | 0   | 0 | 0  | 1  |
|                                         | 7 | 0 | 3 | 1 | 1 | 4   | 0 | 0  | 9  |
| Grand Total                             |   | 4 | 4 | 1 | 1 | 4   | 0 | 16 | 30 |
| THE PERCENTAGE OF THE DIVERTED VEHICLES |   |   |   |   |   | 77% |   |    |    |

**Table 6.9(d)**

| Combined trip matrix for 4-Axle |   |                  |   |   |   |   |    |   |             |
|---------------------------------|---|------------------|---|---|---|---|----|---|-------------|
|                                 |   | Destination Zone |   |   |   |   |    |   |             |
| Origin Zone                     |   | 1                | 2 | 3 | 4 | 5 | 6  | 7 | Grand Total |
|                                 | 1 | 0                | 6 | 0 | 0 | 4 | 11 | 0 | 21          |
|                                 | 2 | 8                | 0 | 0 | 0 | 0 | 0  | 0 | 8           |
|                                 | 3 | 0                | 0 | 0 | 0 | 0 | 0  | 0 | 0           |
|                                 | 4 | 0                | 0 | 0 | 0 | 0 | 0  | 0 | 0           |
|                                 | 5 | 2                | 2 | 0 | 0 | 0 | 0  | 3 | 7           |
|                                 | 6 | 10               | 1 | 0 | 2 | 0 | 0  | 3 | 16          |
|                                 | 7 | 0                | 0 | 0 | 0 | 0 | 0  | 0 | 0           |
| Grand Total                     |   | 20               | 9 | 0 | 2 | 4 | 11 | 6 | 52          |

|                                         |     |
|-----------------------------------------|-----|
| THE PERCENTAGE OF THE DIVERTED VEHICLES | 67% |
|-----------------------------------------|-----|

**Table 6.9 (e): Diverted Vehicle On NH 127B from NH-31**

| Types of vehicles | Total | Nos Traffic Diverted from NH 31 | % of vehicles towards NH 127B |
|-------------------|-------|---------------------------------|-------------------------------|
| 2-Axle            | 103   | 61                              | 59%                           |
| 3-Axle            | 175   | 99                              | 57%                           |
| 4-Axle            | 52    | 35                              | 67%                           |
| BUS               | 30    | 23                              | 77%                           |
| ALL               | 361   | 218                             | 60%                           |

### 6.2.7 Intersection Turning Movement Counts

Intersection turning movement surveys were carried out at the identified 2 major intersections on the project road. The locations considered for intersection turning movement surveys is as described earlier. For ready reference these are listed again below.

- 4-legged junction near Srirumpur (0+000 Km) (as per Survey chainage)
- 3-legged junction on NH 31 (40+000 Km) (as per Survey chainage)

Classified directional turning movements were counted at each of the above intersections for one day (1X12 hrs) on a working day. Trained enumerators, under careful supervision of Transport Planners, have carried out these surveys.

The details on the turning movement counts are given in Annexure

The peak hour flows (in vehicles and PCUs) have been presented in Figures 6.2 to 6.5.

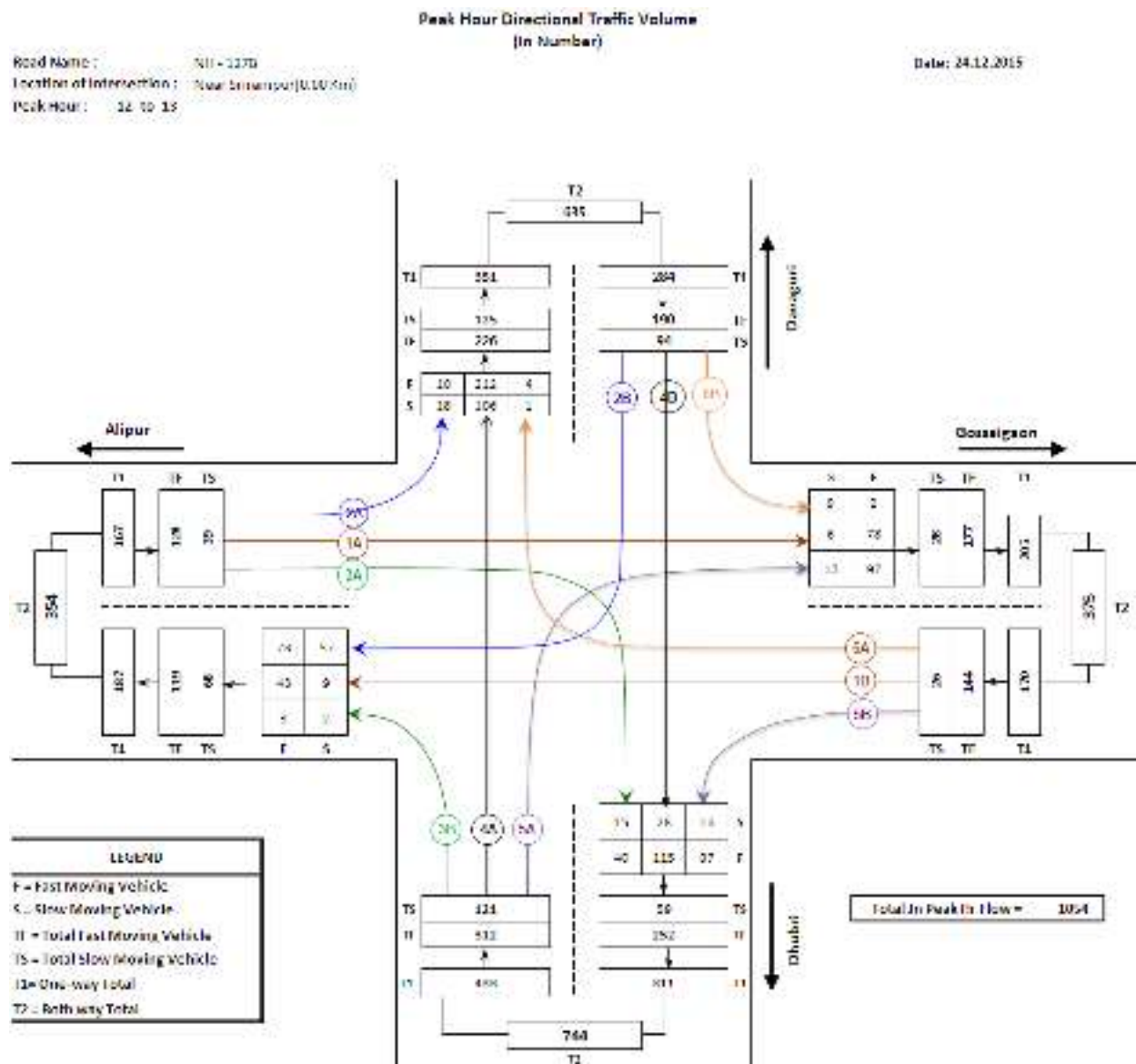


Fig 6.2: Peak hour traffic in Number at Ch. 0+000Km of NH 127

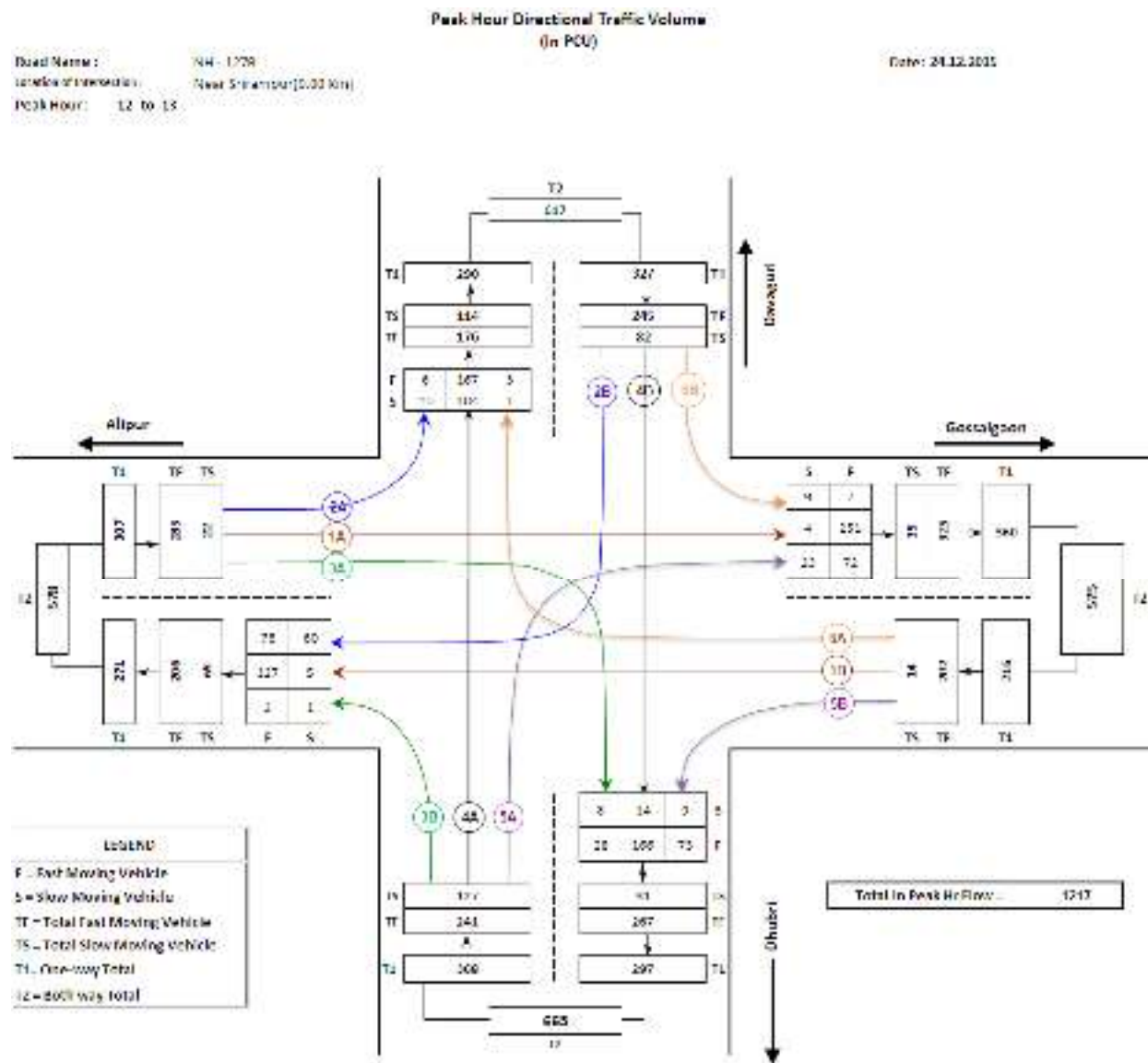


Fig 6.3: Peak Hour traffic in PCU at Ch. 0+000Km of NH 127B

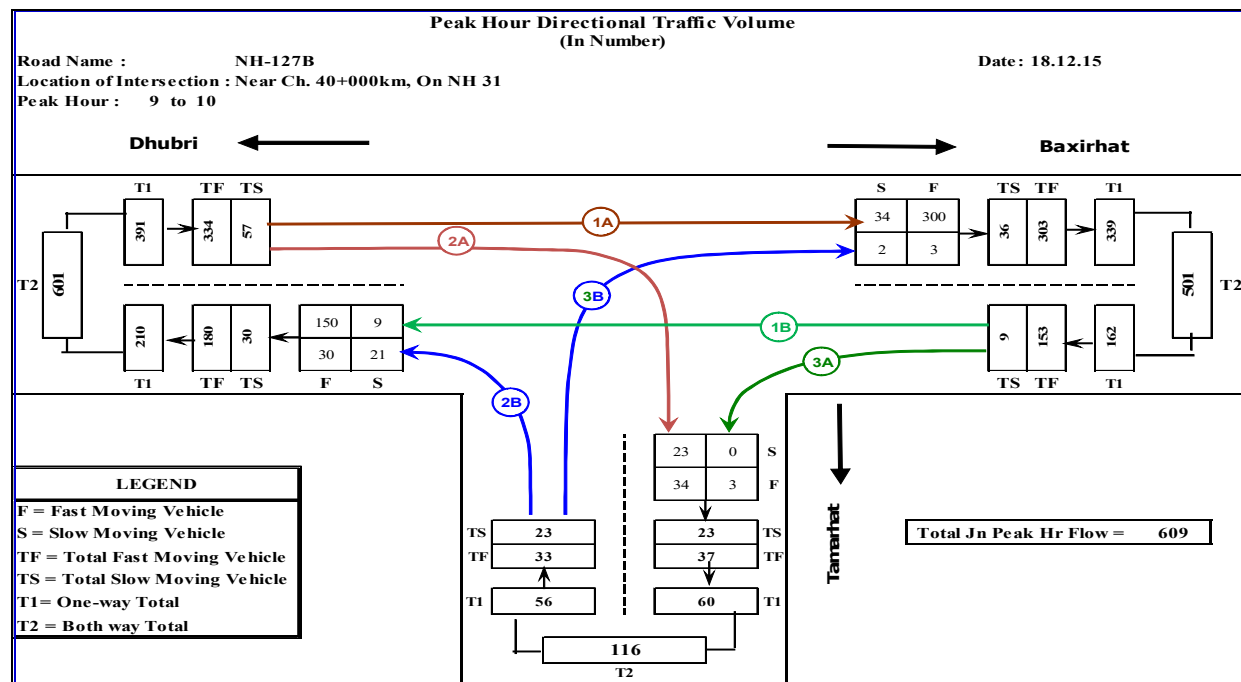


Fig 6.4: Peak hour traffic in Number at Ch. 40+000Km of NH 127B

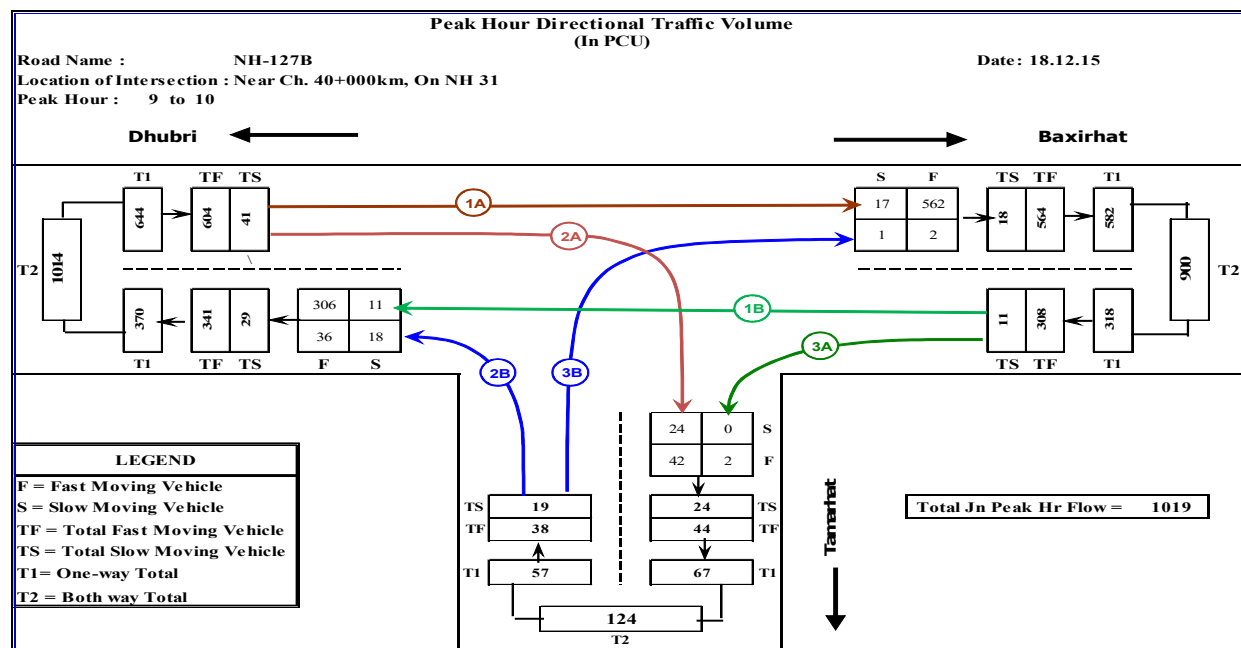


Fig 6.5: Peak Hour traffic in PCU at Ch. 40+000Km of NH 127B

## Forecasts of Intersection Turning Movements



The peak hour turning movements at various major junctions on the Project Road have been calculated. These forecasts consider the likely growth in the traffic at intersections. Forecasts of peak hour intersection turning movements are given in Appendix. IRC:92-1985 9, Section 3, specifies warrants for providing grade separation. Since the Project Road will be developed to National Highway standards, grade separators are needed when the total peak hour traffic at a junction exceeds 10,000 PCUs/hr. The following table shows that the peak hour intersection flow doesn't reach 10,000 PCUs/hr for any locations. But grade separate is provide at the Junction of NH-31 and NH-127-B (CH- 40+600) as to the project road cross a railway line and a National highway (NH-31) at same location

**Table 6.10: Summary of Peak Hour Intersection Flows**

| Sl.No. | Name of Intersection                         | Total Jn Peak Hr Flow |      |
|--------|----------------------------------------------|-----------------------|------|
|        |                                              | Number                | PCU  |
| 1      | Junction of NH-31C and NH-127-B ( CH. 0+000  | 1054                  | 1217 |
| 2      | Junction of NH-31 and NH-127-B ( CH. 40+000) | 621                   | 1019 |

## 6.2.8 Classified Traffic Volume Counts

Classified directional traffic volumes were counted manually for 7 continuous days at each of the four identified locations on the project road, to obtain the following.

- Average Daily Traffic (ADT)
- Seasonal Variation
- ✓ Annual Average Daily Traffic (AADT)
- ✓ Peak Season AADT

The details of the above are presented in the following sections.

### A. Average Daily Traffic

The traffic volumes counted in 15-minute intervals have been aggregated to one-hour volumes. These are presented in in a separate volume field investigation report (Appendix). The hourly volumes have been aggregated into daily volumes for the entire survey period (7-days). The daily volumes are then averaged for



ADT. To express the classified vehicular count in terms of PCUs, the PCU factors as given in IRC-64: 1990 have been considered. For ready reference, the PCU Factors considered in the analysis are given in **Table 6.11**

**Table 6.11: PCU Factors Considered for the Study**

| Sl. No. | Vehicle Type                    |                 | PCU Factor |
|---------|---------------------------------|-----------------|------------|
| 1       | <b>Two Wheeler</b>              |                 | 0.50       |
| 2       | <b>Car/Jeep/ Van/Taxi/ Auto</b> |                 | 1.00       |
| 3       | <b>BUS</b>                      | Mini            | 1.50       |
| 4       |                                 | Standard        | 3.00       |
| 5       | <b>LCV</b>                      |                 | 1.50       |
| 6       | <b>Truck</b>                    | 2-Axle          | 3.00       |
| 7       |                                 | 3 -Axle         | 3.00       |
| 8       |                                 | Multi-Axle      | 4.50       |
| 9       | <b>Agricultural Tractor</b>     | With Trailer    | 4.50       |
| 10      |                                 | Without Trailer | 1.50       |
| 11      | <b>Cycle</b>                    |                 | 0.50       |
| 12      | <b>Cycle Rickshaw</b>           |                 | 2.00       |
| 13      | <b>Hand Cart</b>                |                 | 3.00       |
| 14      | <b>Animal Drawn</b>             | Bullock Cart    | 8.00       |
| 15      |                                 | Horse           | 4.00       |

As given in **Table 6.10**, the classification considered in this study for traffic volume counting is quite exhaustive and comprehensive.

The summary of ADT, as observed on the Project Road, in terms of vehicles and PCUs at different survey locations is given in **Table 6.12**.

**Table 6.12: ADT (December 2015) as Observed on the Project Road**

| Vehicle Type                  | ON NH-31C<br>(Near Srirampur) | On project Road<br>Near Tamarhat<br>(CH.15+500) | ON NH 31<br>(Near CH.<br>40+000) | On project<br>road(Near CH<br>57+000) |
|-------------------------------|-------------------------------|-------------------------------------------------|----------------------------------|---------------------------------------|
| <b>Two Wheeler</b>            | 1657                          | 1957                                            | 1584                             | 1647                                  |
| <b>Car/Jeep/Van/Taxi/Auto</b> | 1996                          | 1066                                            | 2368                             | 1081                                  |

| Vehicle Type                                     | ON NH-31C<br>(Near Srirampur) | On project Road<br>Near Tamarhat<br>(CH.15+500) | ON NH 31<br>(Near CH.<br>40+000) | On project<br>road(Near CH<br>57+000) |
|--------------------------------------------------|-------------------------------|-------------------------------------------------|----------------------------------|---------------------------------------|
| Mini Bus                                         | 71                            | 59                                              | 116                              | 0                                     |
| Standard Bus                                     | 111                           | 88                                              | 139                              | 4                                     |
| LCV                                              | 110                           | 10                                              | 50                               | 40                                    |
| 2-Axle                                           | 314                           | 89                                              | 641                              | 39                                    |
| 3-Axle                                           | 307                           | 16                                              | 891                              | 1                                     |
| Multi-Axle                                       | 732                           | 56                                              | 629                              | 0                                     |
| Tractor With Trailer                             | 11                            | 26                                              | 101                              | 39                                    |
| Tractor Without Trailer                          | 2                             | 2                                               | 21                               | 13                                    |
| Cycle                                            | 631                           | 2269                                            | 533                              | 1374                                  |
| Cycle Rickshaw                                   | 100                           | 285                                             | 89                               | 116                                   |
| Hand Cart                                        | 15                            | 29                                              | 5                                | 6                                     |
| Bullock Cart                                     | 1                             | 1                                               | 1                                | 0                                     |
| Horse Cart                                       | 1                             | 11                                              | 5                                | 0                                     |
| <b>Total Motorized Vehicles<br/>(Number)</b>     | <b>5313</b>                   | <b>3370</b>                                     | <b>6540</b>                      | <b>2864</b>                           |
| <b>Total Non-Motorized<br/>Vehicles (Number)</b> | <b>747</b>                    | <b>2594</b>                                     | <b>633</b>                       | <b>1497</b>                           |
| <b>Total Motorized Vehicles<br/>(PCU)</b>        | <b>8642</b>                   | <b>3101</b>                                     | <b>11739</b>                     | <b>2292</b>                           |
| <b>Total Non-Motorized<br/>Vehicles (PCU)</b>    | <b>767</b>                    | <b>1839</b>                                     | <b>484</b>                       | <b>938</b>                            |
| <b>Total Commercial Vehicle<br/>per day</b>      | <b>3656</b>                   | <b>1412</b>                                     | <b>4956</b>                      | <b>1217</b>                           |
| <b>Total PCU per day</b>                         | <b>9209</b>                   | <b>4940</b>                                     | <b>12222</b>                     | <b>3230</b>                           |

#### 6.2.8.1 Temporal Variation

Analysis has been carried out to understand the following parameters on temporal variation of traffic on the Project Road

- Daily variation of traffic,
- Hourly variation of traffic, and
- Peak Hour Factor (PHF)

The results and findings from the above analysis are given below.

### A. Daily Variation

Figure 6.6 present daily variations in traffic in terms of no. of vehicles per day at all the count locations combined.

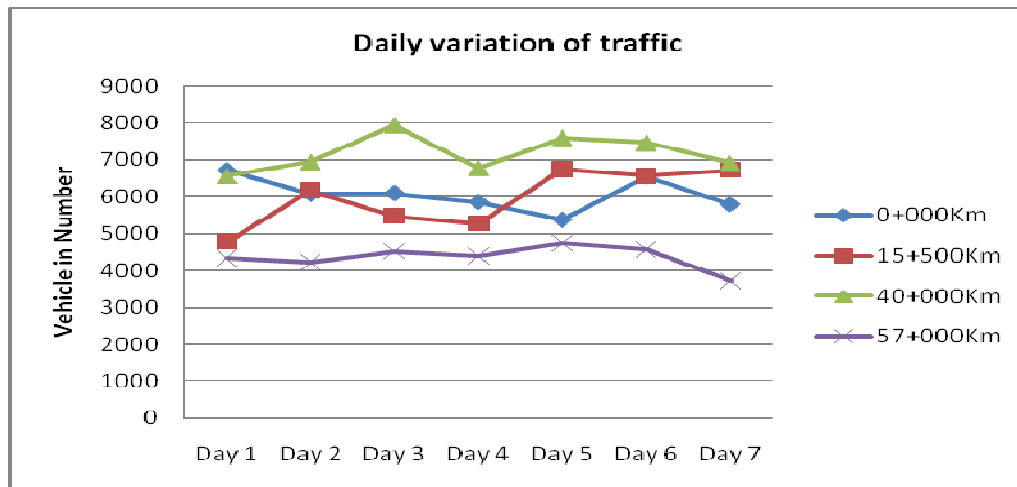


Figure 6.6: Daily Variation of Traffic at Km 0+000, Km 15+500, Km 40+000 & Km 57+000 in Vehicles per Day

### B. Hourly Variation

Similar to daily variation, analysis has also been carried out for hourly variation. The hourly variations will be useful in the Capacity and LOS analysis, in planning of various road side infrastructure facilities, etc. The hourly variations in traffic (in Vehicles and PCUs per Day) observed at both the count stations on the Project Road have been presented in the following figures.

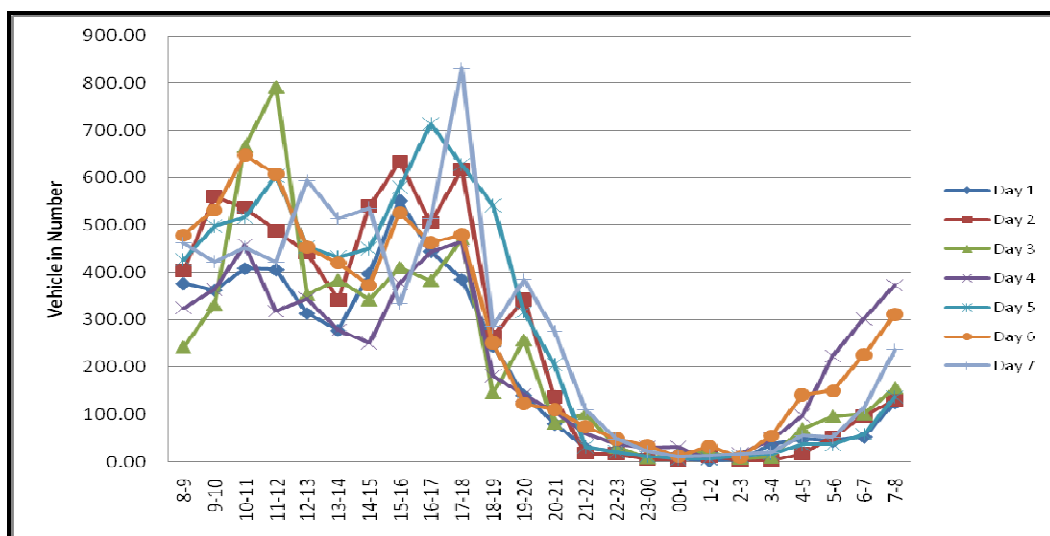


Figure 6.7: Hourly Variation of Traffic at 15+500 Km in Vehicles per Day

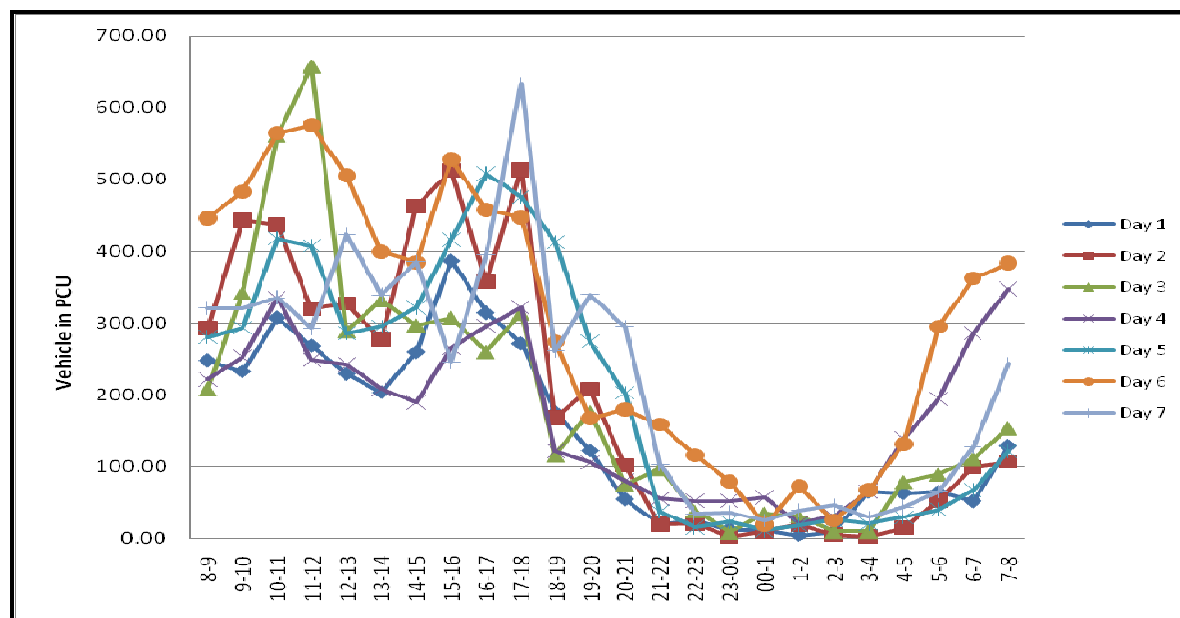


Figure 6.8: Hourly Variation of Traffic at 15+500 Km in PCU per Day

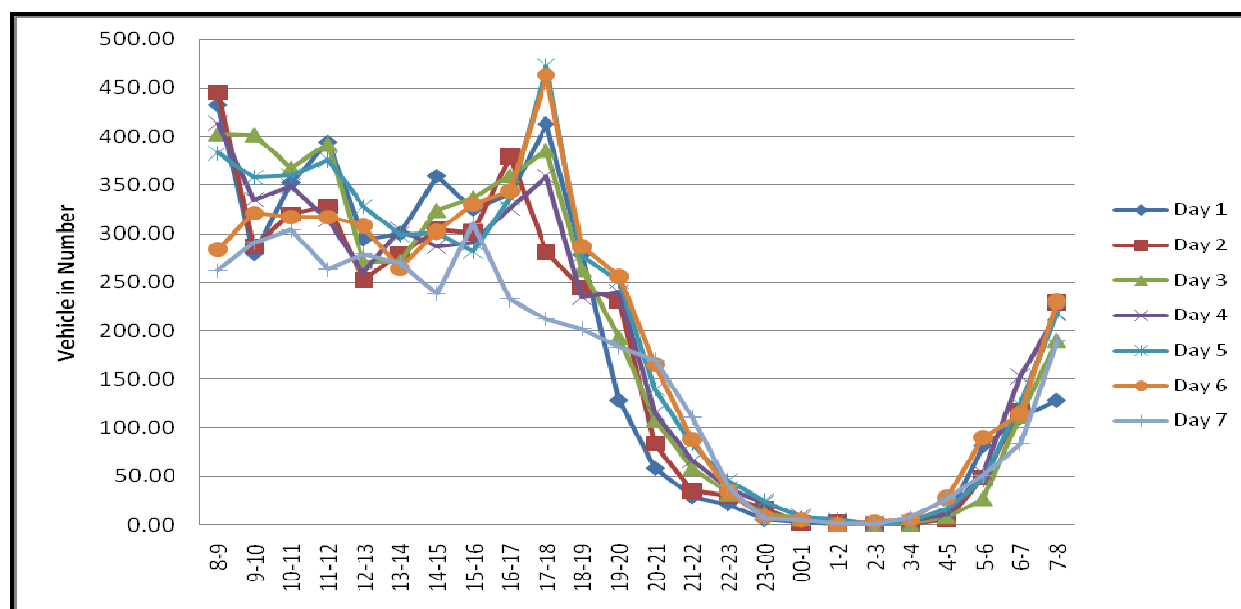


Figure 6.9: Hourly Variation of Traffic at 57+000 Km in Vehicles per Day

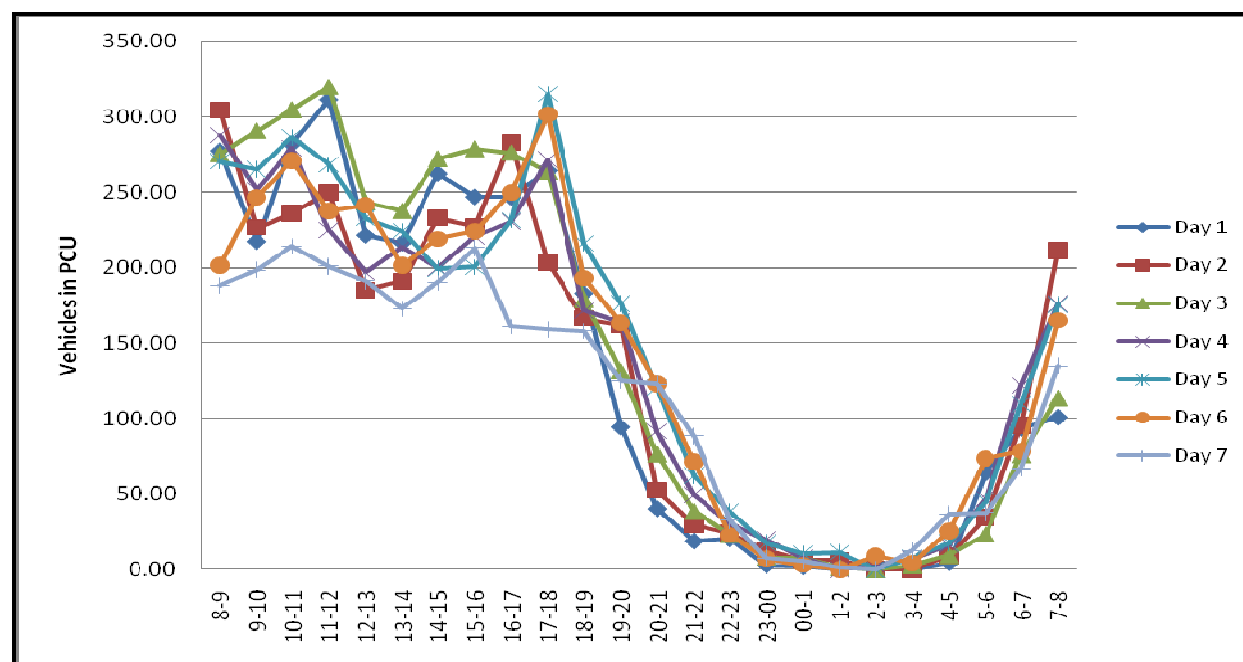


Figure 6.10: Hourly Variation of Traffic at 57+000 Km in PCU per Day

From these above figures on hourly variation the following can be derived:

- The passenger traffic at all the locations, and therefore on the Project Road, moves mostly during the day time, and it is very low particularly in the night.
- The variation of traffic is observed on different day.

### C. Peak Hour Factors

Hourly variations observed in traffic at all the count locations have been analyzed for PHFs (Peak Hour Flow as a percentage of the total day flow), and are summarized in **Table 6.13**.

Table 6.13: Peak Hour Factors as Observed on the Project Road

| S. No: | Count Location | Peak Hour          | PHF (%) |
|--------|----------------|--------------------|---------|
| 1      | 15+500Km       | 10.00a.m-11. 00a.m | 10.13   |
| 2      | 57+000Km       | 10.00a.m-11. 00a.m | 9.01    |

The above PHFs represent a nearly uniform traffic distribution. As described earlier, this smaller PHF in the range 9.01 to 10.13% implies that the traffic on the project road is spread over a larger duration of time in a day.

### 6.2.8.2 Directional Distribution

Like hourly variations, directional distribution of traffic will be useful in the Capacity and LOS analysis and in planning of various road side infrastructure facilities, etc.

The directional distribution observed at the count stations on the Project Road have been presented in **Table 6.14**.

**Table 6.14: Directional Distribution**

|                      |    | Km 15+500     |             |                                |           | Km 57+000     |             |                                |           |
|----------------------|----|---------------|-------------|--------------------------------|-----------|---------------|-------------|--------------------------------|-----------|
| Time Interval (Hour) |    | Traffic (PCU) |             | Directional Distribution ( % ) |           | Traffic (PCU) |             | Directional Distribution ( % ) |           |
| From                 | To | Up            | Down        | Up                             | Down      | Up            | Down        | Up                             | Down      |
| 8                    | 9  | 128           | 122         | 51                             | 49        | 89            | 197         | 31                             | 69        |
| 9                    | 10 | 172           | 167         | 51                             | 49        | 100           | 145         | 41                             | 59        |
| 10                   | 11 | 229           | 207         | 53                             | 47        | 119           | 156         | 43                             | 57        |
| 11                   | 12 | 247           | 168         | 60                             | 40        | 133           | 161         | 45                             | 55        |
| 12                   | 13 | 141           | 141         | 50                             | 50        | 112           | 105         | 52                             | 48        |
| 13                   | 14 | 124           | 147         | 46                             | 54        | 115           | 100         | 54                             | 46        |
| 14                   | 15 | 175           | 165         | 52                             | 48        | 139           | 117         | 54                             | 46        |
| 15                   | 16 | 199           | 203         | 50                             | 50        | 151           | 100         | 60                             | 40        |
| 16                   | 17 | 129           | 182         | 42                             | 58        | 153           | 116         | 57                             | 43        |
| 17                   | 18 | 159           | 207         | 43                             | 57        | 146           | 98          | 60                             | 40        |
| 18                   | 19 | 60            | 93          | 39                             | 61        | 115           | 61          | 65                             | 35        |
| 19                   | 20 | 73            | 96          | 43                             | 57        | 86            | 44          | 66                             | 34        |
| 20                   | 21 | 28            | 49          | 37                             | 63        | 34            | 23          | 59                             | 41        |
| 21                   | 22 | 36            | 10          | 79                             | 21        | 19            | 10          | 67                             | 33        |
| 22                   | 23 | 13            | 15          | 47                             | 53        | 14            | 8           | 63                             | 37        |
| 23                   | 0  | 4             | 4           | 51                             | 49        | 5             | 3           | 62                             | 38        |
| 0                    | 1  | 9             | 10          | 46                             | 54        | 3             | 2           | 65                             | 35        |
| 1                    | 2  | 12            | 6           | 65                             | 35        | 1             | 2           | 20                             | 80        |
| 2                    | 3  | 2             | 6           | 29                             | 71        | 0             | 1           | 0                              | 100       |
| 3                    | 4  | 9             | 17          | 35                             | 65        | 1             | 0           | 100                            | 0         |
| 4                    | 5  | 32            | 20          | 61                             | 39        | 4             | 4           | 46                             | 54        |
| 5                    | 6  | 27            | 42          | 39                             | 61        | 12            | 29          | 29                             | 71        |
| 6                    | 7  | 53            | 34          | 61                             | 39        | 54            | 34          | 61                             | 39        |
| 7                    | 8  | 78            | 52          | 60                             | 40        | 56            | 86          | 40                             | 60        |
| <b>Total-</b>        |    | <b>2138</b>   | <b>2160</b> | <b>50</b>                      | <b>50</b> | <b>1659</b>   | <b>1600</b> | <b>51</b>                      | <b>49</b> |

The overall directional distribution is 50:50 at Km 15+500 and 51:49 at Km 57+000 considering the traffic flow at all the count stations.

#### 6.2.8.3 Traffic Composition

While detailed traffic counts are presented in **Annexure**, for ready reference and easier appreciation, the composition of traffic at various count locations has been shown in **Figure 6.11 & 6.12**



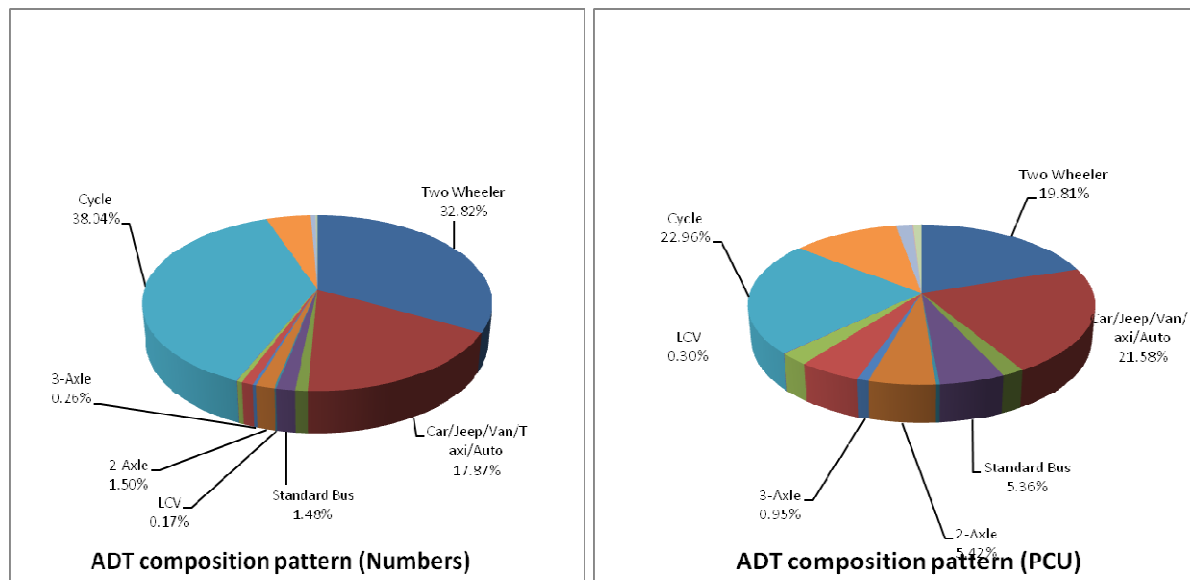


Figure 6.11: Traffic Composition (15+500 Km)

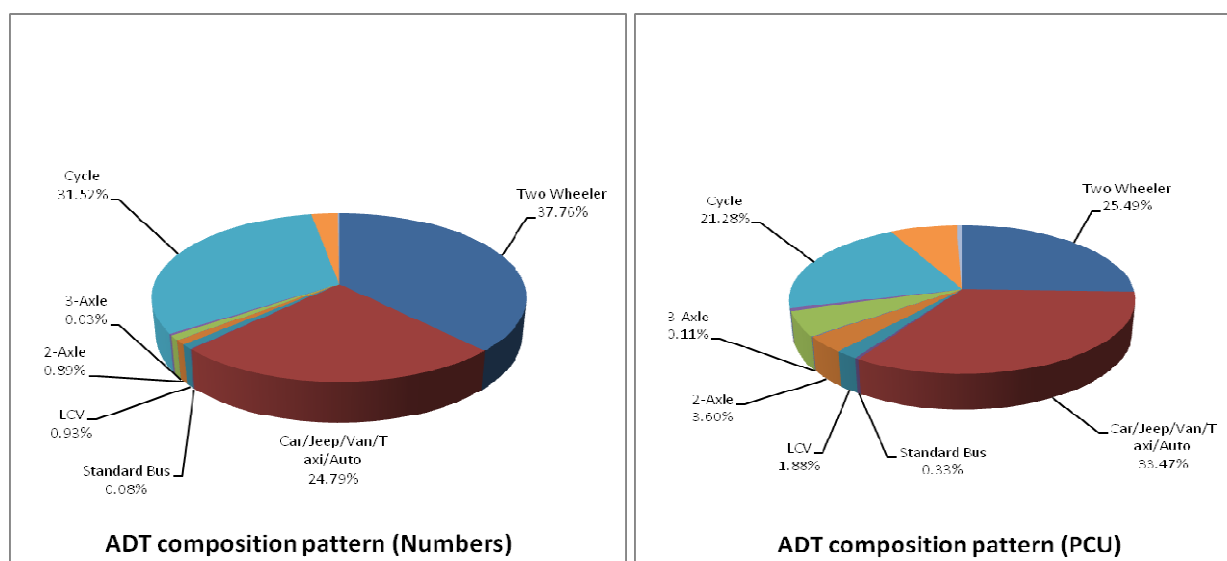


Figure 6.12: Traffic Composition (57+000 Km)

From the above figures it can be seen that car & two wheelers comprise about 49-61% of total traffic whereas 2-axle & 3-axle trucks comprise about 1.5-20% of total traffic on the project road..

The traffic composition shown in the above figures has been summarized in **Tables 6.15 & 6.16**

**Table 6.15: Summary of Traffic Composition at km 15+500 (December 2015) as observed on the project road**

| Type of Vehicle         | ADT  | % of Total |
|-------------------------|------|------------|
| Two-Wheeler             | 1957 | 32.82      |
| Car/Jeep/Van/Taxi/Auto  | 1066 | 17.87      |
| Mini Bus                | 59   | 0.99       |
| Standard Bus            | 88   | 1.48       |
| LCV                     | 10   | 0.17       |
| 2-Axle                  | 89   | 1.50       |
| 3-Axle                  | 16   | 0.26       |
| Multi-Axle              | 56   | 0.94       |
| Tractor with Trailer    | 26   | 0.44       |
| Tractor Without Trailer | 2    | 0.03       |
| Cycle                   | 2269 | 38.04      |
| Cycle Rickshaw          | 285  | 4.78       |
| Hand Cart               | 29   | 0.48       |
| Bullock Cart            | 1    | 0.01       |
| Horse Cart              | 11   | 0.18       |

**Table 6.16: Summary of Traffic Composition at km 40+000 (December 2015) as observed on the project road**

| Type of Vehicle         | ADT  | % of Total |
|-------------------------|------|------------|
| Two-Wheeler             | 1647 | 37.76      |
| Car/Jeep/Van/Taxi/Auto  | 1081 | 24.79      |
| Mini Bus                | 0    | 0.00       |
| Standard Bus            | 4    | 0.08       |
| LCV                     | 40   | 0.93       |
| 2-Axle                  | 39   | 0.89       |
| 3-Axle                  | 1    | 0.03       |
| Multi-Axle              | 0    | 0.00       |
| Tractor with Trailer    | 39   | 0.90       |
| Tractor Without Trailer | 13   | 0.29       |
| Cycle                   | 1374 | 31.52      |
| Cycle Rickshaw          | 116  | 2.65       |
| Hand Cart               | 6    | 0.15       |
| Bullock Cart            | 0    | 0.00       |
| Horse Cart              | 0    | 0.00       |

## B. Seasonal Correction

The traffic plying on any road generally varies over different periods of year depending on the cycle of different socio-economic activities in the regions through which it passes. Therefore, in order to have more realistic picture of the traffic on the project road, it is required to assess seasonal variation in traffic to estimate Annual Average Daily Traffic (AADT) and Peak Season ADT. Therefore, the ADT observed during the survey duration is multiplied by a Seasonal Correction Factor (SCF) to derive AADT and Peak season ADT. The seasonal correction factor is

generally derived from secondary data sources such as past month-wise traffic data on the project road, sales of fuel at different filling stations along the project highway etc.

In the absence of any other data, either of the project road or in the vicinity, only the monthly figures of fuel sales collected from one petrol bunk on the project road is considered in the estimation of seasonal variation and seasonal correction factors.

#### **Seasonal Correction Factor**

For the present study, firstly the petrol and diesel sale figures have been used from four different petrol bunks on the project road. The petrol and diesel fuel sale data for the years 2014-2015 have been collected and analyzed for estimation of Average Seasonal Correction Factor (ASCF) and Peak Seasonal Correction Factor (PSCF). As the traffic surveys were conducted in the month of December, the above factors for the month of December is considered. The fuel sales figures at the filling station in the region are presented season wise in **Table 6.17 & 6.18.**

#### **Detailed Sales fuel data calculation at Kalaghat Fuel Station**

**Table 6.17: Summary of Petrol sales data at Kalaghat Fuel Station**

| <i>Petrol Sales Data (in Litre)</i> |              |                              |                                     | <i>Diesel Sales Data (in Litre)</i> |                                     |
|-------------------------------------|--------------|------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <i>Year</i>                         | <i>Month</i> | <i>Fuel Stations</i>         |                                     | <i>Fuel Stations</i>                |                                     |
|                                     |              | <i>Kalaghat Fuel Station</i> | <i>Avg. Sales Per Station (Lt.)</i> | <i>Kalaghat Fuel Station</i>        | <i>Avg. Sales Per Station (Lt.)</i> |
| 2014                                | Jan          | 150,448                      | 150,448                             | 70,213                              | 70,213                              |
| 2014                                | Feb          | 144,066                      | 144,066                             | 32,502                              | 32,502                              |
| 2014                                | Mar          | 148,481                      | 148,481                             | 32,546                              | 32,546                              |
| 2014                                | Apr          | 159,306                      | 159,306                             | 21,566                              | 21,566                              |
| 2014                                | May          | 144,958                      | 144,958                             | 35,602                              | 35,602                              |
| 2014                                | Jun          | 125,563                      | 125,563                             | 36,560                              | 36,560                              |
| 2014                                | Jul          | 136,662                      | 136,662                             | 31,235                              | 31,235                              |
| 2014                                | Aug          | 133,386                      | 133,386                             | 32,256                              | 32,256                              |
| 2014                                | Sep          | 137,814                      | 137,814                             | 26,211                              | 26,211                              |
| 2014                                | Oct          | 135,357                      | 135,357                             | 32,612                              | 32,612                              |
| 2014                                | Nov          | 141,588                      | 141,588                             | 31,055                              | 31,055                              |
| 2014                                | Dec          | 153,454                      | 153,454                             | 35,772                              | 35,772                              |
| 2015                                | Jan          | 142,204                      | 142,204                             | 73,542                              | 73,542                              |
| 2015                                | Feb          | 154,420                      | 154,420                             | 49,284                              | 49,284                              |
| 2015                                | Mar          | 184,575                      | 184,575                             | 38,952                              | 38,952                              |
| 2015                                | Apr          | 146,507                      | 146,507                             | 23,386                              | 23,386                              |
| 2015                                | May          | 190,314                      | 190,314                             | 39,082                              | 39,082                              |
| 2015                                | Jun          | 181,270                      | 181,270                             | 37,894                              | 37,894                              |

| <i>Petrol Sales Data (in Litre)</i> |              |                              |                                     | <i>Diesel Sales Data (in Litre)</i> |                                     |
|-------------------------------------|--------------|------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <i>Year</i>                         | <i>Month</i> | <i>Fuel Stations</i>         |                                     | <i>Fuel Stations</i>                |                                     |
|                                     |              | <i>Kalaghat Fuel Station</i> | <i>Avg. Sales Per Station (Lt.)</i> | <i>Kalaghat Fuel Station</i>        | <i>Avg. Sales Per Station (Lt.)</i> |
| 2015                                | <i>Jul</i>   | 156,782                      | 156,782                             | 12,881                              | 12,881                              |
| 2015                                | <i>Aug</i>   | 179,227                      | 179,227                             | 12,241                              | 12,241                              |
| 2015                                | <i>Sep</i>   | 109,286                      | 109,286                             | 36,259                              | 36,259                              |
| 2015                                | <i>Oct</i>   | 110,220                      | 110,220                             | 21,611                              | 21,611                              |
| 2015                                | <i>Nov</i>   | 140,255                      | 140,255                             | 22084                               | 22,084                              |
| 2015                                | <i>Dec</i>   | 152,033                      | 152,033                             | 29237                               | 29,237                              |

**Table 6.18: Summary of Seasonal Variation Factor (Petrol and Diesel)**

| <i>Month</i>               | <i>Avg. Sales (Lt.)</i> |               | <i>Avg Seasonal Correction Factor</i> |               | <i>Peak Seasonal Correction Factor</i> |               |
|----------------------------|-------------------------|---------------|---------------------------------------|---------------|----------------------------------------|---------------|
|                            | <i>Petrol</i>           | <i>Diesel</i> | <i>Petrol</i>                         | <i>Diesel</i> | <i>Petrol</i>                          | <i>Diesel</i> |
| <i>Jan</i>                 | 146,326                 | 71,878        | 0.97                                  | 0.47          | 1.15                                   | 1.00          |
| <i>Feb</i>                 | 149,243                 | 40,893        | 0.95                                  | 0.83          | 1.12                                   | 1.76          |
| <i>Mar</i>                 | 166,528                 | 35,749        | 0.86                                  | 0.95          | 1.01                                   | 2.01          |
| <i>Apr</i>                 | 152,907                 | 22,476        | 0.93                                  | 1.51          | 1.10                                   | 3.20          |
| <i>May</i>                 | 167,636                 | 37,342        | 0.85                                  | 0.91          | 1.00                                   | 1.92          |
| <i>Jun</i>                 | 153,417                 | 37,227        | 0.93                                  | 0.91          | 1.09                                   | 1.93          |
| <i>Jul</i>                 | 146,722                 | 22,058        | 0.97                                  | 1.54          | 1.14                                   | 3.26          |
| <i>Aug</i>                 | 156,307                 | 22,249        | 0.91                                  | 1.53          | 1.07                                   | 3.23          |
| <i>Sep</i>                 | 123,550                 | 31,235        | 1.15                                  | 1.09          | 1.36                                   | 2.30          |
| <i>Oct</i>                 | 122,789                 | 27,112        | 1.16                                  | 1.25          | 1.37                                   | 2.65          |
| <i>Nov</i>                 | 70,794                  | 27,570        | 2.01                                  | 1.23          | 2.37                                   | 2.61          |
| <b>Dec</b>                 | <b>152,744</b>          | <b>32,505</b> | <b>0.93</b>                           | <b>1.05</b>   | <b>1.10</b>                            | <b>2.21</b>   |
| <b>Avg. Sale per Month</b> | <b>142,413</b>          | <b>34,024</b> |                                       |               |                                        |               |

|                                                                   |             |
|-------------------------------------------------------------------|-------------|
|                                                                   |             |
| Average Seasonal Correction Factor for Petrol operated vehicles = | <b>0.93</b> |
| Average Seasonal Correction Factor for Diesel operated vehicles = | <b>1.05</b> |
|                                                                   |             |
| Peak Seasonal Correction Factor for Petrol operated vehicles =    | <b>1.10</b> |
| Peak Seasonal Correction Factor for Diesel operated vehicle =     | <b>2.21</b> |

The **Average Seasonal Correction Factor (ASCF)** has been applied on the ADT observed at the count location to derive **AADT** which will be used for **pavement design and Economic Analysis**. On the other hand, **Peak Seasonal Correction Factor (PSCF)** has been applied on the ADT to derive **Peak Season ADT** which will be used for the **Capacity Assessment**.

The following observation can be made from the above table

- An Average Seasonal Correction Factor of 0.93 and Peak Seasonal Correction Factor of 1.10 are applied on ADT for all toll able Petrol based motorized modes –two wheelers to derive AADT and Peak Season ADT respectively
- An Average seasonal correction factor of 1.05 and Peak Seasonal Correction factor of 2.21 are applied on ADT for all Diesel based traffic like buses, trucks, tractors, etc. to derive AADT and Peak Season ADT respectively.
- An average of ASCF (**0.99**) and average of PSCF (**1.65**) has been calculated based on petrol and diesel sales percentage of total fuel consumption on the project road are applied on ADT

### C. Annual Average Daily Traffic (AADT)

The Average seasonal correction factors for petrol and diesel driven vehicles, described in the previous sections have been applied to ADT to derive AADT. The AADT is used for pavement design and economic analysis. **For this Project road it is assumed that some percentages of vehicles will use few portions of the project road (from Km 40+000 to Km 57+000) after completion of it for their viable reason. That's why that percentage of vehicles is taken into consideration while calculating the total AADT on NH-127B. These percentages are calculated in Table 6.19.**

**Table 6.19: Estimates of AADT as observed on the project road (December 2015)**

| Vehicle Type          | ON NH-127B (Near Chowmore) | ON NH-31 | Probable diverted traffic from NH 31 to NH-127B | ON NH-31C | Probable diverted traffic from NH 31C to NH-127B | Expected traffic on NH-127B after completion |
|-----------------------|----------------------------|----------|-------------------------------------------------|-----------|--------------------------------------------------|----------------------------------------------|
| Two-Wheeler           | 1535                       | 1477     | 0                                               | 1545      | 0                                                | 1535                                         |
| Car/Jeep/Van/Taxi/Aut | 1070                       | 2344     | 703                                             | 1976      | 99                                               | 1872                                         |
| Mini Bus              | 0                          | 121      | 93                                              | 75        | 7                                                | 101                                          |
| Standard Bus          | 4                          | 145      | 112                                             | 116       | 12                                               | 127                                          |
| LCV                   | 42                         | 52       | 396                                             | 115       | 0                                                | 42                                           |
| 2-Axle Truck          | 41                         | 671      | 531                                             | 329       | 39                                               | 476                                          |
| 3-Axle Truck          | 1                          | 932      | 441                                             | 322       | 10                                               | 542                                          |
| Multi-Axle            | 0                          | 658      | 0                                               | 767       | 23                                               | 464                                          |
| Tractor With Trailer  | 41                         | 106      | 0                                               | 11        | 0                                                | 41                                           |

| Vehicle Type                                 | ON NH-127B (Near Chowmore) | ON NH-31     | Probable diverted traffic from NH 31 to NH-127B | ON NH-31C   | Probable diverted traffic from NH 31C to NH-127B | Expected traffic on NH-127B after completion |
|----------------------------------------------|----------------------------|--------------|-------------------------------------------------|-------------|--------------------------------------------------|----------------------------------------------|
| Tractor Without Trailer                      | 13                         | 22           | 0                                               | 2           | 0                                                | 13                                           |
| Cycle                                        | 1374                       | 533          | 0                                               | 631         | 0                                                | 1374                                         |
| Cycle Rickshaw                               | 116                        | 89           | 0                                               | 100         | 0                                                | 116                                          |
| Hand Cart                                    | 6                          | 5            | 0                                               | 15          | 0                                                | 6                                            |
| Bullock Cart                                 | 0                          | 1            | 0                                               | 1           | 0                                                | 0                                            |
| Horse Cart                                   | 0                          | 5            | 0                                               | 1           | 0                                                | 0                                            |
| <b>Total Motorized Vehicles (Number)</b>     | <b>2747</b>                | <b>6529</b>  | <b>2277</b>                                     | <b>5257</b> | <b>190</b>                                       | <b>5214</b>                                  |
| <b>Total Non-Motorized Vehicles (Number)</b> | <b>1497</b>                | <b>633</b>   | <b>0</b>                                        | <b>747</b>  | <b>0</b>                                         | <b>1497</b>                                  |
| <b>Total Commercial Vehicle per day</b>      | <b>142</b>                 | <b>2708</b>  | <b>1574</b>                                     | <b>1737</b> | <b>91</b>                                        | <b>1807</b>                                  |
| <b>Total PCU per day</b>                     | <b>3181</b>                | <b>11429</b> | <b>5946</b>                                     | <b>8625</b> | <b>396</b>                                       | <b>9523</b>                                  |

#### D. Peak Season AADT

The Peak Seasonal factor for petrol and diesel driven vehicle, describe in previous section have been applied to ADT to derive Peak Season AADT. The Peak Season AADT is used for the capacity assessment. The Peak Season AADT, thus derived is given in **Table 6.20**.

**Table 6.20: Estimates of Peak Season AADT as observed on project road (December 2015)**

| Vehicle Type             | At Km 15+500 (Near Tamarhat) | At Km 57+000 |
|--------------------------|------------------------------|--------------|
| Two-Wheeler              | 2148                         | 1807         |
| Car/Jeep/Van/Taxi/Auto   | 1764                         | 1788         |
| Mini Bus                 | 131                          | 0            |
| Standard Bus             | 195                          | 8            |
| LCV                      | 22                           | 89           |
| 2-Axle Truck             | 197                          | 86           |
| 3-Axle Truck             | 35                           | 3            |
| Artic / Semi Artic Truck | 124                          | 0            |
| Tractor With Trailer     | 58                           | 87           |
| Tractor Without Trailer  | 4                            | 28           |
| Cycle                    | 2269                         | 1374         |

| Vehicle Type                                 | At Km 15+500<br>(Near Tamarhat) | At Km 57+000 |
|----------------------------------------------|---------------------------------|--------------|
| Cycle Rickshaw                               | 285                             | 116          |
| Hand Cart                                    | 29                              | 6            |
| Bullock Cart                                 | 1                               | 0            |
| Horse Cart                                   | 11                              | 0            |
| <b>Total Motorized Vehicles (Number)</b>     | <b>4678</b>                     | <b>3896</b>  |
| <b>Total Non Motorized Vehicles (Number)</b> | <b>2594</b>                     | <b>1497</b>  |
| <b>Total Motorized Vehicles (PCU)</b>        | <b>5121</b>                     | <b>3546</b>  |
| <b>Total Non Motorized Vehicles (PCU)</b>    | <b>1839</b>                     | <b>938</b>   |
| <b>Total Commercial Vehicle per day</b>      | <b>2350</b>                     | <b>2089</b>  |
| <b>Total PCU per day</b>                     | <b>6960</b>                     | <b>4484</b>  |

#### E. Base Year Total Traffic (AADT) on Project Road

Total traffic for homogeneous section 1 (Km 0+000 to Km 39+000) is given in **table. 6.21(a)**

**Table 6.21(a): AADT on homogeneous section-1**

| AADT                                         |                              |
|----------------------------------------------|------------------------------|
| Vehicle Type                                 | Near Tamarhat(CH - 15.500Km) |
| Two-Wheeler                                  | 1825                         |
| Car/Jeep/Van/Taxi/Auto                       | 1055                         |
| Mini Bus                                     | 62                           |
| Standard Bus                                 | 92                           |
| LCV                                          | 10                           |
| 2-Axle Truck                                 | 93                           |
| 3-Axle Truck                                 | 16                           |
| Multi-Axle                                   | 58                           |
| Tractor with Trailer                         | 28                           |
| Tractor Without Trailer                      | 2                            |
| Cycle                                        | 1357                         |
| Cycle Rickshaw                               | 285                          |
| Hand Cart                                    | 29                           |
| Bullock Cart                                 | 1                            |
| Horse Cart                                   | 11                           |
| <b>Total Motorized Vehicles (Number)</b>     | <b>3243</b>                  |
| <b>Total Non Motorized Vehicles (Number)</b> | <b>2594</b>                  |
| <b>Total Motorized Vehicles (PCU)</b>        | <b>2891</b>                  |



| AADT                               |                              |
|------------------------------------|------------------------------|
| Vehicle Type                       | Near Tamarhat(CH - 15.500Km) |
| Total Non Motorized Vehicles (PCU) | 1839                         |
| Total Commercial Vehicle per day   | 363                          |
| Total vehicles in Number           | 5837                         |

## 6.3 Traffic Growth Rates

### Expected Traffic Growth Rates

As per IRC: 37-2012 5% growth of traffic is considered. The growth rates of traffic for this are in tabulated form.

**Table 6.22: Projected Growth Rate of Traffic, (%)**

| Vehicle Category | Growth rate |
|------------------|-------------|
| Bus              | 5%          |
| Lcv              | 5%          |
| Truck            | 5%          |
| Tractor          | 5%          |

Total traffic for homogeneous section 2 (Km 39+000 to Km 54+523) is calculated from the traffic of NH-127B and the diverted traffic of NH-31 and NH NH-31C to NH-127B. The diverted traffic is calculated from origin destination Survey on NH-31 and NH-31C. The calculation of total traffic on project road is given bellow in **Table 6.23**

**Table 6.23: AADT on homogeneous section-2**

|                                                                                                      | AADT           |                                |                          |               |     |            |             |                |                                    |                                       |       |                   |              |                 |               | Total in<br>Numbers | Total<br>in<br>PCU |
|------------------------------------------------------------------------------------------------------|----------------|--------------------------------|--------------------------|---------------|-----|------------|-------------|----------------|------------------------------------|---------------------------------------|-------|-------------------|--------------|-----------------|---------------|---------------------|--------------------|
|                                                                                                      | Two<br>Wheeler | Car/Jeep/<br>Van/Taxi/<br>Auto | Mini<br>/<br>RTVs<br>Bus | Stand.<br>Bus | LCV | 2-<br>Axle | 3 -<br>Axle | Multi-<br>Axle | Agri.<br>Tract.<br>With<br>Trailer | Agri.<br>Tract.<br>Without<br>Trailer | Cycle | Cycle<br>Rickshaw | Hand<br>Cart | Bullock<br>Cart | Horse<br>Cart |                     |                    |
| BASE YEAR TRAFFIC ON<br>NH-31                                                                        | 1,477          | 2,344                          | 121                      | 145           | 52  | 671        | 932         | 658            | 106                                | 22                                    | 533   | 89                | 5            | 1               | 5             | 7,162               | 12545              |
| % DIVERTED TRAFFIC<br>FROM NH-31 TO NH-127B                                                          | 0%             | 30%                            | 77%                      | 77%           | 0%  | 59%        | 57%         | 67%            | 0%                                 | 0%                                    | 0%    | 0%                | 0%           | 0%              | 0%            |                     |                    |
| NOS OF DIVERTED<br>TRAFFIC FROM NH-31 TO<br>NH-127B                                                  | 0              | 703                            | 93                       | 112           | 0   | 396        | 531         | 441            | 0                                  | 0                                     | 0     | 0                 | 0            | 0               | 0             | 2277                | 5946               |
| BASE YEAR TRAFFIC ON<br>NH-31C                                                                       | 1545           | 1976                           | 75                       | 116           | 115 | 329        | 322         | 767            | 11                                 | 2                                     | 631   | 100               | 15           | 1               | 1             | 6,004               | 9404               |
| % DIVERTED TRAFFIC<br>FROM NH-31C TO NH-<br>127B                                                     | 0%             | 5%                             | 10%                      | 10%           | 0%  | 12%        | 3%          | 3%             | 0%                                 | 0%                                    | 0%    | 0%                | 0%           | 0%              | 0%            |                     |                    |
| NOS OF DIVERTED<br>TRAFFIC FROM NH-31C<br>TO NH-127B                                                 | 0              | 99                             | 7                        | 12            | 0   | 39         | 10          | 23             | 0                                  | 0                                     | 0     | 0                 | 0            | 0               | 0             | 190                 | 396                |
| BASE YEAR TRAFFIC ON<br>NH-127B                                                                      | 1535           | 1070                           | 0                        | 4             | 42  | 41         | 1           | 0              | 41                                 | 13                                    | 1374  | 116               | 6            | 0               | 0             | 4244                | 3181               |
| BASE YEAR TRAFFIC ON<br>NH-127B + DIVERTED<br>TRAFFIC FROM NH-<br>31+DIVERTED TRAFFIC<br>FROM NH-31C | 1535           | 1872                           | 101                      | 127           | 42  | 476        | 542         | 464            | 41                                 | 13                                    | 1374  | 116               | 6            | 0               | 0             | 6711                | 9523               |

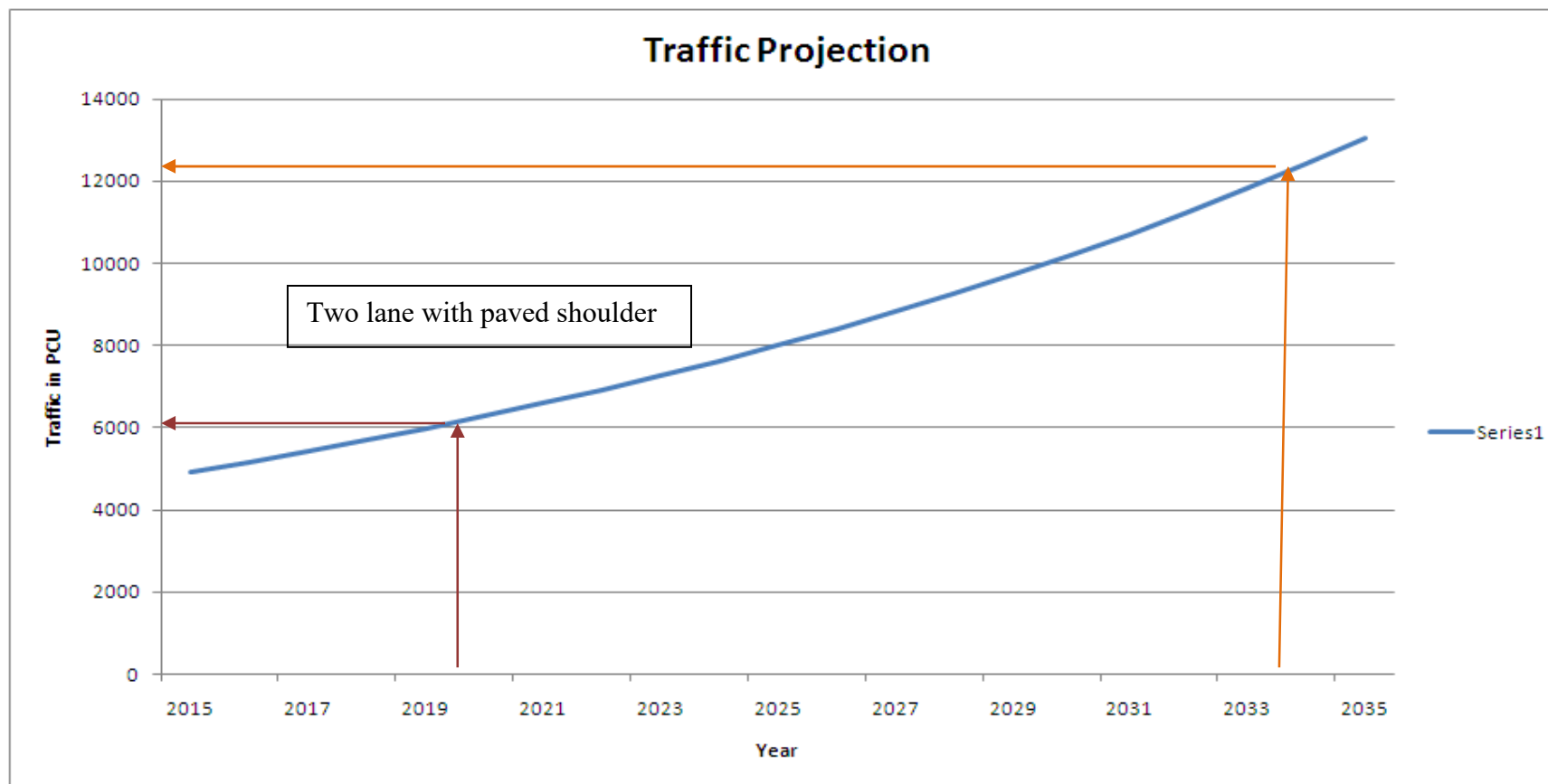
## F. Traffic Projection

### Homogeneous section-1

From the traffic projection it is seen that the PCU of project road from Km 0+000 to Km 38+990 (homogeneous section 1) is within 18000 upto the year 2034, so as per IRC:SP 73-2015 **two lane with paved shoulder is sufficient up to 2034**, but 4 Lane cross section has been adopted as per instruction received from NHIDCL vide Minutes of 56<sup>th</sup> meeting of executive committee Dated: 27.08.2018. The road is designed for 15 years design life as per IRC-37 2012. The calculation of traffic for **homogeneous section -1** is given bellow in **Table 6.24**

**Table 6.24: Traffic Projection of Project Road for Homogeneous section-1 from Km 0+000 to Km 38+990**

| Year | AADT           |             |                          |                 |            |     |         |          |             |                           |                              |       |                |           |              |            | Total in Numbers | Total in PCU | Remarks                    |
|------|----------------|-------------|--------------------------|-----------------|------------|-----|---------|----------|-------------|---------------------------|------------------------------|-------|----------------|-----------|--------------|------------|------------------|--------------|----------------------------|
|      | Growth Factors | Two Wheeler | Car/Jeep/ Van/Taxi/ Auto | Mini / RTVs Bus | Stand. Bus | LCV | 2- Axle | 3 - Axle | Multi- Axle | Agri. Tract. With Trailor | Agri. Tract. Without Trailor | Cycle | Cycle Rickshaw | Hand Cart | Bullock Cart | Horse Cart |                  |              |                            |
| 2015 | 5.0%           | 1825        | 1055                     | 62              | 92         | 10  | 93      | 16       | 58          | 28                        | 2                            | 2269  | 285            | 29        | 1            | 11         | 5837             | 4912         |                            |
| 2016 | 5.0%           | 1916        | 1108                     | 65              | 97         | 11  | 98      | 17       | 61          | 29                        | 2                            | 2382  | 299            | 30        | 1            | 12         | 6128             | 5157         |                            |
| 2017 | 5.0%           | 2012        | 1163                     | 68              | 102        | 11  | 103     | 18       | 64          | 30                        | 2                            | 2501  | 314            | 32        | 1            | 12         | 6435             | 5415         |                            |
| 2018 | 5.0%           | 2113        | 1221                     | 72              | 107        | 12  | 108     | 19       | 68          | 32                        | 2                            | 2626  | 330            | 33        | 1            | 13         | 6757             | 5686         |                            |
| 2019 | 5.0%           | 2218        | 1282                     | 75              | 112        | 13  | 114     | 20       | 71          | 34                        | 2                            | 2757  | 347            | 35        | 1            | 13         | 7094             | 5970         |                            |
| 2020 | 5.0%           | 2329        | 1346                     | 79              | 118        | 13  | 119     | 21       | 75          | 35                        | 2                            | 2895  | 364            | 36        | 1            | 14         | 7449             | 6269         | YEAR OF OPENNING           |
| 2021 | 5.0%           | 2446        | 1414                     | 83              | 124        | 14  | 125     | 22       | 78          | 37                        | 2                            | 3040  | 382            | 38        | 1            | 15         | 7822             | 6582         | 2 LANE WITH PAVED SHOULDER |
| 2022 | 5.0%           | 2568        | 1484                     | 87              | 130        | 15  | 132     | 23       | 82          | 39                        | 3                            | 3192  | 401            | 40        | 1            | 15         | 8213             | 6911         |                            |
| 2023 | 5.0%           | 2696        | 1559                     | 92              | 137        | 15  | 138     | 24       | 86          | 41                        | 3                            | 3352  | 421            | 42        | 1            | 16         | 8623             | 7257         |                            |
| 2024 | 5.0%           | 2831        | 1636                     | 96              | 143        | 16  | 145     | 26       | 91          | 43                        | 3                            | 3519  | 442            | 44        | 1            | 17         | 9054             | 7620         |                            |
| 2025 | 5.0%           | 2973        | 1718                     | 101             | 151        | 17  | 152     | 27       | 95          | 45                        | 3                            | 3695  | 464            | 47        | 1            | 18         | 9507             | 8001         |                            |
| 2026 | 5.0%           | 3121        | 1804                     | 106             | 158        | 18  | 160     | 28       | 100         | 47                        | 3                            | 3880  | 488            | 49        | 1            | 19         | 9982             | 8401         |                            |
| 2027 | 5.0%           | 3278        | 1894                     | 111             | 166        | 19  | 168     | 30       | 105         | 50                        | 3                            | 4074  | 512            | 51        | 1            | 20         | 10482            | 8821         |                            |
| 2028 | 5.0%           | 3441        | 1989                     | 117             | 174        | 19  | 176     | 31       | 110         | 52                        | 3                            | 4278  | 538            | 54        | 1            | 21         | 11006            | 9262         |                            |
| 2029 | 5.0%           | 3613        | 2089                     | 123             | 183        | 20  | 185     | 33       | 116         | 55                        | 4                            | 4492  | 565            | 57        | 1            | 22         | 11556            | 9725         |                            |
| 2030 | 5.0%           | 3794        | 2193                     | 129             | 192        | 21  | 194     | 34       | 122         | 58                        | 4                            | 4716  | 593            | 59        | 1            | 23         | 12134            | 10211        |                            |
| 2031 | 5.0%           | 3984        | 2303                     | 135             | 202        | 23  | 204     | 36       | 128         | 60                        | 4                            | 4952  | 622            | 62        | 2            | 24         | 12740            | 10722        |                            |
| 2032 | 5.0%           | 4183        | 2418                     | 142             | 212        | 24  | 214     | 38       | 134         | 63                        | 4                            | 5200  | 654            | 65        | 2            | 25         | 13377            | 11258        |                            |
| 2033 | 5.0%           | 4392        | 2539                     | 149             | 222        | 25  | 225     | 40       | 141         | 67                        | 4                            | 5460  | 686            | 69        | 2            | 26         | 14046            | 11821        |                            |
| 2034 | 5.0%           | 4612        | 2666                     | 157             | 234        | 26  | 236     | 42       | 148         | 70                        | 5                            | 5733  | 721            | 72        | 2            | 28         | 14749            | 12412        | Design life end            |
| 2035 | 5.0%           | 4842        | 2799                     | 165             | 245        | 27  | 248     | 44       | 155         | 73                        | 5                            | 6019  | 757            | 76        | 2            | 29         | 15486            | 13032        |                            |



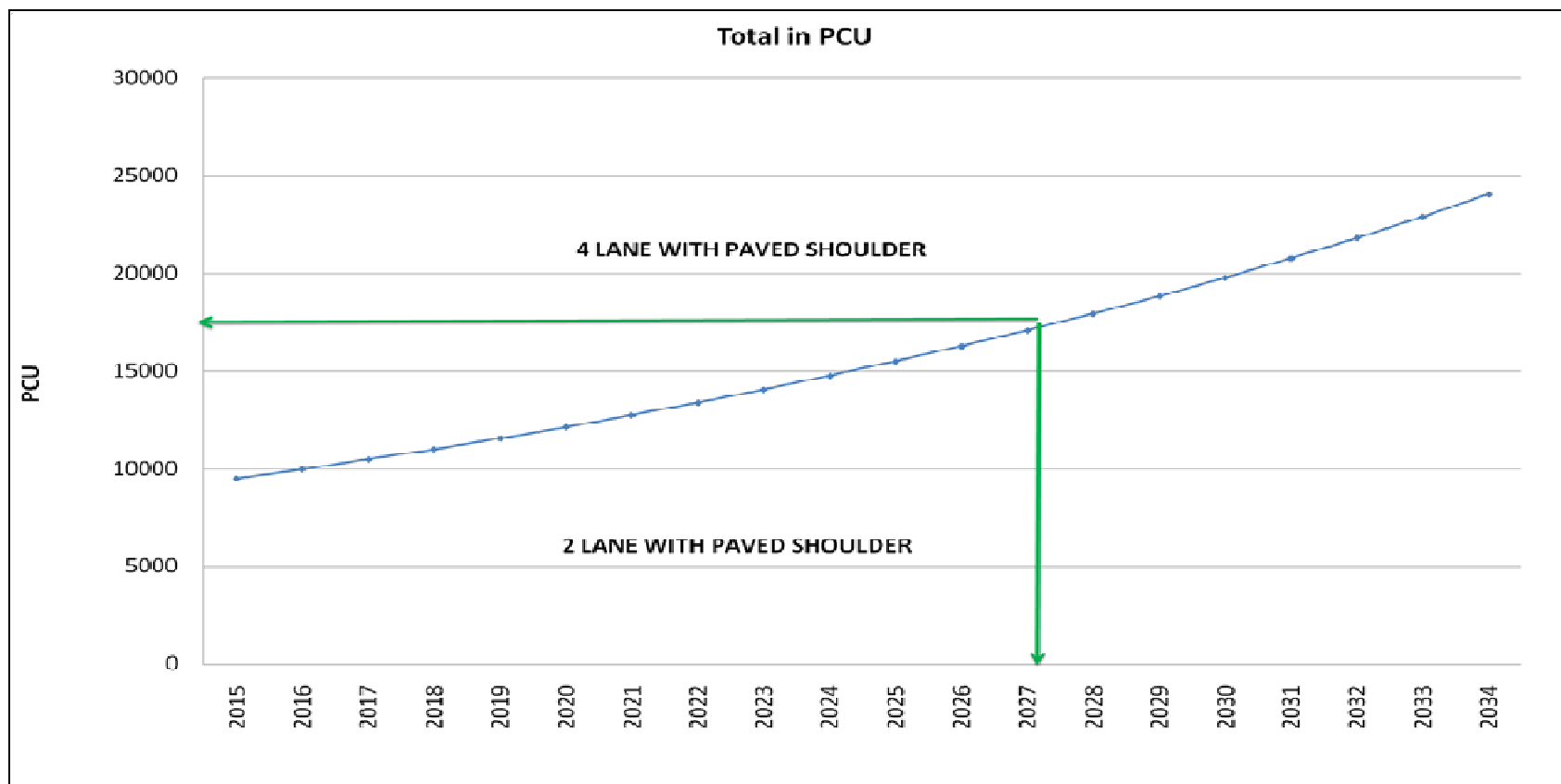
## Homogeneous section-2

From the traffic projection it is seen that the PCU of the project road for homogeneous section-2 (from Km 38+990 to Km 54+523) reaches **18000 PCU in the year 2028** which is 8 years after the opening of traffic on the project road. **So that portion of the project road i.e from Km 38+990 to Km 54+523 is proposed to construct as 4-lane with paved shoulder.** The calculation of traffic for **homogeneous section -2** is given bellow in **Table 6.25**

**Table 6.25: Traffic Projection of Project Road for Homogeneous section-2 from Km 38+990 to Km 54+523**

| Year | Growth Factors | AADT        |                        |                  |           |     |        |          |             |                           |                               |       |                |           |              |            | Total in Numbers | Total in PCU | REMARKS                    |
|------|----------------|-------------|------------------------|------------------|-----------|-----|--------|----------|-------------|---------------------------|-------------------------------|-------|----------------|-----------|--------------|------------|------------------|--------------|----------------------------|
|      |                | Two Wheeler | Car/Jeep/Van/Taxi/Auto | Mini / RTV's Bus | Stand Bus | LCV | 2-Axle | 3 - Axle | Multi -Axle | Agri. Tract. With Trailor | Agri. Tract. With out Trailor | Cycle | Cycle Rickshaw | Hand Cart | Bullock Cart | Horse Cart |                  |              |                            |
| 2015 | 5.0%           | 1535        | 1872                   | 101              | 127       | 42  | 476    | 542      | 464         | 41                        | 13                            | 1374  | 116            | 6         | 0            | 0          | 6711             | 9523         |                            |
| 2016 | 5.0%           | 1612        | 1965                   | 106              | 134       | 44  | 500    | 569      | 487         | 43                        | 14                            | 1443  | 122            | 7         | 0            | 0          | 7046             | 9999         |                            |
| 2017 | 5.0%           | 1693        | 2063                   | 111              | 140       | 47  | 525    | 598      | 512         | 46                        | 15                            | 1515  | 128            | 7         | 0            | 0          | 7399             | 10499        |                            |
| 2018 | 5.0%           | 1777        | 2167                   | 117              | 147       | 49  | 551    | 628      | 537         | 48                        | 15                            | 1591  | 134            | 7         | 0            | 0          | 7769             | 11024        |                            |
| 2019 | 5.0%           | 1866        | 2275                   | 123              | 155       | 51  | 578    | 659      | 564         | 50                        | 16                            | 1671  | 141            | 8         | 0            | 0          | 8157             | 11575        |                            |
| 2020 | 5.0%           | 1959        | 2389                   | 129              | 162       | 54  | 607    | 692      | 593         | 53                        | 17                            | 1754  | 148            | 8         | 0            | 0          | 8565             | 12154        | YEAR OF OPENNING           |
| 2021 | 5.0%           | 2057        | 2508                   | 135              | 170       | 57  | 638    | 727      | 622         | 55                        | 18                            | 1842  | 155            | 9         | 0            | 0          | 8993             | 12761        | 2 LANE WITH PAVED SHOULDER |
| 2022 | 5.0%           | 2160        | 2634                   | 142              | 179       | 60  | 670    | 763      | 653         | 58                        | 19                            | 1934  | 163            | 9         | 0            | 0          | 9443             | 13400        |                            |
| 2023 | 5.0%           | 2268        | 2765                   | 149              | 188       | 63  | 703    | 801      | 686         | 61                        | 19                            | 2031  | 171            | 9         | 0            | 0          | 9915             | 14070        |                            |
| 2024 | 5.0%           | 2382        | 2903                   | 157              | 197       | 66  | 738    | 841      | 720         | 64                        | 20                            | 2132  | 180            | 10        | 0            | 0          | 10411            | 14773        |                            |
| 2025 | 5.0%           | 2501        | 3049                   | 164              | 207       | 69  | 775    | 883      | 756         | 67                        | 21                            | 2239  | 188            | 10        | 0            | 0          | 10931            | 15512        |                            |
| 2026 | 5.0%           | 2626        | 3201                   | 173              | 218       | 72  | 814    | 928      | 794         | 71                        | 23                            | 2351  | 198            | 11        | 0            | 0          | 11478            | 16287        |                            |
| 2027 | 5.0%           | 2757        | 3361                   | 181              | 228       | 76  | 855    | 974      | 834         | 74                        | 24                            | 2468  | 208            | 12        | 0            | 0          | 12052            | 17102        |                            |

| Year | Growth Factors | AADT        |                        |                 |           |     |        |          |             |                           |                               |       |                |           |              |            | Total in Numbers | Total in PCU | REMARKS                    |
|------|----------------|-------------|------------------------|-----------------|-----------|-----|--------|----------|-------------|---------------------------|-------------------------------|-------|----------------|-----------|--------------|------------|------------------|--------------|----------------------------|
|      |                | Two Wheeler | Car/Jeep/Van/Taxi/Auto | Mini / RTVs Bus | Stand Bus | LCV | 2-Axle | 3 - Axle | Multi -Axle | Agri. Tract. With Trailer | Agri. Tract. With out Trailer | Cycle | Cycle Rickshaw | Hand Cart | Bullock Cart | Horse Cart |                  |              |                            |
| 2028 | 5.0%           | 2895        | 3529                   | 190             | 240       | 80  | 897    | 1023     | 875         | 78                        | 25                            | 2592  | 218            | 12        | 0            | 0          | 12654            | 17957        | 4 LANE WITH PAVED SHOULDER |
| 2029 | 5.0%           | 3040        | 3706                   | 200             | 252       | 84  | 942    | 1074     | 919         | 82                        | 26                            | 2721  | 229            | 13        | 0            | 0          | 13287            | 18854        |                            |
| 2030 | 5.0%           | 3192        | 3891                   | 210             | 264       | 88  | 989    | 1127     | 965         | 86                        | 27                            | 2857  | 241            | 13        | 0            | 0          | 13951            | 19797        |                            |
| 2031 | 5.0%           | 3351        | 4085                   | 220             | 278       | 92  | 1039   | 1184     | 1013        | 90                        | 29                            | 3000  | 253            | 14        | 0            | 0          | 14649            | 20787        |                            |
| 2032 | 5.0%           | 3519        | 4290                   | 231             | 291       | 97  | 1091   | 1243     | 1064        | 95                        | 30                            | 3150  | 265            | 15        | 0            | 0          | 15381            | 21826        |                            |
| 2033 | 5.0%           | 3695        | 4504                   | 243             | 306       | 102 | 1145   | 1305     | 1117        | 99                        | 32                            | 3308  | 278            | 15        | 0            | 0          | 16150            | 22918        |                            |
| 2034 | 5.0%           | 3879        | 4729                   | 255             | 321       | 107 | 1202   | 1370     | 1173        | 104                       | 33                            | 3473  | 292            | 16        | 0            | 0          | 16958            | 24064        |                            |





## 6.4 Axle Load Surveys and Vehicle Damage Factors

For the purpose of preliminary pavement design required for the project, axle load surveys have been carried out on the project road.

- These surveys were carried for 24 hrs at **Srirampur (0.500 Km Along NH 31C Towards Gossaigaon From 0.000Km of NH 127B), Near Tamarhat P.S CH 15+200 KM and 2 Km Towards Dhubri Along NH 31 From CH 40.00 KM of NH 127B.**
- The axle load spectrum observed on the project road, along with the derivation of vehicle damage factors (VDFs) as per the relevant IRC Codes are given in **Table 6.26 to Table 6.27** summarizes the VDF observed on the Project Road. Details of VDF Calculation are produced in a separate volume field investigation report (Appendix)



**Table 6.26: Near Tamarhat P.S CH 15+200 KM**

| TYPE OF VEHICLES                              | VDF  |           |      |           |
|-----------------------------------------------|------|-----------|------|-----------|
|                                               | UP   | Frequency | DOWN | Frequency |
| 2 Axle truck                                  | 4.92 | 21        | 1.99 | 9         |
| Bus                                           | 0.45 | 14        | 0.53 | 13        |
| LCV                                           | 0.02 | 1         | 0.00 | 0         |
| TOTAL                                         |      | 36        |      | 22        |
| WEIGHTED VDF IN EACH DIRECTION                | 3.04 |           | 1.13 |           |
| WEIGHTED VDF                                  | 3.04 |           |      |           |
| WEIGHTED VDF OF COMMERCIAL VEHICLE ON NH-127B |      |           |      | 3.04      |

**Table 6.26(a): VDF OF DIVERTED VEHICLE OF NH 31C**

| VDF of NH 31C                                                  |      |           |      |           | % of<br>VEHICLE<br>DIVERTED<br>FROM<br>NH-31C<br>TO NH-127B | VDF of DIVERTED VEHICLE FROM NH 31C |           |      |           |
|----------------------------------------------------------------|------|-----------|------|-----------|-------------------------------------------------------------|-------------------------------------|-----------|------|-----------|
| TYPE OF<br>VEHICLES                                            | VDF  |           |      |           |                                                             | VDF                                 |           |      |           |
|                                                                | UP   |           | DOWN |           |                                                             | UP                                  |           | DOWN |           |
|                                                                | VDF  | Frequency | VDF  | Frequency |                                                             | VDF                                 | Frequency | VDF  | Frequency |
| 4 Axle truck                                                   | 2.68 | 380       | 4.03 | 314       | 3%                                                          | 2.68                                | 11        | 4.03 | 9         |
| 3 Axle truck                                                   | 3.84 | 115       | 3.68 | 108       | 3%                                                          | 3.84                                | 3         | 3.68 | 3         |
| 2 Axle truck                                                   | 4.23 | 95        | 4.39 | 121       | 12%                                                         | 4.23                                | 11        | 4.39 | 15        |
| Bus                                                            | 0.68 | 82        | 0.55 | 88        | 10%                                                         | 0.68                                | 8         | 0.55 | 9         |
| TOTAL                                                          |      | 672       |      | 631       |                                                             |                                     | 34        |      | 36        |
| WEIGHTED<br>VDF IN EACH<br>DIRECTION                           | 2.85 |           | 3.55 |           |                                                             | 2.84                                |           | 3.29 |           |
|                                                                |      |           |      |           |                                                             |                                     |           |      |           |
| WEIGHTED VDF OF COMMERCIAL VEHICLE<br>ON NH-31C                |      |           |      | 3.55      |                                                             |                                     |           |      |           |
| MAX. WEIGHTED VDF OF DIVERTED<br>COMMERCIAL VEHICLE ON NH-127B |      |           |      | 3.29      |                                                             |                                     |           |      |           |

**Table 6.26(b): VDF OF DIVERTED VEHICLE OF NH 31**

| VDF of NH 31                                                   |      |           |      |           | % of<br>VEHICLE<br>DIVERTED<br>FROM<br>NH-31TO<br>NH-127B | VDF of DIVERTED VEHICLE FROM NH 31 |           |      |           |
|----------------------------------------------------------------|------|-----------|------|-----------|-----------------------------------------------------------|------------------------------------|-----------|------|-----------|
| TYPE OF<br>VEHICLES                                            | VDF  |           |      |           |                                                           | VDF                                |           |      |           |
|                                                                | UP   |           | DOWN |           |                                                           | UP                                 |           | DOWN |           |
|                                                                | VDF  | Frequency | VDF  | Frequency |                                                           | VDF                                | Frequency | VDF  | Frequency |
| 4 Axle truck                                                   | 3.04 | 441       | 2.95 | 197       | 67%                                                       | 3.04                               | 295       | 2.95 | 132       |
| 3 Axle truck                                                   | 3.91 | 504       | 4.02 | 385       | 57%                                                       | 3.91                               | 287       | 4.02 | 219       |
| 2 Axle truck                                                   | 4.05 | 341       | 4.40 | 242       | 59%                                                       | 4.05                               | 201       | 4.40 | 143       |
| Bus                                                            | 0.62 | 115       | 0.47 | 106       | 77%                                                       | 0.62                               | 89        | 0.47 | 82        |
| LCV                                                            | 0.00 | 5         | 0.01 | 5         | 0%                                                        | 0.00                               | 0         | 0.01 | 0         |
| TOTAL                                                          |      | 1406      |      | 935       |                                                           |                                    | 872       |      | 576       |
| WEIGHTED<br>VDF IN EACH<br>DIRECTION                           | 3.39 |           | 3.47 |           |                                                           | 3.32                               |           | 3.37 |           |
|                                                                |      |           |      |           |                                                           |                                    |           |      |           |
| WEIGHTED VDF OF COMMERCIAL VEHICLE<br>ON NH-31                 |      |           |      | 3.47      |                                                           |                                    |           |      |           |
| MAX. WEIGHTED VDF OF DIVERTED<br>COMMERCIAL VEHICLE ON NH-127B |      |           |      | 3.37      |                                                           |                                    |           |      |           |

**Table 6.27: VDF OF PROJECT ROAD AFTER DIVERSION**

| TRAFFIC ON NH-127B     |             |           |       |           | DIVERTED TRAFFIC OF NH 31                |      |             |      |            | DIVERTED TRAFFIC OF NH 31C                |      |            |      |            |
|------------------------|-------------|-----------|-------|-----------|------------------------------------------|------|-------------|------|------------|-------------------------------------------|------|------------|------|------------|
| TYPE OF VEHICLES       | UP          |           | DOWN  |           | % DIVERTED VEHICLE FROM NH-31 TO NH-127B | UP   |             | DOWN |            | % DIVERTED VEHICLE FROM NH-31C TO NH-127B | UP   |            | DOWN |            |
|                        | VDF         | Frequency | VDF   | Frequency |                                          | VDF  | Frequency   | VDF  | Frequency  |                                           | VDF  | Frequency  | VDF  | Frequency  |
| 4 Axle truck           | 0.000       | 0         | 0.000 | 0         | 67%                                      | 3.04 | 441         | 2.95 | 197        | 3%                                        | 2.68 | 380        | 4.03 | 314        |
| 3 Axle truck           | 0.000       | 0         | 0.000 | 0         | 57%                                      | 3.91 | 504         | 4.02 | 385        | 3%                                        | 3.84 | 115        | 3.68 | 108        |
| 2 Axle truck           | 4.92        | 36        | 1.99  | 33        | 59%                                      | 4.05 | 341         | 4.40 | 242        | 12%                                       | 4.23 | 95         | 4.39 | 121        |
| Bus                    | 0.45        | 40        | 0.53  | 42        | 77%                                      | 0.62 | 115         | 0.47 | 106        | 10%                                       | 0.68 | 82         | 0.55 | 88         |
| LCV                    | 0.02        | 3         | 0.00  | 0         | 0%                                       | 0.00 | 5           | 0.01 | 5          | 0%                                        |      | 0          |      | 0          |
| <b>TOTAL</b>           |             | <b>79</b> |       | <b>75</b> |                                          |      | <b>1406</b> |      | <b>935</b> |                                           |      | <b>672</b> |      | <b>631</b> |
| <b>Maximum WT. VDF</b> | <b>2.47</b> |           |       |           | <b>3.37</b>                              |      |             |      |            | <b>3.29</b>                               |      |            |      |            |

|                                                            |             |
|------------------------------------------------------------|-------------|
| VDF CALCULATION OF TRAFFIC ON NH-127B                      | <b>2.47</b> |
| VDF CALCULATION OF DIVERTED TRAFFIC ON NH-127B FROM NH-31  | <b>3.37</b> |
| VDF CALCULATION OF DIVERTED TRAFFIC ON NH-127B FROM NH-31C | <b>3.29</b> |
| <b>VDFAFTER DIVERSION OF VEHICLE FROM NH 31 AND NH 31C</b> | <b>3.37</b> |

## 6.5 Estimation of design ESA

- (a) **Traffic growth rate (Both direction):** As per IRC: 37-2012, 5% growth of traffic is considered for homogeneous section 1 and homogeneous section 2.
- (b) **Vehicle Damage Factors (F):** for homogeneous section 1 i.e Km 0000 to Km 38+990 and for homogeneous section 2 i.e Km 38+990 to Km 54+523 adopted VDF value is 3.37.
- (c) **Lane Factor (D):** 0.50 for two lane single carriageway. (Clause 4.5.1 IRC : 37-2012)

### **(i) ESA Computation for homogeneous section 1 ( Km 0+000 to Km 38+990)**

N: Cumulative number of standard axle to be created for in the design in terms of msa

A: Initial traffic in the year of completion of construction in terms of the number of commercial vehicle per day=461

D: Lane distribution factor (Refers IRC:37-2012 , Clause 4.5.1(ii) , page-8)= 0.5

F: Vehicle Damage Factor (Refers IRC:37-2012 , Clause 4.4.6) , page-8) =3.37

n: Design life in years =15

r: Annual growth rate of commercial vehicles in decimal =0.05

$$N = (365 * [(1+r)^n - 1] * A * D * F) / r = 6 \text{ msa}$$

As per IRC 73-2015 ( page no-44, Clause 5.4.1), it is stated that flexible pavement shall be designed for minimum design period of 15 years, subject to the condition that design traffic shall not be less than 20msa.

**Hence, design traffic of 20msa is adopted for flexible pavement design.**

### **(ii) ESA Computation for homogeneous section 2 ( Km 38+990 to Km 54+523)**

N: Cumulative number of standard axle to be created for in the design in terms of msa

A: Initial traffic in the year of completion of construction in terms of the number of commercial vehicle per day=1145

D: Lane distribution factor (Refers IRC:37-2012 , Clause 4.5.1(iv) , page-8)= 0.75

F: Vehicle Damage Factor (Refers IRC:37-2012 , Clause 4.4.6) , page-8) =3.37

n: Design life in years =15

r: Annual growth rate of commercial vehicles in decimal =0.05

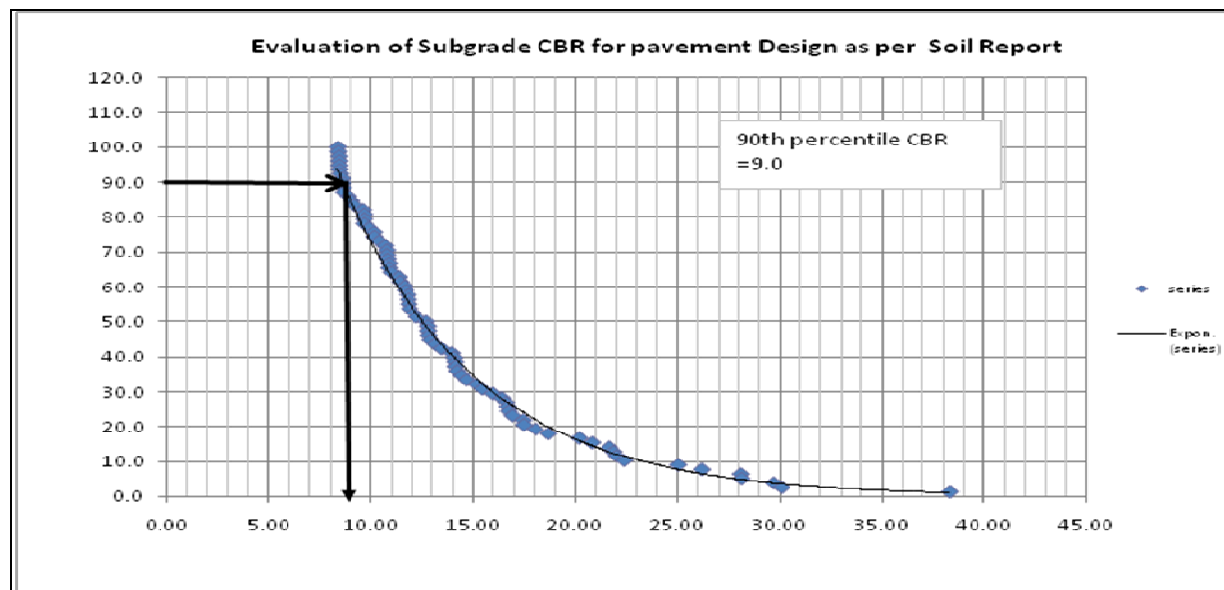
$$N = (365 * [(1+r)^n - 1] * A * D * F) / r = 23 \text{ msa}$$

**Considered the average traffic and the design has been adopted for minimum 20 MSA.**

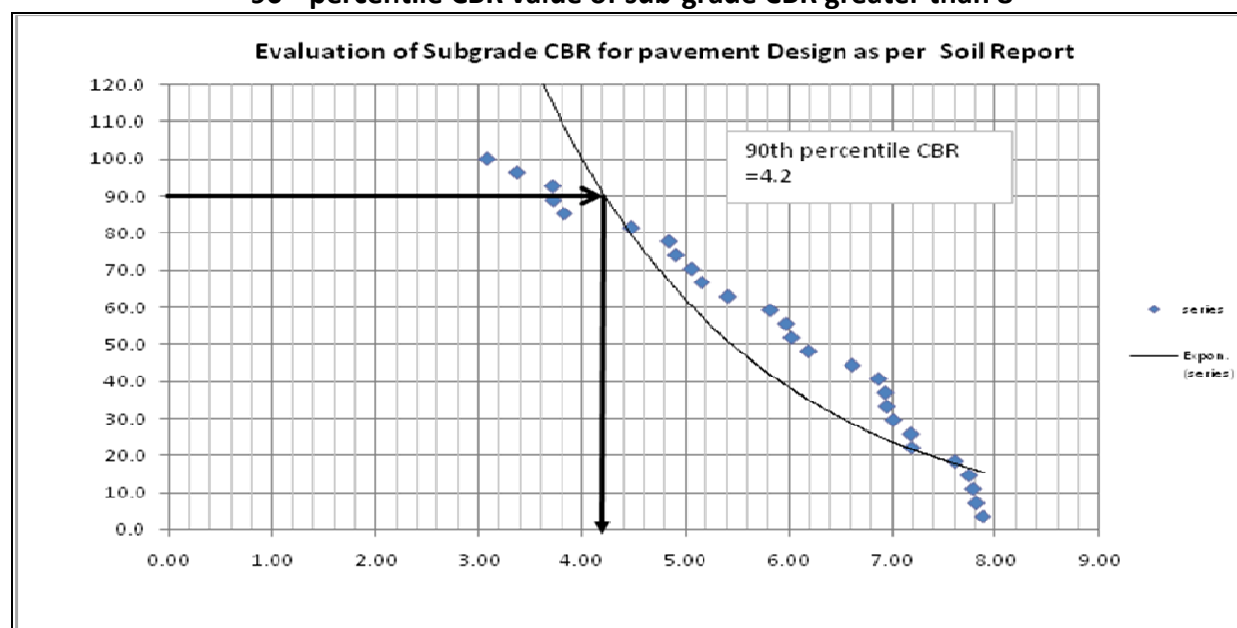
## 6.6 Flexible pavement thickness in new/reconstruction stretch:

### CBR of Sub-grade

Design CBR has been adopted as per codal provision of IRC 37-2012 for Flexible pavement design. Sample from different trial pits collected during field investigation have been further tested in laboratory and analysis of the test results has already been presented in Annexure.



### 90<sup>th</sup> percentile CBR value of sub-grade CBR greater than 8



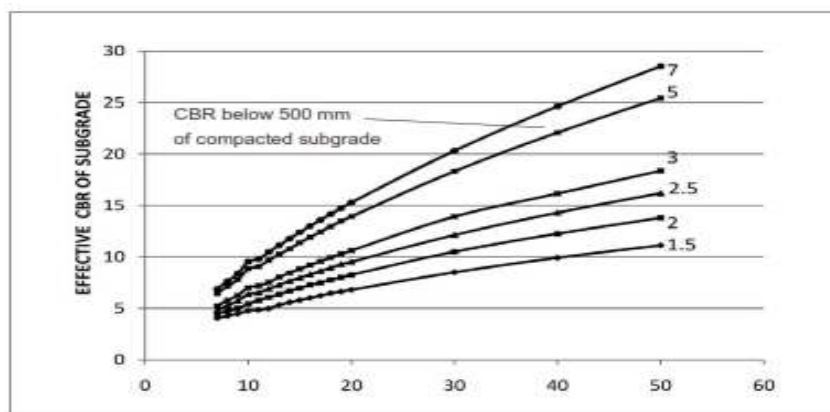
### 90<sup>th</sup> percentile CBR value of sub-grade CBR less than 8

As per IRC: 37-2012 recommends- 90 percentile sub grade modulus for design traffic greater than one msa”) the 90th percentile of CBR values considering for flexible pavement design, Percentage greater than equal to each of the value has been calculated. Then a plot is made between percentages of values greater than equal the CBR values versus the CBR.

### Calculation of Effective CBR (Design CBR)

As per above calculation 90th percentile of CBR of existing sub-grade / embankment soil having sub-grade CBR more than 8% comes as 9% as shown in the above graph. In some stretches where the existing CBR value is less than 8%, 90th percentile of CBR of that portion comes 4.2%.

Construction of new sub-grade has been recommended with soil having minimum CBR value of 9%. And CBR of existing embankment soil below the proposed new sub-grade is 4.2%.



Since the difference between the CBR value of new sub-grade and the CBR of existing embankment soil below the new sub-grade is found significant, designed should be based on effective CBR as per Clause- 5.2 of IRC: 37-2012 (Page No-11). Accordingly, effective CBR of Sub-grade comes 8% from the fig-5.1 of IRC-37. So, Design CBR for total stretch is considered 8 %.

But, it is observed from DCP Test results that, the degree of field compaction of existing sub-grade varies from 69.1% to 96.2%. As such, existing soil of the sub-grade needs to be loosened and re-compacted in layers up to 500 mm depth, so that the density thereof may be achieved at a minimum of 97% of MDD in the field.

Since the underneath soil of sub-grade is also found to have less degree of compaction, we would consider safe Design CBR of 8% for the total stretch.

## 6.7 Design of Bituminous Pavement with Granular Base and Granular Sub-base

From the pavement thickness design chart of IRC-37 of 2012(Plate-6, Page-27) 8% CBR, following pavement thickness is to be found for design life of 15 years.

**Pavement Thickness As Per IRC-37-2012**

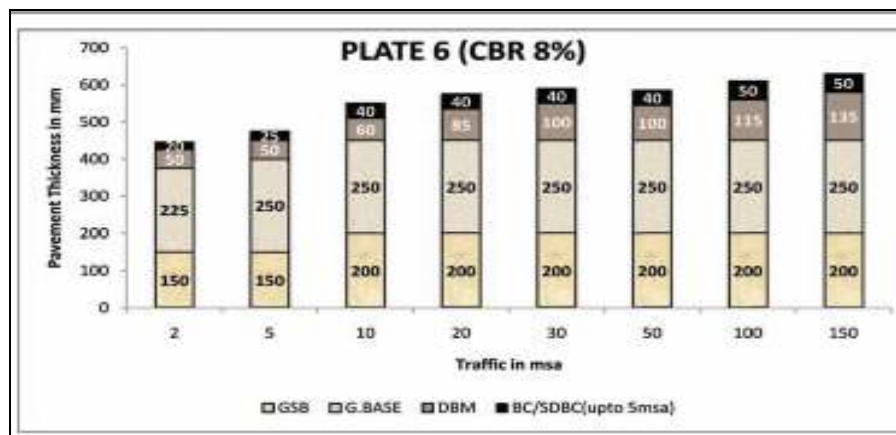


**Table- 6.28 Adopted Pavement Thickness for Granular Base and Granular Sub-base**

| Homogenous Section  | Design CBR (%) | Design Traffic (MSA) | GSB (mm) | WMM (mm) | DBM (mm) | BC (mm) | Total Thickness (mm) |
|---------------------|----------------|----------------------|----------|----------|----------|---------|----------------------|
| Km0.00 – Km 39.000  | 8              | 20                   | 200      | 250      | 85       | 40      | 575                  |
| Km39.00 – Km 54.523 | 8              | 20                   | 200      | 250      | 85       | 40      | 575                  |

Pavement design as per IRC: 37-2012 is based on mechanistic pavement design principle which has evolved from theoretical, laboratory and pavement performance studies on Indian pavement materials and pavements constructed in India. In IRC: 37-2012, for analysis, Bituminous layer with VG30 bitumen (for <30 MSA as per IRC: 37-2012 Para No-10.1 Page No-25) and an annual average pavement temperature (AAPT) of 35°C have been used (As per IRC: 37-2012 Para No-7.4.2 Page No-22).

## 6.8 Rigid pavement thickness:

Rigid pavement thickness has been provided in congested built up area. Adopted pavement thickness for rigid pavement construction is listed below.

| PQC (mm) | DLC (mm) | GSB (mm) |
|----------|----------|----------|
| 280      | 150      | 150      |



## **CHAPTER - 7**

### **DESIGN STANDARDS**

#### **7.1 Geometric Design Standard for Highways**

The following guiding principles form the basis of all good highway design:

- ❖ A uniform application of design standards for any area is essential from the viewpoint of road safety and the smooth flow of traffic. The selection of optimum design standards reduces the possibility of early obsolescence of the facility, which can be MORT&H thought about by any inadequacy in the original standards.
- ❖ Faulty geometric standards, after construction, are frequently difficult to rectify at a later date and they are always costly. As such, both horizontal and vertical geometry should be accorded due importance at the initial design stage itself and selected standards should not be compromised without the most careful deliberation.
- ❖ The design should thus be consistent within any area and the standards proposed for the different elements should be compatible with one another. It is sometimes necessary to reduce the selected design speed for economic reasons but any abrupt changes in the design speed must be avoided.
- ❖ The selected design should minimize the total transportation cost, including initial construction costs, costs for maintenance of the facility, and the cost borne by the road users.
- ❖ Safety should be built-in into design elements.
- ❖ "Ruling" standards should be followed as a matter of routine. "Minimum" standards should be followed only where serious restrictions are imposed by technical or economic consideration.

#### **7.2 Design Controls**

##### **Terrain Classification**

- ❖ The geometric design of a highway is influenced significantly by terrain conditions. Economy dictates a sensible choice of different standards for different types of terrain but the guiding principles above will always apply. Where it is necessary to change design standards, this will be done in discrete areas and with a careful eye to consistency and road safety.
- ❖ The entire project road (from Srirampur to Dhubri (length 54.523 Km, as per design length) lies in plain terrain and the geometric standards relevant to IRC-SP 84-2014, Four lane manual will be adopted.

### 7.3 Design Standard

In general, the design standard follows the provisions of IRC: SP: 84-2014. Some of the salient provisions made in them and followed in preparation of this DPR are indicated here under. The project road having single/intermediate lane wide carriageway, will be widened to 2-lane with paved shoulder configuration.

#### 7.3.1 Design Speed

The project is for up gradation of existing road having horizontal and vertical alignment generally substandard. Attempt has been made to raise the road to NH-standard with Two-lane with paved shoulder configuration having minimum design speed of 80kmph and rulling design speed of 100 kmph in plain /Rolling terrain.

#### 7.3.2 Sight Distance

Stopping sight distance is the clear distance ahead needed by a driver to bring his vehicle to a stop before meeting a stationary object on his path. Intermediate sight distance is defined as twice the stopping sight distance. In two lane road, stopping sight distance is the absolute minimum from safety angle and must be ensured regardless of any consideration.

Design values for stopping sight distance and intermediate sight distance for various speeds:

| Design Values (meters) |                            |                                |
|------------------------|----------------------------|--------------------------------|
| Speed (km/h)           | Stopping sight<br>Distance | Intermediate sight<br>distance |
| 40                     | 45                         | 90                             |
| 60                     | 90                         | 180                            |
| 80                     | 120                        | 240                            |
| 100                    | 180                        | 360                            |

Criteria for measuring sight distance:

| Sl. No. | Sight Distance              | Driver's eye sight | Height of object |
|---------|-----------------------------|--------------------|------------------|
| 1.      | Safe stopping distance      | 1.2 m              | 0.15 m           |
| 2.      | Intermediate sight distance | 1.2 m              | 1.20 m           |

### 7.3.3 Right-of-Way (ROW)

Desirable target width of road land (ROW) for NH-127B is to be as follows:

| Open Area              |             | Built-up Areas |             |
|------------------------|-------------|----------------|-------------|
| Normal                 | Exceptional | Normal         | Exceptional |
| 60m                    | 45m         | 45m            | 30m         |
| Bypass / New Alignment |             |                |             |
| Normal                 | Exceptional |                |             |
| 60m                    | -           |                |             |

### 7.3.4 Cross sectional Parameters

#### i) For Plain & Rolling Terrain (Rural Area)

|    |                             |   |          |
|----|-----------------------------|---|----------|
| a) | Two Lane Carriage Way Width | - | 7.00m    |
| b) | Paved Shoulder Width        | - | 2 x 1.5m |
| c) | Earthen Shoulder Width      | - | 2 x 2.0m |
| d) | Roadway Width               | - | 14.00m   |

#### ii) For Plain & Rolling Terrain (Built-up Area)

|    |                             |   |          |
|----|-----------------------------|---|----------|
| a) | Two Lane Carriage Way Width | - | 7.00m    |
| b) | Paved Shoulder Width        | - | 2 x 2.5m |
| c) | Earthen Shoulder Width      | - | Nil      |
| d) | Covered Drain cum Footpath  | - | 2 x 1.0m |
| e) | Roadway Width               | - | 14.00m   |

On horizontal curves, the roadway width should be increased corresponding to the extra widening of

carriage way for curvature as per below mentioned table.

| Radius of Curve | Extra Width |
|-----------------|-------------|
| 75-100m         | 0.9m        |
| 101-300m        | 0.6m        |

### 7.3.5 Cross-slope/Camber

In general bituminous surfacing has been proposed. The pavement in the straight reaches is to be provided with a crown in middle and slope of 2.5% on either side has to be provided. In reaches with winding alignment where straight sections are few and far between, the carriage way is to be given a unidirectional cross fall of 2.5% having regard to super elevation at the flanking horizontal curves and ease of drainage.

The cross fall of earth shoulders is to be at least 0.5% more than that of carriage way subject to a minimum of 3.0%. Paved shoulders and shoulders on super-elevated sections are to have the same cross fall as the pavement. In case of rigid pavement, the cross fall on straight section of road carriageway and paved shoulder shall be kept 2%.

### 7.3.6 Horizontal Alignment

As a general rule, the horizontal alignment should be fluent and should blend well with the surrounding topography. In a given section there should be consistency and no element of surprise or unexpected situation for the driver.

#### ❖ Horizontal Curves

Horizontal curves will be circular curve flanked by spiral transition curves at both ends.

No transition is required for curve radius and design speed as follows:

| <u>Design Speed (km/hr)</u> | <u>Curve Radius (m)</u> |
|-----------------------------|-------------------------|
| 100                         | 400                     |
| 80                          | 250                     |
| 65                          | 150                     |
| 50                          | 90                      |

#### ❖ Super-elevation

Super-elevation provided on horizontal curves is based on the following formula:

$$e = \frac{V^2}{225R}$$

Where

|   |   |                                |
|---|---|--------------------------------|
| e | = | super elevation (metre/metre). |
| V | = | speed (km/hr)                  |
| R | = | radius (meters)                |

When the value of super elevation obtained from above expression is less than the road camber, the normal crown section continued on the curved portion without providing any super-elevation.

#### ❖ Radius of Horizontal Curves

The radius of horizontal curve is obtained from following formula:

$$R = \frac{V^2}{127(e+f)}$$

Where,

|   |   |                                                                                      |
|---|---|--------------------------------------------------------------------------------------|
| V | = | Vehicle speed (km/hr)                                                                |
| e | = | Super elevation ratio (metre/metre)                                                  |
| f | = | Coefficient of side friction between vehicle tyre and pavement<br>(Consider as 0.15) |
| R | = | Radius in meters                                                                     |

#### ❖ Transition Curves

Transition curves are necessary for vehicles to progress from a straight alignment into a circular curve or between curves of different radius. The transition curve also facilitates a gradual application of the super elevation and any widening of the carriageway which may be required for horizontal curves.

The minimum length of the transition curve shall be determined from the following two considerations, the larger of the two values being adopted for design:

$$i) \quad L_s = \frac{0.0215 V^3}{CR}$$

Where,  $L_s$  = length of transition in meters

$V$  = speed in km/hr

$R$  = radius of circular curve in meters

$$C = \frac{80}{75+V}$$

Subject to a maximum of 0.8 and minimum of 0.5

- ii) The rate of change of super elevation (i.e. the longitudinal grade developed at the pavement edge compared to through grade along the centre line) should be such as not to cause discomfort to travelers or to make the road appear unsightly. The formula for minimum length of transition on this basis for Mountainous and Steep Terrain is :

$$L_s = \frac{2.7 V^2}{R}$$

#### ❖ Widening of Carriageway at Curve

At sharp horizontal curves, it is necessary to widen the carriageway to provide for safe passage of vehicles. The extra widths are provided as follows:

| Radius of Curve (m) | Extra Width |
|---------------------|-------------|
| 75-100 m            | 0.9 m       |
| 101-300 m           | 0.6 m       |

Extra width should be given by increasing the width at uniform rate along transition curve and full width given along circular curve. Entire widening should preferably be provided on inside of the curve. The extra widening may obtained by means of offsets radial to the centre line. It should be ensured that the pavement edge lines are smooth and there is not apparent kink.

#### ❖ Set-back Distance at Horizontal Curves

Set-back distance from the centreline of the carriageway for obtaining requisite sight distance across the inside of horizontal curves is calculated from following equation:

$$M = R - (R - N) \cos \theta$$

Where,

$$\theta = S/2(R-N) \text{ radians}$$

$$m = \text{the minimum set-back distance from centre line of the road to sight}$$

Obstruction in meters at middle of the curve

$$r = \text{radius of centre line of the road in meters}$$

$$n = \text{distance between the centre line of road and the inside lane in metre}$$

(n = 1.5 may be taken considering possible widening at curve)

$$s = \text{stopping sight distance (minimum),}$$

Intermediate sight distance (if feasible)

### 7.3.7 Vertical Alignment

#### ❖ Gradient

The project road traverses through Plain terrain and recommended gradients for the same are:

| Nature of Terrain | Ruling Gradient | Limiting Gradient |
|-------------------|-----------------|-------------------|
| Plain & Rolling   | 2.5%            | 3.3%              |

#### ❖ Grade compensation at curve

The gradient at horizontal curves should be eased by an amount known as 'grade compensation' which is intended to offset extra effort involved at curves. This is calculated by the following formula.

$$\text{Grade compensation (\%)} = \frac{30 + R}{R} \text{ subject to,}$$

Maximum of 75/R where R is radius of the curve in meters . Since grade compensation is not necessary for gradients flatter than 4%, when applying grade compensation correction, the gradients need not be eased beyond 4%.

#### ❖ Vertical Curves

Vertical curves should be provided at all grade changes exceeding those indicated below. The minimum lengths of curve for satisfactory appearance are shown alongside:

| Design Speed<br>(km/hr) | Maximum Grade Change (%)<br>not requiring a vertical curve | Minimum Length of<br>vertical curve (m) |
|-------------------------|------------------------------------------------------------|-----------------------------------------|
| 50                      | 1.0                                                        | 30                                      |
| 65                      | 0.8                                                        | 40                                      |
| 80                      | 0.6                                                        | 50                                      |
| 100                     | 0.5                                                        | 60                                      |

#### ❖ Summit Curves

The length of summit curves is governed by the choice of sight distance. For the project road length is calculated for safe stopping sight distance on the basis of following formula:

##### ➤ For Safe Stopping sight distance

Case (i) When length of the curve exceeds the required sight distance i.e.  $L > S$

$$L = \frac{NS^2}{4.4}$$

Where,

N = Deviation angle i.e. the algebraic difference between the two grades

L = Length of parabolic vertical curve in meters

S = Sight distance in meters



Case (ii) When length of the curve is less than the required sight distance i.e.  $L < S$

$$L = 2S - \frac{4.4}{N}$$

➤ **For Intermediate sight distance**

Case (i) When length of the curve exceeds the required sight distance i.e.  $L > S$

$$L = \frac{NS^2}{9.6}$$

Case (ii) When length of the curve is less than the required sight distance i.e.  $L < S$

$$L = 2S - \frac{9.6}{N}$$

❖ **Valley Curves**

The length of valley curves should be such that for night travel, the head light beam distance is equal to the stopping sight distance. The length of the curve is calculated as under:

Case (i) When the length of the curve exceeds the required sight distance, i.e.  $L > S$

$$L = \frac{NS^2}{1.50 + 0.035S}$$

Case (ii) When the length of the curve is less than the required sight distance i.e.  $L < S$

$$L = 2S - \frac{1.5 + 0.035S}{N}$$

In both cases,

$N$  = Deviation angle i.e. the algebraic difference between the two grades

$L$  = Length of parabolic vertical curve in metres

$S$  = Stopping sight distance in metres

## 7.4 Specifications

The project will use the MOSRT&H specifications for Road and Bridge Works (Fifth Revision). Where there are no appropriate standards within the MORT&H guidelines, AASHTO specifications may be followed.

The following Indian standards will be incorporated wherever appropriate:

Ordinary Portland cement IS: 269

High Strength Ordinary Portland cement IS: 8112

|                                                                       |                                    |
|-----------------------------------------------------------------------|------------------------------------|
| Admixtures (where permitted)                                          | IS: 6925 and IS: 9103              |
| Thermo mechanically Treated deformed<br>Bars (TMT/H.Y.S.D)            | IS: 1789                           |
| Prestressing Steel:                                                   |                                    |
| Uncoated stress relieved low relaxation<br>Strands for 19 T 13 cables | IS: 14268                          |
| Sheathing: "Drossbatch" 0.4 mm thick                                  | IS: 18-1985, appendix: 1           |
| Water                                                                 | IRC: SP33-1989, Clause 5.1 (ii)    |
| Bearings                                                              | IRC: 83-1987 (Part II) or BS: 5400 |
| Foundations                                                           | IRC: 78-2014 and IRC-SP: 33-1989   |

## **7.5 Design Standards: Bridges and Cross-drainage Structures**

### **(a) Geometric Design**

- i) Top width of the approach embankment will be kept equal to the overall width (out to out of kerb) of the deck slab.
- ii) The span arrangement and span lengths provided will be such that piers/abutments are in line with those of the existing bridges/culverts to ensure smooth flow of water. Spans are either equal to or a multiple of the spans of old structure.
- iii) The linear water way provided will be determined from the consideration of design discharge, effective and adequate drainage.

### **(b) Loading Standard**

- i) All structures will be designed for 3 lanes of IRC class A with due consideration to reduction allowed for a multi-lane bridge and single lane of class 70-R with single lane class A whichever produces worst effect.
- ii) LL on footpath will be taken as per IRC-6 : 2014
- iii) Environmental loadings such as earth pressure, water current, seismic forces and temperature effect will be taken as per IRC/BIS Codes. IS-1893 will be followed in evaluating dynamic increment of earth pressure.

### **(c) Guiding Standards for Structures**

The Structural planning of new bridges or culverts will be guided by the layout of existing structures.

The preliminary designs of proposed structures will be carried out in accordance with the provisions of the following IRC Codes/guidelines.

- |              |   |                                       |
|--------------|---|---------------------------------------|
| ❖ IRC:5-2015 | - | Section I, General Features of Design |
| ❖ IRC:6-2014 | - | Section II, loads and Stresses        |

- ❖ IRC:112-2011 - Code for Concrete Road Bridges
- ❖ IRC:22-2015 - Section VI, Composite Construction
- ❖ IRC:40-2002 - Section IV, Brick, stone & Block Masonry
- ❖ IRC:SP 42 - Guidelines on road drainage
- ❖ IRC:45-1972 - Recommendations for estimating the Resistance of soil  
Below Maximum scour level in the Design of Well
- ❖ IRC:SP:73-2015 -- Two Lane Highway with Paved Shoulder Manual
- ❖ IRC:SP:13-2004 -- Guidelines for design of small bridges and culverts

#### Foundations of Bridges

- ❖ IRC:78-2014 - Section VII, Foundations and Structure
- ❖ IRC:83-2015 - Section IX,(Part I), Metallic Bearings
- ❖ IRC:83-2015 - Section IX,(Part II), Elastomeric Bearings
- ❖ IRC:83-2002 - Section IX,(Part III), POT Bearings
- ❖ IRC:87-2011 - Guidelines for the Design & Erection of False work for  
Road Bridges
- ❖ IRC:SP-33-1989 - Guidelines on Supplemental Measures for Design,  
Detailing and Durability of Important Bridge Structures
- ❖ IRC:89-1997 - Guidelines for design and construction of river training  
And control works for road bridges (1st Revision)

Where IRC Codes are silent relevant BIS Codes will be followed. And where even BIS codes are silent, international codes / MOST, MORTH guidelines will be adopted.

#### (d) Seismic Design

The project road falls in Seismic Zone V, as per the classification specified in IRC:6. All bridges will be designed for Seismic forces as per clause 222.1 of the said code.

#### (e) Soil Parameters

The Soil parameters used in the preliminary design of foundations for Bridges will be taken from the report of soil investigation and information obtained from local authorities / existing bridge design data.

The following soil parameters will be used for material for back fill behind abutment of bridges and culverts and the abutment structure will be designed accordingly.

$$\begin{aligned}\phi &= 30^\circ \\ \delta &= 20^\circ \\ \gamma_d &= 18 \text{ KN/m}^3\end{aligned}$$

$$\gamma_{\text{sub}} = 10 \text{ KN/m}^3$$

A 600 mm thick granular material filter behind abutment and adequate weep holes in abutment walls will be provided for proper drainage.

#### **(f) Hydraulic Design**

The relevant hydraulic data for fixing linear water way of bridges will be taken from the river hydraulic survey done by us and hydraulic data obtained from PWD / Flood Control and Irrigation Department.

For the cross: drainage structures, both the empirical and rational analytical approach as detailed out in IRC-SP-13-2014 will be used to check the adequacy of the waterways provided.

#### **(g) Foundations**

For major bridges, either well or pile foundation and for minor bridges well, pile or open foundation will be adopted based on the geotechnical investigation data for those bridges.

#### **(h) Substructure**

RC wall type piers and wall type / spill through type abutment will be provided in the bridges, matching the requirements, site conditions and constraints. Their design will be carried out in conformity with IRC-78-2000. The shape, size and alignment will be matching with the existing structure from aesthetic and hydraulic considerations.

#### **(i) Superstructure**

i) RC Beam and slab and PSC super-structure will be adopted wherever applicable. RC slab will form the deck for all new culverts, Multi-cell box structure may be adopted in the minor bridges and culverts, if found appropriate.

#### **ii) Bearings**

Neoprene/metallic/POT bearings will be used in the bridges as required for specific span, loads etc. and tar paper will be used in the culverts.

#### **iii) Railings**

Reinforced concrete railings in M-30 grade concrete following MOST standard will be provided.

#### **iv) Crash Barrier**

Reinforced concrete crash barrier in M-40 grade concrete following MOST standard will be provided.

#### **v) Expansion joints**

Buried type expansion/strip seal joints as per MOSRT&H standard will be used.

vi) **Wearing Course**

65mm thick asphaltic concrete wearing course will be adopted.

vii) **Approach slab**

R.C. approach slabs, 3.50m long and 300mm thick in M-30 concrete will be used at either end of the bridges and culverts to ensure riding comfort and to reduce vehicular surcharge on the abutment walls. One end of the approach slab is supported on R.C. bracket projecting out, from dirt wall while the rest of the slab is placed on compacted soil as per the guidelines issued by MOSRT&H. A leveling course, 100mm thick in M-20 / M-15 grade concrete will be used under the approach slab.

viii) **Drainage Spouts**

100mm dia drainage spout will be used for deck drainage at least one on both sides of Carriageway per span.

ix) **TMT Reinforcement and Pre stressing Cables**

Fe-500 high yield strength deformed bars conforming to IS-1789 will be used as reinforcement in all R.C. works. Uncoated stress relieved low relaxation strands conforming to IS-14268 will be used in PSC works.

(j) **Protection Works**

Protection works in the major bridge will be provided matching the protection work used in the existing bridges. IRC-89-1997 will be followed in detailing the protection works.

- i) Return walls of required length will be provided in all bridges and culverts to stop the spilling of earth into the waterway,
- ii) Flooring will be provided over both side of the base raft of culverts to guard against deterioration of the base raft
- iii) Perimetral cut-off walls around the base raft of culverts and boulder apron on both upstream and downstream sides will be provided to reduce the scouring,
- iv) The perimetral cut-off walls will also increase the effective depth of foundation in addition to their protective functions.

## **7.6 Pavement Design Standard and Methodology**

### **Design of New Flexible Pavement**

Design of new pavement has been carried out based on IRC 37-2012 “Guidelines for the Design of Flexible Pavements” for design life of 15 years. Procedure for the same is given below:

Step 1: To find out initial traffic in the year of completion of construction in terms of the number of the number of commercial vehicles per day (CVPD)

Step 2: To determine traffic growth rate factor by studying the past trends of traffic growth

Step 3: Design life of Pavement

Step 4: To find out Vehicle Damage Factor to convert the number of commercial vehicles of different axle loads and axle configuration to the number of standard axle load repetition. It may be obtained by conducting axle load survey at site.

Step 5: To find out lane distribution factor of traffic over the carriageway

Step 6: To determine design traffic in cumulative number of standard axles (msa) by the following formula mentioned below:

$$N = [365 \times \{(1+r)^n - 1\} / r] \times A \times D \times F$$

Where,

N = Cumulative number of standard axles to be catered for in the design in terms of msa

A = Initial traffic in the year of completion of construction in terms of number of commercial vehicles per day

D = Lane Distribution Factor

n = Design life in years

r = Annual growth rate of commercial vehicles

F = Vehicle damage factor

Step 7: To determine total pavement thickness and crust composition by charts/graphs with respect to CBR and cumulative number of standard axles.

### **Overlay Design**

Overlay Design has been carried out over existing pavement based on IRC 81-1997. The guidelines provide the method for determining characteristic deflection using Benkelman Beam. The required characteristics deflection values used for design purpose have been obtained from the following formula.

$$DC = X + 2\sigma$$

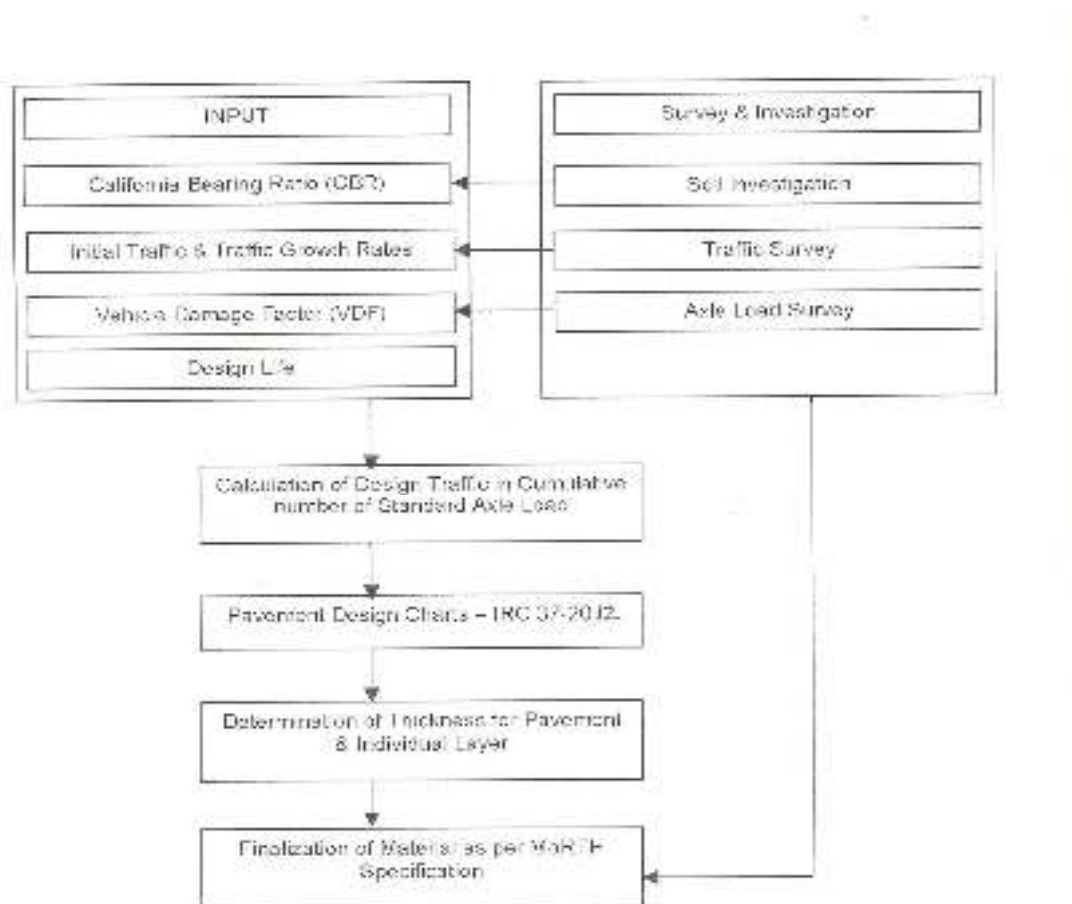
Where, DC = Characteristic Deflection (in mm)

X = Mean Deflection (in mm) determined on the basis of individual deflection corrected for temperature and seasonal variation

$\sigma$  = Standard Deviation

Pavement strengthening shall be done for a design period 10 years. Using the Overlay Thickness Design Curves as presented in page 19 of IRC: 81-1997, for the msa values (corresponding to 10 years design life) and the characteristics deflection values, the overlay thickness in terms of Bituminous Macadam has been derived. This thickness of Bituminous Macadam has been converted to BC/DBM thickness using the recommended multiplier value of 0.7.

Methodology flow chart for the design of new Flexible pavement and overlay design over existing pavement has been shown in **Figure 7.1**





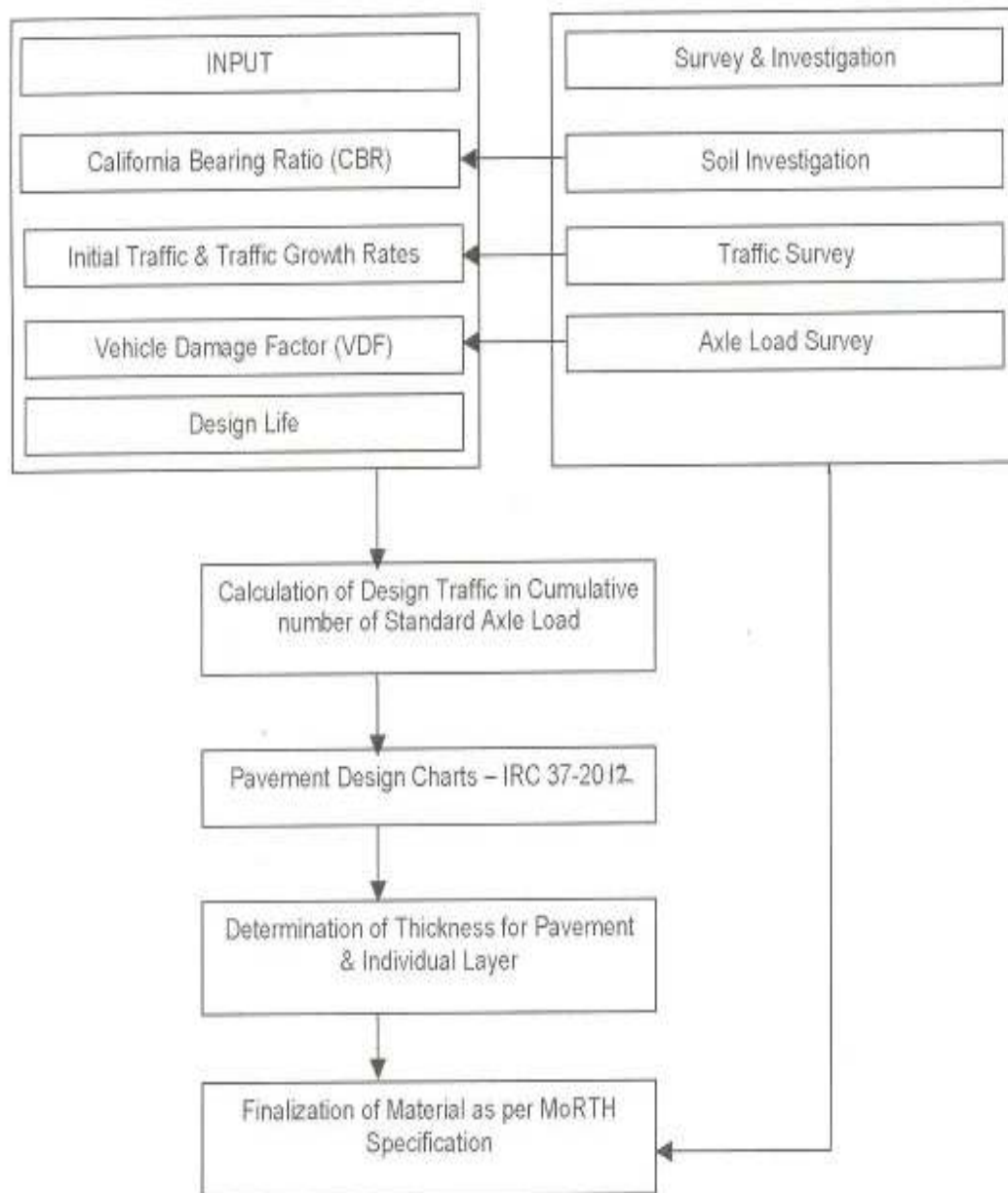


**Figure 7.1: Methodology Flow Chart for Design of New Flexible Pavement**

## 1. INTRODUCTION

### A. General

Assam is located in north-eastern part of India and covers an area of 78,438 km<sup>2</sup>. The state is bordered by Bhutan and Arunachal Pradesh to the north; Nagaland and Manipur to the east; Meghalaya, Tripura, Mizoram and Bangladesh to the south; and West Bengal to the west via Siliguri Corridor, a 22 kilometres strip of land that connects the state to the rest of India.

Assam is well connected by a network of national highways and other roads to important places within the state and other major cities in the country. Assam comprises approximately 40342 km of road network including 2841 km of national highway. The national highway (NH) number 31, 37, 38, 40 and 52 links the state of Assam with other states and cities. The Union Ministry of Surface Road Transport and highways has acknowledged two new roads connecting neighboring states of Arunachal Pradesh and Meghalaya as National Highways. They are NH Number 315A and 127B respectively.



Figure 1: Road Map of Assam State

The deficient road network and the quality of the road infrastructure is an important deterrent factor constraining the development of major parts of the state. In this regard, the state government has invested on extending the road network rather than on improving the quality of roads. The Project Road is a connection between two NH (NH31C and NH-31) and connecting with Meghalaya state with proposed bridge over river Brahmaputra in Assam. The total length of the project road is about 54.154 km (as per design length).

On behalf of MoRT&H, Assam Public Work Department(PWD) NH Works acting as an executing agency had appointed C.E. Testing Company Pvt. Ltd. (CETEST) as consultant to prepare the detailed project report (DPR) for the proposed improvement and up-gradation of the roadway. After the approval of the project PAPER by NHIDCL in 2019, the Government of India (GOI) requested Japan International Co-operation Agency (JICA), the aid agency of Japan, to provide a project finance for the NH-127B improvement and widening Project.

### B. Project Background

The project is a part of a larger development that the Government of India is proposing JICA for yen loan. In order to improve the connectivity and contribute to the economic development, the project envisages to establish and improve roads in Northeast India, from Khowai to Sabroom in Tripura and from Srirampur to Dhubri in Assam as well as Fakirganj to Tura in Meghalaya. For the

improvement of NH-128 Assam portion, DPR was prepared in March 2020, which includes an Environmental Impact Assessment EIA and Social Impact Assessment (SIA).

The road name as per TOR/Contract is NH-127B starting from Srirampur on NH-27(old NH-31 C) to the immediate approach of proposed bridge over river Brahmaputra near Dhubri in the state of Assam. The project road lies in Kokrajhar and Dhubri district of Assam. The road runs through five police stations namely, Srirampur, Tamarhat, Dhubri, Gouripur and Gossaigaon police station. The length of the road is 54.154 km (As per Design length).

The project road is of significant importance as the road connecting two National Highways (NH31C and NH-31), one proposed bridge over river Brahmaputra and connects to important nearby villages Srirampur, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, DebputtaHazardaha 1, Kachari Hat, DebputtaHazardaha 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari. As per the JICA's guidelines for environmental and social considerations (2010)<sup>1</sup>, a Supplementary EIA (SEIA) is being undertaken to disclose the key environmental aspects before the intended stakeholder meetings.

### C. Nature, Size and Location of Sub-project Road

The road project is to provide NH standard connectivity to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 54.154 km (as per design chainage) from Srirampur on NH-27 (old NH-31C) at chainage 0.00. Satellite image of existing road alignment of Srirampur to Dhubri road stretch is shown in Figure 2.

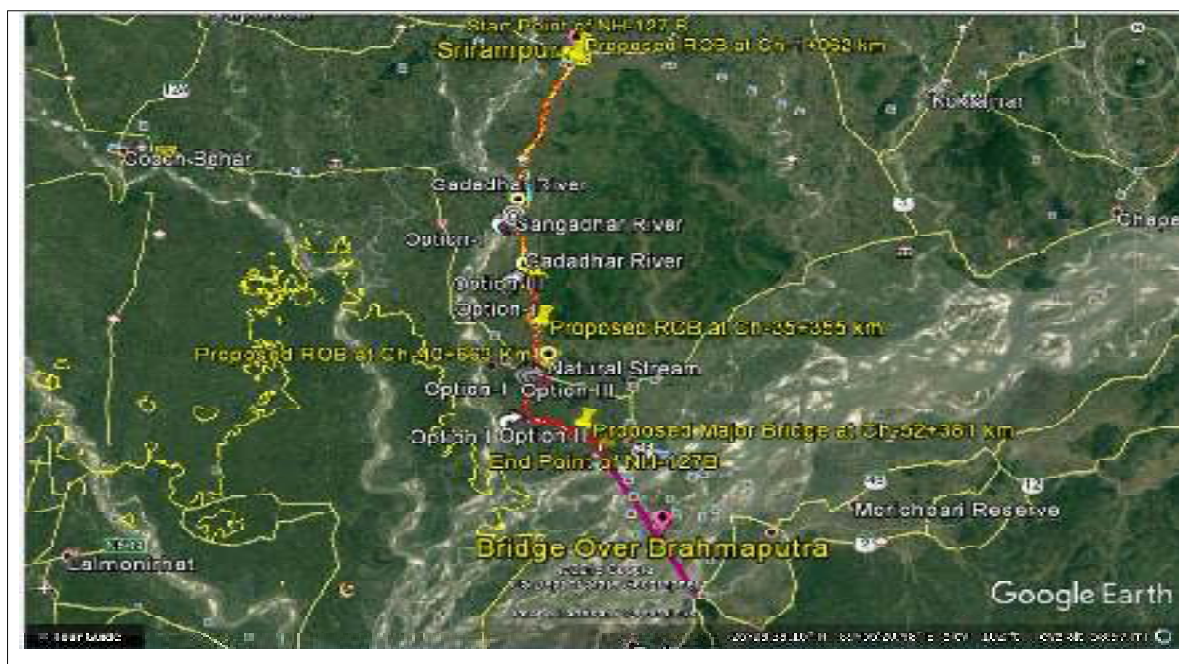


Figure 2: Existing Road Alignment of Srirampur to Dhubri road stretch on satellite imagery

The project road corridor Srirampur- Dhubri is currently a single lane/ Intermediate road. The road starts from Srirampur on NH-27(old NH-31 C) and ends at the immediate approach of the proposed bridge over river Brahmaputra near Dhubri, covering a distance of 53.616 km. The entire road stretch passes through plain terrain and is located in Kokrajhar and Dhubri district in state of Assam.

<sup>1</sup>[https://www.jica.go.jp/english/our\\_work/social\\_environmental/guideline/index.html](https://www.jica.go.jp/english/our_work/social_environmental/guideline/index.html)

The existing road is with a number of geometric deficiencies as the existing road is of Major District Road (MDR) standard and towns & villages are only connected with road facilities without proper geometrics. For the improvement of existing alignment number of realignments & bypasses are required with land acquisition at large extent.

The high embankment sections are at approaches to major/minor Bridges. However, as the most part of project road is in Brahmaputra river flood zone, significantly road embankment required to be kept high.

## D. Objective and Scope of the Study

### D.1. Objective of the project

The JICA guidelines require both EIA and RAP surveys due to the proposed project's "Category A" status. Processes of EIA and RAP preparation in the JICA Guidelines are different from that of Indian EIA Notification 2006 and its amendments thereafter. In order to evaluate the project's environmental impacts in accordance with the JICA guidelines, this Supplementary EIA is being conducted.

### D.2. Scope of the Study

The scope of supplementary EIA study is presented in Error! Reference source not found..

Table 1: Scope of study as per TOR

| Sl.no. | Item                | Study/Survey                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Air pollution       | <b>Review of present and estimated values (quantitative) and analysis</b><br>1. Comparison with the domestic and international standards<br>2. Mitigation measures shall be proposed.<br><u>Refer to: EIA 2020 3.1.11-13, 4.1.13</u>                                                                                                                                                                               |
| 2      | Water pollution     | <b>Review of present (quantitative) values and estimated impacts (qualitative)</b><br>3. Turbidity dispersion of the major existing river, streams, and other channels along with the project site shall be evaluated.<br>4. Mitigation measures shall be proposed, if necessary.<br><u>Refer to: EIA 2020 3.1.16-18, 4.1.14</u>                                                                                   |
| 3      | Waste               | <b>Present and estimated values(quantitative)</b><br>5. Present waste management systems<br>6. Impact in both construction and operation periods shall be evaluated quantitatively.<br>7. Mitigation measures shall be proposed, if necessary.                                                                                                                                                                     |
| 4      | Soil pollution      | <b>Review the present values (quantitative) and expected impacts (qualitative)</b><br>8. Analysis on the present values<br>9. Estimate the impactson both construction and operation periods shall be evaluated quantitatively.<br>10. Mitigation measures shall be proposed, if necessary.<br><u>Refer to: EIA 2020 3.1.3-5, 4.1.6-7</u>                                                                          |
| 5      | Noise and Vibration | <b>Review of the present values and estimated values of noise/ vibrations (quantitative)</b><br>11. Analysis on Present values<br>12. The impact of transportation during construction time shall be evaluated quantitatively.<br>13. The impact of operation period shall be evaluated quantitatively.<br>14. Mitigation measures shall be proposed, if necessary.<br><u>Refer to: EIA 2020 3.1.14-15, 4.1.21</u> |
| 6      | Bottom sediment     | <b>Present values and anticipated impacts</b><br>15. Present values and estimated impact of bridge/pier construction. Discussions on sedimentation and erosion.<br>16. Mitigation measures shall be proposed, if necessary.                                                                                                                                                                                        |



|           |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>7</b>  | Protected area                    | <b>Review of the present conditions and anticipated impacts</b><br>17. Identification/Mapping of the protected areas, 10km radius map from the alignment<br>18. Consultants should qualitatively assess the impacts to the protected areas and propose mitigation measures.<br><u>Refer to: EIA 2020 3.2.5-6, 4.2.2</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>8</b>  | Ecosystem                         | <b>Present and anticipated impacts</b><br>19. Ecosystem data for two seasons (dry and rain) by primary data collection or secondary data collection<br>20. Terrestrial ecosystem (forests, hills)<br>21. Aquatic ecosystem (rivers, streams, wetlands) distribution and its composition<br>22. Comparison with the list of endangered species (IUCN red list categories, Attachment 2)<br>23. Distribution map of ecosystem (ecology map for mangrove, seagrass bed), within the 10km radius, shall be developed using available data and supplemental field survey.<br><u>Refer to: EIA 2020 3.2, 4.2.1, 4.2.3-4</u>                                                                                                                                                                                                                                                                                                                                                         |
| <b>9</b>  | Hydrology                         | <b>Review of the present and anticipated impacts</b><br>24. Impact on the existing rivers/creeks during and after completion of the bridge on the river<br>25. Mitigation measures shall be proposed, if necessary.<br><u>Refer to: EIA 2020 4.1.19-20</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>10</b> | Topography and Geology            | <b>Present and estimated conditions</b><br>26. Detailed information shall be obtained to evaluate the appropriateness<br>Construction period: civil works, such as cutting and filling will cause slope failures or landslides, soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites<br>Operation period: soft ground on the route, landslides possibility, soil runoff<br>27. Mitigation measures shall be proposed, if necessary.<br><u>Refer to: EIA 2020 4.1.1-2</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>11</b> | Working condition                 | <b>Present and anticipated impacts</b><br>28. Working safety (legal frameworks & safety policies of -NHIDCL) shall be summarized. Improvement practices shall be proposed if it is necessary in accordance with national and Japan International Cooperation Agency (JICA) safety guidelines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>11</b> | Accident                          | <b>Present anticipated impacts</b><br>29. Review of the road accidents and their countermeasures in EIAs & Assessment of road accidents caused by increased vehicle traffic<br>30. Improvement plan of the safety management plan shall be proposed as per JICA safety guidelines, if necessary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>12</b> | The cross border & Climate change | <b>Present and estimated values</b><br>31. CO <sub>2</sub> emissions from the following items shall be estimated based on JICA Survey Team's construction plan and available secondary data. <ul style="list-style-type: none"> <li>Impact sources (construction stage): construction machineries, trucks, construction/transportation vehicles, cutter-suction dredgers</li> <li>Impact sources (operation stage): increased trucks/vehicles for other areas based on present logistic patterns and their emissions</li> </ul> 32. Estimation of CO <sub>2</sub> emissions from the existing facilities based on available secondary data and hearing<br>33. General impact assessment of the present values includes a review of the Indian emission standards and a summary of the necessary actions by existing facilities<br><u>Refer to: Basic Information and Data Collection Study on Connectivity Improvement in North Eastern Region of India Ch6. Final Report</u> |

## E. Extent of the EIA

This Supplementary Environmental Impact Assessment (SEIA) report has been prepared on the basis of detailed engineering design, field investigations and stakeholder consultations to meet the applicable requirements as per prevailing policy statement. EIA extent has been decided considering all the risks involved and likely impacts in the context of the project's area of influence. The study area is considered up to 10 km on either side of road alignment for larger analysis of landuse and other environmental features.

### E.1. EIA Objectives

The Supplementary EIA (SEIA) report covers the general environmental profile of the study area and includes an overview of the potential environmental impacts and their magnitude on physical, ecological, economical, social and cultural resources within the project's area of influence during design, construction, and operation stages. It also reflects the gaps of environmental issues of previous EIA report (March 2020). An Environmental Management Plan (EMP) is also proposed as part of this report which includes mitigation measures for identified environmental impacts during construction and operation of the project, environmental monitoring program, and the responsible entities for mitigation and monitoring.

SEIA has four basic objectives; (i) identify the environmental issues that should be taken into account (ii) determine the magnitude of potential environmental concerns and to ensure that environmental considerations are given adequate weight at planning/design stage (iii) identify need for further environmental studies or EIA and (iv) suggest enhancement measures, if any.

## F. Methodology Adopted for EIA Study

EIA commenced with the review of technical details provided by the DPR team and preceding environmental assessment reports conducted for the project road. This was followed by a reconnaissance site visit and discussion with the implementing agency to reconfirm the technical details of the project road improvement work. This helped to identify those environmental attributes which may get altered with the passage of time and incorporate additional information to the baseline environmental scenario/environmental setting of the project. Further steps followed for SEIA have been concisely described in following paragraphs.

**Review of Country's Legal Framework:** India has a well-defined policy/legal framework for the safeguard of environment. Prior to initiation of any civil work, it is essential to analyze the various permissions/clearances required for any developmental project. Same has been presented in later section of this chapter.

**Primary Data Collection:** Environmental resource inventory is prepared for all environmental features viz. terrain, landuse, waterways/water bodies, road side vegetation, sensitive receptors, common property resources, utilities, drainage, flooding/water logging, industries, accident prone areas etc. within the area of interest/core zone. Information about this will be done by trained persons under the supervision of an expert team. Baseline monitoring was conducted at the locations for which data was not available in the previous environmental assessment report conducted by a detailed design team.

**Secondary Data Collection:** Secondary sources include published government reports, environmental impact assessments conducted in the similar region, government websites, recognized institutions and relevant government departments (forest, irrigation, pollution control board, fisheries, statistics, Indian Meteorological Department (IMD) etc. Recent Google images have been captured to view environmental features at regional scale.

**Public Consultation:** Meaningful consultations were organized with the NHIDCL, local people/beneficiary population to know the level of project acceptability, understand their concerns,

apprehensions, and overall opinion. Information was gathered about the existing baseline environmental condition viz. ambient levels and its effects on health, water resources, water logging/flooding, flora and fauna, socio-economic standing of local people, impact due to loss of land other assets and common property resources, accident risk during construction and operation stage, perceived benefits and losses, etc. Information thus gathered was used to integrate it in the project design and formulate mitigation measures and environmental management plan.

**Other Tools, Surveys and Studies:** Assessment of landuse of larger area beyond the project site has been prepared for better planning and decision-making. Remote sensing and Geographic Information System (GIS) based landuse map of the study area (10 km buffer) was prepared through recent satellite imagery. A rapid bio-diversity assessment was also carried out to generate baseline on floral and faunal elements in the project area. The survey also helped in assessing impact on any rare threatened or endangered species of floral species in the project area. Extensive air, noise, water & soil quality monitoring & analysis has been carried out in the project road.

**Assessment of Potential Impacts:** The impact assessment has been done undertaken to ascertain whether the project is environmentally sustainable or not. Nature of impacts are classified as significant, insignificant, short-term, long-term, reversible, irreversible etc. After identification of nature and extent of impacts, mitigation measures has been suggested.

**Preparation of the Environment Management Plan:** The project specific Environment Management Plan (EMP) was formulated with an aim to avoid, reduce, mitigate, or compensate for adverse environmental impacts/risks and propose enhancement measures. This includes

- Mitigation of potentially adverse impacts
- Monitoring of impacts and mitigation measures during project implementation and operation
- Institutional capacity building and training
- Compliance to statutory requirements
- Integration of EMP with Project planning, design, construction and operation.

**Environment Monitoring Plan:** Monitoring involves periodic checking to ascertain whether activities are going according to the plan or not. It provides the necessary feedback for project management to ensure project environmental objectives are met and on schedule.

The reporting system is based on accountability to ensure that the mitigation measures are implemented efficiently. Environmental monitoring program has the underlying objective to ensure that the intended environmental mitigations are realized and these results in desired benefits to the target population causing minimal deterioration to the environmental parameters. Such program targets proper implementation of the EMOP. The broad objectives are:

- To evaluate the performance of mitigation measures proposed in the EMP.
- To evaluate the adequacy of environmental assessment.
- To suggest ongoing improvements in management plan based on the monitoring
- To enhance environmental quality through proper implementation of mitigation measures.
- To meet existing environmental regulatory framework and community obligations.

**Performance Indicators:** The significant physical, biological and social components affecting the environment at critical locations serve as wider/overall performance Indicators. However, the following specific environmental parameters can be quantitatively measured and compared over a period of time and are, therefore, selected as specific Performance Indicators (PIs) for monitoring because of their regulatory importance and the availability of standardized procedures and relevant expertise. Performance indicators requiring quantitative measurements are:

- Air quality with respect to PM2.5, PM10, NOx and SO2 at selected location.



- Water quality as per CPCB prescribed standards
- Noise levels at sensitive receptors (schools, hospitals, community/religious places).
- Survival rates of trees planted as compensatory plantation.

#### Assessment of impacts to address the environmental concern of the project:

EIA assess the capacity of the executing agency for effective implementation of EMP. Accordingly, if needed, a training and awareness program will be formulated to enhance the capacity of officials for implementing proposed mitigation measures and monitoring the resultant effects, as well as create awareness amongst workers and public. The institutions/agencies like regional office of MoEF, SPCB/CPCB, and Indian Institute of Technologies can be consulted for such trainings. Independent subject's experts/consultants can also be the resource persons to impart trainings. A separate budget for the training shall be allocated under the Construction Supervision Consultant budget.

### F.1. Delineation of Project Impact Zone

The environmental impacts caused due to the development of the project road sections can be categorised as primary (direct) and secondary (indirect) impacts. Primary impacts are those which are induced directly by the project whereas the secondary impacts are those which are indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action.

The study area for the environmental screening is categorized in two influence areas:

- Corridor of Impact (Col):** Proposed ROW of the alignment
- Indirect influence area:** 10km around the project road.

### F.2. Approach to Environmental Impact Assessment

Environmental Impact Assessment (EIA) is an assessment of the possible impacts, positive or negative, that a proposed project may have on the environment, together consisting of the natural, social and economic aspects. Its purpose is to identify, examine, assess and evaluate the likely and probable impacts of a proposed project on the environment and, thereby, to work out remedial action plans to minimize adverse impact on the environment.

For the purpose of a transparent presentation and evaluation, a tabulated evaluation (Table 2) has been applied. On the basis of a point scale, the severity of the particular environmental or social impact together with its general trend - that is, negative or positive - is described. The following evaluation scale is applied:

#### Extent of impact:

$\Delta\Delta\Delta$  = high negative  
 $\Delta\Delta$  = medium negative  
 $\Delta$  = low negative  
 $\Theta$  = nil  
 $+$  = locally positive  
 $++$  = regionally positive

As a basis for the evaluation, the duration of an impact and the impact magnitude are estimated

Table 2: Impact Evaluation Matrix

| Severity     | Duration  |           |              |
|--------------|-----------|-----------|--------------|
|              | Transient | Long Term | Irreversible |
| Catastrophic | Medium    | High      | High         |
| Major        | Low       | Medium    | High         |
| Minor        | Low       | Low       | Medium       |

The severity classification is presented below on a qualitative scale. It may be noted that severity of magnitude 'Notable' has been treated in this project as 'Nil'.

**Table 3: Severity classification based on a qualitative scale**

| Effect              | Area                                                    | Air                                                                                                                                                     | Water                                                                                                                                        | Waste                                                                                                                                                                                                             | Biodiversity                                                                                                                                                      | Resources                                                                                               | Regulation                                                                                                                                                                   | Society                                             |
|---------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Catastrophic</b> | Extending Over a wide Area 50 km <sup>2</sup> from site | Significant Acute impact On the receptor(s) potentially Leading to fatality. Significant Deterioration of Air quality on a National and Regional level. | Regional or Inter-state contamination or depletion of potable groundwater. Regional or inter-state contamination of marine environment.      | Significant uncontrolled generation, handling, Storage or Disposal of priority hazardous Waste leading To catastrophic contamination Of valued groundwater, soil and/or loss of non- renewable natural resources. | Significant Effect on regionally important attributes of the ecological environment is observable or measurable over a wide area notified by National authorities | Significant damage to archaeological, cultural or natural resources regional /international importance. | Constant very high exceedance of statutory or prescribed limits (assessed not To be ALARP) Immediate Intervention by Third parties or governmental body                      | High profile community outrage/ repeated complaints |
| <b>Major</b>        | Extending Over 10 km <sup>2</sup> from site             | Acute impact On the receptors. Significant Deterioration of Air quality on a National level.                                                            | Serious local contamination or depletion of potable groundwater. Serious local Or considerable national contamination of marine environment. | Serious uncontrolled generation, handling, storage or disposal of hazardous waste leading to serious contamination of valued groundwater, soil and/or loss of non- renewable natural resources.                   | A serious effect on locally important attributes of the ecological environment is observable or measurable locally.                                               | Serious damage to archaeological, cultural or natural resources of national importance.                 | Repeated Exceedance of Statutory or prescribed limits (assessed not To be ALARP) Significant Alarm raised by Third parties or governmental body with instruction to mitigate | Serious community concern and complaints.           |
| <b>Minor</b>        | Extending                                               | Limited                                                                                                                                                 | Limited                                                                                                                                      | Limited                                                                                                                                                                                                           | A limited effect                                                                                                                                                  | Limited impact on natural                                                                               | Few                                                                                                                                                                          | Some                                                |

| Effect         | Area                                                     | Air                                                                                                                          | Water                                                                                                                     | Waste                                                                                                                                                                                | Biodiversity                                                                                                      | Resources                                                                           | Regulation                                                                                                                    | Society                        |
|----------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                | Over 10,000 m <sup>2</sup> area.                         | Deterioration of Air quality on a limited level.<br>Some odor<br>And irritation<br>Caused by<br>Deterioration of air quality | Degradation of potable groundwater quality or reduction of its volume<br>Limited contamination of marine environment.     | uncontrolled generation, handling, storage or disposal of waste leading to limited loss of natural resources and/or land contamination without putting valued ground- water at risk. | on significant attributes of the ecological environment is observable or measurable                               | resources or damage any archaeological or cultural resources of local importance.   | Exceedance of Statutory or prescribed limits but assessed to be ALARP<br>No complaint from third parties or governmental body | community concern raised.      |
| <b>Notable</b> | Measurable above background<br>Confined within Fenceline | Slight change of ambient air quality over a limited area.<br>Some local influence.                                           | Slight degradation of quality or reduction of volume of potable groundwater.<br>Some contamination of marine environment. | Controlled generation, handling, storage disposal of waste.                                                                                                                          | Negligible effect on any attribute of the or ecological environment is observable or measurable above background. | Some impact on natural resources or damage to archaeological or cultural resources. | No exceedance of statutory or prescribed limits but Assessed to be ALARP.<br>No third party or government concern.            | No Possible community focuses. |

## **G. Structure of the Report**

SEIA has been structured based on JICA Guidelines for Environmental and Social Considerations (April, 2010) as presented bellow;

Chapter 1 – Introduction

Chapter 2 – Policy, Legal and Administrative Framework

Chapter 3 – Project Description

Chapter 4 – Analysis of Alternatives

Chapter 5 – Baseline Environmental Studies

Chapter 6 –Anticipated Environmental Impacts and Mitigation Measures

Chapter 7 – Public Consultation & Information disclosure

Chapter 8 - Environmental Management Plan, Monitoring Plan

Chapter 9 – Grievance Redress Mechanism

Chapter 10 – Conclusions and Recommendations

## 2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

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. The Ministry of Environment, Forest & Climate Change made it mandatory for introducing environment assessment into the planning process of road projects as well as environmental impact appraisal as per Environmental Protection Act, 1986. The MoEFCC have assigned all central and State authorities to develop policies towards protection of environment for any infrastructure development activities as per the act. The Ministry of Environment, Forest & Climate Change (MoEFCC) has overall authority for the administration and implementation of government policies, laws and regulations. In the present project the environment acts, policy guidelines of both State and Central Government will be applicable. The environmental management and protection policies, regulations and administrative framework governing the project is reviewed in this section. The review includes sector-specific environmental policies & regulations of the Government of India, State Govt of Assam, JICA Guidelines for Environment and Social Considerations (2010), and the administrative framework of various agencies, such as the MoEF&CC, the State Pollution Control Boards (SPCB) and other bodies associated with the implementation of the proposed project. The following subsections summarized the legislative framework in which the present project will be addressed with respect to the environment including social issues.

### A. National Laws & Regulations

The Government of India has formulated various policy guidelines; acts and regulations aimed at protection and enhancement of environmental resources. The following table surmise the existing legislations pertaining to the project, the various clearances required for the project and the status as on date.

Table 4: Relevant National Environmental Laws & Regulations

| Law                                                                                                                       | Description                                                                                                                                                                                                                                                                                 | Applicable Yes/No | Applicability in the project                                                                                                                  | Implementing / Responsible Agency      |
|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| <b>The Environmental (Protection) Act, 1986, and the Environmental (Protection) Rules, 1987-2002 (various amendments)</b> | Umbrella Act. Protection and improvement of the environment. Establishes the standards for emission of noise in the atmosphere.                                                                                                                                                             | Yes.              | All environmental notifications, rules and schedules are issued under the act.                                                                | MoEF. (Govt. of Assam) State Gov. SPCB |
| <b>The EIA Notification, 14th September 2006 and subsequent amendments</b>                                                | The EIA Notification of 2006 set out the requirement for environmental assessment in India. Environmental Clearance is required for certain defined activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. | No                | Environmental clearance is not required as project activity does not attract provisions of EIA notification 2006 and its amendment till date. | MoEF SEIAA                             |
| <b>Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments(1987)</b>                       | Act was enacted to provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water, by Central and State Pollution Control Boards and for                                                                                              | Yes               | Consent to Establish (CTE) before start of construction works and Consent to Operate (CTO) before start of operation will be                  | SPCB                                   |

|                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                         |     |                                                                                                                                                                                                                                                  |                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
|                                                                                                                                                                         | conferring on and assigning to CPCB/SPCBs powers and functions relating to water pollution control. Such projects have to obtain Consent to Establish (CTE) under Section 25 of the Act from State Pollution Control Board (SPCB) before starting implementation and Consent to Operate (CTO) before commissioning.                                     |     | required for (if any)- <ul style="list-style-type: none"> <li>• Batching Plant</li> <li>• Hot mix plants; and</li> <li>• Sand mining</li> </ul>                                                                                                  |                                          |
| <b>Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.</b>                                                                             | This Act was enacted to achieve prevention, control and abatement of air pollution activities by assigning regulatory powers to Central and State boards for all such functions. The Act also establishes ambient air quality standards.                                                                                                                | Yes | Following will require CTE and CTO from SPCB:<br>Establishment of DG sets more than 10 KVA. <ul style="list-style-type: none"> <li>• Batching Plant</li> <li>• Hot mix plants; and</li> <li>• Crushers</li> <li>• Sand mining, if any</li> </ul> | SPCB                                     |
| <b>Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010.</b>                                                                                         | Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.                                                                                                                                                                                                                                                | Yes | Ensure applicable noise standards and noise limits for DG sets.                                                                                                                                                                                  | SPCB                                     |
| <b>Central Motor Vehicle Act Central Motor Vehicle Rules and (Amendment) Rules (1988 and amendment thereafter)</b>                                                      | Objective of this Act is to check vehicular air and noise pollution. Vehicles to be used for construction and other purposes need to meet the standards and certificates prescribed as per the Rules, 1989 to control noise, pollution, etc.                                                                                                            | Yes | Ensure vehicle exhaust emission standards.                                                                                                                                                                                                       | Motor Vehicle Department                 |
| <b>Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010</b> | The Act designates areas within 100 meters (m) of the "protected monument/area" as "prohibited area" and beyond that up to 200 m as "regulated area" respectively. No "construction" is permitted in the "prohibited area" and any construction activity in the "regulated area" requires prior permission of the Archaeological Survey of India (ASI). | No  | Not applicable as no such monuments within the project corridors.                                                                                                                                                                                | National Monument Authority              |
| <b>Seventy Third Constitution Amendment Act 1992</b>                                                                                                                    | This act guides governments to establish rules for Panchayat involvement in project preparation and implementation. The Act stipulates involvement of the institutions especially, the Gram Sabha/ Panchayat                                                                                                                                            | Yes | Ensure involvements of Gram Sabha/Gram Panchayat in the project design.                                                                                                                                                                          | Ministry of Rural Development, Panchayat |



|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |                                                                                                                                          |                                           |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
|                                                     | during project preparation and implementation. The Panchayats at the village level will be involved for preparation and implementation of the project.                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                          |                                           |
| <b>Labor Laws</b>                                   | The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type. | Yes | Applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works. | Ministry of Labor and Employment          |
| <b>Wildlife Protection Act, 1972 amendment 1991</b> | This overarching Act provides protection to wild animals, birds, plants and matters connected with habitat protection, processes to declare protected areas, regulation of wildlife trade, constitution of state and national board for wildlife, zoo authority, tiger conservation authority, penalty clauses and other important regulations.                                                                                                                                                                                                                            | No  | There is no national park, wildlife sanctuary along the project road. Furthermore the project road does not come under any ESZ.          | Forest Department, Gol and Govt. of Assam |
| <b>Forest (Conservation) Act, 1980</b>              | The Forest (Conservation) Act prohibits the use of forest land for non-forest purposes without the approval of Ministry of Environment and Forests and Climate Change (MoEF&CC), Government of India                                                                                                                                                                                                                                                                                                                                                                       | No. | This particular project road widening and improvement work does not require diversion of significant forest land                         | Forest Department, Gol and Govt. of Assam |
| <b>Solid Waste Management Rules 2016</b>            | Responsibility of Solid Waste Generator<br>(i) segregate and store the waste generated in three separate streams namely bio-degradable, non-biodegradable and domestic hazardous wastes in suitable bins and handover segregated wastes to authorized waste pickers or waste collectors as per the direction or notification                                                                                                                                                                                                                                               | Yes | Contractor to follow all the rules during construction works.                                                                            | SPCB and local municipality               |

|                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |     |                                                                                  |                             |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------|-----------------------------|
|                                                                      | by the local authorities from time to time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |                                                                                  |                             |
| <b>Construction and Demolition Waste Management Rules 2016</b>       | <p>(i) Every waste generator shall segregate construction and demolition waste and deposit at collection centre or handover it to the authorized processing facilities</p> <p>(ii) Shall ensure that there is no littering or deposition so as to prevent obstruction to the traffic or the public or drains.</p> <p>(iii) Large generators (who generate more than 20 tons or more in one day or 300 tons per project in a month) shall submit waste management plan and get appropriate approvals from the local authority before starting construction or demolition or re-modeling work,</p> <p>(iv) Large generators shall have environment management plan to address the likely environmental issues from construction, demolition, storage, transportation process and disposal / reuse of C &amp; D Waste.</p> <p>(v) Large generators shall segregate the waste into four streams such as concrete, soil, steel, wood and plastics, bricks and mortar,</p> <p>Large generators shall pay relevant charges for collection, transportation, processing and disposal as notified by the concerned authorities;</p> | Yes | Contractor to follow all the rules during construction works.                    | SPCB and local municipality |
| <b>Hazardous Waste Rules 2016</b>                                    | <p>Responsibilities of the occupier for management of hazardous and other wastes.-</p> <p>(1) For the management of hazardous and other wastes, an occupier shall follow the following steps, namely:- (a) prevention; (b) minimization; (c) reuse; (d) recycling; (e) recovery.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Yes | Contractor to comply all the requirements of this Act during construction works. | SPCB                        |
| <b>Notification for use of fly ash, 3<sup>rd</sup> November 2009</b> | Reuse large quantity of fly ash discharged from thermal power plant to minimize land use for disposal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Yes | Bongaigaon NTPC (63km away from project road)                                    | MOEF&CC                     |
| <b>Office memorandum dated 18.05.12 by MoEF in view of</b>           | Conserve top soil, aquatic biodiversity, hydrological regime etc. by haphazard and unscientific mining of minor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Yes | In case of renewal of quarries and opening of new borrow areas                   | SEIAA                       |

|                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                                 |                                                        |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| <b>Apex Court order dated 27.2.2012</b>                                               | minerals                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                                                                                 |                                                        |
| <b>National Environment Appellate Authority Act (NEAA) 1997</b>                       | Address Grievances regarding the process of environmental clearance.                                                                                                                                                                                                                                                                                                                        | No                   | This project will not require environmental clearance.                                          | NEAA                                                   |
| <b>Public Liability and Insurance Act 1991</b>                                        | Protection from hazardous materials and accidents.                                                                                                                                                                                                                                                                                                                                          | Yes                  | Contractor need to stock hazardous material like diesel, Bitumen, Emulsions etc.                | SPCB                                                   |
| <b>Minor Mineral and concession Rules</b>                                             | For opening new quarry.                                                                                                                                                                                                                                                                                                                                                                     | Yes                  | Regulate use of minor minerals like stone, soil, river sand etc.                                | District Collector                                     |
| <b>The Explosives Act (&amp; Rules) 1884 (1983)</b>                                   | Sets out the regulations as to regards the use of explosives and precautionary measures while blasting & quarrying.                                                                                                                                                                                                                                                                         | No (Not anticipated) | New quarrying operation                                                                         | Chief Controller of Explosives                         |
| <b>Manufacture, storage and Import of Hazardous Chemical Rules 1989</b>               | Storage of fuel oil, lubricants, explosives, diesel etc. at construction camp.                                                                                                                                                                                                                                                                                                              | Yes                  | Storage of hazardous material                                                                   | State Pollution Control Board & PESO.                  |
| <b>Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996</b> | Protection against chemical accident while handling any hazardous chemicals resulting                                                                                                                                                                                                                                                                                                       | yes                  | Handling of hazardous (flammable, toxic and explosive) chemicals during road construction       | District & Local Crisis Group headed by the DM and SDM |
| <b>International conventions and treaties</b>                                         |                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                                                                                 |                                                        |
| <b>Ramsar Convention, 1971</b>                                                        | The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. India is one of the signatories to the treaty. The Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans. | No                   | Not applicable to this project as there is no declared site within the vicinity of the project. | -                                                      |
| <b>Wetlands (Conservation and Management) Rules, 2017</b>                             | The Rules specify activities which are harmful and prohibited in the wetlands such as industrialization, construction, dumping of untreated waste and effluents, and reclamation. The Central Government may permit any of the prohibited activities on the recommendation of Central Wetlands Regulatory Authority.                                                                        | No                   | Not applicable as project components are not located in designated wetland area.                | -                                                      |

|                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |     |                                                                                                                                                                                                |   |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| <b>Montreal Protocol 1992</b>                                                        | India is a signatory of this convention which aims to reduction in the consumption and production of ozone-depleting substances (ODS), while recognizing differences in a nation's responsibilities. Ozone depleting substances are divided in two groups Chlorofluorocarbons (CFCs) and Hydro chlorofluorocarbons (HCFCs).                                                                                                                                                                                                                         | No  | Not applicable in this project as no ODS are involved in construction works.                                                                                                                   | - |
| <b>Basel Convention on Trans-boundary Movement of Hazardous Wastes, 1989</b>         | India is a signatory of this convention which aims to reduce trans-boundary movement and creation of hazardous wastes.                                                                                                                                                                                                                                                                                                                                                                                                                              | Yes | Contractor to follow the provisions of Hazardous Waste Rules 2016 for storage, handling, transport and disposal of hazardous waste generated during construction works/operational activities. | - |
| <b>Convention on Migratory Species of Wild Animals (CMS), 1979 (Bonn convention)</b> | CMS, also known as Bonn convention was adopted in 1979 and entered into force on 1 November 1983, which recognizes that states must be the protectors of migratory species that live within or pass through their national jurisdictions, and aims to conserve terrestrial, marine and avian migratory species throughout their ranges. CMS Parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. | No  | Not applicable to this project as no migratory species of wild animals are reported in the project areas.                                                                                      | - |

### A.1. Environmental Categorisation as per MoEF&CC

According to the Environmental Impact Assessment Notification, dated 14th September 2006 (amended till date) various development projects and activities require prior Environmental Clearances. All these projects and activities are categorized into two categories - Category A and B, based on the spatial extent of potential impacts on human health, natural and manmade resources.

The requirements for highway projects are specified in schedule item 7(f) of the Notification, 2006,

| Project or Activity |          | Category with Threshold Limit |                   | Conditions, if any      |
|---------------------|----------|-------------------------------|-------------------|-------------------------|
|                     |          | A                             | B                 |                         |
| (1)                 | (2)      | (3)                           | (4)               | (5)                     |
| 7 (f)               | Highways | (i) New National              | (i) All New State | General Condition shall |

|  |  |                                                                                                                                                                                                                   |                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | Highways; and<br><br>(ii) Expansion of National Highways greater than 100 km involving additional right of way or land acquisition greater than 40m on existing alignments and 60m on re-alignments or by-passes. | Highway Projects; and<br><br>(ii) State Highway expansion projects in hilly terrain (above 1000 MSL) and/or ecologically sensitive areas. | apply.<br><u>General Conditions:</u><br>Any project or activity specified in Category 'B' will be treated as Category 'A', if located in whole or in part within 10km from the boundary of:<br>i) Protected Areas notified under Wild Life (Protection) Act, 1972;<br>ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time;<br>iii) Notified Eco-sensitive areas;<br>iv) Inter-state boundaries and international boundaries.<br><u>Note:</u><br>Highways include Expressways. |
|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The project includes the widening and strengthening of National highway with length less than 100km. Therefore, the project does not belong to Category 'A' projects. Further, this being a National Highway, Category 'B' is also not applicable. Hence, this project does not require prior 'Environmental Clearance' as per EIA Notification, 2006 and amendments made thereafter.

## B. State Laws & Regulations

The following tables shows lists the state legislations and which clearances are required from the state. Further, Table 5 details estimated time requirements for various clearances, agency responsible for obtaining clearance, and the stage at which these clearances will be required.

**Table 5: Summary of Clearances & NOCs Applicable as per State Legislation**

| Sl. No | Type of clearance                                                | Statutory Authority                        | Applicability                                                                | Project stage                           | Time required |
|--------|------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------|---------------|
| 1.     | Tree felling permission                                          | State Department of Environment and Forest | Felling of trees                                                             | Pre construction                        | 1-2 months    |
| 2.     | NOC And consents under Air, Water, EP Acts & Noise rules of SPCB | State Pollution Control Board              | For establishing Hot mix plants and batching plants.                         | Construction (Prior to work initiation) | 2-3 months    |
| 3.     | NOC and consents under Air, Water, EP Acts & Noise rules of SPCB | State Pollution Control Board              | For operating Hot mix plants & batching plant,                               | Construction (Prior to work initiation) | 1-2 months    |
| 4.     | Permission to store Hazardous Materials                          | State Pollution Control Board              | Generation, Storage and Transportation of Hazardous Materials and Explosives | Construction (Prior to work initiation) | 2-3 months    |

|    |                                                                      |                                      |                               |                                         |                   |
|----|----------------------------------------------------------------------|--------------------------------------|-------------------------------|-----------------------------------------|-------------------|
| 5. | PUC certificate for use of vehicles for construction                 | Department of Transport              | For all construction vehicles | Construction (Prior to work initiation) | 1-2 months        |
| 6. | NOC for water extraction for construction and allied works           | Ground Water Authority               | Ground water extraction       | Construction (Prior to work initiation) | 2-3 months        |
| 7. | <b>NOC for establishment of DG sets of capacity more than 10 KVA</b> | <b>State Pollution Control Board</b> | <b>For use of DG sets</b>     | <b>Before use of DG sets</b>            | <b>1-2 months</b> |

**Table 6: Summary of Clearances & NOCs Not Applicable for this Sub-Project**

| Sl. No | Type of clearance                                                     | Statutory Authority                                                  | Reason                                                   |
|--------|-----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------|
| 1      | Prior Environmental Clearance                                         | MoEF / SEIAA                                                         | <b>Not a category A / B project</b>                      |
| 2      | Permission for Activities near archaeological protected area          | Archaeological survey of India / the state department of Archaeology | <b>No Archaeological structures in the project road</b>  |
| 3      | <b>Diversion of Sanctuary land / Permission for road construction</b> | <b>NBWL</b>                                                          | <b>Project road is not passing through any sanctuary</b> |

### C. Social Regulatory Requirements in India

There are many rules and regulations framed by the Government of India for the protection of workers. Most of these legislations will be applicable to contractors in charge of construction. EA will ensure compliance to these social legislations through contractual obligation and regular checks & penalties. These legislations include;

- The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996;
- Child Labour (prohibition and Regulation) Act, 1986;
- Minimum Wages Act, 1948;
- Workmen Compensation Act, 1923;
- Payment of Gratuity Act, 1972;
- Employee State Insurance Act; Employees P.F. and Miscellaneous Provision Act, 1952;
- Maternity Benefit Act, 1951;
- Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act (RFCTLARR), 2013, Govt. of India;
- RFCTLARR (Removal of Difficulties) Order, 2015;
- The Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015;
- Scheduled Caste and Scheduled Tribes Orders (Amendment) Act, 2002;
- The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; National Tribal Policy, 2006;
- Payment of Wages Act, 1936;
- Equal Remuneration Act, 1979;
- Inter-State Migrant Workmen's (Regulation of Employment & Conditions of Service) Act, 1979;
- Equal Remuneration Act, 1979 etc.



## D. JICA Safeguard Policy

In accordance with JICA's Guidelines for Environment and Social Considerations (**ESC**) is a pre-requisite for all project funded by JICA. If a significantly adverse impact on the environment or society is identified in JICA-assisted project, following steps are taken:

### 1. ESCs are pre-requisite

- a. JICA will take necessary measures to ensure that the appropriate ESC is given;
- b. When JICA reviews a project proposal and finds that the project could cause negative impacts on the environment or society, JICA advises the project proponents to provide appropriate ESC;
- c. If the negative impact of the project cannot be avoided or mitigated to an acceptable level, JICA will not support its implementation.

### 2. Respect human rights

- a. Development project should aim for fair distribution of its benefits and must not burden or exclude certain stakeholders for the sake of others;
- b. The project proponents must respect the rights of all people concerned, and pay special attention to vulnerable social groups such as women, elderly, the poor, people with disabilities, indigenous peoples, ethnic minorities, and other minority groups to ensure that they are involved in decision-making processes and that they benefit from the project;
- c. JICA's ESC Guidelines defines 'stakeholders' as local residents including non- titleholders who are affected by the project as well as local NGOs. By involving local stakeholders from the early stage of the project, the project proponents can receive their inputs and plan appropriate measures to address their concerns, avoid conflict, and achieve higher results with their support. For this reason, the project proponents should conduct a series of consultations with local stakeholders in an interactive and meaningful manner. During this process, appropriate consideration must be given to socially vulnerable or different people such as women, children, the elderly and ethnic minorities.

### 3. Avoid adverse impacts

- a. Priority should be given to the avoidance of adverse impacts on the environment or society when a project is planned;
- b. Minimization or mitigation of impacts should be considered only if avoidance is not feasible and if the benefit of the project outweighs the cost of mitigation measures;
- c. The project proponents must assess the environmental and social impacts at the earliest possible stage of planning, and implement ESC measures in accordance with the ESC Guidelines.

### 4. Information on ESC must be disclosed to the public

- a. Information disclosure is key in ESC. Project proponents must proactively release relevant information to the public;
- b. Sharing information with a wide range of stakeholders from the early stage, the project proponents can utilize their feedback to improve the plan/project. In addition, the project proponents can ensure that unnecessary concerns and misunderstandings among the stakeholders are ameliorated.

### 5. Host country's laws, standards, policies and plans

- a. JICA-funded project must comply with the laws, standards, policies, and plans of the host country;



- b. If the standard set by the host country differs from the international standard, the project proponents are advised to adopt international standard that better serves the purpose of attaining a higher level of ESC.

#### **D.1. Categorization of the Project as per JICA Safeguard Policy**

Projects in sensitive sectors, projects that have characteristics that are liable to cause adverse environmental impacts, and projects located in or near sensitive areas are considered as Category A project as per JICA guideline (April 2010). In accordance with Appendix 3 of JICA Guideline, flood plain and erosion prone areas are considered as sensitive areas (Sl. No. 7). Hence the project road is located in flood prone area and soil erosion is one of the major environmental issue, it comes under category A project as per JICA guidelines for environmental and social considerations (April, 2010).

### **3. PROJECT DESCRIPTION**

#### **A. Introduction**

The project road is currently a single lane/ Intermediate road. The total length of the road is about 54.154 km (as per Design length). The road project is to provide NH standard connectivity to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 54.154 km (As per design chainage) from Srirampur on NH-27(old NH-31 C) at Chainage 0.00.

The project road is of significant importance as the road connecting two National Highways (NH31C and NH-31), one proposed bridge over river Brahmaputra and connects to important nearby villages. The project road is traverses in plain terrain passing through rural areas as well as few intermittent semi-urban and urban settlements. In rural areas the land use on both sides is agricultural land/open spaces interspersed with small structures. The abutting land use in the built-up areas is predominantly residential and semi-commercial. Few Educational institutions and worship places exist along the roads in some of the villages and semi-urban sections. It is observed that the vertical alignment of the road is quite flat except at few bridge and culvert locations. The existing formation height of the project road varies from 2m to 5 m and even more at approaches to bridges, where it is higher. In some stretches it is flushing with GL resulting in serious drainage problems.

#### **B. Project Type**

The improvement proposal consist of improvement to existing carriageway by reconstruction/new construction/ widening to two/four Lane with Paved Shoulders. The improvement proposal includes improvement to geometrically deficient curves and grades to meet the geometrical standards, Proposed New Bypasses and Realignment. All existing minor and major bridges proposed for reconstruction / widening / new construction as per standards of MoRT&H. It is also proposed reconstruction / widening / new construction of Hume Pipe Culverts / Slab drains to meet the National Highway standards.

#### **C. Project Details**

##### **C.1. Project Location**

The road name as per TOR/Contract is NH-127B starting from Srirampur on NH-27(old NH-31 C) to the immediate approach of proposed bridge over river Brahmaputra near Dhubri in the state of Assam. The project road lies in Kokrajhar and Dhubri district of Assam. The road runs through five Police Stations namely, Srirampur, Tamarhat, Dhubri, Gouripur and Gossaigaon Police Station.

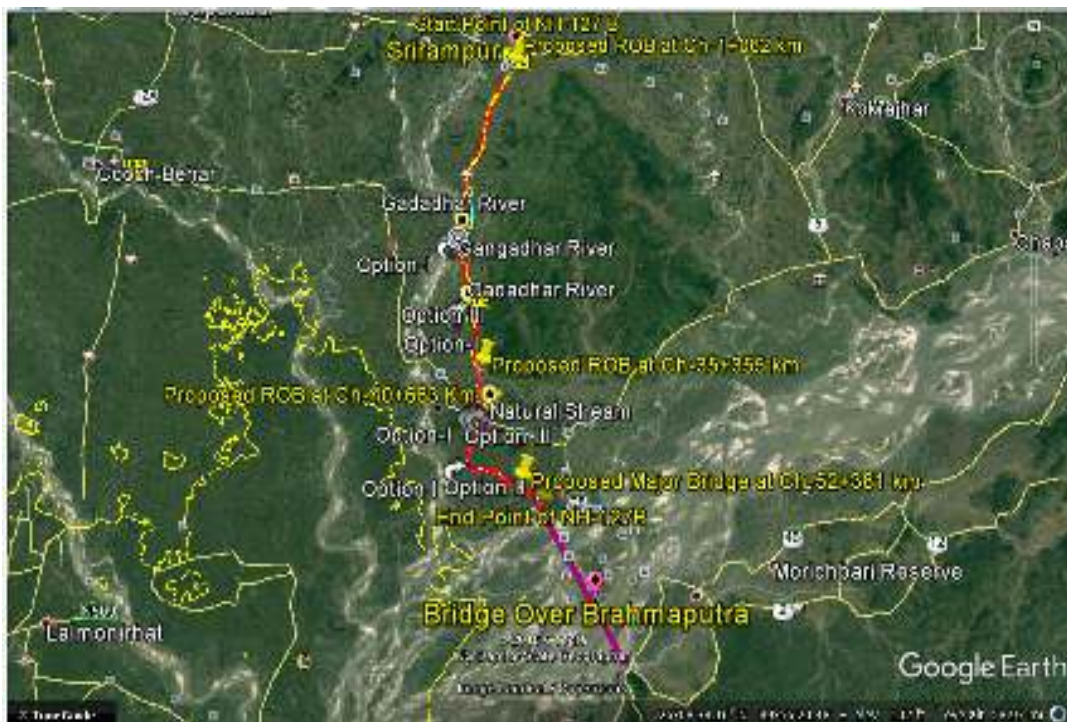


Figure 3: Existing Road Alignment of Srirampur to Dhubri road stretch on satellite imagery

## C.2. Settlement along the project road

Project Road traverse through mainly semi-urban and rural settlements. From start chainage it passes through 27 settlements, i.e. Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, DebduttaHazardaha 1, Kachari Hat, DebduttaHazardaha 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari and ends at immediate approach of proposed bridge over river Brahmaputra near Dhubri. Surrounding road network and places along the project road is shown in Figure 4.

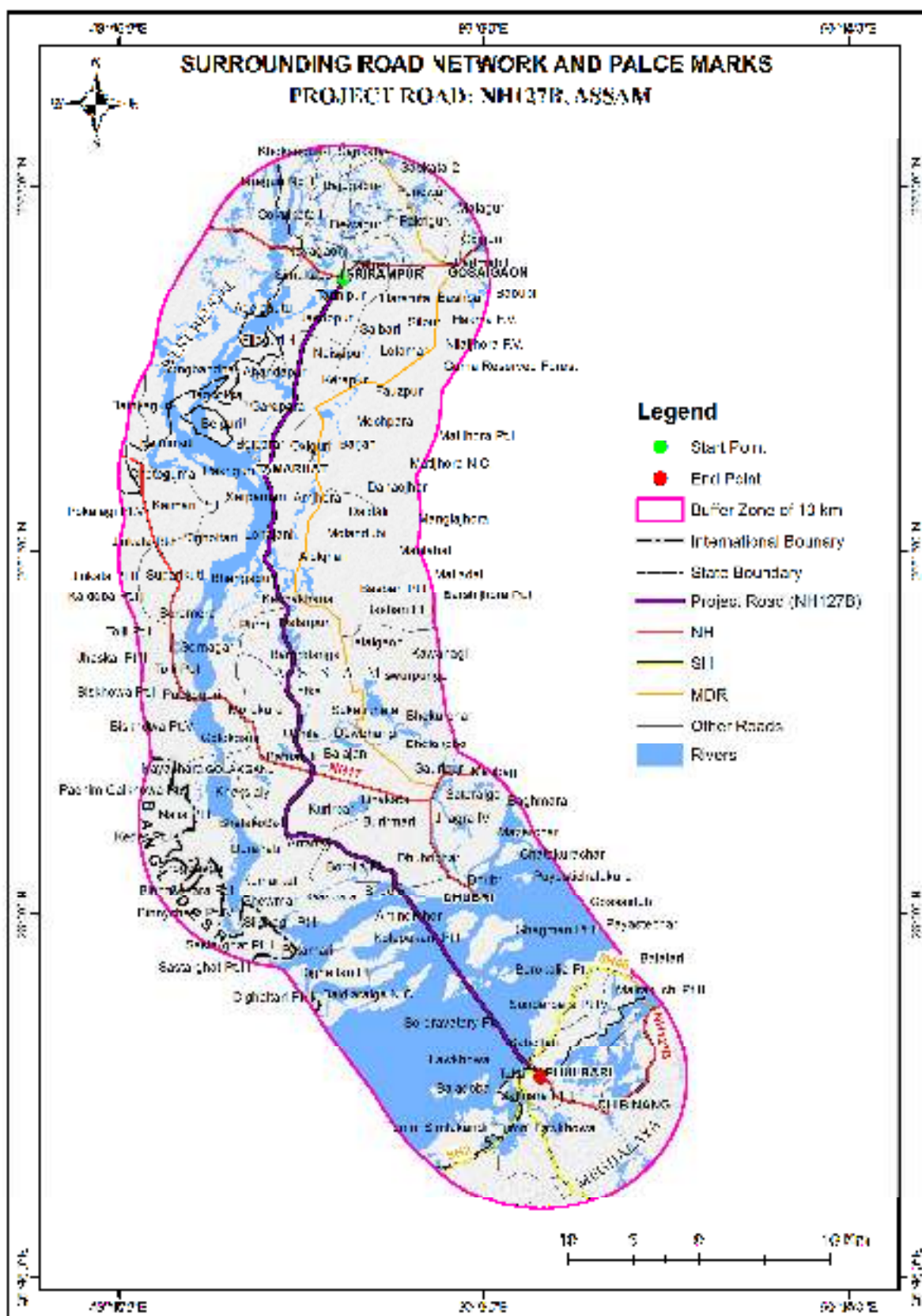


Figure 4: GIS Map showing the project alignment and road network



### C.3. Terrain type

The project road passes through Plain terrain. The topography is mostly rural in nature. Satellite Image of terrain classification of the project road area is shown in Figure 5.

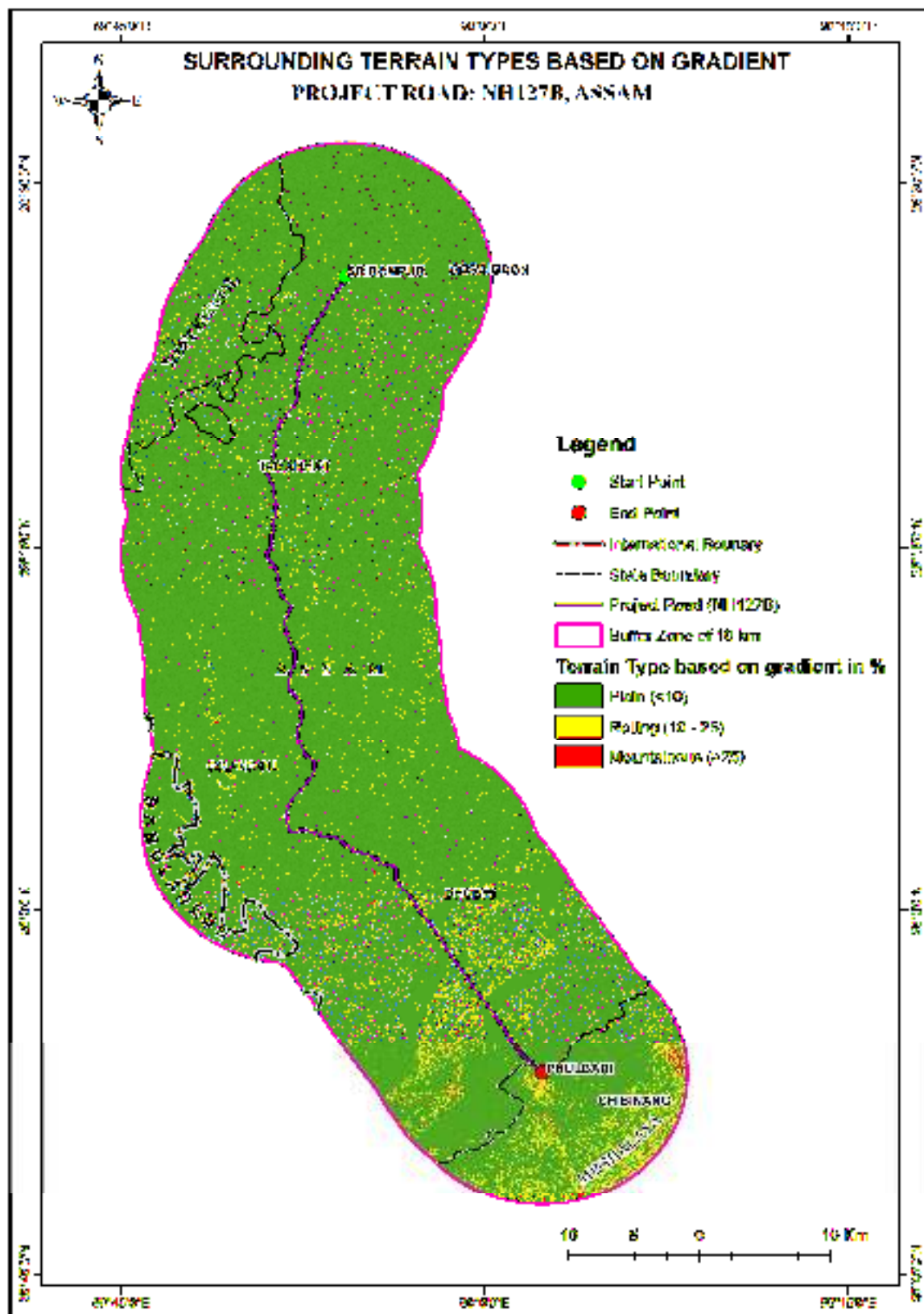


Figure 5: Satellite Image of terrain classification for subproject Area

### C.3. Land Use Pattern

The land use of the project road stretch is mainly road side plantation, agricultural area. Some of stretches have settlement and residential structures having Rural / semi-urban character.

### C.4. Right of Way (ROW)

The existing ROW of project road has been observed to be around 20m to 30m. However, the existing ROW does not cater to the codal provision of 60m ROW for plain road and hence land is required to be acquired to adhere to the codal provision. The proposed ROW is 45m-60m. The project road doesn't have sufficient RoW for proposed upgradation and widening. The actual additional land requirements can be assessed when the design philosophy, necessity and locations of bypasses are decided and. The additional land requirement and land actuation related details are provided separately in Land Acquisition Plan (LAP).

The concept of development improvement & construction of the project highway to Two/Four Lane with Paved Shoulders is for reduction in transport cost, enhanced safety & Level of Service for road users, with superior operation & maintenance enabling enhanced operation efficiency, minimal adverse impact on the local population, minimal adverse impact on environment, minimal land acquisition by appropriate engineering solutions. The preliminary designs of the major components are carried out for the alternative alignment options of project road.

### C.5. Pavement Condition

The existing bituminous road surface has been classified into poor, and failed on visual inspection and BBD test. Pavement has been found to poor with absolutely cracking, raveling, rutting and potholes almost the full stretch and some proportion DBM and WBM layer fully exposed. Existing pavement thickness has been found to vary from 60 mm to 1000 mm.

### C.6. Main Carriage Way

The existing carriageway width is generally 3.70m to 6.00m. The geometric of existing alignment was reviewed based on survey drawing and data showing the existing road alignment and it is revealed that horizontal alignment and vertical profile at most of the places are deficient in geometrics.

### C.7. Typical Cross Section Details

The **Error! Reference source not found.** showing below is the proposed project length after geometric improvement of the project road.

**Table 7: Widening/Improvement Proposal**

| Package | Proposed Chainage |       | Length (m) | TCS     | TCS Details                                                                                                             |
|---------|-------------------|-------|------------|---------|-------------------------------------------------------------------------------------------------------------------------|
|         | From              | To    |            |         |                                                                                                                         |
| I       | 0                 | 420   | 420        | TCS -1B | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (With New Sub-Grade)                   |
|         | 420               | 1780  | 1360       | TCS -5A | 4-Lane Carriageway for flexible pavement with Both side RE Wall & Service Road                                          |
|         | 1780              | 10900 | 9120       | TCS -2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
| II      | 10900             | 12700 | 1800       | TCS -2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|         | 12700             | 14650 | 1950       | TCS-1A  | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (dismantling upto Existing GSB Layer ) |
|         | 14650             | 15550 | 900        | TCS -2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |

|     |           |       |      |          |                                                                                                                         |
|-----|-----------|-------|------|----------|-------------------------------------------------------------------------------------------------------------------------|
|     | 1555<br>0 | 17000 | 1450 | TCS-4A   | Reconstruction of 4-Lane carriageway Rigid Pavement with both side Drain (dismantling upto Existing GSB Layer)          |
|     | 1700<br>0 | 20300 | 3300 | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|     | 2030<br>0 | 23050 | 2750 | TCS - 3  | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |
|     | 2305<br>0 | 23200 | 150  | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|     | 2320<br>0 | 23550 | 350  | TCS-1B   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (with New Sub-Grade)                   |
|     | 2355<br>0 | 26705 | 3155 | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|     | 2670<br>5 | 27226 | 521  | TCS-4B   | Reconstruction of 4-Lane carriageway Rigid Pavement with both side Drain (with New Sub-Grade)                           |
|     | 2722<br>6 | 27650 | 424  | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
| III | 2765<br>0 | 27870 | 220  | TCS-1B   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (with New Sub-Grade)                   |
|     | 2787<br>0 | 28450 | 580  | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|     | 2845<br>0 | 30350 | 1900 | TCS-3    | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |
|     | 3035<br>0 | 34300 | 3950 | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|     | 3430<br>0 | 34450 | 150  | TCS-1B   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (with New Sub-Grade)                   |
|     | 3445<br>0 | 34645 | 195  | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|     | 3464<br>5 | 36070 | 1425 | TCS - 5A | 4-Lane Carriageway for flexible pavement with Both side RE Wall & Service Road                                          |
|     | 3607<br>0 | 36500 | 430  | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
| IV  | 3650<br>0 | 36900 | 400  | TCS-1A   | Re-Construction of 4-Lane Carriageway for flexible pavement with Both side drain (dismantling upto Existing GSB Layer ) |
|     | 3690<br>0 | 39150 | 2250 | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |
|     | 3915<br>0 | 39370 | 220  | TCS-3    | New Construction of 4-Lane Carriageway for flexible Pavement                                                            |
|     | 3937<br>0 | 40700 | 1330 | TCS-5B   | 4-Lane Carriageway for flexible pavement with Both Side RE Wall                                                         |
|     | 4070<br>0 | 41250 | 550  | TCS - 5A | 4-Lane Carriageway for flexible pavement with Both side RE Wall & Service Road                                          |
|     | 4125<br>0 | 42550 | 1300 | TCS - 2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                                          |



|          |           |       |      |             |                                                                                                            |
|----------|-----------|-------|------|-------------|------------------------------------------------------------------------------------------------------------|
|          | 4255<br>0 | 43300 | 750  | TCS-3       | New Construction of 4-Lane Carriageway for flexible Pavement                                               |
| <b>v</b> | 4330<br>0 | 45650 | 2350 | TCS -<br>2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                             |
|          | 4565<br>0 | 46350 | 700  | TCS-3       | New Construction of 4-Lane Carriageway for flexible Pavement                                               |
|          | 4635<br>0 | 47750 | 1400 | TCS -<br>2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                             |
|          | 4775<br>0 | 48400 | 650  | TCS-3       | New Construction of 4-Lane Carriageway for flexible Pavement                                               |
|          | 4840<br>0 | 49400 | 1000 | TCS -<br>5A | 4-Lane Carriageway for flexible pavement with Both side RE Wall & Service Road                             |
|          | 4940<br>0 | 51590 | 2190 | TCS -<br>2B | Re-Construction of 4-Lane Carriageway for flexible pavement with New Sub-Grade                             |
|          | 5159<br>0 | 52000 | 410  | TCS-7       | New construction of 4-Lane carriageway for flexible Pavement with High Embankment                          |
|          | 5200<br>0 | 53550 | 1550 | TCS-6       | New construction of 4-Lane carriageway for flexible Pavement with Both Side Service Road & Retaining Wall. |
|          | 5355<br>0 | 54154 | 604  | TCS-7       | New construction of 4-Lane carriageway for flexible Pavement with High Embankment                          |

### C.8. Intersections

The existing project road has a number of junctions mainly with village roads. Junctions have been classified into “Major” and “Minor” junctions according to functional importance and future prospects. At most of “Major” junctions channelized at-grade junction improvement has been proposed. Traffic island and rotary have been provided wherever necessary to channelize flow of traffic and minimize collision points and increase road safety. There are 2 nos. major junctions in the project road, among them 1 no location is proposed to be improved at grade and improvement of other location is done with a provision of 1 no ROB with grade separator of span 1x18m T-Beam + 4x36m RDSO +1x16m T-Beam at the following locations in the table below.

**Table 8: Major junction along the project road**

| SI No | Package   | Existing Chainage (Km) | Proposed Chainage (Km) | Type     | Location                                | Improvement Proposal                                            |
|-------|-----------|------------------------|------------------------|----------|-----------------------------------------|-----------------------------------------------------------------|
| 1     | Package-1 | 0                      | 0                      | 4-legged | Intersection With NH-31C & Village Road | At-grade 4-Legged Junction with turning radius, traffic islands |
| 2     | Package-4 | 42.25                  | 40.600                 | 3-legged | Intersection with NH-31                 | ROB at Ch. 40.600 km                                            |

### C.9. Details of Service Roads

Service Roads have been proposed in the project stretch. Total 11.17 km of service roads are planned for entire highway. The details of the service road are given below;

**Table 9: Details of Service Road**

| Sl. No.                      | Package   | Design Chainage(m) |       | Length (m) | Both Sides | Net Length (m) |
|------------------------------|-----------|--------------------|-------|------------|------------|----------------|
|                              |           | From               | To    |            |            |                |
| 1                            | Package-1 | 420                | 1780  | 1360       | 2          | 2720           |
| 2                            | Package-3 | 34645              | 36070 | 1425       | 2          | 2850           |
| 3                            | Package-4 | 40700              | 41250 | 550        | 2          | 1100           |
| 4                            | Package-5 | 48400              | 49400 | 1000       | 2          | 2000           |
| 5                            |           | 52000              | 53550 | 1550       | 2          | 2500           |
| Total Length of Service Road |           |                    |       |            |            | 11170          |

### C.10. Major and Minor Bridges

Bridges, culverts form a vital link between the road sections and are basic infrastructure elements in any highway network. Bridges, in India, are categorized as follows:

|              |                                           |
|--------------|-------------------------------------------|
| Major Bridge | Total length exceeding 60 m               |
| Minor Bridge | Total length upto 60 m, but exceeding 6 m |
| Culverts     | C D Works of length upto 6 m.             |

The existing alignment includes 9 Nos. of bridges. However, due to realignment 1 minor bridge would be bypassed. All together 3 nos. of existing minor bridges (including 2nos. wooden bridges) have been proposed for reconstruction. Whereas remaining 5 Nos. of existing bridges (4 nos. Minor Bridge & 1 no. Major Bridge) has been proposed for widening with new 2 lane bridge. Moreover 4 no. of new minor bridges has been included in the project road. All existing minor and major bridges proposed for reconstruction / widening / new construction as per standards of MoRT&H. Details of major and minor bridges are given below;

**Table 10: List of omitted bridges due to realignment**

| SI No. | Existing Chainage (km) | Existing          |                             |                                  |
|--------|------------------------|-------------------|-----------------------------|----------------------------------|
|        |                        | Type of Water Way | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) |
| 1      | 29.200                 | Nala              | RCC Slab Bridge             | 2 x 12m                          |

**Table 11: Details of Minor bridges with additional two lane**

| SI No. | Survey Chainage (km) | Proposed Chainage (km) | Existing          |                             |                                  | Proposal                    |                               |
|--------|----------------------|------------------------|-------------------|-----------------------------|----------------------------------|-----------------------------|-------------------------------|
|        |                      |                        | Type of Water Way | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) | Type of Structures (Bridge) | Span Arrangement (No.xSpan) m |
| 1      | 7+300                | 7+241                  | Open Land         | Bridge(RC C Box)            | 4x4m                             | Minor Bridge                | Box Bridge 4mx4.066m x 4cell  |
| 2      | 24+400               | 23+999                 | Nala              | RCC Slab Bridge             | 2 nos. x 12m span                | Minor Bridge                | 2x 12m (Integral Slab)        |
| 3      | 31+500               | 30+408                 | Nala              | Bridge (T-Beam Girder)      | 1 x 19.6m                        | Minor Bridge                | 1x 21m (T-Beam)               |
| 4      | 45+800               | 44+645                 | Water Logged      | Bridge (PSC T-Beam Girder)  | 40.80m                           | Minor Bridge                | 1x 41m (PSC)                  |

**Table 12: Details of Minor bridges New Construction**

| Sl No. | Proposed Chainage (km) | Existing         |                             |                                 | Proposal                    |                               |
|--------|------------------------|------------------|-----------------------------|---------------------------------|-----------------------------|-------------------------------|
|        |                        | Type of WaterWay | Type of Structures (Bridge) | Span Arrangement (No.xSpan) (m) | Type of Structures (Bridge) | Span Arrangement (No.xSpan) m |
| 1      | 21+140                 | Gadadhar Rvier   |                             |                                 | Minor Bridge                | 2x 18m (T-Beam)               |
| 2      | 21+871                 | Gadadhar Rvier   |                             |                                 | Minor Bridge                | 2x 18m (T-Beam)               |
| 3      | 28+974                 | Gadadhar Rvier   |                             |                                 | Minor Bridge                | 2x 24m (T-Beam)               |
| 4      | 30+050                 | Gadadhar Rvier   |                             |                                 | Minor Bridge                | 3x 18m (T-Beam)               |

**Table 13: Minor Bridges Reconstruction as 4 lane**

| Sl No. | Survey Chainage (km) | Proposed Chainage (km) | Existing          |                             |                                  | Proposal                    |                               |
|--------|----------------------|------------------------|-------------------|-----------------------------|----------------------------------|-----------------------------|-------------------------------|
|        |                      |                        | Type of Water Way | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) | Type of Structures (Bridge) | Span Arrangement (No.xSpan) m |
| 1      | 44+000               | 43+100                 | Open Land         | (RCC Box)                   | 4.0X3.0X2.0                      | Minor Bridge                | Box Bridge 4mx3m x 2cell      |
| 2      | 48+750               | 47+286                 | Water Logged      | Wooden Bridge               |                                  | Minor Bridge                | 1x 24m (T-Beam)               |
| 3      | 49+700               | 48+167                 | Water Logged      | Wooden Bridge               |                                  | Minor Bridge                | 1x 24m (T-Beam)               |

**Table 14: Details of Major bridges with additional 2 lane**

| Sl No. | Proposed Chainage (km) | Existing                |                             |                                  | Proposal                    |                                |
|--------|------------------------|-------------------------|-----------------------------|----------------------------------|-----------------------------|--------------------------------|
|        |                        | Type of Water Way       | Type of Structures (Bridge) | Span Arrangement (No x Span) (m) | Type of Structures (Bridge) | Span Arrangement (No x Span) m |
| 1      | 51+536                 | Redundant part of River | (T-Beam Girder)             | 2 span 42m                       | Major Bridge                | 2x 41m (PSC)                   |



Figure 6: image of existing major bridge at chainage 51+536km

### C.11. Culverts

There are 55 nos. of existing culverts out of which 28 nos. are Pipe culverts, 1 no. is RCC Box culvert, 25 nos. are RCC slab culverts, and 1 no. Remaining culverts is fully chocked. Reconstruction has been proposed for 49 no. existing culverts and additional 69 no. new culverts are also proposed in the project road.

### C.12. Vehicular Underpass/Light Vehicular Underpass

3 Vehicular Underpass and 1 Light Vehicular Underpasses are proposed at the following locations mentioned below.

Table 15: Location of Vehicular/Light Vehicular Underpass (VUP/LVUP)

| Sl. No. | Design Chainage (km) | Type of Structure | Span Arrangement (No. x Span)m |
|---------|----------------------|-------------------|--------------------------------|
| 1       | 39.700               | VUP               | 1x15m(Integral Slab)           |
| 2       | 48.810               | VUP               | 1x15m(Integral Slab)           |
| 3       | 52.353               | VUP               | 1x15m(Integral Slab)           |
| 4       | 53.191               | LVUP              | 1x15m(Integral Slab)           |

### C.13. Road Over Bridges (ROB) and Level Crossing

There is no existing manned railway crossing (LC)/ROB in the existing project road stretch. However, 3 numbers of road over bridges are proposed along the project road. Details of ROB are given below.

Table 16: Details of Road Over Bridges(ROB)

| Sl. No. | Design Chainage (km) | Type of Structure        | Span Arrangement(No. x Span)m           |
|---------|----------------------|--------------------------|-----------------------------------------|
| 1       | 1.044                | ROB                      | 8x 36m RDSO                             |
| 2       | 35.355               | ROB                      | 1x18m T-Beam + 3x36m RDSO+ 1x18m T-Beam |
| 3       | 40.637               | ROB With grade separator | 1x18m T-Beam + 4x36m RDSO +1x16m T-Beam |

## C.14. Bypasses

There are 3 numbers of by pass proposed along the project road. Details of bypass are given below.

**Table 17: details of Bypasses**

| Sl. No | Type   | Chainage (km) |        | Length (km) |
|--------|--------|---------------|--------|-------------|
|        |        | From          | To     |             |
| 1      | Bypass | 20+300        | 23+100 | 2.800       |
| 2      | Bypass | 28+450        | 30+400 | 1.950       |
| 3      | Bypass | 39+100        | 41+200 | 2.100       |
| total  |        |               |        | 6.850       |

## C.15. Slope Protection/Protection work

Fillings in slopes have been involved in widening the road to 2/4-lane configuration including the high-embankment in bridge approaches. Predominant nature of the soil in the slopes is to be grader-trimmed machined earth of ordinary/heavy type available in the locality. A natural slope of 1:1.5 and flatter, found stable with adequate factor of safety, has been proposed. Protection of the cut and fill slopes will be provided with turfs grown by mulching and seeding.

Protection works in the major bridge will be provided matching the protection work used in the existing bridges. IRC-89-1997 will be followed in detailing the protection works.

- Return walls of required length will be provided in all bridges and culverts to stop the spilling of earth into the waterway,
- Flooring will be provided over both side of the base raft of culverts to guard against deterioration of the base raft
- Perimetral cut-off walls around the base raft of culverts and boulder apron on both upstream and downstream sides will be provided to reduce the scouring,

The perimetral cut-off walls will also increase the effective depth of foundation in addition to their protective functions.

## C.16. Miscellaneous Works

**Provision of signs and road markings proposed to ensure road safety-** Retro reflective road signs shall be provided at all locations necessitating informatory, Cautionary and Mandatory signs as per guidelines given in IRC : 35 – 1997 and IRC : 67 – 2001 for road markings, painting and signage systems. In addition to this proper safety signs and marking shall be provided at all busy crossings for safety of traffic and pedestrians. For visibility at night times all road sections passing through built up areas shall be provided with lighting system as per standards and specifications.

**Metal Beam Crash Barriers (MBCB)** - Metal Beam Crash Barriers are proposed on both edges of road embankments where the height is more than 3.00 m on both sides of main carriageway. The metal Beam Crash Barrier shall consist of W – Beam fixed on posts (15 MB150) placed at 5.0 m apart c/c with spacers (also 15 MB – 150). Reflectors shall be fixed on the Metal Beams @ 3m c/c for proper delineation of barrier line.

**Guard Posts-** Standard Guard Posts made of M-20 grade concrete fixed with M-20 grade concrete foundation proposed to be provided on inner and outer edges of road with sharp curves, road on hill side at 1.50 m intervals and 2.00 m from the edge of carriageway with reflectors fixed on it.

**200 m, Kilometre and 5th km. stones-** These stones shall be fixed as per guidelines of IRC : 8 and IRC : 26 with lettering and numbering as per code provisions. These shall be fixed on LHS for each direction of travel.

**Delineators-** Delineators are provided for visual assistance to drivers to follow and negotiate the alignment of road ahead and provide warning about hazards particularly at night times. Various types in use are:-

- Clustered Red Reflectors on triangular nodes as object markers are provided at the edge of median and directional islands.
- Circular red reflectors on face / top of islands and medians.
- Circular white Reflectors on Guard Posts.

**Boundary Stones-** Road Boundary stones shall be fixed on both sides of the road to demarcate the boundary of new ROW. These shall be fixed with proper founding concrete and dowel bars to guard against tampering.

**Traffic Signals-** All at grade junctions in built up areas shall be provided with traffic signals. These shall be provided as per safety manual.

**Lighting System-** All road stretch passing through built up area shall be provided with lighting system erected on poles with adequate height and 30 m c/c., such that it shall provide uniform illumination of 40 lux minimum at all places.

**Landscaping and Arboriculture** - The environment along the proposed corridor shall be enhanced using various techniques of soft landscapes, principally through plantation of various types of shade and ornamental trees along with shrubs. Landscaping strategy has been developed to enhance the visual quality of the project road. Tree plantations have manifold benefits. They may help in reducing the air pollution levels, especially Suspended Particulate Matter (SPM) in the surrounding area. A marginal decrease of 3 to 4 dB (A) in noise levels may also be expected due to the plantation used for landscaping. The scheme of Landscaping shall be part of overall Environmental Mitigation Plan (EMP). The planting shall be such that it does not obstruct the visibility of traffic from any side and shall be pleasing in appearance.

## D. Traffic Projection

Two homogeneous sections have been identified for traffic study.

### • Homogeneous section-1

From the traffic projection it is seen that the PCU of project road from Km 0+000 to Km 38+990 (homogeneous section 1) is within 18000 upto the year 2034, so as per IRC:SP 73-2015 two lane with paved shoulder is sufficient up to 2034, but 4 Lane cross section has been adopted as per instruction received from NHIDCL vide Minutes of 56th meeting of executive committee Dated: 27.08.2018. The road is designed for 15 years design life as per IRC-37 2012.

### • Homogeneous section-2

From the traffic projection it is seen that the PCU of the project road for homogeneous section-2 (from Km 38+990 to Km 54+523) reaches 18000 PCU in the year 2028 which is 8 years after the opening of traffic on the project road. So that portion of the project road i.e. from Km 38+990 to Km 54+523 is proposed to construct as 4-lane with paved shoulder.

In 53.6 km long project road traffic survey has been done at 5 below mentioned locations. Classified traffic volume count has been detailed in below mentioned table.



**Table 18: Classified Traffic Volume Count**

| Vehicle Type                                 | ON NH-127B (Near Chowmore) | ON NH-31     | Probable diverted traffic from NH 31 to NH-127B | ON NH-31C   | Probable diverted traffic from NH 31C to NH-127B | Expected traffic on NH-127B after completion |
|----------------------------------------------|----------------------------|--------------|-------------------------------------------------|-------------|--------------------------------------------------|----------------------------------------------|
| Two Wheeler                                  | 1535                       | 1477         | 0                                               | 1545        | 0                                                | 1535                                         |
| Car/Jeep/Van/Taxi/Auto                       | 1070                       | 2344         | 703                                             | 1976        | 99                                               | 1872                                         |
| Mini Bus                                     | 0                          | 121          | 93                                              | 75          | 7                                                | 101                                          |
| Standard Bus                                 | 4                          | 145          | 112                                             | 116         | 12                                               | 127                                          |
| LCV                                          | 42                         | 52           | 396                                             | 115         | 0                                                | 42                                           |
| 2-Axle Truck                                 | 41                         | 671          | 531                                             | 329         | 39                                               | 476                                          |
| 3-Axle Truck                                 | 1                          | 932          | 441                                             | 322         | 10                                               | 542                                          |
| Multi-Axle                                   | 0                          | 658          | 0                                               | 767         | 23                                               | 464                                          |
| Tractor With Trailer                         | 41                         | 106          | 0                                               | 11          | 0                                                | 41                                           |
| Tractor Without Trailer                      | 13                         | 22           | 0                                               | 2           | 0                                                | 13                                           |
| Cycle                                        | 1374                       | 533          | 0                                               | 631         | 0                                                | 1374                                         |
| Cycle Rickshaw                               | 116                        | 89           | 0                                               | 100         | 0                                                | 116                                          |
| Hand Cart                                    | 6                          | 5            | 0                                               | 15          | 0                                                | 6                                            |
| Bullock Cart                                 | 0                          | 1            | 0                                               | 1           | 0                                                | 0                                            |
| Horse Cart                                   | 0                          | 5            | 0                                               | 1           | 0                                                | 0                                            |
| <b>Total Motorized Vehicles (Number)</b>     | <b>2747</b>                | <b>6529</b>  | <b>2277</b>                                     | <b>5257</b> | <b>190</b>                                       | <b>5214</b>                                  |
| <b>Total Non Motorized Vehicles (Number)</b> | <b>1497</b>                | <b>633</b>   | <b>0</b>                                        | <b>747</b>  | <b>0</b>                                         | <b>1497</b>                                  |
| <b>Total Commercial Vehicle per day</b>      | <b>142</b>                 | <b>2708</b>  | <b>1574</b>                                     | <b>1737</b> | <b>91</b>                                        | <b>1807</b>                                  |
| <b>Total PCU per day</b>                     | <b>3181</b>                | <b>11429</b> | <b>5946</b>                                     | <b>8625</b> | <b>396</b>                                       | <b>9523</b>                                  |

Traffic projections from year 2015 to 2035 were collected as presented in Table 19 and Table 20.



Table 19: Traffic Projection of Project Road for Homogeneous section-1 from Km 0+000 to Km 38+990

| Year | Growth Factors | AADT        |                             |                       |               |     |        |         |            |                                 |                                       | Total in Numbers | Total in PCU |
|------|----------------|-------------|-----------------------------|-----------------------|---------------|-----|--------|---------|------------|---------------------------------|---------------------------------------|------------------|--------------|
|      |                | Two Wheeler | Car/Jeep/<br>Van/Taxi/ Auto | Mini /<br>RTVs<br>Bus | Stand.<br>Bus | LCV | 2-Axle | 3 -Axle | Multi-Axle | Agri.<br>Tract. With<br>Trailer | Agri.<br>Tract.<br>Without<br>Trailer |                  |              |
| 2015 | 5.0%           | 1825        | 1055                        | 62                    | 92            | 10  | 93     | 16      | 58         | 28                              | 2                                     | 5837             | 4912         |
| 2016 | 5.0%           | 1916        | 1108                        | 65                    | 97            | 11  | 98     | 17      | 61         | 29                              | 2                                     | 6128             | 5157         |
| 2017 | 5.0%           | 2012        | 1163                        | 68                    | 102           | 11  | 103    | 18      | 64         | 30                              | 2                                     | 6435             | 5415         |
| 2018 | 5.0%           | 2113        | 1221                        | 72                    | 107           | 12  | 108    | 19      | 68         | 32                              | 2                                     | 6757             | 5686         |
| 2019 | 5.0%           | 2218        | 1282                        | 75                    | 112           | 13  | 114    | 20      | 71         | 34                              | 2                                     | 7094             | 5970         |
| 2020 | 5.0%           | 2329        | 1346                        | 79                    | 118           | 13  | 119    | 21      | 75         | 35                              | 2                                     | 7449             | 6269         |
| 2021 | 5.0%           | 2446        | 1414                        | 83                    | 124           | 14  | 125    | 22      | 78         | 37                              | 2                                     | 7822             | 6582         |
| 2022 | 5.0%           | 2568        | 1484                        | 87                    | 130           | 15  | 132    | 23      | 82         | 39                              | 3                                     | 8213             | 6911         |
| 2023 | 5.0%           | 2696        | 1559                        | 92                    | 137           | 15  | 138    | 24      | 86         | 41                              | 3                                     | 8623             | 7257         |
| 2024 | 5.0%           | 2831        | 1636                        | 96                    | 143           | 16  | 145    | 26      | 91         | 43                              | 3                                     | 9054             | 7620         |
| 2025 | 5.0%           | 2973        | 1718                        | 101                   | 151           | 17  | 152    | 27      | 95         | 45                              | 3                                     | 9507             | 8001         |
| 2026 | 5.0%           | 3121        | 1804                        | 106                   | 158           | 18  | 160    | 28      | 100        | 47                              | 3                                     | 9982             | 8401         |
| 2027 | 5.0%           | 3278        | 1894                        | 111                   | 166           | 19  | 168    | 30      | 105        | 50                              | 3                                     | 10482            | 8821         |
| 2028 | 5.0%           | 3441        | 1989                        | 117                   | 174           | 19  | 176    | 31      | 110        | 52                              | 3                                     | 11006            | 9262         |
| 2029 | 5.0%           | 3613        | 2089                        | 123                   | 183           | 20  | 185    | 33      | 116        | 55                              | 4                                     | 11556            | 9725         |
| 2030 | 5.0%           | 3794        | 2193                        | 129                   | 192           | 21  | 194    | 34      | 122        | 58                              | 4                                     | 12134            | 10211        |
| 2031 | 5.0%           | 3984        | 2303                        | 135                   | 202           | 23  | 204    | 36      | 128        | 60                              | 4                                     | 12740            | 10722        |
| 2032 | 5.0%           | 4183        | 2418                        | 142                   | 212           | 24  | 214    | 38      | 134        | 63                              | 4                                     | 13377            | 11258        |
| 2033 | 5.0%           | 4392        | 2539                        | 149                   | 222           | 25  | 225    | 40      | 141        | 67                              | 4                                     | 14046            | 11821        |
| 2034 | 5.0%           | 4612        | 2666                        | 157                   | 234           | 26  | 236    | 42      | 148        | 70                              | 5                                     | 14749            | 12412        |
| 2035 | 5.0%           | 4842        | 2799                        | 165                   | 245           | 27  | 248    | 44      | 155        | 73                              | 5                                     | 15486            | 13032        |

**Table 20: Traffic Projection of Project Road for Homogeneous section-2 from Km 38+990 to Km 54+523**

| Year | Growth Factors | AADT        |                          |                 |           |     |        |         |            |                           |                              | Total in Number s | Total in PCU |
|------|----------------|-------------|--------------------------|-----------------|-----------|-----|--------|---------|------------|---------------------------|------------------------------|-------------------|--------------|
|      |                | Two Wheeler | Car/Jeep/ Van/Taxi/ Auto | Mini / RTVs Bus | Stand Bus | LCV | 2-Axle | 3 -Axle | Multi-Axle | Agri. Tract. With Trailer | Agri. Tract. Without Trailer |                   |              |
| 2015 | 5.0%           | 1535        | 1872                     | 101             | 127       | 42  | 476    | 542     | 464        | 41                        | 13                           | <b>6711</b>       | <b>9523</b>  |
| 2016 | 5.0%           | 1612        | 1965                     | 106             | 134       | 44  | 500    | 569     | 487        | 43                        | 14                           | 7046              | 9999         |
| 2017 | 5.0%           | 1693        | 2063                     | 111             | 140       | 47  | 525    | 598     | 512        | 46                        | 15                           | 7399              | 10499        |
| 2018 | 5.0%           | 1777        | 2167                     | 117             | 147       | 49  | 551    | 628     | 537        | 48                        | 15                           | 7769              | 11024        |
| 2019 | 5.0%           | 1866        | 2275                     | 123             | 155       | 51  | 578    | 659     | 564        | 50                        | 16                           | 8157              | 11575        |
| 2020 | 5.0%           | 1959        | 2389                     | 129             | 162       | 54  | 607    | 692     | 593        | 53                        | 17                           | 8565              | 12154        |
| 2021 | 5.0%           | 2057        | 2508                     | 135             | 170       | 57  | 638    | 727     | 622        | 55                        | 18                           | 8993              | 12761        |
| 2022 | 5.0%           | 2160        | 2634                     | 142             | 179       | 60  | 670    | 763     | 653        | 58                        | 19                           | 9443              | 13400        |
| 2023 | 5.0%           | 2268        | 2765                     | 149             | 188       | 63  | 703    | 801     | 686        | 61                        | 19                           | 9915              | 14070        |
| 2024 | 5.0%           | 2382        | 2903                     | 157             | 197       | 66  | 738    | 841     | 720        | 64                        | 20                           | 10411             | 14773        |
| 2025 | 5.0%           | 2501        | 3049                     | 164             | 207       | 69  | 775    | 883     | 756        | 67                        | 21                           | 10931             | 15512        |
| 2026 | 5.0%           | 2626        | 3201                     | 173             | 218       | 72  | 814    | 928     | 794        | 71                        | 23                           | 11478             | 16287        |
| 2027 | 5.0%           | 2757        | 3361                     | 181             | 228       | 76  | 855    | 974     | 834        | 74                        | 24                           | 12052             | 17102        |
| 2028 | 5.0%           | 2895        | 3529                     | 190             | 240       | 80  | 897    | 1023    | 875        | 78                        | 25                           | 12654             | 17957        |
| 2029 | 5.0%           | 3040        | 3706                     | 200             | 252       | 84  | 942    | 1074    | 919        | 82                        | 26                           | 13287             | 18854        |
| 2030 | 5.0%           | 3192        | 3891                     | 210             | 264       | 88  | 989    | 1127    | 965        | 86                        | 27                           | 13951             | 19797        |
| 2031 | 5.0%           | 3351        | 4085                     | 220             | 278       | 92  | 1039   | 1184    | 1013       | 90                        | 29                           | 14649             | 20787        |
| 2032 | 5.0%           | 3519        | 4290                     | 231             | 291       | 97  | 1091   | 1243    | 1064       | 95                        | 30                           | 15381             | 21826        |
| 2033 | 5.0%           | 3695        | 4504                     | 243             | 306       | 102 | 1145   | 1305    | 1117       | 99                        | 32                           | 16150             | 22918        |
| 2034 | 5.0%           | 3879        | 4729                     | 255             | 321       | 107 | 1202   | 1370    | 1173       | 104                       | 33                           | 16958             | 24064        |

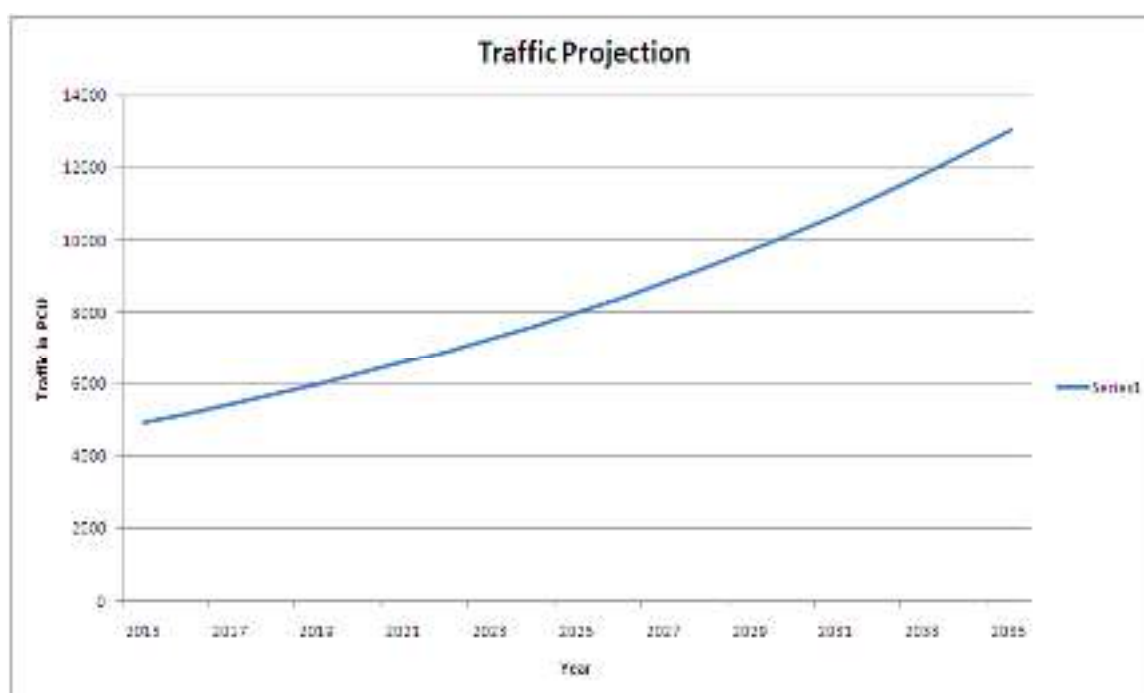


Figure 7: Projected traffic volume increase in the project road

The future traffic generation is carried out based on IRC: 37-2012, 5% growth of traffic is considered for homogeneous section 1 and homogeneous section 2.

## E. Bus Bay

Bus Bay with passenger shelter is provided near village area at 9 locations (both side) in the project road. The details of Bus Bay locations are given below;

Table 21: Location of projected bus bay

| SI no | Package   | Design chainage (km) | Side |
|-------|-----------|----------------------|------|
| 1     | Package-1 | 9+300                | Both |
| 2     | Package-2 | 12+350               | Both |
| 3     |           | 18+300               | Both |
| 4     |           | 22+450               | Both |
| 5     | Package-3 | 29+300               | Both |
| 6     | Package-4 | 37+650               | Both |
| 7     |           | 38+550               | Both |
| 8     |           | 41+600               | Both |
| 9     | Package-5 | 45+500               | Both |

There is no existing truck lay bye on project road. 1 no Truck lay bye is proposed at location mentioned below.

| SI No | Package   | Design Chainage (km) | Side |
|-------|-----------|----------------------|------|
| 1     | Package-2 | 14+750               | Both |

## **F. Utilities Shifting**

Both LT and HT lines run along / across the road at a number of places. At few stretches, telephone lines and water pipes also exist. Telephone, LT lines need relocation in consultation with local electricity authorities. OFC lines are also to be realigned. Strip plans showing relocation of utilities have been prepared and submitted with DPR. Provisions have been made in the cross-section for accommodating Utilities at both over as well as underground as the case may be and a 2.0 m wide strip of land at the extreme of ROW as prescribed in MANUAL are kept for accommodating Utility Services. Provisions contained in IRC: 98 have been followed to accommodate Utility Services for Project Highway in built up area.

## **G. Project Benefits**

Transportation/Highway projects are generally intended to improve the economic and social welfare of the people and the locality.

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

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

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

The construction of the project road in the state of Assam will ensure smooth flow of the traffic. Installation of proper road safety system through signage, barricades, and crash barriers will add to be safety to the traffic. Bus bays, truck lay bays, rest areas, ROBs, service roads are proposed in the project, which shall enhance the road safety

## H. Natural Resources/Materials

Detailed analysis of the availability of water requirement and construction material such as selected soil, hard rock, fine aggregates and coarse aggregates was carried out as part of detailed engineering design. During the investigations borrow areas and quarries for earth, sand & aggregates were identified. Details of the each type of material source are given below:

**Stone Aggregates/Stone Quarries:** Potential approved stone quarries for extraction of aggregates and stone exists at the nearby locations within 100 kms.

**Sand:** The beds of the river Brahmaputra flowing near to the proposed road have medium to fine sand in sufficient quantities with a lead of 05-10 Kms.

**Moorum & Earth:** The good quality laterite moorum will be collected from nearby locality with a lead of 10-20 kms. Barren lands and agricultural land, where the owners are planning to lower the levels of the land for making it irrigated or develop to a pond/fishery ponds will be used for borrow area. The area around and along the proposed project was surveyed for the selection of borrow areas. The survey revealed that adequate materials are available in the borrow areas.

**Fly Ash:** Fly ash should be used, if available within 300 kms approach of the project as per MoEF & CC fly ash notification. Few sources of fly ash available within 300 kms of project road and will be used as per the requirement and suitability.

Table 22: Leads for Various Materials

| Sl. No. | Material               | Place    | Av. Lead (Km.) |
|---------|------------------------|----------|----------------|
| 1       | Sand (Fine)            | Koraghat | 26             |
| 2       | Lime                   | Dhubri   | 1              |
| 3       | Moorum/ Rubbish        | Garubasa | 63             |
| 4       | Stone Metal            | Haraputa | 6              |
| 5       | Stone Boulder          | Haraputa | 6              |
| 6       | Stone Chips, Aggregate | Haraputa | 6              |
| 7       | Coarse Sand            | Koraghat | 26             |
| 8       | Cement                 | Dhubri   | 1              |
| 9       | Steel                  | Dhubri   | 1              |
| 10      | Tar, Bitumen           | Guwhati  | 270            |
| 11      | Bitumen Emulsion       | Guwhati  | 270            |
| 12      | Structural Steel       | Guwhati  | 1              |

## I. Cost Estimation

The estimated cost for widening and strengthening into 4 laning with paved shoulder with all structure, road furniture in all respect is Rs. 1487.70 Crores. The package cost wise breakup is as follow:

| DESCRIPTION OF WORKS |                                                                     | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM<br>(IN LAKHS.) | % of Total<br>Civil Works<br>Cost |
|----------------------|---------------------------------------------------------------------|---------------------------|-------------------------------|-----------------------------------|
| <b>A.</b>            | <b>ROAD WORKS</b>                                                   |                           |                               |                                   |
| 1                    | Site Clearance                                                      | 563.18                    | 10.40                         | 0.63%                             |
| 2                    | Earthwork, Erosion control and Drainages                            | 8,054.06                  | 148.73                        | 8.95%                             |
| 3                    | Sub-Base, Base                                                      | 11,999.69                 | 221.58                        | 13.34%                            |
| 4                    | Bituminous surface                                                  | 11,598.69                 | 214.18                        | 12.89%                            |
| 5                    | Rigid Pavement                                                      | 1,521.36                  | 28.09                         | 1.69%                             |
| 6                    | Traffic signs, Road marking & other road appurteances               | 1,906.98                  | 35.21                         | 2.12%                             |
| 7                    | Drain & Protection Works                                            |                           |                               |                                   |
| a)                   | Drain                                                               | 4,105.43                  | 75.81                         | 4.56%                             |
| b)                   | RE Wall                                                             | 10,559.98                 | 195.00                        | 11.74%                            |
| c)                   | Retaining Wall                                                      | 2,159.68                  | 39.88                         | 2.40%                             |
| d)                   | Toe Wall                                                            | 156.18                    | 2.88                          | 0.17%                             |
| e)                   | Stone Pitching                                                      | 1,911.05                  | 35.29                         | 2.12%                             |
| 8                    | Project Facilities                                                  |                           |                               |                                   |
| a)                   | Bus Bay With Passenger Shelter                                      | 643.04                    | 11.87                         | 0.71%                             |
| b)                   | Truck lay Bye                                                       | 83.25                     | 1.54                          | 0.09%                             |
| 9                    | Service Road                                                        | 3,173.86                  | 58.61                         | 3.53%                             |
| 10                   | Junction                                                            | 2,361.72                  | 43.61                         | 2.63%                             |
| 11                   | Grade Separater                                                     | 1,097.50                  | 20.27                         | 1.22%                             |
|                      | <b>TOTAL FOR ROAD WORKS =</b>                                       | <b>61,551.44</b>          | <b>1,142.96</b>               |                                   |
| <b>B.</b>            | <b>BRIDGES &amp; CULVERTS</b>                                       |                           |                               |                                   |
| 12                   | Major Bridges                                                       | 867.78                    | 16.02                         | 0.96%                             |
| 13                   | Minor Bridges                                                       | 5,274.26                  | 97.39                         | 5.86%                             |
| 14                   | VUP                                                                 | 1,528.10                  | 28.22                         | 1.70%                             |
| 15                   | ROB                                                                 | 12,698.43                 | 234.49                        | 14.11%                            |
| 16                   | Culvert                                                             | 6,522.35                  | 120.44                        | 7.25%                             |
| 17                   | Repairing & Rehabilitation                                          | 25.56                     | 0.47                          | 0.03%                             |
|                      | <b>TOTAL FOR BRIDGE WORKS =</b>                                     | <b>26,916.48</b>          | <b>497.04</b>                 |                                   |
| <b>C.</b>            | <b>TOLL PLAZA</b>                                                   |                           |                               |                                   |
|                      | Toll Plaza                                                          | 1,500.00                  | 27.70                         | 1.67%                             |
| <b>D.</b>            | <b>COST OF CIVIL WORKS (IN LAKHS)</b>                               | <b>89,967.92</b>          | <b>1,661.33</b>               |                                   |
| <b>E.</b>            | <b>GST @ 12% on (D)</b>                                             | 10,796.00                 |                               |                                   |
| <b>F.</b>            | <b>Add Contingencies @ 2.8% over Civil Cost (D)</b>                 | 2,519.00                  |                               |                                   |
| <b>G.</b>            | <b>Supervision Consultancy Charges @ 3% of (D)</b>                  | 2,699.00                  |                               |                                   |
| <b>H.</b>            | <b>Agency Charges @3% of (D)</b>                                    | 2,699.00                  |                               |                                   |
| <b>I.</b>            | <b>Escalation Cost @ 5% during Construction Period(For 1 Years)</b> | 4,498.00                  |                               |                                   |
| <b>J.</b>            | <b>Maintenance Charges @ 2.5% of Civil Works( D)</b>                | 2,249.00                  |                               |                                   |

|           |                                                                           |                    |                 |  |
|-----------|---------------------------------------------------------------------------|--------------------|-----------------|--|
| <b>K.</b> | <b>TOTAL PROVISION FOR GST/ CONTIGENCIES &amp; CENTAGES (E+F+G+H+I+J)</b> | <b>25,460.00</b>   | <b>470.14</b>   |  |
| <b>L.</b> | <b>PRE CONSTRUCTION ACTIVITIES</b>                                        |                    |                 |  |
|           | LA cost with solatium (Approx.)                                           | 23,698.30          | 437.61          |  |
|           | R & R cost with solatium (Approx.)                                        | 9,129.80           | 168.59          |  |
|           | Utility Shifting cost                                                     | 338.70             | 6.25            |  |
|           | Environmental cost                                                        | 1776.00            | 32.79           |  |
|           | <b>Sub Total (L)</b>                                                      | <b>34,941.80</b>   | <b>615.70</b>   |  |
| <b>M.</b> | <b>GRAND TOTAL (M=D+K+L)</b>                                              | <b>1,50,368.72</b> | <b>2,776.68</b> |  |



## 4. ANALYSIS OF ALTERNATIVE

### A. Introduction (Comparison with the zero option)

In the state of Assam, the total freight transport output is likely to be doubled every 7 to 10 years and the passenger transport is also likely to be doubled every in 7 to 10 years. The 'With' and 'without' project scenarios are analysed with this backdrop of requirement of reliable quality infrastructure for sustained growth of state's economy and consequent well-being of its citizens.

The project will have multiple benefits. The project will unlock the potential of development of the area and fast connectivity. This project will also reduce the travel time substantially and it is expected that the journey from Srirampur in 30-40 minutes. The present journey time is more than 2-3 hours. In addition this project road will provide further other benefits like:

- Fast and safe connectivity resulting in saving in fuel, travel time and Total Transportation Cost to the Society;
- Employment opportunities to people;
- Development of local industry, agriculture and handicrafts;
- Transporting, processing and marketing of agricultural products;
- Reduction in accidents;
- Reduction in pollution;
- Opening of opportunities for new occupations;
- Better approach to Medical & Educational services and quick transportation of Perishable goods like fruits , Vegetables and Dairy products; and
- Improved quality of life for people and so on.

Providing better connectivity will ensure that goods and people from areas covered by the road can move in and out of the areas quicker and save time. Increased trade and commerce activity are expected. Accounting just for the savings in the Vehicle Operating Costs makes the project viable. However, there would be an increase in the vehicular pollution-air and noise, in the vicinity of the highway. Some agricultural land will have to be diverted for road use to widen and realignments planned. This construction will result in loss of private properties and loss of living.

If the project is not implemented, there is likelihood that the roads presently carrying the traffic between Srirampur-Dhubri Road will deteriorate further and rampant traffic disruptions will hinder the free flow of the traffic. In the absence of the project, the road agencies responsible for construction and maintenance of NH-127B will also find it extremely difficult to generate funds for such a massive improvement of the road infrastructure from their own resources. Increased air pollution, due to slow moving traffic and congestion, will follow suit. Noise levels in built up portions will rise due to deterioration of the pavement as well as increased honking.

Therefore, "With" project scenario, with its minor adverse impacts is more acceptable than the "Without" project scenario which would mean an aggravation of the existing problems. The potential benefits of the proposed road improvements are substantial and far-reaching both in terms of the geographical spread and time. Hence, it is clear that the implementation of the project will be a definite advantage to State of Assam in order to achieve all-round development of its economy and progress of its people.

### B. Alternative analysis

The criteria for selecting the preferred Alignment based on alternative alignment study are:

- **Design Speed:** The proposed alignment should maintain design speed between 80-100 kmph.
- **Riding Comfort:** The proposed alignment is such that passengers of the vehicle feel comfort while traveling through the proposed Road.

- **Land Acquisition:** Minimum land to be acquired. Try to acquire Govt. land as much as possible and minimum acquisition of existing structures has been used for fixation of proposed alignment.
- **Social Impact & Severance:** The proposed alignment has minimized effect upon the existing structures which minimizes the R&R impact of that locality.
- **Cost Effectiveness:** The Project cost consisting of Civil construction Cost, LA & R&R Utility Shifting cost of the proposed alignment has been kept minimal.
- **Safety:** The proposed alignment has been prepared in such a way that it requires minimum safety hazards along its entire length.
- **Environment:** Lost Forest land Expected Pollution

### C. 'Without Project' Scenario

In the case of 'without project' scenario the existing road carriageway is considered 'as is'. Considering the present traffic volume and potential for growth in near future, the capacity of the present road is insufficient for handling expected traffic volume and calls in for immediate improvements. The poor road conditions, population growth, increase in traffic volumes and the economic development along the project corridor would continue to occur and will exacerbate the present situation. The existing unsafe conditions and the adverse environmental consequences, in terms of impact on ambient air and noise along the roads, would continue to worsen in the absence of the proposed improvements.

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

### D. 'With Project' Scenario

#### D.1. Alternative Alignment Option Study for Bypass in between existing km 20.700 to km23.450 (Near Madhya Petla Village)

##### Legend

| Options  | Symble                                                                              | Node              | Length |
|----------|-------------------------------------------------------------------------------------|-------------------|--------|
| Option-1 |  | A – B – C - D     | 2750m  |
| Option-2 |  | A – E – F – G - D | 2750m  |
| Option-3 |  | A – E – G - D     | 2725m  |



Figure 8: GIS image of Alternative Alignment Option Study for Bypass in between existing km 20.700 to km 23.450

The Comparison for proposed three alignment options are given below

| S. No | Design, Safety & other Parameter | Alignment Option - I (Follows the Existing alignment)                                                          | Alignment Option - II (Red alignment)                                                  | Alignment Option- III (Blue alignment)                                                                                               |
|-------|----------------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1     | Design Speed                     | 100 Kmph                                                                                                       | 100 Kmph                                                                               | 100 Kmph                                                                                                                             |
| 2     | Total Length                     | Total length 2.750 km                                                                                          | New alignment length 2.750 km,                                                         | New alignment length 2.725 km,                                                                                                       |
| 3     | Land Acquisition                 | 4.13 Hectare                                                                                                   | 16.50 Hectare                                                                          | 16.35 Hectare                                                                                                                        |
| 4     | Description of alignment         | This Alignment Passes in between Gangadhar River & Gadadhar River within Builtup Area of Madhya Petla Village. | Alignment having right angle crossing over Gadadhar River.                             | Alignment having Skew crossing over Gadadhar River.                                                                                  |
| 5     | Environment-Lost Forest land     | No forest land is diverted. Approximately 25 number of trees to be cut.                                        | No forest land is diverted. Approximately 13 number of trees to be cut.                | No forest land is diverted. Approximately 18 number of trees to be cut.                                                              |
| 6     | Environment-Expected Pollution   | Due to the road geometry, congestion and narrow stretches, pollution is a major concern.                       | During construction phase both air and noise pollution will be a concern, which can be | During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures. |

|    |                                 |                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                |
|----|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                 |                                                                                                                                                                                                                                                                                                                                                                            | minimized by appropriate mitigation measures. The pollution during construction phase is temporary, once the road is operational, the air and noise pollution get reduced by smooth traffic movement.                                                                                                                       | But due to the geometry and curves, congestion will still be a concern even during road operational and lead to air pollution and noise pollution.                                                                                                                                                                                                                             |
| 7  | Social Impact and R&R           | Nearly 55 Nos. structures and one Big Temple are affected                                                                                                                                                                                                                                                                                                                  | Nearly 15 nos. structures are affected                                                                                                                                                                                                                                                                                      | Nearly 4 nos. structures are affected                                                                                                                                                                                                                                                                                                                                          |
| 8  | Structures and Protective Works | Both side service/slip road, approx 800m Retaining/curtain wall/ grouted rip-rap, to protect embankment in contact with water and approx. 10 nos. balancing box culverts are required.                                                                                                                                                                                     | 2 nos. minor Bridge (approx length 48m) required over Gadadhar River and approx. 8 nos. balancing box culverts are required.                                                                                                                                                                                                | 1 nos. major Bridge required over Gadadhar River due to skew crossing (approx length 96m) and 1 no minor bridge required (approx length 48m) and approx. 8 nos. balancing box culverts are required.                                                                                                                                                                           |
| 9  | Civil Cost                      | 15.99 Crore (5.92 Cr. PerKM)                                                                                                                                                                                                                                                                                                                                               | 24.04 Crore (8.66 Cr. PerKM)                                                                                                                                                                                                                                                                                                | 30.24 Crore (10.67 Cr. PerKM)                                                                                                                                                                                                                                                                                                                                                  |
| 10 | R&R & LA Cost                   | LA Cost = 3.06 Crore R&R Cost = 4.65 Crore                                                                                                                                                                                                                                                                                                                                 | LA Cost = 8.15 Crore R&R Cost = 0.42 Crore                                                                                                                                                                                                                                                                                  | LA Cost = 8.08 Crore R&R Cost = Nil                                                                                                                                                                                                                                                                                                                                            |
| 11 | Total Cost Including R&R and LA | 23.70 Crore                                                                                                                                                                                                                                                                                                                                                                | 32.60 Crore                                                                                                                                                                                                                                                                                                                 | 38.32 Crore                                                                                                                                                                                                                                                                                                                                                                    |
| 12 | Utility Shifting Cost           | Maximum                                                                                                                                                                                                                                                                                                                                                                    | Minimum                                                                                                                                                                                                                                                                                                                     | Minimum                                                                                                                                                                                                                                                                                                                                                                        |
| 13 | Result                          |                                                                                                                                                                                                                                                                                                                                                                            | ✓                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                |
| 14 | Comment                         | <ul style="list-style-type: none"> <li>Totally following the existing alignment</li> <li>Land acquisition cost is less than option II &amp; III</li> <li>This Alignment Passes in between Gangadhar River &amp; Gadadhar River with in Builtup Area of Madhya Petla Village.</li> <li>Approximately 45 nos. of houses are affected at Madhya Petla village. So,</li> </ul> | <ul style="list-style-type: none"> <li>Totally Green field alignment</li> <li>R&amp;R cost is less than option I</li> <li>Right angle crossing over Gadadhar River</li> <li>Civil cost is high because 2 nos. minor bridge is required over Gadadhar River.</li> <li>LA Cost High</li> <li>Utility Shifting Cost</li> </ul> | <ul style="list-style-type: none"> <li>Totally Green field alignment</li> <li>R&amp;R cost is Nil</li> <li>Civil cost is high because 1 nos. major Bridge required over Gadadhar River due to skew crossing (approx length 96m) and 1 no minor bridge required (approx length 48m)</li> <li>LA Cost high compare to Option I</li> <li>Utility Shifting Cost minimum</li> </ul> |

|  |  |                                                                |         |  |
|--|--|----------------------------------------------------------------|---------|--|
|  |  | LA and R&R cost is high.<br>• Utility Shifting Cost<br>maximum | minimum |  |
|--|--|----------------------------------------------------------------|---------|--|

**Hence, Alignment-3 is discarded being involving huge land acquisition cost and Civil Cost. Alignment-2 is preferred to Alignment-1 and recommended, as it is avoiding Gangadhar River and Built Up location of Madhya petal Village.**



## D.2. Alternative Alignment Option Study for Bypass in between existing km 28.850 to km 31.200 (Near Sonahat Village)

| Legend   |                                                                                   |               |        |
|----------|-----------------------------------------------------------------------------------|---------------|--------|
| Options  | Symble                                                                            | Node          | Length |
| Option-1 |  | A – B – C – D | 2350m  |
| Option-2 |  | A – F – D     | 1900m  |
| Option-3 |  | A – E – F – D | 1660m  |

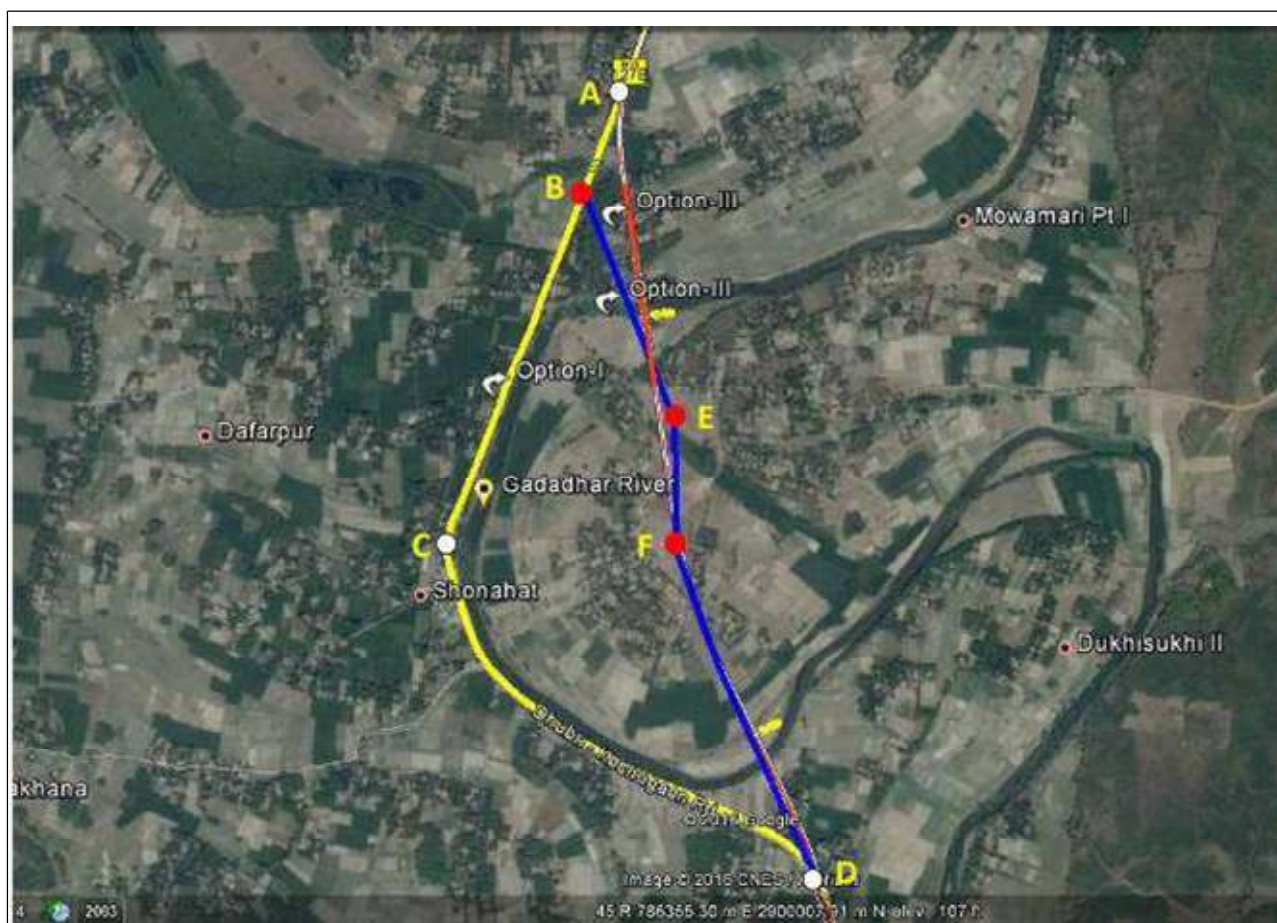


Figure 9: GIS image of Alternative Alignment Option Study for Bypass in between existing km 28.850 to km 31.200

The Comparison for proposed three alignment options are given below:

| S. No. | Design, Safety & other Parameter | Alignment Option - I (Follows the Existing alignment)                                                                                                                                                             | Alignment Option - II (Red alignment)                                                                                                                                                                                                                                                        | Alignment Option- III (Blue alignment)                                                                                                                                                                                                                                                  |
|--------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Design Speed                     | 65 Kmph                                                                                                                                                                                                           | 100 Kmph                                                                                                                                                                                                                                                                                     | 80 Kmph                                                                                                                                                                                                                                                                                 |
| 2      | Total Length                     | Total length 2.350 km                                                                                                                                                                                             | New alignment length 1.900 km,                                                                                                                                                                                                                                                               | New alignment length 1.660 km,                                                                                                                                                                                                                                                          |
| 3      | Land Acquisition                 | 3.50 Hectare                                                                                                                                                                                                      | Private Land=5.0 Ha; Govt Land = 6.40 Ha                                                                                                                                                                                                                                                     | Private Land=5.96 Ha; Govt Land = 4.0 Ha                                                                                                                                                                                                                                                |
| 4      | Description of alignment         | This Alignment passes along the Gadadhar River and Builtup Area of Sonahat Village.                                                                                                                               | Greenfield Alignment passes through maximum Govt. Lands.                                                                                                                                                                                                                                     | Greenfield Alignment passes through minimum Govt. Lands.                                                                                                                                                                                                                                |
| 5      | Environment-Lost Forest land     | No forest land is diverted. Approximately 98 number of trees to be cut.                                                                                                                                           | No forest land is diverted. Approximately 17 number of trees to be cut.                                                                                                                                                                                                                      | No forest land is diverted. Approximately 19 number of trees to be cut.                                                                                                                                                                                                                 |
| 6      | Environment-Expected Pollution   | Due to the road geometry, congestion and narrow stretches, pollution is a major concern.                                                                                                                          | During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures. The pollution during construction phase is temporary, once the road is operational, the air and noise pollution get reduced by smooth traffic movement. | During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures. But due to the geometry and curves, congestion will still be a concern even during road operational and lead to air pollution and noise pollution. |
| 7      | Social Impact and R&R            | Nearly 78 Nos. structures and one Big Mosque are affected                                                                                                                                                         | Nearly 20 nos. structures are affected                                                                                                                                                                                                                                                       | Nearly 10 nos. structures are affected                                                                                                                                                                                                                                                  |
| 8      | Structures and Protective Works  | Both side service/slip road required in built up area, approx 1450m Retaining/curtain wall/ grouted rip- rap, to protect embankment in contact with water and approx. 8 nos. balancing box culverts are required. | 2 nos. minor Bridge (approx length 48m) required over Gadadhar River and approx. 6 nos. balancing box culverts are required.                                                                                                                                                                 | 2 nos. minor Bridge (approx length 48m) required over Gadadhar River and approx. 6 nos. balancing box culverts are required.                                                                                                                                                            |
| 9      | Civil Cost                       | 20.09 Crore (8.55 Cr. Per KM)                                                                                                                                                                                     | 20.66 Crore (10.87 Cr. Per KM)                                                                                                                                                                                                                                                               | 20.10 Crore (12.11 Cr. Per KM)                                                                                                                                                                                                                                                          |



|    |                                 |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                       |                                                                                                                                                                                 |
|----|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | R&R & LA Cost                   | LA Cost = 2.61 Crore<br>R&R Cost = 9.30 Crore                                                                                                                                                                                                                                                                         | LA Cost = 2.47 Crore<br>R&R Cost = 0.52 Crore                                                                                         | LA Cost = 2.94 Crore<br>R&R Cost = 1.03 Crore                                                                                                                                   |
| 11 | Total Cost including R&R and LA | 32.00 Crore                                                                                                                                                                                                                                                                                                           | 23.65 Crore                                                                                                                           | 24.08 Crore                                                                                                                                                                     |
| 12 | Utility Shifting Cost           | Maximum                                                                                                                                                                                                                                                                                                               | Minimum                                                                                                                               | Minimum                                                                                                                                                                         |
| 13 | Result                          |                                                                                                                                                                                                                                                                                                                       | ✓                                                                                                                                     |                                                                                                                                                                                 |
| 14 | Comment                         | <ul style="list-style-type: none"> <li>Totally following the existing alignment</li> <li>Land acquisition cost is less than option II &amp; III</li> </ul>                                                                                                                                                            | <ul style="list-style-type: none"> <li>Totally Greenfield alignment</li> <li>R&amp; R cost is less than option I &amp; III</li> </ul> | <ul style="list-style-type: none"> <li>Totally Greenfield alignment</li> <li>R&amp;R cost is less than Option I</li> </ul>                                                      |
|    |                                 | <ul style="list-style-type: none"> <li>This Alignment passes along with Gadadhar River so protection cost is so high</li> <li>Approximately 90 nos. of houses are affected at Sonahat village. So, LA and R&amp;R cost is also high.</li> <li>Poor Geometry. Design Speed has not reached as per standard.</li> </ul> | <ul style="list-style-type: none"> <li>Civil cost is high because 2 nos. minor bridge is required over Gadadhar River.</li> </ul>     | <ul style="list-style-type: none"> <li>Civil cost is high because 2 nos. minor bridge is required over Gadadhar River.</li> <li>R&amp; R cost is more than Option II</li> </ul> |

**Hence, Alignment-I is discarded being involving huge Civil Cost & R&R cost and poor geometry. Alignment-II is preferred and recommended, due to acquisition of maximum Govt. land and total project cost is less compare to Alignment III option.**

### D.3. Alternative Alignment Option Study for Bypass in between existing km 39.750 to km 41.900 (Near Saheb ganj Village)

Legend:

| Options    | Symble                                                                            | Node      | Length |
|------------|-----------------------------------------------------------------------------------|-----------|--------|
| Option-1   |  | A – B - F | 2150m  |
| Option-2   |  | A – D - E | 2050m  |
| Option - 3 |  | A- C-F    | 2250 m |

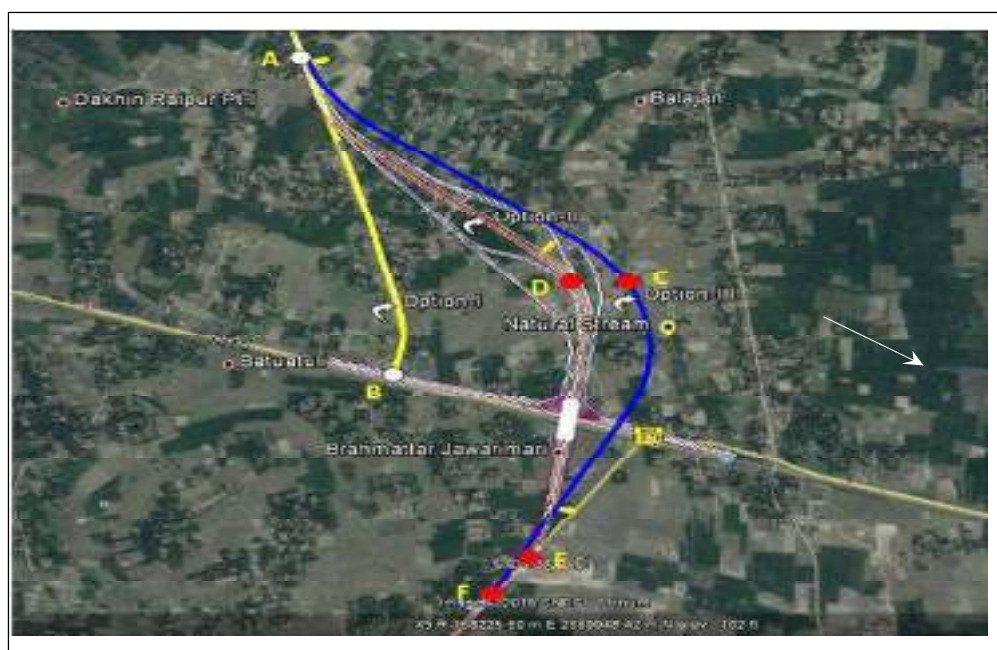


Figure 10: GIS image of Alternative Alignment Option Study for Bypass in between existing km 39.750 to km 41.900

The Comparison for proposed three alignment options are given below. The cost of Grade Separator is not considered in this Alignment Option Study as it is applicable for all three options.

| S. No. | Design, Safety & other Parameter | Alignment Option - I (Follows the Existing alignment)             | Alignment Option - II (Red alignment)                                                            | Alignment Option- III (Blue alignment)                                                      |
|--------|----------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1      | Design Speed                     | 100 Kmph                                                          | 100 Kmph                                                                                         | 100 Kmph                                                                                    |
| 2      | Total Length                     | Total length 2.150 km                                             | New alignment length 2.050 km,                                                                   | New alignment length 2.250 km,                                                              |
| 3      | Land Acquisition                 | 3.23 Hectare                                                      | 12.30 Hectare                                                                                    | 13.50 Hectare                                                                               |
| 4      | Description of alignment         | This alignment passes through builtup Area of Saheb Ganj Village. | This alignment passes through completely greenfield land and some structures are to be effected. | This alignment passes through completely greenfield land & one settlement area are effected |

|    |                                                   |                                                                                                                      |                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                         |
|----|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5  | Environment-Lost Forest land                      | No forest land is diverted. Approximately 20 number of trees to be cut.                                              | No forest land is diverted. Approximately 13 number of trees to be cut.                                                                                                                                                                                                                      | No forest land is diverted. Approximately 19 number of trees to be cut.                                                                                                                                                                                                                 |
| 6  | Environment-Expected Pollution                    | Due to the road geometry, congestion and narrow stretches, pollution is a major concern.                             | During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures. The pollution during construction phase is temporary, once the road is operational, the air and noise pollution get reduced by smooth traffic movement. | During construction phase both air and noise pollution will be a concern, which can be minimized by appropriate mitigation measures. But due to the geometry and curves, congestion will still be a concern even during road operational and lead to air pollution and noise pollution. |
| 7  | Social Impact and R&R                             | Nearly 55 Nos. structures and one Big Mosque are affected                                                            | Nearly 20 nos. structures are affected                                                                                                                                                                                                                                                       | Nearly 12 nos. structures are affected                                                                                                                                                                                                                                                  |
| 8  | Structures and Protective Works                   | Both side service/slip road required in built up area and 1 no. grade separator required between NH- 127B and NH-31. | 1 no. grade separator required between NH- 127B and NH-31.                                                                                                                                                                                                                                   | 1 no. grade separator required between NH- 127B and NH-31.                                                                                                                                                                                                                              |
| 9  | Civil Construction Cost (Without Grade Separator) | 10.43 Crore (4.85 Cr. Per KM)                                                                                        | 8.53 Crore (4.16 Cr. Per KM)                                                                                                                                                                                                                                                                 | 9.33 Crore (4.15 Cr. Per KM)                                                                                                                                                                                                                                                            |
| 10 | R&R & LA Cost                                     | LA Cost = 2.39 Crore<br>R&R Cost = 6.20 Crore                                                                        | LA Cost = 6.08 Crore<br>R&R Cost = 0.52 Crore                                                                                                                                                                                                                                                | LA Cost = 6.70 Crore<br>R&R Cost = 2.58 Crore                                                                                                                                                                                                                                           |
| 11 | Total Cost including R&R and LA                   | 19.02 Crore                                                                                                          | 15.12 Crore                                                                                                                                                                                                                                                                                  | 18.58 Crore                                                                                                                                                                                                                                                                             |
| 12 | Utility Shifting Cost                             | Maximum                                                                                                              | Minimum                                                                                                                                                                                                                                                                                      | Minimum                                                                                                                                                                                                                                                                                 |
| 13 | Results                                           |                                                                                                                      | ✓                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                         |

|    |          |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                    |                                                                                                                                         |
|----|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 14 | Comments | <ul style="list-style-type: none"> <li>• Totally following the existing alignment</li> <li>• Land acquisition cost is less than option II &amp; III.</li> <li>• Approximately 60 nos. of houses are affected at Saheb Ganj village. So, LA and R&amp;R cost is also high.</li> </ul> | <ul style="list-style-type: none"> <li>• This Alignment passes through completely Greenfield land and some structures are to be effected.</li> <li>• Total Cost is less than option I &amp; III</li> <li>• Short length than option III</li> </ul> | <ul style="list-style-type: none"> <li>• Totally Greenfield alignment</li> <li>• Total Cost is higher than option I &amp; II</li> </ul> |
|----|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|

Hence, Alignment-I is discarded being involving huge civil cost and R&R cost. Alignment-II is preferred in comparison with Alignment-III and recommended due to shorter length and lesser project cost.

## 5. ENVIRONMENTAL BASELINE STUDIES

### A. Introduction

This chapter describes the baseline environmental conditions in and around the project road sections. It comprises both secondary information and primary information collected through baseline studies, secondary data collection and primary field surveys.

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

The baseline condition describes the state of the existing environment before the onset of the proposed development work. The collection of baseline information of the project area is the most important reference for conducting environmental screening and preliminary EIA study.

The existing baseline conditions have been analyzed based on the secondary data/information collected from published authentic sources and various government agencies. Efforts have been made to collect the latest information both at regional as well as local level. The proposed road passes through two districts i. e Kokrajhar and Dhubri of Assam state. The existing baseline data and analysis around the project road covering both districts are presented in the following sections.

#### A.1. Study Area

The project road corridor Srirampur- Dhubri is currently a single lane/ Intermediate road. The road starts from Srirampur on NH-27(old NH-31 C) and ends to the immediate approach of proposed bridge over river Brahmaputra near Dhubri, covering a distance of 54.154 km. The entire road stretch passes through Plain terrain and located in Kokrajhar and Dhubri district in state of Assam.

The project road sections passes through Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, Mudha Petla, Alokjhari, Madha Petla, Bhati Petla, Satsaura, Kachakana, PaglaHat, Barun Danga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, DebduttaHazdaha 1, Kachari Hat, DebduttaHazdaha 2, Raja Katli, Kachua Kash, Chanda Khol, Ada Bari and ends at immediate approach of proposed bridge over river Brahmaputra near Dhubri. GIS map of the study area is shown in Figure 11.



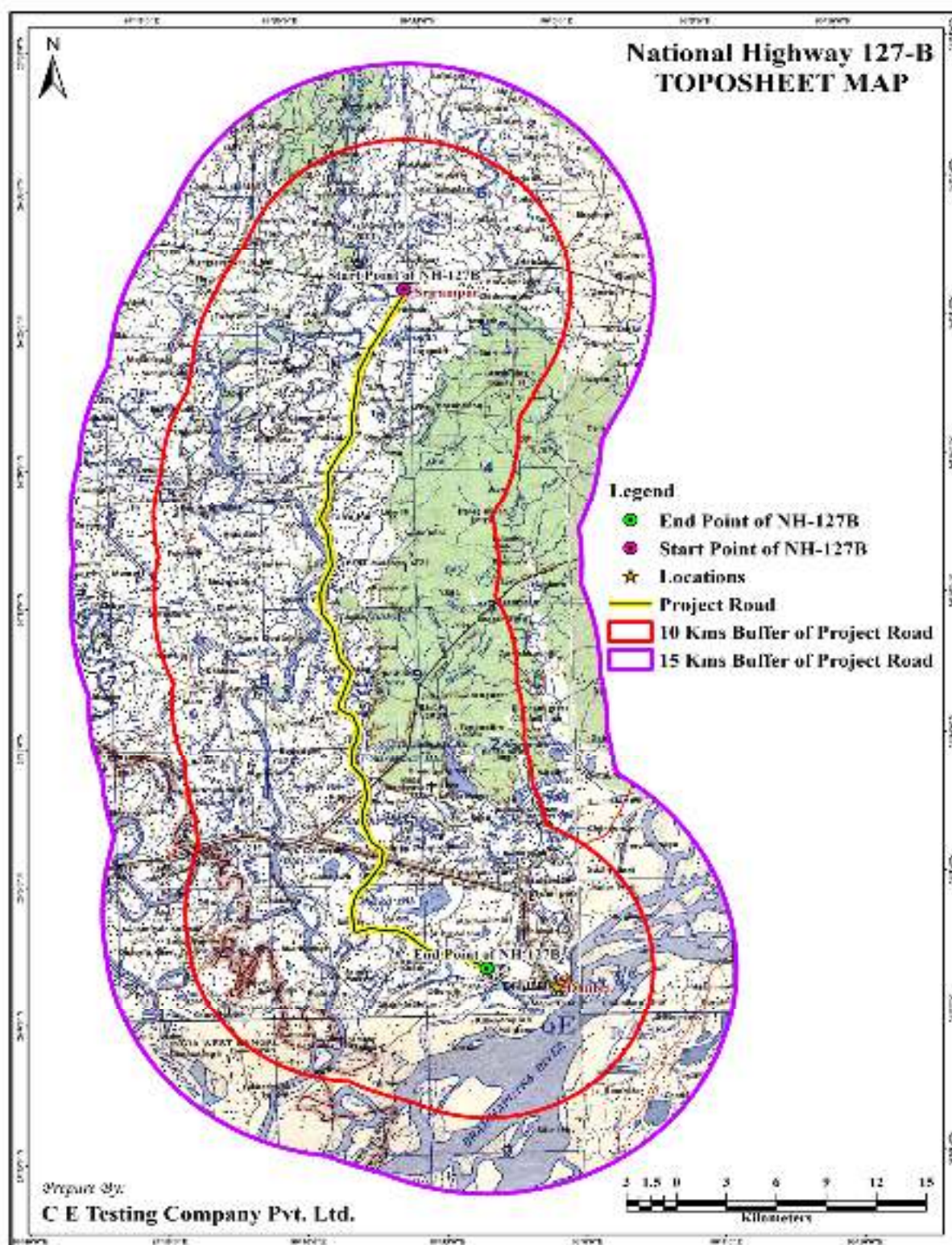


Figure 11: Map of Study Area

The area of direct influence is confined in a linear fashion along the corridor, where the construction activities take place. The area of direct influence of 500 m on either side of PRow has been considered. Secondary data have been collected within 10 km aerial distances specifically mentioned at Para 9(iii) of Form I of EIA Notification 2006.

## ➤ Baseline Environment

Baseline environmental conditions about all facet of environment viz. physical, biological and socioeconomic have been established using both primary and secondary sources. Efforts have been made to collect the latest information's 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. The profile presented below comprises of the following:

|                               |                                                                                                            |
|-------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Physical Environment</b>   | Meteorology, Geology, Topography, Soil characteristics, Air quality, Surface and sub-surface water quality |
| <b>Biological Environment</b> | Aquatic, Biotic and marine flora, fauna and mammals.                                                       |
| <b>Land Environment</b>       | Land use, Soil composition                                                                                 |

## B. Physical Environment

### B.1. Topography

The topography of the study area is plain lands. Basically it comes under lower Brahmaputra valley of Assam.

### B.2. Climate and Meteorology

**Kokrajhar district:** The district has a humid sub-tropical climate characteristics of the lower Brahmaputra Valley of Assam. The entire state experiences hot and humid climate during the summer. It also experiences strong spell of cold winter. In this district summer months are from March to mid May with occasional thunderstorms, monsoon months are from mid May to mid September with heavy shower because of the south-west monsoon, and winter months are from November to February (District Census Handbook, Kokrajhar, 2011).

**Dhubri district:** The Dhubri district has a highly humid climate with excessive heat during summer months. The climate of the district has the characteristics that are intermediate between the North Bengal plains as well as the Brahmaputra valley. The hottest part of the year in the district is during the southwest monsoon season. Dhubri has four seasons namely, the winter season from December to February, the summer season from March to May, the southwest monsoon season from June to September, and the post-monsoon season from October and November. The district enjoys dry and clear weather from November to March (District Census Handbook, Dhubri, 2011).

### B.3. Rainfall

**Kokrajhar district:** The maximum rainfall occurs from April to August and continues in abundance for over six months in a single year with occasional shower throughout the year. The average annual rainfall of Kokrajhar district is 3102.4 mm with 110 annual average rainy days are present. Heavy shower starts from April with the onset of monsoon which continues till September and July receives maximum rainfall in a year (Ground Water Information Booklet Kokrajhar District, Assam, CGWB, 2013). In 2018, actual averaged data was 3.100 mm from Jun 2018 to 01 Nov 2018 with 137 observations and the data reached an all-time maximum of 228.700 mm in 01 Jul 2018 and a record minimum of 0.000 mm in 01 Nov 2018 in the district (CEIC, Reported by India Meteorological Department). From Figure 12, it is observed that in the last few years from 2009, July 2019 has the maximum average rainfall in a year along with the 31 rainfall days.



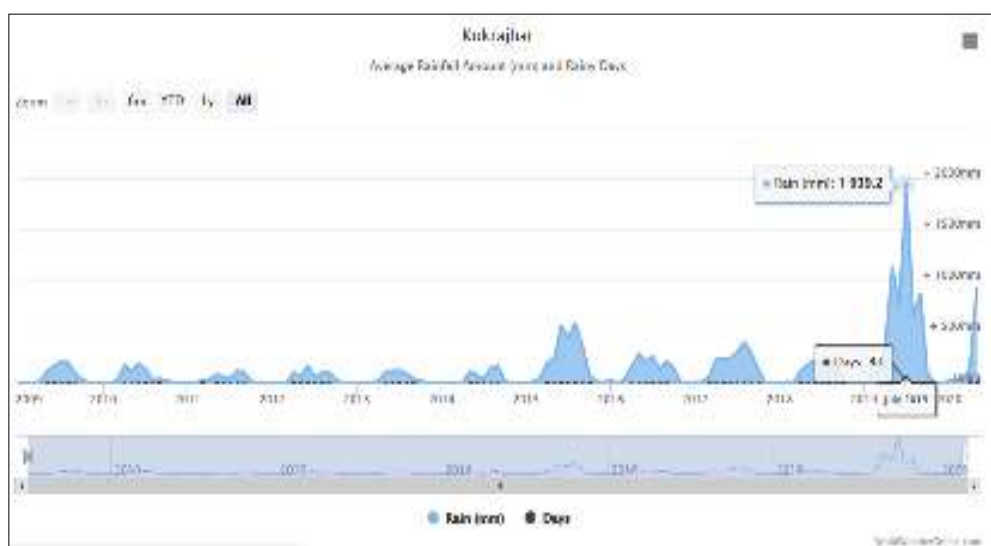


**Figure 12:** Graphical representation showing the annual trends of rainfall in mm and rainfall days of last few years in Kokrajhar district (Source: <https://www.worldweatheronline.com/kokrajhar-weather-averages/assam/in.aspx>)

**Dhubri district:** The southwest monsoon season starts from June to September. The average annual rainfall of the district is 2,363 mm with about 65% rainfall occurring during the monsoon season and the monthly evapo-transpiration is about 40% of the rainfall, the highest in August and lowest in January as recorded (Ground Water Information Booklet Dhubri District, Assam, CGWB, 2013). In 2018, actual averaged data was 19.10 mm from Jun 2018 to 27 Jul 2018 with 40 observations and the data reached an all-time maximum of 32.800 mm in 19 Jun 2018 and a record minimum of 10.300 mm in 19 Jul 2018 in the district (CEIC, Reported by India Meteorological Department). From Figure 13, it is observed that in the last few years from 2009, June 2020 has the maximum average rainfall in a year which was 1355.7 mm along with the 30 rainfall days.

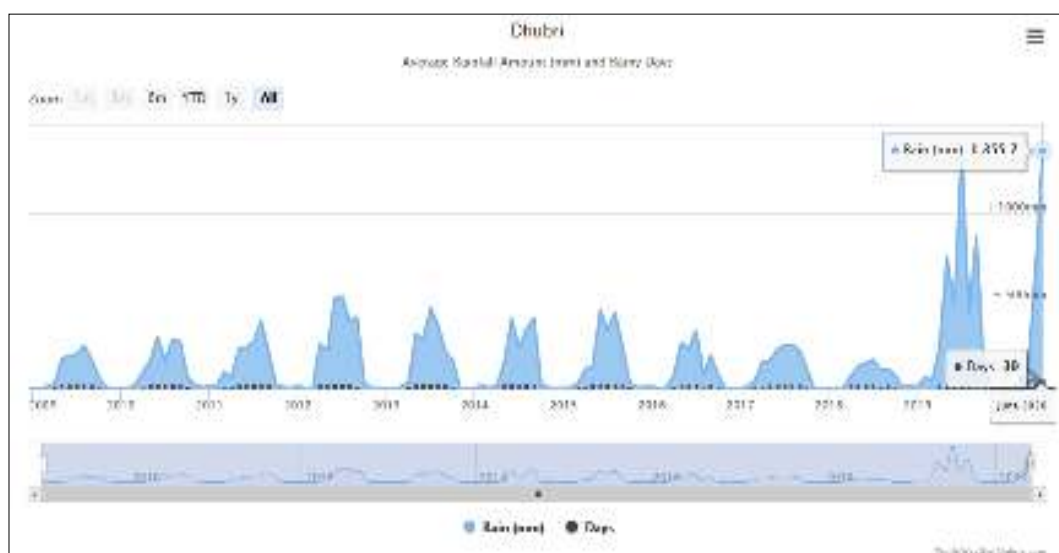


**Figure 13:** Graphical representation showing the annual trends of rainfall in mm and rainfall days of last few years in Dhubri district (Source: <https://www.worldweatheronline.com/lang/en-in/dhubri-weather-averages/assam/in.aspx>)

## B.4. Temperature

**Kokrajhar district:** The average temperature in Kokrajhar district ranges from minimum 10°C to maximum 35°C throughout the year. In summer season, the average temperature ranges from 27.64°C to 31.67°C and in the winters, it ranges from 19.34°C to 23.66°C (Kokrajhar District, Govt. of Assam, 2018). Maximum, minimum and average temperature of Kokrajhar district in last 10 years has been graphically represented in Figure 14.

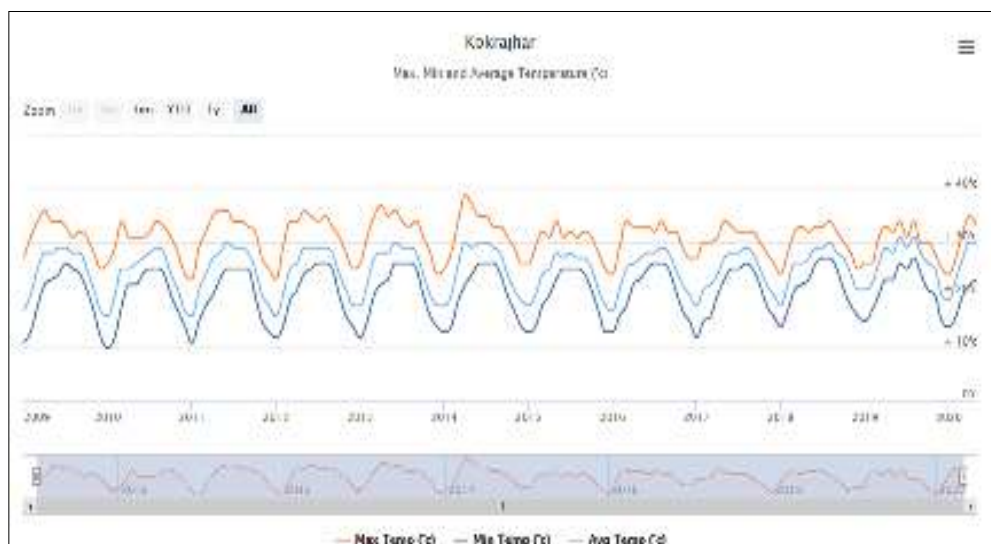


**Figure 14:** Graphical representation showing the annual trends of temperature in °C of last few years in Kokrajhar district (Source: <https://www.worldweatheronline.com/kokrajhar-weather-averages/assam/in.aspx>)

**Dhubri district:** Dhubri district has a subtropical humid climate with temperature ranging between 10.5° C (minimum, in December/January) and 30° C (maximum, in July/August). The average annual temperature in Dhubri is 24.2° C. The hottest time of the year is during the southwest monsoon season (Ground Water Information Booklet Dhubri District, Assam, CGWB, 2013). Maximum, minimum and average temperature of Dhubri district in last 10 years has been graphically represented in Figure 15.

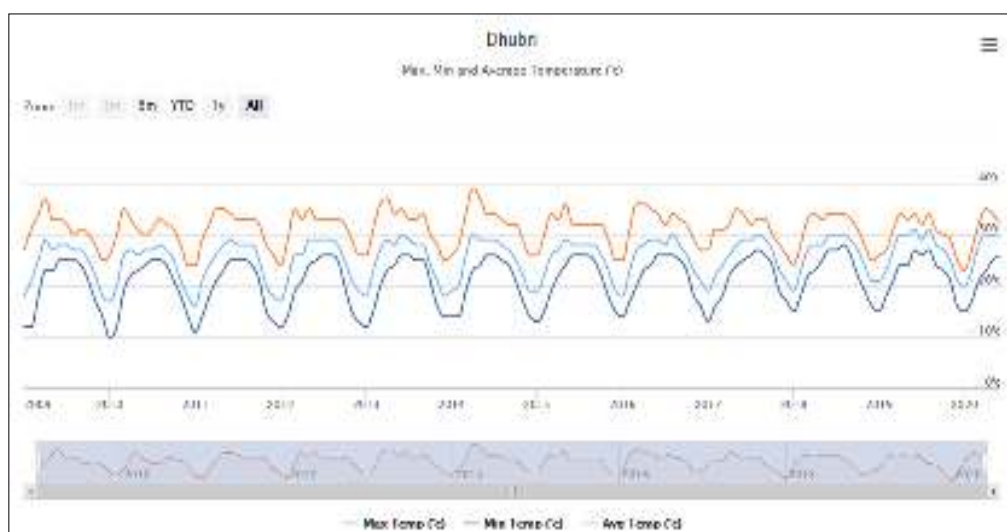


**Figure 15:** Graphical representation showing the annual trends of temperature in °C of last few years in Dhubri district (Source: <https://www.worldweatheronline.com/lang/en-in/dhubri-weather-averages/assam/in.aspx>)

### B.5. Relative Humidity:

**Kokrajhar district:** The district is highly humid during the summer season from June to October when the south west monsoon season start, November constitute the period of post monsoon. The average humidity remains almost same with variation from 62% in winter period to around 87% in post monsoon period (Ground Water Information Booklet Kokrajhar District, Assam, Figure 16).

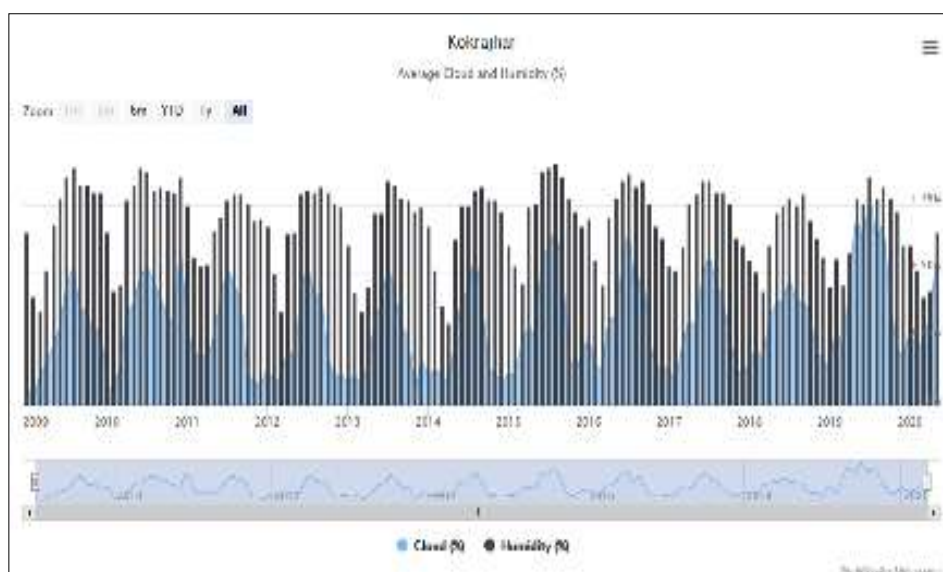


**Figure 16:** Graphical representation showing the annual trends of relative humidity in % of last few years in Kokrajhar district (Source: <https://www.worldweatheronline.com/kokrajhar-weather-averages/assam/in.aspx>)

**Dhubri district:** Dhubri district is also highly humid with excessive heat during summer months. The average humidity remains almost same with variation from 78% in winter period to around 82% in post monsoon period and near about 70% in the summer season and 82% during the southwest monsoon season (District Census Handbook, Dhubri, 2011). Annual trends of relative humidity in Dhubri district in previous years is shown in Figure 17.

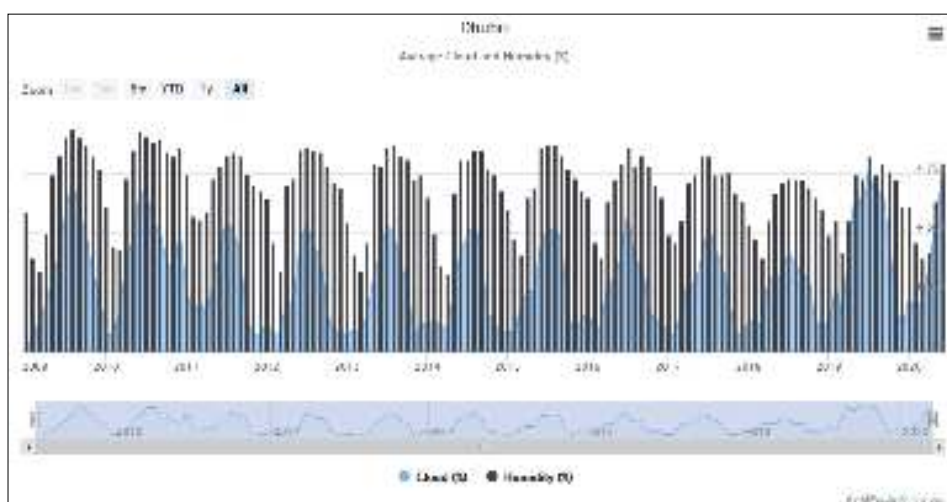


**Figure 17: Graphical representation showing the annual trends of relative humidity in % of last few years in Dhubri district** (Source: <https://www.worldweatheronline.com/lang/en-in/dhubri-weather-averages/assam/in.aspx>)

## B.6. Wind Speed:

**Kokrajhar district:** The average hourly wind speed in Kokrajhar district experiences mildseasonal variation throughout the year. The windier part of the year lasts for about 6 months ranging from March to August. The calmer part of the year lasts for about 6 months ranging from late August to June.

From Figure 18, it is observed that the average wind gust of the district lies in the range of 5 to 16 kmph and average wind speed lies in the range of 3 to 9 kmph; it is also seen that the average wind gust in May 2020 was the highest (15.4 kmph)..

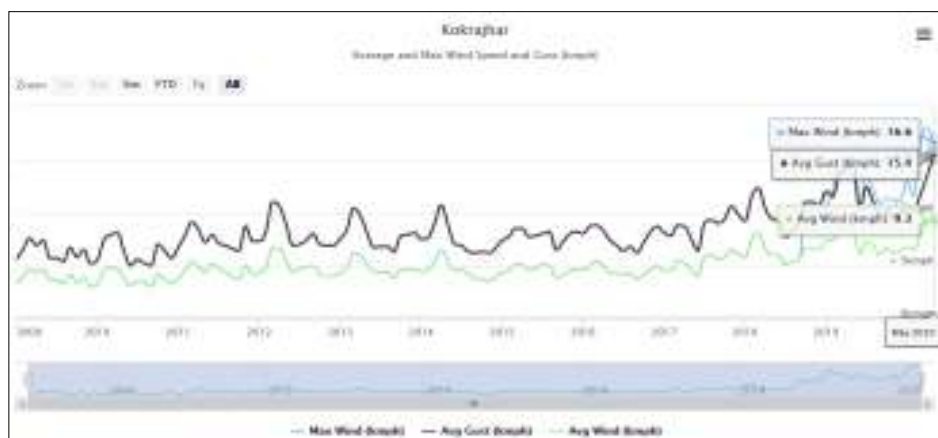


**Figure 18: Graphical representation showing the annual trends of wind speed and gust in kmph of last few years in Kokrajhar district** (Source: <https://www.worldweatheronline.com/kokrajhar-weather-averages/assam/in.aspx>)



In Figure 19, the windrose diagram for Kokrajhar shows the hours per year the wind blows from the indicated direction and it is seen that the wind mostly blows towards the north and north east

**Dhubri district:** The average hourly wind speed in Dhubri district experiences mild seasonal variation throughout the year. The windier part of the year lasts for 6 months ranging between the March to September. The calmer part of the year lasts for about 6 months ranging between September to March. From Figure 20, it is seen that the average wind gust of the district lies in the range of 4 to 24 kmph and average wind speed lies in the range of 3 to 14 kmph; it is also seen that the average wind gust in May 2019 was the highest (22.8 kmph)..

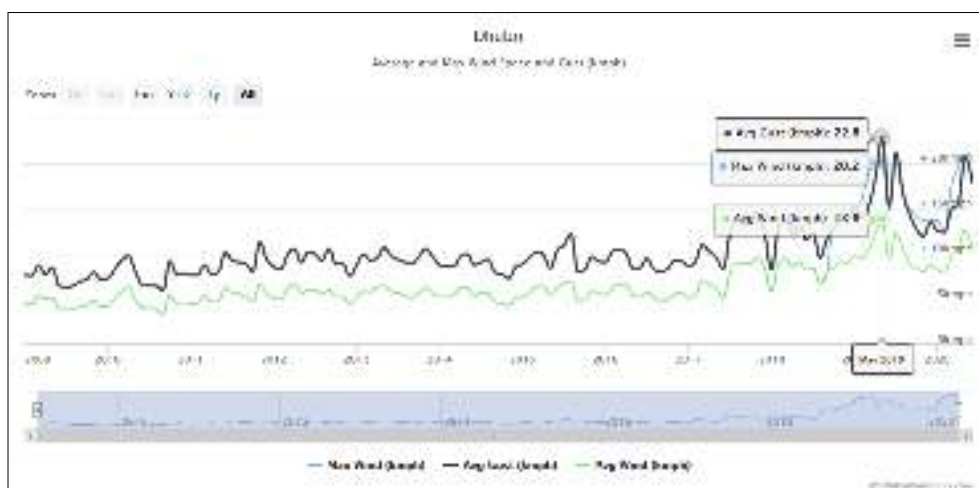


**Figure 20:** Graphical representation showing the annual trends of wind speed and gust in kmph of last few years in Dhubri district (Source: <https://www.worldweatheronline.com/lang/en-in/dhubri-weather-averages/assam/in.aspx>)

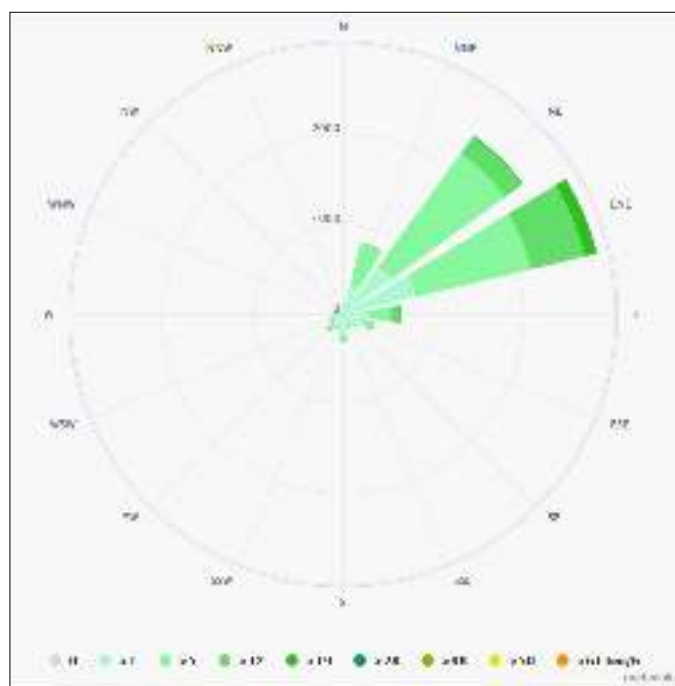


**Figure 21:** Windrose diagram showing the wind direction in Dhubri district (Source: [https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/dhubri\\_india\\_1272694](https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/dhubri_india_1272694))



The predominant average hourly wind direction in this district varies throughout the year. The wind is often from the south in mid early May to late September; from the east in late late Septemberto early May. In Figure 21, the windrose diagram for Dhubri shows the hours per year the wind blows from the indicated direction and it is seen that the wind mostly blows towards the north east.

### B.7. Geology:

**Kokrajhar district:** The major part of the district is a flat plain which is characterized by its configuration and drainage pattern along with geological structure such as Inselberges (Granites & Gneisses). Physiographically, the district has been divided into two units (1) Northern alluvial region which forms a flat land at a height of 40-300 m above MSL constituting a gentle slope towards river Brahmaputra in the south. This alluvial plain is further classified into two: piedmont plain (which forms the highest terrace of quaternary landscape, also characterized by high relief with dense forest as well as less populated) and terraced alluvial plain (which covers a large part of cultivable land along with moderate population). The alluvium consists unconsolidated sediments of sand, clay, silt, gravel, cobbles as well as boulders of quartz, feldspars etc. The younger alluvial cover being deposited constitutes thick beds of clay, sand and gravel. The upper layer of the alluvial formation constitutes clayey/sandy soil which is followed by coarse sand gravel beds at certain depth. A major part of Kokrajhar district comprises of alluvial area formed because of river Brahmaputra present in the south (Ground Water Information Booklet Kokrajhar District, Assam, CGWB, 2013).

(2) Southern swamps or flood plain of Brahmaputra River. The regional gradient indicating the general flow of Brahmaputra River is from east to west with tributaries such as Gangia, Laponi, Saralaganga, Lonya and Saumukha originating from the foothill of Northern Himalaya which thus have a steep slope as well as shallow braided channels for considerable distances. The land elevation near the Brahmaputra is 5-10 m above MSL and in the flood plain area which is the Southern swamps; the flood water gets detained in low depression which thus leads to formation of beel or marshy swamp along the main river course. The soil is composed of sand in the riverbed and soft clay in varying proportion throughout the district (District Census Handbook, Kokrajhar, 2011).

**Dhubri district:** The district comprises of the vast alluvial plains of Brahmaputra River. The monotony of the flat alluvial tract is being interrupted by the Archaean inliers in the form of disconnected hillocks which are referred to as inselbergs and these occur mainly in the eastern as well as southern parts of the district. These hillocks are joined by the offshoots of Shillong plateau and are found on the north bank near Diple beel, Sitdanga beel and east of Bilasipara and on the south bank of the foothill part of Garo Hills along the boundary of the district. The difference of level between the valley and peaks of the inselbergs ranges from 25 to 455 m. These hillocks are covered by a thick lateritic mantle occupied by evergreen mixed forest. Terraced alluvial deposits are present in 80% of the district with conspicuous occurrence of back swamps, buried channels, etc. Soils in greater part of the district are mainly sandy and silty loam or clayey loam (Ground Water Information Booklet Dhubri District, Assam, CGWB, 2013). This district is poor in mineral resources with no significant mineral deposit other than minor minerals such as river bed sand, boulders etc. are found (Brief Industrial Profile of Dhubri District by Ministry of MSME, Govt. of India).

### B.8. Seismicity:

Considering the plate tectonics, Assam is in the eastern-most projection of the Indian Plate, where the plate is thrusting underneath the Eurasian Plate which creates a subduction zone. This led Assam to fall under the seismic zone V (as per the 2002 Bureau of Indian Standards (BIS) map) making the entire State prone to earthquake of moderate to very high intensity. Zone V comprises the areas with the highest risks zone which suffers earthquakes of intensity MSK



IX or greater. The State has experienced two major earthquakes in the year 1897 and 1950 whose intensities were 8.7 and 8.5 on the Richter scales respectively (Assam State Disaster Management Authority). Therefore, both the districts are under seismic Zone V. Seismic zone map of India and Assam is given in Figure 22.

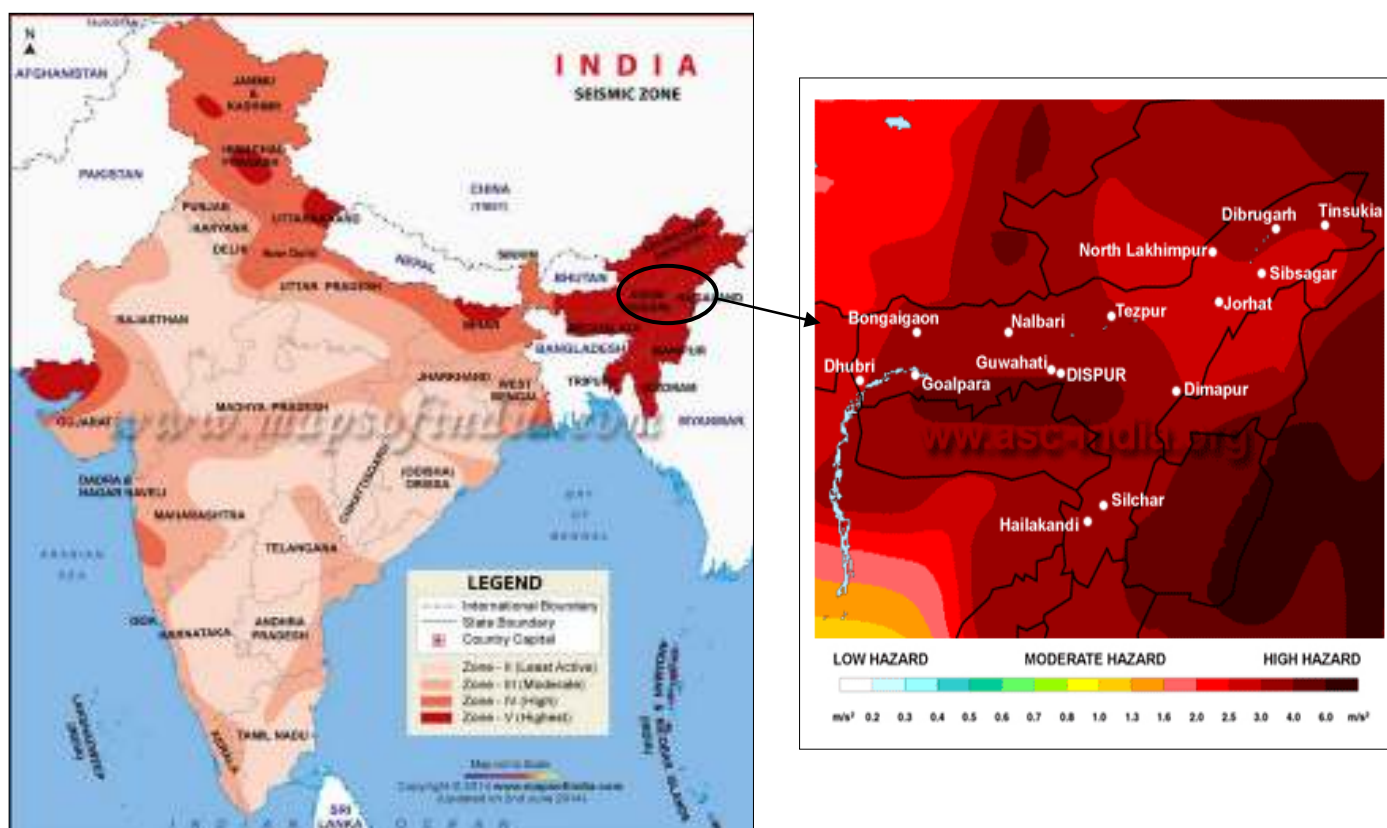


Figure 22: Seismic zone map of India and Assam (Source: <http://asc-india.org/maps/hazard/haz-assam.htm>)

*From the above map it is clear that the project road comes under zone V, which is susceptible to major earthquakes.*

## B.9. Land Use

Land use refers to, 'man's activities and the various uses which are carried on land'. Land cover refers to, 'natural vegetation, water bodies, rock/soil, artificial cover and others resulting due to land transformations. The term's land use and land cover being closely related are interchangeable, because the former is generally inferred based on the cover and on the contextual evidence.

### ➤ Along the Project Road

The project study area is dominated by agricultural crop land (34.74 %) while agricultural fallow land is 26.10% which shows that farming is very prevalent in the study area. Vegetation is covered in 19.93 % of the study area while urban and rural settlement is 2.10 %. Most of the area along the project road is flood prone. Some images of land use has been shown in Figure 23. The detailed land use and land cover map is shown in Figure 24.

Table 23: Land Use Classification of Study Area

| S. No. | LULC Classes             | Area (in Sq Kms) | Area (in %) |
|--------|--------------------------|------------------|-------------|
| 1      | Settlements              | 47.298           | 2.10        |
| 2      | Transportation           | 3.228            | 0.14        |
| 3      | Agricultural Crop Land   | 783.972          | 34.74       |
| 4      | Agricultural Fallow Land | 588.889          | 26.10       |
| 5      | Barren Land / Waste Land | 165.539          | 7.34        |
| 6      | Mixed Forest             | 449.755          | 19.93       |
| 7      | River Bed                | 120.409          | 5.34        |
| 8      | River & Water Bodies     | 97.298           | 4.31        |
|        | TOTAL                    | 2,256.387        | 100.00      |



Figure 23: Photographs of road side landuse



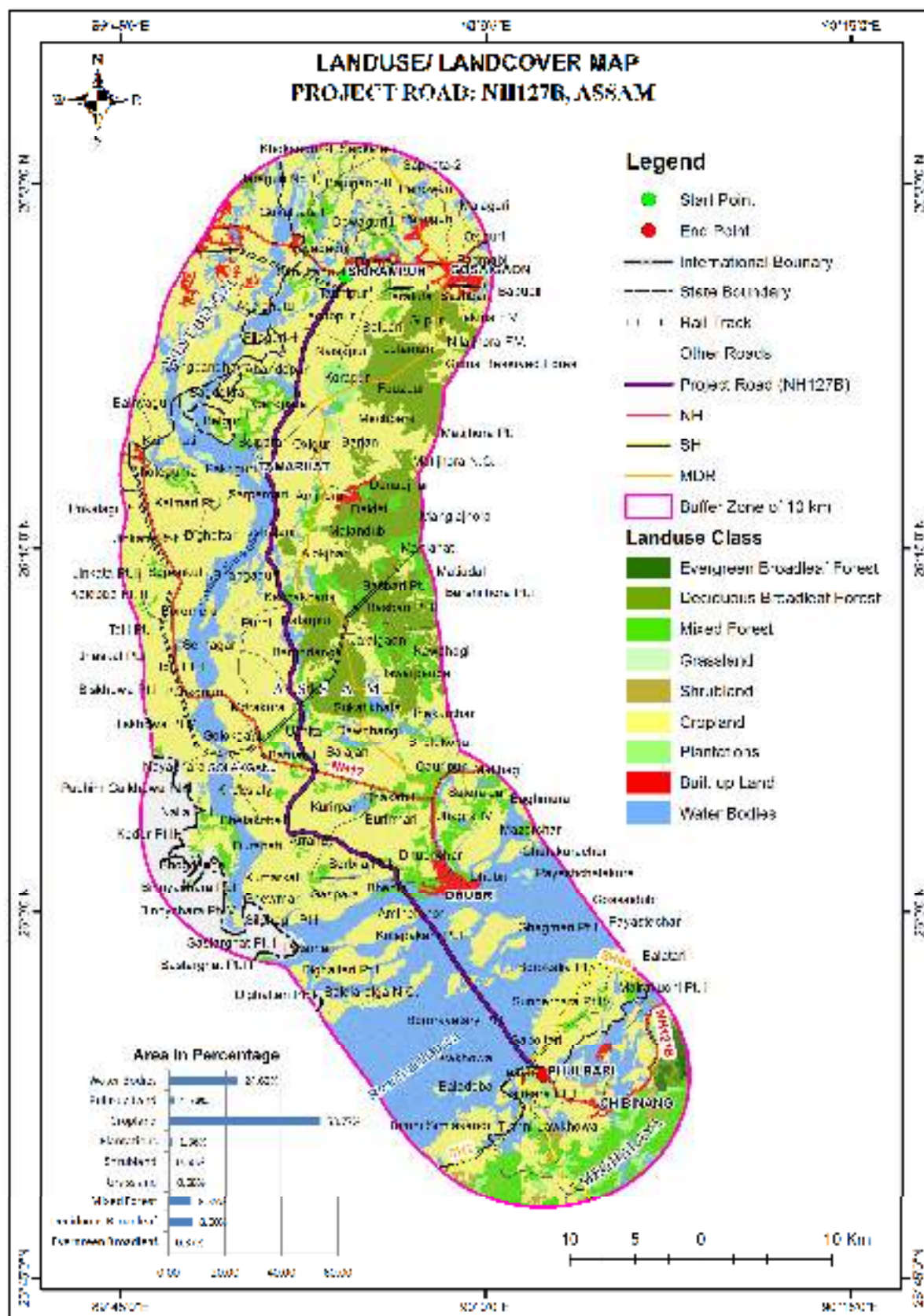


Figure 24: Land use and land Cover along the project road

### **B.10. Elevation**

The elevation of the project road and project influence area has been presented in Figure 25. As shown in the elevation map, the elevation of the project road start point is lower than end point. The general slope of the project road and project influence area is south to north. The elevation of the project road at its start point (Srirampur) is in the range of 30-40m while near Dhubri, it is in the range of 20-30m while it's lesser at the project road end point.

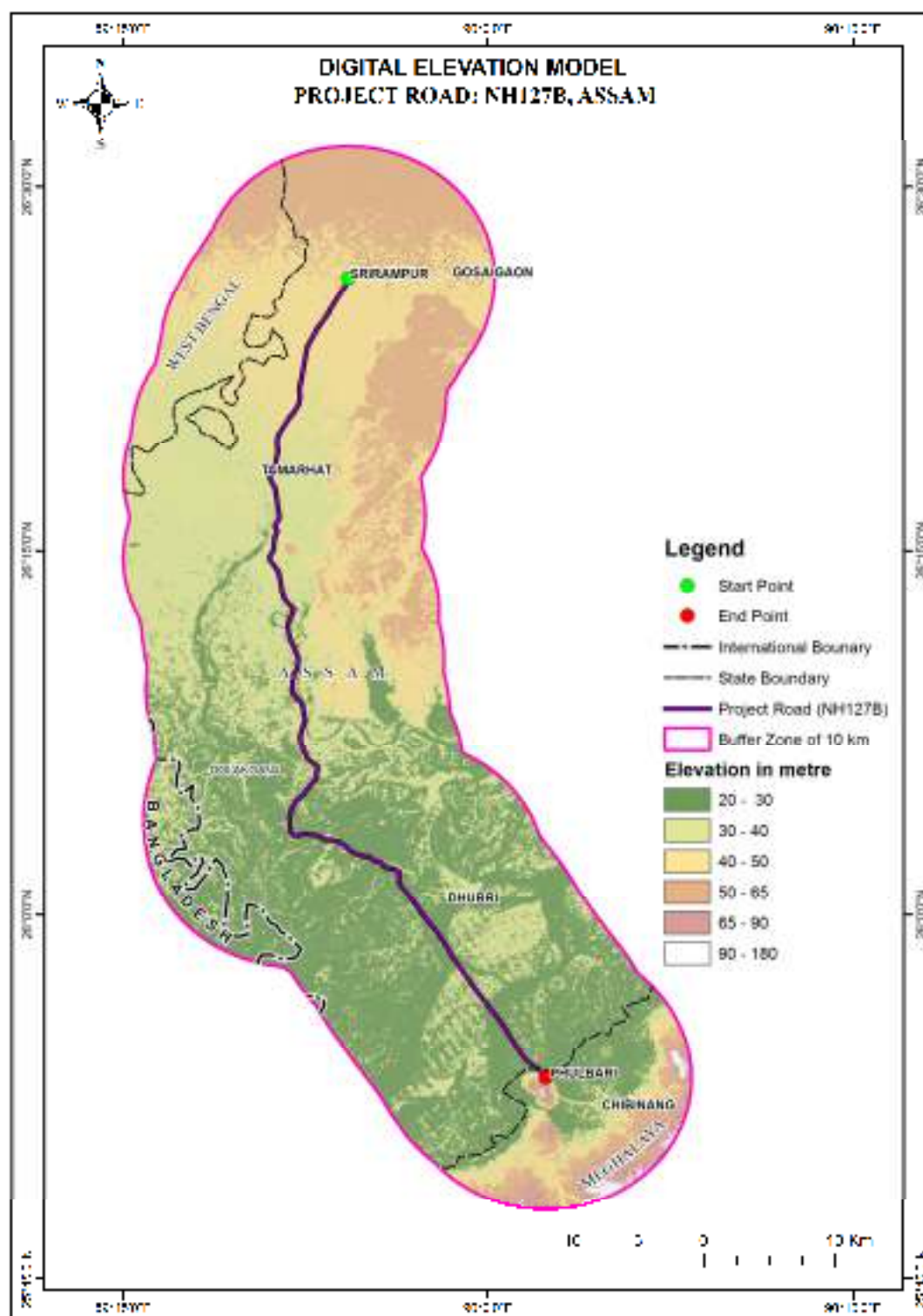


Figure 25: Elevation Map of the Project Road and Project Influence Area

### B.11. Soil

**Kokrajhar district:** The district forms a part of the vast alluvial plains of Brahmaputra River system and sub-basin of River Manas. Physiographically, it is characterised by the different land forms (a) inselbergs and (b) alluvial plains.

The inselbergs are Archaean inliers occurring in the form of disconnected hillocks in the alluvial plains. They are found occurring in the south-eastern part of the district. The hillocks are covered by a thick lateritic mantle and are occupied by evergreen mixed forests. The alluvial plains consists of older and newer alluvium. The older alluvium occupies the piedmont zone towards the north of the district bordering Bhutan. The high narrow zone at the Himalayan foothill is known as the Bhabar zone and supports dense forests. To the south of the Bhabar zone and parallel to it, there lies the flat Terai zone where the ground remains damp and sometimes springs oozes out. Tall grasses cover the Terai zone. The formation is composed of sand, clay with mixtures of pebble, cobble and boulders. The Newer alluvium includes sand, gravel, pebble with silt and clay.

Soil in greater parts of the district is sandy and silty loam, or clayey loam. The soils of the alluvium are partly new or recent and partly old. The variation in composition is mainly a result of the varying composition of the river borne materials deposited at different times and under different conditions. The younger alluvial soil has a high phosphorous content whereas in older alluvial soils, the content is very low. In general, the soil is acidic to slightly alkaline in nature and is moderately permeable and characterised by the presence of low organic carbon and low soluble salts. Soils restricted to inselberg areas are more clayey, lateritic and less permeable and are highly acidic in nature. From an agricultural point of view, the soils in major part of the district are suitable for all sorts of crops.

**Dhubri district:** Physiographically, the district constitutes the vast alluvial plains of Brahmaputra River system. The monotony of the flat alluvial tract is interrupted by the presence of Archaean inliers in the form of disconnected hillocks referred to as inselbergs and these occur specially in the eastern and southern parts of the district. These hillocks are joined by the offshoots of Shillong plateau and are found on the north bank near Diple beel, Sitdanga beel and east of Bilasipara and on the south bank of the foothill portion of Garo Hills along the district boundary. The level difference between the valley and the peaks of the inselbergs ranges from 25 to 455 m. These hillocks are covered by a thick lateritic mantle and are occupied by evergreen mixed forest. Terraced alluvial deposits occupy 80% of the district with conspicuous occurrence of buried channels, back swamps, etc. Soils in greater part of the district are sandy and silty loam, or clayey loam. It is found to be highly acidic to slightly alkaline in nature and is moderately permeable and characterised by the presence of low organic carbon and low soluble salts. Soils restricted to inselberg areas are more clayey, lateritic and less permeable and are highly acidic in nature. From agriculture point of view, the soils in major part of the area are suitable for all sorts of crops cultivation.

### ➤ Soil Quality

To understand the soil characteristics of the study area, 4 locations in the study area were selected for soil sampling. The soil sampling locations are shown in Figure 26.

**Table 24: Soil Sampling location details**

| Location Area                      | Chainage | Latitude       | Longitude     | Distance from Alignment |
|------------------------------------|----------|----------------|---------------|-------------------------|
| <b>Shrirampur (SSM 1)</b>          | 1+580km  | 26°25'28.65"N  | 89°53'49.76"E | 10m                     |
| <b>Paglahat (SSM 2)</b>            | 27+000km | 26°12'41.94" N | 89°51'53.17"E | 30m                     |
| <b>Moterjhar (SSM 3)</b>           | 35+100km | 26°08'35.19" N | 89°52'21.87"E | 10m                     |
| <b>Kachuar Khas Pt. II (SSM 4)</b> | 51+300km | 26° 2'24.76"N  | 89°54'50.11"E | 15m                     |



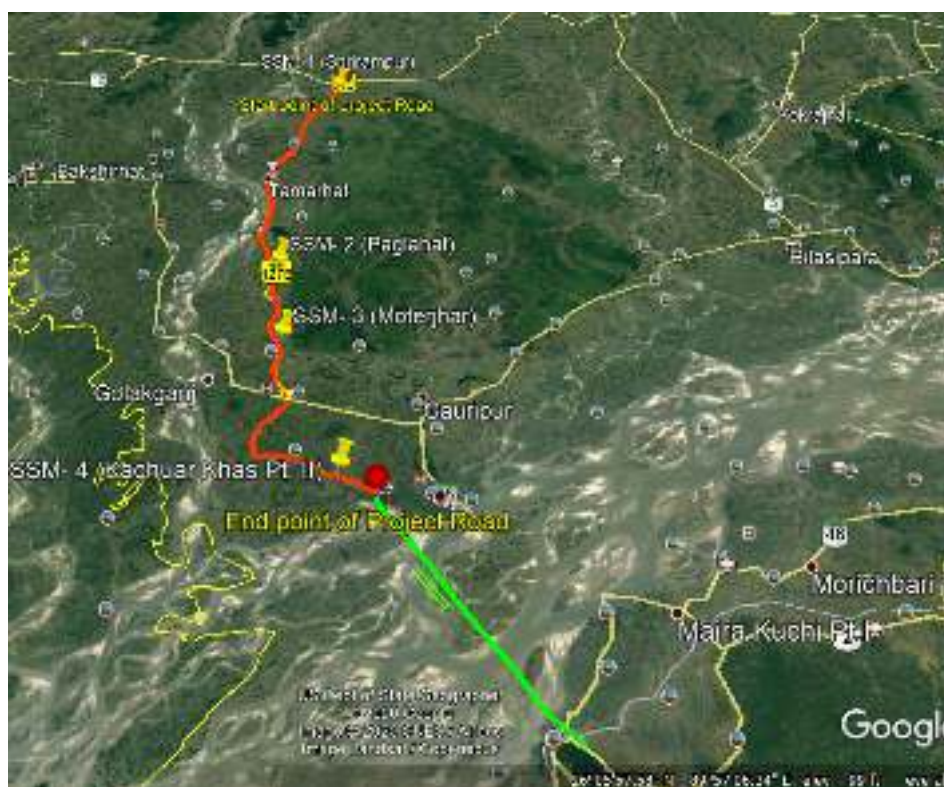


Figure 26: Soil sampling stations along the project road

The analysis results of soil quality are presented in Table 25.



**Table 25: Physio-Chemical Analysis of soil quality<sup>2</sup>**

| Sl. No. | Parameters                  | Unit        | Shrirampur1+580 km | Paglahat 27+000km | Moterjhar 35+100km | Kachuar Khas Pt. II 51+300km | Minimum BDL value |
|---------|-----------------------------|-------------|--------------------|-------------------|--------------------|------------------------------|-------------------|
| 1       | Soil Texture                | -           | Sandy Loam         | Loam              | Loam               | Sandy Loam                   | -                 |
| 2       | Soil Colour                 |             | Whitish Brown      | Whitish Brown     | Whitish Brown      | Whitish Brown                | -                 |
| 3       | pH Value at 25°C            | -           | 7.66               | 7.91              | 8.04               | 7.77                         | 1.0               |
| 4       | Conductivity at 25°C        | µS/cm       | 681                | 604               | 708                | 633                          | 1.0               |
| 5       | Moisture                    | % by mass   | 12.4               | 12.4              | 12.4               | 11.6                         | 1.0               |
| 6       | Bulk Density                | gm/cc       | 1.41               | 1.34              | 1.28               | 1.31                         | 0.5               |
| 7       | Water Holding Capacity      | Inches/foot | 1.17               | 1.14              | 1.12               | 1.16                         | 0.5               |
| 8       | Nitrogen as N               | mg/Kg       | 28.2               | 26.4              | 21.4               | 22.8                         | 2.0               |
| 9       | Phosphorus                  | mg/Kg       | 2.15               | 2.48              | 2.99               | 3.40                         | 0.5               |
| 10      | Potassium (as K)            | mg/Kg       | 58.4               | 51.2              | 60.4               | 57.6                         | 1.0               |
| 11      | Calcium as Ca               | mg/Kg       | 41.3               | 41.0              | 48                 | 45                           | 1.0               |
| 12      | Nitrate as NO <sub>3</sub>  | mg/Kg       | 78                 | 69.4              | 81                 | 76                           | 1.0               |
| 13      | Sulphate as SO <sub>4</sub> | mg/Kg       | 9.8                | 11.4              | 12.1               | 11.3                         | 1.0               |
| 14      | Chloride                    | mg/Kg       | 2.3                | 2.8               | 2.7                | 2.8                          | 0.5               |
| 15      | Organic Carbon              | % by mass   | 4.4                | 4.4               | 4.8                | 4.4                          | 0.5               |
| 16      | Organic Matter              | % by        | 3.6                | 3.2               | 3.7                | 3.4                          | 0.5               |

<sup>2</sup>Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15<sup>th</sup> June to 30<sup>th</sup> September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliance against Indian statutory requirement

| Sl. No.                    | Parameters           | Unit      | Shrirampur1+580 km | Paglahat 27+000km | Moterjhar 35+100km | Kachuar Khas Pt. II 51+300km | Minimum BDL value |
|----------------------------|----------------------|-----------|--------------------|-------------------|--------------------|------------------------------|-------------------|
|                            |                      | mass      |                    |                   |                    |                              |                   |
| 17                         | Total Soluble Solids | mg/Kg     | 12.4               | 11.7              | 10.8               | 11.9                         | 1.0               |
| Particle size distribution |                      |           |                    |                   |                    |                              |                   |
| A                          | Sand                 | % by mass | 35.4               | 28.4              | 26.4               | 36.6                         | 1.0               |
| B                          | Silt                 | % by mass | 42.2               | 48.7              | 41.4               | 42.1                         | 1.0               |
| C                          | Clay                 | % by mass | 22.4               | 22.9              | 32.2               | 21.3                         | 1.0               |

Soil texture of Shrirampur and Kachuar Khas Pt II is sandy loam, whereas the soil texture of Paglahat and Moterjhar is loam. The soil samples were alkaline, pH value at 25°C ranges between 7.66 to 8.04. The moisture content is medium. Bulk density in all locations varies from 1.28 to 1.41. The electrical conductivity is in the range of 633 - 708  $\mu\text{S}/\text{cm}$ . Based on above analysis, it can be inferred that all locations have moderate leaching potential and thus in case of any hydrocarbon/ chemical spill, there would be potential for groundwater contamination.

### **B.12. Water Resource and Hydrology**

Water resources of the study area are classified into the following categories:

(i) Surface Water Resource: River, Nallah, Ponds, etc.

(ii) Ground Water Resources: Accumulation of water in deeper strata of ground.

The only source of recharging for surface water and ground water is from the atmospheric precipitation, which is in the form of rainfall.

#### **➤ Surface Water Resource:**

There are 2 rivers and 237 nos. of other water bodies (i.e. ponds, lakes etc along the project road). Satellite image of water bodies along the project road is shown in Figure 27. Detailed road strip plan is attached in Annexure 8

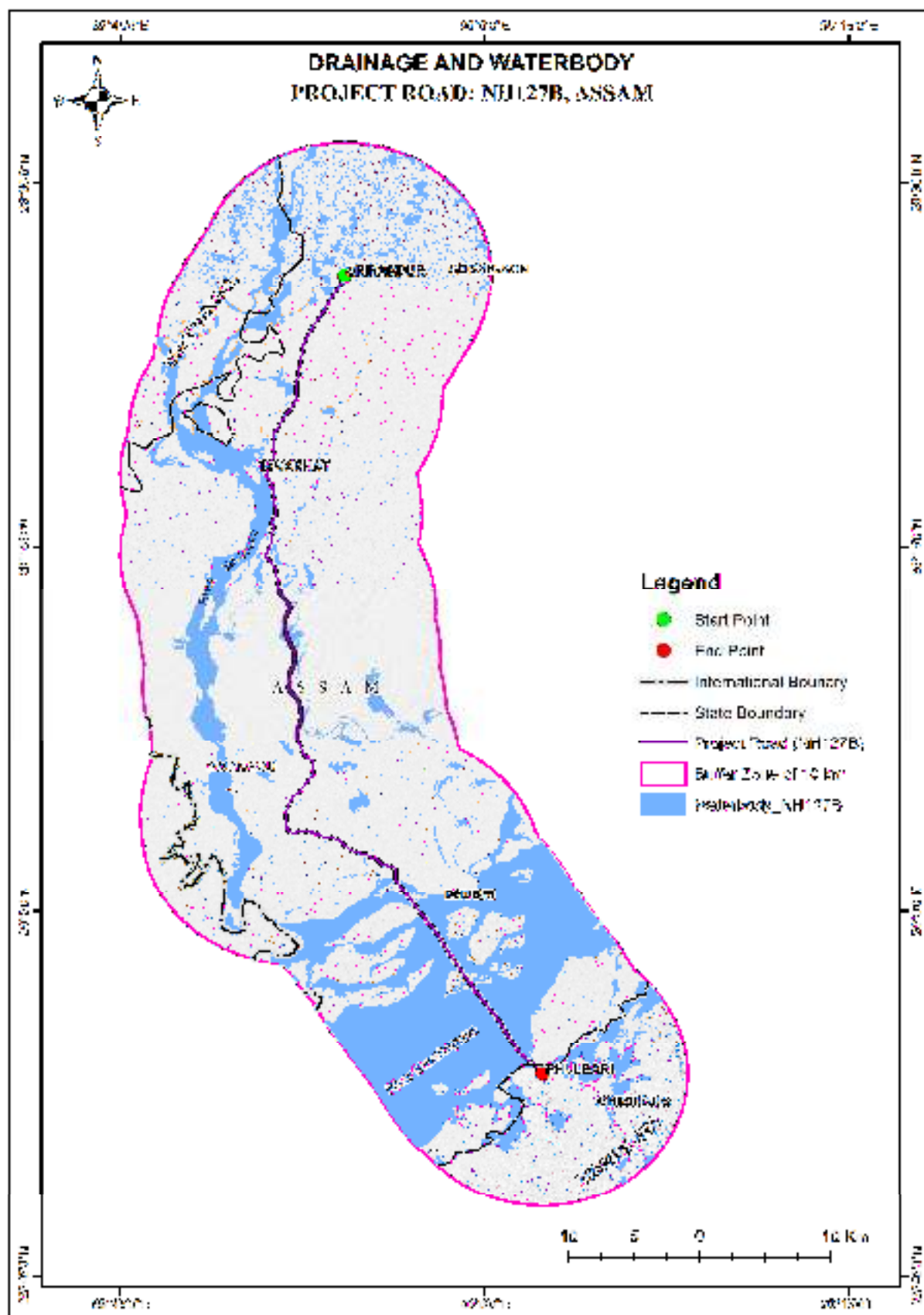


Figure 27: water bodies along the project road

Some photographs of road side ponds and rivers are shown in Figure 28.



Figure 28: photographs of few surface water bodies along the project road

### ➤ Ground Water Resource

**Kokrajhar district:** Major Drainage Rivers of the district are Saralaganga, Paponi, Gangia, Saumukha and Lonya rivers including their tributaries. The drainage density is very high along with more or less parallel drainage patterns. The net ground water which is available in the district as estimated in the year 2009 is 1609.70 mcm. In Kokrajhar district stage of ground water development is around 9%. In this district, ground water occurs under unconfined condition to semi-confined conditions and it is a mono aquifer system, thus the water level is almost directly proportional to the amount of precipitation received. Therefore the pre-monsoon average water level is 2.2 – 4.5 mbgl, while the post monsoon water level is 1.9 - 4.1 mbgl. The long term water level trend does not show any kind of significant change (Ground Water Information Booklet Kokrajhar District, Assam, CGWB, 2013).

**Dhubri district:** There are a number of perennial streams flowing through the district from north to south and joining the Brahmaputra River. The major drainage rivers of the area are Sankosh, Silai, Gadadhar and Gouranga Rivers. The net ground water which is available in the district as estimated in the year 2009 is 1636 mcm. The pre-monsoon depth of water level is 1.2 to 16.8 mbgl, while the post monsoon depth of water level is 1.2 to 15.5 mbgl (Figure 29). The existing gross ground water draft 181.1 mcm and the stages of development are 11% only which is under the SAFE category. Future provision for domestic and Industrial use is 65.35mcm including for Irrigation use is 1432.9 mcm (Ground Water Information Booklet Dhubri District, Assam, CGWB, 2013).



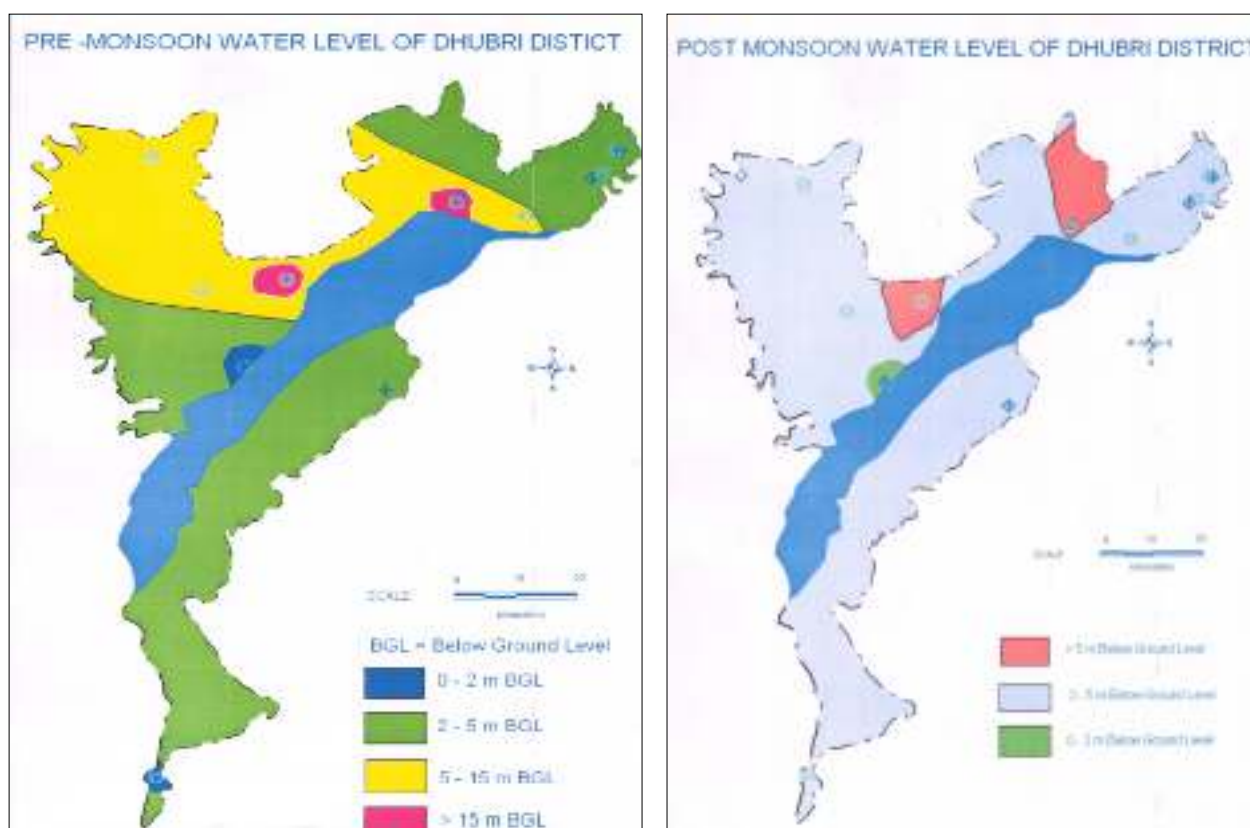


Figure 29: Map showing Pre-Monsoon and Post-Monsoon Water Level of Dhubri District  
(Source: [http://cgwb.gov.in/District\\_Profile/Assam/Dhubari.pdf](http://cgwb.gov.in/District_Profile/Assam/Dhubari.pdf))

For ready reference of drainage pattern and elevation map has been prepared in a buffer of 10 km either side of project road alignment using IRS Resource SAT-1 LISS-III, the drainage network of study area has been shown in Figure 30.

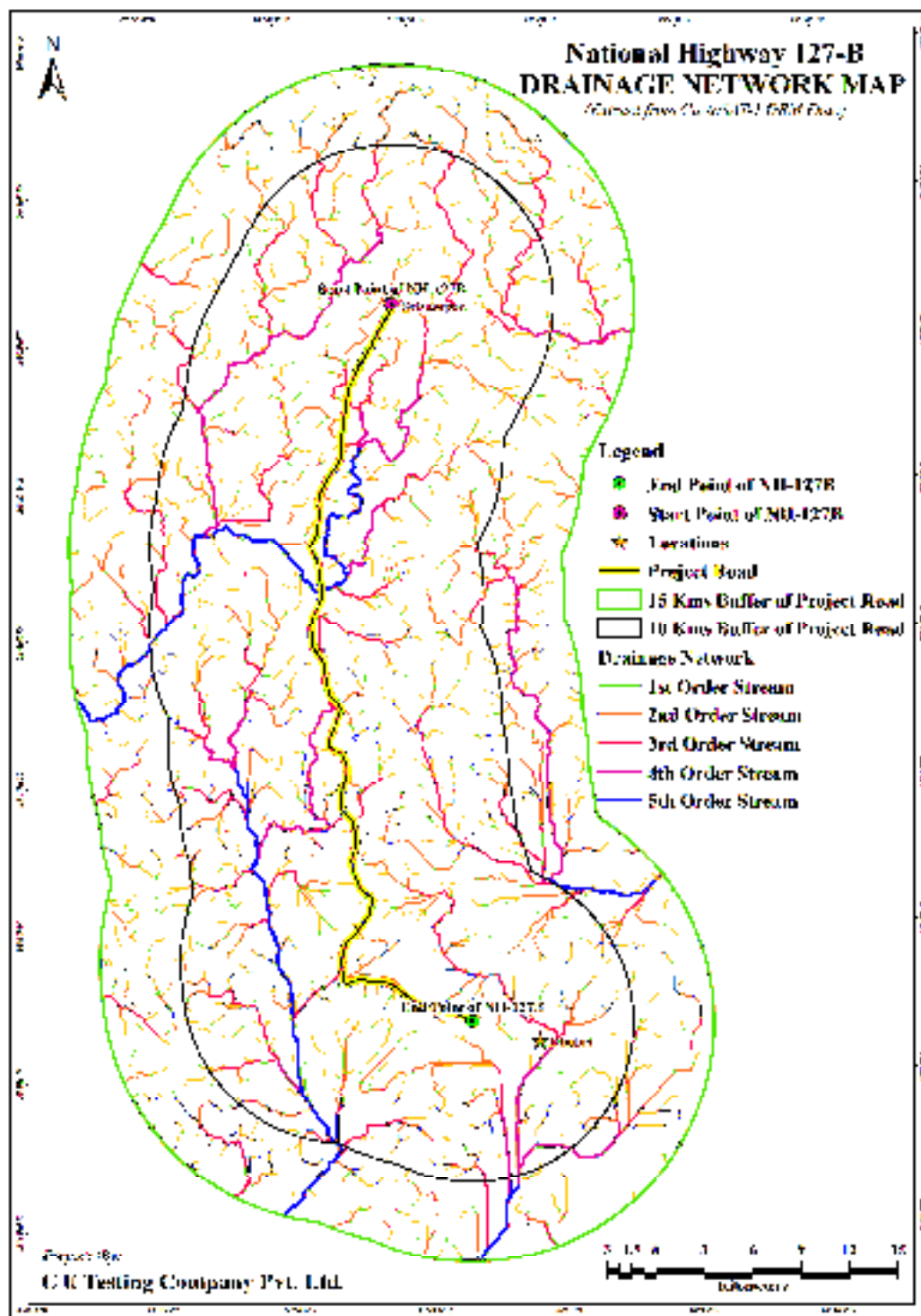


Figure 30: Drainage Network of Project Study Area

### ➤ Hydrogeology:

**Kokrajhar district:** The major water bearing formation of the district is the sand and pebble aquifer zone which is down to 300 m depth along with weathered and fracture zones which are up to 100 m depth present in consolidated rocks. Hydrogeologically, the district is divided into 2 units namely, Piedmont plain (occupying in the north as well as elevated portion along the foothills of Himalayas) and Flood plain (present in the lower part comprising of newer alluvium forms in south). The district is underlain by thick alluvium which comprises of uniform porosity



and permeability of around 10-15%. The ground water monitoring stations show very little variation in water level records. The average pre-monsoon water level of the district is 4.07 m bgl whereas post monsoon is 1.64 mbgl. The flood plain area constitutes a major portion of the district underlined by alluvial formation. The depth to water level varies from 2 to 4 mbgl and the seasonal fluctuation is in the range between 1 to 2 m. The movement of ground water is always towards the south. The ground water recharge by rainfall infiltration in the flood plain is much slower as compared to the piedmont zone. The average value of permeability of the shallow aquifer is about 40 m/day (Ground Water Information Booklet Kokrajhar District, Assam, CGWB, 2013). and shown in Figure 31.

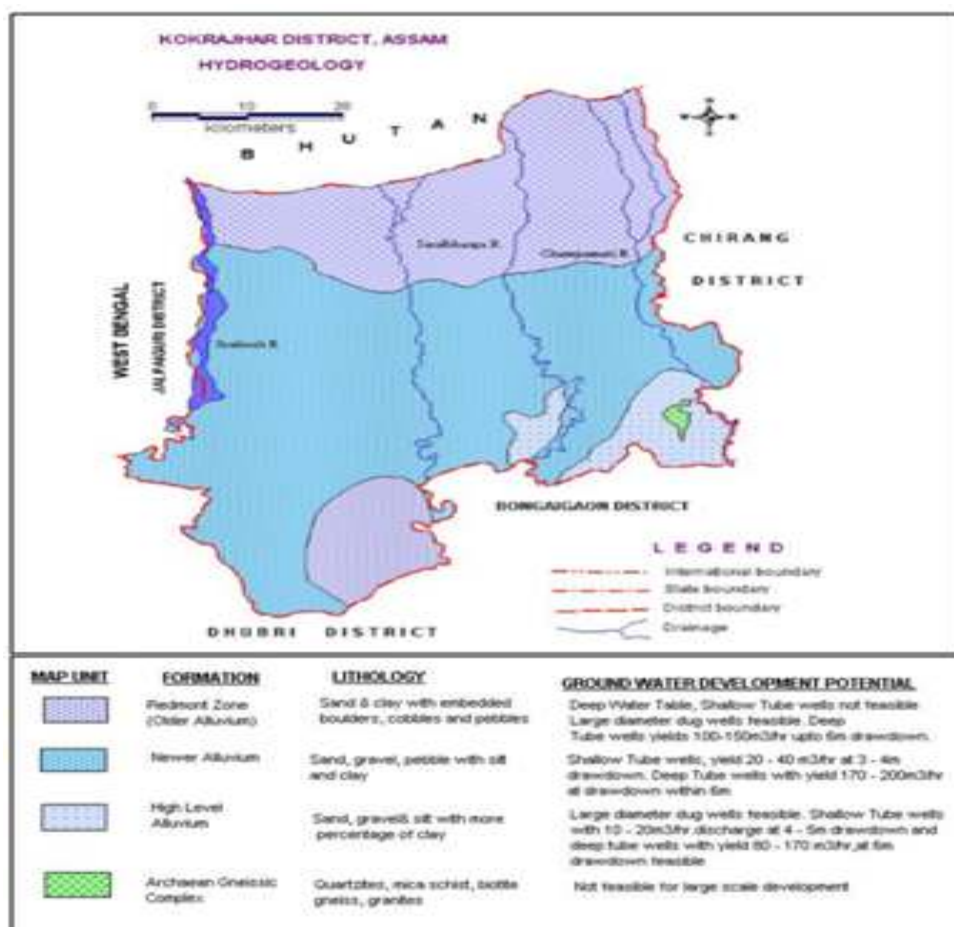


Figure 31: Map showing Hydrogeology of Kokrajhar District

(source: [http://cgwb.gov.in/District\\_Profile/Assam/Kokrajhar.pdf](http://cgwb.gov.in/District_Profile/Assam/Kokrajhar.pdf))

**Dhubri district:** Ground water conditions in the district are described under two different hydrogeological units namely, (i) conditions prevailing in consolidated formations and (ii) conditions prevailing in unconsolidated formations. Pre-Cambrian gneiss-schist complex which projects abruptly above the large stretch of alluvium referred as isolated hills forms the consolidated formation in the district. These rock formations had been subjected to faulting as well as fracturing at several places through which water percolates for facilitation of weathering. Weathered zone forms as such are restricted to about 10 m thickness and is mainly lateritic in character. Occurrence of ground water is limited in these formations and is confined to topographic lows along with weathered residuum. The ground water movement is controlled by the presence of fractures and fissures. Extraction of ground water in these zones is possible through large diameter dug wells as well as bore wells in hydrogeologically suitable areas. Ground water is present under water table conditions in the weathered zone. The

unconsolidated formation is represented by the alluvial deposits of the recent age. This formation is found spreading on either side of the River Brahmaputra and comprises medium to coarse grained sand, cobbles, gravel, pebbles, etc. with intercalation of silt and clay. It is characterised by the presence of hard compact lateritic clay followed by coarse sand with pebbles and cobbles. Ground water is present under water table as well as semi-confined conditions. The water table contour follows topography of the area and also lies mainly parallel to the Brahmaputra River. The movement of ground water is from north to south in the north bank and south to north in the south bank of Brahmaputra. An artesian belt also present around Mancachar in the southern part of the district. There are promising aquifer zones down to the depth of maximum 200 m bgl in the northern bank of the River Brahmaputra and more than 100 m in the southern bank. Aquifer displays various degree of lateral and vertical variation of aquifer which indicates different degree of depositional environment both in space as well as time (Ground Water Information Booklet Dhubri District, Assam, CGWB, 2013).

### B.13. Water Quality

#### ➤ Surface Water

Surface water includes drainage channels (eg. rivers, streams, and canals) and stagnant water bodies (eg. lakes, ponds, tanks and other impounded water bodies). A highway project can significantly alter the hydrological setting of the project area by acting as an impediment to the natural drainage system of the region. It is, therefore, essential that all surface water resources and their characteristics be identified and examined along the project road.

To understand the surface water characteristics of the study area, 5 locations in the study area were selected for surface water sampling. The sampling locations are shown in Figure 32.

**Table 26: Sampling location details of Surface Water**

| Location Area               | Chainage | Latitude       | Longitude     | Distance from Alignment |
|-----------------------------|----------|----------------|---------------|-------------------------|
| Jacobpur (SWM 1)            | 3+100km  | 26°24'47.21" N | 89°53'20.85"E | 85m                     |
| Alokjhari (SWM 2)           | 21+500m  | 26°15'28.33" N | 89°50'55.71"E | 435m                    |
| Paglahat (SWM 3)            | 27+000km | 26°12'41.94" N | 89°51'53.17"E | 30m                     |
| Debbatar Barundanga (SWM 4) | 34+650km | 26°08'50.49" N | 89°52'17.22"E | 117m                    |
| Kachuar Khas (SWM 5)        | 51+500km | 26° 2'23.71"N  | 89°54'58.26"E | 14m                     |



Figure 32: Surface water Monitoring locations

Analytical results of surface water quality along the project road is shown in Table 27;

Table 27: Analytical result of surface water quality<sup>3</sup> along the project road

| S. No. | Parameter(s)                                                    | Jacobpur<br>3+100km | Alokjhari<br>21+500m | Paglahat<br>27+000k<br>m | Debbatar<br>Barundanga<br>34+650km | Kachuar<br>Khas<br>51+500km | Acceptabl<br>e Limit | Permissible<br>Limit | Minimum<br>BDL value | WHO<br>Guideline<br>Value (4 <sup>th</sup><br>Edition) |
|--------|-----------------------------------------------------------------|---------------------|----------------------|--------------------------|------------------------------------|-----------------------------|----------------------|----------------------|----------------------|--------------------------------------------------------|
| 1      | pH Value at 25°C                                                | 7.98                | 8.1                  | 7.86                     | 7.67                               | 7.53                        | 6.5 – 8.5            | No Relaxation        | 1.0                  | 6.5-8.0                                                |
| 2      | Conductivity at 25°C, µS/cm                                     | 541                 | 511                  | 304                      | 289                                | 314                         | -                    | -                    | 1.0                  | -                                                      |
| 3      | Total Dissolve Solids, mg/l                                     | 352                 | 332                  | 198                      | 188                                | 204                         | 500 Max              | 2000 Max             | 5.0                  | 1000                                                   |
| 4      | Turbidity, mg/l                                                 | 21                  | 18                   | 16                       | 18                                 | 14                          |                      |                      | 1.0                  | 5                                                      |
| 5      | Calcium (as Ca),mg/l                                            | 48.7                | 46.2                 | 25.1                     | 24.1                               | 29.4                        | 75 Max               | 200 Max              | 0.2                  | 75                                                     |
| 6      | Magnesium (as Mg) , mg/l                                        | 22.4                | 21.4                 | 13.4                     | 12.1                               | 14.2                        | 30 Max               | 100 Max              | 0.2                  | 50                                                     |
| 7      | Sodium (as Na) ,mg/l                                            | 19.4                | 18.4                 | 11.2                     | 9.8                                | 8.6                         | -                    | -                    | 0.2                  | 200                                                    |
| 8      | Potassium (as K) ,mg/l                                          | 10.2                | 9.2                  | 5.4                      | 4.2                                | 4.8                         | -                    | -                    | 0.2                  | 20                                                     |
| 9      | Total Alkalinity (as CaCO <sub>3</sub> ) ,mg/l                  | 185                 | 224                  | 138                      | 128                                | 141                         | 200 Max              | 600 Max              | 2.0                  | -                                                      |
| 10     | Sulphate (as SO <sub>4</sub> ) ,mg/l                            | 24.6                | 28.4                 | 13.4                     | 12.1                               | 16.4                        | 200 Max              | 400 Max              | 2.0                  | 250                                                    |
| 11     | Chloride (as Cl),mg/l                                           | 18.4                | 19.4                 | 10.2                     | 9.4                                | 10.2                        | 250 Max              | 1000 Max             | 1.0                  | 250                                                    |
| 12     | Nitrate (as NO <sub>3</sub> ) ,mg/l                             | 11.5                | 12.4                 | 11.2                     | 8.4                                | 9.3                         | 45 Max               | No Relaxation        | 1.0                  | 50                                                     |
| 13     | * Fluoride as F, mg/l                                           | 0.1                 | 0.4                  | 0.1                      | 0.2                                | 0.1                         |                      |                      | 0.05                 | 1.5                                                    |
| 14     | Sodium Absorption Ratio (SAR)                                   | 3.25                | 3.16                 | 2.55                     | 2.30                               | 1.84                        |                      |                      | -                    | -                                                      |
| 15     | Iron (as Fe),mg/l                                               | 0.12                | 0.14                 | 0.18                     | 0.21                               | 0.17                        | 0.3 Max              | No Relaxation        | 0.1                  | 0.3                                                    |
| 16     | * Dissolve Phosphate (as PO <sub>4</sub> ) ,mg/l                | 0.18                | 0.16                 | 0.21                     | 0.27                               | 0.22                        | -                    | -                    | 0.05                 | -                                                      |
| 17     | Total Hardness (as CaCO <sub>3</sub> ) ,mg/l                    | 282                 | 203                  | 118                      | 110                                | 132                         | 200 Max              | 600 Max              | 5.0                  | 500                                                    |
| 18     | Biochemical Oxygen Demand, mg/l                                 | 6.1                 | 5.9                  | 5.4                      | 6.0                                | 5.8                         | -                    | -                    | 1.0                  | -                                                      |
| 19     | Dissolve Oxygen, mg/l                                           | 4.2                 | 5.2                  | 6.8                      | 5.4                                | 5.3                         | -                    | -                    | 0.2                  | -                                                      |
| 20     | Chemical Oxygen Demand, mg/l                                    | 21                  | 19                   | 18                       | 16                                 | 22                          | -                    | -                    | 2                    | -                                                      |
| 21     | * Phenolic compound (as C <sub>6</sub> H <sub>5</sub> OH), mg/l | BDL                 | BDL                  | BDL                      | BDL                                | BDL                         |                      |                      | 0.003                | -                                                      |
| 22     | * Lead (as Pb), mg/l                                            | BDL                 | BDL                  | BDL                      | BDL                                | BDL                         | 0.01                 | No Relaxation        | 0.01                 | 0.01                                                   |

<sup>3</sup>Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15<sup>th</sup> June to 30<sup>th</sup> September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliance against Indian statutory requirement

|    |                                            |      |     |      |      |     |       |               |       |       |
|----|--------------------------------------------|------|-----|------|------|-----|-------|---------------|-------|-------|
| 23 | * Nickel (as Ni), mg/l                     | BDL  | BDL | BDL  | BDL  | BDL | 0.02  | No Relaxation | 0.01  | 0.07  |
| 24 | * Copper (as Cu), mg/l                     | BDL  | BDL | BDL  | BDL  | BDL | 0.05  | 1.5           | 0.01  | 2.0   |
| 25 | * Zinc (as Zn), mg/l                       | 1.2  | 0.9 | 1.2  | 1.2  | 1.8 | 5     | 15            | 0.01  | 3-5   |
| 26 | * Cadmium (as Cd), mg/l                    | BDL  | BDL | BDL  | BDL  | BDL | 0.003 | No Relaxation | 0.001 | 0.003 |
| 27 | * Arsenic (as As), mg/l                    | BDL  | BDL | BDL  | BDL  | BDL | 0.01  | 0.05          | 0.01  | 0.01  |
| 28 | * Manganese (as Mn), mg/l                  | BDL  | BDL | BDL  | BDL  | BDL |       |               | 0.1   | 1-5   |
| 29 | * Boron (as B), mg/l                       | 0.11 | 0.1 | 0.06 | 0.16 | 0.1 |       |               | 0.05  | 2.4   |
| 30 | * HexaChromium (as Cr <sup>6+</sup> , mg/l | BDL  | BDL | BDL  | BDL  | BDL |       |               | 0.01  | 0.05  |
| 31 | Faecal Coliform MPN/100 ml                 | 348  | 542 | 426  | 278  | 253 |       |               | -     | -     |

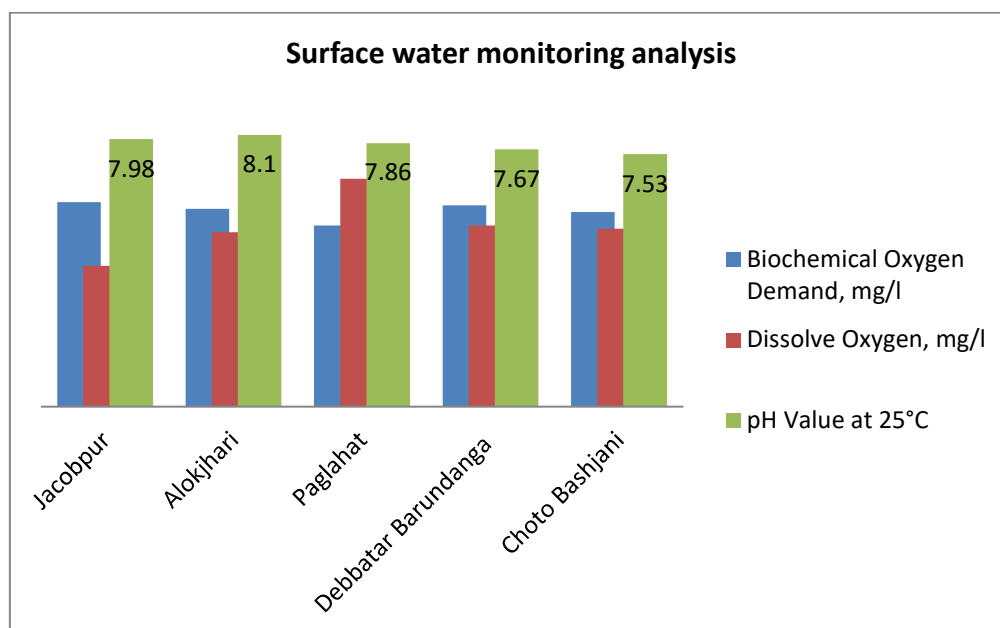


Figure 33: graphical representation of surface water quality analysis

From the above monitoring result it can be concluded that, the pH value varies from 7.53 to 8.1. Whereas BOD and DO values are almost close in all locations and COD value ranges between 16-22. Furthermore, in Jacobpur and Alokjhari total hardness is slightly exceeded compared to the acceptable limit.

CPCB and MOEF&CC has categorized the surface water in 5 different categories namely A, B, C, D and E (Ref: <http://cpcb.nic.in/water-quality-criteria/>) as presented in Table 28.

Table 28: Categorisation of surface water by CPCB and MOEF&CC

| Designated-Best-Use                                                         | Class of water | Criteria                                                                                                                                                                  |
|-----------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drinking Water Source without conventional treatment but after disinfection | A              | Total Coliforms Organism MPN/100ml shall be 50 or less<br>pH between 6.5 and 8.5<br>Dissolved Oxygen 6mg/l or more<br>Biochemical Oxygen Demand 5 days 20C 2mg/l or less  |
| Outdoor bathing (Organised)                                                 | B              | Total Coliforms Organism MPN/100ml shall be 500 or less<br>pH between 6.5 and 8.5<br>Dissolved Oxygen 5mg/l or more<br>Biochemical Oxygen Demand 5 days 20C 3mg/l or less |
| Drinking water source after conventional treatment and disinfection         | C              | Total Coliforms Organism MPN/100ml shall be 5000 or less<br>pH between 6 to 9<br>Dissolved Oxygen 4mg/l or more<br>Biochemical Oxygen Demand 5 days 20C 3mg/l or less     |
| Propagation of Wild life and Fisheries                                      | D              | pH between 6.5 to 8.5<br>Dissolved Oxygen 4mg/l or more<br>Free Ammonia (as N) 1.2 mg/l or less                                                                           |
| Irrigation, Industrial Cooling, Controlled Waste disposal                   | E              | pH between 6.0 to 8.5<br>Electrical Conductivity at 25C micro mhos/cm Max.2250                                                                                            |



Sodium absorption Ratio Max. 26  
Boron Max. 2mg/l

As per the categorization the surface water along the project road can be classified as Category D.

### ➤ Ground Water

Groundwater quality is a concern during road construction to establish baseline quality, ground water samples were drawn from 5 locations along the project road and analyzed as per IS 10500. The locations of ground water sampling is shown in Figure 34.

Table 29: Sampling location details of Ground Water

| Location Area              | Chainage | Latitude      | Longitude     | Distance from Alignment |
|----------------------------|----------|---------------|---------------|-------------------------|
| Shrirampur (GWM 1)         | 1+400km  | 26°25'33.99"N | 89°53'52.34"E | 12m                     |
| Jacobpur (GWM 2)           | 3+500km  | 26°24'36.43"N | 89°53'13.89"E | 62m                     |
| Ujanpetia (GWM 3)          | 17+350km | 26°17'34.80"N | 89°51'14.58"E | 48m                     |
| Paglahat (GWM 4)           | 27+000km | 26°12'39.37"N | 89°51'53.28"E | 17m                     |
| Kachuar Khas Pt II (GWM 5) | 51+000km | 26° 2'27.56"N | 89°54'38.63"E | 21m                     |

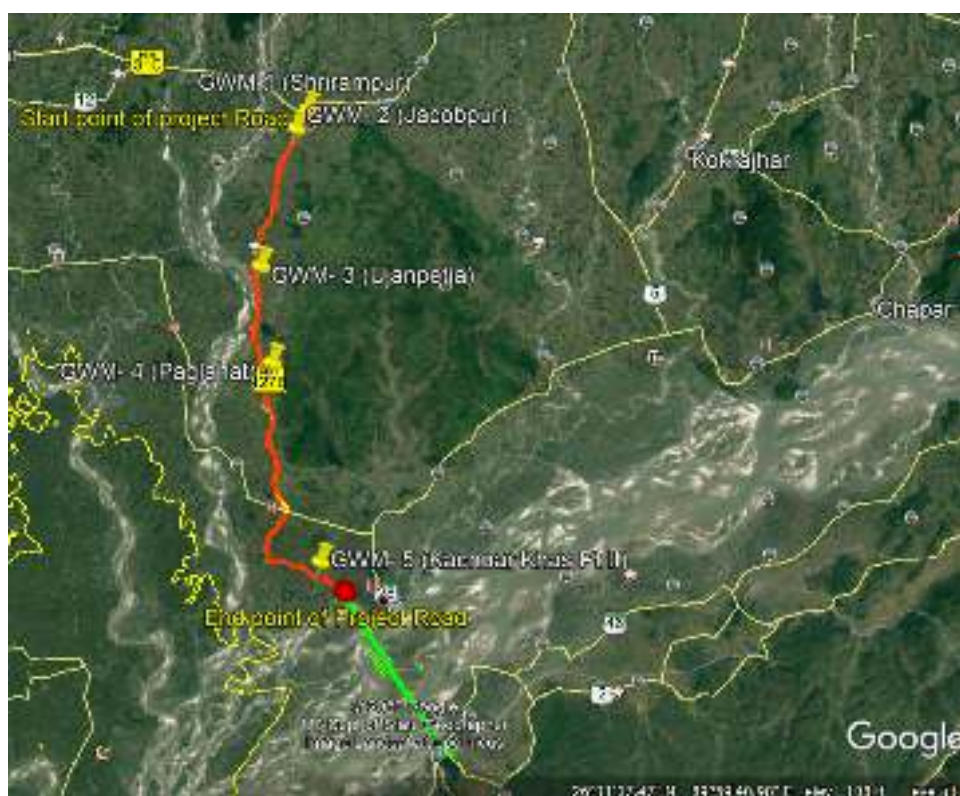


Figure 34: Ground water sampling locations along the project road

Analytical results of ground water quality along project road alignment is shown in Table 30.



Table 30: Analytical results of Ground water quality<sup>4</sup> along the project road

| SI no. | Parameter(s)                                                  | Shrirampur 1+400km | Jacobpur 3+500km | Ujanpetia 17+350km | Paglahat 27+100km | Kachuar Khas Pt II 51+000km | Acceptable Limit | Permissible Limit | Minimum BDL value | WHO Guideline Value (4 <sup>th</sup> Edition) |
|--------|---------------------------------------------------------------|--------------------|------------------|--------------------|-------------------|-----------------------------|------------------|-------------------|-------------------|-----------------------------------------------|
| 1      | Colour, Hazen units                                           | < 1                | < 1              | < 1                | < 1               | < 1                         | 5 Max            | 15 Max            | 2.0               | 5.0                                           |
| 2      | Odour                                                         | Agreeable          | Agreeable        | Agreeable          | Agreeable         | Agreeable                   | Agreeable        | Agreeable         | -                 | Unobjectionable                               |
| 3      | Temperature, °C                                               | 20.2               | 20.2             | 20.2               | 20.2              | 20.2                        | -                | -                 | 1.0               | 12-25                                         |
| 4      | pH Value at 25°C                                              | 7.39               | 7.70             | 7.56               | 7.33              | 7.48                        | 6.5 – 8.5        | No Relaxation     | 1.0               | 6.5-8.0                                       |
| 5      | Conductivity at 25°C, µS/cm                                   | 648                | 588              | 634                | 456               | 603                         | -                | -                 | 1.0               | -                                             |
| 6      | Total Dissolve Solids, mg/l                                   | 421                | 382              | 412                | 296               | 392                         | 500 Max          | 2000 Max          | 5.0               | 1000                                          |
| 7      | Turbidity, mg/l                                               | <1                 | <1               | <1                 | <1                | <1                          | 1                | 5                 | 0.5               | 5                                             |
| 8      | Calcium (as Ca),mg/l                                          | 56.3               | 48.2             | 51.2               | 36.4              | 42.1                        | 75 Max           | 200 Max           | 0.2               | 75                                            |
| 9      | Magnesium (as Mg) , mg/l                                      | 32.1               | 30.2             | 32.4               | 24.1              | 36.1                        | 30 Max           | 100 Max           | 0.2               | 50                                            |
| 10     | Sodium (as Na) ,mg/l                                          | 15.4               | 14.5             | 17.4               | 11.2              | 16.2                        | -                | -                 | 0.2               | 200                                           |
| 11     | Potassium (as K) ,mg/l                                        | 10.2               | 9.6              | 10.8               | 6.7               | 9.1                         | -                | -                 | 0.2               | 20                                            |
| 12     | Total Alkalinity (as CaCO <sub>3</sub> ) ,mg/l                | 264                | 245              | 264                | 194               | 254                         | 200 Max          | 600 Max           | 2.0               | -                                             |
| 13     | Sulphate (as SO <sub>4</sub> ) ,mg/l                          | 45.2               | 41.2             | 43.2               | 24.8              | 36.7                        | 200 Max          | 400 Max           | 2.0               | 250                                           |
| 14     | Chloride (as Cl),mg/l                                         | 23.5               | 21.4             | 23.5               | 16.4              | 21.5                        | 250 Max          | 1000 Max          | 1.0               | 250                                           |
| 15     | Nitrate (as NO <sub>3</sub> ) ,mg/l                           | 11.4               | 9.4              | 11.3               | 6.7               | 9.8                         | 45 Max           | No Relaxation     | 1.0               | 50                                            |
| 16     | *Fluoride as F, mg/l                                          | 0.09               | 0.12             | 0.14               | 0.15              | 0.11                        | 1.0              | 1.5               | 0.05              | 1.5                                           |
| 17     | Iron (as Fe),mg/l                                             | 0.24               | 0.27             | 0.19               | 0.18              | 0.25                        | 0.3 Max          | No Relaxation     | 0.10              | 0.3                                           |
| 18     | *Dissolve Phosphate (as PO <sub>4</sub> ) ,mg/l               | 0.18               | 0.17             | 0.14               | 0.12              | 0.16                        | -                | -                 | 0.05              | -                                             |
| 19     | Total Hardness (as CaCO <sub>3</sub> ) ,mg/l                  | 272                | 244              | 261                | 190               | 253                         | 200 Max          | 600 Max           | 5.0               | 500                                           |
| 20     | Phenolic compound (as C <sub>6</sub> H <sub>5</sub> OH), mg/l | BDL                | BDL              | BDL                | BDL               | BDL                         | 0.001 Max        | 0.002 Max         | 0.001             | -                                             |
| 21     | *Lead (as Pb), mg/l                                           | BDL                | BDL              | BDL                | BDL               | BDL                         | 0.01 Max         | No Relaxation     | 0.01              | 0.01                                          |
| 22     | *Nickel (as Ni), mg/l                                         | BDL                | BDL              | BDL                | BDL               | BDL                         | 0.02 Max         | No Relaxation     | 0.01              | 0.07                                          |

<sup>4</sup>Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15<sup>th</sup> June to 30<sup>th</sup> September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliance against Indian statutory requirement.

|    |                              |        |        |        |        |        |                                       |               |       |       |
|----|------------------------------|--------|--------|--------|--------|--------|---------------------------------------|---------------|-------|-------|
| 23 | *Copper (as Cu), mg/l        | BDL    | BDL    | BDL    | BDL    | BDL    | 0.05 Max                              | 1.5 Max       | 0.01  | 2.0   |
| 24 | *Zinc (as Zn), mg/l          | 1.2    | 1.4    | 1.2    | 1.4    | 1.3    | 5 Max                                 | 15 Max        | 0.1   | 3-5   |
| 25 | *Cadmium (as Cd), mg/l       | BDL    | BDL    | BDL    | BDL    | BDL    | 0.003                                 | No Relaxation | 0.002 | 0.003 |
| 26 | *Arsenic (as As), mg/l       | BDL    | BDL    | BDL    | BDL    | BDL    | 0.01 Max                              | 0.05 Max      | 0.01  | 0.01  |
| 27 | *Aluminium (as Al), mg/l     | BDL    | BDL    | 0.1    | BDL    | BDL    | 0.03 Max                              | 0.2 Max       | 0.01  | -     |
| 28 | Boron (as B), mg/l           | 0.12   | 0.10   | 0.09   | 0.11   | 0.16   | 0.5 Max                               | 1.0 Max       | 0.1   | 2.4   |
| 29 | Total Chromium (as Cr), mg/l | BDL    | BDL    | BDL    | BDL    | BDL    | 0.05 Max                              | No Relaxation | 0.05  | 0.05  |
| 30 | E. Coli, (MPN/100ml)         | Absent | Absent | Absent | Absent | Absent | Shall not be detected in 100ml sample |               | -     | -     |
| 31 | Total Coliform, (MPN/100ml)  | Absent | Absent | Absent | Absent | Absent | Shall not be detected in 100ml sample |               | -     | -     |

Analysis results when compared with potable IS:10500 norms indicates that all parameters are within the permissible limit and maybe used as drinking water. Indian standard specification drinking water specification : IS 10500:1991 is attached in annexure 5.

### ➤ Bottom Sediment

Sediments form a natural buffer and filter system and often play an important role in the storage and release of nutrients in the aquatic ecosystems. During the last two centuries, heavy metals released by human activities have superimposed new pattern of metal distribution on those which are naturally occurring. In rivers the predominant source of bottom sediments is land runoff. Impoundments and estuaries are often characterized by heavy siltation from tributary streams. The bottom sediment sample was collected at the major bridge at ch. 51+536km from redundant part of river.

**Table 31: Bottom sediment result**

| S. No. | Parameter(s)                | Test Method    | Test Result |            | Minimum BDL value |
|--------|-----------------------------|----------------|-------------|------------|-------------------|
|        |                             |                | Location-1  | Location-2 |                   |
| 1      | pH Value at 25°C            | ITL/W&W/SOP/02 | 7.88        | 7.62       | 1.0               |
| 2      | Organic Carbon, %           | ITL/W&W/SOP/07 | 6.51        | 4.58       | 1.0               |
| 3      | Organic Matter, %           | ITL/W&W/SOP/07 | 7.14        | 5.15       | 1.0               |
| 4      | Total Nitrogen, mg/g        | ITL/W&W/SOP/08 | 4.54        | 3.48       | 0.5               |
| 5      | Phosphate (Available), mg/g | ITL/W&W/SOP/09 | 0.14        | 0.12       | 0.05              |
| 6      | Potassium, mg/g             | ITL/W&W/SOP/10 | 18.4        | 16.1       | 1.0               |
| 7      | Chloride as Cl, mg/g        | ITL/W&W/SOP/11 | 35.1        | 24.5       | 2.0               |
| 8      | Sodium as Na, mg/g          | ITL/W&W/SOP/13 | 28.1        | 21.3       | 1.0               |
| 9      | Copper as Cu, mg/g          | ITL/W&W/SOP/15 | 0.014       | 0.011      | 0.2               |
| 10     | Zinc as Zn, mg/g            | ITL/W&W/SOP/12 | 0.036       | 0.024      | 0.2               |
| 11     | Lead as Pb, mg/g            | ITL/W&W/SOP/16 | 0.022       | 0.018      | 0.2               |
| 12     | Nickel as Ni, mg/g          | ITL/W&W/SOP/18 | 0.032       | 0.024      | 0.2               |

From the above baseline monitoring it can be conclude that, organic carbon percentage varies from 4.58 to 6.51. The total nitrogen level varies between 3.48 to 4.54.

### B.14. Ambient Air Environment

Air pollution is caused due to both natural and manmade processes. The main source of air pollution is human induced/manmade, which includes industrialization and its by products, burning of timber, heat and light, rapid urbanization, vehicular pollution, plastics, burning of polymers and processing of various materials emitting obnoxious gases, generation of smoke, dust and fine respirable particles due to construction activity and rapid burning etc. Vehicular emission is major source of air pollution now-a-day. Presently some patches of study area are in the locality of heavy traffic movement particularly at congested places i.e at major market areas, which may impact the ambient air quality of the area. During construction stage of the project, temporary air pollution arises due to the movement of construction vehicles, operation of plants & machineries, dust emission due to excavation and demolition etc. The air quality parameters considered for the construction phase includes PM<sub>10</sub>, PM<sub>2.5</sub>, Nitrogen Oxides (NO<sub>x</sub>) Sulphur Di-oxide (SO<sub>2</sub>), and Carbon monoxide (CO).

**Table 32: Ambient Air Quality Standard**

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

### ➤ Along the Project Road

Ambient air quality monitoring has been conducted at 5 locations along the project road alignments. The air sampling locations is shown in Figure 35. SPM and RPM have been determined gravimetrically and as specified in IS 5182 (Part 23):2006. The concentration of NOx has been estimated using IS 5182 Part 2:2001 method and SOx has been estimated by IS 5182 Part 6:2006 method. CO was measured as per EPA Method 13. Sampling duration for SO2, NOx, PM2.5 and PM10 was 24 hourly as per NAAQS Standards requirements and CO sampling duration was 1 Hr.

The monitoring stations had been distributed throughout the project road so as to get a representative baseline of any variation in land use as well as road geometrics and traffic conditions across the project road. The purpose is also to establish a benchmark, which can form the reference for monitoring in the construction and operation period. GOI ambient air quality standard is given in annexure 3.

**Table 33: Sampling location details of Ambient Air Quality**

| Location Area                      | Chainage  | Latitude       | Longitude     | Distance from Alignment |
|------------------------------------|-----------|----------------|---------------|-------------------------|
| <b>Shrirampur (AAQM 1)</b>         | 01+400 Km | 26°25'34.04" N | 89°53'53.80"E | 20m                     |
| <b>Tamarhat (AAQM 2)</b>           | 16+200 Km | 26°18'9.20"N   | 89°51'3.20"E  | 8m                      |
| <b>Ujanpetla (AAQM 3)</b>          | 17+500 Km | 26°17'31.44"N  | 89°51'13.61"E | 16m                     |
| <b>Moterjhar (AAQM 4)</b>          | 35+100 Km | 26°08'35.19" N | 89°52'21.87"E | 12m                     |
| <b>Kachuar Khas Pt II (AAQM 5)</b> | 51+000km  | 26° 2'26.77"N  | 89°54'41.46"E | 15m                     |

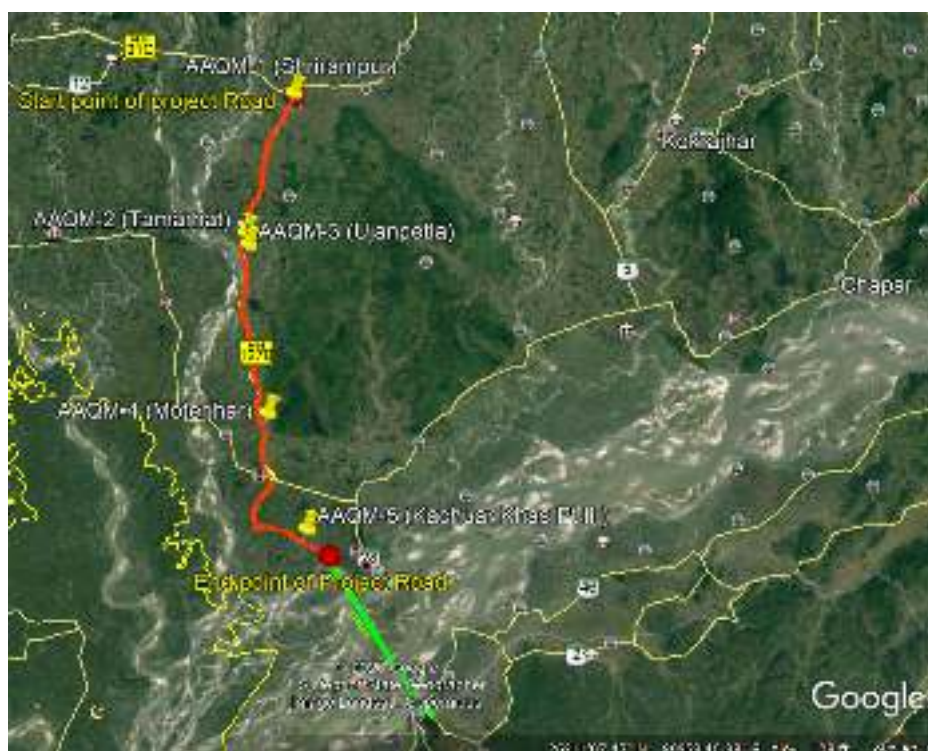


Figure 35: Air quality monitoring stations along the project road

Table 34: Analysis of ambient air quality monitoring<sup>5</sup> along the project road

|                                                   | S.N. | Description | PM <sub>10</sub><br>(µg/m <sup>3</sup> ) | PM <sub>2.5</sub><br>(µg/m <sup>3</sup> ) | SO <sub>2</sub><br>(µg/m <sup>3</sup> ) | NO <sub>2</sub><br>(µg/m <sup>3</sup> ) | CO<br>(mg/m <sup>3</sup> ) |
|---------------------------------------------------|------|-------------|------------------------------------------|-------------------------------------------|-----------------------------------------|-----------------------------------------|----------------------------|
| Location - Shrirampur (AAQM 1)                    |      |             |                                          |                                           |                                         |                                         |                            |
| Week 1                                            | 1    | Day 1       | 92.3                                     | 41.2                                      | 11.5                                    | 18.2                                    | BDL                        |
|                                                   | 2    | Day 2       | 95.3                                     | 47.2                                      | 16.8                                    | 19.2                                    | BDL                        |
| Week2                                             | 3    | Day 3       | 92.4                                     | 35.4                                      | 15.4                                    | 18.4                                    | BDL                        |
|                                                   | 4    | Day 4       | 97.2                                     | 40.2                                      | 14.8                                    | 19.7                                    | BDL                        |
| Week3                                             | 5    | Day 5       | 86.2                                     | 42.1                                      | 17.6                                    | 21.2                                    | BDL                        |
|                                                   | 6    | Day 6       | 85.2                                     | 46.1                                      | 18.1                                    | 22.4                                    | BDL                        |
| Week4                                             | 7    | Day 7       | 90.8                                     | 35.2                                      | 22.4                                    | 24.2                                    | BDL                        |
|                                                   | 8    | Day 8       | 91.8                                     | 42.7                                      | 24.5                                    | 25.1                                    | BDL                        |
|                                                   |      | Minimum     | 85.2                                     | 35.2                                      | 11.5                                    | 18.2                                    | -                          |
|                                                   |      | Maximum     | 97.2                                     | 47.2                                      | 24.5                                    | 25.1                                    | -                          |
|                                                   |      | Average     | 91.4                                     | 41.3                                      | 17.7                                    | 21.1                                    | -                          |
| WHO Air quality guideline<br>2005, Guidance Value |      |             | 50                                       | 25                                        | 40**                                    | 20                                      | -                          |

<sup>5</sup>Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15<sup>th</sup> June to 30<sup>th</sup> September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliance against Indian statutory requirement.

|                                                | S.N. | Description | PM <sub>10</sub><br>(µg/m <sup>3</sup> ) | PM <sub>2.5</sub><br>(µg/m <sup>3</sup> ) | SO <sub>2</sub><br>(µg/m <sup>3</sup> ) | NO <sub>2</sub><br>(µg/m <sup>3</sup> ) | CO<br>(mg/m <sup>3</sup> ) |
|------------------------------------------------|------|-------------|------------------------------------------|-------------------------------------------|-----------------------------------------|-----------------------------------------|----------------------------|
| NAAQMS Standard                                |      |             | 100                                      | 60                                        | 8                                       | 80                                      | 02                         |
| Minimum BDL value                              |      |             | 25                                       | 10                                        | 5                                       | 5                                       | 1.14                       |
| Location –Tamarhat (AAQM 2)                    |      |             |                                          |                                           |                                         |                                         |                            |
| Week 1                                         | 1    | Day 1       | 74.2                                     | 24.5                                      | 10.2                                    | 11.4                                    | BDL                        |
|                                                | 2    | Day 2       | 76.3                                     | 26.5                                      | 11.5                                    | 12.6                                    | BDL                        |
| Week2                                          | 3    | Day 3       | 68.5                                     | 27.3                                      | 12.5                                    | 13.2                                    | BDL                        |
|                                                | 4    | Day 4       | 70.2                                     | 28.2                                      | 16.4                                    | 17.2                                    | BDL                        |
| Week3                                          | 5    | Day 5       | 64.2                                     | 31.2                                      | 18.4                                    | 20.1                                    | BDL                        |
|                                                | 6    | Day 6       | 71.2                                     | 30.4                                      | 17.4                                    | 21.2                                    | BDL                        |
| Week4                                          | 7    | Day 7       | 68.2                                     | 28.7                                      | 14.2                                    | 16.2                                    | BDL                        |
|                                                | 8    | Day 8       | 65.4                                     | 24.8                                      | 13.5                                    | 15.2                                    | BDL                        |
|                                                |      | Minimum     | 64.2                                     | 24.5                                      | 10.2                                    | 11.4                                    | -                          |
|                                                |      | Maximum     | 74.2                                     | 31.2                                      | 17.4                                    | 21.2                                    | -                          |
|                                                |      | Average     | 69.8                                     | 27.7                                      | 14.3                                    | 15.9                                    | -                          |
| WHO Air quality guideline 2005, Guidance Value |      |             | 50                                       | 25                                        | 40**                                    | 20                                      | -                          |
| NAAQMS Standard                                |      |             | 100                                      | 60                                        | 80                                      | 80                                      | 02                         |
| Minimum BDL value                              |      |             | 25                                       | 10                                        | 5                                       | 5                                       | 1.14                       |
| Location – Ujanpetla (AAQM 3)                  |      |             |                                          |                                           |                                         |                                         |                            |
| Week 1                                         | 1    | Day 1       | 88.2                                     | 31.2                                      | 10.5                                    | 16.2                                    | BDL                        |
|                                                | 2    | Day 2       | 77.4                                     | 30.5                                      | 11.6                                    | 14.2                                    | BDL                        |
| Week2                                          | 3    | Day 3       | 84.2                                     | 31.2                                      | 13.2                                    | 17.2                                    | BDL                        |
|                                                | 4    | Day 4       | 83.4                                     | 31.1                                      | 11.5                                    | 16.8                                    | BDL                        |
| Week3                                          | 5    | Day 5       | 85.2                                     | 30.4                                      | 18.2                                    | 21.4                                    | BDL                        |
|                                                | 6    | Day 6       | 91.4                                     | 32.4                                      | 14.5                                    | 22.3                                    | BDL                        |
| Week4                                          | 7    | Day 7       | 84.4                                     | 32.5                                      | 12.5                                    | 24.1                                    | BDL                        |
|                                                | 8    | Day 8       | 76.3                                     | 30.2                                      | 15.2                                    | 20.8                                    | BDL                        |
|                                                |      | Minimum     | 76.3                                     | 30.2                                      | 10.5                                    | 14.2                                    | -                          |
|                                                |      | Maximum     | 91.4                                     | 32.5                                      | 18.2                                    | 24.1                                    | -                          |
|                                                |      | Average     | 83.8                                     | 31.2                                      | 13.4                                    | 19.1                                    | -                          |
| WHO Air quality guideline 2005, Guidance Value |      |             | 50                                       | 25                                        | 40**                                    | 20                                      | -                          |
| NAAQMS Standard                                |      |             | 100                                      | 60                                        | 80                                      | 80                                      | 02                         |
| Minimum BDL value                              |      |             | 25                                       | 10                                        | 5                                       | 5                                       | 1.14                       |
| Location – Moterjhar (AAQM 4)                  |      |             |                                          |                                           |                                         |                                         |                            |
| Week 1                                         | 1    | Day 1       | 84.6                                     | 37.2                                      | 14.4                                    | 19.2                                    | BDL                        |
|                                                | 2    | Day 2       | 82.4                                     | 41.2                                      | 13.1                                    | 14.5                                    | 1.2                        |



|                                                | S.N. | Description | PM <sub>10</sub><br>(µg/m <sup>3</sup> ) | PM <sub>2.5</sub><br>(µg/m <sup>3</sup> ) | SO <sub>2</sub><br>(µg/m <sup>3</sup> ) | NO <sub>2</sub><br>(µg/m <sup>3</sup> ) | CO<br>(mg/m <sup>3</sup> ) |
|------------------------------------------------|------|-------------|------------------------------------------|-------------------------------------------|-----------------------------------------|-----------------------------------------|----------------------------|
| Week2                                          | 3    | Day 3       | 93.4                                     | 34.5                                      | 15.4                                    | 18.4                                    | BDL                        |
|                                                | 4    | Day 4       | 88.2                                     | 31.2                                      | 11.1                                    | 18.4                                    | BDL                        |
| Week3                                          | 5    | Day 5       | 94.1                                     | 38.3                                      | 18.5                                    | 22.2                                    | 1.3                        |
|                                                | 6    | Day 6       | 88.4                                     | 36.2                                      | 14.8                                    | 19.2                                    | BDL                        |
| Week4                                          | 7    | Day 7       | 91.4                                     | 37.8                                      | 11.5                                    | 13.2                                    | BDL                        |
|                                                | 8    | Day 8       | 81.5                                     | 36.2                                      | 12.8                                    | 16.4                                    | BDL                        |
|                                                |      | Minimum     | 81.5                                     | 31.2                                      | 11.1                                    | 13.2                                    | -                          |
|                                                |      | Maximum     | 94.1                                     | 41.2                                      | 15.4                                    | 22.2                                    | -                          |
|                                                |      | Average     | 88                                       | 36.6                                      | 13.9                                    | 17.6                                    | -                          |
| WHO Air quality guideline 2005, Guidance Value |      |             | 50                                       | 25                                        | 40**                                    | 20                                      | -                          |
| NAAQMS Standard                                |      |             | 100                                      | 60                                        | 80                                      | 80                                      | 02                         |
| Minimum BDL value                              |      |             | 25                                       | 10                                        | 5                                       | 5                                       | 1.14                       |
| Location - Kachuar Khas Pt II (AAQM 5)         |      |             |                                          |                                           |                                         |                                         |                            |
| Week 1                                         | 1    | Day 1       | 82.2                                     | 36.2                                      | 15.4                                    | 18.5                                    | BDL                        |
|                                                | 2    | Day 2       | 78.5                                     | 34.2                                      | 14.2                                    | 18.3                                    | BDL                        |
| Week2                                          | 3    | Day 3       | 86.4                                     | 31.2                                      | 12.4                                    | 16.7                                    | BDL                        |
|                                                | 4    | Day 4       | 82.4                                     | 38.4                                      | 13.2                                    | 16.2                                    | BDL                        |
| Week3                                          | 5    | Day 5       | 89.3                                     | 37.8                                      | 14.5                                    | 18.1                                    | BDL                        |
|                                                | 6    | Day 6       | 81.1                                     | 40.1                                      | 14.2                                    | 19.2                                    | BDL                        |
| Week4                                          | 7    | Day 7       | 89.7                                     | 32.4                                      | 14.5                                    | 18.6                                    | BDL                        |
|                                                | 8    | Day 8       | 84.2                                     | 32.5                                      | 15.1                                    | 19.4                                    | BDL                        |
|                                                |      | Minimum     | 78.5                                     | 31.2                                      | 12.4                                    | 16.2                                    | -                          |
|                                                |      | Maximum     | 89.3                                     | 40.1                                      | 15.4                                    | 19.4                                    | -                          |
|                                                |      | Average     | 84.2                                     | 35.3                                      | 14.2                                    | 18.1                                    | -                          |
| WHO Air quality guideline 2005, Guidance Value |      |             | 50                                       | 25                                        | 40**                                    | 20                                      | -                          |
| NAAQMS Standard.                               |      |             | 100                                      | 60                                        | 80                                      | 80                                      | 02                         |
| Minimum BDL value                              |      |             | 25                                       | 10                                        | 5                                       | 5                                       | 1.14                       |

\*\* Annual Mean

All monitoring was conducted between 1<sup>st</sup> July, 2020 to 30<sup>th</sup> July, 2020.



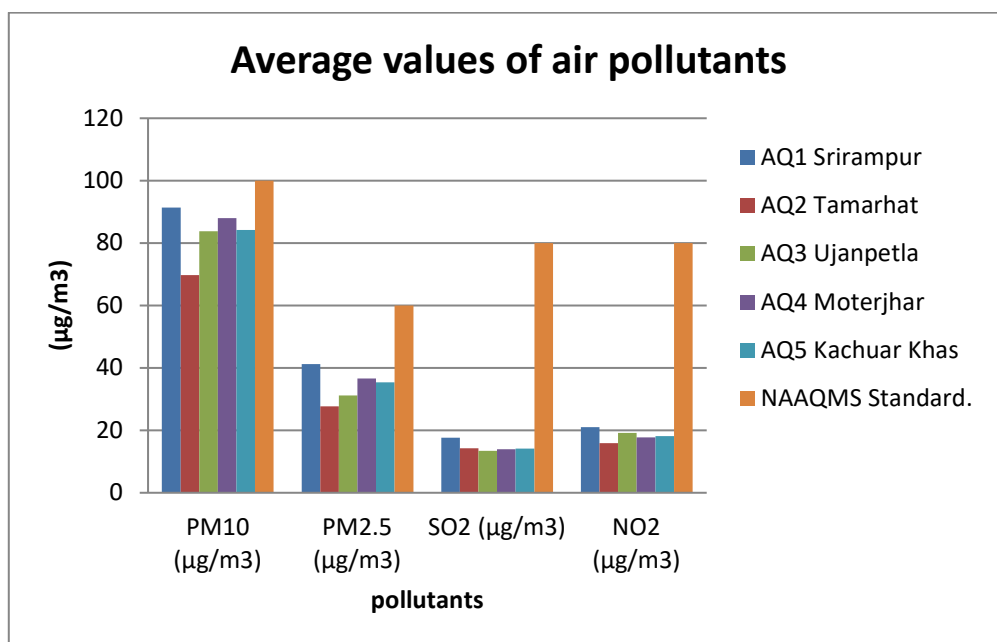


Figure 36: Average values of air pollutants in all locations (July 2020)

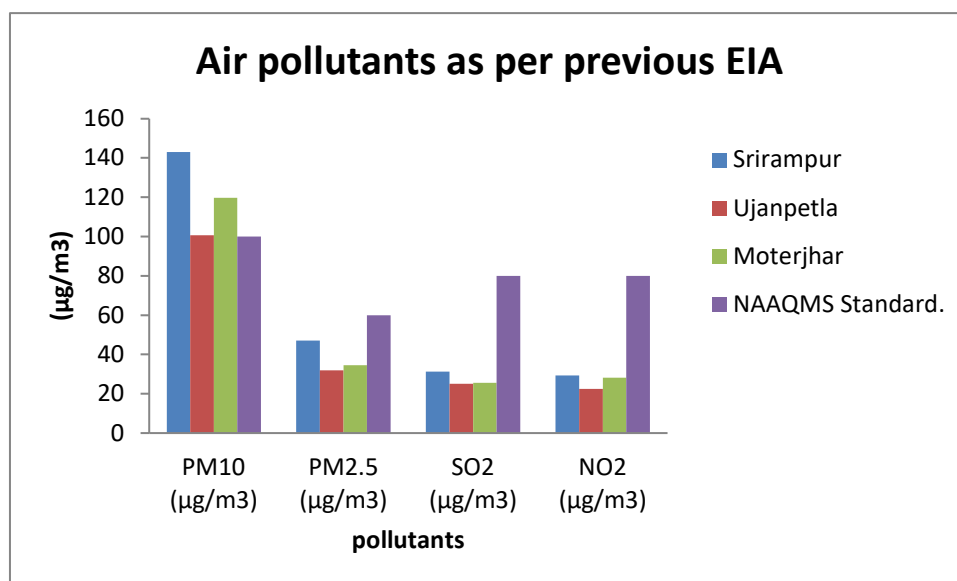


Figure 37: Air monitoring analysis as per previous EIA report

#### ➤ Comparison of Air monitoring baseline analysis with previous EIA report

In the previous EIA report (March, 2020) 4 air quality monitoring locations were selected. Whereas, in this SEIA 5 locations (3 previous monitoring locations i.e. Srirampur, Ujanpetla and Moterjhar and 2 new monitoring locations i.e. Tamarhat, Kachuar Khas) are considered.

The PM<sub>10</sub> concentrations in the common locations were found to be above the NAAQMS standard value (100 µg/m<sup>3</sup>) previously; whereas, the concentrations were below the NAAQMS standard during the current monitoring (i.e. month of July, 2020). This decrease in concentration could be attributed to the monsoon time when PMs are trapped in raindrops falling on the ground.

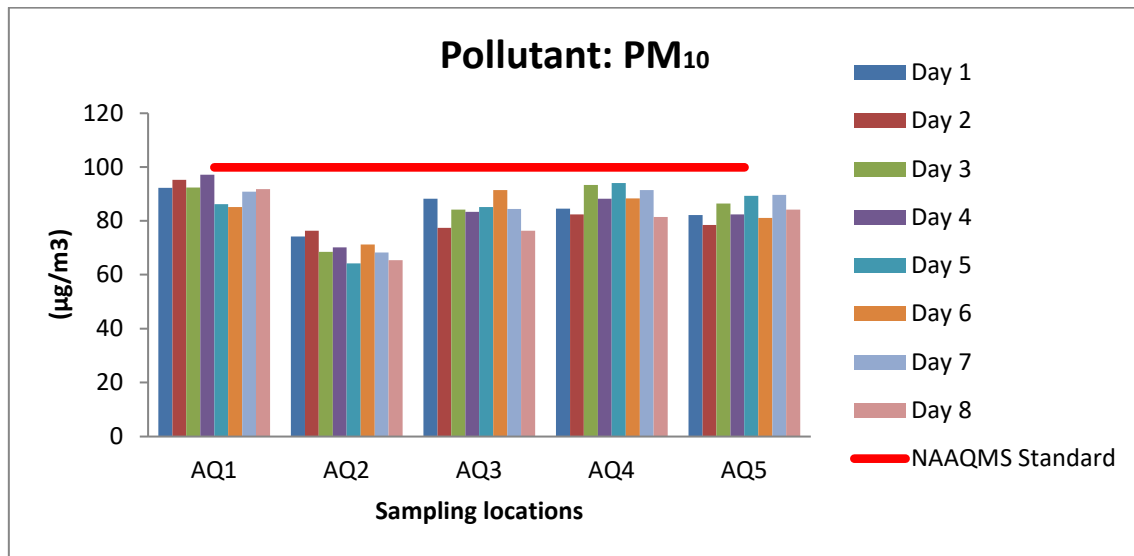


Figure 38: PM<sub>10</sub> values in all locations along with NAAQMS standard

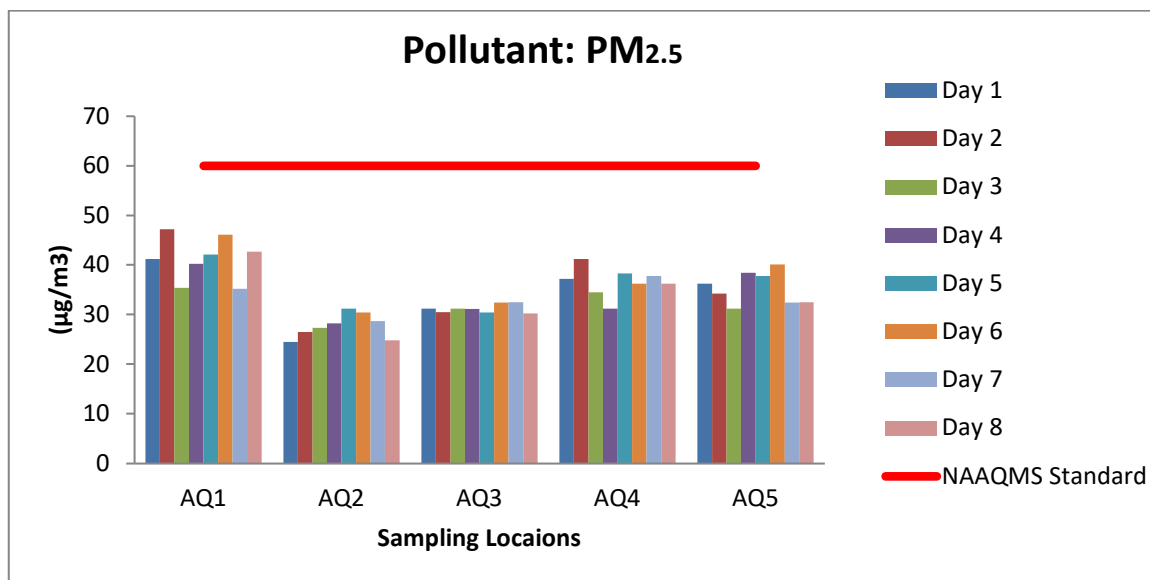


Figure 39: PM<sub>2.5</sub> values in all locations along with NAAQMS standard

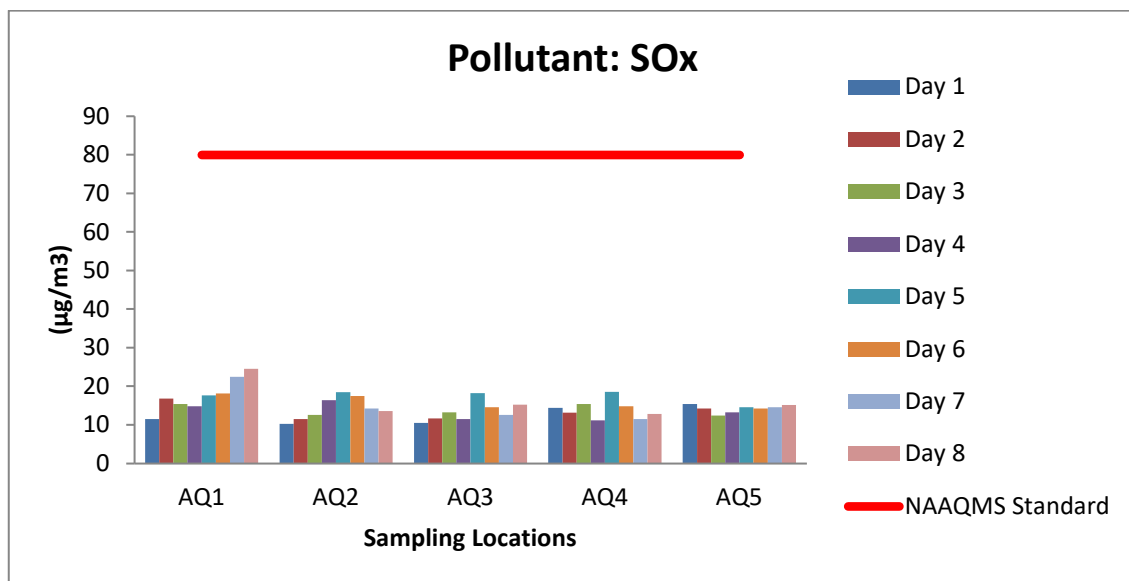


Figure 40: SOx values in all locations along with NAAQMS standard

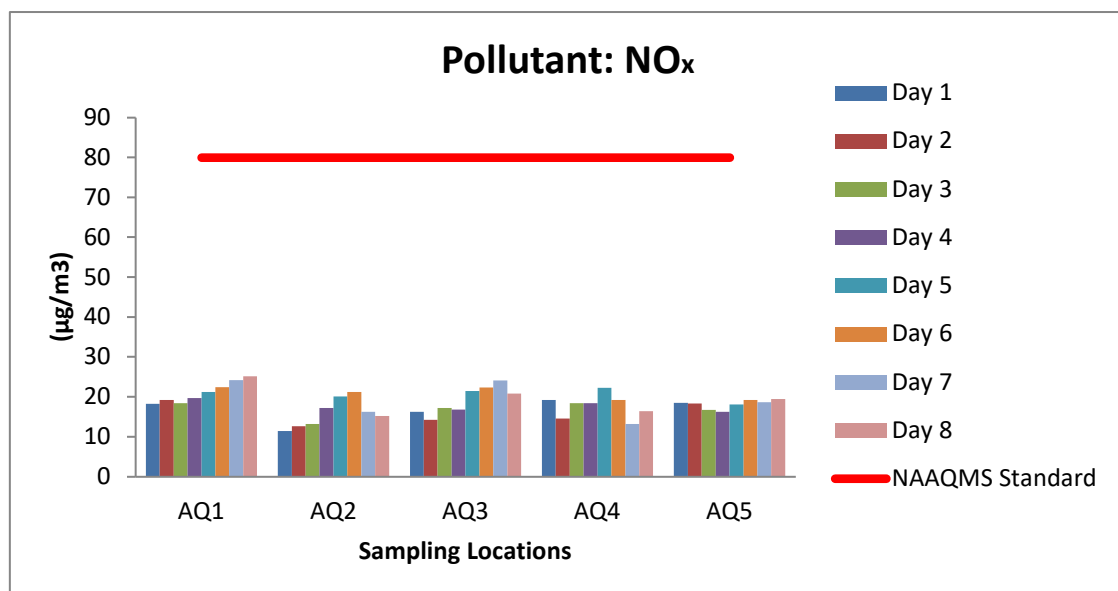


Figure 41: NOx values in all locations along with NAAQMS standard

The analysis shows that measured PM<sub>10</sub> and PM<sub>2.5</sub> concentrations are mostly below the NAAQS standard in all 5 locations. The SOx and NOx values along the project road are also within the NAAQS standard.

### B.15. Noise Environment

Noise attributed to roads depends on factors such as traffic intensity, the type and condition of the vehicles plying on the road, acceleration/deceleration/gear changes by the vehicles depending on the level of congestion and smoothness of road surface. High noise levels are a concern for sensitive receptors i.e. hospitals, educational institutions, etc. Silence zone is defined as an area up to 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the competent authority.

The Central Pollution Control Board (CPCB) has specified ambient noise levels for different land uses for day and night times is presented in Table 35 and Annexure 4.

Importance was given to the timing of exposure and areas designated as sensitive.

**Table 35: National Ambient Noise Level Standards**

| Area Code | Category      | Limits in Decibels (dB A) |            |
|-----------|---------------|---------------------------|------------|
|           |               | Day time                  | Night time |
| A         | Industrial    | 75                        | 70         |
| B         | Commercial    | 65                        | 55         |
| C         | Residential   | 55                        | 45         |
| D         | Silence Zones | 50                        | 40         |

Source: Central Pollution Control Board, New Delhi

Note:

- 1) Day-time: 6 AM to 10 P.M., Night-time: 10 PM to 6 AM;
- 2) Silence zone is an area up to 100 m around premises as hospitals, educational institutions and courts.

Locations for noise monitoring along the project road were identified based on the criteria same as those used for air monitoring but the relative importance of each criterion carries a weightage in arriving at the final set of locations. In case of noise monitoring locations, sensitive land use such as schools, hospitals and religious places gains more importance due to ill effects of noise. The noise levels were monitored with Integrated Noise Level Meter.

Locations of noise monitoring is shown in Figure 42.

**Table 36: Sampling location details of Noise**

| Location Area             | Chainage  | Latitude        | Longitude      | Category          |
|---------------------------|-----------|-----------------|----------------|-------------------|
| <b>Srirampur (NM 1)</b>   | 1+400 Km  | 26°25'34.04" N  | 89°53'52.80"E  | Resi.+Comm.       |
| <b>Jacobpur(NM 2)</b>     | 3+350km   | 26°24'39.25"N   | 89°53' 19.08"E | Rural Area        |
| <b>Oxiguri(NM 3)</b>      | 14+500km  | 26°19' 01.35" N | 89°51' 19.27"E | Commercial        |
| <b>Tamarhat(NM 4)</b>     | 16+200km  | 26°18'9.20"N    | 89°51'3.20"E   | Resi.+Comm.       |
| <b>Ujanpetla(NM 5)</b>    | 17+500 Km | 26°17'31.44"N   | 89°51'13.61"E  | Residential       |
| <b>Paglahat(NM 6)</b>     | 27+000km  | 26°12'40.93"N   | 89°51'51.84"E  | Residential       |
| <b>Moterjhar(NM 7)</b>    | 35+100km  | 26°08'35.19"N   | 89°52'21.87"E  | Sensitive         |
| <b>Kechuar Khas(NM 8)</b> | 51+200km  | 26° 2'24.44"N   | 89°54'47.61"E  | Resi + Rural Area |

All monitoring was conducted between 1<sup>st</sup> July, 2020 to 29<sup>th</sup> July, 2020.

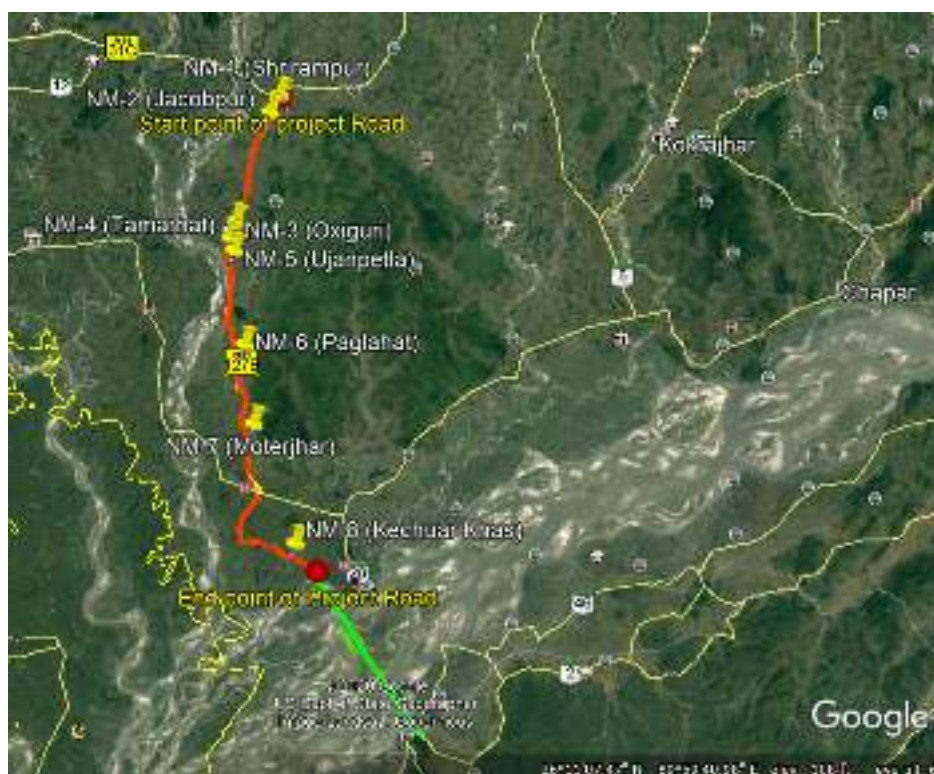


Figure 42: Noise monitoring locations along the project road

**Table 37: Analysis of noise monitoring<sup>6</sup> in all locations**

|                       | <b>Shrirampur (NM 1)</b> |                   | <b>Jacobpur (NM 2)</b> |                   | <b>Oxiguri (NM 3)</b> |                   | <b>Tamarhat (NM 4)</b> |                   | <b>Ujanpetla (NM 5)</b> |                   | <b>Paglahat (NM 6)</b> |                   | <b>Moterjhar (NM 7)</b> |                   | <b>Kechuar Khas (NM 8)</b> |                   |
|-----------------------|--------------------------|-------------------|------------------------|-------------------|-----------------------|-------------------|------------------------|-------------------|-------------------------|-------------------|------------------------|-------------------|-------------------------|-------------------|----------------------------|-------------------|
| <b>Classification</b> | Resi.+Comm               |                   | Resi+rural Area        |                   | Commercial            |                   | Resi.+Comm.            |                   | Residential             |                   | Residential            |                   | Sensitive               |                   | Resi + Rural Area          |                   |
| Date                  | Day 1                    | Day 2             | Day 1                  | Day 2             | Day 1                 | Day 2             | Day 1                  | Day 2             | Day 1                   | Day 2             | Day 1                  | Day 2             | Day 1                   | Day 2             | Day 1                      | Day 2             |
| Maximum               | 62.4                     | 61.5              | 54.2                   | 53.1              | 62.4                  | 61.5              | 53.4                   | 52.9              | 62.1                    | 60.1              | 57.2                   | 58.4              | 54.2                    | 54.2              | 60.1                       | 59.2              |
| Minimum               | 35.4                     | 35.2              | 34.2                   | 34.1              | 35.4                  | 35.2              | 34.6                   | 34.5              | 38.4                    | 36.4              | 35.4                   | 35.4              | 36.4                    | 35.4              | 36.8                       | 35.1              |
| Leqday                | 56.7                     | 55.5              | 51.2                   | 50.1              | 56.7                  | 55.5              | 50.2                   | 49.7              | 55.8                    | 54.5              | 53.1                   | 52.0              | 51.2                    | 51.3              | 53.6                       | 52.4              |
| Leqnigh               | 38.3                     | 36.9              | 35.4                   | 34.8              | 38.3                  | 36.9              | 35.9                   | 35.4              | 40.6                    | 37.5              | 36.4                   | 37.1              | 38.0                    | 36.4              | 37.8                       | 37.0              |
| Leq                   | 55.2                     | 54.0              | 50.0                   | 49.0              | 55.2                  | 54.0              | 49.2                   | 48.7              | 54.7                    | 53.2              | 51.8                   | 50.8              | 50.4                    | 50.2              | 52.3                       | 51.2              |
| <b>STANDARD</b>       | <b>Day –55</b>           | <b>Night - 45</b> | <b>Day – 55</b>        | <b>Night - 45</b> | <b>Day – 65</b>       | <b>Night - 55</b> | <b>Day – 55</b>        | <b>Night – 45</b> | <b>Day - 55</b>         | <b>Night - 45</b> | <b>Day - 55</b>        | <b>Night - 45</b> | <b>Day - 50</b>         | <b>Night - 40</b> | <b>Day - 55</b>            | <b>Night - 45</b> |

<sup>6</sup> Disclaimer: Although MoEF/CPCB does not recommend conduct of environmental monitoring during 15<sup>th</sup> June to 30<sup>th</sup> September in India. However this particular project is being developed in accordance with the JICA requirement, Terms of Reference for which require collection and compilation of baseline environmental status during this project (July 2020). Accordingly this collected baseline data is not prescribed to be used for compliance against Indian statutory requirement

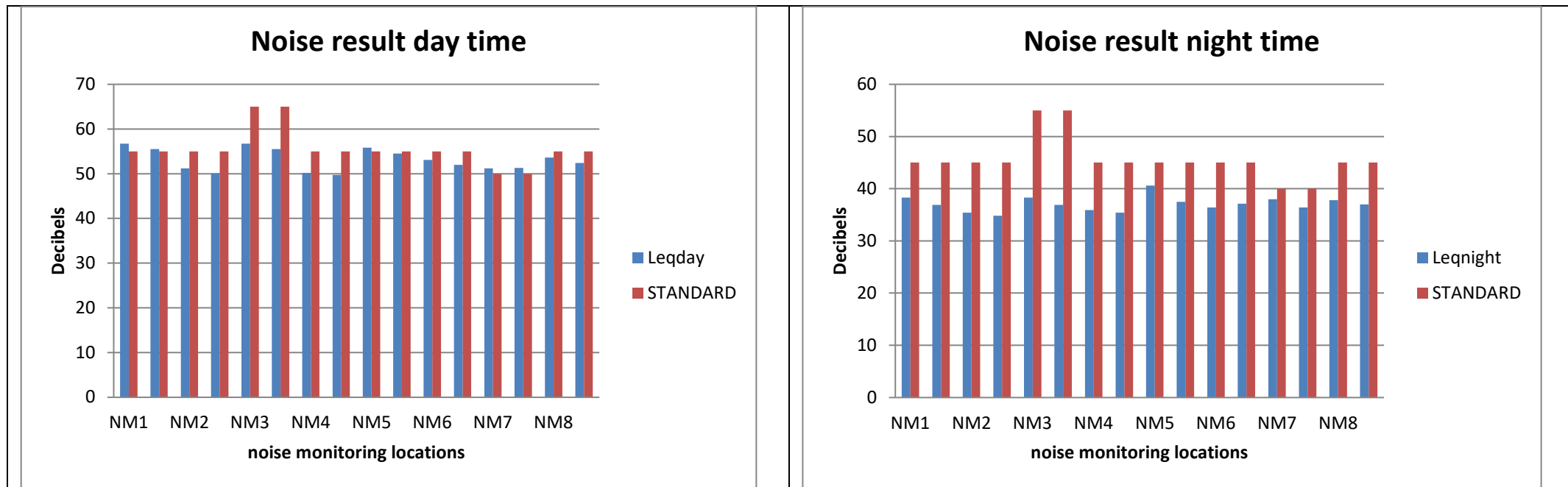


Figure 43: Noise monitoring results in day and night time along the project road



➤ **WHO Guidelines for Community Noise:**

| Specific environment                                                            | Critical health effect(s)                                                            | LAeq [dB] | Time base [hours] | LAmix, fast [dB]               |
|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------|-------------------|--------------------------------|
| <b>Outdoor living area</b>                                                      | Serious annoyance, daytime and evening<br>Moderate annoyance, daytime and evening    | 55<br>50  | 16<br>16          | -<br>-                         |
| <b>Dwelling, indoors</b>                                                        | Speech intelligibility and moderate annoyance, daytime and evening                   | 35        | 16                |                                |
| <b>Inside bedrooms</b>                                                          | Sleep disturbance, night-time                                                        | 30        | 8                 | <b>45</b>                      |
| <b>Outside bedrooms</b>                                                         | Sleep disturbance, window open (outdoor values)                                      | 45        | 8                 | <b>60</b>                      |
| <b>School class rooms and pre-schools, indoors</b>                              | Speech intelligibility, disturbance of information extraction, message communication | 35        | during class      | -                              |
| <b>Pre-school Bedrooms, indoors</b>                                             | Sleep disturbance                                                                    | 30        | sleeping time     | <b>45</b>                      |
| <b>School, playground outdoor</b>                                               | Annoyance (external source)                                                          | 55        | during play       | -                              |
| <b>Hospital, ward rooms, indoors</b>                                            | Sleep disturbance, night-time<br>Sleep disturbance, daytime and evenings             | 30<br>30  | 8<br>16           | <b>40</b><br>-                 |
| <b>Hospitals, treatment rooms, indoors</b>                                      | Interference with rest and recovery                                                  | #1        |                   |                                |
| <b>Industrial, commercial, shopping and traffic areas, indoors and Outdoors</b> | Hearing impairment                                                                   | 70        | 24                | <b>110</b>                     |
| <b>Ceremonies, festivals and entertainment events</b>                           | Hearing impairment (patrons:<5 times/year)                                           | 100       | 4                 | <b>110</b>                     |
| <b>Public addresses, indoors and outdoors</b>                                   | Hearing impairment                                                                   | 85        | 1                 | <b>110</b>                     |
| <b>Music through headphones/ Earphones</b>                                      | Hearing impairment (free-field value)                                                | 85 #4     | 1                 | <b>110</b>                     |
| <b>Impulse sounds from toys, fireworks and firearms</b>                         | Hearing impairment (adults)<br>Hearing impairment (children)                         | -<br>-    | -<br>-            | <b>140 #2</b><br><b>120 #2</b> |
| <b>Outdoors in parkland and conservation areas</b>                              | <b>Disruption of tranquillity</b>                                                    | <b>#3</b> |                   |                                |

#1: as low as possible;

#2: peak sound pressure (not LAmix, fast), measured 100 mm from the ear;

#3: existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low;

#4: under headphones, adapted to free-field values

An analysis of the results indicates that the day & night time noise levels in all eight locations were mostly within the permissible limit. However, at NM1, NM5 and NM7 area, there were few instances when the noise level slightly exceeded the standard value.

## **C. Biological Environment**

An ecological survey of the study area was conducted particularly with reference to recording the existing biological resources in the study area. Ecological studies are one of the important aspects of Environmental Impact Assessment with a view to conserve environmental quality and biodiversity. Ecological systems show complex inter-relationships between biotic and abiotic components including dependence, competition and mutualism. Biotic components comprise of both plant and animal communities, which interact not only within and between themselves but also with the abiotic components viz. physical and chemical components of the environment.

Generally, biological communities are good indicators of climatic and edaphic factors. Studies on biological aspects of ecosystems are important in Environmental Impact Assessment for safety of natural flora and fauna. The biological environment includes terrestrial and aquatic ecosystems.

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

### **C.1. Biodiversity of Assam**

Being a transitional zone between the Indian, Indo- Malayan and Indo-Chinese Biographical regions, Assam provides the gateway for spread of both oriental and Palaearctic fauna and flora to other parts of the country. Ideal climatic, topographic and edaphic factors sustain growth of diverse plant groups. The forest as well as wide-ranging network of rivers and wetlands offers ideal conditions and suitable habitat for wide variety of fauna like mammals, primates, reptiles, amphibians, fishes, molluscs, birds, butterflies, moths etc. The recorded forest area of Assam is 26,832 sq km accounting for 34.21% of its geographical area. According to their legal status, reserved forests constitute 66.58% and unclassified forests 33.42% of the total forest area. The protected area network of Assam includes 5 National Parks and 18 wildlife sanctuaries covering an area of 0.40 million ha constituting 4.98% of the geographical area.

293 species of orchids are reported from Assam which represent 44.39% of North East species and 24.42% of species found in India. Assam's mammalian diversity is represented by 193 species which are widely distributed in this region. Out of 15 Indian primate species 9 are found in Assam.

With 950 bird species the State is home to 53.5% of the bird species found in the Indian Sub-Continent, 17 species of birds are endemic to Assam. Assam and other parts of the North East region have 70 species of amphibians reported from the region which 60+ species are found in Assam. 19 species of tortoises and 77 species of snakes and lizards are found in the state. The Brahmaputra and Barak river system along with their tributaries and flood plain wetlands locally known as beels provide very conducive habitat for an array of fish species, Assam and other parts of North East region is recognized as one of the hot spots of fresh water fish biodiversity. 197 food, sports and ornamental fish species are reported from the region of which 185 are reported from Assam.

### Forest Map of Assam

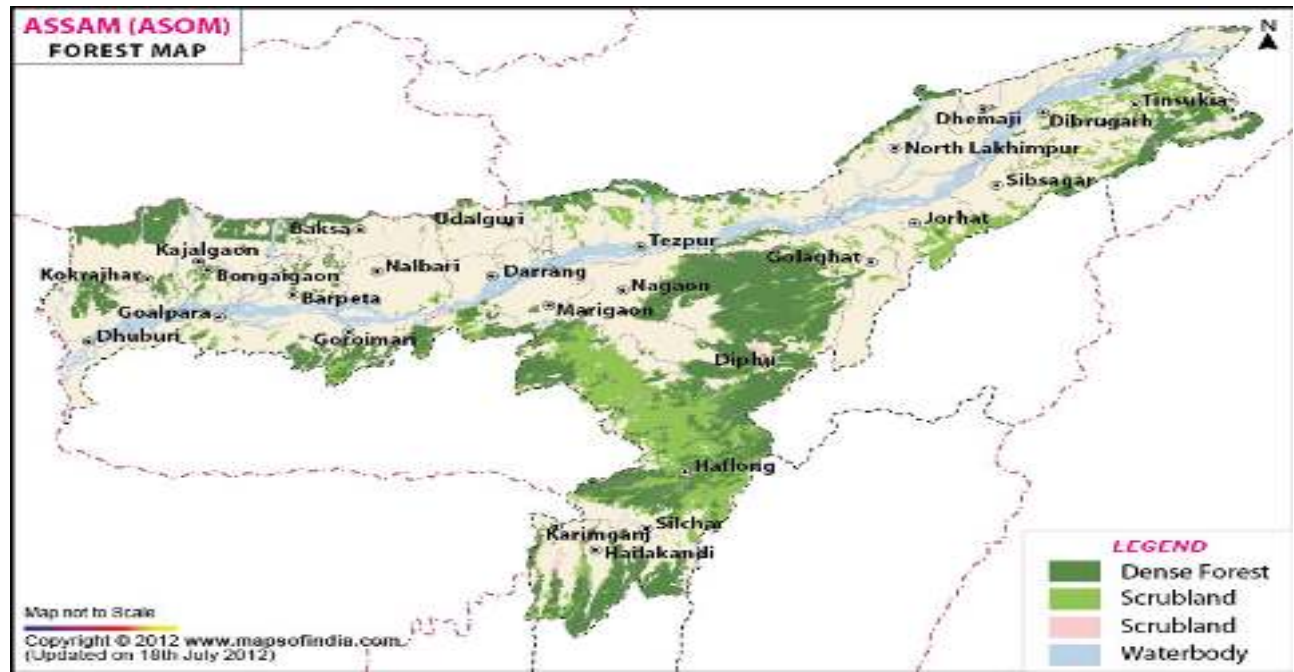


Figure 44: Forest cover in district Dhubri and Kokrajhar

### Wildlife Map of Assam



Figure 45: Wildlife map of Assam

## ➤ Natural Environment of the project Site

### C.2.Forest Status in Project Districts

Project road alignment traverse in two district namely Dhubri (approx 44 km) and Kokrajhar (approx) 10 K. As per FSR Assam report 2011, the 36.10% area of district Kokrajhar and 14.94% of district Dhubri. The details are given in below:

| District  | Geographical Area (sq km) | 2011 Assessment           |                           |                     | Total (sq km) | %of Geographical Area |
|-----------|---------------------------|---------------------------|---------------------------|---------------------|---------------|-----------------------|
|           |                           | Very Dense Forest (sq km) | Mod. Dense Forest (sq km) | Open Forest (sq km) |               |                       |
| Kokrajhar | 3169                      | 208                       | 716                       | 220                 | 1144          | 36.10                 |
| Dhubri    | 2176                      | 21                        | 201                       | 196                 | 418           | 14.94                 |

**Kokrajhar district:** Forest is one of the most prominent characteristics of this district. In the year 1990 Kokrajhar district became residence to Manas National Park which has an area of 500 km. sq. and being shared with four other districts. The major part of the district is covered by forest both reserved as well as unreserved. The Chirang Reserved Forest, the Manas Reserved Forest, the Panbari Reserved Forest, the Bengtol Reserved Forest and the Kachugaon Reserved Forest are the main reserved forests which are covered by evergreen and semi evergreen trees comprising an unusually dense mixed jungle. A huge part of the forest areas which are mostly low lying area remains scattered among the small high lands covered with tall grasses (which are home to wild animals). In the district, there are total 161195 hectares of forest area which is 8.7 % of total forest area of Assam (District Census Handbook, Kokrajhar, 2011).

The present estimated area under reserved forests is roughly 1,719 sq. km. which include parts of Aie Valley Forest Division of Bongaigaon district as well as Guma Range of Dhubri Forest Division. The two forest divisions which fall totally under this district are Haltugaon and Kachugaon. There are three overlapping forest divisions in the district for particular purposes, namely Social Forestry Division, Working Plan Division as well as Wildlife Division. A portion of the Chakrasila Wildlife Sanctuary also falls under Kokrajhar district (Brief Industrial Profile of Kokrajhar District by Ministry of MSME, Govt. of India). According to 2011 Census, the total geographical area under forest is 312900 hectares of which the forest area is 161195 hectares, revenue forests is 64877.12 hectares, protected area is 4556 hectares and other protected reserve forest is 2947 hectares.

**Dhubri district:** The district is rich in forest resources having a total forest covers of 6947.83 hectares, comprises 6082.06 hectares of Reserved forest and 865.77 hectares of Proposed Reserved forest. The total forest area does not include unclassified state forest. The forests are mainly tropical moist deciduous forests interspersed with grass lands. The valuable trees available in forests of the district are – Sal, Poma, Outenga, Sida, Azar, Bhomra, Simul, etc. A portion of the Chakrasila Wildlife Sanctuary covering an area of 4558.7 hectares of land also falls under Dhubri district sharing with Kokrajhar district (Brief Industrial Profile of Dhubri District by Ministry of MSME, Govt. of India).

### C.3.Sensitive Area

No sensitive ecological habitats or ecosystems i.e wildlife sanctuary, national park, Ramsar Site, important bird area, wildlife corridor, tiger reserve, elephant reserve are identified within the direct influence area of the project corridor. Nambor wildlife sanctuary is the sensitive ecological habitat in the indirect influence area (above 10km buffer zone). The NOC copy from DFO is attached in annexure 2.



#### C.4.Vegetation:

Vegetation around 10 km and 15 km buffer of the study area mostly comprises of large/ medium/ small trees bushy shrubs and annuals perennial or biennials herbs. No scheduled species (as per Wildlife Protection Act, 1972) or any species listed under endangered or vulnerable (as per IUCN Red list) had been described from the project site.

Table 38: List of vegetation along the project road<sup>7</sup>

| Family           | Scientific Name                 | Local Name     | Type | IUCN Status |
|------------------|---------------------------------|----------------|------|-------------|
| Anacardiaceae    | <i>Mangifera indica</i>         | Aam            | T    | DD          |
| Anacardiaceae    | <i>Spondias pinnata</i>         | Amora          | T    | NA          |
| Arecaceae        | <i>Calamus latifolius</i>       | Bet            | S    | LC          |
| Aracea           | <i>Alocasia sp</i>              | Kochu          | H    | NA          |
| Athyriaceae      | <i>Diplexium esculentum</i>     | Dhekiak sak    | H    | NA          |
| Bambacaceae      | <i>Bombax ceiba</i>             | Himulu/Shimul  | T    | LC          |
| Basellaceae      | <i>Basella sp</i>               | Puroi/ Pui xak | C    | NA          |
| Brassicaceae     | <i>Brassica nigra</i>           | Soriyoh Sak    | H    | LC          |
| Caesalpiniaceae  | <i>Bauhinia acuminata</i>       | Kanchan        | T    | LC          |
| Caesalpiniaceae  | <i>Cassia fistula</i>           | Hunaru/Amaltas | T    | LC          |
| Caricaceae       | <i>Carica papaya</i>            | Amita          | T    | LC          |
| Combretaceae     | <i>Terminalia chebula</i>       | Silikha        | T    | NA          |
| Combretaceae     | <i>Terminalia bellerica</i>     | Bhomora        | T    | NA          |
| Commelinales     | <i>Eichhornia crassipes</i>     | Meteka         | AV   | NA          |
| Dilleniaceae     | <i>Dillenia indica</i>          | Ou tenga       | T    | LC          |
| Dipterocarpaceae | <i>Shorea robusta</i>           | Sal            | T    | LC          |
| Euphorbiaceae    | <i>Baccaurea ramiflora</i>      | Leteku         | T    | LC          |
| Elaeocarpaceae   | <i>Elaeocarpus floribundus</i>  | Jolphai        | T    | NA          |
| Euphorbiaceae    | <i>Phyllanthus emblica</i>      | Amlokhi        | T    | NA          |
| Euphorbiaceae    | <i>Trewia nudiflora</i>         | Bhelo          | T    | LC          |
| Fabaceae         | <i>Tamarindus indica</i>        | Teteli         | T    | LC          |
| Gentianaceae     | <i>Swertia chirayita</i>        | Chirota tita   | H    | NA          |
| Lauraceae        | <i>Cinnamomum tamala</i>        | Tejpat         | T    | LC          |
| Lythraceae       | <i>Lagerstroemia speciosa</i>   | Ajar, Jarul    | T    | NA          |
| Meliaceae        | <i>Azadiracta indica</i>        | Maha-neem      | T    | LC          |
| Meliaceae        | <i>Toona ciliata</i>            | Poma           | T    | LC          |
| Moraceae         | <i>Artocarpus heterophyllus</i> | Kothal         | T    | NA          |
| Moraceae         | <i>Ficus hispida</i>            | Dumur, Dumuru  | T    | LC          |
| Moraceae         | <i>Ficus benghalensis</i>       | Bor, Bot       | T    | NA          |
| Moraceae         | <i>Ficus religiosa</i>          | Ahot, Asothyo  | T    | NA          |
| Moringaceae      | <i>Moringa oleifera</i>         | Sajina         | T    | NA          |
| Musaceae         | <i>Musa sp</i>                  | kol            | H    | NA          |
| Myrtaceae        | <i>Syzygium cumini</i>          | Kola Jamu, Jam | T    | LC          |
| Myrtaceae        | <i>Psidium guajava</i>          | Madhuri/Peyara | T    | LC          |
| Nelumbonaceae    | <i>Nelumbo nucifera</i>         | Podom/Podmo    | AV   | DD          |
| Nymphaeaceae     | <i>Nymphaea rubra</i>           | Seluk          | AV   | LC          |
| Oxalidaceae      | <i>Averrhoa carambola</i>       | Kordoi         | T    | NA          |
| Oleaceae         | <i>Nyctanthes arbor-tristis</i> | Sewali phul    | T    | NA          |
| Poaceae          | <i>Bambusa balcooa</i>          | Bhaluka Bah    | S    | LC          |
| Poaceae          | <i>Bambusa tulda</i>            | Jati Bah       | S    | LC          |
| Piperaceae       | <i>Piper betle</i>              | Pan            | C    | NA          |

<sup>7</sup> Reference:

1. <https://avibase.bsc-eoc.org/avibase.jsp>  
2. <http://asbb.gov.in/>

|                                                                        |                                |                          |           |           |
|------------------------------------------------------------------------|--------------------------------|--------------------------|-----------|-----------|
| <b>Rhamnaceae</b>                                                      | <i>Zizyphus mauritiana</i>     | <i>Bogori</i>            | <i>T</i>  | <i>NA</i> |
| <b>Rutaceae</b>                                                        | <i>Aegle marmelos</i>          | <i>Bel</i>               | <i>T</i>  | <i>NA</i> |
| <b>Rubiaceae</b>                                                       | <i>Anthocephalus chinensis</i> | <i>Kadam</i>             | <i>H</i>  | <i>NA</i> |
| <b>Rutaceae</b>                                                        | <i>Citrus grandi</i>           | <i>Robab tenga</i>       | <i>T</i>  | <i>NA</i> |
| <b>Rutaceae</b>                                                        | <i>Murraya koenigii</i>        | <i>Narasingha</i>        | <i>S</i>  | <i>NA</i> |
| <b>Salicaceae</b>                                                      | <i>Flacourtia jangomas</i>     | <i>Ponial</i>            | <i>T</i>  | <i>NA</i> |
| <b>Solanaceae</b>                                                      | <i>Capsicum sp</i>             | <i>Bhot Jolokia</i>      | <i>S</i>  | <i>NA</i> |
| <b>Trapaceae</b>                                                       | <i>Trapa natans</i>            | <i>Singori/Pani phal</i> | <i>AV</i> | <i>LC</i> |
| <b>Verbenaceae</b>                                                     | <i>Tectona grandis</i>         | <i>Segun</i>             | <i>T</i>  | <i>NA</i> |
| <b>Zingiberaceae</b>                                                   | <i>Curcuma longa</i>           | <i>Halodhi</i>           | <i>H</i>  | <i>DD</i> |
| <b>T= Tree, S= Shrub, AV= Aquatic Vegetation, H= Herb, C= Climbers</b> |                                |                          |           |           |
| <b>LC= Least Concern, DD= Data Deficient, NA= Not Listed</b>           |                                |                          |           |           |

### C.5. Fauna in Study Area:

On the basis field observations, there is no major wildlife as there are no forest areas in and around the project road alignment. Primary field surveys are conducted through random observations in the study area and also information collected from elderly persons of the area, forest officials. This area hosts jackal, foxes and other animals. There are no endangered animals in project influence area. Withing 10 km and 15 km Buffer area of the project site presence of Gangetic Dolphins had been reported from the Brahmaputra River<sup>8</sup>, but the proposed project would not have any impact as the Gangetic dolphins is not coming under direct influence zone.

### C.6. Mammal of study area:

Mammalian diversity is not high as the area doesn't have any dense forest cover. Only minor mammals are seen. Gangetic dolphin is only found in the waters of Brahmaputra which donot fall under direct influence zone of the project site.

Table 39: List of Mammals along the project road<sup>9</sup>

| Order               | Common Name            | Scientific Name                   | Local Name     | IUCN Status | WPA Status |
|---------------------|------------------------|-----------------------------------|----------------|-------------|------------|
| <b>Primates</b>     | Monkey                 | <i>Macaca mulatta</i>             | Molu Bandor    | LC          | II         |
| <b>Artiodactyla</b> | Gangetic Dolphin       | <i>Platanista gangetica</i>       | Hihu           | EN          | I          |
| <b>Artiodactyla</b> | Wild Boar              | <i>Sus scrofa</i>                 | Gahori         | LC          | III        |
| <b>Carnivora</b>    | Jackal                 | <i>Canis aureus</i>               | Siyal          | LC          | II         |
| <b>Carnivora</b>    | Bengal Fox             | <i>Vulpes bengalensis</i>         | Siyal          | LC          | II         |
| <b>Carnivora</b>    | Jungle Cat             | <i>Felis chaus</i>                | Junglee Mekuri | LC          | II         |
| <b>Carnivora</b>    | Common Palm Civet      | <i>Paradoxurus hermaphroditus</i> | Joha Mol       | LC          | II         |
| <b>Carnivora</b>    | Small Indian Mongoose  | <i>Herpestes auropunctatus</i>    | Neul           | LC          | IV         |
| <b>Lagomorpha</b>   | Black-Naped Hare       | <i>Lepus nigricollis</i>          | Sohapohu       | LC          | IV         |
| <b>Chiroptera</b>   | Flying Fox             | <i>Pteropus giganteus</i>         | Baduli         | LC          | V          |
| <b>Eulipotyphla</b> | The Asian House Shrew  | <i>Suncus murinus</i>             | Sika           | LC          | V          |
| <b>Rodentia</b>     | Himalayan Porcupine    | <i>Hystrix brachyura</i>          | Katela Pohu    | LC          | II         |
| <b>Rodentia</b>     | Hoary-Bellied Squirrel | <i>Callosciurus pygerythrus</i>   | Kerketua       | LC          | V          |
| <b>Rodentia</b>     | The House Mouse        | <i>Mus musculus</i>               | Nigoni         | LC          | V          |
| <b>Rodentia</b>     | Bandicoot Rat          | <i>Bandicota bengalensis</i>      | Musua          | LC          | IV         |

LC= Least Concern, EN= Endangered

<sup>8</sup> Reference:

1. Wakid, A. and Braulik, G. (2009): Protection of endangered Gangetic dolphin in Brahmaputra River, Assam, India. Final report to IUCN-Sir Peter Scott Fund. Pp 44
2. Wakid, A. (2007): Report on the initiatives to involve the major stakeholders of Assam in the conservation of Gangetic dolphin. 65 pp

<sup>9</sup> Reference:

1. Khatun, M., Ali, A. and Sarma, A. (2014) Population fluctuation at Indian Flying Fox (*Pteropus giganteus*) colonies in the Kacharighat Roosting Site of Dhubri district of Assam. Int. J. Pure App. Biosci. 2 (4): PP184-188
2. Das A., Sharma P., Harikrishnan S., Ghosh S., Nath A., Dhar D., Mondol J. and Wangdi Y. (2014) A Rapid Assessment of Herpetofaunal Diversity in Manas-Bhutan Transboundary Landscape
3. [http://asmenvis.nic.in/Database/Animal\\_Diversity\\_844.aspx](http://asmenvis.nic.in/Database/Animal_Diversity_844.aspx)
4. [http://wiienvis.nic.in/Database/ScheduleSpeciesDatabase\\_7969.aspx](http://wiienvis.nic.in/Database/ScheduleSpeciesDatabase_7969.aspx)



### C.7. Herpetofauna of study area:

Herpetofauna includes reptiles and amphibian animals of a particular area. Major reptiles include snakes, lizards, turtles and tortoises. Turtles and tortoise are found mostly in Brahmaputra river system and large beels which are not in direct influence zone of project site. Snakes are common in the project site as the area being a predominantly agriculture zone. Few snakes are also venomous such as Banded Krait, Monocled Cobra, Spectacled Cobra and Red Necked Keelback.

Table 40: Snakes and lizards along the project road

| Snakes and lizards <sup>10</sup> |                               |                               |                |             |            |
|----------------------------------|-------------------------------|-------------------------------|----------------|-------------|------------|
| Order                            | Common Name                   | Scientific Name               | Local Name     | IUCN Status | WPA Status |
| Agamidae                         | Garden Lizard                 | <i>Calotes versicolor</i>     | Tez-Pia        | LC          | IV         |
| Gekkonidae                       | Tokay Gecko                   | <i>Gekko gekko</i>            | Keko Sap       | LC          | IV         |
| Gekkonidae                       | Indian House Gecko            | <i>Hemidactylus sp</i>        | Jethi          | LC          | IV         |
| Scincidae                        | Common Skink                  | <i>Eutropis carinata</i>      | Nai Pia        | LC          | IV         |
| Varanidae                        | Common Indian Monitor         | <i>Varanus bengalensis</i>    | Gui Haap       | LC          | I          |
| Pythonidae                       | Burmese Python                | <i>Python bivittatus</i>      | Ajogor         | VU          | I          |
| Typhlopidae                      | Diard's Blind Snake           | <i>Typhlops diardii</i>       | Kechu Haap     | LC          | IV         |
| Colubridae                       | Common Wolf Snake             | <i>Lycodon aulicus</i>        | Maroli         | LC          | IV         |
| Colubridae                       | Copper-Headed Trinket Snake   | <i>Coelognathus radiatus</i>  | Dhundhuli Feti | LC          | IV         |
| Colubridae                       | Indian Rat Snake              | <i>Ptyas mucosa</i>           | Musuagum       | LC          | IV         |
| Colubridae                       | Checkered Keelback            | <i>Fowlea piscator</i>        | Dhora          | LC          | IV         |
| Elapidae                         | Banded Krait                  | <i>Bungarus fasciatus</i>     | Hokso          | LC          | IV         |
| Colubridae                       | Spectacled Cobra              | <i>Naja naja</i>              | Feti           | LC          | II         |
| Colubridae                       | Monocled Cobra                | <i>Naja kaouthia</i>          | Feti           | LC          | II         |
| Colubridae                       | Red Necked Keelback Snake     | <i>Rhabdophis subminiatus</i> | Batchupa       | LC          | IV         |
| Colubridae                       | Vine Snake                    | <i>Ahaetulla Sp</i>           | Lata Sap       | LC          | IV         |
| Colubridae                       | Ornate Flying Snake           | <i>Chrysopelea ornata</i>     | Sundori        | LC          | IV         |
| Colubridae                       | Painted Bronzeback Tree Snake | <i>Dedrelaphis pictus</i>     | Achari         | LC          | IV         |
| Turtles and Tortoises            |                               |                               |                |             |            |
| Testudines                       | Assam Roofed Turtle           | Pangshura sylhetensis         | Salika Dura    | EN          | I          |
| Testudines                       | Indian Tent Turtle            | Pangshura tentoria            | Salika Dura    | LC          | ~          |
| Testudines                       | Brown Roofed Turtle           | Pangshura smithii             | Muga Dura      | NT          | ~          |

<sup>10</sup> Reference:

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|                                                                        |                                  |                              |                                      |    |    |
|------------------------------------------------------------------------|----------------------------------|------------------------------|--------------------------------------|----|----|
| Testudines                                                             | Indian Eyed Turtle               | Morenia petersi              | ~                                    | VU | ~  |
| Testudines                                                             | The Assam Leaf Turtle            | Cyclemys gemeli              | Sepeta Dura                          |    | ~  |
| Testudines                                                             | Tricarinate Turtle               | Melanochelys tricarinata     | Sil Dura/<br>Paharia Dura            | EN | I  |
| Testudines                                                             | Indian Flap-Shelled Turtle       | Lissemys punctata andersonii | Bagh Dura/<br>Halodhiya Phutuki Kaso | LC | I  |
| Testudines                                                             | Narrow-Headed Softshell Turtle   | Chitra indica                | Baghia Kaso                          | EN | IV |
| Testudines                                                             | Indian Peacock Soft-Shell Turtle | Nilssonina hurum             | Bor Kaso/<br>Chokori Kaso            | VU | I  |
| Testudines                                                             | Gangetic Soft-Shell Turtle       | Nilssonina gangeticus        | Laomura Kaso                         | VU | I  |
| Testudines                                                             | Crowned River Turtle             | Hardella thurjii             | Kaldhap / Bor Dura                   | VU | ~  |
| Testudines                                                             | Yellow Tortoise                  | Indotestudo elongata         | Halodiya Kaso                        | EN | IV |
| Testudines                                                             | Three-Striped Roofed Turtle      | Batagur dhongoka             |                                      | EN | ~  |
| Amphibians                                                             |                                  |                              |                                      |    |    |
| Bufonidae                                                              | Common Asian Toad                | Duttaphrynus melanostictus   | Chuk Bhekuli                         | LC | ~  |
| Rhacophoridae                                                          | Terai Tree Frog                  | Polypedates teraiensis       | Pat Beng                             | LC | ~  |
| Dicroglossidae                                                         | Indian Bull Frog                 | Hoplobatrachus tigerinus     | Bamun Beng                           | LC | IV |
| Dicroglossidae                                                         | Indian Skipping Frog             | Euphyllctis cyanophlyctis    | Pani Beng                            | LC | IV |
| Microhylidae                                                           | Ornate Narrow Mouth Frog         | Microhyla ornata             | Paruwa Beng                          | LC | ~  |
| Microhylidae                                                           | Ballon Frog                      | Uperodon globulosus          | Belun Beng                           | LC | ~  |
| LC= Least Concern, EN= Endangered, NT= Near Threatened, VU= Vulnerable |                                  |                              |                                      |    |    |

### C.8. Common Fishes of study area:

Water bodies of Dhubri district are rich in ichthyofaunal diversity. Some studies reported that diversity of fish found to be more numerous in the lower reaches of the Brahmaputra River. Carps constitute the largest group of ichthyofauna in the study area. Ilish (Hilsa ilisha), Chital (Notopterus chitala), Borali (Wallago Sp.) along with some other large sized catfishes are some highly valuable fish species found abundantly in this zone of Assam.

Table 41: Name of the common fishes<sup>11</sup>

| Order | Scientific Name | Local Name | IUCN Status |
|-------|-----------------|------------|-------------|
|-------|-----------------|------------|-------------|

<sup>11</sup> Reference:

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|                          |                             |             |    |
|--------------------------|-----------------------------|-------------|----|
| <b>Beloniformes</b>      | Xenentodon cancila          | Kokila      | LC |
| <b>Clupeiformes</b>      | Gudusia chapra              | Karati      | LC |
| <b>Clupeiformes</b>      | Tenuialosa ilisha           | Ilish       | LC |
| <b>Cypriniformes</b>     | Botia Dario                 | Rani        | LC |
| <b>Cypriniformes</b>     | Botia rostrata              | Gethu       | VU |
| <b>Cypriniformes</b>     | Lepidocephalichthys guntea  | Getho       | LC |
| <b>Cypriniformes</b>     | Amblypharyngodon mola       | Moa         | LC |
| <b>Cypriniformes</b>     | Barbonymus gonionotus       | Puthi       | LC |
| <b>Cypriniformes</b>     | Barilius barna              | Balisundre  | LC |
| <b>Cypriniformes</b>     | Catla catla                 | Bhakua      | LC |
| <b>Cypriniformes</b>     | Chela cachius               | Laopota     | LC |
| <b>Cypriniformes</b>     | Cirrhinus mrigala           | Mirika      | LC |
| <b>Cypriniformes</b>     | Cirrhinus reba              | Lachim      | LC |
| <b>Cypriniformes</b>     | Ctenophryngodon idella      | Grass carp  | LC |
| <b>Cypriniformes</b>     | Cyprinus carpio             | Common carp | VU |
| <b>Cypriniformes</b>     | Esomus danricus             | Dorikona    | LC |
| <b>Cypriniformes</b>     | Hypophthalmichthys molitrix | Silver carp | NT |
| <b>Cypriniformes</b>     | Labeo calbasu               | Mali        | LC |
| <b>Cypriniformes</b>     | Labeo gonius                | Kurhi       | LC |
| <b>Cypriniformes</b>     | Labeo rohita                | Rou         | LC |
| <b>Cypriniformes</b>     | Laubuka laubuca             | Laopota     | LC |
| <b>Cypriniformes</b>     | Pethia conchoni             | Puthi       | LC |
| <b>Cypriniformes</b>     | Puntius chola               | puthi       | LC |
| <b>Cypriniformes</b>     | Puntius sophore             | Puthi       | LC |
| <b>Cypriniformes</b>     | Systemus sarana             | Cheniputhi  | LC |
| <b>Cypriniformes</b>     | Acanthocobitis botia        | Botia       | LC |
| <b>Osteoglossiformes</b> | Chitala chitala             | Chital      | NT |
| <b>Osteoglossiformes</b> | Notopterus notopterus       | Kanduli     | LC |
| <b>Perciformes</b>       | Chanda nama                 | Chanda      | LC |
| <b>Perciformes</b>       | Parambassis lala            | Chanda      | LC |
| <b>Perciformes</b>       | Anabas testudineus          | Kaowi       | DD |
| <b>Perciformes</b>       | Badis assamensis            | Randhoni    | DD |
| <b>Perciformes</b>       | Channa gachua               | Seng        | DD |
| <b>Perciformes</b>       | Channa marulius             | Sal         | LC |
| <b>Perciformes</b>       | Channa orientalis           | Seng        | NE |
| <b>Perciformes</b>       | Channa punctata             | Goroi       | LC |
| <b>Perciformes</b>       | Channa striata              | Shol        | LC |
| <b>Perciformes</b>       | Glossogobius giuris         | Patimutura  | LC |
| <b>Perciformes</b>       | Nandus nandus               | Gedgedi     | LC |
| <b>Perciformes</b>       | Ctenop nobilis              | Kholihona   | NT |
| <b>Perciformes</b>       | Trichogaster chuna          | Kholisa     | LC |
| <b>Perciformes</b>       | Trichogaster fasciata       | Kholihona   | LC |
| <b>Perciformes</b>       | Trichogaster labiosa        | Kholihona   | LC |
| <b>Siluriformes</b>      | Mystus cavasius             | Singora     | LC |
| <b>Siluriformes</b>      | Mystus tengara              | Tengera     | LC |
| <b>Siluriformes</b>      | Mystus bleekari             | Singora     | LC |
| <b>Siluriformes</b>      | Sperata aor                 | Ari         | LC |
| <b>Siluriformes</b>      | Sperata seenghala           | Ari         | LC |
| <b>Siluriformes</b>      | Chaca chaca                 | Kurkuria    | LC |
| <b>Siluriformes</b>      | Clarias batrachus           | Magur       | LC |
| <b>Siluriformes</b>      | Heteropneustes fossilis     | Singi       | LC |
| <b>Siluriformes</b>      | Ompok pabda                 | Pavo        | NT |
| <b>Siluriformes</b>      | Wallago attu                | Barali      | NT |
| <b>Siluriformes</b>      | Ailia coila                 | Kajoli      | NT |
| <b>Siluriformes</b>      | Clupisoma garua             | Neria       | LC |
| <b>Siluriformes</b>      | Eutropiichthys sp           | Bacha       | LC |

|                         |                        |        |    |
|-------------------------|------------------------|--------|----|
| <b>Siluriformes</b>     | Pangasius pangasius    | Koch   | LC |
| <b>Synbranchiformes</b> | Mastacembelus armatus  | Bami   | LC |
| <b>Synbranchiformes</b> | Macrognathus aral      | Tura   | LC |
| <b>Synbranchiformes</b> | Macrognathus punctatus | Tura   | LC |
| <b>Synbranchiformes</b> | Monopterus albus       | Cuchia | LC |

LC= Least Concern, NT= Near Threatened, VU= Vulnerable, DD= Data Deficient, NE= Not Evaluated

### C.9. Common Birds of study area:

Due to presence of numerous fish rich water bodies and mighty Brahmaputra River, agricultural fields the area is home to numerous bird species. Some water bodies such as Sareswar Beel and Brahmaputra River act as winter migration habitat for many species. There are reports of rare sightings of White Rumped Vulture from the area but no nesting sites had been reported in close vicinity of the project's direct influence zone.

Table 42: Name of the common birds in study area<sup>12</sup>

| Order                      | Common Name                | Scientific name                | Type | IUCN Status | WPA Status |
|----------------------------|----------------------------|--------------------------------|------|-------------|------------|
| <b>ANSERIFORMES</b>        | Lesser Whistling Duck      | <i>Dendrocygna javanica</i>    | R    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Common Shelduck            | <i>Tadorna tadorna</i>         | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Ruddy Shelduck             | <i>Tadorna ferruginea</i>      | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Red-Crested Pochard        | <i>Netta rufina</i>            | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Common Pochard             | <i>Aythya ferina</i>           | W    | VU          | IV         |
| <b>ANSERIFORMES</b>        | Ferruginous Duck           | <i>Aythya nyroca</i>           | W    | NT          | IV         |
| <b>ANSERIFORMES</b>        | Tufted Duck                | <i>Aythya fuligula</i>         | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Garganey                   | <i>Spatula querquedula</i>     | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Northern Shoveler          | <i>Spatula clypeata</i>        | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Gadwall                    | <i>Mareca strepera</i>         | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Eurasian Wigeon            | <i>Mareca penelope</i>         | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Indian Spot-Billed Duck    | <i>Anas poecilorhyncha</i>     | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Mallard                    | <i>Anas platyrhynchos</i>      | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Northern Pintail           | <i>Anas acuta</i>              | W    | LC          | IV         |
| <b>ANSERIFORMES</b>        | Common Teal                | <i>Anas crecca</i>             | W    | LC          | IV         |
| <b>PHOENICOPTERIFORMES</b> | Little Grebe               | <i>Tachybaptus ruficollis</i>  | R    | LC          | IV         |
| <b>COLUMBIFORMES</b>       | Rock Dove                  | <i>Columba livia</i>           | R    | LC          | IV         |
| <b>COLUMBIFORMES</b>       | Oriental Turtle Dove       | <i>Streptopelia orientalis</i> | R    | LC          | IV         |
| <b>COLUMBIFORMES</b>       | Yellow-Footed Green-Pigeon | <i>Treron phoenicoptera</i>    | R    | LC          | IV         |
| <b>COLUMBIFORMES</b>       | Spotted Dove               | <i>Streptopelia chinensis</i>  | R    | LC          | IV         |

<sup>12</sup> Reference:

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|                         |                         |                                   |   |    |    |
|-------------------------|-------------------------|-----------------------------------|---|----|----|
| <b>COLUMBIFORMES</b>    | Red Collared Dove       | <i>Streptopelia tranquebarica</i> | R | LC | IV |
| <b>CAPRIMULGIFORMES</b> | Common Swift            | <i>Apus apus</i>                  | R | LC | IV |
| <b>CUCULIFORMES</b>     | Greater Coucal          | <i>Centropus sinensis</i>         | R | LC | IV |
| <b>CUCULIFORMES</b>     | Indian Cuckoo           | <i>Cuculus micropterus</i>        | R | LC | IV |
| <b>CUCULIFORMES</b>     | Asian Koel              | <i>Eudynamis scolopaceus</i>      | R | LC | IV |
| <b>GRUIFORMES</b>       | White-Breasted Waterhen | <i>Amaurornis phoenicurus</i>     | R | LC | IV |
| <b>GRUIFORMES</b>       | Purple Swamp Hen        | <i>Porphyrio porphyrio</i>        | R | LC | IV |
| <b>GRUIFORMES</b>       | Common Coot             | <i>Fulica atra</i>                | R | LC | IV |
| <b>PELECANIFORMES</b>   | Lesser Adjutant         | <i>Leptoptilos javanicus</i>      | R | VU | IV |
| <b>PELECANIFORMES</b>   | Asian Openbill          | <i>Anastomus oscitans</i>         | R | LC | IV |
| <b>PELECANIFORMES</b>   | Indian Pond Heron       | <i>Ardeola grayii</i>             | R | LC | IV |
| <b>PELECANIFORMES</b>   | Cattle Egret            | <i>Bubulcus ibis</i>              | R | LC | IV |
| <b>PELECANIFORMES</b>   | Great Egret             | <i>Ardea alba</i>                 | R | LC | IV |
| <b>PELECANIFORMES</b>   | Intermediate Egret      | <i>Ardea intermedia</i>           | R | LC | IV |
| <b>PELECANIFORMES</b>   | Little Egret            | <i>Egretta garzetta</i>           | R | LC | IV |
| <b>PELECANIFORMES</b>   | Little Cormorant        | <i>Microcarbo niger</i>           | R | LC | IV |
| <b>CHARADRIIFORMES</b>  | Northern Lapwing        | <i>Vanellus vanellus</i>          | W | NT | IV |
| <b>CHARADRIIFORMES</b>  | Grey-Headed Lapwing     | <i>Vanellus cinereus</i>          | W | NT | IV |
| <b>CHARADRIIFORMES</b>  | Red-Wattled Lapwing     | <i>Vanellus indicus</i>           | R | LC | IV |
| <b>CHARADRIIFORMES</b>  | River Lapwing           | <i>Vanellus duvaucelii</i>        | R | LC | IV |
| <b>CHARADRIIFORMES</b>  | Pheasant-Tailed Jacana  | <i>Hydrophasianus chirurgus</i>   | R | LC | IV |
| <b>CHARADRIIFORMES</b>  | Bronze-Winged Jacana    | <i>Metopidius indicus</i>         | R | LC | IV |
| <b>CHARADRIIFORMES</b>  | Common Sandpiper        | <i>Actitis hypoleucos</i>         | W | LC | IV |
| <b>CHARADRIIFORMES</b>  | Common Greenshank       | <i>Tringa nebularia</i>           | W | LC | IV |
| <b>CHARADRIIFORMES</b>  | Marsh Sandpiper         | <i>Tringa stagnatilis</i>         | W | LC | IV |
| <b>CHARADRIIFORMES</b>  | Common Snipe            | <i>Gallinago gallinago</i>        | W | LC | IV |
| <b>CHARADRIIFORMES</b>  | Black-Headed Gull       | <i>Chroicocephalus ridibundus</i> | W | LC | IV |
| <b>CHARADRIIFORMES</b>  | Whiskered Tern          | <i>Chlidonias hybrida</i>         | W | LC | IV |
| <b>ACCIPITRIFORMES</b>  | Black-Winged Kite       | <i>Elanus caeruleus</i>           | R | LC | IV |
| <b>ACCIPITRIFORMES</b>  | Himalayan Griffon       | <i>Gyps himalayensis</i>          | R | EN | IV |
| <b>ACCIPITRIFORMES</b>  | White Rumped Vulture    | <i>Gyps indicus</i>               | R | CR | I  |
| <b>ACCIPITRIFORMES</b>  | Crested Serpent-Eagle   | <i>Spilornis cheela</i>           | R | LC | IV |
| <b>ACCIPITRIFORMES</b>  | Black Kite              | <i>Milvus migrans</i>             | R | LC | IV |
| <b>ACCIPITRIFORMES</b>  | Pallas's Fish-Eagle     | <i>Haliaeetus leucoryphus</i>     | R | EN | IV |
| <b>ACCIPITRIFORMES</b>  | Gray-Headed Fish-Eagle  | <i>Haliaeetus ichthyaetus</i>     | R | NT | IV |
| <b>STRIGIFORMES</b>     | Barn Owl                | <i>Tyto alba</i>                  | R | LC | IV |
| <b>STRIGIFORMES</b>     | Brown Fish-Owl          | <i>Ketupa zeylonensis</i>         | R | LC | IV |
| <b>STRIGIFORMES</b>     | Asian Barred Owlet      | <i>Glaucidium</i>                 | R | LC | IV |



|                       |                                |                                      |   |    |    |
|-----------------------|--------------------------------|--------------------------------------|---|----|----|
|                       |                                | <i>cuculoides</i>                    |   |    |    |
| <b>STRIGIFORMES</b>   | Jungle Owlet                   | <i>Glaucidium radiatum</i>           | R | LC | IV |
| <b>STRIGIFORMES</b>   | Spotted Owlet                  | <i>Athene brama</i>                  | R | LC | IV |
| <b>BUCEROTIFORMES</b> | Oriental Pied-Hornbill         | <i>Anthracoceros albirostris</i>     | R | LC | IV |
| <b>BUCEROTIFORMES</b> | Common Hoopoe                  | <i>Upupa epops</i>                   | R | LC | IV |
| <b>CORACIIFORMES</b>  | Common Kingfisher              | <i>Alcedo atthis</i>                 | R | LC | IV |
| <b>CORACIIFORMES</b>  | White-Throated Kingfisher      | <i>Halcyon smyrnensis</i>            | R | LC | IV |
| <b>CORACIIFORMES</b>  | Pied Kingfisher                | <i>Ceryle rudis</i>                  | R | LC | IV |
| <b>CORACIIFORMES</b>  | Green Bee-Eater                | <i>Merops orientalis</i>             | R | LC | IV |
| <b>CORACIIFORMES</b>  | Chestnut-Headed Bee-Eater      | <i>Merops leschenaulti</i>           | R | LC | IV |
| <b>CORACIIFORMES</b>  | Indian Roller                  | <i>Coracias benghalensis</i>         | R | LC | IV |
| <b>PICIFORMES</b>     | Coppersmith Barbet             | <i>Psilopogon haemacephalus</i>      | R | LC | IV |
| <b>PICIFORMES</b>     | Blue-Eared Barbet              | <i>Psilopogon duvaucelii</i>         | R | LC | IV |
| <b>PICIFORMES</b>     | Lineated Barbet                | <i>Psilopogon lineatus</i>           | R | LC | IV |
| <b>PICIFORMES</b>     | Blue-Throated Barbet           | <i>Psilopogon asiaticus</i>          | R | LC | IV |
| <b>PICIFORMES</b>     | Common Flame-Backed Woodpecker | <i>Dinopium javanense</i>            | R | LC | IV |
| <b>PICIFORMES</b>     | Black-Rumped Flameback         | <i>Dinopium benghalense</i>          | R | LC | IV |
| <b>PICIFORMES</b>     | Greater Flameback              | <i>Chrysocolaptes guttacristatus</i> | R | LC | IV |
| <b>PSITTACIFORMES</b> | Alexandrine Parakeet           | <i>Psittacula eupatria</i>           | R | NT | IV |
| <b>PSITTACIFORMES</b> | Rose-Ringed Parakeet           | <i>Psittacula krameri</i>            | R | LC | IV |
| <b>PSITTACIFORMES</b> | Gray-Headed Parakeet           | <i>Psittacula finschii</i>           | R | NT | IV |
| <b>PSITTACIFORMES</b> | Blossom-Headed Parakeet        | <i>Psittacula roseata</i>            | R | NT | IV |
| <b>PSITTACIFORMES</b> | Red-Breasted Parakeet          | <i>Psittacula alexandri</i>          | R | NT | IV |
| <b>PASSERIFORMES</b>  | Scarlet Minivet                | <i>Pericrocotus speciosus</i>        | R | LC | IV |
| <b>PASSERIFORMES</b>  | Black-Hooded Oriole            | <i>Oriolus xanthornus</i>            | R | LC | IV |
| <b>PASSERIFORMES</b>  | Common Iora                    | <i>Aegithina tiphia</i>              | R | LC | IV |
| <b>PASSERIFORMES</b>  | Black Drongo                   | <i>Dicrurus macrocercus</i>          | R | LC | IV |
| <b>PASSERIFORMES</b>  | Long-Tailed Shrike             | <i>Lanius schach</i>                 | R | LC | IV |
| <b>PASSERIFORMES</b>  | Rufous Treepie                 | <i>Dendrocitta vagabunda</i>         | R | LC | IV |
| <b>PASSERIFORMES</b>  | House Crow                     | <i>Corvus splendens</i>              | R | LC | IV |
| <b>PASSERIFORMES</b>  | Common Tailorbird              | <i>Orthotomus sutorius</i>           | R | LC | IV |
| <b>PASSERIFORMES</b>  | Paddyfield Warbler             | <i>Acrocephalus agricola</i>         | R | LC | IV |
| <b>PASSERIFORMES</b>  | Red-vented Bulbul              | <i>Pycnonotus cafer</i>              | R | LC | IV |
| <b>PASSERIFORMES</b>  | Red-whiskered Bulbul           | <i>Pycnonotus jocosus</i>            | R | LC | IV |

|               |                        |                                 |   |    |    |
|---------------|------------------------|---------------------------------|---|----|----|
| PASSERIFORMES | Jungle Babbler         | <i>Turdoides striata</i>        | R | LC | IV |
| PASSERIFORMES | Indian White-eye       | <i>Zosterops palpebrosus</i>    | R | LC | IV |
| PASSERIFORMES | Asian Pied Starling    | <i>Gracupica contra</i>         | R | LC | IV |
| PASSERIFORMES | Common Myna            | <i>Acridotheres tristis</i>     | R | LC | IV |
| PASSERIFORMES | Bank Myna              | <i>Acridotheres ginginianus</i> | R | LC | IV |
| PASSERIFORMES | Jungle Myna            | <i>Acridotheres fuscus</i>      | R | LC | IV |
| PASSERIFORMES | House Sparrow          | <i>Passer domesticus</i>        | R | LC | IV |
| PASSERIFORMES | Oriental Magpie-Robin  | <i>Copsychus saularis</i>       | R | LC | IV |
| PASSERIFORMES | Baya Weaver            | <i>Ploceus philippinus</i>      | R | LC | IV |
| PASSERIFORMES | Western Yellow Wagtail | <i>Motacilla flava</i>          | R | LC | IV |
| PASSERIFORMES | Gray Wagtail           | <i>Motacilla cinerea</i>        | R | LC | IV |
| PASSERIFORMES | Citrine Wagtail        | <i>Motacilla citreola</i>       | R | LC | IV |
| PASSERIFORMES | White Wagtail          | <i>Motacilla alba</i>           | R | LC | IV |

#### C.10. Comparison with the list of Endangered Species (Iucn Red List)<sup>13</sup>

| Common Name/ Local Name          | Scientific Name                 | Type    | IUCN Status | Remarks                                                              |
|----------------------------------|---------------------------------|---------|-------------|----------------------------------------------------------------------|
| Gangetic Dolphin                 | <i>Platanista gangetica</i>     | Mammals | EN          | Mostly seen in deep waters of Brahmaputra River .                    |
| Burmese Python                   | <i>Python bivittatus</i>        | Reptile | VU          | Locally Common, mostly found in forested areas.                      |
| Assam Roofed Turtle              | <i>Pangshura sylhetensis</i>    | Reptile | EN          | Rare. Found mostly in river waters of Brahmaputra . Out side of ROW. |
| Indian Eyed Turtle               | <i>Morenia petersi</i>          | Reptile | VU          | Rare. Found mostly in river waters of Brahmaputra . Outside of ROW.  |
| Tricarinate Turtle               | <i>Melanochelys tricarinata</i> | Reptile | EN          | Rare. Found mostly in forested areas. Outside of ROW                 |
| Narrow-Headed Softshell Turtle   | <i>Chitra indica</i>            | Reptile | EN          | Rare. Found mostly in river waters of Brahmaputra . Out side of ROW. |
| Indian Peacock Soft-Shell Turtle | <i>Nilssonia hurum</i>          | Reptile | VU          | Rare. Found mostly in river waters of Brahmaputra . Out side of ROW. |
| Gangetic Soft-Shell Turtle       | <i>Nilssonia gangeticus</i>     | Reptile | VU          | Rare. Found mostly in river waters of Brahmaputra . Out side of ROW. |
| Crowned River Turtle             | <i>Hardella thurjii</i>         | Reptile | VU          | Rare. Found mostly in river waters of Brahmaputra . Out side of ROW. |
| Yellow Tortoise                  | <i>Indotestudo elongata</i>     | Reptile | EN          | Rare. Found mostly in                                                |

<sup>13</sup> Reference: <http://www.iucnredlist.org/>



|                                    |                               |         |    |                                                                                                                  |
|------------------------------------|-------------------------------|---------|----|------------------------------------------------------------------------------------------------------------------|
|                                    |                               |         |    | forested areas. Outside of ROW                                                                                   |
| <b>Three-Striped Roofed Turtle</b> | Batagur dhongoka              | Reptile | EN | Rare. Found mostly in river waters of Brahmaputra. Out side of ROW.                                              |
| <b>Gethu</b>                       | Botia rostrata                | Fish    | VU | Locally Common. Mostly found in deep river waters or Beels.                                                      |
| <b>Common carp</b>                 | Cyprinus carpio               | Fish    | VU | Locally Common. Mostly found in deep river waters or Beels.                                                      |
| <b>Silver carp</b>                 | Hypophthalmichthys molitrix   | Fish    | NT | Locally Common. Mostly found in deep river waters or Beels.                                                      |
| <b>Chital</b>                      | Chitala chitala               | Fish    | NT | Locally Common. Mostly found in deep river waters or Beels.                                                      |
| <b>Kholihona</b>                   | Ctenop nobilis                | Fish    | NT | Locally Common. Mostly found in deep river waters or Beels.                                                      |
| <b>Pavo</b>                        | Ompok pabda                   | Fish    | NT | Locally Common. Mostly found in deep river waters or Beels.                                                      |
| <b>Barali</b>                      | Wallago attu                  | Fish    | NT | Locally Common. Mostly found in deep river waters or Beels.                                                      |
| <b>Kajoli</b>                      | Ailia coila                   | Fish    | NT | Locally Common. Mostly found in deep river waters or Beels.                                                      |
| <b>Common Pochard</b>              | <i>Aythya ferina</i>          | Bird    | VU | Migratory. Mostly found near large water bodies( Beels) or River Beds                                            |
| <b>Ferruginous Duck</b>            | <i>Aythya nyroca</i>          | Bird    | NT | Migratory. Mostly found near large water bodies( Beels) or River Beds                                            |
| <b>Lesser Adjutant</b>             | <i>Leptoptilos javanicus</i>  | Bird    | VU | Migratory. Mostly found near large water bodies( Beels) or River Beds                                            |
| <b>Northern Lapwing</b>            | <i>Vanellus vanellus</i>      | Bird    | NT | Migratory. Mostly found near large water bodies( Beels) or River Beds                                            |
| <b>Grey-Headed Lapwing</b>         | <i>Vanellus cinereus</i>      | Bird    | NT | Migratory. Mostly found near large water bodies( Beels) or River Beds                                            |
| <b>Himalayan Griffon</b>           | <i>Gyps himalayensis</i>      | Bird    | EN | Rare visitor. No nesting sites reported in close vicinity of ROW                                                 |
| <b>White Rumped Vulture</b>        | <i>Gyps indicus</i>           | Bird    | CR | Rare visitor. No nesting sites reported in close vicinity of ROW.                                                |
| <b>Pallas's Fish-Eagle</b>         | <i>Haliaeetus leucoryphus</i> | Bird    | EN | Mostly found near large water bodies (Beels) or River banks. No nesting sites reported in close vicinity of ROW. |
| <b>Gray-Headed Fish-</b>           | <i>Haliaeetus</i>             | Bird    | NT | Mostly found near large                                                                                          |

|                                                                                    |                             |      |    |                                                                                          |
|------------------------------------------------------------------------------------|-----------------------------|------|----|------------------------------------------------------------------------------------------|
| Eagle                                                                              | <i>ichthyaetus</i>          |      |    | water bodies (Beels) or River banks. No nesting sites reported in close vicinity of ROW. |
| Alexandrine Parakeet                                                               | <i>Psittacula eupatria</i>  | Bird | NT | Locally Common.                                                                          |
| Gray-Headed Parakeet                                                               | <i>Psittacula finschii</i>  | Bird | NT | Locally Common.                                                                          |
| Blossom-Headed Parakeet                                                            | <i>Psittacula roseata</i>   | Bird | NT | Locally Common.                                                                          |
| Red-Breasted Parakeet                                                              | <i>Psittacula alexandri</i> | Bird | NT | Locally Common.                                                                          |
| VU = Vulnerable, T = Near Threatened, EN = Endangered, CR = Critically Endangered, |                             |      |    |                                                                                          |

### ➤ Seasonal Ecological Variation along the project road

The filed study was conducted in the peak growth period (rainy season) which produces maximum bio diversity of the site. The tree and shrub diversity will remain same in other seasons of the year. In case of herb and grass species, there will be insignificant changes in the rest of the year. Similarly in case of the bird species (Winter migration) and faunal diversity there will be minor variations. The secondary data is limited to a checklist of species which does not differentiate the availability of bio diversity in different seasons. However, being a linear project the impacts on seasonal variation of bio diversity is very limited and detailed seasonal variation study is unlikely to be required.

## C.11. Species Diversity Analysis

Plankton are the microscopic organisms that drift on the water currents. Phytoplankton forms the sole base of food chain in aquatic system as they act as energy transducers and convert the solar energy into chemical energy of food. Zooplankton passes this food energy to the higher trophic levels and thus provides a link between energy producers and the consumers. These organisms are important biological indicator of water quality and trophic status of aquatic ecosystem as they respond quickly to the environmental changes.

**Table 43: Species Diversity of Phytoplankton at various Location of River : Redundant part of River at Kachuar Khas Pt II (ch. 51+536km)**

| S. No | Name of Species             | No/L       |            |            |            |
|-------|-----------------------------|------------|------------|------------|------------|
|       |                             | Location 1 | Location 2 | Location 3 | Location 4 |
| 1     | <i>Frustulia sp.</i>        | +          | +          | +          | +          |
| 2     | <i>Gyrosigma sp.</i>        | +          | +          | +          | +          |
| 3     | <i>Navicula sp.</i>         | +          | *          | +          | +          |
| 4     | <i>Tabellaria sp.</i>       | +          | +          | +          | +          |
| 5     | <i>Gomphonema sp.</i>       | +          | +          | +          | +          |
| 6     | <i>Fragilaria sp.</i>       | +          | +          | +          | +          |
| 7     | <i>Synedra sp.</i>          | +          | *          | +          | +          |
| 8     | <i>Pinnularia sp.</i>       | +          | +          | +          | +          |
| 9     | <i>Draparnaldiopsis sp.</i> | +          | +          | +          | *          |
| 10    | <i>Hyalotheca sp.</i>       | +          | +          | *          | +          |
| 11    | <i>Spirogyra sp.</i>        | *          | *          | +          | +          |
| 12    | <i>Gonatozygon sp.</i>      | +          | +          | +          | *          |
| 13    | <i>Ulothrix sp.</i>         | +          | *          | *          | +          |
| 14    | <i>Eudorina sp.</i>         | +          | +          | +          | +          |
| 15    | <i>Anabaena sp.</i>         | +          | +          | +          | +          |
| 16    | <i>Oscillatoria sp.</i>     | +          | *          | *          | *          |
| 17    | <i>Spirulina sp.</i>        | +          | +          | +          | +          |
| 18    | <i>Nostoc sp.</i>           | +          | +          | *          | +          |
| 19    | <i>Mougeotia sp.</i>        | +          | +          | +          | +          |
| 20    | <i>Zygnema sp.</i>          | *          | +          | +          | +          |
| 21    | <i>Microspora sp.</i>       | +          | *          | +          | +          |
| 22    | <i>Triploceras sp.</i>      | +          | +          | +          | +          |
| 23    | <i>Eudorina sp.</i>         | +          | +          | +          | *          |
| 24    | <i>Ceratium sp.</i>         | +          | *          | +          | +          |
| 25    | <i>Glenodinium sp.</i>      | +          | +          | *          | +          |
| 26    | <i>Closterium sp.</i>       | +          | +          | +          | +          |
| Total |                             | 24         | 19         | 21         | 22         |

\* Organism not present

Table 44: Species Diversity of Zooplankton at various Location of River: Redundant part of River at Kachuar Khas Pt II (ch. 51+536km)

| S. No        | Name of Species           | No/m <sup>3</sup> |            |            |            |
|--------------|---------------------------|-------------------|------------|------------|------------|
|              |                           | Location 1        | Location 2 | Location 3 | Location 4 |
| 1            | <i>Nauplii sp. larvea</i> | +                 | +          | +          | +          |
| 2            | <i>Cyclops sp.</i>        | +                 | +          | +          | +          |
| 3            | <i>Diaptomus sp.</i>      | +                 | +          | +          | +          |
| 4            | <i>Mesocyclops sp.</i>    | +                 | *          | +          | *          |
| 5            | <i>Tropocyclops sp.</i>   | +                 | +          | +          | +          |
| 6            | <i>Moina sp.</i>          | +                 | +          | *          | +          |
| 7            | <i>Bosmina sp.</i>        | +                 | +          | +          | *          |
| 8            | <i>Ceriodaphnia sp.</i>   | +                 | +          | +          | +          |
| 9            | <i>Daphnia sp.</i>        | *                 | +          | +          | +          |
| 10           | <i>Monostyla sp.</i>      | +                 | +          | +          | *          |
| 11           | <i>Brachionus sp.</i>     | +                 | +          | +          | +          |
| 12           | <i>Keratella sp.</i>      | +                 | *          | +          | +          |
| 13           | <i>Lepadella sp.</i>      | +                 | +          | *          | *          |
| 14           | <i>Nauplius sp.</i>       | +                 | +          | +          | +          |
| 15           | <i>Euchlanis sp.</i>      | +                 | *          | +          | +          |
| 16           | <i>Paramoecium sp.</i>    | +                 | +          | +          | +          |
| 17           | <i>Euglena sp.</i>        | +                 | +          | +          | +          |
| <b>Total</b> |                           | <b>16</b>         | <b>14</b>  | <b>15</b>  | <b>13</b>  |

\* Organism not present

The sampling site is mainly a redundant part of river course which presently act as a seasonal part time natural reservoir and drainage system for flood water during the monsoon season in Assam. In the year 2020, the state of Assam experienced several waves of floods and heavy rains started from month of April. The sampling sites get inundated after receiving of excess runoff waters from the nearby village lakes, ponds, Beels, small seasonal creeks and surface runoffs from nearby agricultural fields which gets flooded during the monsoon. Along with the flood water, different microorganisms present in different surrounding water sources and agricultural fields also reaches the sampling sites. Hence the area might show a higher degree of planktonic diversity during the month of Monsoon i.e. June –September. As the sampling and study of Plankton diversity was conducted in the month of July 2020, which is the peak monsoon period. Therefore, there is also possibility of documentation of some species of planktons which might not be present in the stagnant water of this old Redundant part of River in summer and winter.

## D. Socio Economy Environment

As stated in previous section, the project road alignment traverses from the two districts namely Dhubri and Kokrajhar district. The demographic profile of this district has been taken as reference for primary assessment. The Primary data/ Socio economic profile of the villages/ blocks/will be generated using structured questioner once the alignment is frizzed. This survey will include detailed community consultation, socio-economic & census survey and estimation of community properties resources, religious structure, and educational intuitions coming to RoW (if any). The detail of assessment on socio-economic profile has been given in separate chapter (SIA) of this report. The socio demographic status of project influence districts have been illustrated below section.

### D.1. Socio-Demographic Setup- District Dhubri

Dhubri is situated in the Brahmaputra valley. The river Brahmaputra flows through the heart of Assam and touches almost all the districts. Dhubri was one of the three subdivisions of old Goalpara district. It has three subdivisions namely, Dhubri, Bilasipara and Mankachar. It has 9 revenue circles, which include 5 statutory towns and 4 Census towns. Thus the district has 1,091 villages spread over 3

subdivisions and 9 Revenue Circles. It has 15 Community Development Blocks. The total area of the districts is 2176.00 Sq. Kms (Rural: 2144.06 Sq. Km. and Urban: 31.94 Sq. Km). In terms of area the district occupies the 17th rank of the total 27 districts in Assam. It has 168 Gram Panchayats in all.

### **Important Socio-Economic and Demographic fact –District Dhubri**

- In the district, Dhubri (Pt) Revenue Circle is the most populous having 425809 persons.
- Among the CD Block, Gauripur CD Block has the highest number of population with 213877 whereas the lowest is found in Hatidhura (Part) CD Block with 53842.
- The district comprises nine (9) towns: 5 Statutory Towns and 4 Census Towns. Dhubri (MB) is the most populous with 63388 persons while Anand Nagar (CT) is the smallest in population with 2050 souls.
- While the highest number (138) inhabited villages is found in Birshingjarua CD Block and lowest inhabited villages (35) is found in Hatidhura (Pt) CD Block.
- The largest village by population is Borokalia Sharsho with 10628 souls under South Salmara CD Block and the smallest village is Gobrakuti under Agamoni CD Block with 12 persons.
- The famous Mahamaya Devalaya is situated at this District which is a famous religious place for pilgrims.
- The district has the largest number of Char (an area use as residential place near to the bank of big river) villages with 480 numbers.

#### **➤ Total Population (Urban and rural)**

Out of the total Dhubri population for 2011 census, 10.45 percent lives in urban regions of district. In total 203,701 people lives in urban areas of which males are 103,934 and females are 99,767. Sex Ratio in urban region of Dhubri district is 960 as per 2011 census data. Similarly child sex ratio in Dhubri district was 935 in 2011 census. Child population (0-6) in urban region was 22,983 of which males and females were 11,879 and 11,104. This child population figure of Dhubri district is 11.43 % of total urban population. Average literacy rate in Dhubri district as per census 2011 is 82.28 % of which males and females are 87.07 % and 77.30 % literates respectively. In actual number 148,695 people are literate in urban region of which males and females are 80,156 and 68,539 respectively.

As per 2011 census, 89.55 % population of Dhubri districts lives in rural areas of villages. The total Dhubri district population living in rural areas is 1,745,557 of which males and females are 893,914 and 851,643 respectively. In rural areas of Dhubri district, sex ratio is 953 females per 1000 males. If child sex ratio data of Dhubri district is considered, figure is 971 girls per 1000 boys. Child population in the age 0-6 is 345,279 in rural areas of which males were 175,213 and females were 170,066. The child population comprises 19.60 % of total rural population of Dhubri district. Literacy rate in rural areas of Dhubri district is 55.25 % as per census data 2011. Gender wise, male and female literacy stood at 60.02 and 50.21 percent respectively. In total, 773,646 people were literate of which males and females were 431,395 and 342,251 respectively.

#### **Religion –wise Population**

| Description | Total     | Percentage |
|-------------|-----------|------------|
| Hindu       | 388,380   | 19.92 %    |
| Muslims     | 1,553,023 | 79.67 %    |
| Christian   | 4,107     | 0.21 %     |
| Sikh        | 254       | 0.01 %     |
| Buddhist    | 101       | 0.01 %     |
| Jain        | 1,846     | 0.09 %     |
| Others      | 45        | 0.00 %     |
| Not Stated  | 1,502     | 0.08 %     |

#### **➤ Population Density**

The initial provisional data released by census India 2011, shows that density of Dhubri district for 2011 is 896 people per sq. km. In 2001, Dhubri district density was at 941 people per sq. km. Dhubri district administers 2,176 square kilometers of areas.

➤ **Literacy Rate**

Average literacy rate of Dhubri in 2011 were 58.34 compared to 48.17 of 2001. If things are looked out at gender wise, male and female literacy were 63.10 and 53.33 respectively. For 2001 census, same figures stood at 55.84 and 40.02 in Dhubri District. Total literate in Dhubri District were 922,341 of which male and female were 511,551 and 410,790 respectively. In 2001, Dhubri District had 9,102,384 in its district.

➤ **Sex Ratio**

With regards to Sex Ratio in district, it stood at 953 per 1000 male compared to 2001 census figure of 946. The average national sex ratio in India is 940 as per latest reports of Census 2011 directorate. In 2011 census, child sex ratio is 968 girls per 1000 boys compared to figure of 965 girls per 1000 boys of 2001 census data.

➤ **Child Population**

In census enumeration, data regarding child under 0-6 age were also collected for all districts including Dhubri. There were total 368,262 children under age of 0-6 against 326,739 of 2001 census. Of total 368,262 male and female were 187,092 and 181,170 respectively. Child Sex Ratio as per census 2011 was 968 compared to 965 of census 2001. In 2011, children under 0-6 formed 18.89 percent of Dhubri District compared to 20.86 percent of 2001. There was net change of -1.97 percent in this compared to previous census of India.

➤ **Houseless Population**

In 2011, total 207 families live on footpath or without any roof cover in Dhubri district of Assam. Total population of all, who lived without roof at the time of Census 2011, was approx 815. This is approx 0.04% of total population of Dhubri district.

## **D.2. Socio-demographic setup- district Kokrajhar**

Kokrajhar, recognized as the gateway to the north-eastern region of India is a major district of Assam. The district of Kokrajhar nestled on the riverbank of Brahmaputra is bounded by Bhutan on the north and Dhubri district on the south. The Bongaigon district lies on the eastern side whereas West Bengal borders the west of the Kokrajhar district. Kokrajhar is well accessible by both roadway and railway. Kokrajhar was originally a part of undivided Goalpara district. Till 1956, it was merely a small village with a railway station that connected it to the rest of the world. In 1957, when Bimala Prasad Chaliha was the Chief Minister of Assam, a new civil Sub-division was created after carving out the northern part of Dhubri Sub-division and some parts of Goalpara Sub-division. This new subdivision was called Kokrajhar Sub-division. Goalpara district thus became divided into three sub-divisions. The area covered by the then Kokrajhar subdivision consisted of five tracts of the Eastern Dooars, viz., Bijni, Sidli, Chirang, Ripu and Guma with a total area of 1569.9 square miles or 4065.88 square kilometres.

### **Important Soci-economic and demographic fact –District Kokrajhar**

- In Kokrajhar there are 9 Revenue Circles and 11 CD Blocks which comprises 1068 villages including 15 uninhabited villages.
- In the district, Gossaigaon (Pt) Revenue Circle is the most populous having 270952 persons while Bilasipara (Pt) is the least populous Revenue Circle having 8736 persons. Among the CD Block, Kokrajhar CD Block has the highest number of population with 218958 whereas the lowest is found in Golakganj (Part) CD Block with 3318.
- The district comprises four (4) towns: 2 Statutory Towns and 2 Census Towns. Kokrajhar (MB) is the most populous with 34136 persons while Salakati (CT) is the smallest in population



with 4863 souls. While the highest number (238) inhabited villages is found in Kachugaon CD Block and lowest inhabited villages (4) is found in Bilasipara (Pt) CD Block.

- The largest village by population is Amguri Forest Block with 8393 souls under Kokrajhar CD Block and the smallest village is Bamuni with 5 persons under Debitola (Pt) CD Block.

### ➤ **Total Population of district Kokrajhar (Urban & Rural)**

Out of the total Kokrajhar population for 2011 census, 6.19 percent lives in urban regions of district. In total 54,941 people lives in urban areas of which males are 28,459 and females are 26,482. Sex Ratio in urban region of Kokrajhar district is 931 as per 2011 census data. Similarly child sex ratio in Kokrajhar district was 947 in 2011 census. Child population (0-6) in urban region was 5,527 of which males and females were 2,839 and 2,688. This child population figure of Kokrajhar district is 9.98 % of total urban population. Average literacy rate in Kokrajhar district as per census 2011 is 87.86 % of which males and females are 91.97 % and 83.44 % literates respectively. In actual number 43,415 people are literate in urban region of which males and females are 23,562 and 19,853 respectively.

As per 2011 census, 93.81 % population of Kokrajhar districts lives in rural areas of villages. The total Kokrajhar district population living in rural areas is 832,201 of which males and females are 424,446 and 407,755 respectively. In rural areas of Kokrajhar district, sex ratio is 961 females per 1000 males. If child sex ratio data of Kokrajhar district is considered, figure is 954 girls per 1000 boys. Child population in the age 0-6 is 131,397 in rural areas of which males were 67,246 and females were 64,151. The child population comprises 15.84 % of total rural population of Kokrajhar district. Literacy rate in rural areas of Kokrajhar district is 63.63 % as per census data 2011. Gender wise, male and female literacy stood at 70.45 and 56.53 percent respectively. In total, 445,890 people were literate of which males and females were 251,658 and 194,232 respectively.

### **Religion wise population**

| <b>Description</b>      | <b>Rural</b> | <b>Urban</b> |
|-------------------------|--------------|--------------|
| Population (%)          | 93.81 %      | 6.19 %       |
| Total Population        | 832,201      | 54,941       |
| Male Population         | 424,446      | 28,459       |
| Female Population       | 407,755      | 26,482       |
| Sex Ratio               | 961          | 931          |
| Child Sex Ratio (0-6)   | 954          | 947          |
| Child Population (0-6)  | 131,397      | 5,527        |
| Male Child(0-6)         | 67,246       | 2,839        |
| Female Child(0-6)       | 64,151       | 2,688        |
| Child Percentage (0-6)  | 15.79 %      | 10.06 %      |
| Male Child Percentage   | 15.84 %      | 9.98 %       |
| Female Child Percentage | 15.73 %      | 10.15 %      |
| Literates               | 445,890      | 43,415       |
| Male Literates          | 251,658      | 23,562       |
| Female Literates        | 194,232      | 19,853       |
| Average Literacy        | 63.63 %      | 87.86 %      |
| Male Literacy           | 70.45 %      | 91.97 %      |
| Female Literacy         | 56.53 %      | 83.44 %      |

### ➤ **Population Density**

The population density of Kokrajhar district for 2011 is 269 people per sq. km. In 2001, Kokrajhar district density was at 266 people per sq. km. Kokrajhar district administers 3,296 square kilometers of areas.

### ➤ **Literacy Rate**

Average literacy rate of Kokrajhar in 2011 were 65.22 compared to 52.29 of 2001. If things are looked out at gender wise, male and female literacy were 71.89 and 58.27 respectively. For 2001 census,



same figures stood at 61.01 and 43.06 in Kokrajhar District. Total literate in Kokrajhar District were 489,305 of which male and female were 275,220 and 214,085 respectively. In 2001, Kokrajhar District had 4,797,838 in its district.

➤ **Sex Ratio**

With regards to Sex Ratio in Kokrajhar, it stood at 959 per 1000 male compared to 2001 census figure of 946. The average national sex ratio in India is 940 as per latest reports of Census 2011 Directorate. In 2011 census, child sex ratio is 954 girls per 1000 boys compared to figure of 955 girls per 1000 boys of 2001 census data.

➤ **Child Population**

In census enumeration, data regarding child under 0-6 age were also collected for all districts including Kokrajhar. There were total 136,924 children under age of 0-6 against 151,341 of 2001 census. Of total 136,924 male and female were 70,085 and 66,839 respectively. Child Sex Ratio as per census 2011 was 954 compared to 955 of census 2001. In 2011, Children under 0-6 formed 15.43 percent of Kokrajhar District compared to 17.95 percent of 2001. There was net change of -2.52 percent in this compared to previous census of India.

### D.3. Agriculture and Forestry

**Kokrajhar district:** Agriculture is the main occupation of the people of the district because of the fertile alluvial plain and soft and sandy soil along with the climate characterized by humid atmosphere as well as abundant rain which helps in the growth of agricultural crops. Rice is the staple food of people living in the district and therefore paddy is the principal food crops in Kokrajhar district. The district produces paddy in the winter, summer and autumn. The district produces winter paddy nearly about 18,219 tones in winter, 12,248 tones in autumn and 2,950 tones in summer during the year 1998-99. The district produces a huge variety of cereals such as Maize, Wheat, Gram, Lentil pea, Tur, Castor, Seamum, Rape, Rabi pulses, Linseed and Mustard along with a few other crops such as jute. Banana is a prime variety which is found in abundant and throughout the year whereas seasonal fruits like mangoes, jack fruit, papaya, areca nut, coconut, orange, pineapple, etc. are also found in the district. Spices such as Chilli, Turmeric, Ginger, Black pepper and tuber crops like Potato, Tapioca, Colocasia are cultivated in this district. The cultivators mostly depend on rain water for cultivation other than irrigation system (District Census Handbook, Kokrajhar, 2011).

The tea gardens of the district are Daloabari, Banglabari, Kokrajhar and Mornoi Tea Garden (Kokrajhar District, Govt. of Assam, 2018). In this district, Net Area Sown for land use is 865.5 sq. km.; Total cropped area is 1673.8 sq. km. and Area sown more than once is 808.2 sq. km. (Ground Water Information Booklet Kokrajhar District, Assam, CGWB, 2013).

**Dhubri district:** The Dhubri district mainly depends on agriculture and forest products. Since, the district is under the Agro-climate zone of "Lower Brahmaputra Valley", agriculture is the main occupation for majority of the people residing in the district. About one third of the total workforce has taken agro-based activities as means of their livelihood. Main source of income of the district is paddy along with Jute and mustard seed which occupy the major share of cash crops. The principal crops cultivated are Autumn paddy, Winter paddy, Rape seeds, Mustard, Wheat, Jute, Potato, Sugarcane, Masur, etc. Other than agriculture, the people are also engaged in live- stock, fishery, forestry, etc. From forests, mainly timber and bamboo add to their income. The Banana plantations are common to all households and sold in the markets. Mangoes, Areca nut, Jack fruits, Lemons, Coconut etc. are common in the district including vegetables like Brinjal, Cauliflower, Onion, Papaya, Sweet Potato, Tomato, Cabbage, etc. (District Census Handbook, Dhubri, 2011).

Forest wealth is one of the major sources of occupation of the people of Dhubri district. A large number of people in this district mainly rural area depend on forest to a larger extent. In this district,

Net Area Sown for land use is 1343.49 sq. km.; Total cropped area is 1725.81 sq. km. and Area sown more than once is 382.32 sq. km. (Ground Water Information Booklet, Dhubri District, Assam, CGWB, 2013).

#### D.4. Transportation

**Kokrajhar district:** The district is the gateway to Assam as well as northeast India. Rail as well as the road networks touch Kokrajhar district at Srirampur on the path to the rest of the region which makes it well accessible (Brief Industrial Profile of Kokrajhar District by Ministry of MSME, GOI). Rupsi Airport is located about 70km from the BTC headquarter Kokrajhar. All the rural areas except a very few remote areas are well established for motor vehicle roads. Railways are present in all the important paces of the district. Vehicles of all sorts run on the roads in the district. As Kokrajhar Railway station is the gateway station to the northeast India, it is one of the busiest and prime stations of North Eastern Frontier Railways. Along with this, Kokrajhar Railway Station is linked to most part of the country by railway lines.

**Dhubri district:** The Dhubri district is well accessible by both roadway and railway. The Rupsi Airport is located at about 70 km from BTC headquarter Kokrajhar and near about 23 km from Assam's Dhubri town. Previously, the Indian Airlines along with some private commercial flights were in operation regularly between Calcutta, Guwahati and Dhubri which is now totally closed. The town also had a very busy river port on the bank of the Brahmaputra River which was used to be an international trade centre with the neighbouring countries, mainly in British era but at present, this port is lying idle. The train service started on 2010. The train services running from the Dhubri railway station take a new route from Dhubri to Kamakhya and Guwahati Junction. Trains from Dhubri station are Dhubri to Silghat, Dhubri to New Jalpaiguri (Siliguri) (Inter City Express) as well as Dhubri Fakiragram passenger train. As per Economic Survey, Assam, 2011-2012 in Dhubri district there are 570 Km of Black Topped along with 427 Km of earthen/gravelled PWD roads present. The lengths of Roads according to different classes under PWD are mentioned: State Highway is 56 Km, Major district is 53 Km, Rural Road is 850 Km, Urban Road is 38 Km. There are both government and private buses and other transport plying from Guwahati to Dhubri. The eastern and southern part of the district is bordered by the Brahmaputra River where some ferryghats connecting Dhubri and Goalpara district by water ways are present. Dhubri-Fakirganj is a major ferryghat found in the district (District Census Handbook, Dhubri, 2011).

#### D.5. Industrial Situation

**Kokrajhar district:** Industrially, Kokrajhar district is a little backward in comparison to certain other districts in Assam. Lately, efforts were made to creating a favourable industrial climate by augmenting basic infrastructure facilities, subsidiary including other incentives by the Government of Assam. The district has no medium industries but many small scale industries or cottage industries are being set up by the local people with the help and cooperation of the Govt. of Assam such as blacksmith, gold and silversmith, pottery, bamboo, sericulture and weaving industries (District Census Handbook, Kokrajhar, 2011). There is no industrial estate in this district. There are food manufacturing industries, beverage manufacturing industries, tobacco product, wood and wood products, furniture and fixtures, non metallic mineral products manufacturers, ready-made garments and embroidery and engineering units. For new MSMEs, the potential areas are flex printing units, video film studio, paddy reaping service, rice selling units and clinical laboratories (Brief Industrial Profile of Kokrajhar District by Ministry of MSME, Govt. of India).

**Dhubri district:** Industrially, Dhubri district is a little backward district of Assam. There is no large scale industry in this district. The Agricultural and natural resource is not satisfactorily used for industrial purposes. The District has potential for setting up industries based on the raw materials which are available in this District such as Paddy, Pulses, Jute, Bamboo, Wheat, Potatoes and

Mustard Oil seed along with fruits and vegetables like Pine apple, Tomato, Raw Cashew nuts can be used for food processing industries. Handicraft Industries are having a major role as occupation of rural artisans in making items from Jute, Pith craft, Terrakotta, Bamboo, etc. Weaving is a traditional occupation in the district where Bodos, Tanti, Rabhas, Rajbongsis, Ansaris of Dhubri district are skilful weavers. The Handloom & Textile Dept. is running four of HTC's in rural area at Kharuabanda, Kazigaon, Tipkai and Barkanda for imparting one year training to create artisans in handloom weaving, designing, dyeing etc. There are seven Weavers Extension Service Units at Gauripur, Salkocha, Golokganj, Agomoni, Bilasipara, Sapatgram and Tipkai (District Census Handbook, Dhubri, 2011). In Dhubri, there is one industrial area in Gauripur which has an acquired land of 13,597 Sq.m. There are agro based, cotton textiles, Woolen, silk & artificial Thread based textiles, jute based industries, readymade garments and embroidery sectors, Wood/wooden based furniture, Paper & Paper products, leather and chemical based industries, metal mainly steel based units, engineering and equipments industries and repairing and servicing sectors. For new MSMEs, the potential areas are Food processing enterprises, Steel Furniture & Steel Fabrication, Traditional Garments, Cattle & Poultry Feed, Jute diversified Products, Agarbatti & Candle manufacturing along with service industries such as Automobile workshop, Mobile Phone Repairing, Rice & Flour Milling, Electrical Equipments repairing, tourism industry, etc. (Brief Industrial Profile of Dhubri District by Ministry of MSME, Govt. of India).

However here is no such industrial area along the project road.

#### **D.6. Cultural/ Religious and Public Utility Structures**

Festivals and cultural activities are being celebrated throughout the year in Assam. The department of arts and cultural has taken various activities like promotion of art and culture, preservation of old and historical monuments.

The primary data/ socio economic profile of the villages/ blocks/will be generated using structured questioner once the alignment is frizzed. This survey includes, detailed community consultation, socio-economic & census survey and estimation of community properties resources, religious structure, and educational intuitions coming to RoW (if any). The detail of assessment on socio-economic profile has been given in separate chapter (Social Impact Assessment -SIA) of this report. There are few sensitive receptors such as schools, religious centres and health care centres along the project road. Utmost care will be taken to conserve these structures. However, if not feasible these will be either properly relocated or reconstructed in consultations with the local community. There are 84 community structures along this project road (Table 45), some photographs are also provided below (Figure 46).

**Table 45: Type of CPR along the project road**

| SR.NO | Type of CPR         | LHS       | RHS       | TOTAL     |
|-------|---------------------|-----------|-----------|-----------|
| 1.    | Hand Pump           | 02        | 01        | 03        |
| 2.    | Wells               | 00        | 00        | 00        |
| 3.    | Religious Structure | 19        | 11        | 30        |
| 4.    | Schools             | 08        | 06        | 14        |
| 5.    | Hospital            | 01        | 02        | 03        |
| 6.    | Gov. Buildings      | 15        | 16        | 31        |
| 7.    | Other               | 01        | 02        | 03        |
|       | <b>GRAND TOTAL</b>  | <b>46</b> | <b>38</b> | <b>84</b> |



Figure 46: Photographs of CPR along the project road

## D.7. Archaeological Heritage

As per discussion with different stakeholders, field survey and informations obtained from ASI, it has been confirmed that there is no archaeological heritage site near to existing or proposed RoW and also not in immediate project influence area.



## 6. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

### A. Introduction

During planning and design phase the road alignment, construction details, materials of construction etc. ultimately decide the impacts during later phases. Most of the impacts are occurred during construction and operation phase. While some of the construction phase impacts are temporary, others are permanent. Operation phase impacts are continuous in nature. The important criteria for identification of impact are the identification of the impact zone. For present study, a direct Corridor of Impact (COI) within 500 m and indirect impact of 10 Kms of the road alignment has been considered.

Environmental parameters are broadly classified into three groups.

- Physical Environment includes: Air Quality, Water Resources, Water Quality, Noise and Land environment etc.
- Biological Environment includes: Terrestrial & Aquatic Biodiversity and Roadside Plantation etc.
- Social Environment includes: Demography, Employment, Health, Economy, Agriculture, Housing, Culture etc.

This chapter assesses the nature, type and magnitude of the potential impacts on the physical, biological and socio-cultural environmental components along the project road. This chapter presents key environmental issues associated with various aspects of the proposed project. The environmental impacts anticipated due to the development of the project road sections can be categorized as primary (direct) and secondary (indirect) impacts. Primary impacts are those which are induced directly by the project whereas the secondary impacts are those which are indirectly induced and typically include the associated investment and changing patterns of social and economic activities due to the proposed action. Interaction of the project activities with environmental attributes is presented as Activity-Impact matrix in Table 46.

Table 46: Activity-Impact Identification Matrix

| SI No. | Activities                              | Type of Impact |        |        |        |        |        |            |
|--------|-----------------------------------------|----------------|--------|--------|--------|--------|--------|------------|
|        |                                         | Air            | Water  | Noise  | Flora  | Fauna  | Soil   | Topography |
| 1.     | Labour and Construction camp activities |                | - ve/t |        |        |        |        |            |
| 2.     | Quarrying                               | -ve/t          |        | - ve/t | - ve/p | - ve/p | - ve/t | - ve/p     |
| 3.     | Material transport and storage          | - ve/t         |        | - ve/t |        |        |        |            |
| 5.     | Earthwork                               | - ve/t         |        |        |        |        | - ve/t | - ve/t     |
| 6.     | Use of construction equipments          | - ve/t         | - ve/t | - ve/t |        |        | - ve/t |            |
| 7.     | Plantation                              | +ve/p          |        | +ve/p  | +ve/p  | +ve/p  | +ve/p  | +ve/p      |
| 8.     | Drainage work                           | - ve/t         | ve/t   | - ve/t |        |        | - ve/t | - ve/t     |
| 9.     | Culvert and bridge construction         | - ve/t         | ve/t   | - ve/t | - ve/t | -ve/t  | - ve/t | ve/p       |
| 10.    | Stripping of top soil                   | - ve/t         |        |        |        |        | - ve/p | - ve/p     |
| 11.    | Debris generation                       | - ve/t         |        |        |        |        | - ve/t |            |
| 12.    | Oil and grease                          |                | - ve/t |        |        |        | - ve/t |            |
| 13.    | Construction in forest                  | - ve/t         |        | - ve/t | - ve/t | - ve/t | - ve/p | - ve/p     |

|                     |  |  |  |  |  |  |  |
|---------------------|--|--|--|--|--|--|--|
| and sensitive areas |  |  |  |  |  |  |  |
|---------------------|--|--|--|--|--|--|--|

Notes: t – temporary, p – permanent. Impact indicated in bold letters indicates significant impacts.

## **B. Positive Impacts due to improvement of sub-project road**

The positive impacts expected from the up-gradation of the newly declared NH-127 B (Assam portion) starting from Srirampur on NH-27 (old NH-31 C) at Chainage 0.000 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 54.154 km includes:

- The project road is of significant importance as the road connecting two National Highways (NH31C and NH-31), one proposed bridge over river Brahmaputra and connects to important nearby villages and semi-urban settlements.
- The project will have multiple benefits as it will provide all weather high speed National Highway.
- Other than this project road also benefit in below mentioned way:-
- Fast and safe connectivity resulting in savings of fuel, travel time and total transportation cost to the society
- Employment opportunity to people
- Development of local industry, agriculture and handicrafts
- Transporting, processing and marketing of agricultural products
- Reduction in pollution
- Opening up of opportunities for new occupations
- Better approach to Medical & Educational services and quick transportation of perishable goods like fruits , vegetables and dairy products
- Improved quality of life for people.

## **C. Adverse Environmental Impacts due to improvement of subproject road**

The adverse environmental impacts anticipated from the improvement of the project road section are:

- Change in topography and land use due to acquisition of land for new alignment.
- Most part of the project road is in Brahmaputra river flood prone. So soil erosion is one of the major issues in this project.
- Loss of productive soil and agriculture land,
- Cutting of road side trees that falls within formation width i.e. 10-30 m may reduce the ecological balance of the area and also increase soil erosion problem.
- Air, Water, Noise pollution and disposal of construction waste, during construction, will adversely impact the local environment band to the local residents. The impacts are generally temporary and limited to the construction period.
- A number of quarries and other sources will be established which will change the landscape and also a loss to the natural resources. However, the operation of quarries is an independent and regulated activity.
- Adverse impacts on water quality of rivers crossing or running parallel to the proposed alignment in the form of silt deposition and runoff during construction are expected. However, this is short term and will be taken care of by controlled construction activities.
- Improvement on existing road and construction of new road and bridges, although limited, may enhance soil erosion, landslips and reduce the micro-level ecological balance of the area. Construction may also disturb the habitation of faunal diversity living in this area. These should, however, be only temporary/reversible effects.
- The improvement will also require the cutting of about 4202 trees.

## D. Impacts and Mitigation Measure of the Sub-Project

Identification and assessment of the potential environmental impacts are based on secondary information supplemented by field visits. Impacts on various environmental components have been assessed at three different stages, namely:

- Design and Pre-Construction Stage
- Construction Stage
- Operation Stage

A few permanent as well as short-term and long-term adverse effects, mainly at the construction and operation stages, are, nonetheless, anticipated. Temporary short term impacts can be kept in check through proper planning and adopting environment friendly road construction methods and the appropriate regulatory measures.

### D.1. Meteorological Parameters

#### I. Pre-Construction Stage

The Project Highway is located in a subtropical region with marked monsoon effects. Widening of roads usually leads to felling of roadside trees. In this project also, according to design stage EIA report more than 4202 trees were cut. Felling of roadside trees and addition of pavement surface may have led to formation of heat islands especially along the inhabited sections affecting the micro-climate. In addition, at green tunnel locations, the removal of trees increases the amount of direct sunlight resulting in higher temperatures along the highway. This increase in the daytime temperature assumes significance especially to the slow-moving traffic, the pedestrians and the first row of residences / receptors along the corridor, as the entire project stretch experiences temperatures as high as 32°C during summers. Although the impact is significant and long term in nature, it is reversible in nature provided trees as part of compensatory afforestation is planted and maintained along the road. It must be noted that the impact is unavoidable.

#### Mitigation Measure

Avoidance measures, such as the minimising of the number of trees to be cut etc, have been worked out as part of the design finalization. Though no major change in the macro-climatic setting (precipitation, temperature and wind) is envisaged due to the project, the microclimate is likely to be temporarily modified by vegetation removal, loss of roadside plantations and the addition of increased pavement surface. However, there will be a total of 42020 trees are proposed to be planted along the road.

| Impact of/ on             | Extent of Impact (after Mitigation) |
|---------------------------|-------------------------------------|
| Meteorological Parameters | Δ                                   |

### D.2. Land and Soil

#### Land Acquisition and Loss of Productive Land

#### I. Pre-Construction/Construction Stage

The proposed project road will need additional land for the widening & modernisation and construction of cross drainage structures as per the new design. Although land acquisition requirement has been kept to minimum level, it will have impacts on topography and change in land use in the region. Approximately 2,256.387square kilometere of land needs to be acquired for the proposed road project. Mostly the adjacent agricultural land to the road will be acquired for the widening purpose, which resulting in the loss of livelihood of the local residents.



**Mitigation Measures:**

- Adequate compensation and rehabilitation assistance shall be proposed for affected households as per the Government of India's policies.
- Income restoration measures/livelihood options for vulnerable group/resource poor sections and other affected persons as recommended shall be implemented.
- Alignment will be adjusted to avoid and minimize land acquisition
- Topsoil management during construction.
- Use of existing alignment to the maximum extent.

**Felling of Trees**

The project road is not passing through any reserved or protected forest. As the widening of proposed project road will required felling of approx.4202 number of trees.

**Mitigation Measures:**

To minimize loss of trees, the following mitigation measures have been /will be adopted during the detailed design and construction stage of the project:

- Widening option with minimal tree cutting has been considered.
- The compensatory plan has been developed in consultation with local forest department. As per compensatory afforestation, the tree plantation will be done ten times of tree cutting. Around 4202 numbers of trees will be planted against 42020 number of trees felled.

**Compaction and Contamination of Soil**

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

**Mitigation Measures:**

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

**Soil Erosion**

The removal of roadside vegetation will cause erosion, and increased run-off would in turn lead to erosion of productive soil. The direct impact of erosion is the loss of embankment soil and danger of stability loss for the road itself. This impact is generally restricted to the ROW. The project has taken care of this issue at the engineering design stage itself, as at design gradients of 1:2, the slopes of the embankments are perceived to be stable for all stretches of road. These sections of the road embankment would need stone pitching or any other suitable turfing.

#### Mitigation Measures:

- Good engineering practices should be followed:
- Land clearance should be kept to a minimum (Site Boundary only);
- Areas that have been cleared shall have a dust suppressing system;
- Where practicable, excavated areas should be backfilled at the end of the working day.

#### **Borrow Areas and Quarries**

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

#### Mitigation Measures

- Borrow areas if required, shall not be located near forest areas. The edges of borrow sites shall be no closer than 3 meters from any fence line or boundary. Adequate clearance shall be provided for the construction of catch drains. Borrow sites shall have adequate drainage outlets unless the relevant landowner has agreed that the borrow area is to create a permanent tank or dam. Cut batter slopes shall not be steeper than 3 to 1 and shall be left by the Contractor in a tidy and safe condition to the satisfaction of the Engineer. Written clearance from the land owner/village head shall be obtained before leaving a site
- Borrow pits shall be selected from barren land/wasteland to the extent possible. Borrow areas should not be located on cultivable lands except in the situations where land owners desires to level the land. The top soil shall be preserved and depth shall be restricted to the desired level.
- Borrow areas should be excavated as per the intended end use by the owner. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed.
- The dredged material from the nearby water body shall be tested for presence of heavy metals and other pollutants before its reuse.
- The depths in borrow pits to be regulated so that the sides shall not be steeper than 25%, to the extent possible, borrow areas shall be sited away from populated areas. Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil.

| Impact of/ on           | Extent of Impact (after Mitigation) |
|-------------------------|-------------------------------------|
| Land & Soil Environment | Δ                                   |

## **II. Operation Stage**

During the operation stage, soil contamination due to accidental spills or leaks from vehicle is a low probability as one of the main objectives of the project is to reduce accidents, but potentially disastrous to the receiving environment should they occur. These impacts can be long term depending upon the extent of spill.

Further, generation of Solid waste from the rest areas, toll plaza, etc can also have an impact on land if not managed properly. Dumping of solid waste on the land can cause the following impact:

- ground water contamination by the leachate generated by the waste dump
- surface water contamination by the run-off from the waste dump
- bad odour, pests, rodents and wind-blown litter in and around the waste dump

- generation of inflammable gas (e.g. methane) within the waste dump
- fires within the waste dump
- epidemics through stray animals
- acidity to surrounding soil
- release of greenhouse gas

**Mitigation Measures:**

- The project should develop a disaster management plan with specific reference to spill response.
- Solid waste generated should be segregated properly.
- Development of Solid Waste management Plan for the proper disposal of solid waste generated

**Table 47: Impact on Topography, Soil & Land and Mitigation Measures**

| Parameters                 | Potential Impact                                   | Mitigation Measures Suggested                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Topography and Soil</b> | • Cut and fill operations during road construction | • The alignment passes through plain terrain and no substantial cut and fill operations are planned. Minimum cut will be ensured and the cut material will be reused as per the suitability.                                                                                                                                                                                                                              |
|                            | • Borrow earth                                     | <ul style="list-style-type: none"> <li>• Borrow earth will be procured from approved area</li> <li>• IRC guidelines will be followed during excavation</li> <li>• Top soil will be preserved &amp; stockpiled properly.</li> <li>• Borrow area Redevelopment plan will be submitted prior to operation of the same.</li> <li>• Necessary clearance needs to be obtained prior to operation of the borrow area.</li> </ul> |
|                            | • Quarries                                         | <ul style="list-style-type: none"> <li>• Operational and government licensed quarry have been identified, which will be used for procuring material.</li> <li>• Pollution Control Measures should be taken care.</li> <li>• Necessary clearance needs to be obtained prior to operation of the borrow area.</li> </ul>                                                                                                    |
| <b>Land Environment</b>    | • Loss of topsoil                                  | • Topsoil on stripping shall be removed and stockpiled on sides to be used on the side slopes, for top cover of borrow areas and for plantation pits                                                                                                                                                                                                                                                                      |
|                            | • Loss of topsoil from borrowing                   | • Arable lands will be avoided for earth borrowing. If needed, topsoil will be separated and refilled after excavation                                                                                                                                                                                                                                                                                                    |
|                            | • Borrowing of fill material                       | • Excavation from pre selected locations. After excavation the borrow pits will be dressed to match with the surrounding.                                                                                                                                                                                                                                                                                                 |

**Impact of/ on Extent of Impact (after Mitigation)**

|             |          |
|-------------|----------|
| <b>Land</b> | <b>Δ</b> |
|-------------|----------|

### D.3. Ambient Air Quality

#### I. Pre Construction Stage

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

##### Mitigation Measure:

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

#### II. Construction Stage

Construction stage impacts will have adverse impacts on the workers as well as the settlements adjacent to the road, especially those in the down wind direction.

The adverse impacts on air quality during construction stage are classified and presented in the table below. There are two types of pollution i.e. dust pollution and pollution from harmful gases.

**Table 48: Adverse impacts on air quality during construction stage**

| Sl. No. | Impact                                                                           | Source                                                                                                                                                                                                  |
|---------|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Generation of dust                                                               | Transportation and tipping of cut material - while the former will occur over the entire stretch between the cutting location and disposal site, the latter is more location specific and more intense; |
|         |                                                                                  | Transportation of raw materials from quarries and borrow sites                                                                                                                                          |
|         |                                                                                  | Stone crushing, handling and storage of aggregates in asphalt plants                                                                                                                                    |
|         |                                                                                  | Site levelling, clearing of trees, laying of asphalt                                                                                                                                                    |
|         |                                                                                  | Concrete batching plants;                                                                                                                                                                               |
|         |                                                                                  | Asphalt mix plants – due to the mixing of aggregates with bitumen;                                                                                                                                      |
|         |                                                                                  | Construction of structures and allied activities                                                                                                                                                        |
| 2       | Generation of polluting gases including SO <sub>2</sub> , NO <sub>x</sub> and HC | Hot mix plants                                                                                                                                                                                          |
|         |                                                                                  | Large construction equipment, trucks and asphalt producing and paving equipment                                                                                                                         |
|         |                                                                                  | The movement of heavy machinery, oil tankers etc.                                                                                                                                                       |
|         |                                                                                  | Toxic gases released through the heating process during bitumen production                                                                                                                              |
|         |                                                                                  | Inadequate vehicle maintenance and the use of adulterated fuel in vehicles.                                                                                                                             |

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

##### Mitigation Measures:

- Vehicles delivering loose and fine materials shall be covered
- Limiting unnecessary idling of heavy machineries and other vehicles significantly reduce emission of polluting gases.
- Loading and unloading of construction materials in covered area or provisions of water fogging around these locations.
- Storage areas should be located downwind of the habitation area.
- Periodic water sprinkling needs to be done wherever required.

- Regular maintenance of machinery and equipment needs to be done. Vehicular pollution check shall be made mandatory and renewed as per requirement.
- Hot mix plants and other plants should be located at least 1.5 km from the nearest habitation, school, hospital, archaeological site, forest, rivers, streams and lakes, 500 m from ponds, and national highway, 250 m from state highway, unless otherwise required by statutory requirements after securing a No-Objection Certificate (NOC) from the SPCB. Hot mix plant shall be fitted with stack of adequate height as may be prescribed by SPCB to ensure enough dispersion of exit gases.
- Bitumen emulsion and bitumen heaters should be used to extent feasible.
- CTE & CTO for HMP, BMP, crushers & DG sets needs to be obtained.
- LPG should be used as fuel source in construction/labour camps instead of firewood.
- Mask and other PPE shall be provided to all the staffs/workers at construction site.
- Diesel Generating (DG) sets shall be fitted with stack/chimney of adequate height as per regulations (Height of stack = height of the building + 0.2 KVA. Low sulphur diesel shall be used in DG sets as well as machineries.
- Contractor should submit a site specific air pollution management plan.
- Avenue plantation may improve the air quality during operation stage.
- Regular air monitoring will be done to check the ambient air quality of the area.

**Table 49: Impact on Air Environment and Mitigation Measures**

| Parameters             | Potential Impact                                                       | Mitigation Measures Suggested                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Air Environment</b> | <ul style="list-style-type: none"> <li>• Generation of dust</li> </ul> | <ul style="list-style-type: none"> <li>• Sprinkling of water                             <ul style="list-style-type: none"> <li>a. Earth handling site</li> <li>b. Borrow area</li> <li>c. Road construction site</li> <li>d. Access road route</li> </ul> </li> <li>• Air pollution control at crusher and Plants                             <ul style="list-style-type: none"> <li>a. PPE for Workers</li> <li>b. Stone crushing units and Plants should be with environment compliance.</li> <li>c. Necessary clearance needs to be obtained prior to operation of the borrow area.</li> </ul> </li> <li>• Regulations of construction timings near sensitive receptors and settlements</li> </ul> |
|                        | <ul style="list-style-type: none"> <li>• Gaseous Pollution</li> </ul>  | <ul style="list-style-type: none"> <li>• Vehicles and machineries will be regularly maintained to conform to the emission standards.</li> <li>• Asphalt mixing sites and Crusher should be placed 1 km away from residential area and outside forest area.</li> <li>• Asphalt plant will be equipped with pollution control equipment</li> <li>• Use of PPE by workers engaged in construction and application of asphalt mix on road surface.</li> </ul>                                                                                                                                                                                                                                              |

| Impact of/ on          | Extent of Impact (after Mitigation) |
|------------------------|-------------------------------------|
| <b>Air Environment</b> | <b>Δ</b>                            |

### III. Operation Stage:

Operation phase impact to ambient air will be primarily because of emissions from vehicles plying on the project road. In order to assess the impact from vehicular emission, an air dispersion model was run using ADMS-Roads – an internationally recognized dispersion model to predict impacts on air

environment due to vehicular movements. The model was run for the criteria pollutants NO<sub>x</sub>, PM<sub>10</sub> and CO. Although VOC is not a criteria pollutant but it was also modeled as it has significant impact on health and climate change. The SO<sub>2</sub> was not modeled as the ambient concentration of this was found very low.

The model set-up and outputs are presented below for the projected traffic in the year 2020 and 2034. For the purpose of modeling, Atmospheric Dispersion Modeling System (ADMS) ROAD uses vehicular emission rates provided in the Design Manual for Roads and Bridges, UK database. The Project emission rates are calculated based on the vehicle class and speed in accordance with following equation.

$$E = (a + b.v + c.v^2 + d.v^e + f.\ln(v) + g.v^3 + h/v + i/v^2 + j/v^3).x$$

Where:

E is the emission rate expressed in g/km

v is the average vehicle speed in km/hr [The valid speed ranges are 5 km/h to 130 km/h for light duty vehicles, and 5 km/h to 100 km/h for heavy-duty vehicles.]

a to j, and x are coefficients

The projected traffic was split into 2 categories: i) vehicles weighing less than 3.5 ton; and ii) vehicles weighing more than 3.5 ton.

#### **Vehicle exhaust emission rates**

| <b>Emission rate for Passenger Car (Gross Vehicle Weight &lt; 3.5 ton)<sup>14</sup></b> |            |                           |                          |            |
|-----------------------------------------------------------------------------------------|------------|---------------------------|--------------------------|------------|
|                                                                                         | CO(g/kmhr) | HC (g/kmhr)               | NO <sub>x</sub> (g/kmhr) | PM(g/kmhr) |
| <b>Gasoline (Petrol) Vehicles</b>                                                       |            |                           |                          |            |
| Bharat Stage-IV (2017)                                                                  | 1          | 0.1                       | 0.08                     | -          |
| Bharat Stage-VI (2020)                                                                  | 1          | 0.10                      | 0.06                     | 0.0045     |
| <b>Diesel Vehicles</b>                                                                  |            |                           |                          |            |
| Bharat Stage-IV (2017)                                                                  | 0.5        | -                         | 0.25                     | 0.025      |
| Bharat Stage-VI (2020)                                                                  | 0.5        | -                         | 0.08                     | 0.0045     |
| <b>Emission rate for Heavy – duty diesel vehicles (GVW &gt; 3.5 ton)<sup>15</sup></b>   |            |                           |                          |            |
|                                                                                         | CO(g/kmhr) | HC (g/kmhr) <sup>16</sup> | NO <sub>x</sub> (g/kmhr) | PM(g/kmhr) |
| Bharat Stage-VI (2020)                                                                  | 4          | 0.16                      | 0.46                     | 0.01       |

Till April, 2020 vehicles in India were manufactured to comply with Bharat stage –IV (2017) emission standard. Hence, BS-IV is considered as vehicle exhaust emission rates during calculation of 2020. Bharat stage –VI is implemented in India from April, 2020. Although being cognizant that there might be an enhanced emission standard in future but in want of any specific standard, BS-VI has been considered as vehicle exhaust emission rates for modelling of the year 2034.

It is pertinent to note here that significant reduction in vehicle exhaust parameters are expected with change from BS-IV to BS-VI, especially in case of diesel driven vehicles.

#### **Details of Input data:**

- 1) Traffic details: - Refer Chapter 3, Section D
- 2) Meteorology – Bongaigaon District, 2019

#### **Treatment of Oxides of Nitrogen Concentrations**

The key element in assessing the potential environmental impacts from ground level NO<sub>2</sub> concentrations is estimating the NO<sub>2</sub> concentrations from modelled NO<sub>x</sub> emissions. The final NO<sub>2</sub> concentration is a combination of the NO<sub>x</sub> emitted as NO<sub>2</sub> from vehicles the amount of NO<sub>x</sub> that is converted to NO<sub>2</sub> by oxidation in the exhaust after release.

<sup>14</sup> It is assumed that 50% of light passenger vehicles are run on gasoline (Petrol) and rest of 50% on diesel

<sup>15</sup> 100% of heavy vehicles run on diesel

<sup>16</sup> It is assumed that 100% of HC emissions are in the form of VOC



Generally, after NO<sub>x</sub> is emitted from the vehicle, additional NO<sub>2</sub> is formed as the exhaust and reacts with the surrounding air. There are several reactions that both form and destroy NO<sub>2</sub>, but the primary reaction is oxidation with ozone according to the following equation:



This reaction is essentially instantaneous as the exhaust entrains the surrounding air. It is limited by the amount of ozone available and by how quickly the exhaust mixes with the surrounding air. Thus, the ratio of NO<sub>2</sub> to NO<sub>x</sub> increases as the plume disperses downwind.

There are four common methods used to estimate the final ratio of NO<sub>2</sub> to NO<sub>x</sub>:

- Total Conversion: This method conservatively assumes all NO<sub>x</sub> is converted to NO<sub>2</sub>.
- USEPA Tier 2 Assumption: This method assumes a national default ration of NO<sub>2</sub> to NO<sub>x</sub> of 0.75;
- Ozone Limiting Method (OLM): This method commonly assumes 10% of the Vehicle NO<sub>x</sub> emission is NO<sub>2</sub> and that ozone is the limiting reagent for the above equation. The estimated NO<sub>2</sub> concentration can be calculated using the following equation:

$$\text{NO}_2 = (0.1 \times \text{NO}_x) + \text{O}_3$$

Where:

NO<sub>2</sub> = estimated GLC of nitrogen dioxide (ppm)

NO<sub>x</sub> = predicted GLC of oxides of nitrogen (ppm)

O<sub>3</sub> = measured background concentration of ozone (ppm)

- Ambient Ratio Method (ARM): This method typically relies on at least a year worth of ambient monitoring data and assumes the final exhaust NO<sub>2</sub> to NO<sub>x</sub> ratio will be equal to the existing ambient NO<sub>2</sub> to NO<sub>x</sub> ratio.

The total Conversion assumption were considered overly conservative and the OLM and ARM requires detailed baseline conditions which are not available for the study area.

Accordingly, the USEPA Tier 2 assumption was considered the most appropriate method while still remaining conservative enough that the actual NO<sub>2</sub> concentrations are likely less than those predicted by the modeling.

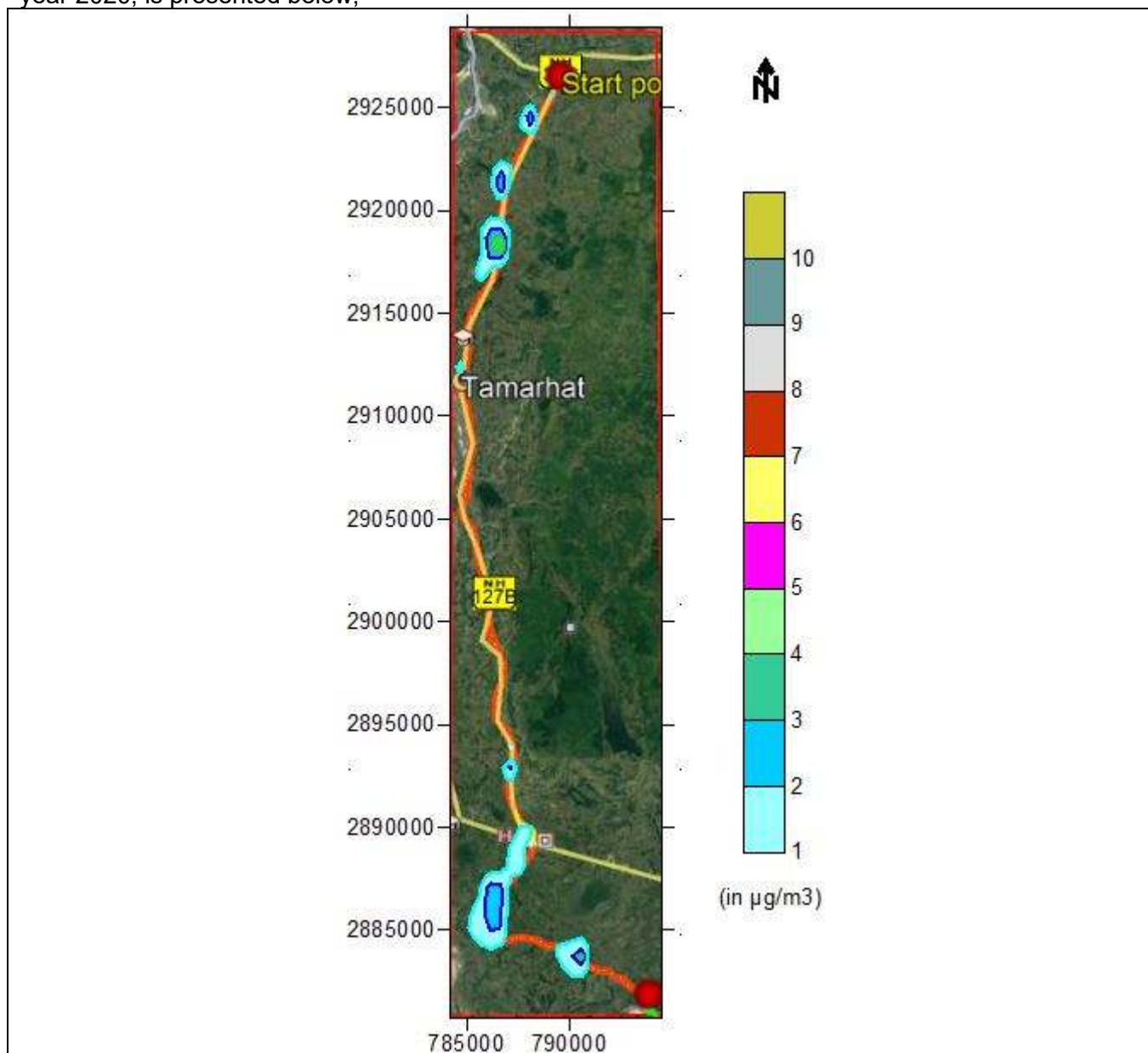
| Model Year:                    |                                                                                                                                                            | 2020     |                                                   |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------------------------------------|
| Scenario:                      | 1 hr Averaging Period.                                                                                                                                     |          |                                                   |
| Assumptions:                   | The average vehicle speed for light duty vehicles – 100 km/hr<br>The average vehicle speed for heavy duty vehicles – 80 km/hr<br>The height of canyon – 0m |          |                                                   |
| Maximum Predicted GLC in µg/m³ |                                                                                                                                                            |          |                                                   |
| Parameters                     | Easting                                                                                                                                                    | Northing | Predicted Conc.                                   |
| NOx                            | 786475                                                                                                                                                     | 2918354  | 12.49 (15 meter from the centre line of the road) |
| PM <sub>10</sub>               | 786475                                                                                                                                                     | 2918354  | 0.39 (15 meter from the centre line of the road)  |
| CO                             | 786475                                                                                                                                                     | 2918354  | 14.32 (15 meter from the centre line of the road) |
| VOC                            | 786475                                                                                                                                                     | 2918354  | 1.86 (15 meter from the centre line of the road)  |
|                                |                                                                                                                                                            |          |                                                   |
| Scenario:                      | 24 hr Averaging Period.                                                                                                                                    |          |                                                   |
| Maximum Predicted GLC in µg/m³ |                                                                                                                                                            |          |                                                   |
| Parameters                     | Easting                                                                                                                                                    | Northing | Predicted Conc.                                   |
| NOx                            | 786475                                                                                                                                                     | 2918354  | 5.87 (15 meter from the centre line of the road)  |



| Model Year: |        | 2020    |      |                                             |
|-------------|--------|---------|------|---------------------------------------------|
| CO (8 hrs)  | 786475 | 2918354 | 6.84 | (15 meter from the centre line of the road) |

Note: As PM<sub>10</sub> value for 2020 was found to be insignificant, this parameter was not modeled further for future years

The 1 hr avg. as well as 24-hr avg. predicted GLC for NO<sub>x</sub> and CO along the project road during the year 2020, is presented below;



Comments:

Hourly Vehicle Count (2020) - 1<sup>st</sup> Homogenous Section Ch 0 – 38.4km

- Vehicles with Tonnage <3.5 Ton : 154

- Vehicles with Tonnage >3.5 Ton : 19

Hourly Vehicle Count (2020) - 1<sup>st</sup> Homogenous Section Ch 38.8 – 54.154km (End of Road)

- Vehicles with Tonnage <3.5 Ton : 183

- Vehicles with Tonnage >3.5 Ton : 94

Figure 47: Predicted Ground Level Concentration for NO<sub>x</sub> – 1 hr Averaging Period, 2020

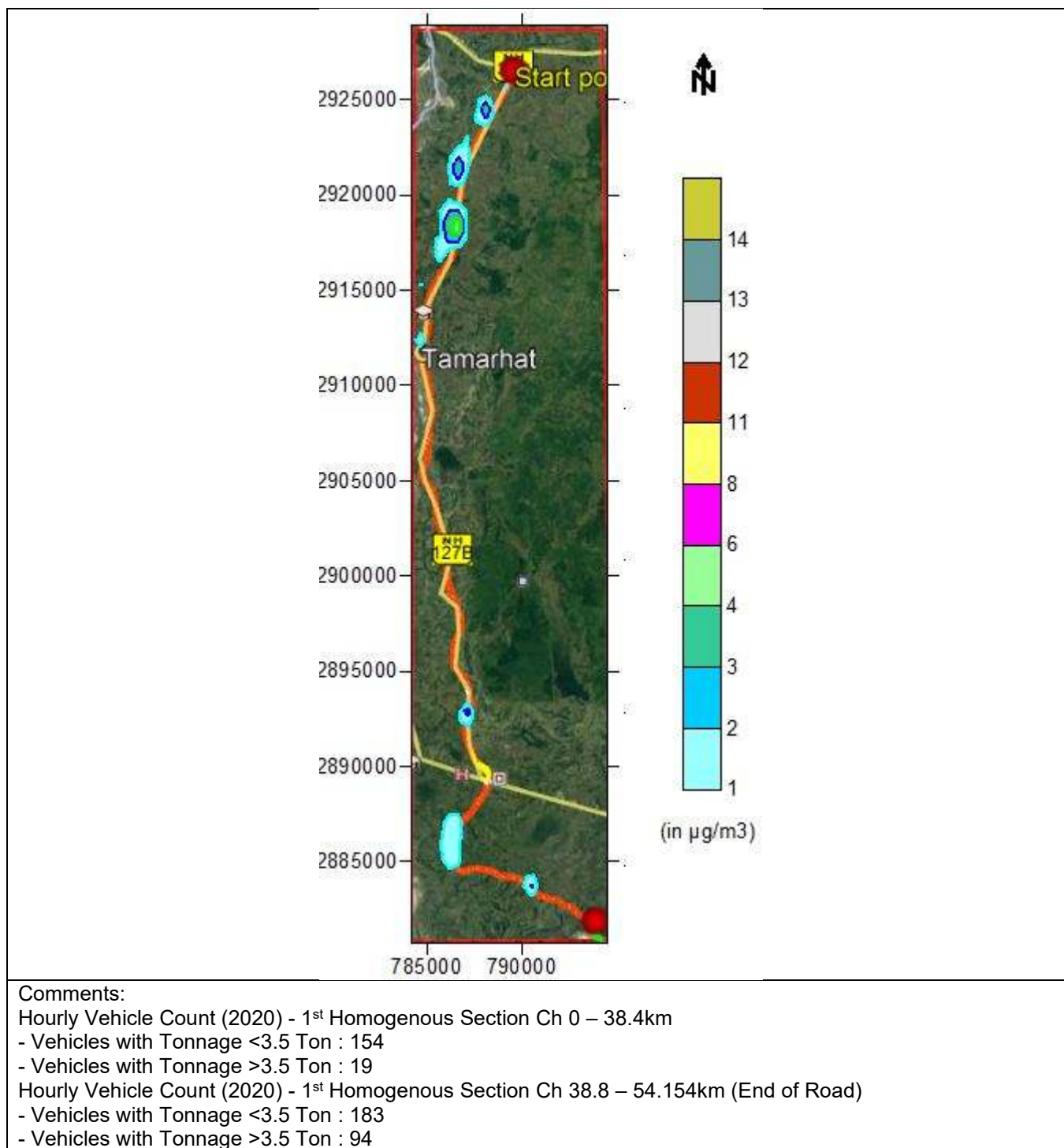
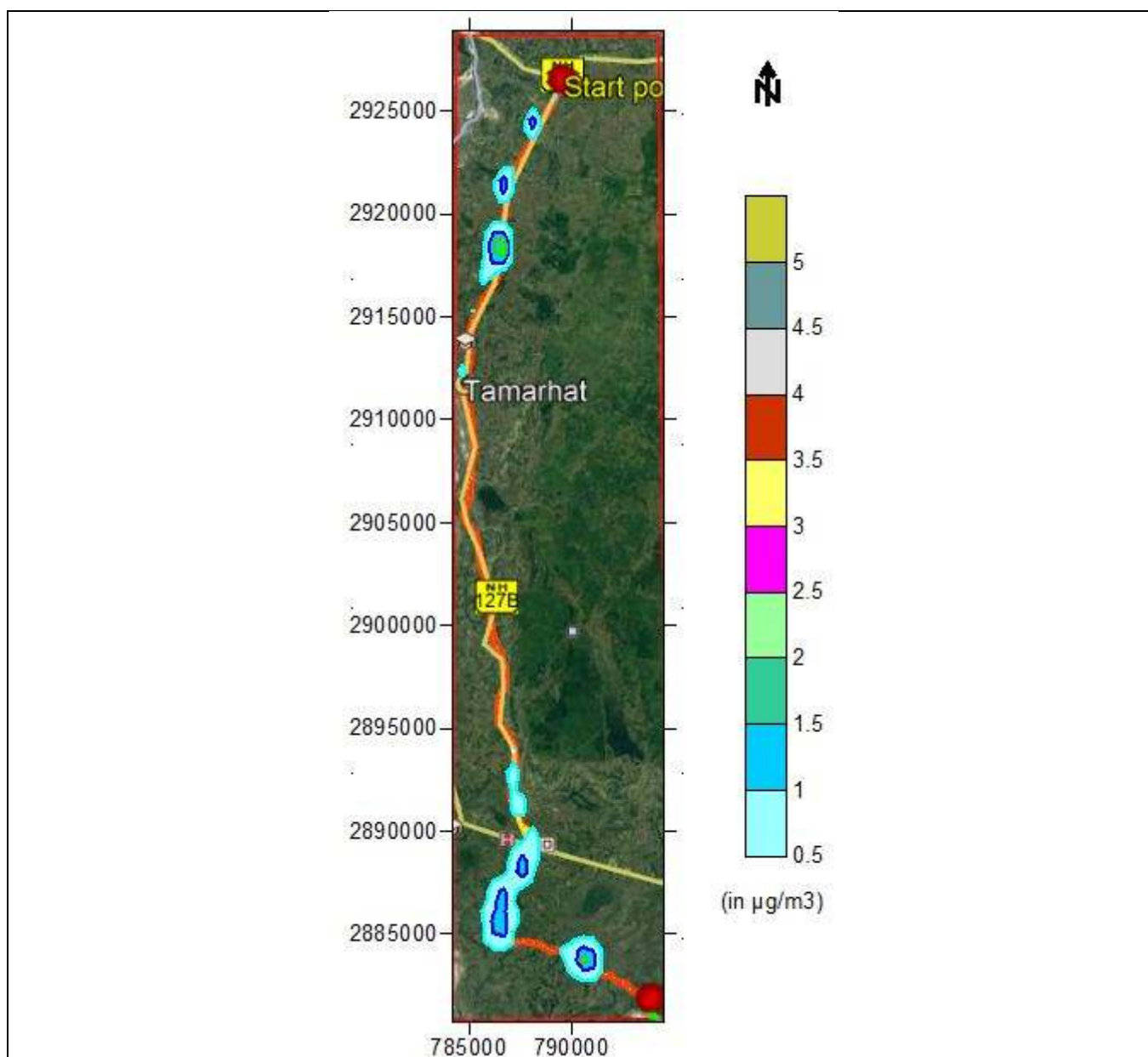


Figure 48: Predicted Ground Level Concentration for CO – 1 hr Averaging Period, 2020



Comments:

Hourly Vehicle Count (2020) - 1<sup>st</sup> Homogenous Section Ch 0 – 38.4km

- Vehicles with Tonnage <3.5 Ton : 154

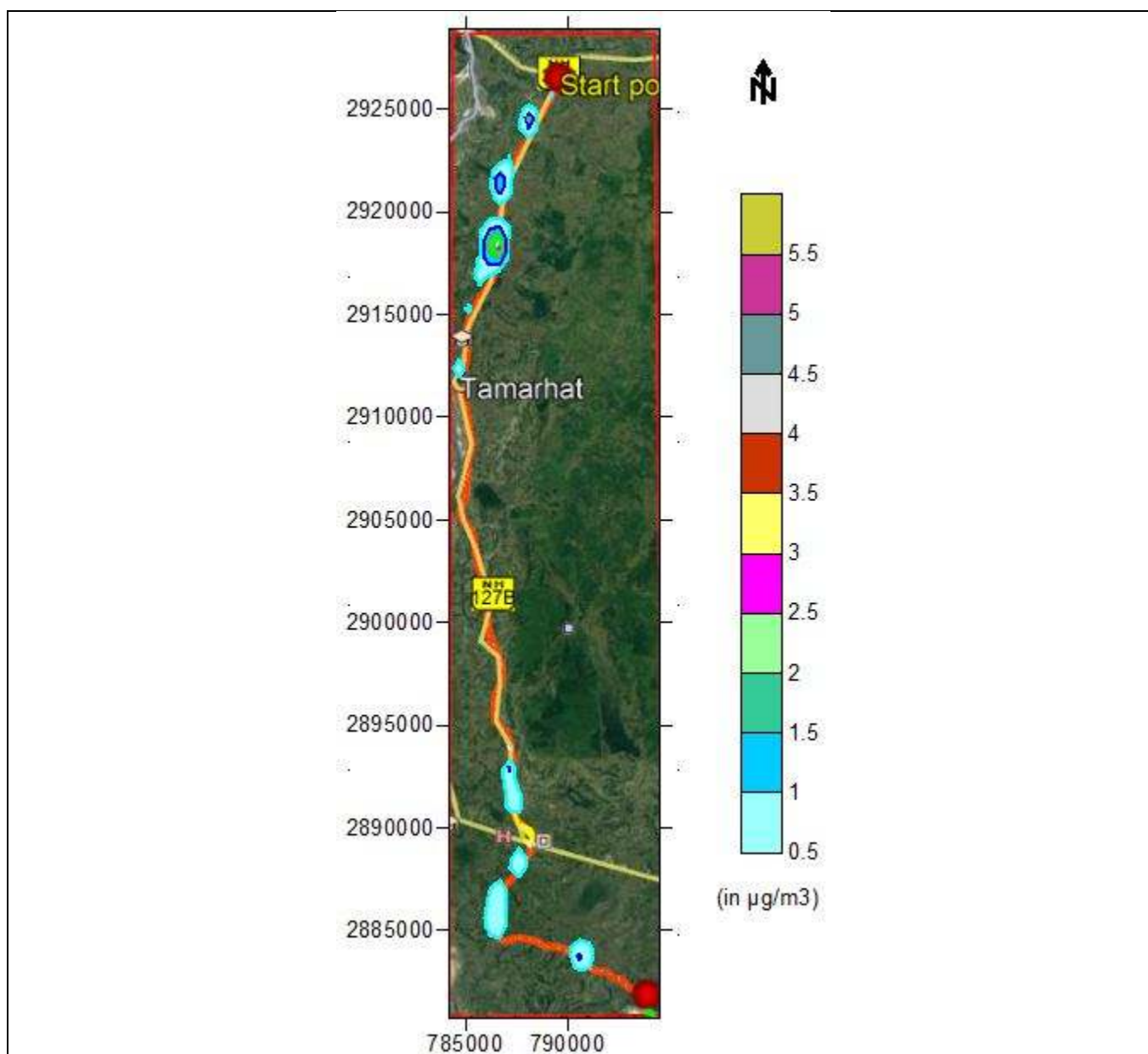
- Vehicles with Tonnage >3.5 Ton : 19

Hourly Vehicle Count (2020) - 1<sup>st</sup> Homogenous Section Ch 38.8 – 54.154km (End of Road)

- Vehicles with Tonnage <3.5 Ton : 183

- Vehicles with Tonnage >3.5 Ton : 94

**Figure 49: Predicted Ground Level Concentration for NOx – 24 hr Averaging Period, 2020**



Comments:

Hourly Vehicle Count (2020) - 1<sup>st</sup> Homogenous Section Ch 0 – 38.4km

- Vehicles with Tonnage <3.5 Ton : 154

- Vehicles with Tonnage >3.5 Ton : 19

Hourly Vehicle Count (2020) - 1<sup>st</sup> Homogenous Section Ch 38.8 – 54.154km (End of Road)

- Vehicles with Tonnage <3.5 Ton : 183

- Vehicles with Tonnage >3.5 Ton : 94

**Figure 50: Predicted Ground Level Concentration for CO – 8 hr Averaging Period, 2020**

## Anticipated Residual Impact- Year 2020

The ambient concentration of the air pollutants found at chainage 9+750km being found as minimum is treated as the background. Hence the cumulative concentrations of air pollutants are expected to be as follows for the **year 2020**:

| Parameters      | Easting | Northing | Backgr<br>ound<br>Conc.<br>(AAQM<br>2*, 24-<br>hr<br>Avg.) | Predicted Incremental<br>Conc.<br>(24-hr Avg.) $\mu\text{g}/\text{m}^3$ | Anticipated<br>cumulative<br>Conc.<br>$\mu\text{g}/\text{m}^3$ | Regulator<br>y Limits<br>(NAAQS,<br>2009)<br>$\mu\text{g}/\text{m}^3$ |
|-----------------|---------|----------|------------------------------------------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------|-----------------------------------------------------------------------|
| NO <sub>2</sub> | 786475  | 2918354  | 15.9                                                       | 4.40 <sup>17</sup>                                                      | 20.30                                                          | 80                                                                    |
| CO**            | 786475  | 2918354  | BDL                                                        | 0.006                                                                   | 0.006                                                          | 2                                                                     |

\* Nearest Air monitoring location is AAQM2

\*\*In case of CO the unit is  $\text{mg}/\text{m}^3$ ; other parameters unit is  $\mu\text{g}/\text{m}^3$

Therefore, based on the above, it can be concluded that the operation of the project road in the year 2020 is not likely to cause any exceedances for the selected criteria pollutants.

Since there is no standard for VOC concentration in ambient air in India, the EU limit for the same has been used for comparison purpose. Using the Air Dispersion Modelling Guideline for Ontario, the annual average concentration (converted from 1-hr predicted value) for VOC is estimated as  $0.15 \mu\text{g}/\text{m}^3$ , which is way lower than the presently existing EU limit for VOC.

**Hence, the impact is categorized as minor due to some negative residual impact.**

| Impact of/ on Extent of Impact (after Mitigation) |          |
|---------------------------------------------------|----------|
| Ambient Air                                       | $\Delta$ |

| Model Year:                                       |                                                                                                                                                            | 2034            |                                                   |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------------------|
| Scenario:                                         | 1 hr Averaging Period.                                                                                                                                     |                 |                                                   |
| Assumptions:                                      | The average vehicle speed for light duty vehicles – 100 km/hr<br>The average vehicle speed for heavy duty vehicles – 80 km/hr<br>The height of canyon – 0m |                 |                                                   |
| Maximum Predicted GLC in $\mu\text{g}/\text{m}^3$ |                                                                                                                                                            |                 |                                                   |
| <u>Parameters</u>                                 | <u>Easting</u>                                                                                                                                             | <u>Northing</u> | <u>Predicted Conc.</u>                            |
| NOx                                               | 786475                                                                                                                                                     | 2918354         | 0.009 (15 meter from the centre line of the road) |
| PM <sub>10</sub>                                  | 786475                                                                                                                                                     | 2918354         | 0.001 (15 meter from the centre line of the road) |
| CO                                                | 786475                                                                                                                                                     | 2918354         | 0.145 (15 meter from the centre line of the road) |
| VOC                                               | 786475                                                                                                                                                     | 2918354         | 0.010 (15 meter from the centre line of the road) |
|                                                   |                                                                                                                                                            |                 |                                                   |
| Scenario:                                         | 24 hr Averaging Period.                                                                                                                                    |                 |                                                   |
| Maximum Predicted GLC in $\mu\text{g}/\text{m}^3$ |                                                                                                                                                            |                 |                                                   |
| <u>Parameters</u>                                 | <u>Easting</u>                                                                                                                                             | <u>Northing</u> | <u>Predicted Conc.</u>                            |
| NOx                                               | 786475                                                                                                                                                     | 2918354         | 0.004 (15 meter from the centre line of the road) |

<sup>17</sup> Nox to No2 conversion factor = 0.75; Nox = 5.87, so, NO2 = 5.87\* 0.75 = 4.40  $\mu\text{g}/\text{m}^3$



| Model Year: |        | 2034    |                                                   |  |
|-------------|--------|---------|---------------------------------------------------|--|
| CO (8 hrs)  | 786475 | 2918354 | 0.068 (15 meter from the centre line of the road) |  |

#### Anticipated Residual Impact- Year 2034

The predicted 1 hr avg. and 24hr avg. value of NO<sub>x</sub> and CO in the year 2034 is very insignificant compared to 2020. Therefore, based on the above, it can be concluded that the operation of the project road in the year 2034 is not likely to cause exceedances for the selected criteria pollutants. Further, it might be concluded that implementation BS-VI is likely to result in significant reduction in vehicle emission concentration.

Hence, the impact is categorized as insignificant due to predicted future impact.

| Impact of/ on | Extent of Impact (after Mitigation) |
|---------------|-------------------------------------|
| Ambient Air   | ⊖                                   |

#### Mitigation Measures:

- Roadside tree plantations shall be maintained at least with 70% survival rate.
- Regular maintenance of the road will be done to ensure good surface condition
- Ambient air quality monitoring. If monitored parameters exceeds prescribed limit, suitable control measures must be taken.
- Signages shall be provided reminding them to properly maintain their vehicles to economize on fuel consumption.
- Enforcement of vehicle emission rules in coordination with transport department or installing emission checking equipment's.

### D.4. GHG Emission

#### I. Construction Stage

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

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

A detailed study conducted for the World Bank titled "Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation- A Toolkit for Developing Countries" established the typical GHG emission rate in terms of ton CO<sub>2</sub>eq per km of road construction. According to this study, for national road, GHG emissions due to material production such as aggregate, bitumen, structures and road furniture are the main contributor, at about 66 percent of totalemissions. Materials transport is also a significant GHG producer, at around 30 percent for national road.

**Table 50: Typical breakdown of GHG emissions by generator for various road categories (t CO<sub>2</sub>eq. /km)**

| Type of Road  | Transport emissions | Material emissions | Machines emissions | Total (t CO <sub>2</sub> eq.) |
|---------------|---------------------|--------------------|--------------------|-------------------------------|
| National Road | 235                 | 523                | 36                 | 794                           |

Source: Greenhouse Gas Emissions Mitigation in Road Construction and Rehabilitation - A Toolkit for Developing Countries, World Bank, 2010. (<http://siteresources.worldbank.org/INTEAPASTAE/Resources/GHG-ExecSummary.pdf>)

Therefore, the 54.154 km of road construction would result in emission of approximately 43,058.62t CO<sub>2</sub>eq.

### Mitigation Measures:

| Alternative practice                                                                                 | Work components & GHG generators concerned            | Remarks, if any                                     |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------|
| <b>Use labor intensive techniques for excavation</b>                                                 | Earthworks (Transport, Equipment)                     |                                                     |
| <b>Optimize location of road safety barriers</b>                                                     | Equipment/furniture (Materials, Transport, Equipment) | GHG emissions from barriers > 5% of total emissions |
| <b>Optimize street lighting</b>                                                                      | Equipment/furniture (Materials, Transport, Equipment) |                                                     |
| <b>Use recycling</b>                                                                                 | Pavement (Materials, Transport, Equipment)            |                                                     |
| <b>Consider gravel roads and surface treatment instead of bituminous / cement concrete pavements</b> | Pavement (Materials, Transport, Equipment)            |                                                     |
| <b>Ensure low roughness</b>                                                                          | Structures (Materials, Transport)                     |                                                     |
| <b>Ensure recycling of steel</b>                                                                     | Structures (Materials, Transport)                     | GHG emissions from metal > 10% of total emissions   |

### Reduction in Transport Emissions:

Transport of materials represents about 30% of the GHG emissions of a road project. From that, about 50% are related to local transport.

- Use of more efficient road vehicle fleets having a lower unit emission ratio. This can be significant as the efficiency improves with the use of trucks with higher payload (50% decrease in unit emission and savings of more than 20% in total transport emissions).
- Modal shift from road to more efficient modes (rail or water having unit emissions 17 times lower) over long distances. Further improvement can be up to 8% of the total emissions after road transport has been optimized

### Reduction in Material Emissions:

- Excavation in hard soil generates two to three times more GHG than in ordinary soil.
- The use of drilling rigs rather than light drillers is twice as productive, but produces 35% more GHG per cubic meter of rock excavated.
- Cold mixtures as well as recycling technologies and materials have lower emissions (a factor of three when compared to hot mixture bituminous structures).

### Reduction in Machine Emissions:

- Regular maintenance of the machineries ensures optimum performance of the machines.

## **II. Operation Phase**

The GHG emissions are estimated based on the per day traffic volume of the yearly estimated total Passenger car unit (PCU) at each section. GHG emission based on HDM-4 are presented in Table 51 and Table 52.

**Table 51: Annual CO2 Emission (tonnes) ,Base Case - Without Project**

| Year        | Annual Emission Quantities in tonnes |                      |                     |                                 |                                   |                  |             |
|-------------|--------------------------------------|----------------------|---------------------|---------------------------------|-----------------------------------|------------------|-------------|
|             | Hydrocarbon (HC)                     | Carbon monoxide (CO) | Nitrous oxide (NOx) | Sulphur dioxide SO <sub>2</sub> | Carbon dioxide (CO <sub>2</sub> ) | Particulates Par | Lead (Pb)   |
| <b>2021</b> | 718.85                               | 1,719.44             | 573.21              | 52.06                           | 57,064.21                         | 165.22           | <b>1.48</b> |
| <b>2022</b> | 765.72                               | 1,830.02             | 610.39              | 55.49                           | 60,755.88                         | 176.07           | <b>1.57</b> |
| <b>2023</b> | 848.12                               | 2,021.45             | 675.31              | 61.58                           | 67,196.84                         | 195.34           | <b>1.71</b> |



|      |                 |                 |                 |               |                   |               |             |
|------|-----------------|-----------------|-----------------|---------------|-------------------|---------------|-------------|
| 2024 | 951.71          | 2,263.48        | 756.06          | 69.25         | 75,372.93         | 219.65        | <b>1.89</b> |
| 2025 | 1,001.10        | 2,380.97        | 795.26          | 72.85         | 79,289.30         | 231.06        | <b>1.99</b> |
| 2026 | 1,053.28        | 2,505.09        | 836.67          | 76.65         | 83,427.40         | 243.12        | <b>2.09</b> |
| 2027 | 1,108.48        | 2,636.34        | 880.45          | 80.68         | 87,804.39         | 255.88        | <b>2.20</b> |
| 2028 | 1,166.94        | 2,775.30        | 926.82          | 84.94         | 92,440.12         | 269.40        | <b>2.32</b> |
| 2029 | 1,228.98        | 2,922.66        | 975.99          | 89.47         | 97,357.81         | 283.75        | <b>2.44</b> |
| 2030 | 1,294.93        | 3,079.22        | 1,028.24        | 94.28         | 102,585.05        | 299.02        | <b>2.57</b> |
| 2031 | 1,365.23        | 3,245.95        | 1,083.91        | 99.42         | 108,155.09        | 315.30        | <b>2.71</b> |
| 2032 | 1,440.41        | 3,424.01        | 1,143.38        | 104.92        | 114,108.45        | 332.74        | <b>2.86</b> |
| 2033 | 1,521.16        | 3,614.94        | 1,207.19        | 110.83        | 120,497.66        | 351.48        | <b>3.01</b> |
| 2034 | 1,608.34        | 3,820.65        | 1,275.99        | 117.22        | 127,389.46        | 371.74        | <b>3.17</b> |
| 2035 | 1,702.91        | 4,043.24        | 1,350.52        | 124.17        | 134,856.84        | 393.76        | <b>3.35</b> |
| 2036 | 1,806.13        | 4,285.45        | 1,431.71        | 131.78        | 142,994.72        | 417.84        | <b>3.54</b> |
| 2037 | 1,919.52        | 4,550.63        | 1,520.72        | 140.15        | 151,920.05        | 444.35        | <b>3.74</b> |
| 2038 | 2,038.67        | 4,830.09        | 1,614.61        | 148.93        | 161,318.42        | 472.17        | <b>3.96</b> |
| 2039 | 2,166.98        | 5,131.09        | 1,715.88        | 158.40        | 171,445.14        | 502.14        | <b>4.19</b> |
| 2040 | 2,308.21        | 5,461.62        | 1,827.33        | 168.84        | 182,582.63        | 535.20        | <b>4.44</b> |
| 2041 | 2,403.41        | 5,694.59        | 1,903.70        | 175.65        | 190,265.19        | 556.87        | <b>4.67</b> |
| 2042 | 2,617.74        | 6,186.90        | 2,072.37        | 191.73        | 207,040.00        | 607.68        | <b>5.00</b> |
| 2043 | 2,836.88        | 6,692.63        | 2,245.60        | 208.12        | 224,244.47        | 659.53        | <b>5.36</b> |
| 2044 | 3,054.51        | 7,198.51        | 2,418.66        | 224.34        | 241,407.55        | 710.85        | <b>5.73</b> |
| 2045 | 3,227.32        | 7,607.78        | 2,555.95        | 237.03        | 255,139.91        | 751.07        | <b>6.07</b> |
| 2046 | 3,479.95        | 8,194.82        | 2,756.95        | 255.87        | 275,068.59        | 810.68        | <b>6.50</b> |
| 2047 | 3,849.59        | 9,041.75        | 3,051.39        | 283.75        | 304,069.50        | 898.77        | <b>7.06</b> |
| 2048 | <b>4,159.57</b> | <b>9,759.37</b> | <b>3,297.59</b> | <b>306.92</b> | <b>328,474.94</b> | <b>972.07</b> | <b>7.58</b> |

**Table 52: Annual CO2 Emission (tonnes), Improvement Case - With Project**

| Year | Annual Emission Quantities in tonnes |                      |                   |                                    |                                   |                    |             |
|------|--------------------------------------|----------------------|-------------------|------------------------------------|-----------------------------------|--------------------|-------------|
|      | Hydrocarb on (HC)                    | Carbon monoxide (CO) | Nitrous oxide NOx | Sulphur dioxide (SO <sub>2</sub> ) | Carbon dioxide (CO <sub>2</sub> ) | Particulates (Par) | Lead (Pb)   |
| 2021 | 718.85                               | 1,719.44             | 573.21            | 52.06                              | 57,064.21                         | 165.22             | <b>1.48</b> |
| 2022 | 755.66                               | 1,807.52             | 602.54            | 54.73                              | 59,989.99                         | 173.69             | <b>1.56</b> |
| 2023 | 770.63                               | 1,843.33             | 614.44            | 55.82                              | 61,181.54                         | 177.14             | <b>1.59</b> |
| 2024 | 875.17                               | 2,246.73             | 760.01            | 57.95                              | 69,995.24                         | 185.53             | <b>2.59</b> |
| 2025 | 920.04                               | 2,361.60             | 798.90            | 60.93                              | 73,580.50                         | 195.06             | <b>2.73</b> |
| 2026 | 966.80                               | 2,481.38             | 839.44            | 64.03                              | 77,317.15                         | 204.99             | <b>2.86</b> |
| 2027 | 1,015.96                             | 2,607.30             | 882.06            | 67.30                              | 81,245.66                         | 215.44             | <b>3.01</b> |
| 2028 | 1,067.64                             | 2,739.68             | 926.86            | 70.73                              | 85,375.85                         | 226.42             | <b>3.16</b> |
| 2029 | 1,121.98                             | 2,878.83             | 973.96            | 74.34                              | 89,718.20                         | 237.97             | <b>3.32</b> |
| 2030 | 1,179.22                             | 3,025.33             | 1,023.55          | 78.14                              | 94,291.07                         | 250.13             | <b>3.49</b> |
| 2031 | 1,239.59                             | 3,179.77             | 1,075.84          | 82.15                              | 99,113.35                         | 262.97             | <b>3.66</b> |
| 2032 | 1,303.28                             | 3,342.59             | 1,130.97          | 86.39                              | 104,199.97                        | 276.53             | <b>3.85</b> |
| 2033 | 1,370.54                             | 3,514.37             | 1,189.15          | 90.87                              | 109,569.41                        | 290.86             | <b>4.04</b> |
| 2034 | 1,441.59                             | 3,695.64             | 1,250.56          | 95.60                              | 115,239.77                        | 306.01             | <b>4.25</b> |
| 2035 | 1,526.04                             | 3,906.09             | 1,322.21          | 101.38                             | 121,931.63                        | 324.43             | <b>4.46</b> |
| 2036 | 1,481.33                             | 3,685.68             | 1,246.31          | 101.69                             | 117,515.21                        | 324.23             | <b>3.78</b> |

|             |                 |                 |                 |               |                   |               |             |
|-------------|-----------------|-----------------|-----------------|---------------|-------------------|---------------|-------------|
| <b>2037</b> | 1,550.32        | 3,703.10        | 1,246.96        | 111.68        | 122,251.20        | 354.39        | <b>3.16</b> |
| <b>2038</b> | 1,678.49        | 4,000.71        | 1,344.67        | 121.49        | 132,613.94        | 385.43        | <b>3.38</b> |
| <b>2039</b> | 1,762.41        | 4,200.74        | 1,411.90        | 127.57        | 139,244.45        | 404.70        | <b>3.55</b> |
| <b>2040</b> | 1,850.53        | 4,410.77        | 1,482.49        | 133.94        | 146,206.45        | 424.94        | <b>3.73</b> |
| <b>2041</b> | 1,943.05        | 4,631.30        | 1,556.61        | 140.64        | 153,516.58        | 446.18        | <b>3.91</b> |
| <b>2042</b> | 2,040.20        | 4,862.86        | 1,634.44        | 147.67        | 161,192.19        | 468.49        | <b>4.11</b> |
| <b>2043</b> | 2,142.21        | 5,106.00        | 1,716.16        | 155.06        | 169,251.59        | 491.92        | <b>4.31</b> |
| <b>2044</b> | 2,249.32        | 5,361.29        | 1,801.97        | 162.81        | 177,713.95        | 516.51        | <b>4.53</b> |
| <b>2045</b> | 2,361.78        | 5,629.35        | 1,892.06        | 170.95        | 186,599.44        | 542.34        | <b>4.76</b> |
| <b>2046</b> | 2,479.86        | 5,910.81        | 1,986.67        | 179.50        | 195,929.19        | 569.45        | <b>4.99</b> |
| <b>2047</b> | 2,603.85        | 6,206.35        | 2,086.00        | 188.47        | 205,725.42        | 597.92        | <b>5.24</b> |
| <b>2048</b> | <b>2,734.04</b> | <b>6,516.66</b> | <b>2,190.29</b> | <b>197.89</b> | <b>216,011.44</b> | <b>627.82</b> | <b>5.51</b> |

The generated CO and CO<sub>2</sub> emission without project in 2021 is expected to be 1,719.44 and 57,064.21 Tones in the base case. The expected CO and CO<sub>2</sub> emission with project in the projected year 2048 would be 6,516.66 and 216,011.44 Tones which is 3.8 times more than the base year of GHG calculation. The impact due to other green house gases is expected to be insignificant. Emissions by different types of vehicle are presented in Annex-9.

#### Mitigation Measures:

- Record energy consumption by grid, fuel and other necessary machineries regularly
- Carry out annual energy audits to find out energy efficiency measures to reduce consumption
- Reduce air trips from head office and use common pooling during travel to site
- Optimization of electrical equipment and machineries using fossil fuel

### **D.5. Noise and Vibration:**

Noise level may increase temporarily in the close vicinity of construction activities, maintenance workshops and earth work site. These construction activities are expected to produce noise levels in the range of 80 - 95 dB(A) (at a distance of about 5 m from the source). Although this level of noise is higher the permissible limit for ambient noise level for residential/commercial levels but will occur only intermittently and temporary. This noise level will attenuate fast with increase in distance from noise source. Since the project road is passing through considerable built-up area, impact of noise on sensitive structures such as schools, hospitals is highly anticipated. There are several noise sensitive receptors such as educational institutes, health centres alongwith residential areas. Noise barriers shall be provided in those sensitive noise receptors to avoid detrimental impact due to noise pollution.

#### **Impacts on Noise Level**

The assessment of potential road noise impacts helps in understanding one of the most significant pollution, the noise pollution. Some salient features related to potential noise impact of a road development include: (i) the road noise impact is greatest where busy road passes through densely populated areas, townships and markets (ii) the range of noise level should be understood in relation to the habitation type also; for example, road noise in industrial area is not likely to be problematic but at sensitive location like schools and hospitals; its impact may be significant, (iii) mitigation of noise in urban areas is rather difficult, especially at the road intersections.

#### **I. Construction Phase**

Noise will be generated due to different construction activities in the project stretch and at plant areas. Piling, if necessary, will cause vibration. Noise and vibration from this source will be unavoidable but the impact will only be temporary and affect people living or working near the project locations. The different sources of noise are as below

- (i) Movement and operation of heavy construction machineries, equipments & vehicles.
- (ii) Construction and demolition activities
- (iii) Operation of plants & crusher
- (iv) Excavation work for foundations and grading

**Mitigation Measures:**

- New machineries and equipments shall be used for the project.
- DG sets shall be fitted with acoustic enclosures or kept within a room.
- PPEs (ear plugs) shall be provided to all the staffs/workers at construction sites.
- Machineries, equipments, plants and vehicles need to be maintained on regular basis.
- Noise barrier (Vegetative) needs to be provided at sensitive (Noise) locations.
- Construction activities should be limited to day time only.
- No horn board shall be provided at sensitive (Noise) locations.
- Avenue plantation may form an effective sound buffer during the operation stage.
- Regular noise monitoring shall be done to check the noise limit with respect to the standard prescribed limit of CPCB.

**Table 53: Impact on Noise Environment and Mitigation Measures**

| Parameters               | Potential Impact                                                                                                 | Mitigation Measures Suggested                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Noise Environment</b> | <ul style="list-style-type: none"> <li>• Noise level may likely to increase during construction phase</li> </ul> | <ul style="list-style-type: none"> <li>• Properly maintained equipment to be used</li> <li>• Noise levels of machineries used shall confirm to relevant standard prescribed in Environment (Protection) Rules, 1986.</li> <li>• Ear plugs and muffs will be used by the workers as per requirement during construction activities.</li> <li>• Regulation of timing of construction work generating noise pollution near the sensitive areas.</li> </ul> |

**Estimation of Construction Phase Noise**

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

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

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

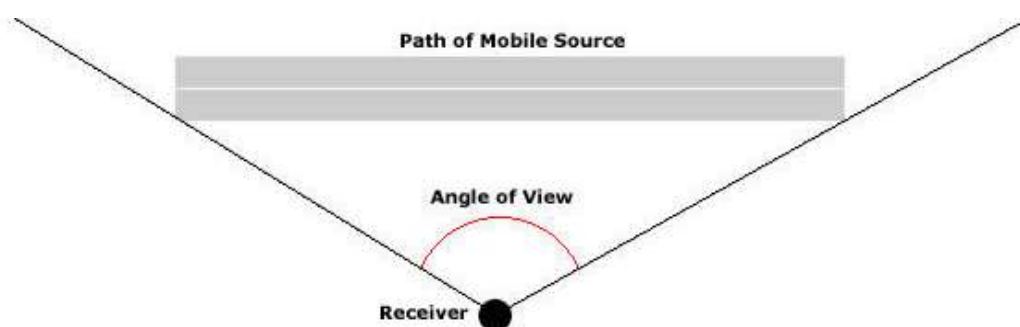
| ID            | Type | Noise pressure (dB), 1m from the source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View (°) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|---------------|------|-----------------------------------------|--------------|---------|------------|-------------|-------------------|-----------------------|---------------|---------------|
| Site Clearing |      |                                         |              |         |            |             |                   |                       |               |               |

| ID                                | Type                       | Noise pressure (dB), 1m from the source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View (°) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|-----------------------------------|----------------------------|-----------------------------------------|--------------|---------|------------|-------------|-------------------|-----------------------|---------------|---------------|
| 1                                 | Dozer                      | 116                                     | 50           | None    | None       | 20          | 90                | 10                    | 10            | 46            |
| 2                                 | Tracked excavator          | 113                                     |              |         |            | 20          | 90                |                       |               | 76            |
| 3                                 | Tracked loader             | 113                                     |              |         |            | 20          | 90                |                       |               | 76            |
| 4                                 | Wheeled loader             | 108                                     |              |         |            | 20          | 90                |                       |               | 71            |
| Total noise from site at receiver |                            |                                         |              |         |            |             |                   |                       |               | 80            |
| Ground Excavation                 |                            |                                         |              |         |            |             |                   |                       |               |               |
| 1                                 | Dozer                      | 114                                     | 50           | None    | None       | 20          | 90                | 10                    | 10            | 44            |
| 2                                 | Tracked excavator idling   | 96                                      |              |         |            | 20          | 90                |                       |               | 59            |
| 3                                 | Tracked excavator          | 113                                     |              |         |            | 20          | 90                |                       |               | 76            |
| 4                                 | Wheeled loader             | 104                                     |              |         |            | 20          | 90                |                       |               | 67            |
| 5                                 | Tracked loader             | 112                                     |              |         |            | 20          | 90                |                       |               | 75            |
| Total noise from site at receiver |                            |                                         |              |         |            |             |                   |                       |               | 79            |
| Tipping Fill                      |                            |                                         |              |         |            |             |                   |                       |               |               |
| 1                                 | Dump Truck                 | 110                                     | 50           | None    | None       | 100         | 90                | 10                    | 10            | 57            |
| Total noise from site at receiver |                            |                                         |              |         |            |             |                   |                       |               | 57            |
| Spreading Fill                    |                            |                                         |              |         |            |             |                   |                       |               |               |
| 1                                 | Wheeled excavator / loader | 104                                     | 50           | None    | None       | 50          | 90                | 10                    | 10            | 81            |
| 2                                 | Dozer                      | 117                                     |              |         |            | 50          | 90                | 10                    | 10            | 61            |
| Total noise from site at receiver |                            |                                         |              |         |            |             |                   |                       |               | 81            |
| Spreading Fill                    |                            |                                         |              |         |            |             |                   |                       |               |               |
| 1                                 | Wheeled excavator / loader | 104                                     | 50           | None    | None       | 50          | 90                | 10                    | 10            | 81            |
| 2                                 | Dozer                      | 117                                     |              |         |            | 50          | 90                | 10                    | 10            | 61            |
| Total noise from site at receiver |                            |                                         |              |         |            |             |                   |                       |               | 81            |
| Ground leveling                   |                            |                                         |              |         |            |             |                   |                       |               |               |
| 1                                 | Dozer                      | 114                                     | 50           | None    | None       | 50          | 90                | 10                    | 10            | 58            |
| 2                                 | Grader                     | 111                                     |              |         |            | 50          | 90                | 10                    | 10            | 55            |

| ID                                     | Type                        | Noise pressure (dB), 1m from the source | Distance (m) | Barrier | Reflection | On Time (%) | Angle of View (°) | Traffic Volume / hour | Speed (km/hr) | Total (dB(A)) |
|----------------------------------------|-----------------------------|-----------------------------------------|--------------|---------|------------|-------------|-------------------|-----------------------|---------------|---------------|
| Total noise from site at receiver      |                             |                                         |              |         |            |             |                   |                       |               | 60            |
| Unloading                              |                             |                                         |              |         |            |             |                   |                       |               |               |
| 1                                      | Tipper lorry                | 113                                     | 50           | None    | None       | 50          | 90                | 10                    | 10            | 57            |
| 2                                      | Tracked loader              | 112                                     |              |         |            | 50          | 90                | 10                    | 10            | 89            |
| Total noise from site at receiver      |                             |                                         |              |         |            |             |                   |                       |               | 89            |
| Rolling gravel / bricks                |                             |                                         |              |         |            |             |                   |                       |               |               |
| 1                                      | Road roller                 | 108                                     | 50           | None    | None       | 100         | 90                | 10                    | 10            | 55            |
| Total noise from site at receiver      |                             |                                         |              |         |            |             |                   |                       |               | 85            |
| Compacting fill                        |                             |                                         |              |         |            |             |                   |                       |               |               |
| 1                                      | Vibratory roller            | 106                                     | 50           | None    | None       | 50          | 90                | 20                    | 15            | 84            |
| 2                                      | Compactor rammer            | 108                                     | 50           | None    | None       | 50          | 90                | 20                    | 15            | 86            |
| Total noise from site at receiver      |                             |                                         |              |         |            |             |                   |                       |               | 88            |
| Compacting sub-base                    |                             |                                         |              |         |            |             |                   |                       |               |               |
| 1                                      | Compactor rammer            | 108                                     | 50           | None    | None       | 100         | 90                | 20                    | 15            | 89            |
| Total noise from site at receiver      |                             |                                         |              |         |            |             |                   |                       |               | 89            |
| Compacting earth                       |                             |                                         |              |         |            |             |                   |                       |               |               |
| 1                                      | Compactor rammer            | 108                                     | 50           | None    | None       | 100         | 90                | 20                    | 15            | 89            |
| Total noise from site at receiver      |                             |                                         |              |         |            |             |                   |                       |               | 89            |
| Road surfacing                         |                             |                                         |              |         |            |             |                   |                       |               |               |
| 1                                      | Asphalt melter (Stationary) | 103                                     | 50           | None    | None       | 70          | NA                | NA                    | NA            | 59            |
| 2                                      | Asphalt spreader            | 110                                     | 50           | None    | None       | 70          | 90                | 10                    | 10            | 88            |
| 3                                      | Road roller and lorry       | 96                                      | 50           | None    | None       | 80          | 90                | 10                    | 10            | 42            |
| Total noise from site at receiver      |                             |                                         |              |         |            |             |                   |                       |               | 88            |
| Installation of traffic light controls |                             |                                         |              |         |            |             |                   |                       |               |               |
| 1                                      | Groove cutter               | 115                                     | 50           | None    | None       | 100         | NA                | NA                    | NA            | 73            |
| Total noise from site at receiver      |                             |                                         |              |         |            |             |                   |                       |               | 73            |

Assumptions

- Receiver Distance: The minimum distance in meters between the source plant and the receiver – considered as 50m.
- On Time (%): The percentage of time (of the overall time period in question) for which this plant is on.
- Barrier: If there is a barrier between the source and the receiver (None - To reflect the worst-case scenario)
- Reflection: If the receiver is within 1m of a wall then select this option
- Angle of view:  $90^{\circ}$
- Traffic Volume (veh/hour): Total number of return journeys that is made by the mobile plant in an hour
- Speed: Average speed of the plant in kilometers per hour



As depicted in the above picture, it is considered that for particular construction zone, the source is located at a distance of 50m with  $90^{\circ}$  angle of view. Accordingly, the sound pressure levels are predicted at the receptor location during different activities.

### **Assessment of Impact:**

Based on the calculations presented below, it is anticipated that whenever the construction will happen in any zone other than industrial, the ambient noise level will exceed the statutory level at a distance of 50m away from the construction zone, if no barrier is put. Hence, the impact is categorized as minor-negative due to a minor impact of transient nature.

#### **Mitigation Measures:**

#### **Mitigation Measures:**

In view of above, following mitigation measures are proposed:

- All construction equipment used for an 8 hour shift shall conform to a standard of less than 90 dB(A). If required, machinery producing high noise as concrete mixers, generators etc., must be provided with noise shields;
- At construction sites within 500m of human settlements, noisy construction activities shall be stopped between 9.00 PM and 6.00 AM;
- Vehicles and construction machinery shall be monitored regularly with particular attention to silencers and mufflers to maintain noise levels to minimum;
- Workers in the vicinity of high noise levels must wear ear plugs and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 85 dB(A) per 8-hour shift.

## **II. Operation Phase**

The noise from traffic plying on the highway is one of the environmental impacts that most people relates to. In order to assess the estimated noise due to projected traffic on this highway, internationally recognized –Sound Plan software was used.

### Noise Prediction:

The following table lists the various assumptions used in modeling along with justification.

**Table 54: Noise Modeling Assumption and Justification**

| Topic                                | Assumptions and Justification                                                                                                                                                                                                                                                                     |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Standards followed</b>            | ISO 9613 Acoustics – Attenuation of Sound during Propagation Outdoors (Part 1: Calculation of the absorption of sound by the atmosphere, and Part 2: General Method of Calculation).<br>Road Noise: TNM 3.0                                                                                       |
| <b>Modelling software</b>            | SoundPLAN, SoundPLAN GmbH.                                                                                                                                                                                                                                                                        |
| <b>Source noise emission levels.</b> | Calculated from: <ul style="list-style-type: none"> <li>Traffic Monitoring Data (Traffic Projection of Project Road for Homogeneous Section-1 from Km 0+000 to Km 38+990 and Section-2 from Km 38+990 to Km 54+523.</li> <li>Road design data (Speed limit, cross section, type, etc.)</li> </ul> |
| <b>Partial screening.</b>            | Structural features which might provide partial screening, such as buildings, trees, etc. are not considered as barriers in the model run to model the worst-case scenario.                                                                                                                       |
| <b>Noise receptors.</b>              | The isophones has been developed at 1.5 m height above ground. This height represents the average hearing height of personnel.                                                                                                                                                                    |
| <b>Noise acceptance criteria.</b>    | CPCB standards are applied for the maximum permissible limits. These are the default regulatory standards applicable to all group companies.                                                                                                                                                      |

The outcome of the modeling exercise is presented below.





**NQ1 – 2020, 46.0 Db(A)**



**NQ1 – 2034, 49.0 Db(A)**

**Sitewise Noise Levels (Project Contribution) around the Shrirampur**





**NQ2 – 2020, 49.5 Db(A)**



**NQ2 – 2034, 52.0 Db(A)**



**Sitewise Noise Levels (Project Contribution) around the Jacobpur**



NQ3 – 2020, 43.5 Db(A)



NQ3 – 2034, 46.0 Db(A)

**Sitewise Noise Levels (Project Contribution) around the Oxiguri**





**NQ4 – 2020, 50.0 Db(A)**



**NQ4 – 2034, 54.5 Db(A)**

**Sitewise Noise Levels (Project Contribution) around the Tamarhat**





**NQ5 – 2020, 44.0 Db(A)**



**NQ5 – 2034, 46.0 Db(A)**

**Sitewise Noise Levels (Project Contribution) around the Ujanpetla**





**NQ6 – 2020, 36.5 Db(A)**



**NQ6 – 2034, 39.5 Db(A)**

**Sitewise Noise Levels (Project Contribution) around the Paglahat**





NQ7 – 2020, 45.0 Db(A)



NQ7 – 2034, 49.0 Db(A)

Sitewise Noise Levels (Project Contribution) around the Moterjhar





**NQ8 – 2020, 35.0 Db(A)**



**NQ8 – 2034, 38.0 Db(A)**

**Sitewise Noise Levels (Project Contribution) around the Kechuar Khas**

**Table 55: Noise model Location and Noise modeling result**

| S.No. | Location     | Environmental Setting | Project Contribution, dB(A) |      |
|-------|--------------|-----------------------|-----------------------------|------|
|       |              |                       | 2020                        | 2034 |
| N-1   | Shrirampur   | Resi.+Comm.           | 46.0                        | 49.0 |
| N-2   | Jacobpur     | residential           | 49.5                        | 52.0 |
| N-3   | Oxiguri      | Commercial            | 43.5                        | 46.0 |
| N-4   | Tamarhat     | Sensitive             | 50.0                        | 54.5 |
| N-5   | Ujanpetla    | Resi.+Comm.           | 44.0                        | 46.0 |
| N-6   | Paglahat     | Residential           | 36.5                        | 39.5 |
| N-7   | Moterjhar    | Sensitive             | 45.0                        | 49.0 |
| N-8   | Kechuar Khas | Rural Area            | 35.0                        | 38.0 |

From the data presented above it can be inferred that, predicted incremental noise level is unlikely to exceed CPCB noise standard at all monitored locations for year 2034. However when compared with the predicted noise level for 2034 against that of 2020 at two location (i.e. N-4 and N-7) the incremental noise value may exceed by more than 3 dB(A).

Based on the above, it may be concluded that the project road may have insignificant impact on noise environment during operation. Hence, the impact is categorized as medium-negative due to a minor impact of irreversible nature.

The mitigation measures to reduce impacts of noise are given below.

#### **Mitigation Measures:**

Based on the noise modeling outcome, requirement of constructed noise barrier is envisaged. As relatively higher noise level in N-4 and N-7.

Proposed tree and shrub plantations planned for avenue plantation especially close to settlements, may form an effective sound buffer during the operation stage.

| Impact of/ on     | Extent of Impact (after Mitigation) |
|-------------------|-------------------------------------|
| Noise Environment | $\Delta\Delta$                      |

#### **Vibration**

Vibration is a mechanical phenomenon whereby oscillations occur about an equilibrium point. Ambient vibration or environmental vibration seldom have such magnitude to be perceptible or cause audible ground borne noise unless there are specific vibration sources close by. During the project construction and operation stage, the impact of vibration is very negligible and temporary during construction stage.

##### **Source of Vibration**

- Increase in noise levels due to running of heavy construction equipment
- Frequent vibration impact due to demolition (existing pavement, road surfaces, etc.), piling, and compaction work.
- Noise propagation due to plying of heavy construction vehicles at the sites
- Blasting operation (if any) may lead to temporary ground borne vibration
- High noise emitting from the construction equipment
- Noise generated from the running of heavy vehicles deployed in the construction activities.

**Table 56: Magnitude of Impact of Vibration Annoyance**

| Vibration Level, mm/sec | Effect                                                                                                                                                                                      | Magnitude of Impact      |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>10</b>               | Vibration is likely to be intolerable for more than a very brief exposure to this level                                                                                                     | Major                    |
| <b>1.0</b>              | It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents               | moderate                 |
| <b>0.3</b>              | Vibration might be just perceptible in residential environments                                                                                                                             | Minor                    |
| <b>0.14</b>             | Vibration might be just perceptible in most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration. | Negligible/<br>No change |

### **Impact of Vibration due to Road Construction and Operation**

Ground-borne vibration can be a concern for nearby habitation of a transit system route or maintenance facility, causing buildings to shake and rumbling sounds to be heard. In contrast to airborne noise, ground-borne vibration is not a common environmental problem. It is unusual for vibration from sources such as buses and trucks to be perceptible, even in locations close to major roads. Some common sources of ground-borne vibration are heavy vehicles on rough roads, and construction activities such as drilling, compaction, piling and operation of heavy earth-moving equipment.

Many construction activities related to road infrastructure give rise to ground-borne vibration that may cause damage to structures or be perceptible to occupants in adjacent buildings and, therefore, give rise to complaints.

These vibrations are produced by the varying forces between tyre and road and can become perceptible in buildings if heavy vehicles pass over irregularities in the road near the properties. Both compression and shear waves are produced and their amplitudes and attenuation with distance depend on a number of factors including the soil composition and the nature of the geological strata.

### **Mitigation Measures**

After using the above methods to locate potential human impacts or building damage from construction vibrations, the next step is to identify control measures. Similar to the approach for construction noise, mitigation of construction vibration requires consideration of equipment location and processes, as follows:

Notify the local people prior to undertake the construction activities associating with higher vibration level such as activities using vibrating rollers.

The vibrations should be reduced considerably by ensuring and keeping correct track geometry by advanced measurement.

Expanding the right of way (buffer zone) is sometimes the easiest method of reducing the vibration impact.

Design considerations and project layout:

- Route heavily-loaded trucks away from residential streets, if possible. Select streets with fewest homes if no alternatives are available.



- Operate earth-moving equipment on the construction lot as far away from vibration-sensitive sites as possible.

#### **Sequence of operations:**

- Phase demolition, earth-moving and ground-impacting operations so as not to occur in the same time period. Unlike noise, the total vibration level produced could be significantly less when each vibration source operates separately.
- Avoid night time activities. People are more aware of vibration in their homes during the night time hours.

#### **Alternative construction methods:**

- Avoid impact pile-driving where possible in vibration-sensitive areas. Drilled piles or the use of a sonic or vibratory pile driver causes lower vibration levels where the geological conditions permit their use (however, see cautionary note below).
- Select demolition methods not involving impact, where possible. For example, sawing bridge decks into sections that can be loaded onto trucks results in lower vibration levels than impact demolition by pavement breakers, and milling generates lower vibration levels than excavation using clam shell or chisel drops.
- Avoid vibratory rollers and packers near sensitive areas.

#### **Noise and Vibration Management**

There are several measures indicated to curtail the noise levels emanating from the construction sites in the EMP:

- Noise barriers such as temporary walls should be established around the yard near residential areas and sensitive receptor during the activities such as pile driving which generate the high level of noise;
- Reroute truck traffic away from the residential areas, if possible select streets with fewer homes if no alternative route is available;
- Site equipment to be placed away from the residential location and sensitive areas;
- Construct walled enclosures around especially noisy activities or clusters of noise generating equipment;
- All plant equipment and vehicles being fitted with appropriate noise suppression equipment to reduce noise levels as far as possible;
- All equipment should be operating in good condition. Use of equipment having inbuilt enclosed air compressor and mufflers on all engines;
- All site workers are trained in noise reduction such as proper use of machinery and hearing protection;
- All site workers must wear appropriate hearing protection if in close proximity to machinery for extended periods;
- Avoid night time construction activities as much as possible in noise sensitive areas;
- Avoid pile driving work where possible in noise sensitive areas by quieter alternatives where geological conditions permit their use;

Plantations of trees and shrubs (as green belts) for instance would contribute little to actual noise reduction, but they do have a psychological effect in reducing the perceived nuisance of the construction noise, and they are often used to soften the visual appearance of mounds and walls.

#### **Impact of/ on Extent of Impact (after Mitigation)**

|                  |           |
|------------------|-----------|
| <b>Vibration</b> | $\ominus$ |
|------------------|-----------|

## **D.6. Water Quality and Resources:**

### **I. Construction Phase**

The different construction activities and allied components may contaminate both surface and ground water quality. The different potential impacts on water quality due to the project activities are as below:

#### **Surface Water Quality and Siltation:**

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

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

#### **Mitigation Measure:**

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

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

#### **Loss of Water Bodies:**

There are 237 locations where the proposed road passes through the edge of ponds. Most of them are within the right of way very close to the alignment. Retaining walls are proposed at such locations. Earth filling may be required in some cases but limited to a narrow strip of 1-1.5 m. This will cause reduction in volumetric capacity of these ponds. However, overall impact will not be significant since the project area is endowed with abundant surface water resources. Moreover, the usage of these ponds is limited to washing/cattle bathing and fishing. No other aquaculture was observed other than fishing of some indigenous variety mostly for domestic consumption and restricting mosquito breeding.

Apart from this, the project road is intersecting 3 rivers & streams including major rivers. Construction activities on bridges shall be stopped during breeding time of fish and other aquatic species.

#### Mitigation Measure

- Alignment may be suitably modified to avoid encroachment of water bodies wherever possible
- Efforts shall be made to increase its volumetric capacity either by increasing depth or area wherever feasible.
- Borrow areas shall be converted into ponds at least equivalent to filling.

#### **Alteration of Surface Water Hydrology/Drainage:**

There are 11 minor bridges and one major bridge found in the project road. None of these bridges are situated on any major river or its tributaries. All are either seasonal Nullah, Water logged area or Redundant part of old River channel. Among them three bridges are proposed to be retained and 4 no. of bridges are newly constructed. 4 numbers of existing minor bridges are proposed to be reconstructed. One major bridge is proposed in the project road. Diversion of some nullahs may be required for a very short period. Courses of those nullahs will be brought back to original within no time once construction is finished.

#### Mitigation Measure

- Construction will be carried out during lean flow period as far as possible;
- All slopes will be stone or brick pitched as per design recommendations;
- Silt fencing will be provided at base of embankment of entire water body;
- Siltation of soil into water bodies will be prevented;
- All solid waste/ construction material will be properly disposed off from bridge sites;
- Contractor will ensure that construction material/ solid wastes are not disposed off in water body;
- No oil or lubricant will be discharged from construction yard or machinery into water body
- The Construction materials will be stored at a minimum distance of 500m from the water body.
- To maintain an efficient storm water flow, all drains will be regularly cleaned as part of regular maintenance.

#### **Ground Water Quality:**

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

#### Mitigation Measures:

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



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

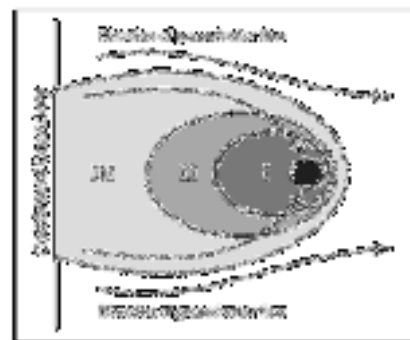
**Drainage pattern:** Diversion of major streams due to construction is expected. Hence, diversion of some nallahs may be required for a very short period. Courses of those nallahs will be brought back to original within no time once construction is finished.

#### **Mitigation Measures:**

- Provision of proper drainage through culverts along the project road (if required)
- All the water bodies will be crossed by the bridges and structures without affecting their original course and flow
- Stabilizing and turfing of slopes along the water bodies (If required)

#### **Protection of a Groundwater Source**

With respect to water intended for human consumption, a Special Protect on Zone around potable abstraction sources (springs, wells, boreholes) is established to protect them from pollution. The adjacent figure shows a typical arrangement of zones around an abstraction source. Immediately adjacent to the source and based upon a 50-day travel time from any point below the water table to the source (50 days being the decay period for most biological contaminants). All potable sources should have a minimum Protection Zone of 50m radius.



#### **Rain Water Harvesting**

Rainwater harvesting structures should be installed to compensate for the loss of groundwater for construction purpose and a part of water conservation. These are cost effective method for recharging of ground water level in the project area. The rainwater-harvesting chamber shall be placed at different locations along the project road.

The typical dimensions of the rainwater harvesting structures are  $2 \times 2 \times 0.75\text{m}^3$ . A perforated RCC Slab covers the chamber. There is a 20cm filling, which also acts as sediment trap. There is another sediment trap in the bottom from where debris can be removed manually after certain period. A vertical drain (PVC pipe) is then sunk from the bottom of the chamber to a depth which varies as per the water table. However, the Rainwater harvesting pit should be at least 3 - 5 m. above the highest ground water table.

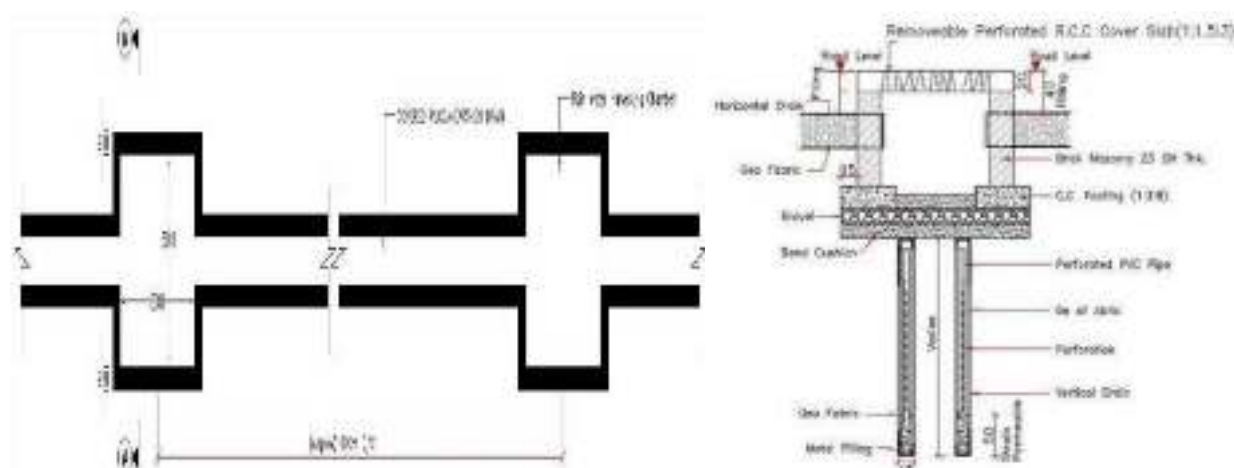


Figure 51: Rain Water Harvesting Structure

Contractor, along with the Engineer shall identify exact locations considering their feasibility where water can be stored for the summer. This shall act as good environmental practice.

**Mitigation Measures:**

- Silt fencing should be implemented while constructing along the project road,
- Fuelling of equipment and machineries should be done in designated place having appropriate spill containment.

Table 57: Impact on Water Environment and Mitigation Measures

| Parameters               | Potential Impact                                                                                   | Mitigation Measures Suggested                                                                                                                                                                                                                                                                                                                           |
|--------------------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Water Environment</b> | <ul style="list-style-type: none"> <li>• Drainage pattern</li> </ul>                               | <ul style="list-style-type: none"> <li>• Provision of proper drainage through culverts along the project road (if required)</li> <li>• All the water bodies will be crossed by the bridges and structures without affecting their original course and flow</li> <li>• Stabilizing and turbing of slopes along the water bodies (If required)</li> </ul> |
|                          | <ul style="list-style-type: none"> <li>• Siltation of water bodies</li> </ul>                      | <ul style="list-style-type: none"> <li>• Silt fencing around water bodies during construction to avoid silt laden runoff entering water body (If Required)</li> <li>• No solid waste will be dumped in or near the water bodies or rivers</li> </ul>                                                                                                    |
|                          | <ul style="list-style-type: none"> <li>• Flooding due to siltation of drainage channel</li> </ul>  | <ul style="list-style-type: none"> <li>• Excavated earth and other construction materials should be stored away from water bodies</li> </ul>                                                                                                                                                                                                            |
|                          | <ul style="list-style-type: none"> <li>• Water for construction</li> </ul>                         | <ul style="list-style-type: none"> <li>• Water surface would be selected so that local availability is not affected</li> </ul>                                                                                                                                                                                                                          |
|                          | <ul style="list-style-type: none"> <li>• Contamination from waste</li> </ul>                       | <ul style="list-style-type: none"> <li>• Provision of septic tanks to prevent any untreated sewage discharge from construction worker camps</li> <li>• Oil interceptions at construction machine maintenance yards</li> </ul>                                                                                                                           |
|                          | <ul style="list-style-type: none"> <li>• Contamination from fuel and waste</li> </ul>              | <ul style="list-style-type: none"> <li>• Vehicle maintenance will be carried out in a confined area, away from water sources and it will be ensured that used oil or lubricants are not disposed to water courses</li> </ul>                                                                                                                            |
|                          | <ul style="list-style-type: none"> <li>• Sanitation and water use in construction camps</li> </ul> | <ul style="list-style-type: none"> <li>• Construction camp will be organized in a planned manner</li> <li>• Proper sanitation facilities including toilets should be provided</li> <li>• Camps will have separate water supply facilities so that local water sources are not affected</li> </ul>                                                       |

| Impact of/ on     | Extent of Impact (after Mitigation) |
|-------------------|-------------------------------------|
| Water Environment | Δ                                   |

## II. Operation Phase

It is envisaged that the construction and renovation of cross-drainage structures will improve existing drainage system leading to positive impact. However, risk of spillages should be managed adequately.

### Management of Spillages

When considering the risk of spillages from a highway and potential pollution to the receiving environment, the following factors must be considered:

- the calculated spillage risk return period must not be greater than 1 in 100 years;
- the calculated spillage risk return period must not be greater than 1 in 200 years where spillage could affect: important drinking water supplies or important commercial activities; and
- spillage risk from existing outfalls must not be increased.

| Impact of/ on     | Extent of Impact (after Mitigation) |
|-------------------|-------------------------------------|
| Water Environment | Δ                                   |

## Bottom Sediment

A number of processes influence the sedimentary content and quality of river water. Sediments have an important role in the nutrient cycle of aquatic environment. In rivers the predominant source of bottom sediments is land runoff. Impoundments and estuaries are often characterized by heavy siltation from tributary streams.

It is necessary to know the existing geochemical characteristics of the bottom sediment of the surface water bodies as during the construction phase, foundation of the piers/well shall be constructed in the crossing rivers/estuaries which may cause some disturbance.

### Impact on bottom sediment during Road Construction and Operation stage

There may be some disturbance to the bottom sediment during the construction phase, particularly during the construction of bridge. As there is only 01 major bridge (ch. 51+536km at redundant part of river), it is anticipated that the impact on bottom sediment is negligible and for a short time.

During operation stage no adverse impact on bottom sediment is envisaged.

**Mitigation Measures:**

- Construction works near waterways/water bodies will not be undertaken during the monsoon season
- Retaining walls have been proposed to prevent erosion wherever required.
- Provision of temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- No construction camp will be established within 500m of any water body
- Locate all parking, repair and fuel and hazardous material storage area away from any water body. Vehicle parking and maintenance areas will have waterproof floors from which drainage is collected and treated to legal standards.
- Refuel vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge
- Collect all waste oil, store in sealed damage-proof containers and dispose it to authorized recyclers.
- All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual cleanup.
- Temporary retention ponds, interception drains, and silt traps are installed to prevent silt laden water from entering adjacent water bodies/waterways;
- The slopes of embankments leading to water bodies should be modified and rechanneled to prevent entry of contaminants.
- Comply with requirements of the clearance issued by the relevant state authority for mining in rivers
- No construction related activities of bridges during breeding season of fish and other aquatic species.

**Turbidity**

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

Extraction of sand from the river bed will increase turbidity and affect propagation of fishes and other aquatic life mainly benthic organisms. Mining and dredging activities, poorly planned stockpiling and uncontrolled dumping of overburden, and chemical/fuel spills from equipment's and machinery involved in dredging may cause deterioration of water quality for downstream users, and poisoning of aquatic life.

**Mitigation Measure:**

- Retaining walls have been proposed to prevent erosion wherever required.
- Construction works near waterways/water bodies will not be undertaken during the monsoon season
- Locate all parking, repair and fuel and hazardous material storage area away from any water body. Vehicle parking and maintenance areas will have waterproof floors from which drainage is collected and treated to legal standards.
- Refuel vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge □ Collect all waste oil, store in sealed damage-proof containers and dispose it to recyclers.
- Temporary retention ponds, interception drains, and silt traps are installed to prevent silt laden water from entering adjacent water bodies/waterways;

## D.7. Construction Waste and Management

Excavated earth/muck is likely to be generated due to dismantling of existing pavement. The muck will also be generated during cutting of road section. All the muck generated will be disposed as per C&D Waste Management rule 2016. The details of muck generated in the project and its disposal locations are provided below:

**Table 58: Abstract of Muck Generated in the project**

| Abstract of Muck Generated in the project |          |       |                      |                      |                            |                                                              |                                       |
|-------------------------------------------|----------|-------|----------------------|----------------------|----------------------------|--------------------------------------------------------------|---------------------------------------|
| Package                                   | Chainage |       | Total Cutting Volume | Total Filling Volume | Quantity of Muck Generated | Quantity of Muck Utilized in different construction Activity | Balance Quantity of Muck for disposal |
|                                           | From     | To    | (Cum)                | (Cum)                | (Cum)                      | (Cum)                                                        | (Cum)                                 |
| I                                         | 0        | 10900 | 26115                | 94240                | 7835                       |                                                              | 7835                                  |
| II                                        | 10900    | 27650 | 97440                | 235833               | 29232                      |                                                              | 29232                                 |
| III                                       | 27650    | 36500 | 20433                | 449934               | 6130                       |                                                              | 6130                                  |
| IV                                        | 36500    | 43300 | 5179                 | 93342                | 1554                       |                                                              | 1554                                  |
| V                                         | 43300    | 54154 | 16449                | 756088               | 4935                       |                                                              | 4935                                  |
| Total Volume from 0/0 to 54.154           |          |       | 165616               | 1629438              | 49685                      | 0                                                            | 49685                                 |

**Table 59: Muck Disposal Locations**

| Muck Disposal Locations |                  |             |                                |                               |
|-------------------------|------------------|-------------|--------------------------------|-------------------------------|
| District                | Location         | Coordinates | Capacity of Dumping Site (Cum) | Amount of Muck Disposed (Cum) |
| Kokrajhar               | 0+0 to 10+900    |             |                                | 7835                          |
| Dhubri                  | 10+900 to 27+650 | -           | -                              | 29232                         |
|                         | 27+650 to 36+500 |             |                                | 6130                          |
|                         | 36+500 to 43+300 |             |                                | 1554                          |
|                         | 43+300 to 54+154 |             |                                | 4935                          |
|                         |                  |             |                                | <b>49685</b>                  |

### Mitigation measures:

- All excavated materials from roadway, shoulders, verges, drains, cross drainage and will be used for backfilling embankments, Borrow area, 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.
- Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.
- Concrete waste should be utilised suitably in temporary access road or disposed off suitably with prior permission of the Environment Expert.

## D.8. Natural Disaster

Flood and flash flood is common during the monsoon in the vicinity of the proposed project road. During public consultation it was revealed by the local people that flash flood occurs in several villages in the project area during the months of monsoon season. Hence All CD structures have been

proposed to design with anticipated risk of flood. Embankment height along potential flood affected areas shall increase. Lined and unlined side drains have been included in the design to avoid water-logging.

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

## **D.9. Ecology and Biodiversity:**

### **Impact on Faunal and Terrestrial Ecology:**

Most of the project road stretch passes through agricultural areas and built-up areas and there are no National Parks, Wildlife Sanctuaries and other eco-sensitive areas nearby.

No Presence of Endangered/ Schedule - I species in the project area confirm by site visit as well as consultation with community and Forest/Wildlife department.

The acquisition of productive agricultural land at some stretches is inherent to the road development projects. The loss of crops on productive agricultural land is inevitable during construction stage due to operating heavy vehicles.

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

### **Mitigation Measures:**

- Hunting of animals/birds by the construction workers should be prohibited.
- If any animal is found near the construction site at any point of time, the contractor shall immediately upon discovery thereof contact authorized wildlife rescuer or Forest Dept for rescue of snakes or other distressed wildlife.
- It is essential to make provisions for the transportation of agricultural equipment and animal crossing wherever necessary by providing service roads, speed breakers (road humps, rumble strips, signboards, etc.). Although situation does not warrant for the provision of exclusive underpasses, all possible efforts shall be made to avoid animal- traffic conflict arising out of proposed improvement of project roads.

### **Impact on Flora and Mitigation measures:**

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

Approximately 4202 numbers of trees needs to be fallen down due to the proposed road project. Felling of trees is also involved resulting in habitat destruction and fragmentation. Plantation in adjacent unused land shall be carried out throughout the project road effectively with proper provision as per state forest department guidelines. This will bring down the adverse impact of tree felling and help in restoration process of local ecosystem. Special care must be taken for rare, threatened or endangered species (if any) in project area.

### **Mitigation Measures:**

- Trees impacted due to the project shall only be cut after requisite permission from State Forest Department is obtained.
- Plantation shall be done on areas exposed after site clearance as per the guidelines of the state forest department. All tree plantations will be carried out in close consultation with forest department.
- Plantation of local species to attract avian fauna and better survival should be encouraged.
- Clearance of vegetation shall not be done by burning



- For safe traffic operation, vertical clearance between the crown of the carriageway and lowest part of overhang of the tree available across the roadway shall conform to the standards laid down in IRC: SP: 21-2009. The pit size, fencing, watering, and manure/fertilizing requirements shall also conform to the above standard. Excess use of pesticides shall be restricted.
- Trees impacted by the project shall be compensated by planting of endemic tree species which are highly tolerable to vehicular emissions and dust will be taken up as per IRC: SP 21.
- All necessary measures such as siting of construction establishments away from human habitations; increase of stack height; regular maintenance of construction equipments and vehicles; etc. shall be taken up to reduce the dust and gaseous emissions during construction activities.
- The compensatory plantation shall act as the new habitat for avifauna, lesser mammals, herpetofauna & insects. List of species recommended for taking up compensatory afforestation has been presented in below tables. Local authority and populace may also be consulted for selection of species types.
- All efforts shall be made for survival of planted trees. A Memorandum of Understanding should be signed with competent authority or agency to take up the plantation.

It is suggested to select native / indigenous tree species for plantation. Various species suggested are given in a table below.

**Table 60: Species Recommended for Plantation**

| Scientific Name                      | Local Name         | Role                                                                           |
|--------------------------------------|--------------------|--------------------------------------------------------------------------------|
| <b><i>Azadeiach Indica</i></b>       | Neem               | Noise barrier, Pollution sink, Economic & Medicinal Value                      |
| <b><i>Cassia fistula</i></b>         | Hunari             | Landscaping, Flowering plant, Pollution sink                                   |
| <b><i>Ficus bengalensis</i></b>      | Banyan/<br>Bogochh | Noise barrier, Pollution sink, Shade, Supports other species, Religious values |
| <b><i>Ficus religiosa</i></b>        | Ahot /Peepal       | Noise barrier, Pollution sink, Shade, Supports other species, Religious values |
| <b><i>Magnifera indica</i></b>       | Aam /Mango         | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value                |
| <b><i>Syzygium cumini</i></b>        | Jamun              | Pollution sink, Economic Value (fruit bearing)                                 |
| <b><i>Terminalia arjuna</i></b>      | Arjun              | Noise barrier, Pollution sink                                                  |
| <b><i>Terminalia chebula</i></b>     | Shilikha           | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value                |
| <b><i>Alstonia scholaris</i></b>     | Sotiyona           | Noise barrier, Pollution sink, Shade, Supports other species                   |
| <b><i>Dillenia indica</i></b>        | Ou Tenga           | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value                |
| <b><i>Mimusops elengi</i></b>        | Bakul              | Noise barrier, Pollution sink, Shed, fruit                                     |
| <b><i>Lagerstroemia speciosa</i></b> | Azar               | Landscaping, Flowering plant, Pollution sink                                   |

|                             |       |                                                                 |
|-----------------------------|-------|-----------------------------------------------------------------|
| <b>Bombax ceiba</b>         | Himul | Landscaping, Flowering plant, Pollution sink                    |
| <b>Mesua ferrea</b>         | Nahor | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value |
| <b>Neolamarckia cadamba</b> | Kadam | Noise barrier, Pollution sink, Shed, Economic & Medicinal Value |

### **Aquatic Ecology & Biodiversity**

Impacts on the aquatic ecology during construction include increase in the silt inflow to the surface water bodies and disposal of liquid wastes and untreated sewage from construction camps and labour camps into the surface water bodies. There is no significant impact on aquatic ecology during operation stage except during accidental chemical spill in the project area entering the surrounding water bodies and proving detrimental to aquatic fauna. Contamination of the surface water due to spillage of construction material, sediment loading & increased turbidity shall result in decline in the number and diversity of aquatic flora and fauna and thus the food web species during construction period. No negative impacts are envisaged on the aquatic ecology during the operational phase.

Construction activities near the river area may degrade the water quality during the construction phase. Improvement of existing embankments particularly along the waterways may increase silt while accidental spill of materials, chemicals, and fuels will deteriorate receiving water quality. Construction of CD structures may also impact the water quality and aquatic life.

There are numbers of water bodies along the project road and a river flowing parallel to the road in some portion. It has been observed during the field survey that fishing activities practiced along the existing road in those ponds.

### **Mitigation Measures**

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

### **I. Construction Stage**

The construction of balanced road shall involve removal of topsoil and clearing of vegetation cover and felling of trees. However, in this project, widening and strengthening of the road does not involved acquisition of forest land. Hence diversion of forest land is not required. Though the loss of these

trees is an irreversible and long-term impact, the loss of the roadside plantations shall have to be compensated in accordance to the principles of the Forest (Conservation) Act.

| Impact of/ on          | Extent of Impact (after Mitigation) |
|------------------------|-------------------------------------|
| Biological Environment | Δ                                   |

## II. Operation Phase

The operation phase is envisaged to have significant long-term positive impact with regard to roadside plantation. In accordance with the NGT ruling, 1:10 trees will have to be planted and maintained as part of this project. It is recommended to plant two rows of trees and shrubs on either side of the road. Large sized trees can be planted at the back and small trees or shrubs can be planted in the front in an alternate manner, between two large trees.

| Impact of/ on          | Extent of Impact (after Mitigation) |
|------------------------|-------------------------------------|
| Biological Environment | ΔΔΔ (Positive)                      |

## D.10. Social Environment

### Amenities and Facilities

The traffic movement will be within the constricted width available and the traffic shall be managed as per the Traffic management Plan during construction of the project road.

#### Mitigation Measures:

Traffic management Plan shall be developed for each area of construction with clear marking of entry and exit points, timings for loading/ unloading. The local administration should be informed of project activities and schedule.

All public utilities like electricity lines, telephone lines or water pipelines which are likely to be impacted shall be replaced before the start of work.

Some squatters shall be affected and the compensation and mitigation shall be as per the RAP prepared for the project.

### Change in Land Use

The construction of the project road, bypasses and rest areas will induce a chain reaction towards change in land use. Change In land use will be sparked off as a result of land speculation. The availability of cheap labour and easy access to markets in the city will make roadside areas quite an incentive for the industrialist and hoteliers. Reduced transportation costs and availability of high-class transportation facilities for raw materials and products will be the most important advantage of the improved road.

#### Mitigation Measures:

Anticipating the future land use changes, the local administration should develop a master plan for this area.

### Exploitation of Resource base

Development of a road in areas previously not easily accessible can work like a double-edged sword for the environmental resources in the area. While the road would unlock potential value in the area, stimulate growth and make the environment hospitable, the rapid depletion of natural resources, by means with which these areas cannot cope is a distinct possibility. Development of such vital Infrastructure will lead to over exploitation of the environmental resources (e.g. too much groundwater

pumping, indiscriminate wastewater disposal, etc.). While the medium term impacts may not be large enough to be noticed, the long-term implications of such depletion are potentially disastrous.

#### Mitigation Measures:

Local administration should anticipate these impacts and accordingly develop a master plan with adequately designed infrastructure.

#### Cultural Properties

Cultural properties (shrines, sacred and archaeological structures) lying near the ROW are most susceptible to impacts due to pre construction and construction activities. Clearing of the site during movement of road construction machinery is likely to require a belt of about 4-5m from the edge of the carriageway, which is likely to adversely impact cultural properties. Cultural properties will be subjected to varying degree of impact depending upon their placement in the ROW. Structures, which are close to the proposed CW, are likely to need relocation. The project shall directly impact some temples which have to be relocated. The construction shall also partially impact some cultural assets which shall be rehabilitated. The access of some of these cultural properties shall also be compromised.

#### Socio-Economic Profile

The impact of the improvements of project road on the socio-economic environment will be significantly beneficial. Improved access and reduced travel time and cost will be major stimuli to economic growth, particularly in rural areas. Better access of agricultural goods to market will be important and a major contributor to poverty reduction. Increased labour mobility will occur. This has both positive and negative impacts. Increased access is a two-way phenomenon, and the corollary to increased access to the project areas is increased access for the residents of these areas to more sub-urban life-styles. Out-migration may result. There is also the likelihood of the relocation of homes and businesses to new roadside locations.

During construction, benefits to local people can be maximized if the contractor recruits construction workers locally regardless of gender. Where possible, he/she should also not discriminate in the employment of women.

#### Community Impacts

Community impacts are mostly due to the resettlement of people due to widening and strengthening of the project road to 4 lanes. Construction camps may put stress on local resources and the infrastructure in nearby communities resulting to people raising grievances. This sometimes leads to aggression between residents and migrant workers.

#### Construction Safety and Accidental Risk

Construction of the road will result in the generation of waste. In isolated places, the amount of waste generated may be greater than normal because of substandard subsoil materials, which will need to be replaced.

Debris generated on account of the above-mentioned activities if not properly disposed might give rise to health problems in the area. However, the structures to be dismantled during pre-construction phase will mainly be of semi-permanent and temporary nature and much of the waste shall be salvageable.

In case of non-local labour, labour camps are set up at one or more sites adjacent to the alignment, and at some ancillary sites, like aggregate quarries. These labourers hired from outside can have clashes with the local population on account of cultural and religious differences. In order to properly address public grievances, a grievance register should be maintained at site.

In and around vegetation areas if alternative fuels are not made available to the workforce, there is a likelihood that trees / branches will be cut down for cooking or heating purposes.

Unsanitary conditions in the labour camps might also result in impact on health of labourers as well as the local population. Transmission of diseases is also facilitated by the migration of people. During the construction phase work, crews and their dependents may bring with them a multitude of communicable diseases including Sexually Transmitted Diseases (STDs) like AIDS. This is more so if the nature of the project requires more male-workers, who have migrated from other parts of the state or country.

During road construction allied activities like quarrying and crushing operations, traffic diversions, etc., may cause disruption of social and economic life of the local population of the nearby areas. Dust and noise generated in crushing and blasting operations may cause nuisance to the nearby communities. Other problems perceived during construction period is inconvenience to the local people as well as the highway passengers due to traffic jams and congestion, loss of access and other road accident risks, as a result of diversion of traffic and construction work on road.

The traffic amount and speeds are likely to increase throughout the road corridors. The accident risk would tend to increase. Although the design speeds have been kept lower in the major settlement areas, some amount of severance is expected in the rural areas.

**Mitigation measures:**

- During the construction phase, contractors shall be required to adopt and maintain safe working practices. Internationally accepted and widely used safety procedures should be followed during (i) road works (ii) handling of large construction equipment and machineries, (iii) handling of chemicals and hazardous materials and inflammable substances (iii) welding (iv) electrical works etc.
- Contractor shall arrange all PPEs for workers, first aid and fire-fighting equipment's at construction sites. An emergency plan shall be prepared duly approved by engineer in charge to respond to any instance of safety hazard.
- To avoid disruption of the existing traffic due to construction activities, comprehensive traffic management plan shall be drawn up by the concessionaire. Traffic in construction zones shall be managed as per the provisions of IRC SP 55.
- After construction is completed in a particular zone, it shall be opened for normal operation. All diversions/access roads should be closed before start of normal operation.
- Use of retro-reflective traffic signs, and cantilever/gantry types overhead signs, thermoplastic road marking paints, delineators, traffic cones, empty bitumen drums, barricades, and flagmen will be used to ensure traffic management and safety. Conduct of regular safety audit on safety measures adopted during construction. The audit will cover manpower and their safety, machinery, temporary works, equipment and vehicles, materials storage and handling, construction procedures, environment, site safety guidelines, and miscellaneous services.

**Risk at Hazardous Activity**

All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Stonebreakers will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any toxic chemical, if any will be strictly in accordance with the manufacturer's instructions. The Engineer will be given at least 6 working days' notice of the proposed use of any toxic chemical. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by Contractor. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, handling and storage procedures, and emergency and first and procedures for the product.

**Risk of Lead Pollution**

No man / woman below the age of 18 years will be employed on the work of painting with products containing lead in any form. No paint containing lead or lead products will be used except in the form



of paste or readymade paint. Face masks will be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.

### **First Aid**

At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Rules. Workplaces remote and far away from regular hospitals will have indoor health units with one bed for every 250 workers. Suitable transport will be provided to facilitate take injured or ill person(s) to the nearest applicable hospital. At every workplace an ambulance room containing the prescribed equipment and nursing staff will be provided as prescribed.

### **Potable Water**

In every workplace at suitable and easily accessible places a sufficient supply of cold potable water (as per IS:10500) will be provided and maintained. If the drinking water is obtained from an intermittent public water supply then, storage tanks will be provided. All water supply storage will be at a distance of not less than 15m from any latrine, drain or other source of pollution. Where water has to be drawn from an existing well, which is within such proximity of any latrine, drain or any other source of pollution, the well will be properly chlorinated before water is drawn from it for drinking water. All such wells will be entirely closed in and be provided with a trap door, which will be dust proof and waterproof. A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once a month.

### **Accidents Involving Hazardous Materials**

#### **Pre Construction and Construction Stage**

During pre construction and construction stage the storage of hazardous materials such as fuel and lubricants at construction camps will be after obtaining permissions/ license from State Chief Controller of Explosives.

#### **Operation Stage**

Accidents involving hazardous chemicals will generally be catastrophic to the environment, though the probability of occurrence is low. Prevention of an accident involving hazardous material is a better way of minimising the impacts. The provisions mandated by 'The Hazardous Wastes (Management and Handling) rules, 1989' and "Manufacture Storage and import of Hazardous Chemicals Rules" 1989 under the Environmental (Protection) Act, 1986 will be complied with. Vehicles delivering hazardous substances will be printed with appropriate warning signs.

In case of spillage, the report to relevant departments will be made and instructions will be followed in taking up the contingency measures immediately.

### **Nuisance to Nearby Properties**

Nuisance to nearby properties is likely to result from:

- noise and vibration from mechanical devices and construction plant;
- dust during quarrying, construction and the trafficking of new surfaces prior to sealing
- gaseous emissions from heavy equipment; and
- Fumes from asphalt boiling sites.

These will be of particular concern at the locations where service roads will be constructed. There will be regular watering of the road surfaces or the application of emulsion coats near villages, where dust is a nuisance. Noise generating equipment such as power generators and concrete mixers will be kept away from populated/commercial areas.

| Impact of/ on      | Extent of Impact (after Mitigation) |
|--------------------|-------------------------------------|
| Social Environment | +                                   |

## **E. Summary of Impacts & Conclusion**



In conclusion, from the results of the impact assessment it can be seen that the environmental impacts will be low or medium, if all proposed mitigation measures of the EMP are implemented. Positive impacts are related to creating of job opportunities especially during construction. The summary of Impacts are as under

| Impact of/ on                    | Extent of Impact (after Mitigation)   |                 |
|----------------------------------|---------------------------------------|-----------------|
|                                  | Pre-construction / Construction Phase | Operation Phase |
| <b>Meteorological Parameters</b> | Δ                                     | Δ               |
| <b>Land Environment</b>          | Δ                                     | Δ               |
| <b>Air Environment</b>           | Δ                                     | Θ               |
| <b>GHG Emission</b>              | Δ                                     | Δ               |
| <b>Water Environment</b>         | Δ                                     | Δ               |
| <b>Noise Environment</b>         | Δ                                     | Δ               |
| <b>Biological Environment</b>    | Δ                                     | Δ               |
| <b>Social Environment</b>        | Δ                                     | +               |

**Extent of impact:**

**ΔΔΔ = high negative**

**ΔΔ = medium negative**

**Δ = low negative**

**Θ = nil**

**+ = locally positive**

**+ + = regionally positive**

Based on the analysis of environmental impacts in the above sections, it can be concluded that the project is anticipated to cause the following environmental impacts:

No direct physical impact on Sensitive receptors like educational institutes during the remaining constructions.

Minimum impact on vegetation during the remaining constructions, as there are few areas where vegetation need to be removed.

No damage to Cultural and religious structures during remaining constructions is envisaged.

Whenever Construction will happen in any zone other than industrial, the ambient noise level will exceed the statutory level at a distance of 50m away from the construction zone, if no barrier is put.

Hence, proper mitigation measures should be implemented.

## 7. Public Consultation & Information disclosure

### A. Meaningful Consultation

Meaningful consultations were carried out during detailed design and Supplementary EIA preparation. All the principles of information dissemination, information solicitation, integration, co-ordination, and engagement into dialogue were incorporated in the consultation process. A framework of mitigating different environmental impacts likely from the project was strengthened and modified based on opinions of all those consulted, especially at the micro level by setting up a dialogue with the village people from whom information on site facts and prevailing conditions were collected. This will be continued during the implementation of the project through grievance redress mechanism.

### B. Objectives of the Public Consultations

The process of public participation/ consultations was taken up as an integral part of the project in accordance with environmental assessment requirements. The objectives of these consultations are:

- To inform and educate the general public, specially potentially impacted communities/ individuals and stakeholders about the proposed project activities;
- To familiarize the people with technical, environmental, social and economic issues of the project for better understanding;
- To solicit the opinion of the affected communities/ individuals on environmental issues and assess the significance of impacts due to the proposed development;
- To foster co-operation among officers of PWD, the communities and the stakeholders to achieve a cordial working relationship for smooth implementation of the project;
- To identify the environmental issues relating to the road improvement work;
- Assess the views of the beneficiary communities and their willingness to participate in the project in a bottom up planning and decision making process;
- To secure people's inputs in respect of project planning, selection of mitigation measures and monitoring strategies;
- To ensure lessening of public resistance to change by providing them a platform in the decision making process;
- To inculcate the sense of belongingness among the public about the project.

### C. Methodology

Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questionnaires. Questionnaire survey/ discussions were designed to obtain background information and details of general environmental issues that concern people in the project area. In addition, environmental issues were discussed with relevant organizations, government officials, beneficiaries, community leaders and experts. In addition, personal discussions with officials, on site discussion with affected stakeholders, and reconnaissance visits have also been made to the project area.

### D. Consultation with the Gov. Officials

Consultation with Government officials like; PWD officials, Forest official, Block Development officers, Circle inspectors etc. revealed that most of them were aware about the project. The details were shared in the meetings. The details of existing RoW were also shared with them and as alignment is finalized the impacts on agricultural land, common properties resources and structures are assessed

and documented in Social Impact Assessment (SIA) Report.

## **E. Stakeholders Consultations**

- Stakeholder Consultation & interview with key persons of the villages and surrounding area were other major sources of primary data, apart from sample Families surveys to appraise existing condition and proper perspective of Government's development schemes in operation in the area.
- The stakeholders are all the people getting affected by the project or are responsible for the project, whether directly or indirectly. The community participation programmes in social impact assessment ensured that information is disseminated to all the PAPs and other stakeholders in appropriate ways. The information dissemination has taken place in vernacular, detailing about the main project features and the entitlement framework. Due consideration has also been given to address the views of the women and vulnerable groups.
- Both primary and secondary stakeholders were identified, based on the above criteria. They were invited to take part in the consultation series and were solicited to participate in planning and implementation of the R&R programme.
- Primary stakeholders included those affected negatively or positively by the project, like the PAPs, project beneficiaries and project implementing agencies. Secondary stakeholders included other individuals and groups, with an interest in the project.
- The details of the Public Consultation with the attendance sheet are annexed as Annexure 6 and some photographs during public consultation is shown in fig. 47.



Public consultation at Srirampur



Public Consultation at Ujanpetla





Public Consultation at Kumarganj



Public Consultation at Vatipetla



Public Consultation at Paglahaat



Public Consultation at Uttar barundanga





Public Consultation at Balajanmor



Public Consultation at Dewatarhasdaha prt1



Public Consultation at Kalahaat



Public Consultation at Sonahaat

**Figure 52: public consultations at different locations along the project road**

## F. Major outcome of Public Consultation

- Most of the local communities consulted were agree to extend their full co-operation.
- Some of them were aware that road is being upgraded and other inventory survey were already in progress and they have already interacted with them.
- According to local people poor condition of the existing road is a major issue of transport.
- According to local people water logging during rainy season is one of the major issues along the project road.
- In some stretches air environment is not good (as per previous EIA PM10 is higher than NAAQMS standard in all 4 monitoring stations). So, proper mitigation measures would be

taken during construction and design phase.

- Villagers also expressed their concern related to unavailability of drinking water, power supply, medical facilities, public toilets, drainage system in the area. Though this particular component is not within the scope of this project but if required PWD-MoRTH can separately look into the scope of development of the area and provide the basic amenities.
- Most of the consulted community was concern for drainage problem in market area and they are expecting their remedy after construction of project road. However, it was conveyed that alignment proposed alignment is traversing in market area and proper mitigation measure will be adopted during construction. They also asked that during construction proper lighting should be provided in construction area to avoid accident as they have experienced in similar work sometimes ago.



## 8. Environment Management and Monitoring Plan

### A. Introduction

Environmental impacts could be positive or negative, direct or indirect, local or regional and also reversible or irreversible. The impacts generated during Pre-construction /Design stage, construction and operational stage of the road, along with management plan for these impacts has been discussed in this section. Environmental management considerations in the form of EMP have been designed for project activities based on the client's requirement. The plan outlines existing and potential problems that may impact the environment and recommends corrective measures wherever required. Enhancement measures are also proposed in order to provide good environmental practices and improve the aesthetics of the project area.

This EMP consists of a set of mitigation, monitoring and institutional measures to be taken up for the project to avoid, minimize and mitigate adverse environmental impacts and enhance positive impacts. The plan also includes the actions needed for the implementation of these measures. The major components of the Environmental Management Plan are:

- Mitigation of potentially adverse impacts;
- Monitoring of EMP implementation during project implementation and operation; and
- Institutional arrangements to implement the EMP

The environmental management measures shall be implemented during the various stages of the project viz: Pre-construction/Design stage, Construction stage and Operational stage.

### B. Objectives Of Environment Management Plan

The Environmental Management Plan (EMP) consists of a set of mitigation, monitoring and institutional measures to be taken during the design, construction and operational phases of the project to eliminate adverse environmental impacts, to offset them, or to reduce them to acceptable levels. The main aim of the Environmental Management Plan is to ensure that the various adverse impacts are mitigated and the positive impacts are enhanced. The main objectives of this EMP are:

- To formulate avoidance, mitigation and compensation measures for anticipated adverse environmental impacts during construction and operation, and ensure that environmentally sound, sustainable and good practices are adopted;
- To stipulate monitoring and institutional requirements for ensuring safeguard compliance; and
- The project road should be environmentally sustainable.

Environmental management measures shall be implemented during the various stages of the project viz: Pre-construction stage, Construction stage and Operational stage.

### C. Pre-Construction Stage

#### C.1. Pre-construction activities by the Authority/ Consultant

Prior to the contractor mobilization, the PIU will ensure that an encumbrance free Corridor is handed over to enable the start of construction. Clearance involves the following activities:

- Removal and felling of trees, which is very minimal;
- Relocation of common property resources and utilities like telephone poles, electric poles and hand pumps;

- Formal arrangements for maintenance of enhancement sites. This includes plantation of trees and barricades along the road; and
- Modification (if any), of the contract documents by the Engineer of the Independent Consultant.

## **C.2. Pre-construction Activities by Contractor**

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

- Joint field verification by the Environment Specialist of the Independent Consultant and Contractor to check the different applicable component of EMP.
- Identification and selection of material sources (quarry and borrow material, water, sand etc).
- Procurement of construction equipment / machinery such as crushers, hot mix plants, batching plants and other construction equipment and machineries.
- Selection, design and layout of construction areas, hot mix and batching plants, labour camps etc.
- Apply for and obtain all the necessary clearances/ NOC's/ consents from the agencies concerned.
- Planning traffic diversions and detours including arrangements for temporary land acquisition.

## **D. Construction Stage**

### **D.1. Construction Activities by the Contractor**

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

### **D.2. Construction Activities by the Authority/ Consultants**

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

- Monitoring and guiding the contractor for the implementation of EMP and EMoP during construction stage;
- Monitoring and guiding the contractor on adopting good environmental and engineering practices;
- Arrangement of plantation through the Forest Department;
- Arranging training to the contractor and other stakeholders according to the needs arising; and
- To make changes in the design if need so arises.

## **E. Operation Stage**

The operational stage involves the following activities by the Authority Monitoring of environmental conditions through approved monitoring agency; and Monitoring of operational performance of the various mitigation/enhancement measures carried out.

## **F. Environment Management Plan**

The Environmental Management Plan indicating the issues, management measures, locations and responsibility matrix is presented in the below table.

**Table 61: Environment Management Plan**

| Sl. No.                | Environmental Issue                         | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Location            | Responsibility<br>Planning and Execution                | Supervision/<br>Monitoring |
|------------------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------------------------------|----------------------------|
| PRE-CONSTRUCTION STAGE |                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                     |                                                         |                            |
| P1                     | Alignment,                                  | <ul style="list-style-type: none"><li>The alignment as finalized by shifting / adjusting the centreline of the road, adopting of suitable cross-sections and adjustment of the median width to minimize land acquisition, loss of settlements and to avoid environmentally sensitive features compatible with project activities.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                          | Throughout Corridor | PIU, Revenue Dept. NGOs<br>Collaborating Agencies       | -                          |
| P2                     | Land Acquisition                            | <ul style="list-style-type: none"><li>The acquisition of land and private properties will be carried out in accordance with the RAP and entitlement framework for the project. It will be ensured that all R &amp; R activities including implementation of Environment Management Plan are completed before the start of work.</li><li>PIU has to ascertain that any additional environmental impacts resulting from acquisition of land are addressed and integrated into the EMP and other relevant documents.</li></ul>                                                                                                                                                                                                                                          | Throughout Corridor | PIU,<br>Revenue Dept.<br>NGOs<br>Collaborating Agencies | -                          |
| P3                     | Preservation of Trees                       | <ul style="list-style-type: none"><li>All efforts will be made to preserve trees including evaluation of minor design adjustments/ alternatives to save trees. Specific attention will be given for protecting giant trees, and locally important trees (religiously important etc.).</li><li>Tree cutting is to proceed only after all the legal requirements including attaining of In-principle and formal Clearances from the Forest Dept./ MoEF&amp; CC are completed and subsequently a written order is issued to the Contractor.</li><li>In the event of design changes, additional assessments including the possibility to save trees shall be made.</li><li>Stacking, transport and storage of the wood will be done as per the relevant norms.</li></ul> | Throughout Corridor | PIU<br>Forest Department<br>Contractor                  |                            |
| P4                     | Relocation of Utilities and Common Property | <ul style="list-style-type: none"><li>All utilities and CPRs i.e., water supply lines, religious structures, hand pumps will be relocated before the construction starts.</li><li>The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Throughout Corridor | PIU<br>Concerned Agencies<br>Contractor                 |                            |

| Sl. No.   | Environmental Issue                                                          | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Location                | Responsibility                        |                                           |
|-----------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------|-------------------------------------------|
|           |                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                         | Planning and Execution                | Supervision/ Monitoring                   |
|           | Resources (CPR)                                                              | <ul style="list-style-type: none"> <li>Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all utilities and CPRs.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                           |                         |                                       |                                           |
| <b>P5</b> | Orientation of Implementing Agency and Contractors                           | <ul style="list-style-type: none"> <li>The PIU shall organize orientation sessions and regular training sessions during all stages of the project. This shall include on-site training (general as well as in the specific context of the sub-project).</li> <li>These sessions shall involve all staff of Authority Engineer, field level implementation staff of PIU and Contractor. The contractor will ensure that his staff including engineers, supervisors and operators attend the training sessions.</li> </ul>                                                                                                   | Throughout Corridor     | Contractor                            |                                           |
| <b>P6</b> | Joint Field Verification                                                     | <ul style="list-style-type: none"> <li>The Environmental Expert of AE and the Contractor will carry out joint field verification to ascertain any additional possibility to saving trees, environmental and community resources.</li> <li>The verification exercise should assess the need for additional protection measures or changes in design/ scale/ nature of protection measures including the efficacy of enhancement measures suggested in the EMP.</li> <li>Proper documentation and justifications/reasons shall be maintained in all such cases where deviation from the original EMP is proposed.</li> </ul> | Throughout out Corridor | Contractor Environmental Expert of AE | <b>PIU</b>                                |
| <b>P7</b> | Assessment of Impacts due to Changes/Revisions/Additions in the Project Work | <ul style="list-style-type: none"> <li>The Environmental Expert of AE will assess impacts and revise/ modify the EMP and other required sections of the project documents in the event of changes/ revisions (including addition or deletion) in the project's scope of work.</li> </ul>                                                                                                                                                                                                                                                                                                                                   | Throughout out Corridor | Contractor Environmental Expert of AE | <b>PIU</b>                                |
| <b>P8</b> | Crushers, Hot-mix plants and Batching Plants Location                        | <ul style="list-style-type: none"> <li>Hot mix plants and batching plants will be sited sufficiently away from settlements and agricultural operations or any commercial establishments. Such plants will be located at least 1 Km away from the nearest village/ settlement preferably in the downwind direction.</li> <li>The Contractor shall submit a detailed layout plan for all such sites and approval of Environmental Expert of AE/PMC shall be necessary prior to their establishment.</li> <li>Arrangements to control dust pollution through provision of windscreens,</li> </ul>                             | Throughout out Corridor | Contractor                            | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue                                  | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Location                         | Responsibility         |                                           |
|------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------|-------------------------------------------|
|            |                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                  | Planning and Execution | Supervision/ Monitoring                   |
|            |                                                      | <p>sprinklers, and dust encapsulation will have to be provided at all such sites.</p> <ul style="list-style-type: none"> <li>Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be submitted to the "PIU through Environmental Expert of AE/PMC.</li> <li>The Contractor shall not initiate plant/s operation till the required legal clearances are obtained and submitted. The engineer will ensure that the regulatory and legal requirements are being complied with.</li> </ul>                                                                                                                                                                                                                                                                      |                                  |                        |                                           |
| <b>P9</b>  | Other Construction Vehicles, Equipment and Machinery | <ul style="list-style-type: none"> <li>All vehicles, equipment and machinery to be procured for construction will confirm to the relevant Indian Standard (IS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 will be strictly adhered to.</li> <li>Noise limits for construction equipments to be procured such as compactors, rollers, front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.</li> <li>The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which shall be produced for NH verification whenever required.</li> <li>Mobile equipment shall be placed at least 100 m away from the nearest dwelling.</li> </ul> | Throughout Corridor              | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>P10</b> | Borrow Areas                                         | <ul style="list-style-type: none"> <li>Finalizing borrow areas for borrowing earth and all logistic arrangements as well as compliance to environmental requirements, as applicable, will be the sole responsibility of the contractor.</li> <li>The Contractor will not start borrowing earth from selected borrow areas until the formal agreement is signed between landowner and contractor and a copy is submitted to the PIU/Environmental Expert of AE through the Engineer.</li> <li>Locations finalized by the contractor shall be reported to the Environmental Expert of AE and who will in turn report to PIU.</li> <li>Planning of haul roads for accessing borrow materials will be undertaken during</li> </ul>                                                                                                                                                                          | Along the Project Influence Area | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue                | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Location                         | Responsibility         |                                           |
|------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------------|-------------------------------------------|
|            |                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  | Planning and Execution | Supervision/ Monitoring                   |
|            |                                    | <p>this stage. The haul roads shall be routed to avoid agricultural areas as far as possible (in case such a land is disturbed, the Contractor will rehabilitate it as per Borrow Area Rehabilitation Guidelines) and will use the existing village roads wherever available.</p> <ul style="list-style-type: none"> <li>• In addition to testing for the quality of borrow materials by the AE, the environmental personnel of the AE will be required to inspect every borrow area location prior to approval</li> <li>• The AE will make sure that each such site is in line with IRC and other project guidelines.</li> <li>• Necessary clearances need to be obtained prior to operation of Borrow areas.</li> </ul>                                                                                                                                                                |                                  |                        |                                           |
| <b>P11</b> | Quarry                             | <ul style="list-style-type: none"> <li>• Contractor will finalize the quarry for procurement of construction materials after assessment of the availability of sufficient materials, quality and other logistic arrangements.</li> <li>• In case the contractor decides to use quarries other than recommended by DPR consultants, then it will be selected based on the suitability of the materials and as per established law.</li> <li>• The contractor will procure necessary permission for procurement of materials from Mining Department, District Administration and State Pollution Control Board and shall submit a copy of the approval and the rehabilitation plan to the PIU through Engineer.</li> <li>• Contractor will also work out haul road network and report to Environmental Expert of AE and will inspect and in turn report to PIU before approval.</li> </ul> | Along the Project Influence Area | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>P12</b> | Arrangement for Construction Water | <ul style="list-style-type: none"> <li>• To avoid disruption/disturbance to other water users, the contractor will extract water from fixed locations and consult the Environmental Expert of AE before finalizing the locations.</li> <li>• The contractor will not be allowed to pump from any irrigation canal and surface water bodies used by community.</li> <li>• The contractor will need to comply with the requirements of the State Ground Water Department and seek their approval for doing so and submit copies of the permission to AE and PIU prior to initiation of any construction work.</li> </ul>                                                                                                                                                                                                                                                                   | Along the Project Road           | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>P13</b> | Labor                              | <ul style="list-style-type: none"> <li>• The contractor preferably will use unskilled labor from local communities to give</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Along the                        | Contractor             | <b>Environmental</b>                      |



| Sl. No. | Environmental Issue                                         | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Location               | Responsibility         |                                    |
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|         | Requirements                                                | the maximum benefit to the local community.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Project Area           |                        | I Expert of AE and PIU             |
| P14     | Construction Camp Locations – Selection, Design and Lay-out | <ul style="list-style-type: none"> <li>Sitting of the construction camps will be selected by the contractor as per the guidelines.</li> <li>Construction camps will not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community.</li> <li>Location for stockyards for construction materials will be identified at least 1000 m from watercourses.</li> <li>The waste disposal and sewage system for the camp will be designed, built and operated such that no odor is generated.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Along the Project Road | Contractor             | Environmental Expert of AE and PIU |
| P15     | Arrangements for Temporary Land Requirement                 | <ul style="list-style-type: none"> <li>The contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for construction sites/hot mix plants/traffic detours/borrow areas etc.</li> <li>The Contractor will submit a copy of agreement to the Environmental Expert of AE. The Environmental Expert will be required to ensure that the clearing up of the site prior to handing over to the owner (after construction or completion of the activity) is included in the contract.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Along the Project Road | Contractor             | Environmental Expert of AE and PIU |
| P16     | Implementation - Information Meetings                       | <ul style="list-style-type: none"> <li>The contractor will organize at least 2 implementation information meetings in the vicinity of Project Site (minimum one in each section) for general public to consult and inform people about his plans covering overall construction schedule, safety, use of local resources (such as earth, water), traffic safety and management plans of debris disposal, drainage protection during construction, pollution abatement and other plans, measures to minimize disruption, damage and in convenience to roadside users and people along the road.</li> <li>The first Implementation information meeting be conducted within four weeks of mobilization. The people should be informed about the date, time and venue at least 7 days prior to meetings. Public shall be informed about the meeting through display of posters at prominent public places (panchayat offices, offices of Market committees, Notice board of religious places etc.) and distribution of pamphlets along roadside communities or in any manner deemed fit.</li> </ul> | Along the Project Road | Contractor             | Environmental Expert of AE and PIU |

| Sl. No.                   | Environmental Issue                                             | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Location                   | Responsibility         |                                           |
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|                           |                                                                 | <ul style="list-style-type: none"> <li>The contractor will maintain a channel of communication with the communities through his designated Environment and Safety Officer to address any concern or grievances.</li> <li>Periodic meetings will also be conducted during the construction period to take feedback from communities or their representatives to ensure minimum disturbance. The mechanism and contents for disclosure shall be approved by PIU prior to the meetings.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |                        |                                           |
| <b>CONSTRUCTION STAGE</b> |                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                            |                        |                                           |
| <b>C1</b>                 | Clearing and Grubbing                                           | <ul style="list-style-type: none"> <li>Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum.</li> <li>Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert of AE.</li> <li>The Contractor under any circumstances will not cut trees other than those identified for cutting and for which he has written instructions from the PIU. The PIU will issue these instructions only after receiving all stages of clearances from the Forest Department/ MoEF&amp; CC.</li> <li>Vegetation only with girth of over 30 cm will be considered as trees and shall be compensated, in the event of PIU's instruction to undertake tree cutting.</li> <li>The sub grade of the existing pavement shall be used as embankment fill material.</li> <li>The existing base and sub-base material shall be recycled as sub-base of the haul road or access roads.</li> <li>The existing bitumen surface may be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes etc.</li> </ul> | Along the work in progress | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C2</b>                 | Disposal of debris from dismantling structures and road surface | <ul style="list-style-type: none"> <li>The contractor shall identify disposal sites. The identified locations will be reported to the Environmental Expert of AE. These locations will be checked on site and accordingly approved by Environmental Expert of AE prior to any disposal of waste materials.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Along the work in progress | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.   | Environmental Issue                              | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Location       | Responsibility         |                                           |
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|           |                                                  | <ul style="list-style-type: none"> <li>All arrangements for transportation during construction including provision, maintenance, dismantling and clearing debris, will be considered incidental to the work and will be planned and implemented by the contractor as approved and directed by the Environmental Expert of AE.</li> <li>The pre-designed disposal locations will be a part of Comprehensive Solid Waste Management Plan to be prepared by Contractor in consultation and with approval of Environmental Expert of AE.</li> <li>Debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area. Guidelines for management of Debris Disposal site is attached in Annexure 17.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                        |                                           |
| <b>C3</b> | Other Construction Waste Disposal                | <ul style="list-style-type: none"> <li>The pre-identified disposal locations will be a part of Comprehensive Waste Disposal Management Plan to be prepared by the Contractor in consultation and with approval of Environmental Expert of AE. Location of disposal sites will be finalized prior to initiation of works on any particular section of the road.</li> <li>The Environmental Expert of AE will approve these disposal sites after conducting a joint inspection on the site with the Contractor.</li> <li>Contractor will ensure that any spoils of material unsuitable for embankment fill will not be disposed off near any water course, agricultural land, and natural habitat like grass lands or pastures. Such spoils from excavation can be used to reclaim borrow pits and low-lying areas located in barren lands along the project corridors (if so desired by the owner/community and approved by the Environmental Expert of AE).</li> <li>All waste materials will be completely disposed and the site will be fully cleaned and certified by Environmental Expert of AE before handing over. Guideline for waste disposal and management is attached in annexure 13.</li> <li>The contractor at its cost shall resolve any claim, arising out of waste disposal or any non-compliance that may arise on account of lack of action on his part.</li> </ul> | Along the Road | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C4</b> | Stripping, stocking and preservation of top soil | <ul style="list-style-type: none"> <li>The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or Right of Way will be earmarked for storing</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Along the Road | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.   | Environmental Issue                         | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Location       | Responsibility         |                                           |
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|           |                                             | <p>topsoil. The locations for stock piling will be pre-identified in consultation and with approval of Environmental Expert of AE. Guideline for soil conservation and reuse is attached in annexure 18. The following precautionary measures will be taken to preserve them till they are used:</p> <ul style="list-style-type: none"> <li>• Stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, silt fencing will protect the edges of the pile.</li> <li>• Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation.</li> <li>• It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles.</li> <li>• Such stockpiled topsoil will be utilized for -</li> <li>• covering all disturbed areas including borrow areas only in case where these are to be rehabilitated as farm lands (not those in barren areas)</li> <li>• top dressing of the road embankment and fill slopes,</li> <li>• filling up of tree pits, in the median and in the agricultural fields of farmers, acquired temporarily.</li> </ul> |                |                        |                                           |
| <b>C5</b> | Accessibility                               | <ul style="list-style-type: none"> <li>• The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road, providing temporary connecting road.</li> <li>• The contractor will take care that schools and religious places are accessible to Public. The contractor will also ensure that the work on / at existing accesses will not be undertaken without providing adequate provisions and to the prior satisfaction of Environmental Expert of AE.</li> <li>• The contractor will take care that the cross roads are constructed in such a sequence that construction work over the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Along the Road | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C6</b> | Planning for Traffic Diversions and Detours | <ul style="list-style-type: none"> <li>• Temporary diversions will be constructed with the approval of the Resident Engineer and Environmental Expert of AE for which contractor will seek prior approval for such plans.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Along the      | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.   | Environmental Issue                      | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Location     | Responsibility         |                                           |
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|           |                                          | <ul style="list-style-type: none"> <li>Detailed Traffic Control Plans will be prepared and submitted to the Resident Engineer for approval, seven days prior to commencement of works on any section of road. The traffic control plans shall contain details diversions; traffic safety arrangement during construction; safety measures for night – time traffic and precautions for transportation of hazardous materials. Traffic control plans shall be prepared in line with requirements of IRC's SP- 55 document and The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</li> <li>The contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from AE and PIU. The temporary traffic detours will be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).</li> </ul>                                                                                                                                                                                                                                                                                       | Road         |                        |                                           |
| <b>C7</b> | Earth from Borrow Areas for Construction | <ul style="list-style-type: none"> <li>No borrow area will be opened without permission of the Environmental Expert of AE. The location, shape and size of the designated borrow areas will be as approved by the Environmental Expert of AE and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961). The borrowing operations will be carried out as specified in the guidelines for sitting and operation of borrow areas. Borrow area management guideline is attached in annexure 11.</li> <li>The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust free by the contractor. Sprinkling of water will be carried out twice a day to control dust along such roads during their period of use.</li> <li>During dry seasons (winter and summer) frequency of water sprinkling will be increased in the settlement areas and Environmental Expert of AE will decide the numbers of sprinkling depending on the local requirements.</li> <li>Contractor will rehabilitate the borrow areas as soon as borrowing is over from a particular borrow area in accordance with the guidelines for Redevelopment of Borrow Areas or as suggested by Environmental Expert of AE.</li> <li>The final rehabilitation plans will be approved by the Environmental Expert of</li> </ul> | Borrow Areas | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue                                          | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Location          | Responsibility         |                                           |
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|            |                                                              | AE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |                        |                                           |
| <b>C8</b>  | Quarry Operations                                            | <ul style="list-style-type: none"> <li>The contractor shall obtain materials from quarries only after the consent of the Department of Mining / SPCB (both the states) / District Administration or will use existing approved sources of such materials. Copies of consent/ approval/ rehabilitation plan for opening a new quarry or use of an existing quarry source will be submitted to Environmental Expert of AE and the Resident Engineer.</li> <li>The contractor will develop a Comprehensive Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy to PIU and AE prior to opening of the quarry site. Guideline for siting operation and re-development of quarry operations is attached in annexure 16.</li> <li>The quarry operations will be undertaken within the rules and regulations in force in the state.</li> </ul>                                           | Quarry Areas      | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C9</b>  | Transporting Construction Materials and Haul Road Management | <ul style="list-style-type: none"> <li>Contractor will maintain all roads (existing or built for the project), which are used for transporting construction materials, equipment and machineries as précised. All vehicles delivering fine materials to the site will be covered to avoid spillage of materials.</li> <li>All existing highways and roads used by vehicles of the contractor or any of his sub-contractor or suppliers of materials and similarly roads, which are part of the works, will be kept clear of all dust/mud or other extraneous materials dropped by such vehicles.</li> <li>Contractor will arrange for regular water sprinkling as necessary for dust suppression of all such roads and surfaces with specific attention to the settlement areas.</li> <li>The unloading of materials at construction sites/close to settlements will be restricted to daytime only.</li> </ul> | All Roads Used    | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C10</b> | Construction Water                                           | <ul style="list-style-type: none"> <li>Contractor will arrange adequate supply and storage of water for the whole construction period at his own costs. The Contractor will submit a list of source/s from where water will be used for the project to 'PIU' through the Engineer.</li> <li>The contractor will source the requirement of water preferentially from ground water but with prior permission from the Central Ground Water Board. A copy of the permission will be submitted to 'PIU' through the Engineer prior to initiation</li> </ul>                                                                                                                                                                                                                                                                                                                                                        | Along the Project | Contractor             | <b>Environmental Expert of AE and PIU</b> |



| Sl. No.    | Environmental Issue                                        | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Location                                | Responsibility         |                                           |
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|            |                                                            | <p>of construction.</p> <ul style="list-style-type: none"> <li>The contractor will take all precaution to minimize the wastage of water in the construction process/ operation.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                         |                        |                                           |
| <b>C11</b> | Disruption to Other Users of Water                         | <ul style="list-style-type: none"> <li>While working across or close to any perennial water bodies, contractor will not obstruct/ prevent the flow of water.</li> <li>Construction over and close to the perennial streams shall not be undertaken in any season.</li> <li>The contractor will take prior approval of the River Authority or Irrigation Department for any such activity. The PIU and the Engineer will ensure that contractor has served the notice to the downstream users of water well in advance.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | All Water Bodies Used                   | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C12</b> | Drainage                                                   | <ul style="list-style-type: none"> <li>Contractor will ensure that no construction materials like earth, stone, ash or appendage is disposed off in a manner that blocks the flow of water of any water course and cross drainage channels. Contractor will take all-necessary measures to prevent any blockage to water flow. In addition to the design requirements, the contractor will take all required measures as directed by the Environmental Expert of AE and the 'Resident Engineer' to prevent temporary or permanent flooding of the site or any adjacent area.</li> <li>To maintain the surface water flow/drainage, proper mitigation measures will be taken along the road, like: <ul style="list-style-type: none"> <li>i. Drainage line will be constructed all along the project road.</li> <li>ii. Good engineering and construction practice should be followed</li> </ul> </li> </ul> <p>Use of sediment traps, silt fencing, oil and grease turving etc. to minimise of the soil movement. Guideline for sediment control is attached in annexure 22.</p> | Drainage line along the road            | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C13</b> | Siltation of Water Bodies and Degradation of Water Quality | <ul style="list-style-type: none"> <li>The Contractor will not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction.</li> <li>Contractor will construct silt fencing at the base of the embankment construction for the entire perimeter of water bodies (including wells) adjacent to the ROW and around the stockpiles at the construction sites close to water bodies.</li> <li>Site Fencing at identified 1 major bridge of project road crossing Redundant part of River at ch 51+536 km. The cost of this bridge fencing comes under project</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | All Surface Water Bodies Along the Road | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue                          | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Location        | Responsibility         |                                           |
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|            |                                              | <p>cost.</p> <ul style="list-style-type: none"> <li>The fencing will be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. The contractor will also put up sedimentation cum grease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m. in present case three Sedimentation Cum Grease Trap are proposed, However the item has been kept in case need arises during construction.</li> <li>Enhancement of road side ponds, mostly big ponds; ch17+750km, ch 18+000km, ch 19+000km, ch 19+850km – ch 20+000km, ch 23+600km, ch 25+300km, ch 32+250km, ch 33+00km, ch 33+100km, ch 35+500km, ch 38+000km, ch 38+050km – 38+300km, ch 38+500km, ch 46+850km) should be considered. Total 900m.</li> <li>Contractor will ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse.</li> </ul> |                 |                        |                                           |
| <b>C14</b> | Slope Protection and Control of Soil Erosion | <ul style="list-style-type: none"> <li>The contractor will take slope protection measures as per design, or as directed by the Environmental Expert of AE to control soil erosion and sedimentation.</li> <li>All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such as no separate payment will be made for them. Guidelines for slope stabilisation is given in Annexure 19.</li> <li>Contractor will ensure the following aspects:               <ol style="list-style-type: none"> <li>During construction activities on road embankment, the side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications.</li> <li>Turfing works will be taken up as soon as possible provided the season is favourable for the establishment of grass sods. Other measures of slope stabilization will include mulching netting and seeding of batters and drains immediately on completion of earthworks.</li> </ol> </li> </ul>                               | Along the Roads | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue                      | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Location        | Responsibility         |                                           |
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|            |                                          | 3. In borrow pits, the depth shall be so regulated that the sides of the excavation will have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank.<br>4. Along sections abutting water bodies, stone pitching as per design specification will protect slopes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |                        |                                           |
| <b>C15</b> | Water Pollution from Construction Wastes | <ul style="list-style-type: none"> <li>The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation system. Contractor will avoid construction works close to the streams or water bodies.</li> <li>All waste arising from the project is to be disposed off in the manner that is acceptable and as per norms of the State Pollution Control Board.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Along the road  | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C16</b> | Water Pollution from Fuel and Lubricants | <ul style="list-style-type: none"> <li>The contractor will ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refuelling sites will be located at least 500 m from rivers and irrigation canal/ponds.</li> <li>All location and layout plans of such sites will be submitted by the Contractor prior to their establishment and will be approved by the Environmental Expert of AE and PIU.</li> <li>Contractor will ensure that all vehicle/machinery and equipment operation, maintenance and refuelling will be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors will be provided for vehicle parking, wash down and refuelling areas as per the design provided.</li> <li>Oil and grease traps will be provided at fuelling locations, to prevent contamination of water.</li> <li>'Oil interceptors' shall be provided in wash down areas and re-fuelling areas</li> <li>In all, fuel storage and refuelling areas, if located on agricultural land or areas supporting vegetation, the top soil will be stripped, stockpiled and returned after cessation of such storage.</li> <li>Contractor will arrange for collection, storing and disposal of oily wastes to the</li> </ul> | Along the Roads | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No. | Environmental Issue                                            | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Location                                   | Responsibility         |                                    |
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|         |                                                                | <p>pre-identified disposal sites (list to be submitted to AE and PIU) and approved by the Environmental Expert of AE. All spills and collected petroleum products will be disposed off in accordance with MoEF&amp;CC and state PCB guidelines.</p> <ul style="list-style-type: none"> <li>Environmental Expert of AE and Resident Engineer' will certify that all arrangements comply with the guidelines of PCB/ MoEF&amp;CC or any other relevant laws.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                            |                        |                                    |
| C17     | Dust Pollution                                                 | <ul style="list-style-type: none"> <li>The contractor will take every precaution to reduce the level of dust from crushers/hot mix plants, construction sites involving earthwork by sprinkling of water, encapsulation of dust source and by erection of screen/barriers.</li> <li>All the plants will be sited at least 1 km in the downwind direction from the nearest human settlement.</li> <li>The contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation.</li> <li>The suspended particulate matter value at a distance of 40m from a unit located in a cluster should be less than 500 g/m<sup>3</sup>. The pollution monitoring is to be conducted as per the monitoring plan.</li> <li>Alternatively, only crushers licensed by the SPCB shall be used. Required certificates and consents shall be submitted by the Contractor in such a case to the Environmental Expert of AE through the 'Engineer'.</li> <li>Dust screening vegetation will be planted on the edge of the ROW for all existing roadside crushers. Hot mix plant will be fitted with dust extraction units.</li> </ul> | Along the Roads, Construction Site/ Camps  | Contractor             | Environmental Expert of AE and PIU |
| C18     | Emission from Construction Vehicles, Equipment and Machineries | <ul style="list-style-type: none"> <li>Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of SPCB.</li> <li>The Contractor will submit PUC certificates for all vehicles/ equipment/machinery used for the project. Monitoring results will also be submitted to 'PIU' through the 'Engineer'.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Along the Roads , all vehicles used/ Camps | Contractor             | Environmental Expert of AE and PIU |
| C19     | Noise Pollution: Noise from Vehicles, Plants and Equipments    | <ul style="list-style-type: none"> <li>The Contractor will confirm the following:</li> <li>All plants and equipment used in construction shall strictly conform to the MoEF&amp; CC/CPCB noise standards.</li> <li>All vehicles and equipment used in construction will be fitted with exhaust</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Along the Roads , all vehicles used/Camps  | Contractor             | Environmental Expert of AE and PIU |

| Sl. No.    | Environmental Issue                 | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Location                                  | Responsibility         |                                           |
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|            |                                     | <p>silencers.</p> <ul style="list-style-type: none"> <li>• Servicing of all construction vehicles and machinery will be done regularly and during routine servicing operations, the effectiveness of exhaust silencers will be checked and if found defective will be replaced.</li> <li>• Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986.</li> <li>• Maintenance of vehicles, equipment and machinery shall be regular to keep noise levels at the minimum.</li> <li>• At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching will be stopped during the night time between 10.00 pm to 6.00 am.</li> <li>• No construction activities will be permitted around educational institutes/health centres (silence zones) up to a distance of 100 m from the sensitive receptors i.e., school, health centres and hospitals between 10.00 pm to 6.00 am.</li> <li>• Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to Environmental Expert of AE through the 'Engineer'.</li> <li>• Noise barriers / trees will be planted along the road especially in front of sensitive locations, for such mitigation measure. the boundary wall should be 50 m. before and after the sensitive locations.</li> </ul> |                                           |                        |                                           |
| <b>C20</b> | Personal Safety Measures for Labour | <ul style="list-style-type: none"> <li>• Contractor will provide:</li> <li>• Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc.</li> <li>• Welder's protective eye-shields to workers who are engaged in welding works</li> <li>• Protective goggles and clothing to workers engaged in stone breaking activities and workers will be seated at sufficiently safe intervals</li> <li>• Earplugs to workers exposed to loud noise, and workers working in crushing, compaction, or concrete mixing operation.</li> <li>• Adequate safety measures for workers during handling of materials.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Along the Roads , all vehicles used/Camps | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Location                                  | Responsibility         |                                           |
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|            |                     | <ul style="list-style-type: none"> <li>The contractor will comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.</li> <li>The contractor will comply with all the precautions as required for ensuring the safety of the workmen as per the International Labor Organization (ILO) Convention No. 62 as far as those are applicable to this contract. Guideline to ensure worker's safety during construction is attached annexure 20.</li> <li>The contractor will make sure that during the construction work all relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to.</li> <li>The contractor will not employ any person below the age of 14 years for any work and no woman will be employed on the work of painting with products containing lead in any form.</li> <li>The contractor will also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint.</li> <li>Contractor will provide facemasks for use to the workers when paint is applied in the form of spray or a surface having lead paint dry is rubbed and scrapped.</li> <li>The Contractor will mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. These will be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and will be approved by AE and PIU.</li> </ul> |                                           |                        |                                           |
| <b>C21</b> | Traffic and Safety  | <ul style="list-style-type: none"> <li>The contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/Drawings and as required by the Environmental Expert of AE and 'Resident Engineer' for the information and protection of traffic approaching or passing through the section of any existing cross roads. Proper guideline of traffic management plan is attached in annexure 21.</li> <li>The contractor will ensure that all signs, barricades, pavement markings are provided as per the MOSRT&amp;H specifications. Before taking up of construction</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Along the Roads , all vehicles used/Camps | Contractor             | <b>Environmental Expert of AE and PIU</b> |



| Sl. No.    | Environmental Issue               | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Location                            | Responsibility         |                                           |
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|            |                                   | on any section of the existing lanes of the highway, a Traffic Control Plan will be devised and implemented to the satisfaction of Environmental Expert of AE and 'Resident Engineer'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                     |                        |                                           |
| <b>C22</b> | Risk from Electrical Equipment(s) | <ul style="list-style-type: none"> <li>The Contractor will take all required precautions to prevent danger from electrical equipment and ensure that:</li> <li>No material will be so stacked or placed as to cause danger or inconvenience to any person or the public.</li> <li>All necessary fencing and lights will be provided to protect the public in construction zones.</li> <li>All machines to be used in the construction will conform to the relevant Indian Standards (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provision and to the satisfaction of the 'Resident Engineer'.</li> </ul> | Along the Roads                     | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C23</b> | Risk Force Measure                | <ul style="list-style-type: none"> <li>The contractor will take all reasonable precautions to prevent danger to the workers and public from fire, flood etc. resulting due to construction activities.</li> <li>The contractor will make required arrangements so that in case of any mishap all necessary steps can be taken for prompt first aid treatment. Construction Safety Plan prepared by the Contractor will identify necessary actions in the event of an emergency. Guidelines for emergency management system is attached in annexure 12.</li> </ul>                                                                                                                                           | Along the Roads, construction Camps | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C24</b> | First Aid                         | <ul style="list-style-type: none"> <li>The contractor will arrange for -</li> <li>a readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone</li> <li>availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital</li> <li>Equipment and trained nursing staff at construction camp.</li> </ul>                                                                                                                                                                                                                                                            | Along the Roads, construction Camps | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C25</b> | Informatory Signs and Hoardings   | <ul style="list-style-type: none"> <li>The contractor will provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required as per IRC and MoRT&amp;H specifications.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Along the Roads, construction       | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue                  | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Location                                  | Responsibility         |                                           |
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| <b>C26</b> | Road side Plantation Strategy        | <ul style="list-style-type: none"> <li>The contractor will do the plantation at median and/or turfing at embankment slopes as per the tree plantation strategy prepared for the project.</li> <li>Minimum 90 percent survival rate of the saplings will be acceptable otherwise the contractor will replace dead plants at his own cost. The contractor will maintain the plantation till they handover the project site to NHAI.</li> <li>Environmental Expert of AE will inspect regularly the survival rate of the plants and compliance of tree plantation guidelines.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Camps<br>Along the Roads                  | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C27</b> | Flora and Fauna                      | <ul style="list-style-type: none"> <li>The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal.</li> <li>If any wild animal is found near the construction site at any point of time, the contractor will immediately upon discovery thereof acquaint the Environmental Expert of AE and carry out the AE instructions for dealing with the same.</li> <li>Environmental Expert of AE will report to the nearby forest office (range office or divisional office) and will take appropriate steps/ measures, if required in consultation with the forest officials.</li> <li>All efforts during the design stage should be made to minimize the tree felling requirement</li> <li>Compensatory plantation should be started during construction phase parallel to the construction activities. . Guideline for tree plantation is attached in annexure 10.</li> <li>Monitoring of tree felling along the road</li> </ul> | Along the Roads                           | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C28</b> | Chance Found Archaeological Property | <ul style="list-style-type: none"> <li>All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation.</li> <li>The contractor will take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Environmental Expert of AE of such discovery and carry out the AE instructions</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Along the Roads, construction sites/Camps | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue  | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Location                                               | Responsibility         |                                           |
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|            |                      | for dealing with the same, waiting which all work shall be stopped.<br><ul style="list-style-type: none"> <li>The AE will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                        |                        |                                           |
| <b>C29</b> | Labour Accommodation | <ul style="list-style-type: none"> <li>Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labor camp.</li> <li>The location, layout and basic facility provision of each labor camp will be submitted to AE and 'PIU' prior to their construction.</li> <li>The construction will commence only upon the written approval of the Environmental Expert of AE.</li> <li>The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the AE.</li> <li>The construction camps will be located away from the habitation as discussed in chapter 3 (project description, section F). guideline for siting construction camp is given in annexure 15.</li> <li>The sewage system for such camps will be properly designed and built so that no water pollution takes place in adjacent canals</li> </ul> | Along the Roads, construction Camps/site               | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C30</b> | Potable Water        | <ul style="list-style-type: none"> <li>The Contractor will construct and maintain all labour accommodation in such a fashion that uncontaminated water is available for drinking, cooking and washing.</li> <li>The Contractor will also provide potable water facilities within the precincts of every workplace in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.</li> <li>Testing of water will be done as per parameters prescribed in IS 10500:1991.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Along the Roads, construction Camps/const ruction site | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.    | Environmental Issue          | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Location                                               | Responsibility         |                                           |
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| <b>C31</b> | Sanitation and Sewage System | <ul style="list-style-type: none"> <li>• The contractor will ensure that -</li> <li>• the sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place</li> <li>• separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women</li> <li>• Adequate water supply is to be provided in all toilets and urinals</li> </ul>                                                                | Along the Roads, construction Camps/Construction Sites | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C32</b> | Waste Disposal               | <ul style="list-style-type: none"> <li>• The contractor will provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of AE.</li> <li>• Unless otherwise arranged by local sanitary authority, arrangements for disposal of night soils (human excreta) suitably approved by the local medical health or municipal authorities or as directed by Environmental Expert of AE will have to be provided by the contractor.</li> </ul> | Along the Roads, construction Camps                    | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>C33</b> | Consultation                 | <ul style="list-style-type: none"> <li>• The Environmental Expert of AE will contact the responsible people with the enhancement drawing of the site for which enhancement has been proposed and take their consent before the start of work.</li> <li>• Accesses to Different Schools along the road will be developed to the satisfaction of 'PIU'.</li> </ul>                                                                                                                                                                                                                        | Along the Roads                                        | Contractor             | <b>Environmental Expert of AE and PIU</b> |

| Sl. No.                                      | Environmental Issue                                 | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Location                            | Responsibility         |                                           |
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| <b>C34</b>                                   | Clean-up Operations, Restoration and Rehabilitation | <ul style="list-style-type: none"> <li>Contractor will prepare site restoration plans, which will be approved by the Environmental Expert of AE. The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. The contractor will clear all temporary structures; dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by AE.</li> <li>All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed in pre identified approved areas or in places suggested by the Environmental Expert of AE areas in a layer of thickness of 75 mm-150 mm. All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's expense, to the entire satisfaction to the Environmental Expert of AE and PIU will certify in this regard.</li> </ul> | Along the Roads, construction Camps | Contractor             | <b>Environmental Expert of AE and PIU</b> |
| <b>• OPERATION STAGE</b>                     |                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                     |                        |                                           |
| <b>• Activities to be carried Out by PIU</b> |                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                     |                        |                                           |
| <b>O1</b>                                    | Monitoring Operation Performance                    | <ul style="list-style-type: none"> <li>The PIU will monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project.</li> <li>The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision, status of rehabilitation of borrow areas and disposal sites,</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Along the Road                      | PIU                    | <b>PIU</b>                                |
| <b>O2</b>                                    | Maintenance of Drainage                             | <ul style="list-style-type: none"> <li>PIU will ensure that all drains (side drains, median drain and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding.</li> <li>PIU will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Along the Road                      | PIU                    | <b>PIU</b>                                |

| Sl. No.   | Environmental Issue          | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Location       | Responsibility                          |                         |
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|           |                              | three months.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                |                                         |                         |
| <b>03</b> | Pollution Monitoring         | <ul style="list-style-type: none"> <li>The periodic monitoring of the ambient air quality, noise level, water quality, soil pollution/contamination in the selected locations as suggested in pollution monitoring plan.</li> <li>PIU will either appoint PCB or its approved pollution-monitoring agency for the purpose</li> </ul>                                                                                                                                                                                                | Along the Road | PIU through Pollution Monitoring Agency | <b>PIU</b>              |
| <b>04</b> | Air Pollution                | <ul style="list-style-type: none"> <li>Ambient air concentrations of various pollutants shall be monitored as envisaged in the pollution-monitoring plan.</li> <li>Bottlenecks should be avoided for smooth flow of traffic.</li> <li>Plantation of pollutant adsorbing trees, such as Spider Plant, Bamboo Palm, etc.</li> <li>Regular maintenance of the road will be done to ensure good surface condition</li> </ul>                                                                                                            | Along the Road | PIU through Pollution Monitoring Agency | <b>PIU</b>              |
| <b>05</b> | Noise Pollution              | <ul style="list-style-type: none"> <li>Noise pollution will be monitored as per monitoring plan at sensitive locations. Noise control programs are to be enforced strictly.</li> <li>According to monitoring results, use of sound barriers / trees will be considered where warranted</li> <li>Signs for sensitive zones (health centers / educational institutions etc.) will be put up where horn should not be blown or traffic speed need to be regulated</li> <li>Pressure Horn must be banned in the project road</li> </ul> | Along the Road | PIU through Pollution Monitoring Agency | <b>PIU</b>              |
| <b>06</b> | Water Pollution              | <ul style="list-style-type: none"> <li>Water Quality will be monitored as per monitoring plan</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                            | Along the Road | PIU through Pollution Monitoring Agency | <b>PIU</b>              |
| <b>07</b> | Plantation (Flora and Fauna) | <ul style="list-style-type: none"> <li>Monitoring of survival of trees should be done at regular interval and suitable mitigation measures should be taken to protect the trees.</li> </ul>                                                                                                                                                                                                                                                                                                                                         | Along the Road | PIU through Pollution Monitoring        | <b>PIU</b>              |



| Sl. No.   | Environmental Issue                         | Management Measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Location       | Responsibility         |                         |
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|           |                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                | Planning and Execution | Supervision/ Monitoring |
|           |                                             | <ul style="list-style-type: none"> <li>• Efforts will be made for proper maintenance of planted trees, shrubs and grasses to maintain greenery and aesthetics</li> <li>• Planted tree should be covered with fence or net</li> </ul>                                                                                                                                                                                                                                                                                                                                                                    |                | Agency                 |                         |
| <b>08</b> | Soil Erosion and Monitoring of Borrow Areas | <ul style="list-style-type: none"> <li>• Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankment &gt; 2m. and other places expected to be affected, will be carried out once in every three months as suggested in monitoring plan. In case soils erosion is found, suitable measures should be taken to control the soil erosion.</li> </ul>                                                                                                                                                                                              | Along the Road | PIU                    | <b>PIU</b>              |
| <b>09</b> | Road Safety and Traffic                     | <ul style="list-style-type: none"> <li>• Road Safety will be monitored during operation especially at location where traffic-calming measures have been proposed.</li> <li>• The spills at the accident sites will be cleared immediately and disposed off properly in accordance with Emergency Response Plan</li> <li>• Traffic management plan will be developed, especially along congested locations and near sensitive locations</li> <li>• Traffic control measures including speed limits will be enforced strictly.</li> <li>• Engagement with local community / Awareness Training</li> </ul> | Along the Road | PIU                    | PIU                     |

AE: Authority Engineer, PIU: Project Implementation Unit

## **G. Environmental Monitoring Program**

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

### **G.1 Objective of Monitoring Program**

The Objectives of environmental monitoring program are-

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

### **G.2. Environmental Monitoring**

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

### **G.3. Methodology**

Monitoring methodology covers the following key aspects:

- Components to be monitored;
- Parameters for monitoring of the above components;
- Monitoring frequency;
- Monitoring standards;
- Responsibilities for monitoring; and

## **H. Performance Indicators**

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

### **Ambient Air Quality Monitoring**

The air quality parameters viz. Sulphur di-oxide (SO<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>), Carbon Monoxide (CO) and Particulate Matter (PM 2.5 & PM 10) shall be regularly monitored at identified locations from the start of the construction activity. The air quality parameters shall be monitored in accordance with the National Ambient Air Quality Standards.

The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

### Noise Quality Monitoring

The noise levels shall be monitored at designated locations in accordance with the Ambient Noise Quality standards. The duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan.

### Water Quality Monitoring

Water quality parameters such as pH, BOD, COD, DO, Coliform, Total Suspended Solids, Total Dissolved Solids, Iron, etc. shall be monitored at all identified locations during the construction stage as per standards prescribed by Central Pollution Control Board and IS:10500 quality standards. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

### Soil Quality Monitoring

Soil quality parameters such as NPK, oil & grease and heavy metals shall be monitored at all the identified locations during the construction stage as per the standards. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

## I. Monitoring Plans for Environment Condition

To ensure the effective implementation of the mitigation measures and environmental management plan, it is essential that an effective Environmental Monitoring Plan (EMoP) to be designed. The EMoP contains parameters, location, sampling and analysis methods, frequency, and compared to standards or agreed actions that will indicate non-compliances and trigger necessary corrective actions. The objectives of the EMoP are to:

- Ensure that impacts do not exceed the applicable legal standards
- Check the implementation of mitigation measures in the manner described in the EIA report
- Monitor implementation of the EMP
- Provide an early warning of potential environmental damage
- Check whether the proposed mitigation measures have been achieved the intended results, and or/ other environmental impacts occurred.

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

**Table 62: Environmental monitoring plan**

| Environmental Component | Project Stage      | Monitoring                                           |                                                                                                                                |                                        |                                                                                                                                                                                                                                 |                                                              | Institutional Responsibility                       |                       |
|-------------------------|--------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------|-----------------------|
|                         |                    | Parameters                                           | Special Guidance                                                                                                               | Standards                              | Location                                                                                                                                                                                                                        | Frequency                                                    | Implementation                                     | Supervision           |
| Air                     | Construction Stage | PM10, PM 2.5, SO <sub>x</sub> , NO <sub>x</sub> , CO | Respirable Dust Sampler to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis | Air (P&CP) Act, 1981 and its amendment | <ul style="list-style-type: none"> <li>Hot mix Plant / Batching Plant approved by engineers. At 3 locations.</li> <li>Monitoring at construction sites near sensitive locations. at 2 locations (Total 05 locations)</li> </ul> | Three times in a Year for two years (Excluding Rainy season) | Contractor through NABL approved monitoring agency | Environment Expert-AE |
|                         | Operational Stage  | PM10, PM 2.5, SO <sub>x</sub> , NO <sub>x</sub> , CO | Respirable Dust Sampler to be located 50m from the plant in the downwind direction. Use method specified by CPCB for analysis  | Air (P&CP) Act, 1981 and its amendment | As directed by the Engineer (04 Project locations)                                                                                                                                                                              | As specified by the Engineer                                 | PIU through NABL approved monitoring agency        | PIU                   |

|               |                    |                              |                                                                                                        |                                 |                                                                                                                         |                                                               |                                                    |                       |
|---------------|--------------------|------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------|-----------------------|
| Water Quality | Construction Stage | Parameters as per IS: 10500  | Grab sample collected from source and analyze as per Standard Methods for Examination of Water quality | Water quality standards by CPCB | 04 ground water sample and 04 surface water samples in project stretch.                                                 | Three times in a Year for two years (Excluding Rainy season)  | Contractor through NABL approved monitoring agency | Environment Expert-AE |
|               | Operation Stage    | Parameters as per IS: 10500  | Grab sample collected from source and analyze as per Standard Methods for Examination of Water quality | Water quality standards by CPCB | As directed by the Engineer (08 Project locations)                                                                      | As specified by the Engineer                                  | PIU through NABL approved monitoring agency        | PIU                   |
| Noise Levels  | Construction Stage | Noise levels on dB (A) scale | As per CPCB                                                                                            | Noise standards by CPCB         | Hot mix Plant / Batching Plant. Stretch of the road where construction is in progress at the site. (Total 05 locations) | Three times in a Year for two years. (Excluding Rainy season) | Contractor through NABL approved monitoring agency | Environment Expert-AE |
|               | Operation Stage    | Noise levels on dB (A) scale | As per CPCB                                                                                            | Noise standards by CPCB         | As directed by the Engineer (04 Project locations)                                                                      | As specified by the Engineer                                  | PIU                                                | PIU                   |

Consultancy services for Preparation of Phase I Reports for Improvement of NH127B (Assam Portion), Srirampur to Dhubri to NH standard

**Corridor No : N127B (Assam); Srirampur - Dhubri**

**Phase I:  
Supplementary Environmental  
Impact Assessment**

|      |                    |                                               |      |                        |                                                       |                                     |            |                       |
|------|--------------------|-----------------------------------------------|------|------------------------|-------------------------------------------------------|-------------------------------------|------------|-----------------------|
| Soil | Construction Stage | NPK, heavy metals & oil-Grease                | ---- | As per Standard (ICAR) | 03 major construction locations. (Total 03 locations) | Three times in a Year for two years | Contractor | Environment Expert-AE |
|      | Operational Stage  | NPK, heavy metals & oil-Grease, water courses | ---- | As per Standard (ICAR) | As directed by the Engineer. (03 Project locations)   | As specified by the Engineer        | PIU        | PIU                   |



**Table 63: Environmental Monitoring Budget**

| S. No                        | Parameters/ Components                              | Frequency                                                                                      | UnitCost/Sample(Rs) | TotalCost(Rs) |
|------------------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------|---------------|
| 1                            | <b>Ambient Air Monitoring</b><br>Construction Stage | At 05 locations for three season in a year for 2 years<br><b>(Total 30 samples in 2 years)</b> | 5600                | 168000        |
|                              | Operation Stage                                     | At 4 locations for three season for a year<br><b>(Total 12 samples in 1 year)</b>              | 5600                | 67200         |
| 2                            | <b>Ground Water Sampling</b><br>Construction Stage  | At 4 locations for three season in a year for 2 years<br><b>(Total 24 samples in 2 years)</b>  | 5000                | 120000        |
|                              | Operation Stage                                     | At 4 locations for three season for a year<br><b>(Total 12 samples in 1 year)</b>              | 5000                | 60000         |
| 3                            | <b>Surface Water Sampling</b><br>Construction Stage | At 4 locations for three season in a year for 2 years<br><b>(Total 24 samples in 2 years)</b>  | 5000                | 120000        |
|                              | Operation Stage                                     | At 4 locations for three season for a year<br><b>(Total 12 samples in 1 year)</b>              | 5000                | 60000         |
| 4                            | <b>Noise Monitoring</b><br>Construction Stage       | At 05 locations for three season in a year for 2 years<br><b>(Total 30 samples in 2 years)</b> | 700                 | 21000         |
|                              | Operation stage                                     | At 04 locations for three season for a year<br><b>(Total 12 samples in 1 year)</b>             | - 700               | 8400          |
| 5                            | <b>Soil Monitoring</b><br>Construction Stage        | At 03 locations for three season in a year for 2 years<br><b>(Total 18 samples in 2 years)</b> | - 4500              | 81000         |
|                              | Operation Stage                                     | At 03 locations for for three season for a year<br><b>(Total 09 samples in 1 year)</b>         | - 4500              | 40500         |
| <b>Total Monitoring Cost</b> |                                                     |                                                                                                |                     | 746100        |

## J. Proposed Institutional Arrangement

NHIDCL, as the Project Executing Agency, shall be responsible for overall implementation of the project, and shall perform, or cause to be performed, its obligations as set forth herein and the Project Agreement through Government of Assam.

A dedicated safeguards team for implementation of safeguards for all projects under NHIDCL including the current project, shall be appointed. The team will be headed by the Member (Administration) and supported by a Deputy General Manager (DGM) and Manager at the headquarter level and an engineer from each Project Implementation Unit (PIU) at the field level.

NHIDCL shall establish field Project Implementation Unit (PIU) for implementing the project. PIU will oversee works for roads under the project. One of the engineers in PIU will be appointed as the safeguards focal person and be responsible for overseeing implementation of EMP.

A construction supervision consultant (CSC) firm will be recruited to supervise and administer civil works contracts and to ensure the works are executed in accordance with the drawings, technical specifications and contract conditions including implementation of EMP. The CSC team will include one environmental specialist and one wildlife specialist. Responsibilities for environmental safeguard implementation is described in below table;

**Table 64: Responsibilities for Environmental Safeguards Implementation**

| S. No | Agency                                                                                     | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.    | NHIDCL - HQ Level,<br>Member (Administration),<br>Deputy General Manager<br>(DGM), Manager | <ul style="list-style-type: none"><li>• Ensure that project complies with GOI laws and regulations</li><li>• Ensure that contract documents include all relevant parts of the environmental assessment and project agreements.</li><li>• Ensure that sufficient funds are available to properly implement all agreed environmental safeguards measures</li><li>• Obtain all statutory clearances and permissions.</li><li>• Review and approve the Contractor's Implementation Plan with Supervision Consultant for the environmental measures, as per the EMP</li><li>• Review the environmental performance of the project through an assessment of the periodic environmental monitoring reports submitted by the Supervision Consultants</li><li>• overall project coordination and management through PIU supported by CSC</li><li>• Formation of Grievance Redress Mechanism</li><li>• Ensure updating of the EMP if any new or unanticipated environmental impacts occur during project implementation</li><li>• due to design change or other reasons</li></ul> |

| S. No | Agency                                                            | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.    | Project Implementation Unit (PIU) – Field Level                   | <ul style="list-style-type: none"> <li>• Ensure that Project complies with GoI laws and regulations</li> <li>• Ensure that the environment checklist is completed on time by contractor, reviewed by CSC and submitted to NHIDCL</li> <li>• Participating in State and District level meetings to facilitate LA and R&amp;R activities</li> <li>• Periodic appraisal of progress and reporting to the HQ on monthly basis,</li> <li>• Facilitating the contractor to obtain necessary permissions/ approvals and its submission to HQ</li> <li>• Directly interact with project affected persons and record their views and grievances and transmit the same to HQ</li> <li>• Settle grievances if any at field level.</li> <li>• Review and approve the package specific EMP's and EMOP's and make necessary modifications if required.</li> <li>• Facilitate the establishment of a grievance redress mechanism, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances related to environment safeguards</li> <li>• Ensure that all mitigation measures as given in the EMP are implemented properly</li> <li>• Ensure proper conduction of environmental monitoring during pre-construction, construction and operation phases</li> <li>• Verify the monitoring checklists/reports prepared by the CSC</li> <li>• Ensure annual environmental monitoring reports are prepared</li> <li>• Identify environmental corrective actions and prepare a corrective action plan, as necessary</li> </ul> |
| 3.    | Environment Specialist, Construction Supervision Consultant (CSC) | <ul style="list-style-type: none"> <li>• Review and approve the contract package specific EMAP's prepared by the contractor</li> <li>• Daily on site supervision for implementation of environmental safeguards</li> <li>• Completion of monitoring checklists</li> <li>• Close coordination and communication with the contractor to facilitate implementation of all mitigation measures identified in EMP</li> <li>• Preparation of monitoring reports and submission to PIU</li> <li>• Provide technical support and advise for addressing complaints and grievances</li> <li>• Provide technical advice and on the job training to the contractors as necessary</li> <li>• Preparation of annual monitoring reports based on the monitoring checklists and submission to NHIDCL</li> <li>• Review and approve updated/revised contract specific EMP's if an new or unanticipated environmental impacts occur during project implementation due to design change or other reasons</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| S. No | Agency     | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.    | Contractor | <ul style="list-style-type: none"> <li>Responsible for the physical implementation of the mitigation measures proposed in the Environmental Management Plans (EMP) associated with the construction activities.</li> <li>Responsible for implementation of the Environmental Monitoring Program (EMOP) on collection of environmental quality data. Prepare contract package specific (EMOP) for approval by the CSC and/or PIU before the start of physical works</li> <li>Ensure that adequate budget provisions are made for implementing all mitigation measures specified in the EMP and EMOP</li> <li>Participate in induction training on EMP provisions and requirements delivered by the PIU</li> <li>Obtain necessary environmental license(s), permits etc. from relevant agencies for associated facilities for project road works, quarries, hot-mix plant etc. prior to commencement of civil works contracts.</li> <li>Implement all mitigation measures in the EMP</li> <li>Ensure that all workers, site agents, including site supervisors and management participate in training sessions delivered by CSC.</li> <li>Ensure compliance with contractual obligations</li> <li>Collect the baseline data on environmental quality before the start of physical works and continue collection of environmental quality data as given in the Environmental Monitoring Plan during construction</li> <li>Respond promptly to grievances raised by the local community or and implement corrective actions</li> </ul> |

## K. Reporting System

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

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

## L. Non Conformity To Environmental Management Plan (EMP)

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

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

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

- On observing any lapses, PIU shall issue a notice to the Contractor, to rectify the same.
- Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.
- If a major lapse is not rectified upon receiving the notice PIU shall invoke reduction, in the subsequent interim payment certificate.
- For major lapses, 1% of the interim payment certificate will be deducted, subject to a maximum limit of about 0.1% of the contract value.

### M. Institutional/Capacity Building

To enhance the capacity of officials for effective implementation of proposed mitigation measures and monitoring the resultant effects, as well as create awareness amongst workers and public, the training and awareness program is planned and is given in Table 65. The institutions/agencies like regional office of MoEF, SPCB/CPCB, and Indian Institute of Technologies can be consulted for such trainings. Independent subject's experts/consultants (e.g., for the environmental awareness program, impact assessment specialist will be the resource person) can also be the resource persons to impart trainings. These experts /agencies shall be appointed based on specific need for the training. A separate budget for training has been allocated under the CSC budget.

**Table 65: Outline Capacity Building Program on EMP Implementation**

| Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Target Participants and Venue                                                                                                    | Estimate (₹) <sup>18</sup>                                                                     | Cost and Source of Funds              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------|
| 1. Introduction and Sensitization to Environmental Issues (1 day)<br>- JICA environmental safeguard policy<br>- Government of India and Assam applicable safeguard laws, regulations and policies including but not limited to core labor standards, occupational health and safety, etc.<br>- Incorporation of environmental management plan (EMP) into the project design and contracts<br>- Monitoring, reporting and corrective action planning<br>- Awareness programme for COVID -19 | All staff and consultants involved in the project<br><br>At project management unit (PMU) (combined program for all subprojects) | -                                                                                              | Included in the overall program cost  |
| 2. EMP implementation (1/2 day per alternative month for 24 month = 12 mandays)<br>- EMP mitigation and monitoring measures<br>- Roles and responsibilities<br>- Public relations, -Consultations<br>- Grievance redress<br>- Monitoring and corrective action planning<br>- Reporting and disclosure                                                                                                                                                                                      | All project implementation unit (PIU) staff, contractor staff and consultants involved in the subproject<br><br>At PIU           | ₹120,000<br>Typical manday rate of an JICA Consultant 20,000/-.<br>(20,000x0.5 x12)= 120,000/- | Included in subproject cost estimates |

<sup>18</sup> The rate are as per current market rate.

| Description                                                                                                                                                                                                       | Target Participants and Venue                                                                                                                                                 | Estimate (₹) <sup>18</sup> | Cost and Source of Funds |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|--------------------------|
| - Construction site standard operating procedures (SOP)<br>-- Chance find (archeological) protocol<br>- AC pipe protocol<br>- Traffic management plan<br>- Waste management plan<br>Site clean-up and restoration |                                                                                                                                                                               |                            |                          |
| 3. Contractors Orientation to Workers (1/2 day)<br>- Environment, health and safety in project construction                                                                                                       | Once before start of work, and thereafter regular briefing every month once.<br>Daily briefing on safety prior to start of work<br>All workers (including unskilled laborers) | -                          | Contractors cost         |

## N. Environmental Budget

The environmental budget for the various environmental management measures proposed in the EMP is detailed in table below. The budget has been worked out on the basis of market rates.

**Table 66: Mitigation and enhancement cost in construction and operation phase**

| Sl. no                        | Environmental Components | Particulars                                                                                                                    | Unit      | Rate In (Rs.)                                                                                                          | Approx. Quantity | Total Cost In (Rs.) |
|-------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|
| Mitigation / Enhancement Cost |                          |                                                                                                                                |           |                                                                                                                        |                  |                     |
| <b>2</b>                      | Construction Stage       |                                                                                                                                |           |                                                                                                                        |                  |                     |
| <b>2.1</b>                    | Air                      | Dust Management with sprinkling of water, covers for vehicles transporting construction material                               | 54.154 Km | Cost included in Total Civil Cost                                                                                      |                  |                     |
| <b>2.2</b>                    | Water                    | Provision of Taps                                                                                                              | No.       | Included in utility shifting and replacement cost.                                                                     |                  |                     |
|                               | Water Bodies             | Enhancement of Road side Ponds (18 big ponds as per EMP Table 61) Total length of water bodies proposed for enhancement = 900m | No.       | Retaining wall has been proposed to protect this water bodies. Cost of retaining wall is included in total Civil Cost. |                  |                     |
|                               |                          | Oil trap at parking/servicing of construction vehicles (at three location every 14km)-                                         | No.       | Ref: Project Cost Estimate                                                                                             |                  |                     |



| Sl. no                              | Environmental Components              | Particulars                                                                                                                                                                                                                                                                                                                                                                         | Unit | Rate In (Rs.)                                                                                                                          | Approx. Quantity | Total Cost In (Rs.) |
|-------------------------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|
| 2.3                                 | Environmental Enhancements            | Enhancement of traffic sign outside of most sensitive locations mentioned in EMP, by planting of traffic sign and planting of 1 row of trees at a distance of 3m c/c and as per directions of the Engineer                                                                                                                                                                          | No.  | At this location proper traffic sign has been proposed. The cost of traffic sign is included in total civil cost.                      |                  |                     |
| 2.4                                 | Flora                                 | 1. Compensatory Afforestation @ 1:10 ratio (Number of trees to be cut =4202) Compensatory Afforestation (Greenbelt) will be provided within the ROW along the roadside at available locations and especially in some of the project section where roadside plantation (greenbelt) does not exist or found very few, including watering and maintenance of Planted trees for 5 years | Nos. | 831 for per year for 1 year. <sup>19</sup>                                                                                             | 42020            | 16,06,25,652        |
|                                     |                                       | Tree guarding (Making Tree Guard 53 cm dia and 1.3 m each 359.00 high as per design from empty bitumen Drum) Price details as per SoR, PWD, Assam is attached in annexure 23                                                                                                                                                                                                        | Nos. | 359                                                                                                                                    | 42020            | 1,50,85,180         |
| 2.5                                 | Silt Runoff Control                   | Slope stabilization, turfing, silt fencing etc                                                                                                                                                                                                                                                                                                                                      |      | For slope stabilization turfing has been proposed on high embankment. Cost of slope stabilization is included in Total Civil Cost.     |                  |                     |
| 2.6                                 | Slope/ embankment protection measures | Stone pitching, Gabion, Retaining wall, Turfing at toe line, etc                                                                                                                                                                                                                                                                                                                    |      | For Slope/ embankment protection Retaining wall, Turfing has been proposed. Cost of Slope/ embankment is included in Total Civil Cost. |                  |                     |
| Total Mitigation / Enhancement Cost |                                       |                                                                                                                                                                                                                                                                                                                                                                                     |      |                                                                                                                                        |                  | 17,57,10,832        |

<sup>19</sup> Considering typical 90% survival rate after 1 year.

Source:

[http://www.indiaenvironmentportal.org.in/files/file/Green%20Highways%20\(Plantation%20&%20Maintenance\)%20Policy-2015.pdf](http://www.indiaenvironmentportal.org.in/files/file/Green%20Highways%20(Plantation%20&%20Maintenance)%20Policy-2015.pdf)

| Sl. no     | Environmental Components                               | Particulars                            | Unit | Rate In (Rs.)                          | Approx. Quantity                                            | Total Cost In (Rs.) |
|------------|--------------------------------------------------------|----------------------------------------|------|----------------------------------------|-------------------------------------------------------------|---------------------|
| <b>3</b>   |                                                        | <b>Operation Stage</b>                 |      |                                        |                                                             |                     |
| <b>3.1</b> | Soil erosion                                           | Mitigation measure for soil erosion    |      |                                        | included in Total Civil Cost                                |                     |
| <b>3.2</b> | Contamination from spills due to traffic and accidents | Clearing of spills at accident site    |      |                                        | Average cost (detailed calculation is given in annexure 23) | 700,000             |
| <b>3.3</b> | Flora                                                  | Maintenance of planted trees           |      | Already included in construction phase |                                                             |                     |
| <b>3.4</b> | Safety                                                 | Traffic management and Traffic control |      | Part of project construction cost.     |                                                             |                     |
|            |                                                        | Total Mitigation / Enhancement Cost    |      |                                        |                                                             | 700,000             |

**Table 67: Summary of Environmental Management Budget**

| Sl. No.                          | Environmental Components             | Cost (Rs.)             |
|----------------------------------|--------------------------------------|------------------------|
| <b>1</b>                         | <b>Construction Phase</b>            |                        |
| 1.1                              | Total Mitigation / Enhancement Cost  | 17,57,10,832.00        |
| 1.2                              | Environmental Monitoring Cost        | 5,10,000.00            |
| Total Cost in Construction phase |                                      | <b>17,62,20,832.00</b> |
| <b>2</b>                         | <b>Operation Phase</b>               |                        |
| 2.1                              | Total Mitigation / Enhancement Cost  | 7,00,000.00            |
| 2.2                              | Environmental Monitoring Cost        | 2,36,100.00            |
| Total Cost in Operation Phase    |                                      | <b>9,36,100.00</b>     |
| <b>3</b>                         | <b>Miscellaneous Cost</b>            |                        |
| 3.1                              | Environmental Awareness and Training | 1,20,000.00            |

| Sl. No.                            | Environmental Components                   | Cost (Rs.)             |
|------------------------------------|--------------------------------------------|------------------------|
| 3.2                                | Administrative Charges including logistics | 4,00,000.00            |
| Total Cost in Miscellaneous        |                                            | <b>5,20,000.00</b>     |
| <b>TOTAL BUDGETED COST (1+2+3)</b> |                                            | <b>17,76,76,932.00</b> |

An environmental management budget at of **INR 17,76,76,932.00/-** (Seventeen crore seventy six lakhs seventy six thousands nine hundred thirty two rupees) has been estimated for implementation of the environmental management plan. This budget includes cost of environmental monitoring and associated trainings.

## 9. GRIEVANCE REDRESSAL MECHANISM

### A. Introduction

Grievance Redressal Mechanism is an integral part of the institutional arrangement in relation to social safeguard issues. At present, there is no established grievance redressal mechanism in PMU. A common GRM will be put in place to redress social, environmental or any other project and/or subproject related grievances. Public awareness campaign is being conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign ensured that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements as per project entitlement matrix. PMU through Project Construction Management Consultant (PCMC) ensure that their grievances are addressed. Anticipated grievances from the environmental point of view could be;

- Affected persons missed out/ not enumerated during the survey,
- Social category and vulnerability incorrect,
- Difference in land area acquired/purchased and measured at site,
- Type and use of land acquired/purchased not considered correctly,
- Wrong measurement of structure/building affected,
- Wrong valuation of structure/building,
- Damage to adjoining property,
- Construction activities at the site, quality of works, safety, etc.
- Road safety ,
- Environmental hazards like dust, noise, air pollution etc.

In view of the above, a Grievance Redressal Committee (GRC) will be constituted by the Project Authority with the aim to resolve as many grievances as possible related to resettlement and rehabilitation and land acquisition/purchase through consultations and negotiation. Affected persons have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaint register in Gram Panchayat office or PMU or PCMC office. Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved is recorded. The name of the persons to be included in the field level GRM will be suggested shortly. The flow chart of grievance redress process is shown in Figure 53. GRM information sheet is attached in annexure 7.

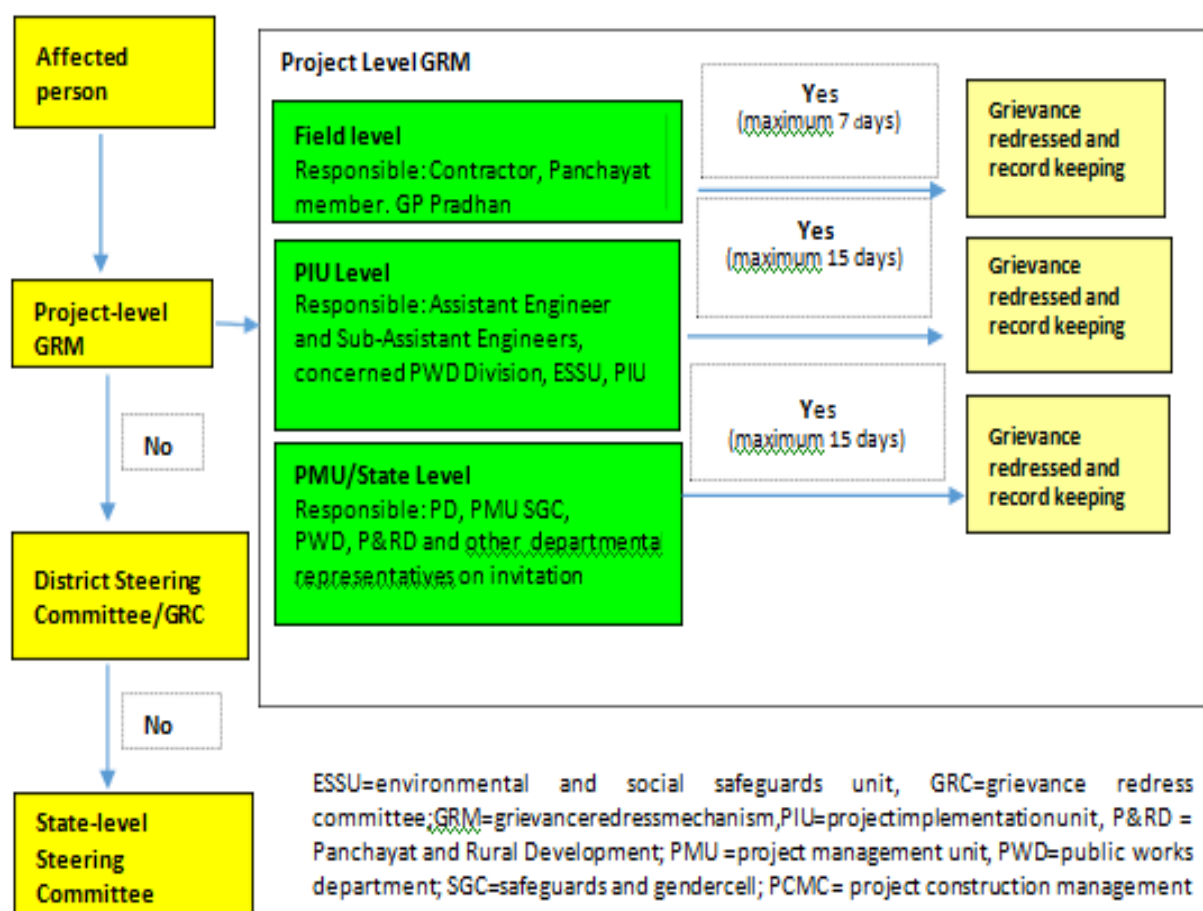


Figure 53: Grievance Redress Mechanism

- **JICA GRS:** Communities and individuals who believe that they are adversely affected by a JICA supported project may submit complaints to existing project-level grievance redress mechanisms or the JICA's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the JICA's independent Inspection Panel which determines whether harm occurred, or could occur, as a result of JICA non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the JICA attention, and Bank Management has been given an opportunity to respond.
- A detailed process of Grievance Redressal Mechanism has been described in Chapter 11 of Supplementary Social Impact Assessment (SEIA).

## 10. CONCLUSION AND RECOMMENDATION

Generally the infrastructure projects are intended to improve the economic and social welfare of the people. At the same time, they may also create adverse impacts on the surrounding environment. The development and operation should, therefore, be planned with careful consideration of the environmental impacts. To minimize these adverse effects that may be created by the projects, the techniques of EIA become necessary.

The proposed road is newly declared NH-127 B (Assam portion) starting from Srirampur on NH-27(old NH-31C) at Chainage 0.00 km to the immediate approach of proposed bridge over river Brahmaputra near Dhubri at chainage 54+154 km to NH standard.

### A. Significant Findings:

The report was prepared after thorough interaction with the engineering section of the consultants, interaction with Govt. officials, public consultations, baseline surveys, collection of primary and secondary datas, so that the negative impacts on the environment and human population could be avoided as far as possible. Some of the important findings of the study are as follows: -

1. There will be no loss of bio-diversity as no rare plant or animal species are going to be affected by the present project.
2. The proposed alignment of the road would be such that it has minimum impact on physical and social environment. Total 84 number of CPR will be affected.
3. Approximately 4202 trees will be cut down due to the proposed project improvement and 42020 (10 times) of trees will be planted as part of the compensation.
4. There is no wildlife migrant route in the project section, which could be affected.
5. No Sanctuary or National Park is located within 10 km radius of the project section.
6. No monuments protected by the Archaeological Survey of India (ASI) are located within the ROW of highway.
7. Total land acquisition is only 159.071 hectares (Private land: 142.688 Ha and Govt. land: 16.383 Ha.).
8. No Reserve or Protected forest falls within the project road.
9. The project road traverses through a flood prone area, hence soil erosion & flooding is a major issue, for which suitable management measures like sufficient CD structures, increased height of embankments etc. are provided in the design report.
10. The impacts on environment (Air, Water, Noise, & Soil) are negligible and temporary i.e mostly during construction phase only.

The Environmental Management Plan is prepared for avoidance, mitigation and management of the negative impacts of the project. EMP includes the list of all the project related activities, their impacts at different stages of project during pre-construction phase / design phase, construction phase and operational phase on environment and remedial measures to be undertaken to mitigate these impacts. Total cost for implementation of environment management plan for the project is INR 17,76,76,932.00/- (seventeen crore seventy six lakhs seventy six thousands nine hundred thirty two).

The Environmental Monitoring Programs are suggested to provide information on which management decisions may be taken during construction and operational phase. The objectives of these programs are: - To evaluate the efficiency of mitigation measures, updating the actions & impacts of baseline data and adaptation of additional mitigation measures (if the present



measures are insufficient) and generation of the data that may be incorporated in the environmental management plan in future projects.

From the entire EIA study, it is established that the project will not cause any significant impact to the environment and to the society. Some impacts are identified, which are temporary and will be mitigated suitably.

Some of the impacts attributable due to the project are tree cutting, deterioration of environmental attributes during construction phase from land clearing, silt run off, loss of natural resources and occupational health and safety. These impacts can be mitigated by adopting good construction practices and effective implementation of Environmental Management Plan (EMP).

## ANNEXURES

### Annex 1: JICA Scoping Matrix for Environmental Impact Assessment

| Item              | No. | Impact              | Scoping                |                    |                 | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------|-----|---------------------|------------------------|--------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |     |                     | Pre construction stage | construction Phase | Operation Phase |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Pollution Control | 1   | Air Quality         | D                      | B-                 | B-              | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b><br>- Minimum dust dispersion will be expected.<br>- Maintenance of machinery will be conducted regularly, resulting in reducing exhaust gas emissions.<br><b>Operation phase:</b><br>- Air pollution caused by exhaust gas generated as the more vehicles traffic predicted.                                                                                          |
|                   | 2   | Water Quality       | D                      | B-                 | B-              | <b>Pre Construction phase: Nil</b><br><b>Construction/Operation phase:</b><br>Although turbidity increases due to construction near the river area, the effect is temporary. For wastewater accompanying concrete construction and wastewater containing oil, the muddy stream caused by embankment at the time of rainy weather.                                                                                                      |
|                   | 3   | Waste               | D                      | B-                 | D               | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> Generally C & D & hazardous waste generated during construction phase, suitable mitigation and disposal facility will be provided.<br><b>Operation phase:</b> No waste will be generated                                                                                                                                                                              |
|                   | 4   | Soil Contamination  | D                      | B-                 | B-              | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> There is chance of soil contamination due to leakage of oil from the operation and maintenance of equipments and machineries. Suitable measures like provision of oil interceptor, secondary containment will be provided along with suitable disposal.<br><b>Operation phase:</b> May occurred in case of any oil spill in the road and leaching to the surrounding. |
|                   | 5   | Noise and Vibration | D                      | B-                 | B-              | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> Minor noise may be generated due to construction activity and movement of vehicles. Suitable mitigation measures will be adopted during construction phase and strict timeline will be followed in the residential and sensitive areas.<br><b>Operation phase:</b> Noise may be generated from the movement of vehicles and machineries, which is temporary.          |
|                   | 7   | Sediment            | D                      | B-                 | D               | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> Sedimentation may occur due construction of cross drainage structures and bridges                                                                                                                                                                                                                                                                                     |

| Item                | No. | Impact                            | Scoping                |                    |                 | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------|-----|-----------------------------------|------------------------|--------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     |     |                                   | Pre construction stage | construction Phase | Operation Phase |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                     |     |                                   |                        |                    |                 | on river. Suitable mitigation measures will be provided.<br><b>Operation phase:</b> Nil                                                                                                                                                                                                                                                                                                                                                                             |
| Natural Environment | 8   | Protected Areas                   | D                      | D                  | D               | <b>Pre Construction phase:</b> No protected area falls within 10 kms of the project road.<br><b>Construction phase:</b> No protected area falls within 10 kms of the project road.<br><b>Operation phase:</b> No protected area falls within 10 kms of the project road.                                                                                                                                                                                            |
|                     | 9   | Ecosystem                         | D                      | B-                 | B-              | <b>Pre Construction phase:</b> Nil<br><b>Construction phase:</b> Cutting of trees and habitat fragmentation may caused by the proposed project, which has some impact on the ecosystem. Mitigation measures like under passes, compensatory afforestation will be there.<br><b>Operation phase:</b> Temporary impact is there like Vehicular noise disturbs the hearing of animals and birds, lighting on animals and accidents road during crossing.               |
| Natural Environment | 10  | Hydrology                         | D                      | B-                 | D               | <b>Pre Construction phase:</b> Nil<br><b>Construction phase:</b> May alter the hydrological process during construction of bridges in the river. Sedimentation may also have some impact on it. Suitable measures will be provided.<br><b>Operation phase:</b> No impact                                                                                                                                                                                            |
|                     | 11  | Topography and Geology            | D                      | B-                 | D               | <b>Pre Construction phase:</b> Nil<br><b>Construction phase:</b> As the road is in plain terrain, no major change will occur in the topography. Only the widening of road and new bypasses due to cutting and filling will slightly change the topography.<br><b>Operation phase:</b> Nil                                                                                                                                                                           |
|                     | 12  | Soil Erosion                      | D                      | B-                 | B-              | <b>Pre Construction phase:</b> Nil<br><b>Construction phase:</b> As the project is in flood prone area and parallel to a river, soil erosion is common particularly in rainy season. Suitable mitigation measures will be provided during construction phase to avoid soil erosion and for embankment protection.<br><b>Operation phase:</b> During flood and heavy rain, soil erosion may take place. Suitable mitigation measures will be in place and monitored. |
| Social Environment  | 12  | Resettlement and Land Acquisition | C                      | D                  | B+              | <b>Pre Construction phase:</b> The project will require Resettlement and land acquisition, however the extent is yet to be finalised.<br><b>Construction phase:</b> Nil                                                                                                                                                                                                                                                                                             |

| Item               | No. | Impact                                                | Scoping                |                    |                 | Rationale                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------|-----|-------------------------------------------------------|------------------------|--------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |     |                                                       | Pre construction stage | construction Phase | Operation Phase |                                                                                                                                                                                                                                                                                                                                                                             |
|                    |     |                                                       |                        |                    |                 | <b>Operation phase:</b> implementation of RAP is expected to generate beneficial impacts.                                                                                                                                                                                                                                                                                   |
|                    | 13  | Poor Classes                                          | D                      | B+                 | B+              | <b>Pre Construction phase: Nil</b><br><b>Construction phase and Operational phase:</b> Envisage to have increase employment/ income generation opportunity.                                                                                                                                                                                                                 |
|                    | 14  | Tribal Peoples                                        | D                      | C                  | C               | <b>Pre Construction phase: Nil</b><br><b>Construction phase and Operational phase :</b> It is known that around 12km of the project road is passing through BTC area, inhabited by Schedule tribes. However the STs are not culturally attached to the Natural Habitat including the Land.                                                                                  |
|                    | 15  | Local Economy such as Employment and Livelihood, etc. | D                      | B+                 | B+              | <b>Pre Construction phase: Nil</b><br><b>Construction phase and Operational phase:</b> Envisage to have increase employment/ income generation opportunity.                                                                                                                                                                                                                 |
| Social Environment | 16  | Land Use and the Utilization of Local Resources       | B                      | B-                 | B+              | <b>Pre Construction phase:</b> It is envisage that proper utilization of local resources in project will be incorporated in the project design.<br><b>Construction phase:</b> Potential exploitation of local resources<br><b>Operational phase:</b> Due to better connectivity land use planning and utilization of local resources is expected to reap positive benefits. |
|                    | 17  | Water Usage and Water Rights                          | B                      | B-                 | D               | <b>Pre Construction phase:</b> proper planning of the local water resources for road construction is expected to avoid any competing water usage and water right issues.<br><b>Construction phase:</b> here are potential contamination which may limit the water usage for other users.<br><b>Operational phase: Nil</b>                                                   |
|                    | 18  | Existing Social Infrastructure and Services           | B                      | B-                 | A+              | <b>Pre Construction phase:</b> Road alignment has been done in such a way to minimize adverse impacts on social infrastructures and services.<br><b>Construction phase:</b> Temporary access restrictions.<br><b>Operational phase:</b> Significant positive impacts due to enhanced social infrastructures (additional CPR) and services (improved connectivity).          |
|                    | 19  | Local Communities and Decision-making Institutions    | D                      | B-                 | B+              | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> Community property resource (CPR) will be impacted during the construction of project by collective decision of the community which will be restored/rehabilitated/resettled during operation<br><b>Operational phase:</b> New CPR will be developed in Post construction phase.                           |

| Item | No. | Impact                                       | Scoping                |                    |                 | Rationale                                                                                                                                                                                                                                                                                                                                                          |
|------|-----|----------------------------------------------|------------------------|--------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |     |                                              | Pre construction stage | construction Phase | Operation Phase |                                                                                                                                                                                                                                                                                                                                                                    |
|      | 20  | Unequal Distribution of Benefits and Damages | D                      | B                  | D               | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> Vulnerable population will be given a special assistance of Rs. 25,000/- over and above all other compensation and assistance. Potential unequal wages to women workers.<br><b>Operational phase: Nil</b>                                                                                         |
|      | 21  | Local Conflicts of Interest                  | D                      | B                  | D               | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> Local community will be involved in construction works and petty contractors.<br><b>Operational phase: Nil</b>                                                                                                                                                                                    |
|      | 22  | Cultural Heritage                            | B                      | B-                 | B+              | <b>Pre Construction phase:</b> Road alignment has been done in such a way to minimize adverse impacts on cultural heritages properties.<br><b>Construction phase:</b> Religious places as well as cultural properties (local theatres, festival ground etc) may get damaged/impacted due to restricted access.<br><b>Operational phase:</b> This will be enhanced. |
|      | 23  | Landscape                                    | B                      | B-                 | B-              | <b>Pre Construction phase:</b> Road alignment has been done in such a way to minimize change in existing land scape.<br><b>Construction phase and Operational phase:</b> There would be changes in land scape such as conversion of crop land in roads and other built up structures.                                                                              |
|      | 24  | Gender                                       | D                      | B+                 | B+              | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> Local females will be employed as unskilled/skilled worker and also play an important role in GRM.<br><b>Operational phase:</b> Training to the local people specially the women, will be provided for livelihood restoration.                                                                    |
|      | 26  | Children's Rights                            | B                      | B-                 | B+              | <b>Pre Construction phase:</b> use of child labour in any of project activities will be strictly prohibited through contract.<br><b>Construction phase:</b> Potential exploitation of child labour.<br><b>Operational phase:</b> Better access to health and educational institutes for children.                                                                  |
|      | 27  | Infectious Disease such as HIV/AIDS          | D                      | B-                 | B-              | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> Because of influx of migrant labours probability of increase in HIV/AIDS.<br><b>Operational phase:</b> Due to improved road connectivity numbers of heavy vehicle (Trucks) will be increased. Therefore there is probability of increase of HIV/AIDS through truck drivers.                       |
|      | 28  | Work Environment (Including                  | B+                     | B-                 | B+              | <b>Pre Construction phase:</b> Improved design the existing road to enhance the work safety.<br><b>Construction phase:</b> During construction work                                                                                                                                                                                                                |

| Item   | No. | Impact                                   | Scoping                |                    |                 | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------|-----|------------------------------------------|------------------------|--------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|        |     |                                          | Pre construction stage | construction Phase | Operation Phase |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|        |     | Work Safety)                             |                        |                    |                 | environment and work safety can be affected.<br><b>Operational phase:</b> Because of improved design operation phase work environment and work safety is expected to be improved.                                                                                                                                                                                                                                                                              |
|        | 29  | Sunlight                                 | D                      | D                  | D               | There is no impacts is anticipated.                                                                                                                                                                                                                                                                                                                                                                                                                            |
|        | 30  | Accidents                                | B+                     | B-                 | B+              | <b>Pre Construction phase:</b> project is designed in such a way to minimize traffic accidents.<br><b>Construction phase:</b> there can be various construction related accidents.<br><b>Operation phase:</b> better road design will expected to reduce traffic accidents.                                                                                                                                                                                    |
|        | 31  | Cross-boundary Impact and Climate Change | B+                     | B-                 | B-              | No cross boundary impact is anticipated due to this project.<br><b>Pre Construction phase:</b> project design has been done in such a way to minimize all adverse impacts of climate changes.<br><b>Construction phase:</b> Construction instruments including hotmix plant, batching plant etc are potential source of GHG emission.<br><b>Operation phase:</b> better road connectivity leads to increase traffic volume which will cause more GHG emission. |
| Others | 32  | Climate Change                           | D                      | B-                 | B-              | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> The emission of GHGs from use of construction machines and operation of vehicles will have minor impact. Regular maintenance of vehicles and machineries will be done. New machineries and vehicles will be encourages for the project.<br><b>Operation phase:</b> The GHG emission will increase due to an increase in traffic volume.                                                       |
|        | 33  | Natural Disaster                         | D                      | B-                 | B+              | <b>Pre Construction phase: Nil</b><br><b>Construction phase:</b> The project road is prone to flood and thus appropriate measures will be provided for the construction work to minimize the impact.<br><b>Operation phase:</b> Slope protection/stabilization measures and drainage are expected to significantly reduce the risk of natural disaster.                                                                                                        |

A: Significant impact is expected (+: Positive impact, -: Negative impact), B: Some impact is expected (+: Positive impact, -: Negative impact), C: Extent of impact is unknown, further examination will be required (+: Positive impact, -: Negative impact), D: No impact is expected,

Source: JICA Study Team



## Annex 2: NOC from Divisional Forest Officer (Dhubri Division)

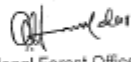


OFFICE OF THE DIVISIONAL FOREST OFFICER :: DHUBRI DIVISION ::  
DHUBRI - 783 301

To whom it may concern

This is to certify that the up-gradation of newly declared NH - 127 B do not  
pass through any recorded forest area of Dhubri Forest Division.

Dated, Dhubri  
The 18<sup>th</sup> July, 2016.

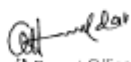
  
Divisional Forest Officer  
Dhubri Division

No. B/ 101 / 1 / NH-127B / 2528-21

Dated, Dhubri the 18th July, 2016.

✓ Copy to the C.E Testing Company Pvt. Ltd, Kolkata for information and  
necessary action.

Copy to the Range Officer, Forest Check Station, Dhubri for information with  
reference to his telephonic confirmation from him on 18.07.2016.

  
Divisional Forest Officer  
Dhubri Division

  
GOVERNMENT OF ASSAM  
OFFICE OF THE DIVISIONAL FOREST OFFICER :: PARBATJHORA DIVISION  
SUPARIGHAT

No. B/PJD/ NH-127B /2016-17/ ~~407~~ 11-12 Dated, Suparighat, the 15/07/2016

To  
✓ C. E. Testing Company Pvt. Ltd.  
124A, N.S.C. Bose Road,  
Kolkata-700092.

Sub: Up-gradation & Construction the newly declared NH-127B

Ref: Your Letter No. DPR/3636/NH127B/2016 dt. 13<sup>th</sup> July/2016.

Sir,  
With respect to subject cited above, you are hereby informed that the said  
NH-127B do not pass through any recorded forest area of Parbatjhora Forest Division.  
Thanking you,

Yours faithfully,  
  
(Dr. Ramesh C, IFS)  
Divisional Forest Officer,  
Parbatjhora Division, Suparighat

Copy to the Range Officer, Guma Range, Borobadha for information. This is in reference  
to telephonic confirmation from him on 15-07-2016.

  
Divisional Forest Officer,  
Parbatjhora Division, Suparighat



GOVT. OF ASSAM  
BODOLAND TERRITORIAL COUNCIL  
DEPARTMENT OF FOREST  
OFFICE OF THE DIVISIONAL FOREST OFFICER :: KACHUGAON DIVISION  
GSSAIGAON.

Memo No .B/23/1/ NH-27/3073

Dated Gossaigaon the 27/05/ 2016

To,

**The Managing Director  
C.E Testing Company Pvt. Ltd.  
124 A , N.S.C Bose Road, Kolkata.**

Sub:- Consultancy services for Feasibility study and preparation of detailed Project report for construction and up-gradation of the newly declared NH-127B starting from Srirampur on NH-27 (old NH-31C) to immediate approach of proposed bridge over river Brahmaputra near Dhubri in the state of Assam to NH standard.

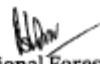
Ref:- Your letter No. DPR/3636/2015/2354 dt. 24/12/2015.

Sir,

With the subject and reference above, I am to inform you that the proposed road from NH-31 (C) to NF Railways within this Kachugaon Division does not fall under any classified Forest land.

So, this is for your information and necessary action.

Yours faithfully

  
Divisional Forest Officer,  
Kachugaon Division, Gossaigaon.

### Annex 3:Gol Ambient Air Quality Standards

| Pollutant                                                   | Time Weighted Average | Concentration in Ambient air ( $\mu\text{g}/\text{m}^3$ ) |                              |
|-------------------------------------------------------------|-----------------------|-----------------------------------------------------------|------------------------------|
|                                                             |                       | Industrial, Residential, Rural and Other Areas            | Ecologically Sensitive Areas |
| Sulphur Dioxide (SO <sub>2</sub> )                          | Annual Average*       | 50                                                        | 20                           |
|                                                             | 24 hr**               | 80                                                        | 80                           |
| Oxides of Nitrogen (as NO <sub>2</sub> )                    | Annual Average *      | 40                                                        | 30                           |
|                                                             | 24 hr**               | 80                                                        | 80                           |
| Particulate Matter: PM <sub>10</sub> (<10 $\mu\text{m}$ )   | Annual Average *      | 60                                                        | 60                           |
|                                                             | 24 hr**               | 100                                                       | 100                          |
| Particulate Matter: PM <sub>2.5</sub> (<2.5 $\mu\text{m}$ ) | Annual Average *      | 40                                                        | 40                           |
|                                                             | 24 hr**               | 60                                                        | 60                           |
| Lead                                                        | Annual Average *      | 0.5                                                       | 0.5                          |
|                                                             | 24 hr**               | 1.0                                                       | 1.0                          |
| Carbon monoxide mg/m <sup>3</sup>                           | 8 hr                  | 2.0                                                       | 2.0                          |
|                                                             | 1 hr                  | 4.0                                                       | 4.0                          |

Annual Arithmetic mean of minimum 104 measurement in a year taken for a week 24 hourly at uniform interval. 24 hourly or 8 hourly or 1 hourly monitored values should meet 98 percent of the time in a year

Source: MoEF notification Central Pollution Control Board (1997) National Ambient Air Quality Monitoring Series, NAQMS/a/1996-97

## Annex 4:GoI Ambient Noise Level Standards

| Area Code | Category      | Limits in Decibels (dB A) |    |
|-----------|---------------|---------------------------|----|
| A         | Industrial    | 75                        | 70 |
| B         | Commercial    | 65                        | 55 |
| C         | Residential   | 55                        | 45 |
| D         | Silence Zones | 50                        | 40 |

Note: (1) Daytime: 6 AM to 10 P.M., Night-time 10 PM to 6 AM;

Silence zone is an area up to 100 m around premises as hospitals, educational institutions and courts. Source: Central Pollution Control Board, New Delhi

## Annex 5: Indian Standard Drinking Water Specification: IS 10500:1991

| Sl. No. | Substance/ Characteristic                                         | Desirable Limit | Permissible limit | Remarks                                                                                                                                                    |
|---------|-------------------------------------------------------------------|-----------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Colour, Hazen units, Max                                          | 5               | 25                | Extended to 25 if toxic substance are not suspected in absence of alternate Sources                                                                        |
| 2       | Odour                                                             | Unobjectionable |                   | a) Test cold and when heated                                                                                                                               |
|         |                                                                   |                 |                   | b) Test at several dilution                                                                                                                                |
| 3       | Taste                                                             | Agreeable       |                   | Test to be conducted only after safety has been established                                                                                                |
| 4       | Turbidity NTU, Max                                                | 5               | 10                |                                                                                                                                                            |
| 5       | pH value                                                          | 6.5 to 8.5      | No relaxation     |                                                                                                                                                            |
| 6       | Total Hardness (as CaCO <sub>3</sub> mg/lit)                      | 600             | 600               |                                                                                                                                                            |
| 7       | Iron (as Fe mg/lit, Max                                           | 0.3             | 1.0               |                                                                                                                                                            |
| 8       | Chlorides (as Cl mg/lit Max                                       | 250             | 1000              |                                                                                                                                                            |
| 9       | Residual Free Chlorine, mg/lit Max                                | 0.2             |                   | To be applicable only when water is chlorinated. Treated at consumer end. When protection against viral infection is required, it should be Min 0.5 mg/lit |
| 10      | Dissolved Solids mg/l, Max                                        | 500             | 2000              |                                                                                                                                                            |
| 11      | Calcium (as Ca) mg/l, Max                                         | 75              | 200               |                                                                                                                                                            |
| 12      | Copper (as Cu) mg/l, Max                                          | 0.05            | 1.5               |                                                                                                                                                            |
| 13      | Manganese (Mn) mg/l Max                                           | 0.1             | 0.3               |                                                                                                                                                            |
| 14      | Sulphate (As SO <sub>4</sub> ), Max                               | 200             | 400               | May be extended up to 400 provided (as Mg) does not exceed 30                                                                                              |
| 15      | Nitrate (as NO <sub>3</sub> ) mg/l, Max                           | 45              | 100               |                                                                                                                                                            |
| 16      | Fluoride (as F) mg/l, Max                                         | 1.0             | 1.5               |                                                                                                                                                            |
| 17      | Phenolic Compounds (as C <sub>6</sub> H <sub>5</sub> OH) mg/l Max | 0.001           | 0.002             |                                                                                                                                                            |
| 18      | Arsenic (as As mg/l                                               | 0.05            | No relaxation     | To be tested when pollution is Suspected                                                                                                                   |



|    |                                   |                                                                              |               |                                          |
|----|-----------------------------------|------------------------------------------------------------------------------|---------------|------------------------------------------|
| 19 | Lead (as Pb) mg/l                 | 0.05                                                                         | No relaxation |                                          |
| 20 | Anionic Detergents (as MBAS) mg/l | 0.2                                                                          | 1.0           |                                          |
| 21 | Chromium (as Cr) mg/l             | 0.05                                                                         | 1.0           | To be tested when pollution is Suspected |
| 22 | Mineral Oil mg/l                  | 0.01                                                                         | 0.03          |                                          |
| 23 | Alkalinity mg/l                   | 200                                                                          | 600           |                                          |
| 24 | Total Coliform                    | 95% of the sample should not contain coliform in 100 ml. 10 coliform /100 ml |               |                                          |

## Annex 6: Record of Public Consultations

**List of Consulted Person & Issues Discussed During Field Visit**

| Sl no | Meeting Location | Chainage | Name & Contact Details        | Date       | Issues raised | Respond |
|-------|------------------|----------|-------------------------------|------------|---------------|---------|
| 1     | Srirampur        | 000-200m | Ranjit Talukdar<br>9957040911 | 29/07/2020 |               |         |
| 2     | Srirampur        | 000-200m | Dipak Dey<br>970748737        | 29/07/2020 |               |         |
| 3     | Srirampur        | 000-200m | Hapijul Sk<br>6001190401      | 29/07/2020 |               |         |
|       |                  |          |                               |            |               |         |
|       |                  |          |                               |            |               |         |
|       |                  |          |                               |            |               |         |

**Issues which are need to discuss**

- Major problem with the road (small road, very poor road condition, railway gate problem)
- Local environmental issues e.g ( flood, noise, dust), etc. (x, v, v)
- Presence of Wild animal along the project road. x
- Congestion and traffic jam along the project road. x
- Issues in street crossing. x
- Traffic density along the project road. x
- Need for the upgradation. What they think (opinion of the local people). They want better road
- Road Side Water logging issues and Duration ( v, half an hour or 40 minutes after raining)
- Safety of Local traffic and pedestrian in Built-up Zone
- Effect of Noise and Dust Pollution (respiratory problem, skin problem)
- Relocation of Road Side Religious Structure (If any)
- Noise and dust pollution in environmental sensitive zone
- Impact on the road side structures due to upgradation of the project road
- Health issues of the local people during construction (respiratory problem, skin problem)
- Adequate traffic signal and sign along the project road
- Any major festival or public gathering along the project road. Asteemhar, Murga puja, Kach gela

| List of Consulted Person & Issues Discussed During Field Visit |                             |          |                               |            |               |         |
|----------------------------------------------------------------|-----------------------------|----------|-------------------------------|------------|---------------|---------|
| Sl no                                                          | Meeting Location            | Chainage | Name & Contact Details        | Date       | Issues raised | Respond |
| 1                                                              | Srirampur pt1 (Schoolghutu) | 005-800  | Motilal Mardi                 | 29/07/2020 |               |         |
| 2                                                              | Srirampur pt1 (Schoolghutu) | 005-800  | Austinson Mardi<br>8474062617 | 29/07/2020 |               |         |
|                                                                |                             |          |                               |            |               |         |

**Issues which are need to discuss**

- Major problem with the road (very bad condition)
- Local environmental issues e.g. flood, noise, dust, etc. (x, V, V)
- Presence of Wild animal along the project road. x
- Congestion and traffic jam along the project road. x
- Issues in street crossing. x
- Traffic density along the project road. x
- Need for the upgradation- What they think (opinion of the local people). (they want good road condition)
- Road Side Water logging issues and Duration. Yes (during raining)
- Safety of Local traffic and pedestrian in Built-up Zone
- Effect of Noise and Dust Pollution. v
- Relocation of Road Side Religious Structure (if any)
- Noise and dust pollution in environmental sensitive zone
- Impact on the road side structures due to Upgradation of the project road.
- Health issues of the local people during construction. skin and respiratory problem
- Adequate traffic signal and signs along the project road.
- Any major festival or public gathering along the project road

### List of Consulted Person & Issues Discussed During Field Visit

| Sl no | Meeting Location | Chainage | Name & Contact Details      | Date       | Issues raised | Respond |
|-------|------------------|----------|-----------------------------|------------|---------------|---------|
| 1     | Hatidhura        | 13-800   | Rajib Roy                   | 31/07/2020 |               |         |
| 2     | Hatidhura        | 13-800   | Ratneswar roy<br>6901337953 | 31/07/2020 |               |         |
| 3     | Hatidhura        | 13-800   | Manoranjan Roy              | 31/07/2020 |               |         |
| 4     | Hatidhura        | 13-800   | Rupiyoti Roy Sarkar         | 31/07/2020 |               |         |
| 5     | Hatidhura        | 13-800   | Manoj Barman                | 31/07/2020 |               |         |

### Issues which are need to discuss

- Major problem with the road. (Bad road condition)
- Local environmental issues e.g. flood, noise, dust, etc. (u.v, v)
- Presence of Wild animal along the project road. x
- Congestion and traffic jam along the project road. x
- Issues in street crossing. x
- Traffic density along the project road. x
- Need for the upgradation- What they think (opinion of the local people). (they want good quality road)
- Road Side Water logging Issues and Duration. (during rainfall)
- Safety of Local traffic and pedestrian in Built-up Zone
- Effect of Noise and Dust Pollution. v
- Relocation of Road Side Religious Structure (if any)
- Noise and dust pollution in environmental sensitive zone
- Impact on the road side structures due to Upgradation of the project road
- Health issues of the local people during construction. Respiratory problem
- Adequate traffic signal and signs along the project road
- Any major festival or public gathering along the project road. Durga Puja, Eid, Raksha, Nashi Mela



#### List of Consulted Person & Issues Discussed During Field Visit

| Sl no | Meeting Location    | Chainage | Name & Contact Details  | Date       | Issues raised | Respond |
|-------|---------------------|----------|-------------------------|------------|---------------|---------|
| 1     | Ujanpetla(Tamarhat) | 16-400   | Ramen Ray               | 31/07/2020 |               |         |
| 2     | Ujanpetla(Tamarhat) | 16-400   | Biren Roy               | 31/07/2020 |               |         |
| 3     | Ujanpetla(Tamarhat) | 16-400   | Tanu Roy<br>7306629654  | 31/07/2020 |               |         |
| 4     | Ujanpetla(Tamarhat) | 16-400   | Dipesh Roy              | 31/07/2020 |               |         |
| 5     | Ujanpetla(Tamarhat) | 16-400   | Shambu Roy              | 31/07/2020 |               |         |
| 6     | Ujanpetla(Tamarhat) | 16-400   | Ainal sk<br>7002933353  | 31/07/2020 |               |         |
| 7     | Ujanpetla(Tamarhat) | 16-400   | Annwar Sk               | 31/07/2020 |               |         |
| 8     | Ujanpetla(Tamarhat) | 16-400   | Jakyr hussain           | 31/07/2020 |               |         |
| 9     | Ujanpetla(Tamarhat) | 16-400   | Pintu Roy<br>6002254315 | 31/07/2020 |               |         |
| 10    | Ujanpetla(Tamarhat) | 16-400   | Niju Roy                | 31/07/2020 |               |         |
| 11    | Ujanpetla(Tamarhat) | 16-400   | Apu Roy<br>936584203    | 31/07/2020 |               |         |
|       |                     |          |                         |            |               |         |
|       |                     |          |                         |            |               |         |

#### Issues which are need to discuss

- Major problem with the road: **very bad condition of road and frequently breakdown of the road**
- Local environmental issues e.g. flood, noise, dust, etc. (V, V, V)
- Presence of Wild animal along the project road. x
- Congestion and traffic jam along the project road. x
- Issues in street crossing. x
- Traffic density along the project road. x
- Need for the upgradation: What they think (opinion of the local people) **(they want thick and wider road)**
- Road Side Water logging issues and Duration. **During rainfall and river over flow**

|    |                      |        |                         |            |  |  |
|----|----------------------|--------|-------------------------|------------|--|--|
| 7  | Ujanpetia (Tamarhat) | 16-400 | Andwar Sk.              | 31/07/2020 |  |  |
| 8  | Ujanpetia (Tamarhat) | 16-400 | Jakur Hussain           | 31/07/2020 |  |  |
| 9  | Ujanpetia (Tamarhat) | 16-400 | Pintu Roy<br>6002254315 | 31/07/2020 |  |  |
| 10 | Ujanpetia (Tamarhat) | 16-400 | Nipu Roy                | 31/07/2020 |  |  |
| 11 | Ujanpetia (Tamarhat) | 16-400 | Agu Roy<br>936584203    | 31/07/2020 |  |  |
|    |                      |        |                         |            |  |  |
|    |                      |        |                         |            |  |  |

#### Issues which are need to discuss

- Major problem with the road. *very bad condition of road and frequently breakdown of the road*
- Local environmental issues e.g. flood, noise, dust, etc. *(x, v, v)*
- Presence of Wild animal along the project road. *x*
- Congestion and traffic jam along the project road. *x*
- Issues in Street crossing. *x*
- Traffic density along the project road. *x*
- Need for the *upgradation*- What they think (opinion of the local people) *(They want thick and wider road)*
- Road Side Water logging issues and Duration. *During rainfall and river over flow*
- Safety of Local traffic and pedestrian in Built-up Zone
- Effect of Noise and Dust Pollution
- Relocation of Road Side Religious Structure (if any). *x*
- Noise and dust pollution in environmental sensitive zone. *x*
- Impact on the road side structures due to Upgradation of the project road. *x*
- Health issues of the local people during construction. *x*
- Adequate traffic signal and signs along the project road. *x*
- Any major festival or public gathering along the project road. *x*



**List of Consulted Person & Issues Discussed During Field Visit**

| Sl no | Meeting Location | Chainage | Name & Contact Details      | Date       | Issues raised | Respond |
|-------|------------------|----------|-----------------------------|------------|---------------|---------|
| 1     | Vatipetla        | 18-600   | Ganesh ch Roy<br>8011801561 | 31/07/2020 |               |         |
| 2     | Vatipetla        | 18-600   | Moinul Sk                   | 31/07/2020 |               |         |
| 3     | Vatipetla        | 18-600   | Sukumar Das                 | 31/07/2020 |               |         |
| 4     | Vatipetla        | 18-600   | Profulla Das                | 31/07/2020 |               |         |
| 5     | Vatipetla        | 18-600   | Amir Ali                    | 31/07/2020 |               |         |
| 6     | Vatipetla        | 18-600   | Hafijul Sk<br>7002190298    | 31/07/2020 |               |         |

**Issues which are need to discuss**

- Major problem with the road. Bad road condition
- Local environmental issues e.g. flood, noise, dust, etc. V X V
- Presence of Wild animal along the project road. X
- Congestion and traffic jam along the project road. X
- Issues in street crossing. X
- Traffic density along the project road. X
- Need for the upgradation. What they think (opinion of the local people).
- Road Side Water logging issues and Duration. During rainfall and over flow of the river
- Safety of Local traffic and pedestrian in Built-up Zone
- Effect of Noise and Dust Pollution. V
- Relocation of Road Side Religious Structure (if any)
- Noise and dust pollution in environmental sensitive zone
- Impact on the road side structures due to Upgradation of the project road.
- Health issues of the local people during construction. Respiratory problem
- Adequate traffic signal and signs along the project road
- Any major festival or public gathering along the project road

List of Consulted Person & Issues Discussed During Field Visit

| Sl no | Meeting Location | Chainage | Name & Contact Details  | Date       | Issues raised | Respond |
|-------|------------------|----------|-------------------------|------------|---------------|---------|
| 1     | Kumarganj        | 20+000   | Rajdeep roy             | 31/07/2020 |               |         |
| 2     | Kumarganj        | 20+000   | Hirakajoti Roy          | 31/07/2020 |               |         |
| 3     | Kumarganj        | 20+000   | Rajesh Das              | 31/07/2020 |               |         |
| 4     | Kumarganj        | 20+000   | Pappu das<br>8638765120 | 31/07/2020 |               |         |
|       |                  |          |                         |            |               |         |
|       |                  |          |                         |            |               |         |
|       |                  |          |                         |            |               |         |
|       |                  |          |                         |            |               |         |

Issues which are need to discuss

- Major problem with the road. *Very bad condition*
- Local environmental issues e.g. flood, noise, dust, etc. *(V, V, V)*
- Presence of Wild animal along the project road. *X*
- Congestion and traffic jam along the project road. *X*
- Issues in street crossing. *X*
- Traffic density along the project road. *X*
- Need for the *upgradation*- What they think (opinion of the local people) *They want a good road.*
- Road Side water logging issues and Duration. *Yes during rainfall and overflow of river*
- Safety of Local traffic and pedestrian in Built-up-Zone. *X*
- Effect of Noise and Dust Pollution. *V*
- Relocation of Road Side Religion Structure (if any). *X*
- Noise and dust pollution in environmental sensitive zone. *X*
- Impact on the road side structures due to Upgradation of the project road. *V*
- Health issues of the local people during construction. *respiratory problem*
- Adequate traffic signal and signs along the project road. *X*
- Any major festival or public gathering along the project road. *X*

**List of Consulted Person & Issues Discussed During Field Visit**

| Sl no | Meeting Location | Chainage | Name & Contact Details | Date       | Issues raised | Respond |
|-------|------------------|----------|------------------------|------------|---------------|---------|
| 1     | Vatipetia        | 22-800   | Baher ali sk           | 31/07/2020 |               |         |
| 2     | Vatipetia        | 22-800   | Alimuddin sk           | 31/07/2020 |               |         |
| 3     | Vatipetia        | 22-800   | Shahijur Rahman        | 31/07/2020 |               |         |
| 4     | Vatipetia        | 22-800   | Sonowar Ali sk         | 31/07/2020 |               |         |
| 5     | Vatipetia        | 22-800   | Hasan Ali              | 31/07/2020 |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |

**Issues which are need to discuss**

- Major problem with the road: **Very bad condition**
- Local environmental issues e.g. Flood, noise, dust, etc. **(V, Y, VI)**
- Presence of Wild animal along the project road: **X**
- Congestion and traffic jam along the project road: **X**
- Issues in street crossing: **X**
- Traffic density along the project road: **X**
- Need for the upgradation: What they think (opinion of the local people): **(they want a good road)**
- Road Side Water Logging Issues and Duration: **yes**
- Safety of Local traffic and pedestrian in Built-up Zone: **X**
- Effect of Noise and Dust Pollution: **V**
- Relocation of Road Side Religious Structure (if any): **X**
- Noise and dust pollution in environmental sensitive zone: **X**
- Impact on the roadside structures due to Upgradation of the project road: **X**
- Health issues of the local people during construction: **RESPIRATORY**
- Adequate traffic signal and signs along the project road: **X**
- Any major festival or public gathering along the project road: **X**



#### List of Consulted Person & Issues Discussed During Field Visit

| Sl no | Meeting Location | Chainage | Name & Contact Details | Date       | Issues raised | Respond |
|-------|------------------|----------|------------------------|------------|---------------|---------|
| 1     | Paglaaht         | 29-000   | Biswajit Roy           | 02/08/2020 |               |         |
| 2     | Paglaaht         | 29-000   | Taposh Sarkar          | 02/08/2020 |               |         |
| 3     | Paglaaht         | 29-000   | Govinda Adhikari       | 02/08/2020 |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |

#### Issues which are need to discuss

- Major problem with the road, bad condition
- Local environmental issues e.g. flood, noise, dust, etc. (x x x)
- Presence of Wild animal along the project road. X
- Congestion and traffic jam along the project road. X
- Issues in street crossing. X
- Traffic density along the project road. X
- Need for the upgradation- What they think (opinion of the local people) They want a good road.
- Road side Water logging issues and Duration. no
- Safety of Local traffic and pedestrian in Built-up Zone. x
- Effect of Noise and Dust Pollution. y
- Relocation of Road Side Religious Structure (if any) X
- Noise and dust pollution in environmental sensitive zone. x
- Impact on the road side structures due to Upgradation of the project road X
- Health issues of the local people during construction. x
- Adequate traffic signal and signs along the project road. X
- Any major festival or public gathering along the project road. water plus. water plus

**List of Consulted Person & Issues Discussed During Field Visit**

| Sl no | Meeting Location | Chainage | Name & Contact Details | Date       | Issues raised | Respond |
|-------|------------------|----------|------------------------|------------|---------------|---------|
| 1     | Sonahat          | 31-200   | Milan Roy              | 02/08/2020 |               |         |
| 2     | Sonahat          | 31-200   | Mithun Roy             | 02/08/2020 |               |         |
| 3     | Sonahat          | 31-200   | Riki Roy               | 02/08/2020 |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |

**Issues which are need to discuss**

- Major problem with the road. **Very bad condition**
- Local environmental issues e.g. flood, noise, dust, etc. **(v, v, v)**
- Presence of Wild animal along the project road. **X**
- Congestion and traffic jam along the project road. **X**
- Issues in street crossing. **X**
- Traffic density along the project road. **X**
- Need for the upgradation- What they think (opinion of the local people). **They want a good road**
- Road side Water logging Issues and Duration. **no**
- Safety of Local traffic and pedestrian in Built-up Zone. **X**
- Effect of Noise and Dust Pollution. **✓**
- Relocation of Road Side Religious Structure (if any). **X**
- Noise and dust pollution in environmental sensitive zone. **X**
- Impact on the road side structures due to Upgradation of the project road. **X**
- Health issues of the local people during construction. **X**
- Adequate traffic signal and signs along the project road. **X**
- Any major festival or public gathering along the project road. **10/22/2020 - Kali Puja**

**List of Consulted Person & Issues Discussed During Field Visit**

| Sl no | Meeting Location | Chainage | Name & Contact Details | Date       | Issues raised | Respond |
|-------|------------------|----------|------------------------|------------|---------------|---------|
| 1     | Uttar Barundanga | 35-000   | Jagadish Ch Sen        | 02/08/2020 |               |         |
| 2     | Uttar Barundanga | 35-000   | Vijay Bhuyan           | 02/08/2020 |               |         |
| 3     | Uttar Barundanga | 35-000   | Gopal Sen              | 02/08/2020 |               |         |
| 4     | Uttar Barundanga | 35-000   | Ratan Roy              | 02/08/2020 |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |

**Issues which are need to discuss**

- Major problem with the road, **Very bad condition**
- Local environmental issues e.g. flood, noise, dust, etc. (V, X, V)
- Presence of Wild animal along the project road X
- Congestion and traffic jam along the project road X
- Issues in street crossing **They want speed breaker**
- Traffic density along the project road X
- Need for the **upgradation**- What they think (opinion of the local people) **They want speed breaker and police point**
- Road Side Water logging Issues and Duration **no**
- Safety of Local traffic and pedestrian in Built-up Zone X
- Effect of Noise and Dust Pollution V
- Relocation of Road Side Religious Structure (if any) X
- Noise and dust pollution in environmental sensitive zone X
- Impact on the road side structures due to **Upgradation** of the project road X
- Health issues of the local people during construction
- Adequate traffic signal and signs along the project road X
- Any major festival or public gathering along the project road **CHITRA PUA X= GURU PUA WDA**



#### List of Consulted Person & Issues Discussed During Field Visit

| Sl no | Meeting Location | Chainage | Name & Contact Details | Date       | Issues raised | Respond |
|-------|------------------|----------|------------------------|------------|---------------|---------|
| 1     | Balajanmor       | 41-200   | Sahar Ali              | 06/08/2020 |               |         |
| 2     | Balajanmor       | 41-200   | Moinul Sk              | 06/08/2020 |               |         |
| 3     | Balajanmor       | 41-200   | Sorag Ali              | 06/08/2020 |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |

#### Issues which are need to discuss

- Major problem with the road, **Very bad condition**
- Local environmental issues e.g. flood, noise, dust, etc. (✓, x, ✓)
- Presence of Wild animal along the project road. X
- Congestion and traffic jam along the project road. X
- Issues in street crossing.
- Traffic density along the project road. X
- Need for the **upgradation**- What they think (opinion of the local people). **They want speed breaker and police point**
- Road Side Water logging issues and Duration. no
- Safety of Local traffic and pedestrian in Built-up Zone. x
- Effect of Noise and Dust Pollution. ✓
- Relocation of Road Side Religious Structure (if any) X
- Noise and dust pollution in environmental sensitive zone X
- Impact on the road side structures due to **Upgradation** of the project road X
- Health issues of the local people during construction x
- Adequate traffic signal and signs along the project road x
- Any major festival or public gathering along the project road

#### List of Consulted Person & Issues Discussed During Field Visit

| Sl no | Meeting Location    | Chainage | Name & Contact Details | Date       | Issues raised | Respond |
|-------|---------------------|----------|------------------------|------------|---------------|---------|
| 1     | Debatarhasdaha Pt 1 | 46-000   | Lakhikanta Ray         | 06/08/2020 |               |         |
| 2     | Debatarhasdaha Pt 1 | 46-000   | Rajesh Roy             | 06/08/2020 |               |         |
| 3     | Debatarhasdaha Pt 1 | 46-000   | KrishnaKanta Roy       | 06/08/2020 |               |         |
| 4     | Debatarhasdaha Pt 1 | 46-000   | Bipul Roy              | 06/08/2020 |               |         |
|       |                     |          |                        |            |               |         |
|       |                     |          |                        |            |               |         |
|       |                     |          |                        |            |               |         |

#### Issues which are need to discuss

- Major problem with the road. **Very bad condition**
- Local environmental issues e.g. flood, noise, dust, etc. (V, V, V)
- Presence of Wild animal along the project road. X
- Congestion and traffic jam along the project road. X
- Issues in street crossing
- Traffic density along the project road. X
- Need for the **upgradation**. What they think (opinion of the local people) Road Side Water logging issues and Duration. **Flood plain area**
- Safety of Local traffic and pedestrian in Built-up Zone. X
- Effect of Noise and Dust Pollution. V
- Relocation of Road Side Religious Structure (if any) X
- Noise and dust pollution in environmental sensitive zone. X
- Impact on the road side structures due to **Upgradation** of the project road. X
- Health issues of the local people during construction. X
- Adequate traffic signal and signs along the project road. X
- Any major festival or public gathering along the project road.



#### List of Consulted Person & Issues Discussed During Field Visit

| Sl no | Meeting Location | Chainage | Name & Contact Details | Date       | Issues raised | Respond |
|-------|------------------|----------|------------------------|------------|---------------|---------|
| 1     | Kalahaat         | 50-400   | Subrata Roy            | 06/08/2020 |               |         |
| 2     | Kalahaat         | 50-400   | Dinonath Roy           | 06/08/2020 |               |         |
| 3     | Kalahaat         | 50-400   | Narendra Roy           | 06/08/2020 |               |         |
| 4     | Kalahaat         | 50-400   | Ganesh Roy             | 06/08/2020 |               |         |
| 5     | Kalahaat         | 50-400   | Muslem Ali             | 06/08/2020 |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |
|       |                  |          |                        |            |               |         |

#### Issues which are need to discuss

- Major problem with the road, **Very bad condition**
- Local environmental issues e.g. flood, noise, dust, etc. (✓, ✓, ✓)
- Presence of Wild animal along the project road. X
- Congestion and traffic jam along the project road. X
- Issues in street crossing.
- Traffic density along the project road. X
- Need for the upgradation- What they think (opinion of the local people) Road Side Water logging issues and Duration. **Flood plain area**
- Safety of Local traffic and pedestrian in Built-up Zone. X
- Effect of Noise and Dust Pollution. ✓
- Relocation of Road side Religious Structure (if any) X
- Noise and dust pollution in environmental sensitive zone. X
- Impact on the road side structures due to Upgradation of the project road. X
- Health issues of the local people during construction.
- Adequate traffic signal and signs along the project road. X
- Any major festival or public gathering along the project road.
- Any major festival or public gathering along the project road. **500X 1000**

## Annex 7: GRM Information Sheet

### SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Asamese and English)

The \_\_\_\_\_ Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing\* (CONFIDENTIAL)\* above your name. Thank you.

|                                                                                                                       |                       |              |                    |     |  |
|-----------------------------------------------------------------------------------------------------------------------|-----------------------|--------------|--------------------|-----|--|
| Date                                                                                                                  | Place of registration | Project Town |                    |     |  |
|                                                                                                                       |                       | Project:     |                    |     |  |
| Contact information/personal details                                                                                  |                       |              |                    |     |  |
| Name                                                                                                                  |                       | Gender       | * Male<br>* Female | Age |  |
| Home address                                                                                                          |                       |              |                    |     |  |
| Place                                                                                                                 |                       |              |                    |     |  |
| Phone no.                                                                                                             |                       |              |                    |     |  |
| E-mail                                                                                                                |                       |              |                    |     |  |
| Complaint/suggestion/comment/question Please provide the details (who, what, where, and how) of your grievance below: |                       |              |                    |     |  |
| If included as attachment/note/letter, please tick here:                                                              |                       |              |                    |     |  |
| How do you want us to reach you for feedback or update on your comment/grievance?                                     |                       |              |                    |     |  |

### FOR OFFICIAL USE ONLY

|                                                                 |        |
|-----------------------------------------------------------------|--------|
| Registered by: (Name of official registering grievance)         |        |
| Mode of communication:<br>Note/letter/e-mail/verbal/telephonic  |        |
| Reviewed by: (Names/positions of officials reviewing grievance) |        |
| Action taken:                                                   |        |
| Whether action taken disclosed:                                 | Yes No |
| Means of disclosure:                                            |        |

## Annex 8: Road Strip Plan

| Left Hand Side<br>(LHS) |                 |       |                         |                    |                        |                        | Chainage | Right Hand<br>Side (RHS)   |                            |                    |                         |       |                 |             |
|-------------------------|-----------------|-------|-------------------------|--------------------|------------------------|------------------------|----------|----------------------------|----------------------------|--------------------|-------------------------|-------|-----------------|-------------|
| Land use                | Water<br>bodies | Trees | Commercial<br>structure | Religious<br>place | HealthCare<br>Facility | Education<br>institute |          | Educatio<br>n<br>institute | Health<br>Care<br>Facility | Religious<br>place | Commercial<br>structure | Trees | Water<br>bodies | Land use    |
| -                       | -               | -     | -                       | -                  | -                      | -                      | 0+000    | -                          | -                          | -                  | -                       | -     | -               | -           |
| Market<br>area          | x               | √     | Small<br>market(shop)   | √(masjid))         | X                      | X                      | 0+200    | x                          | x                          | √(church)          | √(Small<br>market)      | √     | x               | Market area |
| Market<br>area          | x               | √     | Shop                    | X                  | X                      | X                      | 0+400    | X                          | X                          | X                  |                         | √     | x               | Market area |
| Village area            | x               | √     | X                       | X                  | √(hospital)            | X                      | 0+600    | √(HIGH<br>SCHOOL<br>)      | X                          | X                  |                         | √     | x               | VILLAGE     |
| Village area            | x               | √     | X                       | X                  | X                      | X                      | 0+800    | X                          | X                          | X                  |                         | √     | x               | VILLAGE     |
| Marke<br>t area         | x               | √     | Shop                    | √<br>(mandir)      | X                      | √                      | 1+000    | X                          | X                          | (durga<br>mandir)  | X                       | √     | x               | Market area |
| Market<br>area          | x               | √     | Shop                    | X                  | X                      | X                      | 1+200    | X                          | X                          | X                  | SHOP                    | √     | x               | Market area |
| Marke<br>t area         | x               | √     | Shop                    | X                  | X                      | X                      | 1+400    | X                          | X                          | X                  | SHOP                    | √     | x               | Market area |
| Market<br>area          | x               | √     | Shop                    | X                  | X                      | X                      | 1+600    | X                          | X                          | X                  | SHOP                    | √     | x               | Market area |
| Market<br>area          | x               | √     | Shop                    | X                  | X                      | X                      | 1+800    | X                          | X                          | X                  | SHOP                    | √     | x               | Market area |
| Market<br>area          | x               | √     | Shop                    | X                  | X                      | X                      | 2+000    | X                          | X                          | X                  | SHOP                    | √     | x               | Market area |
| Market<br>area          | x               | √     | Shop                    | X                  | X                      | X                      | 2+200    | X                          | X                          | X                  | SHOP                    | √     | x               | Market area |
| Market<br>area          | x               | √     | Shop                    | X                  | X                      | X                      | 2+400    | X                          | X                          | X                  | SHOP                    | √     | x               | Market area |

| Left Hand Side<br>(LHS)    |                 |                 |                         |                    |                        |                        | Chainage | Right Hand<br>Side (RHS) |                            |                    |                         |       |                 |                            |
|----------------------------|-----------------|-----------------|-------------------------|--------------------|------------------------|------------------------|----------|--------------------------|----------------------------|--------------------|-------------------------|-------|-----------------|----------------------------|
| Land use                   | Water<br>bodies | Trees           | Commercial<br>structure | Religious<br>place | HealthCare<br>Facility | Education<br>institute |          | Education<br>institute   | Health<br>Care<br>Facility | Religious<br>place | Commercial<br>structure | Trees | Water<br>bodies | Land use                   |
| Market<br>area             | x               | √               | Shop                    | X                  | X                      | X                      | 2+600    | X                        | X                          | X                  | SHOP                    | √     | x               | Market area                |
| Villageand<br>agriculture  | x               | √               | x                       | X                  | X                      | X                      | 2+800    | X                        | X                          | √(RAM<br>MANDIR)   | X                       | √     | x               | village                    |
| Village and<br>Agriculture | x               | √               | x                       | X                  | X                      |                        | 3+000    | X                        | X                          | X                  | X                       | √     | X               | village and<br>agriculture |
| Villageand<br>Agriculture  | x               | √               | x                       | X                  | X                      | X                      | 3+200    | X                        | X                          | X                  | X                       | √     | X               | village and<br>agriculture |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 3+400    | X                        | X                          | X                  | X                       | √     | X               | village and<br>agriculture |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 3+600    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 3+800    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 4+000    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 4+200    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 4+400    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √(very<br>Poor) | x                       | X                  | X                      | X                      | 4+600    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √(very<br>Poor) | x                       | X                  | X                      | X                      | 4+800    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 5+000    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 5+200    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Agriculture                | x               | √               | x                       | X                  | X                      | X                      | 5+400    | X                        | X                          | X                  | X                       | √     | X               | agriculture                |
| Villageand<br>Agriculture  | x               | √               | x                       | X                  | X                      | X                      | 5+600    | X                        | X                          | X                  | X                       | √     | X               | villageand<br>agriculture  |
| Villageand<br>agriculture  | x               | √               | x                       | x                  | x                      | 1 school               | 5+800    | x                        | x                          | 1 church           | x                       | √     | 1 beel          | Agri                       |
| Agri.                      | x               | √               | x                       | x                  | x                      | x                      | 6+000    | x                        | x                          | x                  | x                       | √     | X               | Agri                       |
| Agri.                      | x               | √               | x                       | x                  | x                      | x                      | 6+200    | x                        | x                          | x                  | x                       | √     | X               | Agri                       |



| Left Hand Side<br>(LHS)    |                 |                 |                         |                    |                        |                        | Chainage | Right Hand<br>Side (RHS) |                            |                    |                         |       |                 |          |
|----------------------------|-----------------|-----------------|-------------------------|--------------------|------------------------|------------------------|----------|--------------------------|----------------------------|--------------------|-------------------------|-------|-----------------|----------|
| Land use                   | Water<br>bodies | Trees           | Commercial<br>structure | Religious<br>place | HealthCare<br>Facility | Education<br>institute |          | Education<br>institute   | Health<br>Care<br>Facility | Religious<br>place | Commercial<br>structure | Trees | Water<br>bodies | Land use |
| Agri.                      | x               | √               | x                       | x                  | x                      | x                      | 6+400    | x                        | x                          | x                  | x                       | √     | X               | Agri     |
| Agri.                      | x               | √               | x                       | x                  | x                      | x                      | 6+600    | 1 school                 | x                          | x                  | x                       | √     | X               | Agri     |
| Village and<br>agriculture | x               | √               | x                       | x                  | x                      | x                      | 6+800    | x                        | x                          | x                  | x                       | √     | X               | Agri     |
| Agri.                      | x               | √               | x                       | x                  | x                      | x                      | 7+000    | x                        | x                          | x                  | x                       | √     | X               | Agri     |
| Agri.                      | x               | √(very<br>poor) | x                       | x                  | x                      | x                      | 7+200    | x                        | x                          | x                  | x                       | √     | X               | Agri     |
| Agri.                      | x               | √(very<br>poor) | x                       | x                  | x                      | x                      | 7+400    | x                        | x                          | x                  | x                       | √     | X               | Agri     |

|                        |   |              |      |          |                 |          |        |          |   |   |      |   |   |                |
|------------------------|---|--------------|------|----------|-----------------|----------|--------|----------|---|---|------|---|---|----------------|
| Agri.                  | x | √(very poor) | x    | x        | 1 health centre | x        | 7+600  | x        | x | x | x    | √ | X | agri           |
| Agri.                  | x | X            | x    | x        | x               | x        | 7+800  | x        | x | x | x    | √ | X | Agri           |
| Agri.                  | x | √            | x    | x        | x               | x        | 8+000  | x        | x | x | x    | √ | X | Agri           |
| Villageand agriculture | X | √            | x    | x        | x               | x        | 8+200  | x        | x | x | x    | √ | X | Vill and agri. |
| Villageand agriculture | X | √            | x    | x        | x               | 1 school | 8+400  | x        | x | x | x    | √ | X | Vill and agri. |
| Villageand agriculture | X | √            | x    | x        | x               | x        | 8+600  | x        | x | x | x    | √ | X | Vill and agri. |
| Villageand agriculture | X | √            | x    | 1 church | x               | x        | 8+800  | x        | x | x | x    | √ | X | Vill and agri. |
| Villageand agriculture | x | √            | x    | 1 church | x               | x        | 9+000  | x        | x | x | x    | √ | X | Vill and agri. |
| Villageand agriculture | x | √            | X    | X        | X               | 1        | 9+200  | 1 school | X | x | X    | √ | X | Agri           |
| Small market           | x | √            | Shop | X        | X               | X        | 9+400  | X        | X | x | Shop | √ | X | Small market   |
| Small market           | x | √            | X    | X        | X               | X        | 9+600  | X        | X | x | X    | √ | X | Agri( tea)     |
| Agri.(tea garden)      | x | √            | X    | X        | X               | X        | 9+800  | X        | X | x | X    | √ | X | Agri( tea)     |
| Agri.(tea garden)      | x | √            | X    | X        | X               | X        | 10+000 | 1 school | X | x | X    | √ | X | Agri( tea)     |
| Vill                   | x | √            | X    | X        | X               | X        | 10+200 | X        | X | x | X    | √ | X | Vill           |
| Vill                   | x | √            | X    | X        | X               | X        | 10+400 | X        | X | x | X    | √ | X | Vill           |
| Vill                   | x | √            | X    | X        | X               | X        | 10+600 | 1 school | X | x | X    | √ | X | Vill           |
| Vill                   | x | √            | X    | X        | X               | X        | 10+800 | X        | X | x | X    | √ | X | Vill           |
| small market           | x | √            | Shop | X        | X               | X        | 11+000 | X        | X | x | Shop | √ | X | Small market   |
| Agri& vill             | x | √            | X    | X        | X               | X        | 11+200 | X        | X | x | X    | √ | X | Agri           |

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**Phase I:  
Supplementary Environmental  
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|              |   |   |      |                    |                   |          |        |          |   |          |                |   |        |              |
|--------------|---|---|------|--------------------|-------------------|----------|--------|----------|---|----------|----------------|---|--------|--------------|
| Agri& vill   | x | √ | X    | X                  | X                 | X        | 11+400 | X        | X | x        | Bricklin       | √ | X      | Agri         |
| Agri& vill   | x | √ | X    | X                  | X                 | X        | 11+600 | X        | X | x        | X              | √ | X      | agri         |
| Agri& vill   | x | √ | X    | X                  | X                 | X        | 11+800 | X        | X | x        | X              | √ | X      | Agri         |
| Agri& vill   | x | √ | X    | X                  | X                 | X        | 12+000 | X        | X | x        | X              | √ | X      | Agri         |
| Vill         | x | √ | X    | X                  | X                 | X        | 12+200 | X        | X | x        | X              | √ | X      | Agri         |
| Vill         | X | √ | X    | X                  | X                 | X        | 12+400 | 1school  | X | 1 masjid | X              | √ | X      | Agri         |
| Vill         | X | √ | X    | X                  | X                 | X        | 12+600 | X        | X | x        | X              | √ | X      | Agri         |
| Small market | X | √ | X    | X                  | X                 | X        | 12+800 | X        | X | x        | X              | √ | X      | Agri         |
| Small market | X | √ | Shop | hanuman mandir     | X                 | 1 school | 13+000 | X        | X | x        | X              | √ | X      | Small market |
| Vill         | X | √ | Shop | X                  | X                 | X        | 13+200 | 1 school | X | x        | X              | √ | X      | Small market |
| Vill         | X | √ | X    | X                  | X                 | X        | 13+400 | X        | X | x        | X              | √ | X      | Vill         |
| Vill&agri    | X | √ | X    | X                  | X                 | X        | 13+600 | X        | X | x        | X              | √ | X      | Vill         |
| Vill&agri    | X | √ | X    | X                  | X                 | 1 school | 13+800 | X        | X | x        | Petrol pump    | √ | X      | Vill         |
| Vill         | X | √ | X    | X                  | X                 | x        | 14+000 | X        | X | 1 mandir | x              | √ | X      | Vill         |
| Vill         | X | √ | X    | Mahanta pur ashram | X                 | X        | 14+200 | 1 school | x | x        | Police station | √ | 1 pond | Vill         |
| Vill         | X | √ | X    | X                  | X                 | X        | 14+400 | x        | x | x        | X              | √ | X      | Vill         |
| Vill         | X | √ | Shop | X                  | X                 | X        | 14+600 | x        | x | x        | X              | √ | X      | Vill         |
| Market       | X | √ | Shop | X                  | X                 | X        | 14+800 | x        | x | x        | Shop           | √ | X      | Market area  |
| Market       | X | √ | Shop | 1 mandir           | Tamarhat hospital | X        | 15+000 | x        | x | x        | Shop           | √ | X      | Market area  |
| Market       | X | √ | Shop | X                  | X                 | 1 school | 15+200 | x        | x | x        | Shop           | √ | X      | Market area  |
| Vill         | X | √ | X    | X                  | X                 | X        | 15+400 | x        | x | x        | X              | √ | X      | Market area  |
| Vill         | X | √ | X    | X                  | X                 | X        | 15+600 | x        | x | x        | Bandhan bank   | √ | X      | Vill         |
| Vill         | X | √ | X    | X                  | X                 | X        | 15+800 | x        | x | x        | X              | √ | River  | Vill         |
| Vill         | X | √ | X    | X                  | X                 | X        | 16+000 | x        | x | x        | X              | √ | River  | Vill         |
| Vill         | X | √ | X    | X                  | X                 | X        | 16+200 | x        | x | x        | X              | √ | X      | Vill         |

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**Phase I:  
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|               |        |   |      |          |   |          |        |          |   |          |      |   |        |                   |
|---------------|--------|---|------|----------|---|----------|--------|----------|---|----------|------|---|--------|-------------------|
| Vill          | 1      | √ | X    | X        | X | X        | 16+400 | x        | x | x        | X    | √ | River  | Vill              |
|               | pond   |   |      |          |   |          |        |          |   |          |      |   |        |                   |
| Vill          | X      | √ | X    | 1 mondir | X | X        | 16+600 | x        | X | 1 mondir | X    | √ | River  | River side        |
| Vill&agri     | X      | √ | X    | X        | X | X        | 16+800 | x        | X | X        | X    | √ | River  | Vill & River side |
| Agri          | x      | x | X    | X        | X | X        | 17+000 | x        | X | X        | X    | √ | River  | Vill & river side |
| Vill&agri     | 1 pond | √ | X    | 1 mandir | X | X        | 17+200 | x        | X | 1 mondir | X    | √ | River  | river side        |
| Vill          | 2 pond | √ | X    | X        | X | X        | 17+400 | x        | X | X        | X    | √ | X      | Vill              |
| agri          | X      | √ | X    | X        | X | X        | 17+600 | x        | X | X        | X    | √ | 1pond  | Vill              |
| Vill&agri     | X      | √ | X    | X        | X | 1 school | 17+800 | x        | X | X        | X    | √ | 2 pond | Vill              |
| Vill&agri     | 3 pond | √ | X    | X        | X | x        | 18+000 | x        | X | X        | X    | √ | 2 pond | Vill              |
| Vill          | X      | √ | Shop | X        | X | X        | 18+200 | x        | X | X        | Shop | √ | 1 pond | Vill              |
| Small market  | X      | √ | Shop | X        | X | 1 school | 18+400 | x        | X | 1 mondir | Shop | √ | 1 pond | Vill              |
| Agri.         | X      | X | X    | X        | X | x        | 18+600 | x        | X | X        | X    | √ | 1      | River side        |
| Vill          | 2 pond | √ | X    | X        | X | X        | 18+800 | x        | X | 1mondir  | X    | √ | X      | River side        |
| Vill          | 2 pond | √ | X    | X        | X | X        | 19+000 | x        | X | X        | X    | √ | X      | Vill              |
| Vill          | 1 pond | √ | X    | X        | X | X        | 19+200 | 1 school | x | X        | X    | √ | X      | Vill              |
| Vill and agri | 1 pond | √ | X    | X        | X | X        | 19+400 | X        | X | X        | X    | √ | X      | Vill              |
| Vill and agri | River  | √ | X    | X        | X | X        | 20+000 | X        | X | X        | X    | √ | 2pond  | Vill              |
| Vill and agri | 1 pond | √ | X    | X        | X | X        | 20+200 | X        | X | X        | X    | √ | 1 pond | Vill              |

|                        |           |              |                |        |               |          |        |          |   |          |      |              |        |                     |
|------------------------|-----------|--------------|----------------|--------|---------------|----------|--------|----------|---|----------|------|--------------|--------|---------------------|
| Agri                   | X         | √(very poor) | X              | X      | X             | X        | 20+400 | X        | X | X        | X    | √            | X      | Barren              |
| Vill and agri          | 1 pond    | √            | X              | X      | X             | X        | 20+600 | X        | X | X        | X    | √            | X      | Vill                |
| Vill                   | 1 pond    | √            | X              | X      | X             | X        | 20+800 | X        | X | X        | X    | √            | 1pond  | Agri                |
| Vill and agri(fishery) | 2 fishery | √            | X              | X      | X             | X        | 21+000 | X        | X | X        | X    | √            | 1 beel | Agri and water body |
| Water body             | 3 fishery | √            | X              | X      | X             | X        | 21+200 | X        | X | X        | X    | √            | 1 beel | Agri and water body |
| Agri.                  | X         | √            | X              | X      | X             | X        | 21+400 | X        | X | X        | X    | √            | 2 pond | Agri                |
| Vill and agri          | X         | √            | X              | X      | X             | X        | 21+600 | X        | X | X        | X    | √            | 3 pond | Agri                |
| Agri                   | X         | √            | X              | temple | X             | X        | 21+800 | X        | X | X        | X    | √            | 1 pond | Agri&vill           |
| Market area            | X         | √            | Shop           | X      | X             | X        | 22+000 | 1 school | X | x        | Shop | √            | X      | Market area         |
| Market                 | 4 pond    | √            | X              | X      | 1 health care | X        | 22+200 | 1 school | X | 1 mosjit | X    | √            | 2 pond | Semi market asre    |
| Agri.                  | 1 pond    | √            | X              | X      | X             | X        | 22+400 | X        | X | X        | X    | √            | 1 pond | Agri.               |
| Agri.                  | 1 lake    | √            | X              | X      | X             | X        | 22+600 | X        | X | X        | X    | √            | X      | Agri.               |
| Agri.                  | X         | √            | X              | X      | X             | X        | 22+800 | X        | X | X        | X    | √(very poor) | X      | Agri.               |
| Agri.                  | X         | √            | X              | X      | X             | X        | 23+000 | X        | X | X        | X    | √            | 1 pond | Vill.               |
| Agri.                  | X         | √            | X              | X      | X             | X        | 23+200 | X        | X | X        | X    | √            | X      | Vill.               |
| Vill                   | X         | √            | 1 water supply | X      | X             | 1 school | 23+400 | X        | X | X        | X    | √            | 1 pond | Vill.               |

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|             |            |                  |      |          |   |   |        |          |               |   |           |   |        |               |
|-------------|------------|------------------|------|----------|---|---|--------|----------|---------------|---|-----------|---|--------|---------------|
| Vill        | X          | √                | X    | X        | X | X | 23+600 | X        | X             | X | X         | √ | 2 pond | Vill.         |
| Vill & agri | 1 pond     | √                | X    | X        | X | X | 23+800 | X        | X             | X | X         | √ | 1 pond | Vill.         |
| Vill & agri | 1 pond     | √                | X    | X        | X | X | 24+000 | X        | X             | X | X         | √ | X      | Vill.         |
| Agri.       | 1 pond     | √                | X    | X        | X | X | 24+200 | X        | X             | X | X         | √ | X      | Vill.         |
| Agri.       | X          | √(<br>very poor) | X    | 1 mondir | X | X | 24+400 | X        | X             | X | X         | √ | X      | Vill.         |
| Agri.       | X          | √(<br>very poor) | X    | X        | X | X | 24+600 | X        | X             | X | X         | √ | 1 pond | Vill.         |
| Agri.       | X          | √(<br>very poor) | X    | 1 mondir | X | X | 24+800 | X        | X             | X | X         | √ | X      | Vill. & agri  |
| Agri.       | River side | √                | X    | X        | X | X | 25+000 | 1 school | X             | X | X         | √ | x      | Vill          |
| River side  | River side | √                | X    | X        | X | X | 25+200 | X        | 1 health care | X | Panchayad | √ | x      | Vill          |
| River side  | River side | √                | X    | X        | X | X | 25+400 | 1 school | X             | X | X         | √ | x      | Vill & market |
| market      | River side | √(<br>very poor) | Shop | X        | X | X | 25+600 | X        | X             | X | Shop      | √ | x      | Market area   |
| market      | River side | √(<br>very poor) | Shop | X        | X | X | 25+800 | X        | X             | X | Shop      | √ | x      | Market area   |
| market      | X          | √(<br>very poor) | shop | X        | X | X | 26+000 | X        | X             | X | x         | √ | x      | Market area   |



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|                     |               |   |              |          |   |          |        |          |   |          |         |   |        |             |
|---------------------|---------------|---|--------------|----------|---|----------|--------|----------|---|----------|---------|---|--------|-------------|
| market              | X             | √ | Shop         | X        | X | X        | 26+200 | X        | X | X        | X       | √ | x      | Market area |
| Vill                | X             | √ | X            | 1 mosjid | X | X        | 26+400 | X        | X | X        | X       | √ | x      | Agri        |
| Vill & agri         | X             | √ | X            | X        | X | X        | 26+600 | X        | X | X        | X       | √ | x      | Agri & vill |
| Vill                | X             | √ | X            | 1 mondir | X | X        | 26+800 | X        | X | X        | X       | √ | x      | Vill        |
| Vill                | 1 pond        | √ | X            | X        | X | X        | 27+000 | X        | X | X        | X       | √ | x      | Agri        |
| Vill                | 1 pond        | √ | X            | X        | X | X        | 27+200 | X        | X | X        | x       | √ | X      | Vill        |
| Vill                | 1 pond        | √ | x            | x        | x | x        | 27+400 | X        | X | X        | X       | √ | X      | Vill        |
| Vill & agri         | X             | √ | x            | x        | x | x        | 27+600 | X        | X | X        | X       | √ | X      | Vill & agri |
| Vill                | X             | √ | x            | x        | x | x        | 27+800 | X        | X | X        | 1 tower | √ | X      | Agri        |
| Vill                | X             | √ | x            | x        | x | x        | 28+000 | X        | X | X        | 1 tower | √ | X      | Agri        |
| Vill                | X             | √ | x            | x        | x | 1 school | 28+200 | X        | X | X        | Shop    | √ | X      | Vill        |
| Vill                | River side    | √ | Water supply | 1 mandir | x | x        | 28+400 | 1 school | X | X        | X       | √ | X      | Vill        |
| River side          | river         | √ | X            | X        | x | x        | 28+600 | X        | X | X        | X       | √ | 2 pond | Vill & agri |
| River side          | river         | √ | X            | X        | x | x        | 28+800 | X        | X | X        | X       | √ | X      | Vill        |
| River side          | river         | √ | X            | 1 mandir | x | x        | 29+000 | X        | X | X        | X       | √ | X      | Market      |
| River side & market | river         | √ | Shop         | x        | x | x        | 29+200 | 1 school | X | X        | X       | √ | X      | Vill        |
| River side & market | river         | √ | Shop         | x        | x | x        | 29+400 | 1 school | X | 1 mosjid | X       | √ | X      | Vill        |
| River side          | river         | √ | X            | x        | x | x        | 29+600 | X        | X | X        | X       | √ | X      | Agri        |
| River side          | river         | √ | X            | x        | x | x        | 29+800 | X        | X | X        | X       | √ | 1 pond | Vill & agri |
| River side          | river         | √ | X            | x        | x | x        | 30+000 | X        | X | X        | X       | √ | 1 pond | Vill        |
| River side & agri.  | River & 1pond | √ | X            | x        | x | x        | 30+200 | x        | X | X        | X       | √ | x      | Vill        |

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|                      |        |   |             |          |   |   |        |          |            |        |   |   |        |        |
|----------------------|--------|---|-------------|----------|---|---|--------|----------|------------|--------|---|---|--------|--------|
| Vill                 | X      | √ | X           | 1 mandir | x | x | 30+400 | X        | x          | x      | x | √ | X      | Vill   |
| Vill                 | 1 pond | √ | X           | 1 mondir | x | x | 30+600 | X        | x          | x      | x | √ | 1 pond | Vill   |
| Agri                 | X      | √ | X           | X        | x | x | 30+800 | X        | x          | x      | x | √ | 1 pond | Vill   |
| Agri                 | X      | √ | X           | X        | x | x | 31+000 | X        | x          | x      | x | √ | X      | Vill   |
| River side           | River  | √ | X           | X        | x | x | 31+200 | X        | x          | x      | x | √ | 1pond  | Agri   |
| River side           | River  | √ | X           | 1 mandir | x | x | 31+400 | X        | x          | x      | x | √ | X      | Vill   |
| River side and agri. | River  | √ | X           | X        | x | x | 31+600 | X        | x          | x      | x | √ | 1pond  | Agri   |
| Agri                 | X      | √ | X           | X        | x | x | 31+800 | X        | x          | x      | x | √ | 1pond  | Vill   |
| Agri                 | X      | √ | X           | X        | x | x | 32+000 | 1 school | x          | x      | x | √ | X      | Vill   |
| Agri                 | X      | √ | X           | X        | x | x | 32+200 | X        | x          | x      | x | √ | X      | Vill   |
| Agri, & vill         | X      | √ | X           | X        | x | x | 32+400 | X        | x          | x      | x | √ | X      | Vill   |
| Agri                 | 1 pond | √ | X           | X        | x | x | 32+600 | X        | x          | x      | x | √ | X      | Vill   |
| Agri, & vill         | 1 pond | √ | X           | 1 masjid | x | x | 32+800 | X        | x          | x      | x | √ | 2 pond | Vill   |
| Vill                 | 3 pond | √ | X           | X        | x | x | 33+000 | X        | x          | x      | x | √ | 1 pond | Agri   |
| Vill                 | 1 pond |   | X           | x        | x | x | 33+200 | x        | x          | x      | x | √ | X      | Agri   |
| Agri, & vill         | X      | √ | X           | X        | x | x | 33+400 | x        | x          | x      | x | √ | X      | Vill   |
| Market               | X      | √ | X           | X        | x | X | 33+600 | x        | Vererinary | Mandir | x | √ | X      | Market |
| Vill                 | 1 pond | √ | X           | X        | x | X | 33+800 | x        | x          | x      | x | √ | 1 pond | Vill   |
| Vill                 | 2 pond | √ | X           | X        | x | X | 34+000 | x        | x          | x      | x | √ | 2pond  | Vill   |
| Agri                 | X      | √ | Gas company | X        | x | X | 34+200 | x        | x          | x      | x | √ | X      | Agri   |
| Vill                 | 1 pond | √ | X           | X        | x | X | 34+400 | 1 school | x          | x      | x | √ | 1 pond | Vill   |

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|                  |        |   |           |          |   |          |        |   |       |          |                      |   |        |               |
|------------------|--------|---|-----------|----------|---|----------|--------|---|-------|----------|----------------------|---|--------|---------------|
| Vill             | 1 pond | √ | X         | X        | x | X        | 34+600 | x | x     | x        | x                    | √ | 1 pond | Vill          |
| Market           | 1 pond | √ | X         | X        | x | X        | 34+800 | x | x     | x        | x                    | √ | 1pond  | Small market  |
| Agri, & vill     | 1 pond | √ | X         | X        | x | X        | 35+000 | x | x     | x        | x                    | √ | 2 pond | Vill.& agri   |
| Vill & agri      | River  | √ | X         | X        | X | X        | 35+200 | X | X     | X        | X                    | √ | X      | Agri          |
| Vill& agri       | River  | √ | X         | 1 mandir | X | 1 school | 35+400 | X | X     | X        | 1 beat forest office | √ | x      | Agri          |
| vill             | X      | √ | X         | X        | X | x        | 35+600 | X | X     | X        | X                    | √ | x      | Agri          |
| Vill             | X      | √ | X         | X        | X | x        | 35+800 | x | x     | X        | 1bank sbi            | √ | X      | Agri          |
| Market           | X      | √ | Shop& atm | X        | X | x        | 36+000 | x | x     | X        | Shop                 | √ | X      | Market area   |
| Railway and agri | X      | √ | Shop      | X        | X | x        | 36+200 | x | x     | X        | X                    | √ | 1 pond | Agri          |
| vill             | 3 pond | √ | X         | 1 mandir | X | x        | 36+400 | x | x     | X        | X                    | √ | X      | Agri and vill |
| vill             | 1 pond | √ | X         | X        | X | 1 school | 36+600 | x | x     | X        | X                    | √ | X      | Vill          |
| vill             | 1pond  | √ | X         | X        | X | x        | 36+800 | x | x     | X        | X                    | √ | 2 pond | Vill          |
| vill             | X      | √ | Shop      | X        | X | x        | 37+000 | x | 1 msd | X        | X                    | √ | X      | Vill          |
| vill             | X      | √ | X         | X        | X | x        | 37+200 | x | x     | X        | X                    | √ | 1pond  | Vill          |
| Vill             | X      | √ | X         | X        | X | x        | 37+400 | x | x     | X        | X                    | √ | 1pond  | Vill          |
| Vill and agri    | X      | √ | X         | X        | X | x        | 37+600 | x | x     | X        | X                    | √ | 2pond  | Vill and agri |
| vill             | 1 pond | √ | X         | X        | X | x        | 37+800 | x | x     | X        | X                    | √ | 4pond  | Vill          |
| vill             | 3 pond | √ | X         | X        | X | x        | 38+000 | x | x     | X        | X                    | √ | 5pond  | Vill          |
| vill             | 3pond  | √ | X         | X        | X | x        | 38+200 | x | x     | 1 masjid | X                    | √ | 2pond  | Vill          |
| vill             | 1 pond | √ | x         | x        | x | x        | 38+400 | x | x     | X        | X                    | √ | 1pond  | Vill          |

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|               |        |              |             |   |   |                    |        |   |   |          |       |              |       |                      |
|---------------|--------|--------------|-------------|---|---|--------------------|--------|---|---|----------|-------|--------------|-------|----------------------|
| Agri          | X      | √            | X           | X | X | x                  | 38+600 | x | x | X        | X     | √            | X     | Agri                 |
| Vill          | 1 pond | √            | X           | X | X | x                  | 38+800 | x | x | X        | X     | √            | X     | Vill                 |
| Agri          | 1 pond | √            | X           | X | X | x                  | 39+000 | x | x | X        | X     | √            | 1pond | Agri                 |
| Vill          | 1 pond | √            | X           | X | X | x                  | 39+200 | x | x | X        | X     | √            | 1pond | Agri and vill        |
| Agri          | 1 pond | √            | X           | X | X | x                  | 39+400 | x | x | X        | X     | √            | 1pond | Agri                 |
| Agri          | X      | √            | X           | X | X | x                  | 39+600 | x | x | X        | X     | √            | X     | Agri                 |
| Agri          | 2 pond | √            | X           | X | X | X                  | 39+800 | x | x | X        | X     | √            | X     | Agri                 |
| Agri          | 1 pond | √            | X           | X | X | X                  | 40+000 | X | X | X        | X     | √            | 1pond | Agri                 |
| Highway       | 1pond  | √            | X           | X | X | X                  | 40+200 | X | X | X        | X     | √            | X     | Agriand highway      |
| highway       | X      | √            | X           | X | X | X                  | 40+400 | x | X | X        | X     | √            | X     | Agriand highway      |
| Vill and agri | 2 pond | √            | X           | X | X | X                  | 40+600 | X | X | X        | X     | √            | X     | Railwayline and agri |
| Agri          | X      | √            | X           | X | X | X                  | 40+800 | X | X | X        | X     | √            | X     | Agri and vill        |
| Agri          | X      | X            | X           | X | X | X                  | 41+000 | X | X | X        | Tower | √            | X     | Agri and vill        |
| Agri          | X      | √            | X           | X | X | X                  | 41+200 | X | X | X        | X     | √            | X     | Agri                 |
| Agri          | 1pond  | √            | Brick kilns | X | X | X                  | 41+400 | X | X | X        | X     | √            | 2pond | Agri                 |
| Agri          | 1pond  | √(very poor) | X           | X | X | X                  | 41+600 | X | X | X        | X     | √(very poor) | X     | Vill                 |
| Agri          | 1pond  | √            | X           | X | X | X                  | 41+800 | X | X | 1 mandir | X     | √            | 1pond | Vill                 |
| Vill          | 1pond  | √            | X           | X | X | 1 jatiya vidyalaya | 42+000 | X | X | X        | X     | √(very poor) | 1pond | Agri                 |

|               |        |              |            |          |            |          |        |          |   |          |            |              |        |                |
|---------------|--------|--------------|------------|----------|------------|----------|--------|----------|---|----------|------------|--------------|--------|----------------|
| Agri          | 1pond  | √very poor)  | X          | X        | X          | X        | 42+200 | 1 school | X | X        | X          | √            | 2 pond | Agri           |
| Agri          | X      | √very poor)  | X          | X        | X          | X        | 42+400 | X        | X | X        | Brick klin | √            | X      | Agri           |
| Agri          | X      | √very poor)  | X          | X        | X          | X        | 42+600 | X        | X | 1 mandir | X          | √            | 1pond  | Agri& vill     |
| Agri          | X      | √very poor)  | X          | X        | X          | X        | 42+800 | X        | X | X        | X          | √            | 5 pond | agri & vill    |
| Agri          | 2pond  | √very poor)  | X          | X        | X          | X        | 43+000 | X        | X | X        | X          | √            | 2 pond | Agri           |
| Agri          | 3 pond | √            | X          | X        | X          | X        | 43+200 | X        | X | X        | X          | √            | 3 pond | Vill           |
| Agri and vill | 1pond  | √            | X          | X        | 1 hospital | 1 school | 43+400 | X        | X | 1 mandir | Small shop | √            | X      | Villand market |
| Market area   | X      | √            | Shop& p.o. | X        | X          | X        | 43+600 | X        | X | X        | Small shop | √            | 1 pond | Villand market |
| Vill          | 2pond  | √            | X          | X        | X          | X        | 43+800 | X        | X | X        | X          | √            | 2 pond | Vill           |
| Agri          | X      | √            | X          | 1 mandir | X          | X        | 44+000 | X        | X | X        | 1 tower    | √(very poor) | 1 pond | Vill           |
| Agri and vill | X      | √            | X          | X        | X          | X        | 44+200 | X        | X | X        | X          | √            | X      | Vill           |
| agri and vill | 1 pond | X            | X          | 1 mandir | X          | X        | 44+400 | X        | X | X        | X          | √            | 1 pond | Vill           |
| Agri          | X      | √(very poor) | X          | X        | X          | X        | 44+600 | X        | X | X        | 1tower     | √            | 1pond  | Agri           |
| Vill          | 1 pond | √            | X          | 1 mandir | X          | X        | 44+800 | 1 school | X | X        | X          | √            | 1 pond | Vill           |
| Agri and vill | 1pond  | √            | X          | X        | X          | X        | 45+000 | X        | X | X        | X          | √            | 1 pond | Vill &agri     |

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|-----------------|--------|---|------|---|--------------|----------|--------|----------|---|----------|-----------------------|--------------|--------|-----------------|
| agri and vill   | 3 pond | √ | X    | X | X            | X        | 45+200 | X        | X | X        | X                     | √            | 2 pond | Vill            |
| Agri            | 1 pond | √ | X    | X | X            | X        | 45+400 | X        | X | X        | X                     | √            | X      | Vill            |
| Agri & vill     | X      | √ | X    | X | X            | X        | 45+600 | X        | X | X        | X                     | √            | X      | Vill            |
| Vill            | 1pond  | √ | X    | X | X            | X        | 45+800 | 1 school | X | 1 mandir | X                     | √            | 1 pond | Agri            |
| agri            | X      | √ | X    | X | X            | X        | 46+000 | X        | X | x        | X                     | √(very poor) | X      | Agri            |
| Agri            | X      | √ | X    | X | X            | X        | 46+200 | X        | X | X        | X                     | √            | X      | Agri            |
| Agri            | 1 pond | √ | X    | X | X            | X        | 46+400 | X        | X | X        | X                     | √            | X      | agri            |
| Agri and market | X      | √ | Shop | X | X            | 1 school | 46+600 | X        | X | X        | Shop                  | √            | 2 pond | Agri and market |
| Market          | X      | √ | Shop | X | 1 veterinary | x        | 46+800 | X        | X | X        | Gaon panchayed, tower | √            | x      | market          |
| Market          | X      | √ | X    | X | X            | X        | 47+000 | X        | X | X        | p.o                   | √            | 1 pond | Vill            |
| Vill            | X      | √ | X    | X | X            | X        | 47+200 | X        | X | X        | X                     | √            | 1pond  | Vill            |
| Vill            | X      | √ | X    | X | X            | 1 school | 47+400 | X        | X | X        | X                     | √            | X      | Vill            |
| Vill            | 1 pond | √ | X    | X | X            | X        | 47+600 | X        | X | X        | X                     | √            | X      | Vill            |
| Vill and agri   | 1 pond | √ | X    | X | X            | X        | 47+800 | X        | X | X        | X                     | √            | X      | Vill            |
| Agri            | 1pond  | √ | X    | X | X            | X        | 48+000 | X        | X | X        | X                     | √            | 1pond  | Vill            |
| Agri and vill   | 1pond  | √ | X    | X | X            | X        | 48+200 | X        | X | X        | X                     | √            | 1pond  | Vill            |
| Agri            | X      | √ | X    | X | X            | X        | 48+400 | X        | X | X        | X                     | √            | 1pond  | Agri            |
| Vill            | 1pond  | √ | X    | X | X            | X        | 48+600 | 1 school | X | X        | X                     | √            | 1pond  | Vill            |
| Agri and vill   | 2 pond | √ | X    | X | X            | X        | 48+800 | X        | X | X        | X                     | √            | 1pond  | Agri            |



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|-----------------|--------|--------------|--------------|---------|---------------|---------|--------|---------|---|------------|-----------|--------------|--------|---------------|
| Vill            | X      | √            | Shop         | X       | X             | 1school | 49+000 | X       | X | X          | X         | √            | X      | Vill          |
| Market          | X      | √            | Shop         | X       | X             | X       | 49+200 | X       | X | X          | X         | √            | X      | Market        |
| Agri and vill   | X      | √            | Tower        | X       | X             | X       | 49+400 | X       | X | X          | X         | √            | X      | Vill and agri |
| Market and agri | X      | √            | Petrol pump  | x       | X             | x       | 49+600 | X       | X | X          | X         | √            | X      | Vill and agri |
| Vill            | X      | √            | X            | x       | X             | x       | 49+800 | X       | X | 1Satsangha | X         | √            | 1      | Vill          |
|                 |        |              |              |         |               |         |        |         |   |            |           |              | pond   |               |
| Agri            | X      | √(very poor) | X            | x       | X             | x       | 50+000 | X       | X | X          | X         | √(very poor) | 1pond  | Agri          |
| Agri            | X      | √(very poor) | X            | x       | X             | x       | 50+200 | X       | X | X          | p.o.      | √            | X      | Vill and agri |
| Vill            | X      | √            | X            | x       | X             | x       | 50+400 | X       | X | X          | X         | √            | X      | Vill          |
| Vill            | X      | √            | Water supply | x       | X             | x       | 50+600 | X       | X | X          | Panchayed | √            | X      | Vill          |
| Vill            | X      | √            | X            | x       | X             | x       | 50+800 | X       | X | 1 mandir   | X         | √            | 1 pond | Vill          |
| Agri            | X      | √            | X            | x       | X             | x       | 51+000 | X       | X | X          | X         | √            | X      | Vill & agri   |
| Agri            | X      | √(very poor) | X            | x       | X             | x       | 51+200 | X       | X | X          | X         | √            | 1pond  | Vill & agri   |
| Vill & market   | 1 pond | √            | Shop         | x       | 1 health care | x       | 51+400 | 1School | X | X          | X         | √            | X      | Vill          |
| Vill & agri     | 1 beel | √(very poor) | x            | x       | x             | x       | 51+600 | X       | X | X          | X         | √            | 1 beel | Market        |
| Vill            | X      | √            | x            | x       | x             | x       | 51+800 | X       | X | X          | X         | √            | 1 pond | Vill          |
| Vill            | 1pond  | √            | x            | x       | x             | x       | 52+000 | X       | X | X          | X         | √            | X      | Agri          |
| Vill            | 1pond  | √            | x            | x       | x             | x       | 52+200 | X       | X | X          | X         | √            | X      | Agri          |
| Vill            | 1pond  | √            | x            | x       | x             | x       | 52+400 | X       | X | X          | X         | √            | X      | Agri& vill    |
| Vill            | X      | √            | x            | x       | x             | x       | 52+600 | X       | X | X          | X         | √            | X      | Vill          |
| Vill            | 1 pond | √            | x            | 1masjid | x             | x       | 52+800 | X       | X | X          | X         | √            | X      | Vill          |
| Vill            | 1 pond | √            | x            | x       | x             | x       | 53+000 | X       | X | X          | X         | √            | 1 pond | Vill          |

**FIELD WORK DATA**

|            |           |   |   |   |   |         |        |        |   |   |   |   |   |               |
|------------|-----------|---|---|---|---|---------|--------|--------|---|---|---|---|---|---------------|
| Agri& vill | X         | √ | x | x | x | x       | 53+200 | X      | X | X | X | √ | X | Vill          |
| Vill       | 1<br>pond | √ | x | x | x | x       | 53+400 | School | X | X | X | √ | X | Vill          |
| Vill       | 1pond     | √ | x | x | x | x       | 53+600 | X      | X | X | X | √ | X | Vill and agri |
| Vill       | X         | √ | x | x | x | 1school | 53+800 | X      | X | X | X | √ | X | Vill          |
| Vill       | X         | √ | x | x | x | X       | 54+000 | X      | X | X | X | √ | X | vill          |

|                |   |   |      |   |   |          |        |          |   |          |      |   |        |        |
|----------------|---|---|------|---|---|----------|--------|----------|---|----------|------|---|--------|--------|
| Villand market | X | √ | x    | x | x |          | 54+200 | X        | X | X        | X    | √ | 1 pond | vill   |
| Vill           | X | √ | shop | x | x | 1 school | 54+400 | X        | X | 1 masjid | shop | √ | X      | Market |
| Vill           | X | √ | x    | x | x | X        | 54+600 | 1 school | X | X        | X    | √ | X      | vill   |
|                |   |   |      |   |   |          | 54+800 |          |   |          |      |   |        |        |
|                |   |   |      |   |   |          |        |          |   |          |      |   |        |        |

**HDM-4** Emissions by Vehicle Type

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[illegible]

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[illegible]

Price: \$14.95

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**References**

Table 2.3.3: Relationship of the Road

| Station | Distance (km) | Area (ha) | Volume (m³) | Cost (Rs. Crore) | Benefit (Rs. Crore) | Net Benefit (Rs. Crore) |
|---------|---------------|-----------|-------------|------------------|---------------------|-------------------------|
| 1000    | 0.00          | 0.00      | 0.00        | 0.00             | 0.00                | 0.00                    |
| 1010    | 0.10          | 0.10      | 0.10        | 0.01             | 0.01                | 0.00                    |
| 1020    | 0.20          | 0.20      | 0.20        | 0.02             | 0.02                | 0.00                    |
| 1030    | 0.30          | 0.30      | 0.30        | 0.03             | 0.03                | 0.00                    |
| 1040    | 0.40          | 0.40      | 0.40        | 0.04             | 0.04                | 0.00                    |
| 1050    | 0.50          | 0.50      | 0.50        | 0.05             | 0.05                | 0.00                    |
| 1060    | 0.60          | 0.60      | 0.60        | 0.06             | 0.06                | 0.00                    |
| 1070    | 0.70          | 0.70      | 0.70        | 0.07             | 0.07                | 0.00                    |
| 1080    | 0.80          | 0.80      | 0.80        | 0.08             | 0.08                | 0.00                    |
| 1090    | 0.90          | 0.90      | 0.90        | 0.09             | 0.09                | 0.00                    |
| 1100    | 1.00          | 1.00      | 1.00        | 0.10             | 0.10                | 0.00                    |
| 1110    | 1.10          | 1.10      | 1.10        | 0.11             | 0.11                | 0.00                    |
| 1120    | 1.20          | 1.20      | 1.20        | 0.12             | 0.12                | 0.00                    |
| 1130    | 1.30          | 1.30      | 1.30        | 0.13             | 0.13                | 0.00                    |
| 1140    | 1.40          | 1.40      | 1.40        | 0.14             | 0.14                | 0.00                    |
| 1150    | 1.50          | 1.50      | 1.50        | 0.15             | 0.15                | 0.00                    |
| 1160    | 1.60          | 1.60      | 1.60        | 0.16             | 0.16                | 0.00                    |
| 1170    | 1.70          | 1.70      | 1.70        | 0.17             | 0.17                | 0.00                    |
| 1180    | 1.80          | 1.80      | 1.80        | 0.18             | 0.18                | 0.00                    |
| 1190    | 1.90          | 1.90      | 1.90        | 0.19             | 0.19                | 0.00                    |
| 1200    | 2.00          | 2.00      | 2.00        | 0.20             | 0.20                | 0.00                    |
| 1210    | 2.10          | 2.10      | 2.10        | 0.21             | 0.21                | 0.00                    |
| 1220    | 2.20          | 2.20      | 2.20        | 0.22             | 0.22                | 0.00                    |
| 1230    | 2.30          | 2.30      | 2.30        | 0.23             | 0.23                | 0.00                    |
| 1240    | 2.40          | 2.40      | 2.40        | 0.24             | 0.24                | 0.00                    |
| 1250    | 2.50          | 2.50      | 2.50        | 0.25             | 0.25                | 0.00                    |
| 1260    | 2.60          | 2.60      | 2.60        | 0.26             | 0.26                | 0.00                    |
| 1270    | 2.70          | 2.70      | 2.70        | 0.27             | 0.27                | 0.00                    |
| 1280    | 2.80          | 2.80      | 2.80        | 0.28             | 0.28                | 0.00                    |
| 1290    | 2.90          | 2.90      | 2.90        | 0.29             | 0.29                | 0.00                    |
| 1300    | 3.00          | 3.00      | 3.00        | 0.30             | 0.30                | 0.00                    |
| 1310    | 3.10          | 3.10      | 3.10        | 0.31             | 0.31                | 0.00                    |
| 1320    | 3.20          | 3.20      | 3.20        | 0.32             | 0.32                | 0.00                    |
| 1330    | 3.30          | 3.30      | 3.30        | 0.33             | 0.33                | 0.00                    |
| 1340    | 3.40          | 3.40      | 3.40        | 0.34             | 0.34                | 0.00                    |
| 1350    | 3.50          | 3.50      | 3.50        | 0.35             | 0.35                | 0.00                    |
| 1360    | 3.60          | 3.60      | 3.60        | 0.36             | 0.36                | 0.00                    |
| 1370    | 3.70          | 3.70      | 3.70        | 0.37             | 0.37                | 0.00                    |
| 1380    | 3.80          | 3.80      | 3.80        | 0.38             | 0.38                | 0.00                    |
| 1390    | 3.90          | 3.90      | 3.90        | 0.39             | 0.39                | 0.00                    |
| 1400    | 4.00          | 4.00      | 4.00        | 0.40             | 0.40                | 0.00                    |
| 1410    | 4.10          | 4.10      | 4.10        | 0.41             | 0.41                | 0.00                    |
| 1420    | 4.20          | 4.20      | 4.20        | 0.42             | 0.42                | 0.00                    |
| 1430    | 4.30          | 4.30      | 4.30        | 0.43             | 0.43                | 0.00                    |
| 1440    | 4.40          | 4.40      | 4.40        | 0.44             | 0.44                | 0.00                    |
| 1450    | 4.50          | 4.50      | 4.50        | 0.45             | 0.45                | 0.00                    |
| 1460    | 4.60          | 4.60      | 4.60        | 0.46             | 0.46                | 0.00                    |
| 1470    | 4.70          | 4.70      | 4.70        | 0.47             | 0.47                | 0.00                    |
| 1480    | 4.80          | 4.80      | 4.80        | 0.48             | 0.48                | 0.00                    |
| 1490    | 4.90          | 4.90      | 4.90        | 0.49             | 0.49                | 0.00                    |
| 1500    | 5.00          | 5.00      | 5.00        | 0.50             | 0.50                | 0.00                    |
| 1510    | 5.10          | 5.10      | 5.10        | 0.51             | 0.51                | 0.00                    |
| 1520    | 5.20          | 5.20      | 5.20        | 0.52             | 0.52                | 0.00                    |
| 1530    | 5.30          | 5.30      | 5.30        | 0.53             | 0.53                | 0.00                    |
| 1540    | 5.40          | 5.40      | 5.40        | 0.54             | 0.54                | 0.00                    |
| 1550    | 5.50          | 5.50      | 5.50        | 0.55             | 0.55                | 0.00                    |
| 1560    | 5.60          | 5.60      | 5.60        | 0.56             | 0.56                | 0.00                    |
| 1570    | 5.70          | 5.70      | 5.70        | 0.57             | 0.57                | 0.00                    |
| 1580    | 5.80          | 5.80      | 5.80        | 0.58             | 0.58                | 0.00                    |
| 1590    | 5.90          | 5.90      | 5.90        | 0.59             | 0.59                | 0.00                    |
| 1600    | 6.00          | 6.00      | 6.00        | 0.60             | 0.60                | 0.00                    |
| 1610    | 6.10          | 6.10      | 6.10        | 0.61             | 0.61                | 0.00                    |
| 1620    | 6.20          | 6.20      | 6.20        | 0.62             | 0.62                | 0.00                    |
| 1630    | 6.30          | 6.30      | 6.30        | 0.63             | 0.63                | 0.00                    |
| 1640    | 6.40          | 6.40      | 6.40        | 0.64             | 0.64                | 0.00                    |
| 1650    | 6.50          | 6.50      | 6.50        | 0.65             | 0.65                | 0.00                    |
| 1660    | 6.60          | 6.60      | 6.60        | 0.66             | 0.66                | 0.00                    |
| 1670    | 6.70          | 6.70      | 6.70        | 0.67             | 0.67                | 0.00                    |
| 1680    | 6.80          | 6.80      | 6.80        | 0.68             | 0.68                | 0.00                    |
| 1690    | 6.90          | 6.90      | 6.90        | 0.69             | 0.69                | 0.00                    |
| 1700    | 7.00          | 7.00      | 7.00        | 0.70             | 0.70                | 0.00                    |
| 1710    | 7.10          | 7.10      | 7.10        | 0.71             | 0.71                | 0.00                    |
| 1720    | 7.20          | 7.20      | 7.20        | 0.72             | 0.72                | 0.00                    |
| 1730    | 7.30          | 7.30      | 7.30        | 0.73             | 0.73                | 0.00                    |
| 1740    | 7.40          | 7.40      | 7.40        | 0.74             | 0.74                | 0.00                    |
| 1750    | 7.50          | 7.50      | 7.50        | 0.75             | 0.75                | 0.00                    |
| 1760    | 7.60          | 7.60      | 7.60        | 0.76             | 0.76                | 0.00                    |
| 1770    | 7.70          | 7.70      | 7.70        | 0.77             | 0.77                | 0.00                    |
| 1780    | 7.80          | 7.80      | 7.80        | 0.78             | 0.78                | 0.00                    |
| 1790    | 7.90          | 7.90      | 7.90        | 0.79             | 0.79                | 0.00                    |
| 1800    | 8.00          | 8.00      | 8.00        | 0.80             | 0.80                | 0.00                    |
| 1810    | 8.10          | 8.10      | 8.10        | 0.81             | 0.81                | 0.00                    |
| 1820    | 8.20          | 8.20      | 8.20        | 0.82             | 0.82                | 0.00                    |
| 1830    | 8.30          | 8.30      | 8.30        | 0.83             | 0.83                | 0.00                    |
| 1840    | 8.40          | 8.40      | 8.40        | 0.84             | 0.84                | 0.00                    |
| 1850    | 8.50          | 8.50      | 8.50        | 0.85             | 0.85                | 0.00                    |
| 1860    | 8.60          | 8.60      | 8.60        | 0.86             | 0.86                | 0.00                    |
| 1870    | 8.70          | 8.70      | 8.70        | 0.87             | 0.87                | 0.00                    |
| 1880    | 8.80          | 8.80      | 8.80        | 0.88             | 0.88                | 0.00                    |
| 1890    | 8.90          | 8.90      | 8.90        | 0.89             | 0.89                | 0.00                    |
| 1900    | 9.00          | 9.00      | 9.00        | 0.90             | 0.90                | 0.00                    |
| 1910    | 9.10          | 9.10      | 9.10        | 0.91             | 0.91                | 0.00                    |
| 1920    | 9.20          | 9.20      | 9.20        | 0.92             | 0.92                | 0.00                    |
| 1930    | 9.30          | 9.30      | 9.30        | 0.93             | 0.93                | 0.00                    |
| 1940    | 9.40          | 9.40      | 9.40        | 0.94             | 0.94                | 0.00                    |
| 1950    | 9.50          | 9.50      | 9.50        | 0.95             | 0.95                | 0.00                    |
| 1960    | 9.60          | 9.60      | 9.60        | 0.96             | 0.96                | 0.00                    |
| 1970    | 9.70          | 9.70      | 9.70        | 0.97             | 0.97                | 0.00                    |
| 1980    | 9.80          | 9.80      | 9.80        | 0.98             | 0.98                | 0.00                    |
| 1990    | 9.90          | 9.90      | 9.90        | 0.99             | 0.99                | 0.00                    |
| 2000    | 10.00         | 10.00     | 10.00       | 1.00             | 1.00                | 0.00                    |

Table 2.3.3: Relationship of the Road

|      |          |          |          |          |          |          |          |
|------|----------|----------|----------|----------|----------|----------|----------|
| 2000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2001 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2002 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2003 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2004 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2005 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2006 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2007 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2008 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2009 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2010 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2011 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2012 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2013 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2014 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2015 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2016 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2017 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2018 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2019 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2020 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2021 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2022 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2023 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2024 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2025 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2026 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2027 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2028 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2029 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2030 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2031 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2032 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2033 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2034 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2035 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2036 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2037 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2038 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2039 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2040 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2041 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2042 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2043 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2044 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2045 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2046 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2047 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2048 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2049 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2050 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2051 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2052 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2053 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2054 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2055 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2056 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2057 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2058 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2059 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2060 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2061 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2062 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2063 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2064 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2065 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2066 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2067 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2068 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2069 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2070 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2071 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2072 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2073 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2074 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2075 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2076 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2077 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2078 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2079 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2080 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2081 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2082 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2083 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2084 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2085 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2086 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2087 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2088 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2089 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2090 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2091 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2092 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2093 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2094 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2095 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2096 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2097 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2098 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2099 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2100 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2101 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2102 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2103 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2104 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2105 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2106 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2107 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2108 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2109 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2110 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2111 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2112 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2113 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2114 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2115 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2116 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2117 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 2118 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 | 4.000000 |
| 21   |          |          |          |          |          |          |          |



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1997-1998

1998

Table 3.3.3: Relationship of Traffic Flow

| From | To   | Flow | Flow | Flow | Flow | Flow | Flow |
|------|------|------|------|------|------|------|------|
| 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 |
| 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 | 1016 |
| 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 |
| 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 | 1032 |
| 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 |
| 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 | 1048 |
| 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 |
| 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 | 1064 |
| 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 |
| 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 | 1080 |
| 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 |
| 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 | 1096 |
| 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 |
| 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 | 1112 |
| 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 |
| 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 | 1128 |
| 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 |
| 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 | 1144 |
| 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 |
| 1153 | 1154 | 1155 | 1156 | 1157 | 1158 | 1159 | 1160 |
| 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 |
| 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 | 1176 |
| 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 |
| 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 | 1192 |
| 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 |
| 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 | 1208 |
| 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 |
| 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 | 1224 |
| 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 |
| 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 | 1240 |
| 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 |
| 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 | 1256 |
| 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 |
| 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 | 1272 |
| 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 |
| 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 | 1288 |
| 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 |
| 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 | 1304 |
| 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 |
| 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 | 1320 |
| 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 |
| 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 | 1336 |
| 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 |
| 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 | 1352 |
| 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 |
| 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 | 1368 |
| 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 |
| 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 | 1384 |
| 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 |
| 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 | 1400 |
| 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 |
| 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 | 1416 |
| 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 |
| 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 | 1432 |
| 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 |
| 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 | 1448 |
| 1449 | 1450 | 1451 | 1452 | 1453 | 1454 | 1455 | 1456 |
| 1457 | 1458 | 1459 | 1460 | 1461 | 1462 | 1463 | 1464 |
| 1465 | 1466 | 1467 | 1468 | 1469 | 1470 | 1471 | 1472 |
| 1473 | 1474 | 1475 | 1476 | 1477 | 1478 | 1479 | 1480 |
| 1481 | 1482 | 1483 | 1484 | 1485 | 1486 | 1487 | 1488 |
| 1489 | 1490 | 1491 | 1492 | 1493 | 1494 | 1495 | 1496 |
| 1497 | 1498 | 1499 | 1500 | 1501 | 1502 | 1503 | 1504 |
| 1505 | 1506 | 1507 | 1508 | 1509 | 1510 | 1511 | 1512 |
| 1513 | 1514 | 1515 | 1516 | 1517 | 1518 | 1519 | 1520 |
| 1521 | 1522 | 1523 | 1524 | 1525 | 1526 | 1527 | 1528 |
| 1529 | 1530 | 1531 | 1532 | 1533 | 1534 | 1535 | 1536 |
| 1537 | 1538 | 1539 | 1540 | 1541 | 1542 | 1543 | 1544 |
| 1545 | 1546 | 1547 | 1548 | 1549 | 1550 | 1551 | 1552 |
| 1553 | 1554 | 1555 | 1556 | 1557 | 1558 | 1559 | 1560 |
| 1561 | 1562 | 1563 | 1564 | 1565 | 1566 | 1567 | 1568 |
| 1569 | 1570 | 1571 | 1572 | 1573 | 1574 | 1575 | 1576 |
| 1577 | 1578 | 1579 | 1580 | 1581 | 1582 | 1583 | 1584 |
| 1585 | 1586 | 1587 | 1588 | 1589 | 1590 | 1591 | 1592 |
| 1593 | 1594 | 1595 | 1596 | 1597 | 1598 | 1599 | 1600 |
| 1601 | 1602 | 1603 | 1604 | 1605 | 1606 | 1607 | 1608 |
| 1609 | 1610 | 1611 | 1612 | 1613 | 1614 | 1615 | 1616 |
| 1617 | 1618 | 1619 | 1620 | 1621 | 1622 | 1623 | 1624 |
| 1625 | 1626 | 1627 | 1628 | 1629 | 1630 | 1631 | 1632 |
| 1633 | 1634 | 1635 | 1636 | 1637 | 1638 | 1639 | 1640 |
| 1641 | 1642 | 1643 | 1644 | 1645 | 1646 | 1647 | 1648 |
| 1649 | 1650 | 1651 | 1652 | 1653 | 1654 | 1655 | 1656 |
| 1657 | 1658 | 1659 | 1660 | 1661 | 1662 | 1663 | 1664 |
| 1665 | 1666 | 1667 | 1668 | 1669 | 1670 | 1671 | 1672 |
| 1673 | 1674 | 1675 | 1676 | 1677 | 1678 | 1679 | 1680 |
| 1681 | 1682 | 1683 | 1684 | 1685 | 1686 | 1687 | 1688 |
| 1689 | 1690 | 1691 | 1692 | 1693 | 1694 | 1695 | 1696 |
| 1697 | 1698 | 1699 | 1700 | 1701 | 1702 | 1703 | 1704 |
| 1705 | 1706 | 1707 | 1708 | 1709 | 1710 | 1711 | 1712 |
| 1713 | 1714 | 1715 | 1716 | 1717 | 1718 | 1719 | 1720 |
| 1721 | 1722 | 1723 | 1724 | 1725 | 1726 | 1727 | 1728 |
| 1729 | 1730 | 1731 | 1732 | 1733 | 1734 | 1735 | 1736 |
| 1737 | 1738 | 1739 | 1740 | 1741 | 1742 | 1743 | 1744 |
| 1745 | 1746 | 1747 | 1748 | 1749 | 1750 | 1751 | 1752 |
| 1753 | 1754 | 1755 | 1756 | 1757 | 1758 | 1759 | 1760 |
| 1761 | 1762 | 1763 | 1764 | 1765 | 1766 | 1767 | 1768 |
| 1769 | 1770 | 1771 | 1772 | 1773 | 1774 | 1775 | 1776 |
| 1777 | 1778 | 1779 | 1780 | 1781 | 1782 | 1783 | 1784 |
| 1785 | 1786 | 1787 | 1788 | 1789 | 1790 | 1791 | 1792 |
| 1793 | 1794 | 1795 | 1796 | 1797 | 1798 | 1799 | 1800 |
| 1801 | 1802 | 1803 | 1804 | 1805 | 1806 | 1807 | 1808 |
| 1809 | 1810 | 1811 | 1812 | 1813 | 1814 | 1815 | 1816 |
| 1817 | 1818 | 1819 | 1820 | 1821 | 1822 | 1823 | 1824 |
| 1825 | 1826 | 1827 | 1828 | 1829 | 1830 | 1831 | 1832 |
| 1833 | 1834 | 1835 | 1836 | 1837 | 1838 | 1839 | 1840 |
| 1841 | 1842 | 1843 | 1844 | 1845 | 1846 | 1847 | 1848 |
| 1849 | 1850 | 1851 | 1852 | 1853 | 1854 | 1855 | 1856 |
| 1857 | 1858 | 1859 | 1860 | 1861 | 1862 | 1863 | 1864 |
| 1865 | 1866 | 1867 | 1868 | 1869 | 1870 | 1871 | 1872 |
| 1873 | 1874 | 1875 | 1876 | 1877 | 1878 | 1879 | 1880 |
| 1881 | 1882 | 1883 | 1884 | 1885 | 1886 | 1887 | 1888 |
| 1889 | 1890 | 1891 | 1892 | 1893 | 1894 | 1895 | 1896 |
| 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 1903 | 1904 |
| 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 | 1912 |
| 1913 | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 | 1920 |
| 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | 1928 |
| 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 |
| 1937 | 1938 | 1939 | 1940 | 1941 | 1942 | 1943 | 1944 |
| 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 |
| 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 | 1960 |
| 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 |
| 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
| 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 |
| 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |

From: 1001 to 2000

To: 2001 to 3000

Table 3.3.3: Relationship of Traffic Flow

| Ranks Trade |      |      |      |      |      |      |      |
|-------------|------|------|------|------|------|------|------|
| 2001        | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| 2009        | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
| 2017        | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
| 2025        | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 |
| 2033        | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 |
| 2041        | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 |
| 2049        | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 |
| 2057        | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 |
| 2065        | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 | 2072 |
| 2073        | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 |
| 2081        | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 | 2088 |
| 2089        | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 |
| 2097        | 2098 | 2099 | 2100 | 2101 | 2102 | 2103 | 2104 |
| 2105        | 2106 | 2107 | 2108 | 2109 | 2110 | 2111 | 2112 |
| 2113        | 2114 | 2115 | 2116 | 2117 | 2118 | 2119 | 2120 |
| 2121        | 2122 | 2123 | 2124 | 2125 | 2126 | 2127 | 2128 |
| 2129        | 2130 | 2131 | 2132 | 2133 | 2134 | 2135 | 2136 |
| 2137        | 2138 | 2139 | 2140 | 2141 | 2142 | 2143 | 2144 |
| 2145        | 2146 | 2147 | 2148 | 2149 | 2150 | 2151 | 2152 |
| 2153        | 2154 | 2155 | 2156 | 2157 | 2158 | 2159 | 2160 |
| 2161        | 2162 | 2163 | 2164 | 2165 | 2166 | 2167 | 2168 |
| 2169        | 2170 | 2171 | 2172 | 2173 | 2174 | 2175 | 2176 |
| 2177        | 2178 | 2179 | 2180 | 2181 | 2182 | 2183 | 2184 |
| 2185        | 2186 | 2187 | 2188 | 2189 | 2190 | 2191 | 2192 |
| 2193        | 2194 | 2195 | 2196 | 2197 | 2198 | 2199 | 2200 |
| 2201        | 2202 | 2203 | 2204 | 2205 | 2206 | 2207 | 2208 |
| 2209        | 2210 | 2211 | 2212 | 2213 | 2214 | 2215 | 2216 |
| 2217        | 22   |      |      |      |      |      |      |



Table 3.3.3: Relationship by Traffic Type

| Vehicle | Heavy Vehicle | Medium Vehicle | Light Vehicle | Motorcycle | Tricycle | Auto Rickshaw | Other  |
|---------|---------------|----------------|---------------|------------|----------|---------------|--------|
| 2001    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2002    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2003    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2004    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2005    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2006    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2007    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2008    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2009    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2010    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2011    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2012    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2013    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2014    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2015    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2016    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2017    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2018    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2019    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2020    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |

Table 3.3.3.1: Relationship by Traffic Type

Page 3.3.3.1

Table 3.3.4: Relationship by Traffic Type

| Vehicle | Heavy Vehicle | Medium Vehicle | Light Vehicle | Motorcycle | Tricycle | Auto Rickshaw | Other  |
|---------|---------------|----------------|---------------|------------|----------|---------------|--------|
| 2001    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2002    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2003    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2004    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2005    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2006    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2007    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2008    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2009    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2010    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2011    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2012    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2013    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2014    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2015    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2016    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2017    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2018    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2019    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |
| 2020    | 10,000        | 10,000         | 10,000        | 10,000     | 10,000   | 10,000        | 10,000 |

Table 3.3.4.1: Relationship by Traffic Type

Page 3.3.4.1

|      |           |            |           |            |           |            |           |            |
|------|-----------|------------|-----------|------------|-----------|------------|-----------|------------|
| 2025 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 |
| 2026 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 |
| 2027 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 |
| 2028 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 |
| 2029 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 | 1,074,479 | 14,547,148 |

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[illegible]

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**Appendix**

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Table 3.3: Release of pollutants

| Vehicle | Vehicle Type | CO <sub>2</sub> (g/km) | HC (g/km) | PM <sub>10</sub> (g/km) | PM <sub>2.5</sub> (g/km) | NO <sub>x</sub> (g/km) | SO <sub>x</sub> (g/km) |
|---------|--------------|------------------------|-----------|-------------------------|--------------------------|------------------------|------------------------|
| 2016    | Light Duty   | 180                    | 1.5       | 0.1                     | 0.05                     | 0.1                    | 0.01                   |
| 2017    | Light Duty   | 180                    | 1.5       | 0.1                     | 0.05                     | 0.1                    | 0.01                   |
| 2018    | Light Duty   | 180                    | 1.5       | 0.1                     | 0.05                     | 0.1                    | 0.01                   |

2010年 注册税务师考试  
 2010年 注册税务师考试  
 2010年 注册税务师考试

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Phone: 416-291-0111

١٠٢- العبد المذنب

10.11.2018, Wednesday 14:30-15:00

[illegible]

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**10.10.2018** Wednesday 10:30-12:00

[illegible]

1992-1993



Table 3.3.3: Relationship of the Road

| Sl. No. | Location  | Distance (km) | Direction | Distance (km) | Direction | Distance (km) | Direction |
|---------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|
| 1       | Srirampur | 0.00          | North     | 1.00          | North     | 1.00          | North     |
| 2       | Srirampur | 1.00          | North     | 2.00          | North     | 2.00          | North     |
| 3       | Srirampur | 2.00          | North     | 3.00          | North     | 3.00          | North     |
| 4       | Srirampur | 3.00          | North     | 4.00          | North     | 4.00          | North     |
| 5       | Srirampur | 4.00          | North     | 5.00          | North     | 5.00          | North     |
| 6       | Srirampur | 5.00          | North     | 6.00          | North     | 6.00          | North     |
| 7       | Srirampur | 6.00          | North     | 7.00          | North     | 7.00          | North     |
| 8       | Srirampur | 7.00          | North     | 8.00          | North     | 8.00          | North     |
| 9       | Srirampur | 8.00          | North     | 9.00          | North     | 9.00          | North     |
| 10      | Srirampur | 9.00          | North     | 10.00         | North     | 10.00         | North     |
| 11      | Srirampur | 10.00         | North     | 11.00         | North     | 11.00         | North     |
| 12      | Srirampur | 11.00         | North     | 12.00         | North     | 12.00         | North     |
| 13      | Srirampur | 12.00         | North     | 13.00         | North     | 13.00         | North     |
| 14      | Srirampur | 13.00         | North     | 14.00         | North     | 14.00         | North     |
| 15      | Srirampur | 14.00         | North     | 15.00         | North     | 15.00         | North     |
| 16      | Srirampur | 15.00         | North     | 16.00         | North     | 16.00         | North     |
| 17      | Srirampur | 16.00         | North     | 17.00         | North     | 17.00         | North     |
| 18      | Srirampur | 17.00         | North     | 18.00         | North     | 18.00         | North     |
| 19      | Srirampur | 18.00         | North     | 19.00         | North     | 19.00         | North     |
| 20      | Srirampur | 19.00         | North     | 20.00         | North     | 20.00         | North     |
| 21      | Srirampur | 20.00         | North     | 21.00         | North     | 21.00         | North     |
| 22      | Srirampur | 21.00         | North     | 22.00         | North     | 22.00         | North     |
| 23      | Srirampur | 22.00         | North     | 23.00         | North     | 23.00         | North     |
| 24      | Srirampur | 23.00         | North     | 24.00         | North     | 24.00         | North     |
| 25      | Srirampur | 24.00         | North     | 25.00         | North     | 25.00         | North     |
| 26      | Srirampur | 25.00         | North     | 26.00         | North     | 26.00         | North     |
| 27      | Srirampur | 26.00         | North     | 27.00         | North     | 27.00         | North     |
| 28      | Srirampur | 27.00         | North     | 28.00         | North     | 28.00         | North     |
| 29      | Srirampur | 28.00         | North     | 29.00         | North     | 29.00         | North     |
| 30      | Srirampur | 29.00         | North     | 30.00         | North     | 30.00         | North     |
| 31      | Srirampur | 30.00         | North     | 31.00         | North     | 31.00         | North     |
| 32      | Srirampur | 31.00         | North     | 32.00         | North     | 32.00         | North     |
| 33      | Srirampur | 32.00         | North     | 33.00         | North     | 33.00         | North     |
| 34      | Srirampur | 33.00         | North     | 34.00         | North     | 34.00         | North     |
| 35      | Srirampur | 34.00         | North     | 35.00         | North     | 35.00         | North     |
| 36      | Srirampur | 35.00         | North     | 36.00         | North     | 36.00         | North     |
| 37      | Srirampur | 36.00         | North     | 37.00         | North     | 37.00         | North     |
| 38      | Srirampur | 37.00         | North     | 38.00         | North     | 38.00         | North     |
| 39      | Srirampur | 38.00         | North     | 39.00         | North     | 39.00         | North     |
| 40      | Srirampur | 39.00         | North     | 40.00         | North     | 40.00         | North     |
| 41      | Srirampur | 40.00         | North     | 41.00         | North     | 41.00         | North     |
| 42      | Srirampur | 41.00         | North     | 42.00         | North     | 42.00         | North     |
| 43      | Srirampur | 42.00         | North     | 43.00         | North     | 43.00         | North     |
| 44      | Srirampur | 43.00         | North     | 44.00         | North     | 44.00         | North     |
| 45      | Srirampur | 44.00         | North     | 45.00         | North     | 45.00         | North     |
| 46      | Srirampur | 45.00         | North     | 46.00         | North     | 46.00         | North     |
| 47      | Srirampur | 46.00         | North     | 47.00         | North     | 47.00         | North     |
| 48      | Srirampur | 47.00         | North     | 48.00         | North     | 48.00         | North     |
| 49      | Srirampur | 48.00         | North     | 49.00         | North     | 49.00         | North     |
| 50      | Srirampur | 49.00         | North     | 50.00         | North     | 50.00         | North     |

Table 3.3.3.1: Relationship of the Road

Page 3.3.3.1

Table 3.3.3: Relationship of the Road

| Sl. No. | Location  | Distance (km) | Direction | Distance (km) | Direction | Distance (km) | Direction |
|---------|-----------|---------------|-----------|---------------|-----------|---------------|-----------|
| 1       | Srirampur | 0.00          | North     | 1.00          | North     | 1.00          | North     |
| 2       | Srirampur | 1.00          | North     | 2.00          | North     | 2.00          | North     |
| 3       | Srirampur | 2.00          | North     | 3.00          | North     | 3.00          | North     |
| 4       | Srirampur | 3.00          | North     | 4.00          | North     | 4.00          | North     |
| 5       | Srirampur | 4.00          | North     | 5.00          | North     | 5.00          | North     |
| 6       | Srirampur | 5.00          | North     | 6.00          | North     | 6.00          | North     |
| 7       | Srirampur | 6.00          | North     | 7.00          | North     | 7.00          | North     |
| 8       | Srirampur | 7.00          | North     | 8.00          | North     | 8.00          | North     |
| 9       | Srirampur | 8.00          | North     | 9.00          | North     | 9.00          | North     |
| 10      | Srirampur | 9.00          | North     | 10.00         | North     | 10.00         | North     |
| 11      | Srirampur | 10.00         | North     | 11.00         | North     | 11.00         | North     |
| 12      | Srirampur | 11.00         | North     | 12.00         | North     | 12.00         | North     |
| 13      | Srirampur | 12.00         | North     | 13.00         | North     | 13.00         | North     |
| 14      | Srirampur | 13.00         | North     | 14.00         | North     | 14.00         | North     |
| 15      | Srirampur | 14.00         | North     | 15.00         | North     | 15.00         | North     |
| 16      | Srirampur | 15.00         | North     | 16.00         | North     | 16.00         | North     |
| 17      | Srirampur | 16.00         | North     | 17.00         | North     | 17.00         | North     |
| 18      | Srirampur | 17.00         | North     | 18.00         | North     | 18.00         | North     |
| 19      | Srirampur | 18.00         | North     | 19.00         | North     | 19.00         | North     |
| 20      | Srirampur | 19.00         | North     | 20.00         | North     | 20.00         | North     |
| 21      | Srirampur | 20.00         | North     | 21.00         | North     | 21.00         | North     |
| 22      | Srirampur | 21.00         | North     | 22.00         | North     | 22.00         | North     |
| 23      | Srirampur | 22.00         | North     | 23.00         | North     | 23.00         | North     |
| 24      | Srirampur | 23.00         | North     | 24.00         | North     | 24.00         | North     |
| 25      | Srirampur | 24.00         | North     | 25.00         | North     | 25.00         | North     |
| 26      | Srirampur | 25.00         | North     | 26.00         | North     | 26.00         | North     |
| 27      | Srirampur | 26.00         | North     | 27.00         | North     | 27.00         | North     |
| 28      | Srirampur | 27.00         | North     | 28.00         | North     | 28.00         | North     |
| 29      | Srirampur | 28.00         | North     | 29.00         | North     | 29.00         | North     |
| 30      | Srirampur | 29.00         | North     | 30.00         | North     | 30.00         | North     |
| 31      | Srirampur | 30.00         | North     | 31.00         | North     | 31.00         | North     |
| 32      | Srirampur | 31.00         | North     | 32.00         | North     | 32.00         | North     |
| 33      | Srirampur | 32.00         | North     | 33.00         | North     | 33.00         | North     |
| 34      | Srirampur | 33.00         | North     | 34.00         | North     | 34.00         | North     |
| 35      | Srirampur | 34.00         | North     | 35.00         | North     | 35.00         | North     |
| 36      | Srirampur | 35.00         | North     | 36.00         | North     | 36.00         | North     |
| 37      | Srirampur | 36.00         | North     | 37.00         | North     | 37.00         | North     |
| 38      | Srirampur | 37.00         | North     | 38.00         | North     | 38.00         | North     |
| 39      | Srirampur | 38.00         | North     | 39.00         | North     | 39.00         | North     |
| 40      | Srirampur | 39.00         | North     | 40.00         | North     | 40.00         | North     |
| 41      | Srirampur | 40.00         | North     | 41.00         | North     | 41.00         | North     |
| 42      | Srirampur | 41.00         | North     | 42.00         | North     | 42.00         | North     |
| 43      | Srirampur | 42.00         | North     | 43.00         | North     | 43.00         | North     |
| 44      | Srirampur | 43.00         | North     | 44.00         | North     | 44.00         | North     |
| 45      | Srirampur | 44.00         | North     | 45.00         | North     | 45.00         | North     |
| 46      | Srirampur | 45.00         | North     | 46.00         | North     | 46.00         | North     |
| 47      | Srirampur | 46.00         | North     | 47.00         | North     | 47.00         | North     |
| 48      | Srirampur | 47.00         | North     | 48.00         | North     | 48.00         | North     |
| 49      | Srirampur | 48.00         | North     | 49.00         | North     | 49.00         | North     |
| 50      | Srirampur | 49.00         | North     | 50.00         | North     | 50.00         | North     |

Table 3.3.3.1: Relationship of the Road

Page 3.3.3.1

## Annex 10: Guidelines for Tree Plantation and Management

### Purpose

To develop eco-friendly road with participation of the community, farmers, NGOs, private sector, institutions, government agencies and the Forest Department. Documentation of species to be planted along road.

### Objectives

- To reduce the impacts of air pollution and dust as trees and shrubs are known to be natural sink for air pollutants
- To reduce the impact of ever increasing noise pollution caused due to increase in number of vehicles
- To arrest soil erosion at the embankment slopes
- Moderating the effect of wind and incoming radiation

### Selection of Tree Species for roadside plantations

The planting species are decided based on the physical growth characteristics of trees, like form and shape, foliage pattern, growth rate, branching pattern, soil characteristics and conditions of the strip like water logged areas etc. While selecting the species of trees for landscaping a great care should be taken to choose the species, which already exist along the project corridor. On the other hand, if a pure avenue of single species is planted for a considerable length of the road, it gives a harmonious and pleasing look. It is, therefore, essential that mixtures of different species should be avoided and pure avenues of a single species be planted over long stretches of road.

### Plantation Pattern

A concept should be evolved so as to maintain visual characteristics and uniformity in terms of landscape along the stretch. In the absence of uniform land availability for the plantations, different schemes may be worked out in tune with the local variations in the design. To achieve this, the entire stretch of the project corridor should be divided into homogenous landscape sections based on similarity in terms of available width, soil conditions, climate (temperature and rainfall) and topography. A study on the local flora and vegetative cover native to these sections should be carried out as part of the field survey to enable a choice of the suitable species for particular section. Depending on the available ROW, plantation pattern should be worked out as follows:-

- The first row along the Highways will be of small to medium sized ornamental trees.
- Planting of shrubs in the median.
- Turfing with grass in the median, special landscapes, and embankment slopes
- The shrubs to be planted in the median should be of low or medium height for prevention of the headlight glare



## **Compliance to Forest Conservation Act and local laws**

Before starting any plantation, the local forest department will be consulted for ensuring compliance to any regulation in force that may affect raising, maintenance, and harvesting of the raised plantation. Necessary modifications will be made in the plantation scheme, in consultation with the forest department, to ensure compliance to law and to avoid complications at the time of harvesting and transportation of forest produce. In case the State Government has any provision for registration of such plantations, the same will be ensured under the relevant scheme.

## **Guidelines for Median Plantation**

One or two rows of flowering shrubs are recommended in accordance to the varying width of the median in different sections. In sections where median width is less than 1.5 meter, only grass turf is recommended. In median width of 3 meters, one row of shrub whereas in 5 meter median width, plantation of two rows of flowering shrubs are proposed. Only two rows of shrubs will be planted on median width of 5 meters and these plants will be at a spacing of 1.5 meters from the inner edge of the median. The plants will be at spacing of 3 x 3 meters and size of the pits for planting will be 0.6m dia and deep. Therefore, total no. of plants per km will be 333 in case where single row is proposed and 666 in case of two rows. The surface for the median plantation should be well prepared. The masses of loose debris on the median and any convexities will be removed and similarly any concavities are to be filled by good soil. The surface should have sufficient layer of good quality soil so as to have a better growth and survival of grasses and shrubs.

## **Protection measures**

The fencing of single row plantations will be done by using iron/brick/cement guards. Locally available bamboo guards or thorn fencing may also be used where protection can be ensured through these. The specifications for the iron guards are as per IRC-SP-21, 2009. The fencing of multiple row plantations will be done preferably by barbed wire. A five strand barbed wire fencing, with cross strands, stretched on angle iron poles fixed at a distance of 4 meter from one another; is recommended. Live fencing/bamboo fencing/thorn fencing may also be used where protection can be ensured through these. The specifications for barbed wire fencing are as per IRC-SP-21, 2009.

## **Maintenance of Plantation**

The scope of the maintenance work is as per Model Tor of plantation and maintenance, IRC-SP-21, 2009 and also as per adjoining forest schedule for those items which are not included in the model Tor/IRC guidelines.

## **Monitoring**

- The Monitoring Agency will monitor progress of planting and status of plantations on continuous basis
- This agency shall carry out the site visit for field verification in respect of survival, growth and size of plantation and maintenance of the same

## Annex 11: Guidelines for Borrow Area Management

### Purpose

Borrow areas are generally required to provide material for road construction sites, can have significant adverse environmental effects, especially on ecologically sensitive areas. Borrow areas can become environmental hotspots and can significantly affect the visual appearance of an area. Special mitigation and management measures are often required to avoid or minimise the environmental and social impacts of borrow areas.

### Scope

These guidelines for borrow areas cover:

- statutory approvals
- environmental and social impacts of borrow areas
- selection of borrow areas
- operation of borrow areas
- rehabilitation of borrow areas

The guidelines seek to ensure that Contractors:

- comply with the regulatory requirements in force at the time
- reasonably manage any impacts
- reinstate and rehabilitate the land appropriately
- consult with affected communities

### Impacts

Some of the potential impacts of borrow areas are:

- trucks transporting materials to the site causing air pollution, and noise and vibrations
- ponds of stagnant water forming in excavated areas giving rise to the breeding of mosquitoes and the spreading of malaria and other mosquito-borne diseases
- natural beauty of the landscape being affected by excavations and the removal of vegetation
- natural drainage systems in the area being affected by excavations
- agriculture land and productive soils being lost, especially in paddy field areas

In IRC: 10 and Clause 305.2.2.2 of MoRTH Specification, exclusive guideline has been given for borrow areas located alongside the road and only some of the requirements have been indicated for borrow areas located outside the road land. Following guideline is proposed to supplement the existing stipulation in IRC:10 and Clause 305.2.2.2 of MoRTH Specification for Roads and Bridge Works:

### Location

- Identify areas having present land use as barren land, riverside land. Otherwise, un-irrigated agriculture land or land without vegetation and tree cover;
- Prefer borrow areas on bed of irrigation water storage tank;
- Prefer areas of highland with respect to surroundings;
- Avoid locating borrow area close to any road (maintain atleast 30 m distance from ROW and 10 m from toe of embankment, whichever is higher);
- Should be at least 1.5 km away from inhabited areas;
- Maintain a distance of about 1.5km from ecologically sensitive area i.e. Reserve Forest, Protected Forest, Sanctuary, wetland etc.;
- Maintain a distance of about 1.5 km from school, hospital and any archaeological sites;
- Having adequate approach road with minimum length of earthen road;
- Ensure that unsuitable soft rock is not prominent within the proposed depth of excavation which will render rehabilitation difficult;
- Depth of excavation should be decided based on natural ground level of the land and the surroundings, and rehabilitation plan. In case higher depth of excavation is agreed

with backfilling by unsuitable excavated soil (from roadway), then filling should be adequately compacted except topsoil which is to be spread on topmost layer (for at least 20cm thick).

#### **Operation**

- Controlled operation as per agreed / approved plan;
- Preservation of topsoil at designated areas e.g. corners of the area etc.;
- Maintain necessary buffer zone in all directions and go for vertical cut within this area. Final cut slope should be maintained within the buffer zone;
- Step-wise excavation if borrow area is located on inclined area having more than 2% slope;
- Restricting excavation up to 2m for each stages of operation if allowed depth is more;
- Avoid cutting of any tree of girth size > 30cm. If any tree cutting is inevitable, prior permission (written) from the competent authority should be taken and compensatory plantation has to be raised.

#### **Rehabilitation**

- Prior approval of Rehabilitation Plan considering terrain, land use and local need;
- Restricting operation as agreed by landowner and approved by the Engineer;
- Rehabilitation within agreed timeframe and before taking over;
- Integrate debris disposal and borrow area redevelopment.

#### **Management Procedure**

The important aspects of this procedure are:

- The first and foremost thing is to have tentative estimate of borrow material requirement chainage-wise. For this, BoQ quantity for earth work, which is given as total quantity for the entire package/milestone, has to be distributed chainage-wise. The requirement of borrow material chainage-wise then has to be estimated based on the suitability of roadway excavation material for reuse and BoQ.
- Contractor to site borrow areas fulfilling environmental requirements and obtaining one time approval of the Engineer both on quality as well as environmental consideration thereby integrating environmental safeguard measures into day-to-day activities;
- Contractor to submit environmental information in prescribed format for obtaining Engineer's approval, as given in the following format (Borrow Area Identification).
- The format has been so designed that it stipulates the requirements as well as what is actual for each borrow areas and could be easily understood by any person, whoever in-charge of identifying borrow areas;
- Contractor to submit Borrow Area Layout Plan as attachment to the format showing the land use of the proposed and surrounding area along with the presence of other environmental features such as water bodies, forests, settlement, temple and any sensitive receptor i.e. health and educational institution, roads etc. within a radius of 1.5km area from the boundary of the borrow area;
- Contractor to prepare and submit Block Contour Map of each borrow area (especially which are located close to road and on undulating terrain) for deciding on operation and redevelopment plan;
- Contractor to prepare Operation Plan and submit as attachment to the format including cross sections on both directions (x,y) mentioning natural ground level, depth of topsoil (if any), total depth of excavation, cut side slope and bed slope;
- Contractor to prepare Redevelopment Plan and submit as attachment to the format include cross sections on both directions (x,y) mentioning natural ground level, excavated profile, finished profile after redevelopment etc.;
- Contractor to maintain Borrow Material Register;
- Periodic joint inspections of each borrow area until rehabilitation is complete as agreed and approved.

The checklist for periodic inspection is given in this Annexure.

### **Borrow Areas Identification**

Construction Stage Report: One Time

Location of Borrow Area (Ch. & Offset):

Date:

Revenue Survey No.:

| Sl. No. | Item / Requirement                                                                                                                                                                | Details as per Actual (to be filled by Contractor & checked by Engineer) |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 1       | Date of Borrow Area planned to be operational                                                                                                                                     |                                                                          |
| 2       | Current Land use (preference to barren land, riverside land, otherwise, un-irrigated agriculture land or land without tree cover)                                                 |                                                                          |
| 3       | Size (Sq.m) and area (m x m) of Borrow Area                                                                                                                                       |                                                                          |
| 4       | Proposed maximum depth of pit in m (IRC 10 & Clause 305.2.2 of MoRTH Spec.)                                                                                                       |                                                                          |
| 5       | Details of riverside borrow area (inner edge should not be less than 10m from the toe of the bank and bottom of pit should not cut the imaginary line of 1:4 from embankment top) |                                                                          |
| 6       | Borrow area in cultivable land (should be avoided or restricted to total depth of 45cm including preservation of 15cm topsoil)                                                    |                                                                          |
| 7       | Quantity Available (Cum)                                                                                                                                                          |                                                                          |
| 8       | Quantity of top soil to be removed (Sq.m & depth in cm)                                                                                                                           |                                                                          |
| 9       | Details of preservation (storage) and management (re-use / re-laid) of top soil                                                                                                   |                                                                          |
| 10      | Width of Haul road (m)                                                                                                                                                            |                                                                          |
| 11      | Total Length of Haul Road (km)                                                                                                                                                    |                                                                          |
| 12      | Length of Non-metal Haul Road (should be as minimum as possible)                                                                                                                  |                                                                          |
| 13      | No of settlements within 200 m of Non-metal Haul Road (should be as minimum as possible)                                                                                          |                                                                          |
| 14      | Distance from settlement (should be minimum 1500 m)                                                                                                                               |                                                                          |
| 15      | Should be away from water bodies. Give details of water bodies within 250 m.                                                                                                      |                                                                          |
| 16      | Details of water sources for dust suppression                                                                                                                                     |                                                                          |
| 17      | Quantity of water required for dust suppression i.e. sprinkling at borrow area and on haul road (Cum)                                                                             |                                                                          |
| 18      | Availability of water required for dust suppression (Cum)                                                                                                                         |                                                                          |
| 19      | Details of ecologically sensitive area i.e. RF, PF, Sanctuary etc. within 1500m (should be nil)                                                                                   |                                                                          |
| 20      | Details of school, hospital and any archaeological sites within 1500m (should be nil)                                                                                             |                                                                          |
| 21      | Distance from nearby road embankment, fence line / boundary (should be minimum 30m from ROW and 10m from toe of embankment, whichever is higher)                                  |                                                                          |
| 22      | No of Trees with girth more than 0.3 m (No tree should be affected)                                                                                                               |                                                                          |

**Documents to be attached:**

Site plan and layout plan of borrow area;

- Proposed borrow area operation and redevelopment plan;
- Written consent from competent authority for use of water for dust suppression
- Written consent of landowner on agreed operation and redevelopment plan
- Certified that the furnished information is correct and all relevant information as required is attached

## **Annex 12: Guidelines for Emergency Management System**

All employees of the Construction Contractor shall immediately report all environmental incidents to their site supervisor who will investigate the incident with the Construction Contractor Manager.

It is a Construction Contractor requirement that all incidents are reported and investigated, such as:

- Any injury to any person, including first-aid,
- Any illness,
- Any damage to property or equipment,
- Any loss of containment of hazardous materials,
- Any environmental incident, and
- Any 'near-miss', that is, an incident with no injury, damage or loss but which could have resulted in significant injury, damage or loss.

No matter how minor, the employee is to report the incident immediately to the relevant supervisor. In every case the site supervisor is to document the incident using the Construction Contractor's Incident Management System.

All incident reports shall be discussed at toolbox meetings to ensure all site personnel learn from the incident.

Incidents that have the potential to cause localized environmental impacts need to be reported to the Project Manager and Environment Team within 24 hours. Incidents that cause or have the potential to cause environmental impacts external to the facility boundary need to be reported to Environment Team and the Project Manager immediately. Full copies of the report / incident investigation shall be provided to the Project Manager upon completion.

### **➤ First Aid / Spill Response Kits**

The Construction Contractor will ensure that First Aid facilities (First Aid Kits) and spill response kits are available on the project site at all times. First Aid Kits shall be stored in the site office and/or the site supervisor's car. First Aid Kits shall also be audited on a regular basis by Construction Contractor and supplies re-ordered as required. The spill response kit shall be stored in the area where refuelling activities shall be undertaken as a priority. Re-fuelling should be limited to small equipment and on hardstand areas only where any spills can be cleaned up immediately. Spill trays should be used during refuelling to prevent spillage.

The Construction Contractor shall also ensure that at least ten percent (10%) of employees are trained in First Aid principles and spill response or site clean-up procedures, including the site supervisor. An emergency contact list shall also be posted on site, which will display the contact details for the nearest hospital and emergency services. This information shall also be covered in the start-up / site induction.

### **➤ Fire Emergency**

The Construction Contractor will ensure that its work areas and facilities are equipped with firefighting equipment suitable for the work being performed. Employees shall also be made aware of the location of firefighting equipment available on site through signage and at the start-up site induction.

The Construction Contractor Manager shall also ensure that the firefighting equipment is checked on a regular basis by competent personnel.



The Construction Contractor Manager should be contacted to report any fires immediately. If it is a life threatening, emergency contact 101 or local fire services should be called first followed by call to Construction Contractor Manager.

➤ **Wardens / Coordinators**

The Site Supervisor is nominated as the senior coordinator for emergency procedures for the project. The Site Supervisor or delegate will take charge in the event of an emergency event and ensure that personnel get to the nearest muster point and that all personnel are accounted for.

➤ **Site Specific Emergency Contact Details**

| Emergency Contact                         | Address / Contact Name | Telephone Number |
|-------------------------------------------|------------------------|------------------|
| Emergencies<br>(Save 101 for emergencies) |                        |                  |
| Police                                    |                        |                  |
| Closest Hospital                          |                        |                  |
| Construction Contractor<br>Manager        |                        |                  |
| Project Manager                           |                        |                  |
| EHS Manager                               |                        |                  |

## **Annex 13: Guidelines for Waste Disposal and Management**

### **Purpose**

- To maximize re-use of material generated during construction and
- To avoid environmental hazards due to improper disposal of construction waste material.

### **Procedure**

The following procedures should be followed for upkeep of storage and disposal sites:

- Contractor shall maintain register for keeping records on kilometer-wise quantities of material generated during grubbing, stripping, excavation and scarifying;
- Contractor shall re-use construction material to the extent possible based on engineering properties. Possible re-use areas are fill sections, embankment slope, village approach roads etc. Debris without bitumen could be used for backfilling of quarry / borrow areas as recommended by the Engineer. At locations identified for dumping of residual bituminous wastes, the dumping shall be carried out over a 60mm thick layer of rammed clay so as to eliminate the possibility of the leaching of the wastes into the ground water. The contractor shall ensure that the filled area is covered with a layer of preserved topsoil layer of preserved topsoil.
- Contractor shall estimate the chainage-wise quantities of various waste material to be disposed of;
- Contractor shall restrict waste disposal strictly at approved site/s only;
- Contractor shall prepare a plan including detailed lay out plan and cross-section for disposal of debris and bitumen waste and get approval of the same by the Engineer;
- Bentonite slurry or similar debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area;
- Contractor and Engineer shall ensure that disposal areas are properly treated as per agreed plan;
- Contractor and Engineer's representatives shall undertake joint weekly inspection to ensure compliance of various environmental requirements.
- Engineer's representatives shall issue non-compliance if disposal site is not managed as per agreed plan;
- All arrangement for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be considered incidental to the work and should be planned and implemented by the contractor as approved and directed by the SC.

### **Site Inspection**

Weekly joint site inspection shall be undertaken for all the storage areas. The details of attributes, which are to be inspected, are given as follows. The Contractor shall ensure compliance of the requirements.

**Details to be inspected for Monitoring Construction Material Reuse & Disposal**

| Attributes                                  | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction material generation and re-use | <ul style="list-style-type: none"><li>• Segregating debris and bitumen during generation;</li><li>• Segregating re-usable portion of debris and bitumen and storing preferably near areas of re-use; and</li><li>• Temporary storage of waste material at sites as directed by the Engineer.</li></ul>                                                                                                                                                                                                                                                                                                                 |
| Waste disposal                              | <ul style="list-style-type: none"><li>• Disposal of waste material at approved disposal site within a week of generation;</li><li>• Disposal site should be properly demarcated;</li><li>• Proper leveling / grading at disposal site/s;</li><li>• Recommended / agreed safeguard measures to avoid ground water contamination by leachate from disposal of scarified material are to be implemented;</li><li>• Recommended / agreed safeguard measures to avoid soil erosion are to be implemented;</li><li>• Recommended / agreed plan for surface treatment of waste disposal site/s are to be implement.</li></ul> |

## Annex 14: Outline of an Environmental Monitoring Report

### 1. Introduction

- Overall project description and objectives
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

| Name           | Designation/Office | Email Address | Contact Number |
|----------------|--------------------|---------------|----------------|
| 1. PMU         |                    |               |                |
|                |                    |               |                |
| 2. PIUs        |                    |               |                |
|                |                    |               |                |
|                |                    |               |                |
| 3. Consultants |                    |               |                |
|                |                    |               |                |
|                |                    |               |                |

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

| Package Number | Components/List of Works | Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M) <sup>a</sup> | Contract Status (specify if under bidding or contract awarded) | If On-going Construction |                          |
|----------------|--------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------|--------------------------|
|                |                          |                                                                                                                |                                                                | % Physical Progress      | Expected Completion Date |
|                |                          |                                                                                                                |                                                                |                          |                          |
|                |                          |                                                                                                                |                                                                |                          |                          |
|                |                          |                                                                                                                |                                                                |                          |                          |
|                |                          |                                                                                                                |                                                                |                          |                          |
|                |                          |                                                                                                                |                                                                |                          |                          |
|                |                          |                                                                                                                |                                                                |                          |                          |
|                |                          |                                                                                                                |                                                                |                          |                          |

<sup>a</sup>If on-going construction, include % physical progress and expected date of completion.

### 2. Compliance Status With National/State/Local Statutory Environmental Requirements<sup>a</sup>

| Package No. | Subproject Name | Statutory Environmental Requirements <sup>b</sup> | Status of Compliance <sup>c</sup> | Validity if obtained | Action Required | Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish <sup>d</sup> |
|-------------|-----------------|---------------------------------------------------|-----------------------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------|
|             |                 |                                                   |                                   |                      |                 |                                                                                                                                       |
|             |                 |                                                   |                                   |                      |                 |                                                                                                                                       |
|             |                 |                                                   |                                   |                      |                 |                                                                                                                                       |

<sup>a</sup>All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.

<sup>b</sup>Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

<sup>c</sup>Specify if obtained, submitted and awaiting approval, application not yet submitted

<sup>d</sup>Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 5 trees for every tree cut, etc.

### 3. Compliance Status With Environmental Loan Covenants

| No. (List schedule and paragraph number of Loan Agreement) | Covenant | Status of Compliance | Action Required |
|------------------------------------------------------------|----------|----------------------|-----------------|
|                                                            |          |                      |                 |
|                                                            |          |                      |                 |
|                                                            |          |                      |                 |

### 4. Compliance Status with the Environmental Management Plan (Refer to EMP Tables in Approved EIA/S)

- Confirm if EIA/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

#### Package-wise Implementation Status

| Package Number | Components | Design Status (Preliminary Design Stage/ Detailed Design Completed) | Final EIA based on Detailed Design              |                                                |                                             |                                             | Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No) | Remarks |
|----------------|------------|---------------------------------------------------------------------|-------------------------------------------------|------------------------------------------------|---------------------------------------------|---------------------------------------------|--------------------------------------------------------------------------------|---------|
|                |            |                                                                     | Not yet due (detailed design not yet completed) | Submitted to JICA (Provide Date of Submission) | Disclosed On project website (Provide Link) | Final EIA provided to Contractor/s (Yes/No) |                                                                                |         |
|                |            |                                                                     |                                                 |                                                |                                             |                                             |                                                                                |         |
|                |            |                                                                     |                                                 |                                                |                                             |                                             |                                                                                |         |
|                |            |                                                                     |                                                 |                                                |                                             |                                             |                                                                                |         |
|                |            |                                                                     |                                                 |                                                |                                             |                                             |                                                                                |         |
|                |            |                                                                     |                                                 |                                                |                                             |                                             |                                                                                |         |

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including signed monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:
  - Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).
  - Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved EIA. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

- o Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- o Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
- o Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
- o Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
- o Confirm spill kits on site and site procedure for handling emergencies.
- o Identify any chemical stored on site and provide information on storage condition. Attach photograph.
- o Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- o Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- o Provide information on barricades, signages, and on-site boards. Provide photographs.
- o Provide information on checking if there are any activities being undertaken out of working hours and how that is being managed.



### 5. Summary of Environmental Monitoring Activities (for the Reporting Period)

| Impacts (List from EIA)       | Mitigation Measures (List from EIA) | Parameters Monitored (As a minimum those identified in the EIA should be monitored) | Method of Monitoring | Location of Monitoring | Date of Monitoring Conducted | Name of Person Who Conducted the Monitoring |
|-------------------------------|-------------------------------------|-------------------------------------------------------------------------------------|----------------------|------------------------|------------------------------|---------------------------------------------|
| <b>Design Phase</b>           |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
| <b>Pre-Construction Phase</b> |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
| <b>Construction Phase</b>     |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
| <b>Operational Phase</b>      |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |
|                               |                                     |                                                                                     |                      |                        |                              |                                             |

<sup>a</sup>Attach Laboratory Results and Sampling Map/Locations

## 6. Overall Compliance with CEMP/ EMP

| No. | Sub-Project Name | EMP/ CEMP Part of Contract Documents (Y/N) | CEMP/ EMP Being Implemented (Y/N) | Status of Implementation (Excellent/Satisfactory/ Partially Satisfactory/ Below Satisfactory) | Action Proposed and Additional Measures Required |
|-----|------------------|--------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------|--------------------------------------------------|
|     |                  |                                            |                                   |                                                                                               |                                                  |
|     |                  |                                            |                                   |                                                                                               |                                                  |
|     |                  |                                            |                                   |                                                                                               |                                                  |

## 7. Approach and Methodology for Environmental Monitoring of the Project

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

## 8. Monitoring of Environmental Impacts on Project Surroundings (Ambient Air, Water Quality and Noise Levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

*As a minimum the results should be presented as per the tables below.*

### 9. Air Quality Results

| Site No. | Date of Testing | Site Location | Parameters (Government Standards) |           |           |
|----------|-----------------|---------------|-----------------------------------|-----------|-----------|
|          |                 |               | PM10 µg/m3                        | SO2 µg/m3 | NO2 µg/m3 |
|          |                 |               |                                   |           |           |
|          |                 |               |                                   |           |           |
|          |                 |               |                                   |           |           |

| Site No. | Date of Testing | Site Location | Parameters (Monitoring Results) |           |           |
|----------|-----------------|---------------|---------------------------------|-----------|-----------|
|          |                 |               | PM10 µg/m3                      | SO2 µg/m3 | NO2 µg/m3 |
|          |                 |               |                                 |           |           |
|          |                 |               |                                 |           |           |
|          |                 |               |                                 |           |           |

### 10. Water Quality Results

| Site No. | Date of Sampling | Site Location | Parameters (Government Standards) |                    |          |          |         |         |
|----------|------------------|---------------|-----------------------------------|--------------------|----------|----------|---------|---------|
|          |                  |               | pH                                | Conductivity µS/cm | BOD mg/L | TSS mg/L | TN mg/L | TP mg/L |
|          |                  |               |                                   |                    |          |          |         |         |
|          |                  |               |                                   |                    |          |          |         |         |
|          |                  |               |                                   |                    |          |          |         |         |

### 11. Noise Quality Results

| Site No. | Date of Testing | Site Location | LAeq (dBA) (Government Standard) |            |
|----------|-----------------|---------------|----------------------------------|------------|
|          |                 |               | Day Time                         | Night Time |
|          |                 |               |                                  |            |

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|  |  |  |  |  |

| Site No. | Date of Testing | Site Location | LA <sub>eq</sub> (dBA) (Monitoring Results) |            |
|----------|-----------------|---------------|---------------------------------------------|------------|
|          |                 |               | Day Time                                    | Night Time |
|          |                 |               |                                             |            |
|          |                 |               |                                             |            |

## 12. Summary of Key Issues and Remedial Actions

- Summary of follow up time-bound actions to be taken within a set timeframe.

## 13. Appendixes

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

## Annex 15: Guidelines for Siting and Layout of Construction Camp

### Purpose

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

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

### Scope

This guideline covers the Contractors' camp sites – whether used by in-house crew or by any sub-contractors' crew. It covers siting, operation, maintenance, repair and dismantling procedures for facilities for labor employed on project (and ancillary) activities as well as equipment and vehicles. ***It does not include siting, operation, maintenance, repair and dismantling of major plants – Hot-mix Plant, Concrete Batching Plant, Crusher or Wet Mix Macadam Plant.***

- **Siting, Establishing, Operation and Closure of Construction Camp**

### Potential Environmental Impacts

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

### Mitigation Measures

#### Siting up Construction Camp

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

- Maintain a distance of at least 1.5 km from boundaries of designated Reserved Forests, Sanctuary or National Park area for locating any temporary or permanent camps.
- Maintain 1.5 km from river, stream and lake and 500m from ponds
- Maintain 250 m from the boundary of state and national highways
- Locate facilities in areas not affected by flooding and clear of any natural or storm water courses.
- Locate campsites in the (most prevalent) downwind direction of nearest village(s). The boundary of the campsite should be at least 1.5 km from the nearest habitation so that the incoming labor does not stress the existing local civic facilities.
- The ground should have gentle slope to allow free drainage of the site.
- Recorded consultations should be held with residents of the nearest settlement and/or their representatives to understand and incorporate where possible, what they would like to see within their locality.

### **Establishment, Operation, and Closure of Camps**

The facilities within the camp site should be laid out so that the separation distances suggested in other guidelines are maintained. A notional lay-out of the facilities except the major plants is included in this guideline.

- Topsoil from the area of the plant shall be stored separately for the duration of the operation of the camp and protected from being washed away, unless agreed otherwise in writing with the owner. If stored, it will be returned on to its original location at the time of closure of the site.
- The Contractor shall prepare, make widely available (especially to staff responsible for water and material management), and implement a Storm water Management Plan (SWMP) for (all) the site(s) following approval of the same by the Engineer.
- The Contractor shall prepare an Emergency and Spill Response Plan as per the requirements
- The Contractor shall prepare a Waste Management Plan describing the types and quantities that are likely to be generated from within the camp site, with the period and duration during the construction schedule; methods to be adopted to minimize these; methods of removal, treatment and (on-site or off-site) disposal for each type; as well as location of final disposal site, if any.
- The Contractor shall provide safe ingress and egress for vehicles from the site and public roads and shall not impact existing through traffic.
- Water tankers with sprayers must be available at the camp site at all times to prevent dust generation.
- In case of stockpiles of stored material rising higher than wind-breaking perimeter fencing provided, sprinklers shall be available on site to prevent dusting from the piles during windy days.
- On completion of works, the Contractor shall restore the site to the condition it was in before the establishment of the campsite, unless agreed otherwise in writing with the owner(s) of the site(s). If such a written agreement has been made, the Contractor shall hand over the site to the owner(s) in accordance with such an agreement.

### **• Equipment and Vehicle-related issues**

#### **Potential Environmental Impacts**

The maintenance and repair of equipment and vehicles in Contractor's camp are activities that can have significant adverse impacts if not carried out properly. The concern mainly arises from discharge of wash water contaminated with oil and grease, whether from washing of vehicles or degreasing of equipment and vehicle parts. Vehicle washing,

especially dirt from tires, also gives rise to sediment-laden run-off. No such discharges should be directly allowed into surface water bodies since they can be harmful to aquatic species.

### **Mitigation Measures**

#### **Vehicles**

All vehicles used by the Contractor must have copies of currently valid Pollution Under Control Certificates displayed as per the requirement of the Motor Vehicles Department for the duration of the Contract.

All vehicles and equipment will be fitted with silencers and/or mufflers which will be serviced regularly to maintain them in good working condition and conforming to the standard of 75dB (A) at 1m from surface of enclosure.

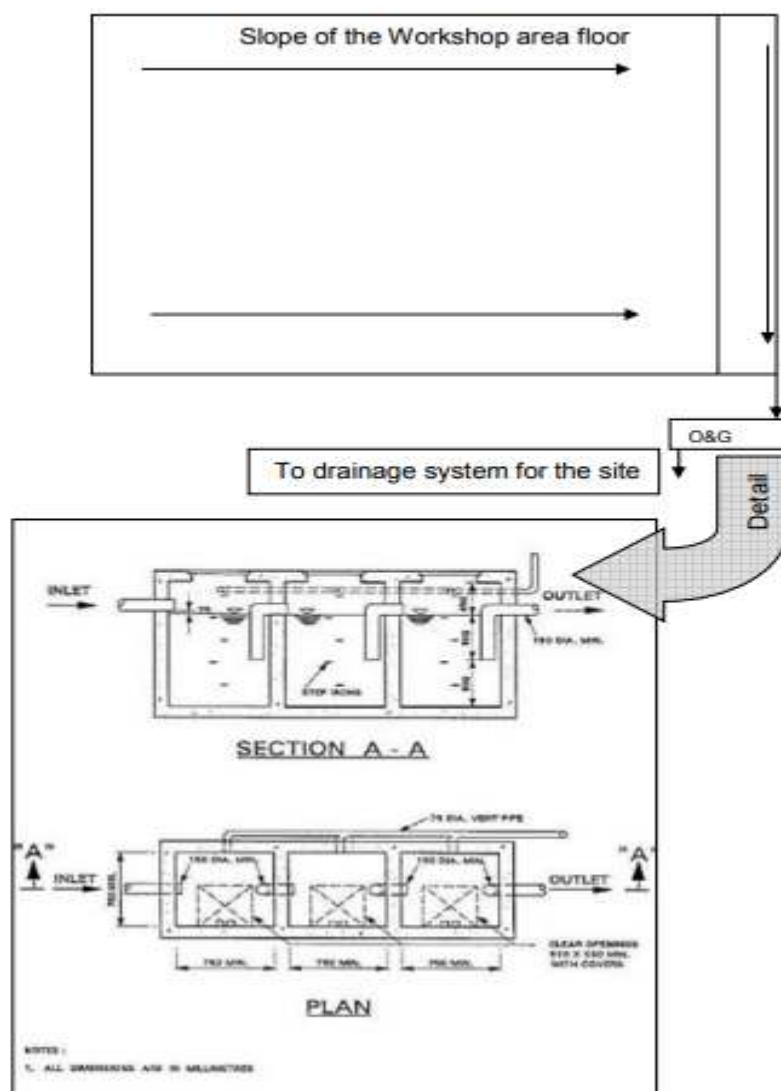
#### **Workshop and Maintenance areas**

These areas must have impervious flooring to prevent seepage of any leaked oil/grease into the ground. The area should be covered with a roof to prevent the entry of rainwater.

The flooring shall be sloped to from both directions to one corner where an oil-and-grease trap with sufficient capacity should be installed. All discharges from the workshop area must pass through the trap to remove the floating oil and grease before entering the drainage system of the site. The trap should be designed to provide a hydraulic residence time of about 20 minutes for the peak hourly discharge anticipated from the area (as per following figure).

Alternatively, degreasing can also be carried out using mechanical spray type degreaser, with complete recycle using an enclosure with nozzles and two sieves, coarse above and fine below, may be used as shown in the adjacent photograph. This arrangement will require some initial investment and running cost for the pump, but the payback period, in terms of the use of diesel, under Indian conditions, has been reported to be less than 1 year.

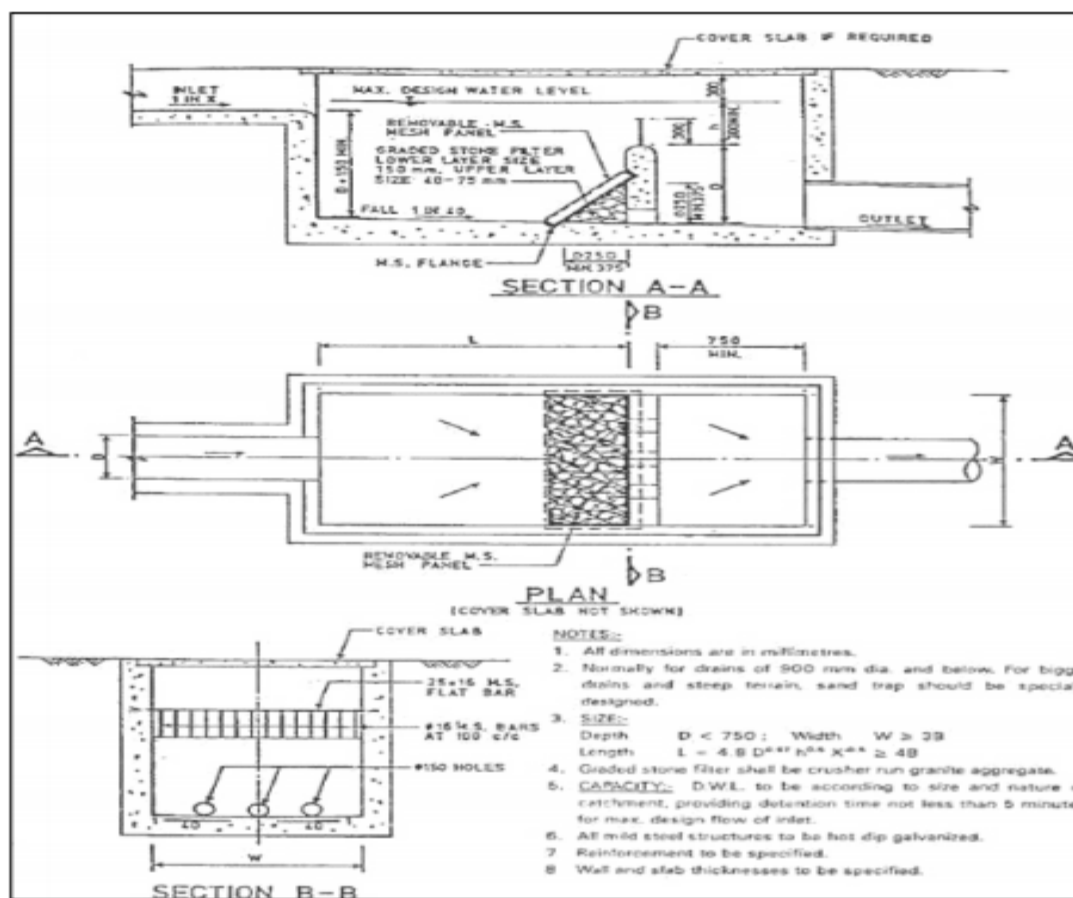




### Workshop Area Pollution Control

All the waste oil collected, from skimming of the oil trap as well as from the drip pans, or the mechanical degreaser shall be stored in accordance with the Environment Protection (Storage and Disposal of Hazardous Wastes) Rules, 1989. For this purpose, metallic drums should be used. These should be stored separately in sheds, preferably banded. The advantage of this arrangement is that it allows for accurate accounting in case the waste material is sold to oilwaste recyclers or other users like brick-kiln owners who can burn such inferior fuel.

A separate vehicle washing ramp shall be constructed adjacent to the workshop for washing vehicles, including truck mounted concrete mixers, if any, after each day's construction is over, or as required. This ramp should have an impervious bottom and it should be sloped so that it drains into a separate chamber to remove the sediment from the wash water before discharge. The chamber should allow for a hydraulic residence time of about 10 minutes for discharge associated with the washing of each truck. Following figure 2 shows an outline sketch for a sedimentation chamber.



Sedimentation Chamber for vehicle washing ramp discharge

## Facilities for Labour

### Potential Environmental Impacts

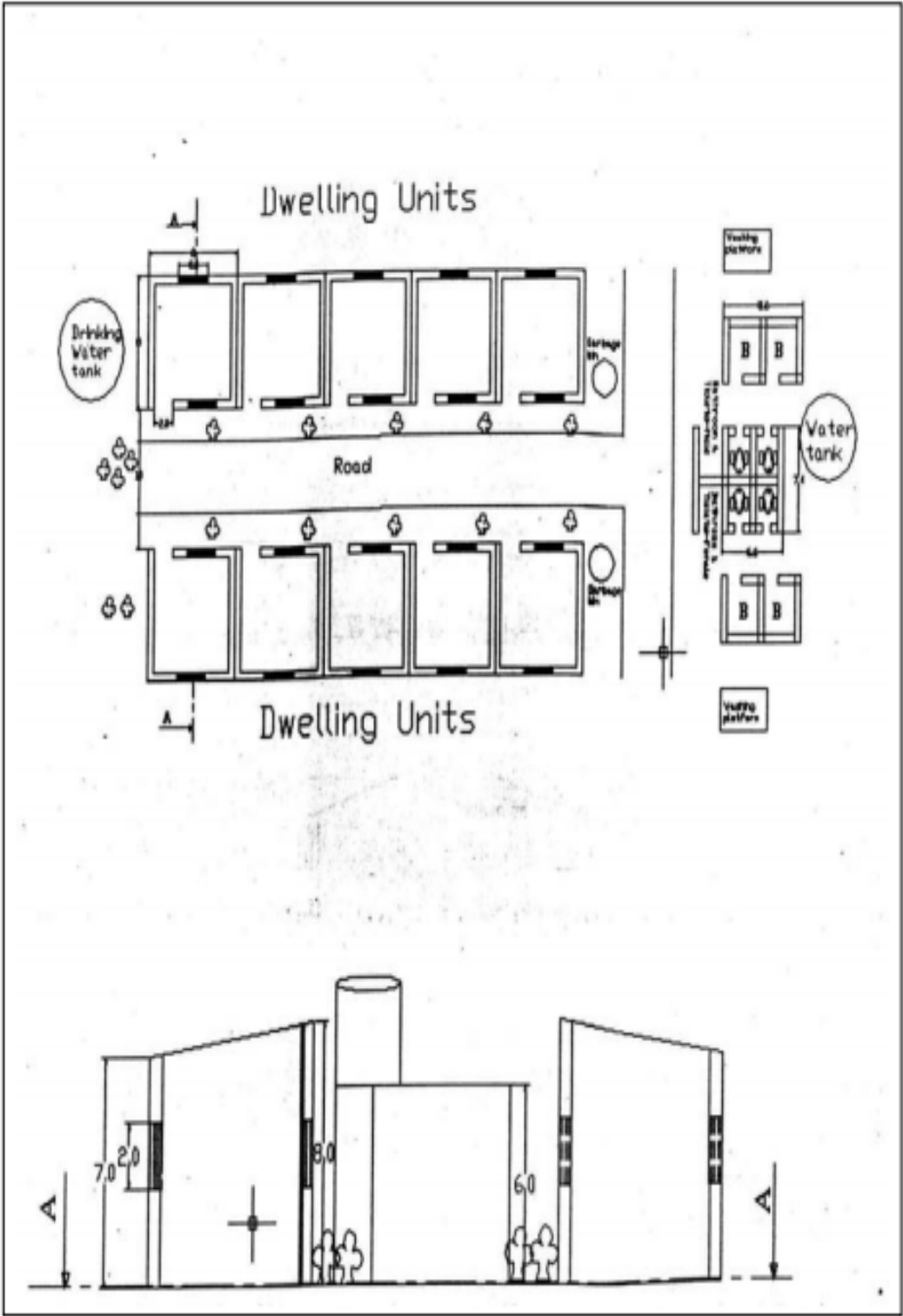
The sudden arrival and relatively longer duration of stay of construction crew can cause substantial strain on the existing infrastructure facilities like water supply, sanitation and medical care, especially in rural areas. Pollution from domestic wastes can affect local sources of water supply and may harm the crew themselves as well as local residents. Improper sanitation and inadequate health care also potential bottlenecks that the Contractor can eliminate with relatively little effort.

### Mitigation Measures

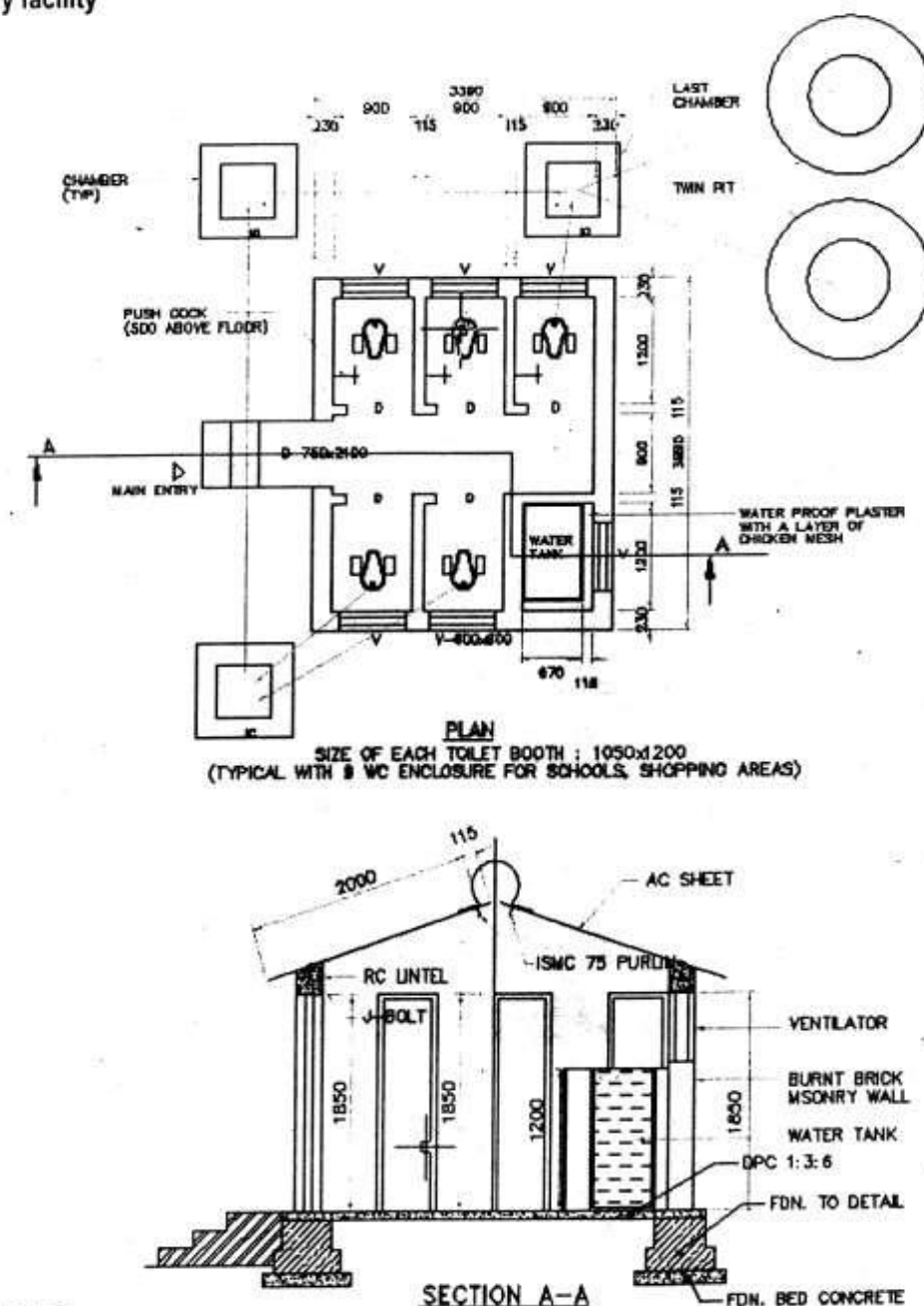
It should be emphasized that the Indian Law requires that the Contractor provide several facilities to for the workers as per Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. Some of the provisions described herein are more stringent to act as benchmark for improved environmental performance of road projects:

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

- The contractor shall ensure the supply of wholesome water for all the labour, including those employed by any other agency working for the contractor. These locations will be marked "Drinking Water" in the language most commonly understood among the labour. In hot season, the contractor shall make efforts to ensure supply of cool water. No water point shall be located within 15 m of any washing place, urinal, or latrine.
- The contractor shall ensure that adequate cooking fuel, preferably kerosene or LPG, is available on-site. The contractor will ensure that wood/ coal are not used as fuel on the site. Workers need to be made aware of this restriction. In cases where more than 250 labours are employed, canteen facility should be provided by the Contractor.
- A crèche must be provided in each campsite where more than 50 female labourers are employed, whether directly or indirectly, for the project or its ancillary activities.
- Contractor must provide adequate facilities for first-aid treatment at the campsite. A doctor / ambulance should be available on call for the duration of project implementation.
- The contractor shall obtain the approval of the Engineer for these facilities within 30 days of mobilization.



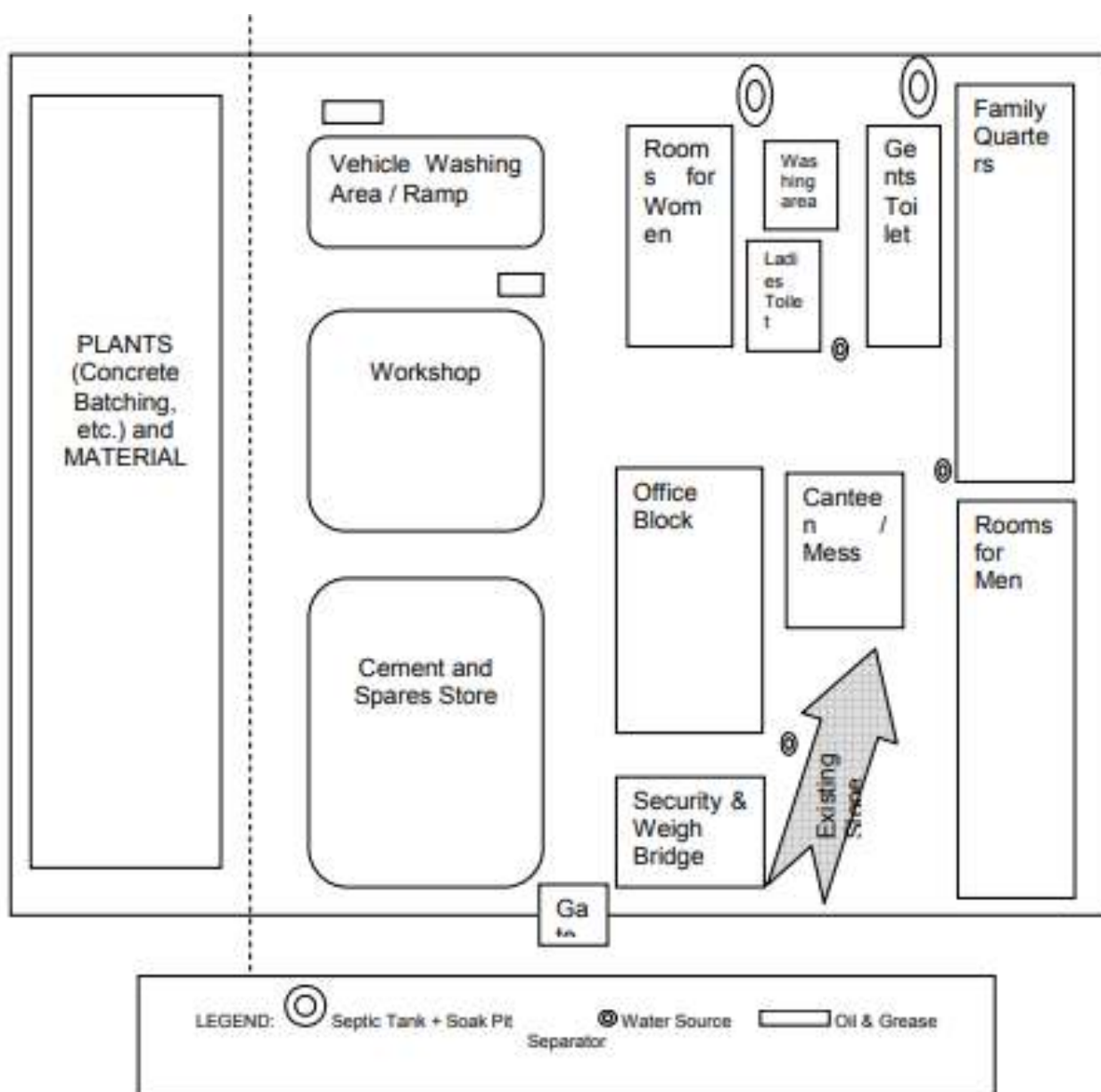
### Sanitary facility



#### NOTES:

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

Typical Drawing of Workers' Camp Sanitary Facility



Layout of a Construction camp



## Annex 16: Guidelines For Siting, Operation And Re-Development Of Quarrying And Stone Crushing Operations

### Introduction

Name of quarry /village and approximate lead distances from project site are tabulated below:

**Table 68: Location of Stone / Coarse Aggregate Material**

| Lead Charts |                        |          |                |
|-------------|------------------------|----------|----------------|
| Sl. No.     | Material               | Place    | Av. Lead (Km.) |
| 1           | Sand (Fine)            | Koraghat | 26             |
| 2           | Lime                   | Dhubri   | 1              |
| 3           | Moorum/ Rubbish        | Garubasa | 63             |
| 4           | Stone Metal            | Haraputa | 6              |
| 5           | Stone Boulder          | Haraputa | 6              |
| 6           | Stone Chips, Aggregate | Haraputa | 6              |
| 7           | Coarse Sand            | Koraghat | 26             |
| 8           | Cement                 | Dhubri   | 1              |
| 9           | Steel                  | Dhubri   | 1              |
| 10          | Tar, Bitumen           | Guwhati  | 270            |
| 11          | Bitumen Emulsion       | Guwhati  | 270            |
| 12          | Structural Steel       | Guwhati  | 1              |

### Overview

A quarry is a type of open-pit mine from which rock or minerals are extracted for building materials, such as dimension stone, construction aggregate, riprap, sand, and gravel. Quarrying causes environmental damages like air and noise pollution, water logging etc. and requires permission from regulatory authorities like mining department, state pollution control board etc. It requires a careful approach in the site selection process, scientific method of quarrying and appropriate measures to redevelop it.

### Criteria for Locating the Site/s

The selection of a quarry is sole responsibility of the contractor and should be undertaken in adherence to the rules & regulations of the authorities. Following criteria should be followed while selecting a quarry site:

- To the extent possible barren land or waste lands shall be preferred during site selection and fertile land and agricultural land shall be avoided.

- There shall be no quarrying of sand in any river bed or adjoining area or any other area which is located within 500 meters radial distance from the location of any bridge, water supply system, infiltration well or pumping installation of any of the local bodies or Central or State Government
- Department or any area identified for locating water supply schemes by any of the Government Department or other bodies.
- Quarry site shall be located at a minimum distance of 1km from any human settlements and 100 meters from any surface water body / natural drainage channel.
- Locate the quarry and crusher at a min. distance of 1.5 km away from forests / wildlife habitats / ecologically sensitive areas
- Access roads to quarry sites must be wide enough for heavy vehicle movement without inconvenience to local traffic.
- After identification of the site the Contractor should fill up the prescribed reporting format and submit the same for approval to the Sr. Environmental Specialist of the Independent Engineer without which any activity shouldn't be started on the site.

### **Finalization of Selected Site/s**

The selected site/s shall be approved by IE and PIU, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the land owner/s prior to receipt of a written approval from the IE and PIU. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost.

### **Setting up of quarrying and Stone Crusher**

Quarrying involves not only extraction of material (rock) but also crushing and screening that makes the rock suitable for use as construction material. Following are the major parameters to be considered before the start of quarrying and stone crushing operations:

#### **Site Preparation**

The stripping, stacking and preservation of top soil will be mandatory and absolutely no activity should be allowed prior to the satisfactory completion of this conservation measure as per guidelines in EMP. The boundary of the quarry should be demarcated using barbed wire fencing in order to avoid the future dispute over land as well as to avoid accidental trespassing of people. There should be recorded documents of exact no of trees cut. Contour trenches should be dug along the quarry area boundary and at any other appropriate places considering the topography to reduce the surface run off and conserve soil and water. Side slopes shall be constructed with slope drains at applicable locations to provide drainage and avoid any landslides. All the drainage constructed should be linked to existing drainages in order to avoid flooding and water logging.

#### **Setting up of a Quarry Site**

The layout of a quarry should provide a gravity flow of material from the face to the crusher, from the crusher to the storage bin and from the bin to the hauling equipment. Adequate arrangements should be made for avoiding fugitive emissions from quarry and crusher premises. This will include:

- housing the noise and dust producing units of the crusher plant in a building with wall of minimum 23 cm thickness and with suitable roofing
- control of air pollution through provision of in-built dust extraction systems in the crusher unit and all transfer points
- a chimney of appropriate height for the DG set (as specified by SPCB)
- water sprinkling facilities for the camp premises
- facilities to store water required for 3 days use

Consent to Operate the crusher unit should be obtained from SPCB under Air (Prevention and Control of Pollution) Act, 1981 before starting the operation.

### **Safety Aspects**

- Blasting timings in quarry should be fixed avoiding the rush hours and these timings should be adhered to in order to avoid the conflict between the surrounding communities or population. Provide warning sirens 10 minutes before each explosion as a warning alarm to people in and outside the quarry. Damaged explosives must be disposed-off in a safe manner away from the operational area. Speed of the vehicles around the quarry should be restricted to a low speed in order to reduce the noise pollution and dust generation. Workers should not be exposed to sound of more than 85 – 90 dB for more than eight hours a day and shall be provided with adequate safety wears and personal protective equipment like ear muffs / plugs etc. Fire extinguishers should be provided in the site office
- Traffic movements should be restricted along the access road around times that children walk to and from school. Proper first aid facilities should be provided within the site office and in case of an accident, quick access to nearby hospital/clinic should be provided.

### **Facilities for Workers**

- Potable drinking water should be provided in the site office in a hygienic environment sufficient for all the people.
- Adequate no. of toilets shall be provided for the workers with adequate water supply, proper drainage and effluent treatment system like septic tank with soakpit. Soak pit should have a sealed bottom, honey comb wall and 75cm thick, 2mm sand envelope around that.
- The sewage system for the camp must be properly sited, designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent water courses takes place.

### **Waste Disposal**

- The Contractor should provide separate garbage bins for biodegradable, nonbiodegradable and hazardous wastes in the camps and ensure that these are regularly emptied and disposed-off in a hygienic manner.
- No incineration or burning of wastes shall be carried out by the Contractor.
- The disposal of any biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold / given out for recycling.
- POL (petroleum, oil and lubricants) waste shall be disposed-off by transfer only to recycler/ re-refiners possessing valid authorization from the State Pollution Control Board and valid registration from the Central Pollution Control Board.
- Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.
- Quarry areas should be protected from illegal dumping of waste by third parties. The overburden should be kept as minimum to maximize the commercial efficiency of the quarry, it can be utilized for creating earth bunds to mitigate the noise and visual impacts and also for the site rehabilitation process.
- No quarry waste shall be dumped within a 100 m either side of the road. The overburden should be reused or disposed properly. Site for overburden disposal should be planned within the quarry site or any other appropriate site.

### **Training to Workers**

- Workers shall be trained in smooth and safe operation of plants and equipment, their regular maintenance and various safety measures to be followed as well as about the need and importance for adherence to these measures.
- All the drivers should be trained about safe driving and should be made aware about the need to observe caution while plying through access roads, especially during the time when children walk to and from school.
- Conduct education programs with the locals regarding the potential impacts of blasting, blasting warning systems, schedules etc.

### **Information Dissemination**

- There should be a sign board of size 6' x 4' mentioning the project details and contractor's details to disseminate the information to the public.
- There should be a second sign board displaying the latest air and noise monitoring data against the standards specified.
- Warning sign boards should be set up at the entrance gate for the public as well as at other required places for the workers to alert them about the nature of operation being undertaken.

### **Other Mitigation Measures**

- The quarry should not damage any building, work, property or rights of other persons.
- The quarry should not alter any right of way, well or tank.
- Roads inside the crusher premises should be tarred or concreted.
- Water course, if any, from a higher slope should be properly drained out.
- Storm water drainage shall be provided to prevent water logging and flooding in and around the area.
- The possibility of collecting the storm water in a pit or a tank should be explored so that it can be reused for dust suppression and the dependence on other water sources could be reduced. If this is not possible, the water should be safely channeled out of the quarry without disturbing any nearby human settlement.
- A register should be provided in the camp site for public to record their grievances if any.
- Environmental monitoring (air, noise, surface & ground water) should be conducted on quarterly basis.
- The concerned authority – AE / PIU should regularly review the environmental, health and safety aspects. If any adverse effect on environment, habitat and concern of safety is noticed, appropriate measures should be taken as suggested by AE or should arrange an alternative for road construction materials.
- In the case of existing quarries and additional quarries, the contractor has to ensure that all actions in these quarries are in compliance with EMP.

### **Operation of Quarry Site and Stone Crushing Unit**

- No quarrying operation shall be done without the approval from the concerned authority.
- The equipment used in quarry should be wear faced, which extends the equipment life and reduce the demand for spare parts.
- Adopt controlled blasting techniques and conduct quarrying in a skillful, scientific and systematic manner.
- All units should operate only between 6 am and 10 pm. or as specified by SPCB in the consent letter.
- Accessory facilities to be provided in the quarry includes sprinklers to spray water for dousing the dust generation, noise suppressers and rubberized mounting to reduce noise and vibration and tarpaulins or covers over material transporting vehicles.
- Provide sufficient water storage facility for 2 days' use.

- Measures have to be taken to reduce the dust generation during drilling operation. Deep wetting of drilling zones also to be done by water sprinkling and drilling machine shall be fitted with dust suppression, collection and disposal arrangements.
- To avoid spillage of fuel and lubricants, the vehicles and equipment should be properly maintained and repaired. Maintenance should be carried out on impervious platforms with spill collection provisions.

Following conditions regarding sound generation should be complied with in a quarry /crusher unit:

- The sound level (Leq) measured at a distance of 1 m from the boundary of the site shall not exceed 55 dB(A) during day time (6 a.m. to 6 p.m.) and 45 dB(A) during night time (6 p.m. to 6 a.m.).
- The DG set shall be provided with exhaust muffler /acoustic enclosure/acoustic treatment with an insertion loss of minimum 25 dB(A) and its emission levels should be within relevant SPCB guidelines.
- A proper, routine and preventive maintenance procedure for the DG set shall beset and followed in consultation with the DG set manufacturer.

## Quarry Management Plan

Quarry Management Plan shall be documented as follows for each quarrying sites:

| Sl. No. | Item                                                                                     | Unit           | Details |
|---------|------------------------------------------------------------------------------------------|----------------|---------|
| 1.      | Name / identity of the location                                                          |                |         |
| 2.      | Nearest project road Chainage                                                            |                |         |
| 3.      | Name of the owner                                                                        |                |         |
| 4.      | Area involved                                                                            | M <sup>2</sup> |         |
| 5.      | Existing land use (verification from land records with Revenue Dept.)                    |                |         |
| 6.      | Land use of the area surrounding the proposed site including a Map                       |                |         |
| 7.      | Access Roads– existing conditions, proposed development and maintenance                  |                |         |
| 8.      | Tree cutting and vegetation clearance if any, along with compensation measures           | Nos.           |         |
| 9.      | Arrangement with the owner (agreement with land owner should be attached as an annexure) |                |         |
| 10.     | Quantity of material to be quarried                                                      | Cum            |         |
| 11.     | Machinery and equipment to be used                                                       |                |         |
| 12.     | Copy of the Consents to Establish and Operate should be attached as an annexure          |                |         |
| 13.     | Copy of the license from Mining and Geology, Police and Fire Department                  |                |         |

| Sl. No. | Item                                                                                                                            | Unit | Details |
|---------|---------------------------------------------------------------------------------------------------------------------------------|------|---------|
| 14.     | Conditions laid down in the clearances / licenses and plans to ensure compliance                                                |      |         |
| 15.     | Information on whether or not the quarry shall be closed under this project. If yes, the proposed closure and restoration plan. |      |         |
| 16.     | Concern of the local people living in the immediate / near vicinity (through dialogue / consultation)                           |      |         |
| 17.     | Photographs showing before and after conditions as well as during operations at regular intervals                               |      |         |
| 18.     | Quarry Site Plan                                                                                                                |      |         |
| 19.     | Quarry Operation Plan                                                                                                           |      |         |
| 20.     | Quality Plan                                                                                                                    |      |         |
| 21.     | Safety Plan                                                                                                                     |      |         |
| 22.     | Waste Management Plan                                                                                                           |      |         |
| 23.     | Restoration and Rehabilitation Plan                                                                                             |      |         |
| 24.     | Monitoring Plan                                                                                                                 |      |         |

### Redevelopment of Quarry Area

The main objective of the redevelopment of quarries is to make the area safe and secure place and adapt it to a suitable land use like leisure place or fishing place etc. which is suitable for the physical environment as well as for the community around. Along with the preparation of quarry and crusher management plan the contractor should also prepare a redevelopment plan, which will be submitted for approval to IE who in turn will be responsible for approving and monitoring these plans. The restoration plan should indicate following points:

List of structures to be demolished and list of the cleanup activities that needs to be undertaken.

- Presence of facilities that could be put in use by the land owner if it is a leased out private land or community in case of a public property
- The proposed use of the quarry site with a layout plan showing the proposed facilities / improvement measures, list of local plant species that could be planted etc.
- Photographs of the site before and during the quarrying process

Possible re-development options include the following:

- Re-vegetation of the quarry to merge with surrounding landscape with reuse of top soil mixed together with farm yard manure.
- Development of exhausted quarries as water bodies, where the quarry pit is developed into pond or a rainwater harvesting structure
- Pits created as a result of blasting could be filled with over burden which are removed and stockpiled in other areas or with construction debris. Top soil should be spread back and trees should be planted along the boundary.



- Tree plantation where ever possible depending on the proposed use, erosion control measures etc. should be taken up as part of the redevelopment plan.

### **De-mobilization of the Site**

- The contractor should clear all temporary structures; dispose all building debris, garbage, night soils and POL waste as per the approved debris management plan.
- All disposal pits or trenches should be filled in, disinfected and effectively sealed off.
- Once the re-development plan is implemented and the site is restored, the same should be intimated to IE by the contractor.
- The IE shall ensure that all clean-up and restoration operations are completed satisfactorily and written approval is given to the contractor before the 'work completion' certificate is issued / recommended.
- The PIU shall ensure through site inspection that the Contractor and IE have complied with all these provisions.
- The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.
- Certification / documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor, Supervision Consultant and PIU.

## **Annex 17: Guideline for Siting and Management of Debris Disposal Site**

### **Purpose**

- To maximize re-use of material generated during construction and
- To avoid environmental hazards due to improper disposal of construction waste material.

### **Procedure**

The following procedures should be followed for upkeep of storage and disposal sites:

- Contractor shall maintain register for keeping records on kilometer-wise quantities of material generated during grubbing, stripping, excavation and scarifying;
- Contractor shall re-use construction material to the extent possible based on engineering properties. Possible re-use areas are fill sections, embankment slope, village approach roads etc. Debris without bitumen could be used for backfilling of quarry / borrow areas as recommended by the Engineer. At locations identified for dumping of residual bituminous wastes, the dumping shall be carried out over a 60mm thick layer of rammed clay so as to eliminate the possibility of the leaching of the wastes into the ground water. The contractor shall ensure that the filled area is covered with a layer of preserved topsoil layer of preserved topsoil.
- Contractor shall estimate the chainage-wise quantities of various waste material to be disposed of;
- Contractor shall restrict waste disposal strictly at approved site/s only
- Contractor shall prepare a plan including detailed lay out plan and cross-section for disposal of debris and bitumen waste and get approval of the same by the Engineer;
- Bentonite slurry or similar debris generated from pile driving or other construction activities shall be disposed such that it does not flow into the surface water bodies or form mud puddles in the area;
- Contractor and Engineer shall ensure that disposal areas are properly treated as per agreed plan;
- Contractor and Engineer's representatives shall undertake joint weekly inspection to ensure compliance of various environmental requirements. Engineer's representatives shall issue non-compliance if disposal site is not managed as per agreed plan;
- All arrangement for transportation during construction including provision, maintenance, dismantling and clearing debris, where necessary will be considered incidental to the work and should be planned and implemented by the contractor as approved and directed by the SC.

### **Site Inspection**

Weekly joint site inspection shall be undertaken for all the storage areas. The details of attributes, which are to be inspected, are given as follows. The Contractor shall ensure compliance of the requirements.

**Table 69: Details to be inspected for Monitoring Construction Material Reuse & Disposal**

| Attributes                                  | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction material generation and re-use | <ul style="list-style-type: none"> <li>• Segregating debris and bitumen during generation;</li> <li>• Segregating re-usable portion of debris and bitumen and storing preferably near areas of re-use; and</li> <li>• Temporary storage of waste material at sites as directed by the Engineer.</li> </ul>                                                                                                                                                                                                                                                                                                                      |
| Waste disposal                              | <ul style="list-style-type: none"> <li>• Disposal of waste material at approved disposal site within a week of generation;</li> <li>• Disposal site should be properly demarcated;</li> <li>• Proper leveling / grading at disposal site/s;</li> <li>• Recommended / agreed safeguard measures to avoid ground water contamination by leachate from disposal of scarified material are to be implemented;</li> <li>• Recommended / agreed safeguard measures to avoid soil erosion are to be implemented;</li> <li>• Recommended / agreed plan for surface treatment of waste disposal site/s are to be implemented.</li> </ul> |

## Annex 18: Guidelines For Top Soil Conservation And Reuse

The top soil from all sites including road side widening and working area, cutting areas, quarry sites, borrow areas, construction camps, haul roads in agricultural fields (if any) and areas to be permanently covered shall be stripped to a specified depth of 15 cm and stored in stock piles for reuse.

At least 10% of the temporary acquired area for construction purposes shall be earmarked for stockpiling of fertile top soil.

The locations for stacking will be pre-identified in consultation and with approval of Environmental Specialist of the Independent Engineer.

The following precautionary measures will be taken by the contractor to preserve the stock piles till they are re-used:

- Slope of the stockpiles should not exceed 1:2 (vertical to horizontal), and height is restricted to 2m to retain soil and allow percolation of H<sub>2</sub>O.
- The edges of pile should be protected by silt fencing and allow percolation of water, which will help to retain soil
- Multiple handling kept to a minimum to ensure that no compaction occurs.
- Stockpiles shall be covered with empty gunny bags or will be planted with grasses to prevent the loss during rains.

Such stockpiled topsoil will be utilized for

- Covering reclamation sites or other disturbed areas including borrow areas (not those in barren areas).
- Top dressing and raising turfs in embankment slopes
- Filling up of tree pits
- For developing median plantation
- In the agricultural fields of farmers, acquired temporarily that needs to be restored.

Residual top soil, if there is any, shall be utilized for the plantations works along the road corridor. The utilization as far as possible shall be in the same area from where top soil was removed. The stripping, preservation and reuse shall be carefully inspected, closely supervised and properly recorded by the Environmental Specialist of the Independent Engineer.

## Annex 19: Guidelines On Slope Stabilization

### Introduction

Erosion Control on roads is fundamental for the protection of water quality. Soil stabilization and erosion control practices are needed and should be used in areas where soil is exposed. Bare ground should be covered, typically with grass seed and some form of matting or mulch. This will help prevent erosion and subsequent movement of sediment into river, streams, lakes and ponds. This movement of sediment can occur during and after road construction. Erosion control measures need to be implemented immediately following construction and every time an area is disturbed.

### Soil Erosion Control

Soil erosion is the process of detachment and transportation of soil particles by wind, water principally. Normally non-cohesive soil particles are blown away by wind erosion. The kinetic energy of falling rain drops causes detachment of soil particles and subsequently carried away by surface run-off. Erodibility co-efficient of soil and impact of rain drops are determinant factors in the process. This is guided by the nature of soil (clay content), particle size distribution and soil condition like saturation, density, permeability, plasticity etc. Dislodged soil particles flow down the slope with the overland flow, eroding and destabilizing the soil-body. When the intensity of rainfall increases surface run-off velocity accelerates and facilitates carriage of subsequent particles and ultimately results in disorders in the form of rill to gully and finally to erosion ditches. These disorders will impair slope stability worst if not controlled with proper protective measures.

Ground cover is considered as the most suitable solution for erosion protection. Tress, grass and other plant species are natural soil-binders and provide the best natural solution against erosion. In bio-engineering, plants have mainly two functions viz. hydrological and mechanical. Hydrological effects of plants are many such as interception (rain drops strike the leaves first before striking the ground soil), storage (leaves and stems hold water for some time before it eventually reaches the ground), infiltration (stems and shoots roughen and loosen the ground, enabling water to infiltrate more easily) etc. Mechanical function of plant is to reinforce the soil by binding the loose soil particles with its fibrous root system.

Bio-engineering is the technique of utilizing vegetation in addressing geotechnical problems. Environmental uncertainties are prompting engineers to favour bioengineering measures. Vegetation as an aid to artificial methods in controlling surficial soil erosion is gaining larger acceptability among engineers all over the world. Growth of appropriate vegetation on exposed soil surface is facilitated by use of natural geotextiles such as Coir Geotextiles. Properly designed Coir Geotextiles laid on slopes or any other exposed soil surface provides a cover over exposed soil lessening the probability of soil detachment and at the same time reduces the velocity of surface runoff, the main agent of soil dissociation. Natural geotextiles bio-degrade quicker than man-made counterpart, but facilitate growth of vegetation quicker and better due to its inherent characteristics. Road slope stabilization can range from allowing native grass (Vetiver grass) to re-establish on a disturbed slope to building an engineered wall.

### Role of Coir Geotextile in Slope Stabilization

Coir is a biodegradable organic fibre material which is coarse, rigid and strong. The constituents of coir have been found to be mostly cellulose and lignin. Coir fibre is weather resistant and resistant to fungal and bacterial decomposition. The rate of decomposition of coir is much less than any other natural fibre. These characteristics are attributed due to the high lignin content in the fibre. Coir in the form of woven mesh mattings or non-woven stitch bonded blankets are used in engineering applications in the geotechnical field. Due to



growing awareness to preserve environment, use of biodegradable natural material has gained popularity. The natural fibre, coir, which has been used in geotextiles for the past 20 years, has already proved its worth.

Coir geotextiles are made from coconut fibre extracted from the husk of coconut. Like other polymeric counterparts, coir geotextiles are developed for specific application in civil engineering like erosion control, ground improvement, filtration, drainage, river bank protection, road pavements, slope stability etc. This biodegradable and environment friendly material is virtually irreplaceable by any of the modern synthetic substitutes.



Coir geo-textiles specifications: Grade I- 400g/m<sup>2</sup>



### Advantages of Coir Geotextile

- The high tensile strength of coir fiber protects steep surface from heavy flows and debris movement
- It can withstand considerable pedestrian movement and vehicular traffic without deterioration
- Easy to install and huge contour of the soil surface due to its heavy weight and ability to absorb water
- Totally Biodegradable, 100% natural
- Water absorbent, thus act as mulch on the surface and as a wick in the soil mantle
- Environmentally friendly and aesthetically pleasing and nonpolluting
- Provides excellent microclimate for plant establishment and healthy growth
- The thick and protruding fibers from the yarn render an extra protection against soil erosion and Provide roughness to the surface floor and hold the soil particles in place.
- The coir geo textile gives the grass plenty of room to grow and at the same time provides large number of "CHECK DAMS" per square meter of soil media
- During the manufacturing process of coir yarn, non-chemicals are used
- Holds the seeds and saplings in place



- Allows sunlight to pass through

Coir Geotextile is laid on the shoulder and slope surface helped retain the soil particles and prevented detachment of soil particles from the prepared slope. Establishment of vegetation ensured stabilization of the soil on the slope surface. It is a bio-degradable natural geotextile, can conveniently be used for controlling surface soil erosion and help growth of vegetation as a bio-engineering measure. After biodegradation coalesces with the soil and adds nutrient to the soil and fosters growth of vegetation.



### Role of Vetiver Grass in Slope Stabilization

Vetiver grass (*Chrysopogon zizanioides*) is native to India. It has been shown to be a simple and economical method to conserve soil by slowing the velocity of water and trapping sediment, filtering out nutrients, and stabilizing steep slopes. In western and northern India, it is popularly known as khus. Several aspects of Vetiver make it an excellent erosion control plant in warmer climates:

- Vetiver grass does not have stolons or rhizomes. Its massive finely structured root system that can grow very fast; in some applications rooting depth can reach 3 to 4m in the first year. This deep root system makes Vetiver plant extremely drought tolerant and difficult to dislodge by strong current.
- Stiff and erect stems, which can stand up to relatively deep water flow
- Highly resistance to pests, diseases and fire
- A dense hedge is formed when planted close together acting as a very effective sediment filter and water spreader
- New roots grow from nodes when buried by trapped sediment. Vetiver will continue to grow up with the deposited silt eventually forming terraces, if trapped sediment is not removed.
- Tolerance to extreme climatic variation such as prolonged drought, flood, submergence and extreme temperature from -14°C to +55°C
- Tolerance to wide range of soil pH from 3.3 to 12.5 without soil amendment
- High level of tolerance to herbicides and pesticides
- Highly efficient in absorbing dissolved nutrients such as N and P and heavy metals in polluted water.
- Highly tolerant to growing medium high in acidity, alkalinity, salinity and magnesium

- Highly tolerant to Al, Mn and heavy metals such as As, Cd, Cr, Ni, Pb, Hg, Se and Zn in the soils
- As typical tropical grass, Vetiver is intolerant to shading. Shading will reduce its growth and in extreme cases, may even eliminate Vetiver in the long term. Therefore Vetiver grows best in the open and weed free environment, weed control may be needed during establishment phase. On erodible or unstable ground Vetiver first reduces erosion, stabilizes the erodible ground (particularly steep slopes), then because of nutrient and moisture conservation, improves its microenvironment so other volunteered or sown plants can establish later. Because of these characteristics Vetiver can be considered as a nurse plant on disturbed lands



- Vetiver is useful to treat pollution due to its capacity to quickly absorb nutrients and heavy metals, and its tolerance to elevated levels of these elements. Although the concentrations of these elements in Vetiver plants is often not as high as those of hyper-accumulators, it's very fast growth and high yield allows Vetiver to remove a much higher volume of nutrients and heavy metals from contaminated lands than most hyper-accumulators.





- When planted closely together, Vetiver plants form dense hedges that reduce flow velocity, spread and divert runoff water and create a very effective filter that controls erosion. The hedges slow down the flow and spreads it out, allowing more time for water to soak into the ground.
- Acting as a very effective filter, Vetiver hedges help to reduce the turbidity of surface run-off. Since new roots develop from nodes when buried by trapped sediment, Vetiver continues to rise with the new ground level. Terraces form at the face of the hedges; this sediment should never be removed. The fertile sediment typically contains seeds of local plants, which facilitates their reestablishment.



### **Cost Analysis**

Cost of slope stabilization using Coir Geo-textile and Vetiver Grass is Rs. 450/- per square meter, which includes coir geo-textiles (erosion control blanket) 600 to 700 GSM woven or non-woven type (inclusive of transportation to site), GI hooks of 4 mm diameter U-Shaped point sharp edges of 300 mm length, installation charges, coir mat spreading, cutting, seeds mix broadcasting, over lapping, watering for 7-9 days twice per day and after complete installation of work get the quality certification from the authorized technical agency.

## Annex 20: Guidelines To Ensure Worker's Safety During Construction

In order to ensure worker's safety while undertaking various operations / stages of construction many safety measures needs to be followed, which are listed down below:

### Tree Felling

- Use hard hats during tree felling
- Ensure safe use and storage of tools such as axes, power chain saw, hand saw of different types, HDPE ropes of approved thickness to drag felled trees and logs.
- Keep the saw blades in proper lubrication and sharpened state for efficient workability.
- Determine proper foot and body position when using the implements for felling, cutting and dragging.
- Wear appropriate foot protection
- Avoid cutting overhead branches
- Keep first aid kits ready at the site.
- Determine possible hazards in the area, e.g. electrical or telephone or other utility lines, buildings, vehicles and domestic cattle that may create unsafe work situations.
- Prior to felling, determine the safest direction of fall and orient fixing of ropes and cutting positions accordingly.
- Determine the proper hinge size before directing the fall.
- Keep machineries and workers ready for speedy removal of the tree from the main traffic movement area.
- Keep flag men and warning signal signage at either end of felling area to control movement of traffic and warn passers-by

### Plant Sites, Construction Camp and Quarry Areas

- Install perimeter fencing
- Ensure good visibility and safe access at site entrances
- Provide adequate warning signs at the entrance and exit, as necessary
- Provide adequate space / area for loading and unloading, storage of materials, plant and machinery
- Display emergency procedure and statutory notices at conspicuous locations
- Provide areas for collecting garbage and other waste material, and also arrange for their regular / periodic disposal.
- Arrange appropriate storage, transportation and use of fuel, other flammable materials and explosives in line with the license requirements obtained from concerned authorities
- Provide defined access roads and movement areas within the site
- Ensure availability of first aid facilities and display notices at various work places showing the location of first aid facilities and emergency contact numbers
- Provide and enforce use of PPE at plant and quarry sites

### House Keeping Practices

- Provide proper slope in kitchen, canteens, washrooms, toilets and bathrooms for easy and immediate draining of water
- Keep all walkways and circulation areas clear and unobstructed at all times
- Ensure that spillages of oil and grease are avoided and in case of accidental spills, these should be collected immediately

- Use metal bins for collection of oily and greasy rags
- Stack raw materials and finished products out of walkways
- Do not leave tools on the floor or in any location where they can be easily dislodged
- Keep windows and light fittings clean
- Maintain the workplace floors dry and in a non-slippery condition
- Provide and maintain proper drainage system to prevent water logging and unhygienic conditions
- Ensure that protruding nails in boards or walls are moved or bent over or removed so that they do not constitute a hazard to people
- Store all flammable materials in appropriate bins, racks or cabinets with proper cover and labels as required for various products
- Make sure that hazardous / dangerous chemicals are kept in the goods stores with the appropriate labeling, display of the material-safety-data-sheet (MSDS) and other precautionary measures.
- Display 'no smoking' signs in areas with high risks of fire, (e.g. near fuelling areas, diesel /oils / lubricant /paint storage area, hessians, rubber, wood and plastic etc.) in and around working area

### **Safety during Excavation**

- The risk of accidents involving people and vehicles remains high in excavated sites. All pits or excavations shall to be barricaded to warn the road users and residents and to avoid any unauthorized entry of persons, children, domestic cattle or wildlife. For deep excavations and culvert construction sites, painted GI sheets, delineators, lamps (as required) and retro-reflective signage shall be used.
- Excavation more than 1.5 m is to be done in steps of minimum 500 mm offsets with plank and stuttering support, as required under contract clauses.
- For excavation in slippery or water logged area, try to dewater the area and spread minimum 150 mm thick sand layer to avoid slipping.
- For excavation for drain, the area should be properly barricaded with sign boards and illumination / lamps for night time safety. In congested stretches, watchmen / guards can also be placed for vigil.
- Snake bites or Scorpion stings during excavation - in areas with vegetation, tall grasses and forest cover, the contractor shall provide the labour with gum boots and gloves. He shall also make snake antidotes available on site. Emergency vehicles should also be kept ready to rush the patient to the nearest hospital.

### **Safety during Some Typical Construction Work**

#### Centering and Scaffolding

- Many a times ballies joined together give away due to weak joints. Use of metal scaffolding and centering plates with metal fasteners are the safest and highly recommended materials for use in all road construction works for ensuring safety, stability and casting of structures. All such scaffolding should be placed on a firm and a level base on the ground for ensuring stability. No wood scaffolding or bamboo scaffolding is to be used for any casting of heavy (RCC) structural construction as the risk to safety of workers is higher.
- Railings are to be provided along working platforms and ladders for better safety. Nets shall be hung below the scaffolding or structures where work is on-going to prevent fall of debris,



stones, bricks, equipment and other heavy to retain soil objects and even workmen, which could be fatal.

#### Form-work for small/light beams and slabs

- The collapse of bottom of the beam that may bring down the slab as well is a risk in such operations, which may injure the labour or supervision staff. Slender ballies without bracing are not be allowed for such works. No concreting should be allowed without bracing at 300 mm above ground and at midway for normal beams and slabs. The bracings should be for the support of beams as well as the slabs.
- Direct ballies support from the ground and the practice of tying planks with binding wire to the steel reinforcement shall not be allowed. A temporary railing and properly based working platforms along the periphery of slab reduces risk to the life of labour and supervision staff

#### Dismantling of Scaffoldings

- Dismantled materials may fall on passer-by and workers. Workers could also get injured during the removal of such materials. Prior to dismantling of scaffoldings / working platforms, the area of operation should be closed for all outsiders. No one should be allowed within 50 m. from the place of demolition.
- Helmets, safety belts and other PPE must be worn by all the workers engaged in such a work. This work requires careful handling by an experienced supervisor / work force and should be executed with utmost caution. Gradual dislodging and use of PPE is required.

#### Column Reinforcements

- The tendency of bar-benders is to tie the vertical steel with coir rope or 8 mm steel rods as ties on all four sides of the column reinforcements. Reinforcement to columns shall be by welding MS rods with metal scaffolding to keep it in position till the final casting of RCC is done

#### Falling of Objects or Debris from a Height

- At bridges construction sites (or in work areas at a height above ground level) thick nylon net or hessian barriers shall be used to prevent any splinter, debris, mortar or concrete from falling onto the passersby or workmen around.

#### Site Cleaning

- Throwing of waste materials, broken concrete pieces, brick bats, sand etc. straight from the top of a structure onto the ground can injure a worker or a passerby. Such materials should be brought to the ground with the help of lift or the use of rope over pully with a bucket.

#### Operation of Excavators

- Ensure that excavators are operated by authorized persons who have been adequately trained.
- Prevent any unauthorized use of the excavators.
- Ensure that only experienced and competent persons are engaged in supervising all excavations and leveling activity.
- Check and maintain as per the manufacturer's manual.
- Issue relevant information, including that related to instructions, training, supervision and safe system of work in writing and provides expert supervision for guidance.
- Ensure that the operation and maintenance manuals, manufacturer's specifications, inspection and maintenance log books are provided for the use of the mechanics, service engineers or other safety personnel during periodic maintenance, inspection and examination.

- During tipping or running alongside the trenches, excavators must be provided with stop blocks.
- Excavators must be rested on firm ground after field operation away from the road
- Locate and identify underground services including telephone cables, OFC cables, sewerage and drainage lines, water supply, electrical cables etc. by checking with all concerned underground utility providers.
- When reversing or in cases where the operator's view is restricted, adequate supervision and signaling arrangements shall be provided.
- Ensure that the type and capacity of the excavator are properly chosen for the intended purposes and site conditions. Never use a machine for any purposes other than it is designed for.
- Check and report for excessive wear and any breakage of the bucket, blade, edge, tooth and other working tools of the excavator and ensure replacement / repair to avoid mishap and break down.
- Check that all linkages / hinges are properly lubricated and linkage pins are secured. Never use improper linkage pins.

### Operation of Trucks and Dumpers

- Ensure that only trained, authorized and licensed drivers operate the vehicles.
- Switch-off the engine when not in use to save fuel, prevent accidents and unnecessary noise and air pollution.
- Lower the tipping bodies when the machine is unattended, but if it is necessary to leave them in the raised position they should be blocked to prevent their fall by fixing a sturdy support below.
- Carryout periodic servicing as per the manufacturer's requirements
- All records of maintenance and repairs should be in writing and available for verification
- Keep the vehicle tidy and the cabin free from clumsy utilities, which might obstruct the controls and create hazards.
- Follow safe driving principles including speed limits as per traffic signage.
- Avoid carrying additional passengers in the cabin or on the body of the dumper, while in field operation other than the connected workers.
- Provide stop blocks when the vehicle is tipping into or running alongside excavations or when it is parked.
- Do not overload the vehicle.
- Carry only well secured loads and use proper covers and fasteners

### Manual Handling and Lifting

- Avoid manual handling of heavy and hazardous objects and chemicals.
- Pre-assess the actual requirement of manpower in case of emergency situations.
- The hazardous and poisonous materials should not be manually handled without proper equipment /gears and prior declaration of the risks needs to be made to the involved workers.
- All concerned persons shall be trained in proper methods of lifting and carrying.
- In all manual operations where groups of workers are involved, a team leader with necessary training to handle the entire work force in unison has to be provided for.
- Watch and ward to control / supervise / guide movement of equipment and machineries, loading and unloading operations, stability of the stockpiled materials and irregularly shaped objects have to be provided for safety and security of workers
- Carriageway used by the workers must be free from objects, which are dangerous.

- Loading and unloading from vehicles shall be under strict supervision.

### Gas Welding

- The welders and welding units should follow all the basic principles of welding for safety and security
- Use face shield to protect the eyes
- Use goggles, particularly when chipping slag and cutting strips.
- Use gloves long enough to protect wrists and forearms against heat, sparks, molten metal and radiation hazards.
- Use high-top boots / gum boots to prevent sparks, splinters, sharp edges of metal and hot welded strips, welding rods, electric cables etc. from injuring the legs.
- Avoid inhaling the noxious fumes and gasses from burning electrodes by using gas masks and screen of the work area to prevent the glare moving outside it.
- Keep the key hung from the regulator control for split seconds operations to stop the valve in case of any accidental damage or leakage to supply pipeline that may catch fire and cause accidents in case acetylene or LPG cylinder.
- The welding area should have sufficient openings with fixed exhaust ventilators or adequate air flow openings to remove poisonous fumes and gases.
- Take precautions of wearing hard hats or fiber helmets to prevent injury due to fall of any object and accidental injury from projections while welding.
- Welders operating above ground should have adequate safety belt secured to stable platform to prevent accidental fall or injury from the scaffold. All electrical and gas connection lines up to the welder should be sufficiently insulated and protected from sharp edges and sharp objects. These shall not come into contact with hot metal.
- Do not use gas cylinders for supporting work or as rollers. While using LPG or CNG cylinders for welding, follow all safety precautions as has been prescribed by the supplier company.
- Avoid fire hazards and accidents by posting safety supervisors to oversee the activities of workers.
- Do not store explosives, high inflammable materials, loose hanging overhead objects, hot welded strips etc. near gas cylinders.
- Close all valves, switches and circuits while leaving the work place under proper lock and key. In case of mobile units, proper carriage procedure have to be followed for safety and security of men and materials

### **Electrical Hazards in Construction Areas**

- Statutory warning leaflets / posters are to be distributed / displayed by the Contractor in the vicinity of work sites for the benefit of all workers, officers and supervisors as well as the public, indicating the do's and don'ts and warning related to electrical hazards associated with operations to be executed / in progress.
- All wires shall be treated as live wires
- Report about dangling wires to the site-in-charge and do not touch them.
- Only a qualified electrician should attempt electrical repairs.
- Train all workers about electrical safety.
- Shut down the equipment that is sparking or getting over heated or emitting smoke at the time of operation, if it is not the normal way of working of such machines.
- Inform technical person/s for required maintenance.
- Never used damaged wires for electrical connection
- Demolition, tree felling and removal of overhead transmission lines shall be undertaken with strong, efficient and closely monitored arrangements to avoid accidents.

- Use and Storage of Gas (LPG)
- Store filled LPG cylinder in a secure area – mark this as a no smoking area.
- Transport, store, use and secure cylinders in upright position
- Ensure proper ventilation at the ground level in locations where LPG is in use.
- Avoid physical damage to the cylinders
- Never weld near the cylinder
- Store empty cylinders secured and upright
- Make sure that the cylinder is closed immediately after use
- Investigate immediately if there is the smell of LPG or gas
- Make sure that there is no other unrelated fire in the vicinity of the cylinder.

### Fire Safety Practices

- Store flammable material in proper areas having adequate fire protection systems
- Display sufficient warning signs
- Install fire alarm wherever required and test regularly.
- Inspect fire extinguishers regularly and replace as necessary.
- Train selected personal on use of fire extinguishers
- Fire escape route should be kept clear at all times and clearly indicated
- Train workers about the escape route and assembly point/s.
- Carryout fire drill periodically
- When fire breaks out alert all persons through fire alarms or other methods.
- Put off the fire with appropriate fire extinguishers only when you are sure that you are safe to do so.
- Escape if you are in danger through the fire escape route to assembly point.
- Call-up Fire Service
- Fire officers to carryout head count at the assembly point.



### Noise Hazards and its Control

- Plan camp lay-out in a manner that ensures barriers /buffers between residential / office units and high noise generating zones.
- Use sound meters to measure the level of noise and if it exceeds 75 dB(A), then ensure preventive measures.
- Make personnel aware of noisy areas by using suitable warning signs and insist on use of ear protectors / ear plugs to prevent excess noise affecting the workmen.
- Reduce noise at source by: use of improved equipment; regular and proper maintenance of the machinery as per the manufacturer's manual; by replacing rickety and noisy equipment and machineries.
- Screening locations with noise absorbing material; making changes in the process / equipment; controlling machine speeds; ensuring that two noise-generating machines are not running at the same time close to each other at same location; using cutting oils and hydraulic noise breakers; providing vibration and noise absorbing platform and firm embedding of equipment with fasteners.
- Appoint a competent person to carryout a detailed noise assessment of the site; designate ear protection zone/s; give training / instructions on the necessary precautionary measures to be observed by site personnel including using suitable type of ear protection equipment.

### Personal Protective Equipment (General)

- Provision of personal protective equipment has to be made over and above all measures taken for removing or controlling safety hazards on a work site.
- Ensure that sufficient personal protective equipment are provided and that they are readily available for every person who may need to use them.
- The Contractor's Project Manager shall ensure that all persons make full and proper use of the personal protective equipment provided.
- Provide instruction/s and training for the proper use and care of personal protective equipment.
- Ensure that the personal protective equipment is in good condition.
- Train workers to report unintentional damages for replacement and to always keep the personal protective equipment clean. PPE includes, but may not be limited to, hard hats, goggles, ear plugs, gloves, air filters/masks, boots, ropes etc.



### Eye Protection

- Road construction work sites, quarries and crushers are full of dust particles, sand, splinter, harmful gases, bright light and welding arc lights, which are injurious for the eyes. Therefore, eye protection and adequate lighting in work areas is required. All workers, supervisors and inspection officers and dignitaries coming over for study of works should be compelled to wear eye protecting glasses /goggles properly fitting the eye sockets to prevent damage due to dust, gases and other particles.



### Head Protection

- Hard hats are compulsory for all workers, supervisors and managers /officials while working and / or inspecting a work sites. Hard hat areas shall be demarcated clearly.

### Hearing Protection

- Provide ear plugs or ear muffs to the workers and to those who need to get in and out of a high noise area frequently.
- Use re-usable earplugs when the reduction required (15-25 dBA) is not excessive.
- Use earmuffs where a large attenuation of up to 40 dBA is demanded.
- Do not use dry cotton wool for hearing protection because it doesn't provide any such protection.
- Provide disposable ear plugs for infrequent visitors and ensure that these are never re-used.
- Replenish ear plugs from time to time for those who need to work continuously for a long period in a high noise area/s.
- Use ear muffs with replaceable ear cushions because they deteriorate with age or may be damaged in use.
- Avoid wearing spectacles with ear muffs. Use soap and water or the recommended solvent for cleaning ear muffs.

### Respiratory (Protective) Equipment

- Wear suitable masks for protection when there is a potential for small particles entering the lungs, e.g. emptying of cement bags, working at crusher sites etc.
- Provide training to all persons using the masks / respirators for their correct fitting, use, limitations and symptoms of exposure.
- Clean and inspect all respirators before and after use
- Store respirators properly when not in use

### Safety Footwear

- Wear suitable footwear for work
- Wear suitable safety shoes or ankle boots when working anywhere where there is high risk of foot injuries from slippery or uneven ground, sharp objects, falling objects etc.
- All safety footwear, including safety shoes, ankle boots and rubber boots, should be fitted with steel toecaps.
- Avoid wearing flip flops, high heeled shoes, slippers, light sport shoes in situations where there is a risk of foot injury and keep shoelace knots tight.

### Hand Protection

- Wear suitable gloves for selected activities such as welding, cutting and manual handling of materials and equipment.
- Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery.
- Wash hands properly with disinfectant soap and clean water before drinking or eating.
- Wash hands immediately after each operation on site when the situation warrants.

### **First Aid**

- Provide first aid boxes at every work site in a cool and shaded place.



- Ensure that training on the use of the first aid box is provided to at least every supervisor on the site.
- Display the list of persons along with their contact numbers who are trained on providing first aid.
- Ensure that every first aid box is marked "First Aid" in English and in local language.
- Check for expiry dates and replace the contents, as necessary.
- Maintain a register on health records including injuries / accidents.

### **Accident Investigations**

- Carryout the investigation/s as quickly as possible
- Investigation should be carried out both internally as well as through third party.
- Conduct interviews with as many witnesses as necessary including the affected persons and supervising officials.
- Do not rely on any one / limited source of evidence.
- Check all the log books, stock registers, issue registers and movement registers on site
- Safety regulations, traffic signals and signal men activities, signage, as well as other field positions and keep a record of all investigations through audio-visual and electronic medium for presenting an evaluation of the incident/s.
- After completion of the investigation / enquiry, a summary of the facts recorded, sequence of happenings, persons-in-charge, persons examined, equipment and machineries tested, follow-up of action as per legal requirements, copy of station diary entry, hospital entry, safety regulations etc. to be prepared with a comparative analysis for proper assessment.

## Annex 21: Guidelines For Preparation Of Traffic Management Plan

The Contractor shall at all times carry out work on the road in manner creating least interference to the flow of traffic with the satisfactory execution. For all works involving improvements to the existing state highway, the Contractor shall, in accordance with the directives of the Sr. Environmental Specialist of the Independent Engineer (IE), provide and maintain, during execution of the work, a passage for traffic either along a part of the existing carriageway under improvement, or along a temporary diversion constructed close to the state highway. The Contractor shall take prior approval of the IE regarding traffic arrangements during construction.

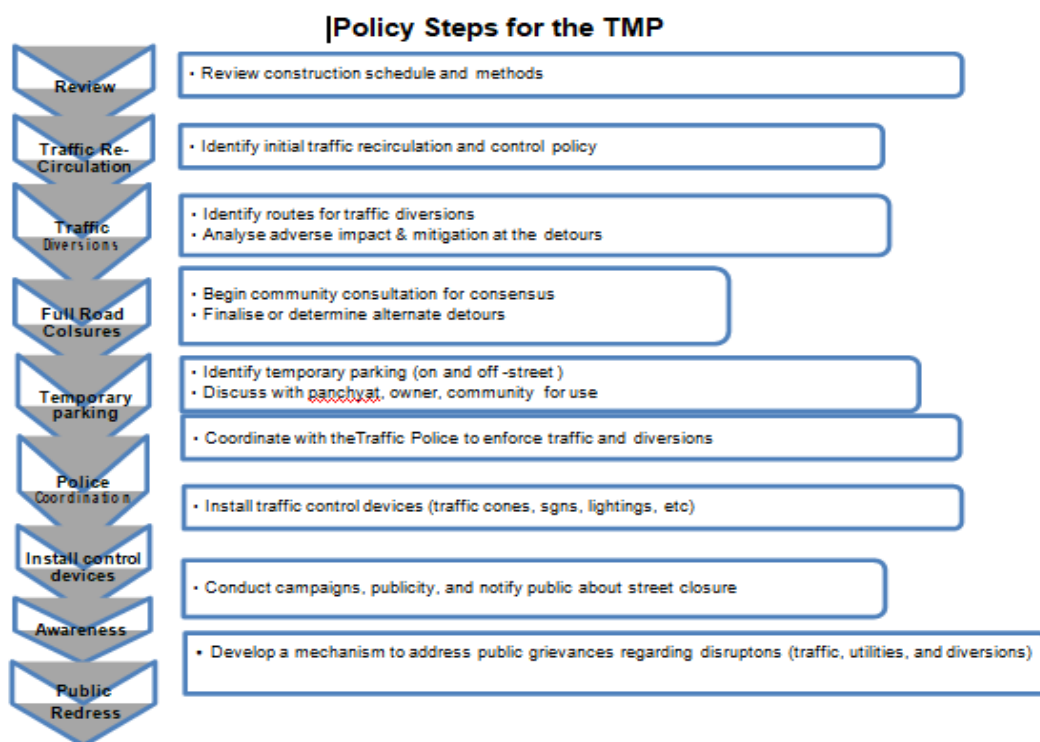
### Traffic Safety and Roads Works

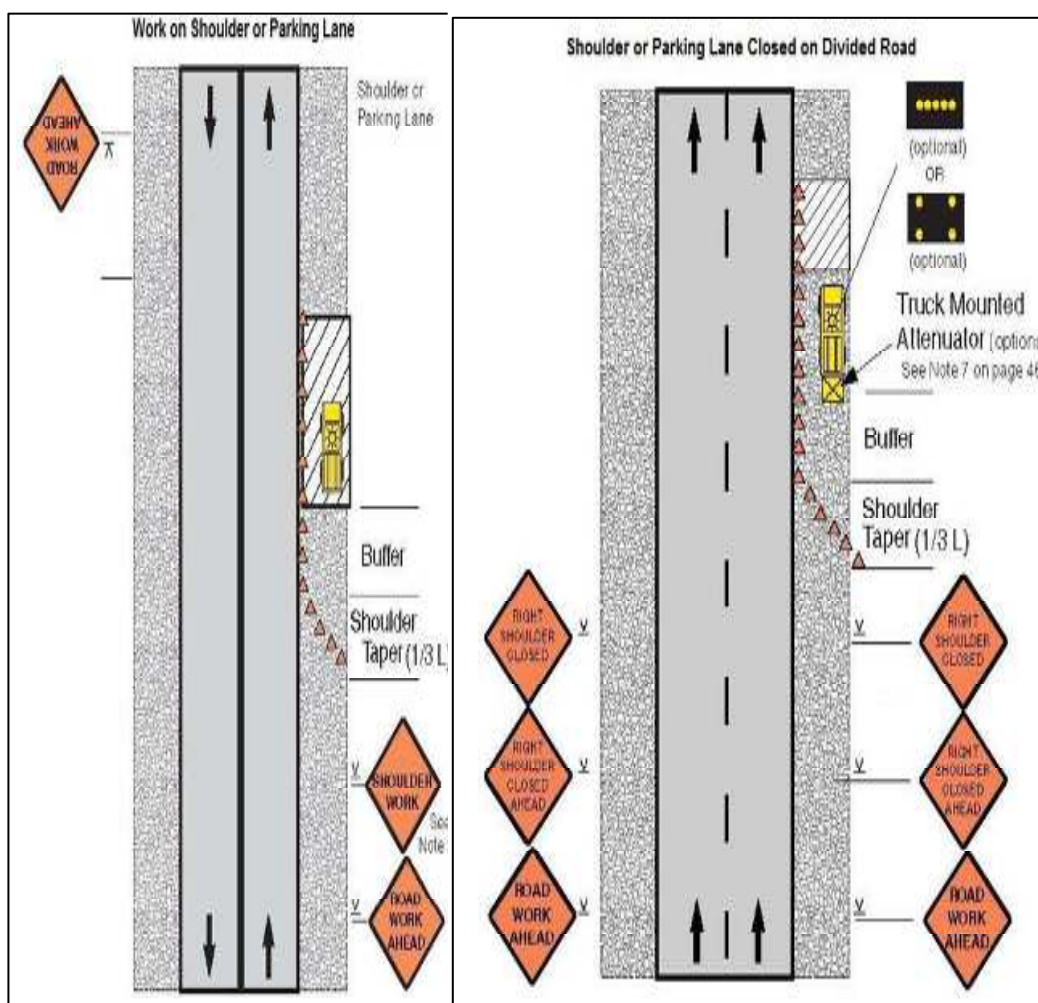
- Delineate advance warning zones, transition zones and construction zones at both ends of a work front. Use devices such as regulatory signs, delineators, barricades, cones, pavement markings, lanterns and traffic control lights, reflectors and signal men in appropriate manner round the clock.
- No work front should be 'touched' without putting appropriate safety measures in place. Sr. Environmental Specialist of the Independent Engineer will be responsible to ensure that the permission for any activity is not given without the required safety plan and practices in place.
- Put signage at appropriate locations as per the road construction activity plan to warn the road users, construction vehicles / equipment operators, pedestrians and local residents about the work in progress, speed controls, hindrances / blockages, diversions, depressions etc. in lines with contract requirements and IRC guidelines
- Signage has to be: (i) simple, easy-to-understand and should convey only one message at a time; (ii) has fluorescent and reflective properties of the paints; (iii) broad, prominent and with appropriate size of letters and figures; (iv) placed at the appropriate 'point/s' as specified in the IRC guidelines to allow proper stoppage / reaction time to approaching vehicles.
- Express a regret signage for the inconvenience caused and alert about the dangers ahead on account of construction activity.
- Different sign boards shall have a mix of pictorial signs and messages in local language, Hindi and English.
- While using barricades, ensure that traffic is kept away from work areas and the road user is guided to the safe, alternative movement track.
- Ensure that excavation sites are provided with effective barriers and reflecting signage to prevent any accidental approach by vehicles during the day or night.
- Provide proper uniform (light reflecting garments) to flagmen engaged in traffic control at diversions so that they can be singled out from the moving traffic.
- Prevent entry of cattle and wildlife through proper fencing / barricading around the excavation sites.
- Provide wide red and green flags or red and green lights to flagmen for controlling traffic. In high traffic zones and congested areas, use of wireless communication devices with protective headgear and shoes by flagmen has to be ensured to prevent confusion and minimize the risk of accidents.

### Ensuring Traffic Control

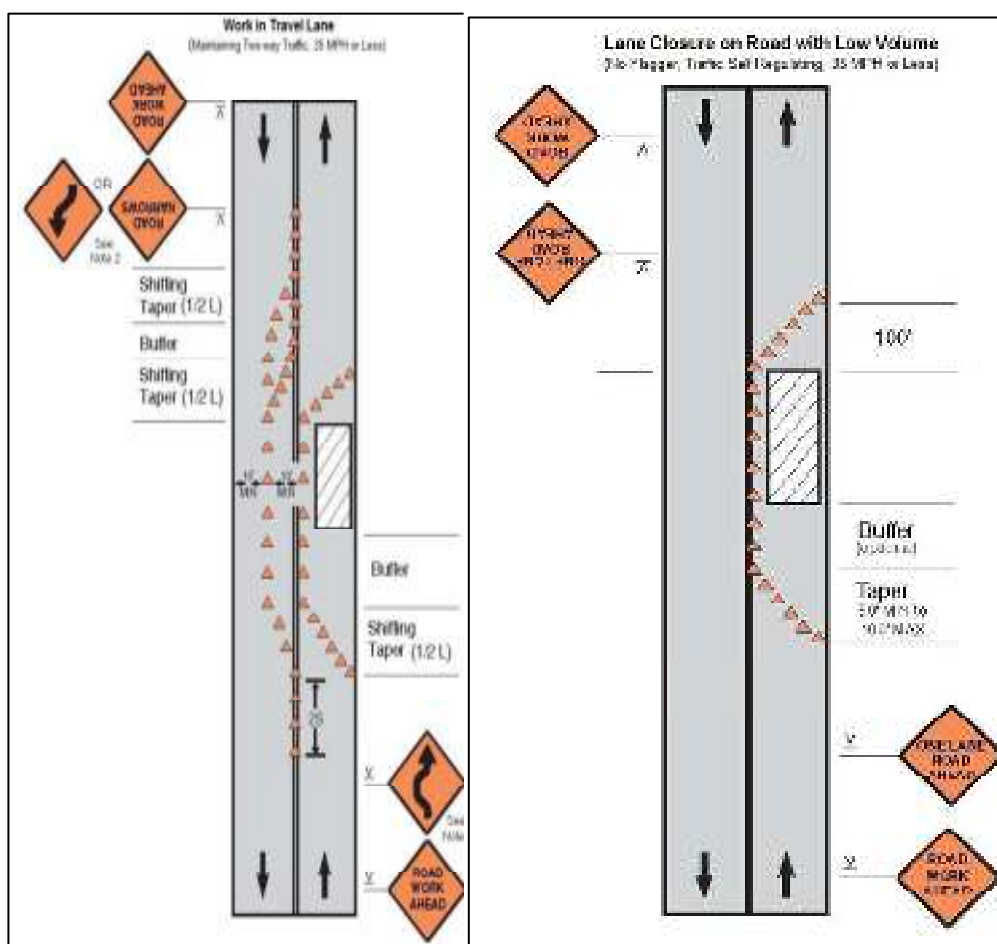
- Where the execution of the works requires temporary closure of road traffic use, the Contractor should provide and maintain temporary traffic diversions. The diversions should generally consist of 200 mm thickness of gravel laid directly upon natural ground and earthworks.

- Where the execution of the works requires single-lane operation on public road, the Contractor should provide and maintain all necessary barriers, warning signs and traffic control signals.
- At the points where traffic is to deviate from its normal path (whether on temporary diversion or part width of the Carriageway) the lane width path for traffic should be clearly marked with the aid of pavement markings and painted drums or a similar device. At night, the passage should be delineated with lanterns or other suitable light source.
- One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This should be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen should be equipped with red and green flags and lanterns / lights.
- On both sides, suitable regulatory / warnings signs as approved by the IE shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 m away. The signs should be of design and of reflector type.
- Upon completion of the works for which the temporary traffic arrangements or diversions have been made, the Contractor should remove all temporary installations and signs and reinstate all affected roads and other structures or installations to the conditions that existed before the work started.

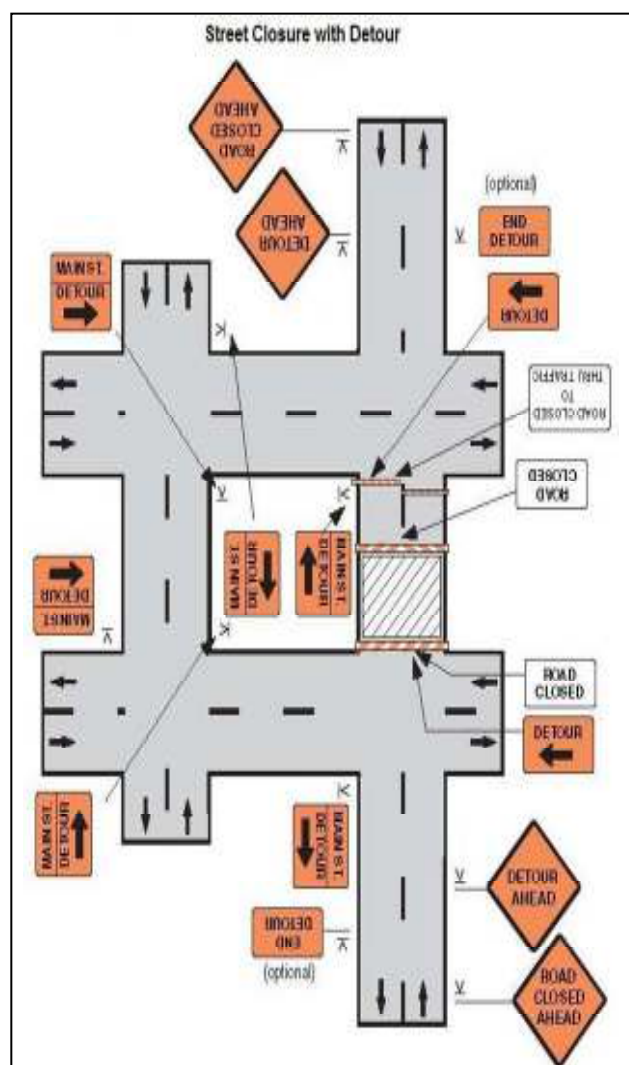




Work on Shoulder or Parking Lane and Shoulder or Parking Lane Closed on Divided Road



Work in Travel Lane and Lane Closure on Road with Low Volume



Street Closure with Detour



## Annex 22: Guidelines For Sediment Control

Right at the initial stage of the work, the operations such as clearing and grubbing, roadway and drainage excavation, embankment / sub-grade construction, bridges and other structures across, pavement courses and shoulders are undertaken. These activities generate huge wastes and debris, which should not find their way into drainage channels and water courses nor should remain exposed to wind at the site and allowed to erode and contaminate productive soils or generate windblown dust particles in the atmosphere.

Erosion and sediment control measures shall, therefore, be planned to prevent soil erosion and sedimentation. These measures may involve temporary measures at construction stage, such as of temporary berms, dikes, sediment basins, slope drains, use of temporary mulches, fabrics, mats, seeding or other control devices. Permanent erosion control measures aim at preventing erosion during the project life cycle and should be planned as a part of the project design. These may involve turfing or pitching the embankment Slopes, turfing / mulching / vegetating the exposed areas, vegetating or reinforcing the cut slopes by appropriate methods such as shot-creting, rock bolting, soil-nailing, gabions etc.

Sediment control, whether temporary or permanent, would be mostly project and site specific. However, some of the generic measures shall be as follows.

- Debris generated at construction site must be removed immediately and dumped at the designated dump sites after useful recyclable materials are sorted out, and properly stocked or stacked.
- The site cleared after removal of debris would usually be prone to erosion. These areas should be treated by mulching and other dust palliation measures.
- There could be many mulching options such as seeding top soil and spreading the mulch (organic) to permit growth of grass, or other methods like mulches of tiles, brick bats, stone chips, or any other non-erodible wastes, which cover the exposed soil, allow moisture to be retained within soil and prevent erosion.
- Dust palliation measures by any suitable commercially available dust palliatives, application of water, cement, lime or bitumen emulsion in thin application to bind the dust particles together.
- All slush at construction sites, which after drying up become erodible must be either dredged and removed or treated appropriately in-situ (say by mulching).
- Temporary drains combined with sedimentation tanks should be created at the periphery or edge of the work sites to arrest the sediments brought by rains or construction activities requiring water and discharge only sediment free water into the water courses.

## Annex 23: Analysis of Rate

### A. Rate of Scheduled items

| Item No. | Ref. of MoSRT&H | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Unit  | Rate (18-19) |
|----------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------|
| 8.17     | 807             | <b>GI Barbed wire Fencing 1.8 metre high</b><br>(Providing and fixing 1.8 metres high GI barbed wire fencing with 2.4 m angle iron posts 50 mm x 50 mm x 6 mm placed every 3 metres center to center founded in M15 grade cement concrete, 0.6 metre below ground level, every 15th post, last but one end post and corner post shall be strutted on both sides and end post on one side only and provided with 12 horizontal lines and 2 diagonals interwoven with horizontal wires, fixed with GI staples, turn buckles etc complete as per clause 807. | metre | 547.00       |
| 8.18     |                 | <b>Fencing with welded steel wire Fabric 75 mm x 50 mm (Suggestive)</b> (Providing 1.20 metre high fencing with angle iron posts 50 mm x 50 mm x 6 mm at 3 metre center to center with 0.40 metre embedded in M15 grade cement concrete, corner, end and every 10th post to be strutted, provided with welded steel wire fabrics of 75mmX50mm mesh or 75mmx25mm mesh and fixed to iron posts by flat iron 50mmX5mm and bolts etc. complete in all respects.)                                                                                              | metre | 660.00       |
| 8.19     | 808             | <b>Tubular Steel Railing on Medium Weight steel channel ( ISMC series) 100 mm x 50 mm</b> (Providing, fixing and erecting 50 mm dia steel pipe railing in 3 rows duly painted on medium weight steel channels (ISMC series) 100 mm x 50 mm, 1.2 metres high above ground, 2m center to center, complete as per approved drawings.                                                                                                                                                                                                                         | metre | 2731.00      |
| 8.20     | 808             | <b>Tubular Steel Railing on Precast RCC posts, 1.2 m high above ground level</b> (Providing, fencing and erecting 50 mm dia painted steel pipe railing in 3 rows on precast M20 grade RCC vertical posts 1.8 metres high (1.2 m above GL) with 3 holes 50 mm dia for                                                                                                                                                                                                                                                                                      | metre | 1360.00      |

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### Cost Of Fencing As Per Schedule Of Rate, Pwd, Assam

| Item No. | Ref. of MoSRT&H | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Unit  | Rate (18-19) |
|----------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------|
| 11.6     | 307             | <b>Maintenance of Lawns with Fine Grassing for the First Year</b> Maintenance of lawns with fine grassing for the first year including watering etc.                                                                                                                                                                                                                                                                                                            | sqm   | 182.00       |
| 11.7     | 307             | <b>a) Planting Permanent Hedges Including Digging of Trenches</b> (Planting permanent hedges including digging of trenches, 60 cm wide and 45 cm deep, refilling the excavated earth mixed with farmyard manure, supplied at the rate of 4.65 cum per 100 metres and supplying and planting hedge plants at 30cm apart                                                                                                                                          | metre | 155.00       |
|          |                 | b) 'Maintenance of Hedge for one year                                                                                                                                                                                                                                                                                                                                                                                                                           | metre | 159.00       |
| 11.8     | 307             | a) Planting Flowering Plants and Shrubs in Central Verge                                                                                                                                                                                                                                                                                                                                                                                                        | km    | 33267.00     |
|          |                 | b). Maintenance of Flowering Plants and Shrubs in Central Verge for one Year                                                                                                                                                                                                                                                                                                                                                                                    | km    | 184815.00    |
| 11.9     | 307             | <b>Planting of Trees and their Maintenance for one Year</b> (Planting of trees by the road side (Avenue trees) in 0.60 m dia holes, 1 m deep dug in the ground, mixing the soil with decayed farm yard/sludge manure, planting the saplings, backfilling the trenches, watering, fixing the tree guard and maintaining the plants for one year.                                                                                                                 | each  | 831.00       |
| 11.10    | 308             | <b>Renovation Lawns Including, Weeding, Forking the Ground, Top Dressing with Forked Soil</b> (Renovation lawns including, weeding, forking the ground, top dressing with forked soil, watering and maintenance the lawns, for 30 days or more, till the grass forms a thick lawns, free from weeds, and fit for moving and disposal of rubbish as directed, including supplying good earth, if needed but excluding the cost of well decayed farm yard manure. | sqm   | 14.00        |

**Cost of tree planting and maintenance as per schedule of rate, PWD, ASSAM**

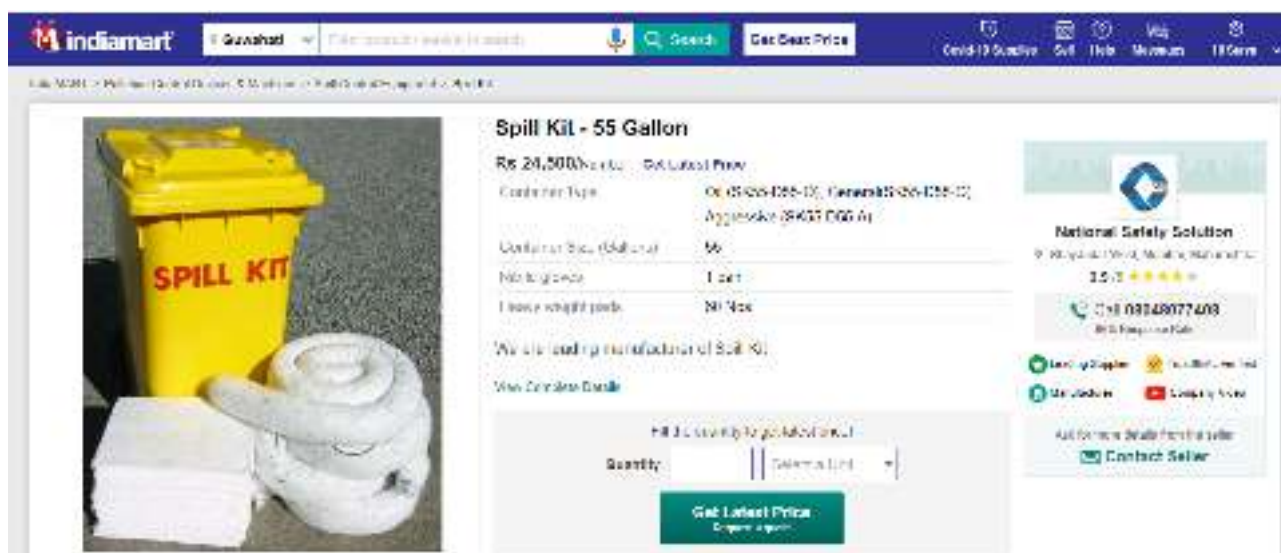
| Item No. | Ref. of MoSRT&H | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Unit    | Rate (18-19) |
|----------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------|
| 11.11    |                 | Half Brick Circular Tree Guard, in 2nd class Brick, internal diameter 1.25 metres, and height 1.2 metres, above ground and 0.20 metre below ground bottom two course laid dry, and top tree courses in cement mortar 1:6 (1cement 6 sand) and the intermediate courses being in dry honey comb masonry, as per design complete. (Half brick circular tree guard, in 2nd class brick, internal diameter 1.25 metres, and height 1.2 meter.)                   | each    | 2565.00      |
| 11.12    |                 | <b>Edging with 2nd class Bricks, laid dry lengthwise</b> (Edging with 2nd class bricks, laid dry lengthwise, including excavation, refilling, consolidation, with a hand packing and spreading nearly surplus earth within a lead of 50 metres)                                                                                                                                                                                                              | metre   | 53.00        |
| 11.13    |                 | <b>Making Tree Guard 53 cm dia and 1.3 m high as per design from empty bitumen drum</b> (Making tree guard 53 cm dia and 1.3 m high as per design from empty bitumen drum, slit suitably to permit sun and air, (supplied by the department at stock issue rate) including providing and fixing 2 nos MS sheet rings 50mmX0.5mm with rivets, complete in all respects.                                                                                       | each    | 359.00       |
| 11.14    |                 | <b>Making Tree Guard 53 cm dia and 2 metres high as per design from empty bitumen drums</b> (Making tree guard 53 cm dia and 2 metres high as per design from empty bitumen drums, slit suitably to permit sun and air, (supplied by the department at stock issue rate.) including providing and fixing four legs 40 cm long of 30mmx 3mm MS riveted to tree guard and providing and fixing 2 nos. MS sheet ring 50mm with rivets complete in all respects. | each    | 721.00       |
| 11.15    |                 | <b>Wrought Iron and Mild Steel Welded Work</b> (Wrought Iron and mild steel welded work)                                                                                                                                                                                                                                                                                                                                                                     | quintal | 9921.00      |

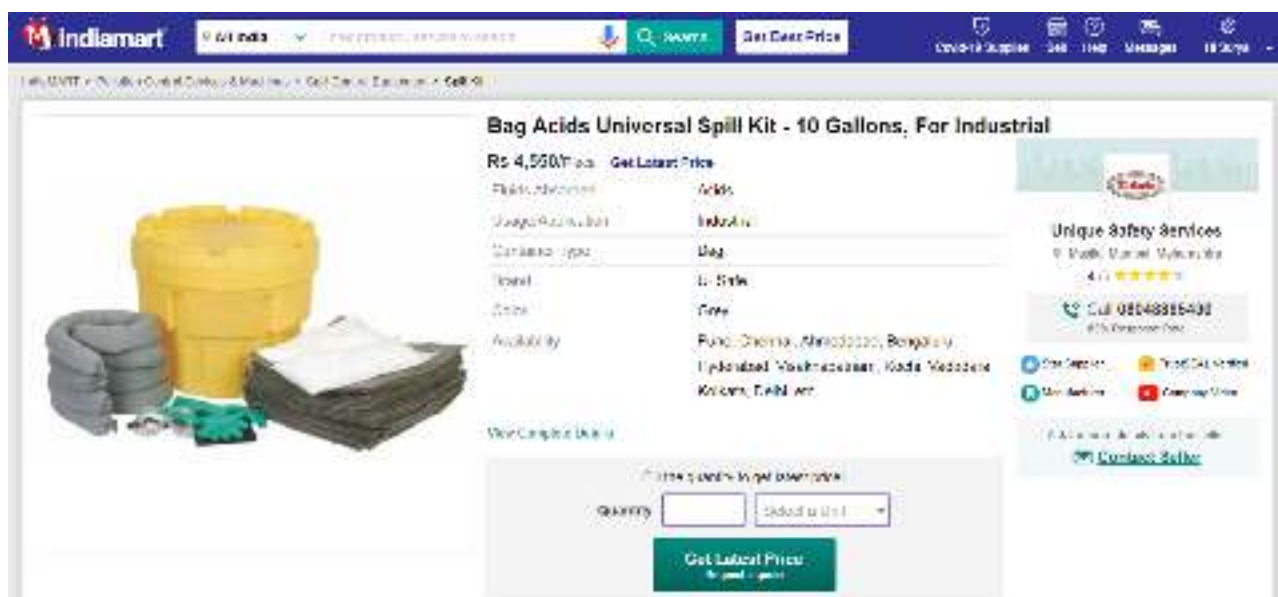
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**Cost of tree guard as per schedule of rate, PWD, ASSAM**

## B. Rate of nonscheduled items

### 1. Quotation for spill kit





### Quote 3 (38 liters per kit)

### Calculation of average cost

Considering the accidental spill contamination kit for a medium size tanker (tanker capacity 5000 liter)

| Quotations          | Unit size | Requirement (considering for 5000 Liter tanker) | Unit cost (per piece) | Total cost |
|---------------------|-----------|-------------------------------------------------|-----------------------|------------|
| Quote 1             | 200 liter | $(5000/200) = 25$ nos.                          | 24,500 /-             | 612,500/-  |
| Quote 2             | 65 liter  | $(5000/65) = 77$ nos.                           | 11,800 /-             | 908,600/-  |
| Quote 3             | 38 liter  | $(5000/38) = 132$ nos.                          | 4,550 /-              | 600,600/-  |
| Approx average cost |           |                                                 |                       | 700,000/-  |



## 2.Quotation for environmental monitoring

| <br><b>RIMS</b><br><small>Testing &amp; Training Institute</small>           | <b>RESEARCH INSTITUTE OF MATERIAL SCIENCES PVT. LTD.</b><br>A complete testing lab and training institute<br>Plot No. 22 & 23, Ranaj Endave, Nangal Sakrawati, New Delhi-110043<br>Ph: 011-25024223, (M) 98599803620, Email: <a href="mailto:usa.rims@gmail.com">usa.rims@gmail.com</a> , Website: <a href="http://www.rimsdelhi.com">www.rimsdelhi.com</a> CIN NO: U72100DL2018PTC0309680 | <br><small>ISO 9001:2015</small> |                                                                              |                                                        |              |                 |              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------|--------------|-----------------|--------------|
| Ref. No: RIMS/Q/Rev/19241                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                            | Dated: 06.02.2020                                                                                                   |                                                                              |                                                        |              |                 |              |
|                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 |              |
| Kind Attention: Mr. Swarnabha Bandyopadhyay                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 |              |
| Subject: Financial offer for Environmental Monitoring and Analysis                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 |              |
| Dear Sir                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 |              |
| This has to reference telephonic discussion with Mr. Prasentjit Ghosh on mentioned scope. We are pleased to quote our best prices for desired scope as below: |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 |              |
| S. No.                                                                                                                                                        | Sample description                                                                                                                                                                                                                                                                                                                                                                         | Location                                                                                                            | Parameter(s)                                                                 | Frequency                                              | No of Sample | Unit Rate (Rs.) | Total Prices |
| 1.                                                                                                                                                            | Air                                                                                                                                                                                                                                                                                                                                                                                        | 20                                                                                                                  | PM 10, PM 2.5, SO <sub>2</sub> , NO <sub>x</sub> , CO, HC & Pb (If Required) | Once in a Week for 2 weeks                             | 40           | 5000            | 200000       |
| 2.                                                                                                                                                            | Ground Water                                                                                                                                                                                                                                                                                                                                                                               | 10                                                                                                                  | As per IS 10200                                                              | Once in study Time                                     | 10           | 5500            | 55000        |
| 3.                                                                                                                                                            | Surface Water                                                                                                                                                                                                                                                                                                                                                                              | 10                                                                                                                  | IS 2296                                                                      | Once in study Time                                     | 10           | 5500            | 55000        |
| 4.                                                                                                                                                            | Soil                                                                                                                                                                                                                                                                                                                                                                                       | 10                                                                                                                  | As per IARI Guideline                                                        | Once in study Time                                     | 10           | 4000            | 40000        |
| 5.                                                                                                                                                            | Noise                                                                                                                                                                                                                                                                                                                                                                                      | 20                                                                                                                  | 24 hrs                                                                       | Twice a Week (one weekday and one weekend) for 1 weeks | 40           | 1000            | 40000        |
| Total Amount                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 | 390000       |
| Lodging and boarding                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 | 110000       |
| Net amount                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 | 5,00,000     |
| We hope that you find the above in order.                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 |              |
| With Warm regards,                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 |              |
| <br><b>Deepak Kumar</b><br>9599983620                                      |                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                     |                                                                              |                                                        |              |                 |              |

### Quotation 1 for environmental monitoring



**Eko Pro Engineers Pvt Ltd**  
32/41, South Side of G T Road, UPSIDC Ind. Area  
Ghaziabad-201 009  
Delhi-NCR(India)  
E-mail: email@ekopro.in  
PAN: AAJCE2669P, GST: 09AAJCE2669P1Z1  
SAC: 998346, IISN: 84212190

For Technical Query : Mr. Uday

**Quotation**  
Date: 01/10/2019  
Quote Number:  
201003700001007682

**BILL TO:-**

**REPORT TO:-**

**Contact Person :** Mr. Prasenjit

**Mobile No**

**E-mail**

| S. No.                      | Sample description | Location | Parameter(s)                                       | Frequency                                             | No of Sample | Unit Rate (Rs.) | Total Price     |
|-----------------------------|--------------------|----------|----------------------------------------------------|-------------------------------------------------------|--------------|-----------------|-----------------|
| 1.                          | Air                | 20       | PM 10, PM 2.5, SOx, NOx, CO, HC & Pb (if Required) | Once in a Week for 2 weeks                            | 40           | 6000            | 240000          |
| 2.                          | Ground Water       | 10       | As per IS 10500                                    | Once in study Time                                    | 10           | 5000            | 50000           |
| 3.                          | Surface Water      | 10       | IS 2296                                            | Once in study Time                                    | 10           | 5000            | 50000           |
| 4.                          | Soil               | 10       | As per IARI Guideline                              | Once in study Time                                    | 10           | 4000            | 40000           |
| 5.                          | Noise              | 20       | 24 hrs                                             | Twice a Week (one weekday and one weekend) for 1 week | 40           | 500             | 20000           |
| <b>Total Amount</b>         |                    |          |                                                    |                                                       |              |                 | <b>400000</b>   |
| <b>Lodging and boarding</b> |                    |          |                                                    |                                                       |              |                 | <b>90000</b>    |
| <b>Net amount</b>           |                    |          |                                                    |                                                       |              |                 | <b>4,90,000</b> |

**Terms and Conditions**

As per ISO requirement, please approve the quotation, as your consent is required before starting the testing work. Client will sign and stamp the test request for carrying out the test.

25% Advance & 25% after Sampling & 50% against submission of soft/hard copy of test reports. The Payment for this work must be made within 15 days, as stipulated in M&MED Act, 2008 clause 15 or as agreed upon. Late payment will accrue interest as per the clause 16 of Act. Also, please note that we issue the copy of invoice only after your email approval of invoice/Estimate, with any one of following conditions. Either pay minimum 25% advance or confirm us through email that you will pay this invoice in current month only, as we need to deposit GST immediately at the end of month. Please quote our invoice # on the back of your cheque along with details of deduction made (if any). Any discrepancy for Payment should be reported within 10 days.

GST will be charged extra as applicable. All disputes are subjected to Ghaziabad jurisdiction only.

**Bank Detail:**  
Eko Pro Engineers Pvt Ltd  
A/c : 556711003101 , Dense Bank Ghaziabad  
IFSC: BKDN0120087

**Eko Pro Engineers Pvt Ltd**

Accredited by NABL Empanelled by Airports Authority of India ,Delhi Metro Rail Corporation Ltd , DDA ,NTPC ,JIL ,CRISH.

## Quotation 2 for environmental monitoring



**ENVIROCHECK**

House of Environmental Pollution Monitoring and Analysis  
Office : 63/6, Rastraguru Avenue, Kolkata - 700020  
Lab : 189 & 190, Rastraguru Avenue, Kolkata - 700028  
Phone : 2579-2884203/0459-1174 / Fax : 2529-9141  
E-mail : envirocheck@sat2.vsnl.net.in / Website : www.envirocheck.org

### QUOTATION

|                                                                                                       |                                                                      |                         |                                         |
|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------|-----------------------------------------|
| ISSUED TO                                                                                             | : Bonga Prayukti International Pvt. Ltd.                             | ISSUE DATE              | : 11.12.2018                            |
| Address                                                                                               | : 4-FR, FL-4B 323/A, Motilal Gupta Road, LP-109/2, Kolkata - 700 008 | Ref. No                 | : 451/EO/C/2018-2019                    |
| Your Ref. No.                                                                                         | : Through e-mail dtd. 11.12.2018                                     | GST Details:            |                                         |
| Site Details                                                                                          |                                                                      | GST No.                 | : 19AAAF6997Q1ZE                        |
| Site Address                                                                                          | : -                                                                  | SAC Code                | : 998346                                |
|                                                                                                       |                                                                      | SAC T.P.                | : 998559                                |
| GST NO.                                                                                               | : 19AAGC86346A1ZW                                                    | Services                | : Technical Testing & Analysis Services |
| PAN                                                                                                   | : -                                                                  | Contact Person Details: |                                         |
| Kind Attn.                                                                                            | : Mr. Swamintha Bandyopadhyay                                        | Name                    | : S.B. Chowdhury                        |
|                                                                                                       |                                                                      | Designation             | : CEO                                   |
| Contact No.                                                                                           | : 8017668861                                                         | Contact No.             | : 9800000000                            |
| E-mail Id                                                                                             | : [redacted]                                                         | E-mail Id               | : info@envirocheck.org                  |
| SUB: ENVIRONMENTAL MONITORING WORK (Road Length – 200km, Starting point – About 80 km from Hyderabad) |                                                                      |                         |                                         |

| Sl. | Scope of Work                                                                                                                                                                                                                                                                                                                                                                      | Frequency                                                                     | Qty. | Unit rate (Rs.) | Amount (Rs.) |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------|-----------------|--------------|
| 1.  | <b>Ambient Air Quality monitoring and analysis.</b><br>Parameters : SPM, PM <sub>10</sub> , PM <sub>2.5</sub> , Sulphur dioxide, Carbon Monoxide, Ozone, Oxides of Nitrogen and Total Hydrocarbons<br>Consultant will incorporate the revised National Ambient Air Quality Standards, 2009                                                                                         | 10 locations twice a week for four weeks                                      | 80   | 6000            | 4,80,000.00  |
| 2.  | <b>Meteorology</b><br>Wind speed, wind direction, maximum and minimum temperature, humidity, atmospheric pressure, relative humidity, rainfall                                                                                                                                                                                                                                     | -                                                                             | 1    | 15000/-         | 15,000.00    |
| 3.  | <b>Soil Quality</b><br>Parameters: pH, Electrical conductivity, sand (%), silt (%), clay (%), texture, moisture retention capacity (%), infiltration rate (mm/hour), bulk density (gm/cc), porosity (%), organic matter (%), nitrogen (mg/1000g), potassium (mg/1000g), phosphorous (mg/1000g), sulphates and sodium sulphates                                                     | 2 locations once in study time                                                | 2    | 5000/-          | 10,000.00    |
| 4.  | <b>Water Quality</b><br>Surface & Ground Water Quality Parameters: TDS, pH, Turbidity, Sulphate as SO <sub>4</sub> , Total alkalinity as calcium carbonate, Calcium as Ca, Magnesium as Mg, Nitrate Nitrogen as NO <sub>3</sub> , Fluoride (as F), Chloride (as Cl), Iron (as Fe), Zinc as Zn, Total Hardness (as CaCO <sub>3</sub> ), Residual Free Chlorine, Total Coliform      | 5 nos. of surface water and 4 nos. of ground water samples once in study time | 9    | 4500/-          | 40,500.00    |
| 5.  | <b>Noise Levels</b><br>Equivalent Noise Level (Leq), L <sub>10</sub> and L <sub>50</sub> will be measured.<br>The noise monitoring will be conducted during 'Day' time as well as 'Night' time on weekdays as well as weekends in accordance with CPCB guideline for ambient noise monitoring once during the monitoring season by installing a sound level meter at 12 locations. | 12 locations once in study time                                               | 12   | 600/-           | 7,200.00     |
| 6.  | Mobilization /demobilization expenses including transportation, Board & Lodging, Instrument booking charges etc.                                                                                                                                                                                                                                                                   | -                                                                             | -    | L.S.            | 40,000.00    |

### Quotation 3 for environmental monitoring

## **CHAPTER – 9**

### **PROJECT COST ESTIMATION**

#### **9.1 General**

Cost estimation is an important component of the study as it provides vital input to economic & financial evaluation and insights for proper planning of project execution. Over and above construction costs, provision has been made for social and environmental mitigation measures. Cost estimates are done based on the detailed engineering designs and detailed drawings presented in drawing volume.

#### **9.2 Quantification**

The construction items covered in cost estimates includes twelve different heads as:

- a. Site clearance
- b. Earthwork & Erosion Control
- c. Sub base and Base Course
- d. Bituminous Surface
- e. Rigid Pavement
- f. Traffic Signs, Road Marking and other road appurtenances
- g. Drainage and Protection works
- h. Project facilities
- i. Service road
- j. Major Bridges
- k. Minor Bridges and VUP
- l. Culvert

#### **9.3 Unit Rates**

Rates for different items of works have been carried out based on Schedule of Rates for Roads, Bridge and Culvert works for National Highways under Assam PWD, Govt. of Assam-2013-14 with 17.62% Escalation except Steel and Bitumen. The Price of Steel and Bitumen are taken as current rate. The rate analysis has been as per MORT&H's Standard Data Book. The priced B.O.Q. made accordingly is enclosed.

Leads for various construction materials considered for the project are mentioned in Table 9.1 below

**Table 9.1:: Leads for Various Materials**

| Lead Charts |                        |          |                |
|-------------|------------------------|----------|----------------|
| Sl. No.     | Material               | Place    | Av. Lead (Km.) |
| 1           | Sand (Fine)            | Koraghat | 0              |
| 2           | Lime                   | Dhubri   | 0              |
| 3           | Moorum/ Rubbish        | Garubasa | 0              |
| 4           | Stone Metal            | Haraputa | 0              |
| 5           | Stone Boulder          | Haraputa | 0              |
| 6           | Stone Chips, Aggregate | Haraputa | 0              |
| 7           | Coarse Sand            | Koraghat | 0              |
| 8           | Cement                 | Dhubri   | 0              |
| 9           | Steel                  | Dhubri   | 0              |
| 10          | Tar, Bitumen           | Guwhati  | 0              |
| 11          | Bitumen Emulsion       | Guwhati  | 0              |
| 12          | Structural Steel       | Guwhati  | 0              |

10% Overhead charge and 10% contractors profit is considered in the rate analysis.

## 9.4 Project Costing

The cost of the road portion has been worked out based on the cross-sections, plan and profile and other drawings for widening and strengthening of the project road.

It is proposed that the excavated earth available from the cutting and reconstructed road sections would be used for the embankment construction and median / island filling. Adjustments have accordingly been made in the quantification of fill materials.

Locations of pavement reconstruction as identified in the pavement design and suitably quantified for dismantling and new crust composition. Extent of improvements to the cross roads at junctions

has been considered up to the limits of proposed right of way. Quantification for road drainage has been in accordance with the recommendations of designs and drawings

Quantification for major intersections along the corridor has been done for each intersection based on the preliminary designs and drawings. Quantification for minor intersections and different kind of improvement option considered for each intersection has been worked out on the typical designs and drawings.

The quantification of various items of work related to Bridges and Culverts have have been detailed out from the structural drawings.

Quantities of traffic signs, marking and other road appurtenances and various project facilities are worked out in the plan drawing and costing has been accordingly.

## **9.5 Social Costs**

Since the widening options for the corridor has not been limited to within the existing ROW, all the affected properties have been categorized as encroachments. Social cost for acquisition of land, replacement value of religious structures, hand pumps and wells falling within the corridor of direct impact has been separately estimated.

## **9.6 Environmental Costs**

The major Environmental Mitigation costs for compensatory afforestation, redevelopments of quarries, provision of safety equipment at quarries and post project monitoring at sensitive locations has been separately estimated.



## 9.7 Total Project Cost

The abstract of cost estimates for the project corridor is included in Table 9.2

### **GENERAL ABSTRACT OF COST**

#### **PKG-I (0.000KM-10.900KM)**

|                                            |   |               |
|--------------------------------------------|---|---------------|
| Length of Road (km)                        | : | <b>10.900</b> |
| Length of CD & Bridge works (km)           | : | <b>0.841</b>  |
| Length of Pavement excluding CD works (km) | : | <b>10.059</b> |

|           | DESCRIPTION OF WORKS                                   | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM.<br>(IN LAKHS.) | % of Total<br>Civil<br>Works<br>Cost |
|-----------|--------------------------------------------------------|---------------------------|--------------------------------|--------------------------------------|
| <b>A.</b> | <b>ROAD WORKS</b>                                      |                           |                                |                                      |
| 1         | Site Clearance                                         | 109.75                    | 10.07                          | 0.616%                               |
| 2         | Earthwork, Erosion control and Drainages               | 1,410.41                  | 129.40                         | 7.913%                               |
| 3         | Sub-Base, Base                                         | 2,577.42                  | 236.46                         | 14.460%                              |
| 4         | Bituminous surface                                     | 2,345.31                  | 215.17                         | 13.158%                              |
| 5         | Traffic signs, Road marking & other road appurtenances | 339.28                    | 31.13                          | 1.904%                               |
| 6         | Drain & Protection Works                               |                           |                                |                                      |
| a)        | Drain                                                  | 684.08                    | 62.76                          | 3.838%                               |
| b)        | RE Wall                                                | 2,039.25                  | 187.09                         | 11.441%                              |
| c)        | Toe Wall                                               | 37.08                     | 3.40                           | 0.208%                               |
| 7         | Project Facilities                                     |                           |                                |                                      |
| a)        | Bus bay with Passenger Shelter                         | 70.21                     | 6.44                           | 0.394%                               |
| 8         | Service Road                                           | 551.17                    | 50.57                          | 3.092%                               |
| 9         | Junction                                               | 638.88                    | 58.61                          | 3.584%                               |
|           | <b>TOTAL FOR ROAD WORKS =</b>                          | <b>10,802.84</b>          | <b>991.10</b>                  |                                      |
| <b>B.</b> | <b>BRIDGES &amp; CULVERTS</b>                          |                           |                                |                                      |
| 10        | Minor Bridges                                          | 156.41                    | 14.35                          | 0.878%                               |
| 11        | ROB                                                    | 5,631.75                  | 516.67                         | 31.597%                              |
| 12        | Culvert                                                | 1,232.33                  | 113.06                         | 6.914%                               |
| 13        | Repairing & Rehabilitation                             | 0.57                      | 0.05                           | 0.003%                               |
|           | <b>TOTAL FOR BRIDGE WORKS =</b>                        | <b>7,021.06</b>           | <b>644.13</b>                  |                                      |
| <b>C.</b> | <b>COST OF CIVIL WORKS (IN LAKHS)</b>                  | <b>17,823.90</b>          | <b>1,635.22</b>                |                                      |

### GENERAL ABSTRACT OF COST

#### **PKG-II (10.900KM-27.650KM)**

|                                            |   |        |
|--------------------------------------------|---|--------|
| Length of Road (km)                        | : | 16.750 |
| Length of CD & Bridge works (km)           | : | 0.522  |
| Length of Pavement excluding CD works (km) | : | 16.228 |

|           | DESCRIPTION OF WORKS                                      | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM.<br>(IN LAKHS.) | % of Total<br>Civil<br>Works<br>Cost |
|-----------|-----------------------------------------------------------|---------------------------|--------------------------------|--------------------------------------|
| <b>A.</b> | <b>ROAD WORKS</b>                                         |                           |                                |                                      |
| 1         | Site Clearance                                            | 155.28                    | 9.27                           | 0.79%                                |
| 2         | Earthwork, Erosion control and Drainages                  | 2,250.02                  | 134.33                         | 11.43%                               |
| 3         | Sub-Base, Base                                            | 3,516.17                  | 209.92                         | 17.87%                               |
| 4         | Bituminous surface                                        | 3,140.00                  | 187.46                         | 15.95%                               |
| 5         | Rigid pavement                                            | 1,521.36                  | 90.83                          | 7.73%                                |
| 6         | Traffic signs, Road marking & other road<br>appurtenances | 499.76                    | 29.84                          | 2.54%                                |
| 7         | Drain & Protection Works                                  |                           |                                |                                      |
| a)        | Drain                                                     | 1,968.92                  | 117.55                         | 10.00%                               |
| b)        | Retaining Wall                                            | 737.49                    | 44.03                          | 3.75%                                |
| c)        | Toe Wall                                                  | 46.80                     | 2.79                           | 0.24%                                |
| d)        | Stone Pitching                                            | 1,527.92                  | 91.22                          | 7.76%                                |
| 8         | Project Facilities                                        |                           |                                |                                      |
| a)        | Bus Bay with Passenger Shelter                            | 212.40                    | 12.68                          | 1.08%                                |
| b)        | Trucklay Bye                                              | 83.25                     | 4.97                           | 0.42%                                |
| 9         | Junction                                                  | 344.21                    | 20.55                          | 1.75%                                |
|           | <b>TOTAL FOR ROAD WORKS =</b>                             | <b>16,003.58</b>          | <b>955.44</b>                  |                                      |
| <b>B.</b> | <b>BRIDGES &amp; CULVERTS</b>                             |                           |                                |                                      |
| 10        | Minor Bridges                                             | 1,592.90                  | 95.10                          | 8.09%                                |
| 11        | Culvert                                                   | 2,080.13                  | 124.19                         | 10.57%                               |
| 12        | Repairing & Rehabilitation                                | 4.81                      | 0.29                           | 0.02%                                |
|           | <b>TOTAL FOR BRIDGE WORKS =</b>                           | <b>3,677.84</b>           | <b>219.58</b>                  |                                      |
| <b>C.</b> | <b>COST OF CIVIL WORKS (IN LAKHS)</b>                     | <b>19,681.42</b>          | <b>1,175.01</b>                |                                      |

**GENERAL ABSTRACT OF COST**  
**PKG-III (27.650KM-36.500KM)**

**Length of Road (km) :** **8.850**  
**Length of CD & Bridge works (km) :** **0.634**  
**Length of Pavement excluding CD works (km) :** **8.216**

|           | DESCRIPTION OF WORKS                                   | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM.<br>(IN LAKHS.) | % of Total<br>Civil<br>Works<br>Cost |
|-----------|--------------------------------------------------------|---------------------------|--------------------------------|--------------------------------------|
| <b>A.</b> | <b>ROAD WORKS</b>                                      |                           |                                |                                      |
| 1         | Site Clearance                                         | 85.63                     | 9.68                           | 0.51%                                |
| 2         | Earthwork, Erosion control and Drainages               | 2,104.22                  | 237.76                         | 12.47%                               |
| 3         | Sub-Base, Base                                         | 1,950.08                  | 220.35                         | 11.56%                               |
| 4         | Bituminous surface                                     | 2,022.82                  | 228.57                         | 11.99%                               |
| 5         | Traffic signs, Road marking & other road appurtenances | 234.01                    | 26.44                          | 1.39%                                |
| 6         | Drain & Protection Works                               |                           |                                |                                      |
| a)        | Drain                                                  | 701.89                    | 79.31                          | 4.16%                                |
| b)        | RE Wall                                                | 2,351.62                  | 265.72                         | 13.94%                               |
| c)        | Retaining Wall                                         | 344.78                    | 38.96                          | 2.04%                                |
| d)        | Toe Wall                                               | 58.61                     | 6.62                           | 0.35%                                |
| e)        | Stone Pitching                                         | 29.83                     | 3.37                           | 0.18%                                |
| 7         | Project Facilities                                     |                           |                                |                                      |
| a)        | Bus Bay with Passenger Shelter                         | 71.67                     | 8.10                           | 0.42%                                |
| 8         | Service Road                                           | 728.40                    | 82.31                          | 4.32%                                |
| 9         | Junction                                               | 209.87                    | 23.71                          | 1.24%                                |
|           | <b>TOTAL FOR ROAD WORKS =</b>                          | <b>10,893.43</b>          | <b>1,230.90</b>                |                                      |
| <b>B.</b> | <b>BRIDGES &amp; CULVERTS</b>                          |                           |                                |                                      |
| 10        | Minor Bridges                                          | 2,198.42                  | 248.41                         | 13.03%                               |
| 11        | ROB                                                    | 2,927.59                  | 330.80                         | 17.35%                               |
| 12        | Culvert                                                | 849.33                    | 95.97                          | 5.03%                                |
| 13        | Repairing & Rehabilitation                             | 4.45                      | 0.50                           | 0.03%                                |
|           | <b>TOTAL FOR BRIDGE WORKS =</b>                        | <b>5,979.79</b>           | <b>675.68</b>                  |                                      |
| <b>C.</b> | <b>COST OF CIVIL WORKS (IN LAKHS)</b>                  | <b>16,873.22</b>          | <b>1,906.58</b>                |                                      |

### GENERAL ABSTRACT OF COST

#### **PKG-IV(36.500KM-43.300KM)**

|                                                   |          |              |
|---------------------------------------------------|----------|--------------|
| <b>Length of Road (km)</b>                        | <b>:</b> | <b>6.800</b> |
| <b>Length of CD &amp; Bridge works (km)</b>       | <b>:</b> | <b>0.645</b> |
| <b>Length of Pavement excluding CD works (km)</b> | <b>:</b> | <b>6.155</b> |

|           | DESCRIPTION OF WORKS                                   | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM<br>(IN LAKHS.) | % of<br>Total<br>Civil<br>Works<br>Cost |
|-----------|--------------------------------------------------------|---------------------------|-------------------------------|-----------------------------------------|
| <b>A.</b> | <b>ROAD WORKS</b>                                      |                           |                               |                                         |
| 1         | Site Clearance                                         | 78.44                     | 11.54                         | 0.42%                                   |
| 2         | Earthwork, Erosion control and Drainages               | 1,064.17                  | 156.50                        | 5.72%                                   |
| 3         | Sub-Base, Base                                         | 1,416.71                  | 208.34                        | 7.61%                                   |
| 4         | Bituminous surface                                     | 1,541.41                  | 226.68                        | 8.28%                                   |
| 5         | Traffic signs, Road marking & other road appurtenances | 323.20                    | 47.53                         | 1.74%                                   |
| 6         | Drain & Protection Works                               |                           |                               |                                         |
| a)        | Drain                                                  | 359.65                    | 52.89                         | 1.93%                                   |
| b)        | RE Wall                                                | 5,002.20                  | 735.62                        | 26.87%                                  |
| c)        | Retaining Wall                                         | 412.58                    | 60.67                         | 2.22%                                   |
| 7         | Project Facilities                                     |                           |                               |                                         |
| a)        | Bus Bay with Passenger Shelter                         | 216.25                    | 31.80                         | 1.16%                                   |
| 8         | Service Road                                           | 279.64                    | 41.12                         | 1.50%                                   |
| 9         | Junction                                               | 950.40                    | 139.76                        | 5.10%                                   |
| 10        | Grade Separater                                        | 1,097.50                  | 161.40                        | 5.89%                                   |
|           | <b>TOTAL FOR ROAD WORKS =</b>                          | <b>12,742.15</b>          | <b>1,873.85</b>               |                                         |
| <b>B.</b> | <b>BRIDGES &amp; CULVERTS</b>                          |                           |                               |                                         |
| 11        | Minor Bridges                                          | 199.73                    | 29.37                         | 1.07%                                   |
| 12        | ROB                                                    | 4,139.09                  | 608.69                        | 22.23%                                  |
| 13        | VUP                                                    | 317.83                    | 46.74                         | 1.71%                                   |
| 14        | Culvert                                                | 1,220.96                  | 179.55                        | 6.56%                                   |
|           | <b>TOTAL FOR BRIDGE WORKS =</b>                        | <b>5,877.61</b>           | <b>864.35</b>                 |                                         |
| <b>C.</b> | <b>COST OF CIVIL WORKS (IN LAKHS)</b>                  | <b>18,619.76</b>          | <b>2,738.20</b>               |                                         |

## GENERAL ABSTRACT OF COST

### PKG-V(43.300KM-54.154KM)

|                                            |   |        |
|--------------------------------------------|---|--------|
| Length of Road (km)                        | : | 10.854 |
| Length of CD & Bridge works (km)           | : | 0.350  |
| Length of Pavement excluding CD works (km) | : | 10.504 |

|           | DESCRIPTION OF WORKS                                  | TOTAL COST<br>(IN LAKHS.) | COST PER KM<br>(IN LAKHS.) | % of Total<br>Civil<br>Works<br>Cost |
|-----------|-------------------------------------------------------|---------------------------|----------------------------|--------------------------------------|
| <b>A.</b> | <b>ROAD WORKS</b>                                     |                           |                            |                                      |
| 1         | Site Clearance                                        | 134.08                    | 12.35                      | 0.78%                                |
| 2         | Earthwork, Erosion control and Drainages              | 1,225.24                  | 112.88                     | 7.13%                                |
| 3         | Sub-Base, Base                                        | 2,539.31                  | 233.95                     | 14.78%                               |
| 4         | Bituminous surface                                    | 2,549.15                  | 234.86                     | 14.84%                               |
| 5         | Traffic signs, Road marking & other road appurteances | 510.73                    | 47.05                      | 2.97%                                |
| 6         | Drain & Protection Works                              |                           |                            |                                      |
| a)        | Drain                                                 | 390.89                    | 36.01                      | 2.28%                                |
| b)        | RE Wall                                               | 1,166.91                  | 107.51                     | 6.79%                                |
| c)        | Retaining Wall                                        | 664.83                    | 61.25                      | 3.87%                                |
| d)        | Toe Wall                                              | 13.69                     | 1.26                       | 0.08%                                |
| e)        | Stone Pitching                                        | 353.30                    | 32.55                      | 2.06%                                |
| 7         | Project Facilities                                    |                           |                            |                                      |
| a)        | Bus Bay With Passenger Shelter                        | 72.51                     | 6.68                       | 0.42%                                |
| 8         | Service Road                                          | 1,270.44                  | 117.05                     | 7.40%                                |
| 9         | Junction                                              | 218.36                    | 20.12                      | 1.27%                                |
|           | <b>TOTAL FOR ROAD WORKS =</b>                         | <b>11,109.44</b>          | <b>1,023.52</b>            |                                      |
| <b>B.</b> | <b>BRIDGES &amp; CULVERTS</b>                         |                           |                            |                                      |
| 10        | Major Bridges                                         | 867.78                    | 79.95                      | 5.05%                                |
| 11        | Minor Bridges                                         | 1,334.83                  | 122.98                     | 7.77%                                |
| 12        | VUP                                                   | 1,210.27                  | 111.50                     | 7.05%                                |
| 13        | Culvert                                               | 1,139.60                  | 104.99                     | 6.63%                                |
| 14        | Repairing & Rehabilitation                            | 15.73                     | 1.45                       | 0.09%                                |
|           | <b>TOTAL FOR BRIDGE WORKS =</b>                       | <b>4,568.21</b>           | <b>420.87</b>              |                                      |
| <b>C.</b> | <b>TOLL PLAZA</b>                                     |                           |                            |                                      |
|           | Toll Plaza                                            | 1,500.00                  |                            | 8.73%                                |
| <b>D.</b> | <b>COST OF CIVIL WORKS (IN LAKHS)</b>                 | <b>17,177.65</b>          | <b>1,582.61</b>            |                                      |

### **GENERAL ABSTRACT OF COST ( SOR 2013-14)**

#### **NH-127-B (FROM 0.000KM-54.154KM)**

|                                            |   |               |
|--------------------------------------------|---|---------------|
| Length of Road (km)                        | : | <b>54.154</b> |
| Length of CD & Bridge works (km)           | : | <b>2.992</b>  |
| Length of Pavement excluding CD works (km) | : | <b>51.162</b> |

|           | DESCRIPTION OF WORKS                                  | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM<br>(IN LAKHS.) | % of Total<br>Civil<br>Works<br>Cost |
|-----------|-------------------------------------------------------|---------------------------|-------------------------------|--------------------------------------|
| <b>A.</b> | <b>ROAD WORKS</b>                                     |                           |                               |                                      |
| 1         | Site Clearance                                        | 563.18                    | 10.40                         | 0.62%                                |
| 2         | Earthwork, Erosion control and Drainages              | 8,054.06                  | 148.73                        | 8.93%                                |
| 3         | Sub-Base, Base                                        | 11,999.69                 | 221.58                        | 13.31%                               |
| 4         | Bituminous surface                                    | 11,598.69                 | 214.18                        | 12.86%                               |
| 5         | Rigid Pavement                                        | 1,521.36                  | 28.09                         | 1.69%                                |
| 6         | Traffic signs, Road marking & other road appurteances | 1,906.98                  | 35.21                         | 2.11%                                |
| 7         | Drain & Protection Works                              |                           |                               |                                      |
| a)        | Drain                                                 | 4,105.43                  | 75.81                         | 4.55%                                |
| b)        | RE Wall                                               | 10,559.98                 | 195.00                        | 11.71%                               |
| c)        | Retaining Wall                                        | 2,159.68                  | 39.88                         | 2.39%                                |
| d)        | Toe Wall                                              | 156.18                    | 2.88                          | 0.17%                                |
| e)        | Stone Pitching                                        | 1,911.05                  | 35.29                         | 2.12%                                |
| 8         | Project Facilities                                    |                           |                               |                                      |
| a)        | Bus Bay With Passenger Shelter                        | 643.04                    | 11.87                         | 0.71%                                |
| b)        | Truck lay Bye                                         | 83.25                     | 1.54                          | 0.09%                                |
| 9         | Service Road                                          | 3,173.86                  | 58.61                         | 3.52%                                |
| 10        | Junction                                              | 2,361.72                  | 43.61                         | 2.62%                                |
| 11        | Grade Separater                                       | 1,097.50                  | 20.27                         | 1.22%                                |
|           | <b>TOTAL FOR ROAD WORKS =</b>                         | <b>61,551.44</b>          | <b>1,142.96</b>               |                                      |
| <b>B.</b> | <b>BRIDGES &amp; CULVERTS</b>                         |                           |                               |                                      |
| 12        | Major Bridges                                         | 867.78                    | 16.02                         | 0.96%                                |
| 13        | Minor Bridges                                         | 5,482.29                  | 101.24                        | 6.08%                                |
| 14        | VUP                                                   | 1,528.10                  | 28.22                         | 1.69%                                |
| 15        | ROB                                                   | 12,698.43                 | 234.49                        | 14.08%                               |
| 16        | Culvert                                               | 6,522.35                  | 120.44                        | 7.23%                                |
| 17        | Repairing & Rehabilitation                            | 25.56                     | 0.47                          | 0.03%                                |
|           | <b>TOTAL FOR BRIDGE WORKS =</b>                       | <b>27,124.51</b>          | <b>500.88</b>                 |                                      |
| <b>C.</b> | <b>TOLL PLAZA</b>                                     |                           |                               |                                      |
|           | Toll Plaza                                            | 1,500.00                  | 27.70                         | 1.66%                                |
| <b>D.</b> | <b>COST OF CIVIL WORKS (IN LAKHS)</b>                 | <b>90,175.95</b>          | <b>1,665.18</b>               |                                      |
| <b>E.</b> | <b>GST @ 12% on (D)</b>                               | <b>10,821.00</b>          |                               |                                      |



|           | DESCRIPTION OF WORKS                                                          | TOTAL COST<br>(IN LAKHS.) | COST PER<br>KM<br>(IN LAKHS.) | % of Total<br>Civil<br>Works<br>Cost |
|-----------|-------------------------------------------------------------------------------|---------------------------|-------------------------------|--------------------------------------|
| <b>F.</b> | Add Contingencies @ 2.8% over Civil Cost <b>(D)</b>                           | 2,525.00                  |                               |                                      |
| <b>G.</b> | Supervision Consultancy Charges @ <b>3% of (D)</b>                            | 2,705.00                  |                               |                                      |
| <b>H.</b> | Agency Charges @3% <b>of (D)</b>                                              | 2,705.00                  |                               |                                      |
| <b>I.</b> | Escalation Cost @ 5% during Construction Period (For<br>1 Years)              | 4,509.00                  |                               |                                      |
| <b>J.</b> | Maintenance Charges @ 2.5% of Civil Works <b>(D)</b>                          | 2,254.00                  |                               |                                      |
| <b>K.</b> | <b>TOTAL PROVISION FOR GST/ CONTIGENCIES &amp; CENTAGES<br/>(E+F+G+H+I+J)</b> | <b>25,519.00</b>          | <b>471.23</b>                 |                                      |
| <b>L.</b> | <b>PRE-CONSTRUCTION ACTIVITIES</b>                                            |                           |                               |                                      |
|           | LA cost with solatium (Approx.)                                               | 23,698.30                 | 437.61                        |                                      |
|           | R & R cost with solatium (Approx.)                                            | 11,236.32                 | 207.49                        |                                      |
|           | Utility Shifting cost                                                         | 338.70                    | 6.25                          |                                      |
|           | Environmental cost                                                            | 1776.77                   | 32.81                         |                                      |
|           | <b>Sub Total (L)</b>                                                          | <b>37,050.09</b>          | 684.16                        |                                      |
| <b>M.</b> | <b>GRAND TOTAL (M=K+L)</b>                                                    | <b>1,52,745.04</b>        | <b>2,820.57</b>               |                                      |

## CHAPTER - 10

### CONCLUSION & RECOMMENDATION

#### 10.1 Existing Scenario

##### Road

The Project Road (NH-127 B) starts from Srirampur on NH-27(old NH-31 C) and passes through the villages/localities, Jakobpur, Kambilpur, Malkapur, Kathalguri, Grampur, Bashantipur, Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, BhatiPetla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, DebduttaHazdaha 1, Kachari Hat, Debdutta Hazdaha 2, Raja Katli, KachuaKash, ChandaKhol, Ada Bari and ends at immediate approach of proposed bridge over river Brahmaputra near Dhubri covering a length of 54.523km.(Design chainage)

##### Carriageway

Existing carriageway width generally varies from 3.70m to 6.00m with about 0.50m to 1.50m earthen shoulder on either side.

##### Alignment

Detailed topographic survey reveals that horizontal alignment needs improvement at places particularly at curve portion. There are some locations / stretches where vertical curves are not in proper gradient, so gradient are provided as per codal provisions to ease of traffic movement.

##### Pavement

The entire length of the road is Bitumen Road having longitudinal cracks, raveling and potholes.

Some stretches have been observed that bituminous layer and granular layer is fully exposed ( From Chainage 6.500Km to 7.500Km and From Chainage 14.000 Km to 41.550 km). The thickness of existing pavement varies along the project road and physical verification reveals pavement thickness of 100mm to 680mm.Majority of the pavement surface are in poor condition with presence of longitudinal cracks, rutting, raveling, potholes, and patches. However small stretches have been observed in fair condition where BBD survey has been conducted to measure characteristic deflection.

##### ROW

Existing ROW was observed about 20 m to 30 m wide. The existing ROW does not cater to the codal provision of 60 m ROW of plain Road hence land may have to be acquired to adhere to the codal provision.

## 10.2 Improvement Proposal

Salient Features of the Improvement Proposal in comparison to the Existing condition are as below:

| Descriptions | Existing                                                                | Proposed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Terrain      | Plain                                                                   | Plain                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Length       | Existing Length = 55.060 Km<br>(as per Survey)                          | Package-I: 0.00 to 10.90 km<br>Package-II: 10.90 to 27.65 km<br>Package-III: 27.65 to 36.50 km<br>Package-IV: 36.50 to 43.30 km<br>Package-V: 43.30 to 54.154 km<br>Proposed Length = 54.154 Km                                                                                                                                                                                                                                                                                                                                                                         |
| Alignment    | The existing Alignment<br>is almost straight<br>except at few locations | <b>Bypass has been proposed in<br/>the project road</b> is given below.<br>i. From km 20.300 to km 23.100<br>ii. From km 28.450 to km<br>30.400<br>iii. From km 39.100 to km<br>41.200<br><b>Realignment has been<br/>proposed in the<br/>Project road</b> is given below.<br>i. From km 42.600 to km 43.300<br>ii. From km 44.450 to km<br>44.800<br>iii. From km 45.650 to km<br>46.350<br>iv. From km 47.750 to km<br>49.450<br>v. From km 51.800 to km<br>54.154<br>Realignment has been<br>proposed due to proposed<br>bridge, curve and geometric<br>improvement. |
| Design Speed | Avg. 25Kmph                                                             | 100Kmph to 80 kmph, in few<br>locations has been designed<br>65kmph where speed limit sign<br>has been proposed.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Descriptions         | Existing                                                                                                                                                                                                                                           | Proposed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cross-Section        | <p>Carriageway: 3.70 - 6.00m</p> <p>Earthen Shoulder: 0.50 – 1.5m</p> <p>Total Formation Width: 4.70 – 9.00m</p>                                                                                                                                   | <p><b>Road Cross Sections:</b></p> <p><b>For flexible pavement</b></p> <p><b>4 lane in Rural area :26m</b></p> <ol style="list-style-type: none"> <li>Carriageway width=2x7.0m</li> <li>Median= 1x4m</li> <li>Kerb signage =2x0.500 m</li> <li>Paved shoulder =2x1.5m</li> <li>Earthen shoulder= 2x2.0m</li> </ol> <p><b>4 lane in Built up area :24.50m</b></p> <ol style="list-style-type: none"> <li>Carriageway width=2x7.0m</li> <li>Median= 1x1.50m</li> <li>Kerb signage=2x0.500m</li> <li>Paved shoulder =2x2.0m</li> <li>Drain= 2x2.0m</li> </ol> <p><b>For rigid pavement</b></p> <p><b>4 lane in Built up area :24.50m</b></p> <ol style="list-style-type: none"> <li>Carriageway width=2x7.0m</li> <li>Median= 1x1.50m</li> <li>Kerb signage=2x0.500m</li> <li>Paved shoulder =2x2.0m</li> <li>Drain= 2x2.0m</li> </ol> |
| Design CBR           | -                                                                                                                                                                                                                                                  | 8%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Traffic (2015)       | <p>On basis of base year (2015) traffic,</p> <p><b>BASE YEAR TRAFFIC ON NH-127B + DIVERTED TRAFFIC FROM NH-31+DIVERTED TRAFFIC FROM NH-31C</b></p> <p>Motorized Vehicle in no. = 5214</p> <p>Total PCU per day = 9523</p> <p>Total CVPD = 1794</p> | <p>After 15years of design life of the road (2034)</p> <p><b>TRAFFIC ON NH-127B + DIVERTED TRAFFIC FROM NH-31+DIVERTED TRAFFIC FROM NH-31C</b></p> <p>Motorized Vehicle in no. = 13176</p> <p>Total PCU per day = 24064</p> <p>Total CVPD = 4534</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Pavement Design Life | Nil                                                                                                                                                                                                                                                | Flexible Pavement-15 Years<br>Rigid Pavement-30 Years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Design msa           | Nil                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>MSA of 1<sup>st</sup>&amp; 2<sup>nd</sup> homogeneous section 6 msa &amp; 23 msa,</li> </ul> <p>But Adopted MSA = 20msa as per <b>IRC SP 73 2015 clause no. 5.4.1.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Descriptions                                                      | Existing                                                                                                                                                                                                                               | Proposed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flexible Pavement Crust Thickness for widening & new construction | Thk. Varies from 100mm to 680mm<br>Length of BT surface = 29.200 Km (from Km 0.000 to km 6.500, km 7.500 to km 14.000 & km 41.550 to 57.750)<br>Length of WBM surface = 28.550 Km (from Km 6.500 to km 7.500 & km 14.000 to km 41.550) | 1 <sup>st</sup> homogeneous section Km 0.00 to Km 39.000 & 2 <sup>nd</sup> homogeneous section Km 39.000 to Km 54.154<br><br><b>Pavement Thickness:</b><br>Package-I: 0.00 to 10.90 km<br>Package-II: 10.90 to 27.65 km<br>Package-III: 27.65 to 36.50 km<br>Package-IV: 36.50 to 43.30 km<br>Package-V: 43.30 to 54.154 km<br><ul style="list-style-type: none"> <li>BC – 40mm</li> <li>DBM – 85mm</li> <li>WMM – 250mm</li> <li>GSB – 200mm</li> </ul> <b>Total – 575mm</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Length of New Construction                                        |                                                                                                                                                                                                                                        | New Construction = 9.534km<br>Package-I: 0.000 km<br>Package-II: 2.750 km<br>Package-III: 1.900 km<br>Package-IV: 0.970 km<br>Package-V: 3.914 km                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Bridges                                                           | Major Bridge – 1 No<br>Minor Bridge – 8 Nos.                                                                                                                                                                                           | <b>Total Bridge=12 nos.</b><br><b>Minor Bridge=11 nos.</b><br>Reconstruction=2 nos.<br>New proposal=4 nos.<br>Additional 2 lane bridge=5 nos.<br><b>Major Bridge=1 no.</b><br>Additional 2 lane bridge=1 no.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Culverts                                                          | <b>Total Culvert = 55 Nos.</b><br>Pipe Culvert = 28 Nos<br>Slab Culvert = 25 Nos.<br>Box Culvert = 1 No.<br>Fully Chocked Culvert = 1 No.                                                                                              | <b>Total Culvert = 152 Nos.</b><br><b>Package-I: (30 Nos.)</b><br><b>Reconstruction (10 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 10 Nos.</li> </ul> <b>New proposal (20 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 20 nos.</li> </ul> <b>Package-II: (50 Nos.)</b><br><b>Reconstruction (16 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 16 Nos.</li> </ul> <b>New proposal (34 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 34 nos.</li> </ul> <b>Package-III: (20 Nos.)</b><br><b>Reconstruction (7 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 7 Nos.</li> </ul> <b>New proposal (13 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 13 nos.</li> </ul> <b>Package-IV: (25 Nos.)</b><br><b>Reconstruction (6 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 6 Nos.</li> </ul> <b>New proposal (19 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 19 nos.</li> </ul> <b>Package-V: (27 Nos.)</b> |

| Descriptions        | Existing | Proposed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                     |          | <b>Reconstruction (9 nos.)</b> <ul style="list-style-type: none"> <li>Box culvert= 9 Nos.</li> </ul> <b>New proposal (18nos.)</b><br>Box culvert= 18 nos.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Protection Work     | Nil      | Length of Toe Wall = 1297 m<br>Package-I: 307 m<br>Package-II: 388 m<br>Package-III: 488 m<br>Package-IV: Nil<br>Package-V: 114 m<br>Length of Retaining Wall = 3717 m (2m Height)<br>Package-I: Nil<br>Package-II: 849 km<br>Package-III: 460 m<br>Package-IV: 923 m<br>Package-V: 1485 m<br>Length of Retaining Wall = 401 m (3.5m Height)<br>Package-I: Nil<br>Package-II: 401 m<br>Package-III: Nil<br>Package-IV: Nil<br>Package-V: Nil<br><br>Length of Retaining Wall = 155 m (6m Height)<br>Package-I: Nil<br>Package-II: Nil<br>Package-III: 155 m<br>Package-IV: Nil<br>Package-V: Nil<br>Stone Pitching = 3160 m<br>Package-I: Nil<br>Package-II: 377 m<br>Package-III: 155 m<br>Package-IV: Nil<br>Package-V: 2628 m |
| Longitudinal Drains | Nil      | Total Length = 19178m (Both side of the road)<br>Package-I: 3557 m<br>Package-II: 8526 m<br>Package-III: 3443 m<br>Package-IV: 1652 m<br>Package-V: 2000 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Bus – Bay           | Nil      | 9 Nos. (both side)<br>Package-I: 1 No.<br>Package-II: 3 No.<br>Package-III: 1 No.<br>Package-IV: 3 No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



| Descriptions                               | Existing             | Proposed                                                                                                                                                                                                                                                           |
|--------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                            |                      | Package-V: 1 No.                                                                                                                                                                                                                                                   |
| Truck Lay Bye                              | Nil                  | 1 No. (both side)<br>Package-I: Nil<br>Package-II: 1 No.<br>Package-III: Nil<br>Package-IV: Nil<br>Package-V: Nil                                                                                                                                                  |
| ROW                                        | About 20m to 30m     | Proposed ROW is 30m to 60m                                                                                                                                                                                                                                         |
| Land to be acquired                        | Available 144.76 Ha. | Additional 142.688 Ha.                                                                                                                                                                                                                                             |
| Major Intersection                         | 2 Nos.               | 2 Nos.<br>Package-I: 1 No.<br>Package-II: Nil<br>Package-III: Nil<br>Package-IV: 1 No.<br>Package-V: Nil                                                                                                                                                           |
| Minor Intersection                         | 159 Nos.             | 158 Nos. (3 Legged-126 Nos and 4 Legged-32 Nos)<br>Package-I: 38 No. (3L-33No. ,4L-5 No.)<br>Package-II: 49 No. (3L-41No ,4L-8 No.)<br>Package-III: 27 No. (3L-22No ,4L-5 No.)<br>Package-IV: 19 No. (3L-16No ,4L-3 No.)<br>Package-V: 25 No. (3L-14No ,4L-11 No.) |
| Flyover                                    | Nil                  | Nil                                                                                                                                                                                                                                                                |
| Underpasses<br>(VUP<br>Cattle/Pedestrians) | Nil                  | VUP-3 No and LVUP-1 Nos.<br>Package-I: Nil<br>Package-II: Nil<br>Package-III: Nil<br>Package-IV: 1 No. VUP<br>Package-V: 2 No. VUP & 1 No. LVUP                                                                                                                    |
| ROBs                                       | Nil                  | 3 nos.<br>Package-I: 1 No.<br>Package-II: Nil<br>Package-III: 1 No.<br>Package-IV: 1 No.<br>Package-V: Nil                                                                                                                                                         |
| RUBs                                       | Nil                  | Nil                                                                                                                                                                                                                                                                |
| Service Road                               | Nil                  | Total length= 11.770 km<br>Package-I: 2.720 km (B/S)<br>Package-II: Nil<br>Package-III: 2.850 km (B/S)<br>Package-IV: 1.100 km (B/S)<br>Package-V: 5.100 km (B/S)                                                                                                  |
| Toll Plaza                                 | Nil                  | Package-I: Nil<br>Package-II: Nil<br>Package-III: Nil<br>Package-IV: Nil<br>Package-V: 1 NO.                                                                                                                                                                       |

| Descriptions           | Existing | Proposed                                                                                                                                                                           |
|------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total Civil Cost (Rs.) | -        | Rs. 901.76 Cr. (Rs. 16.65 Cr / Km)<br>Package-I: Rs. 178.24 Cr<br>Package-II: Rs. 196.81 Cr<br>Package-III: Rs. 168.73 Cr<br>Package-IV: Rs. 186.20 Cr<br>Package-V: Rs. 171.78 Cr |

### 10.3 Summary

The project road(NH-127B) is of significant importance as the road connecting two National Highways (NH-31C and NH-31), one proposed bridge over river Brahmaputra and connects to important nearby villages Srirampur,Jakobpur, Kambilpur, Malkapur ,Kathalguri, Grampur, Bashantipur,Auxiguri, Uzanpetla, MudhaPetla, Alokjhari, MadhaPetla, Bhati Petla, Satsaura, Kachakana, Pgl Hat, BarunDanga, Morterjhar, Baniyamari, Balajan, Dhepdheoi, Debdutta Hazdaha 1, Kachari Hat, DebduttaHazdaha 2, Raja Katli, KachuaKash,ChandaKhol, Ada Bari. The improved road facility is not only developing better connectivity with faster and efficient movement of traffic with proper road safety measures but also enhance the social and commercial activities of the region.