National Highways & Infrastructure Development Corporation Limited

Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services for up gradation of National Highway No. 217 (Paikan-Tura Section) in the state of Assam and Meghalaya

DRAFT DETAILED PROJECT REPORT
PACKAGE-I
CH.-0+000 to 21+200
Cost Estimate
Executive Summary

M/s Almondz Global Infra-Consultant Limited
In association with
Thoughts Consultants Jaipur Private Limited

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Executive Summary

1 . Introduction

The Ministry of Road Transport & Highways (MORTH), Government of India has taken up various programs of up gradation and development of National Highways. The National Highways of India are owned by the Ministry of Road Transport and Highways. These network of roads are constructed and managed by various Departments like the National Highway Authority of India (NHAI), the National Highways & Infrastructure Development Corporation (NHIDCL), the Public Works Departments (PWDs) of the state Governments etc.

M/s Almondz Global Infra-Consultant Limited in association with Thoughts Consultants Jaipur Private Limited was appointed on 8th March 2019. For Consultancy Services for Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services for up gradation of National Highway No. 217 (Paikan-Tura Section) in the state of Assam and Meghalaya. The Project Highway location map is given in Figure 1-1.

The existing Project Highway alignment is passing through two State Assam and Meghalaya, Three Districts Goalpara, North Garo Hills and West Garo Hills and 56 Revenue Villages. The Project Highway alignment was discussed and Approved by NHIDCL on 27-11-2019 and directed to obtain concurrence of all stake holders of State Govt. For obtaining the concurrence the various Public Consultation meeting were carried out in all three districts for obtaining concurrence of all stakeholders

Goalpara District Assam: The Public Consultation meeting was held in the Office of Deputy Commissioner Goalpara Assam on 06-03-2020, where DC, ADC, SP, DFO, other District level officials, village heads and local people along with NHIDCL official were present in the meeting. The Alignment was approved in Assam the some minor modifications.

West Garo Hills District: The Public Consultation meeting was held in the Office of Deputy Commissioner West Garo Meghalaya on 06-03-2020 where DC, ADC, SP, DFO, other District level officials, village heads and local people along with NHIDCL Official were present in the meeting. The alignment was approved with recommendation to take the realignment in Rongram Town on East side instate of Elevated Road on existing alignment.

North Garo Hills District: The Public Consultation Meeting were held at Bajengdoba playground 09.03.2020, Gokol Playground on 11.03.2020 and in the Office of Deputy Commissioner North Garo Resulbelpara on 11-03-2020. The DC, ADC, SP, DFO, other District level officials, village heads and local people were present in the meeting. Deputy General Manager Tura was present on behalf of NHIDCL. The Propsed alignment was approved with the suggestion of Elevated viaduct at Bajengdoba Bypass.

The outcome of the Public Consultation meeting were presented in Review meeting held on 12-03-2020 at New Delhi HQ. The minor changes suggested in alignment were agreed by Authority and directed to carry out further activities. NHIDCL has also directed to plan to construct the Project Highway road in six packages according to keeping in the View of State / Districts Boundaries. After the discussion the following six package are formulated.

Table 1-1: Key features of project

Package	State & District	Existing Ch. From (Km) to (Km)	Design Ch.	Design Length (Km)
Package-1	Assam, Goalpara	From Km. 0/000 to Km. 21/350	From Km. 0/000 to Km 21/200	21.2 Km.
Package-2	Meghalaya, North Garo Hills	From Km. 21/350 to Km. 51/400	From Km. 21/200to Km 35/383	14.183 Km
Package-3			From Km. 35/383 to Km 47/675	12.293 Km.
Package-4	Meghalaya, West Garo Hills	From Km. 51/400 to Km. 85/000	From Km. 47/675 to Km 59/000	11.325 Km
Package-5			From Km. 59/000 to Km 69/500	10.500 Lm
Package-6			From Km. 69/500to Km 78/775	9.250 Km.

The Present Report is dealing with Package-1 in Goalpara District of Assam.

Figure 1-1: Location of Project Highway Road

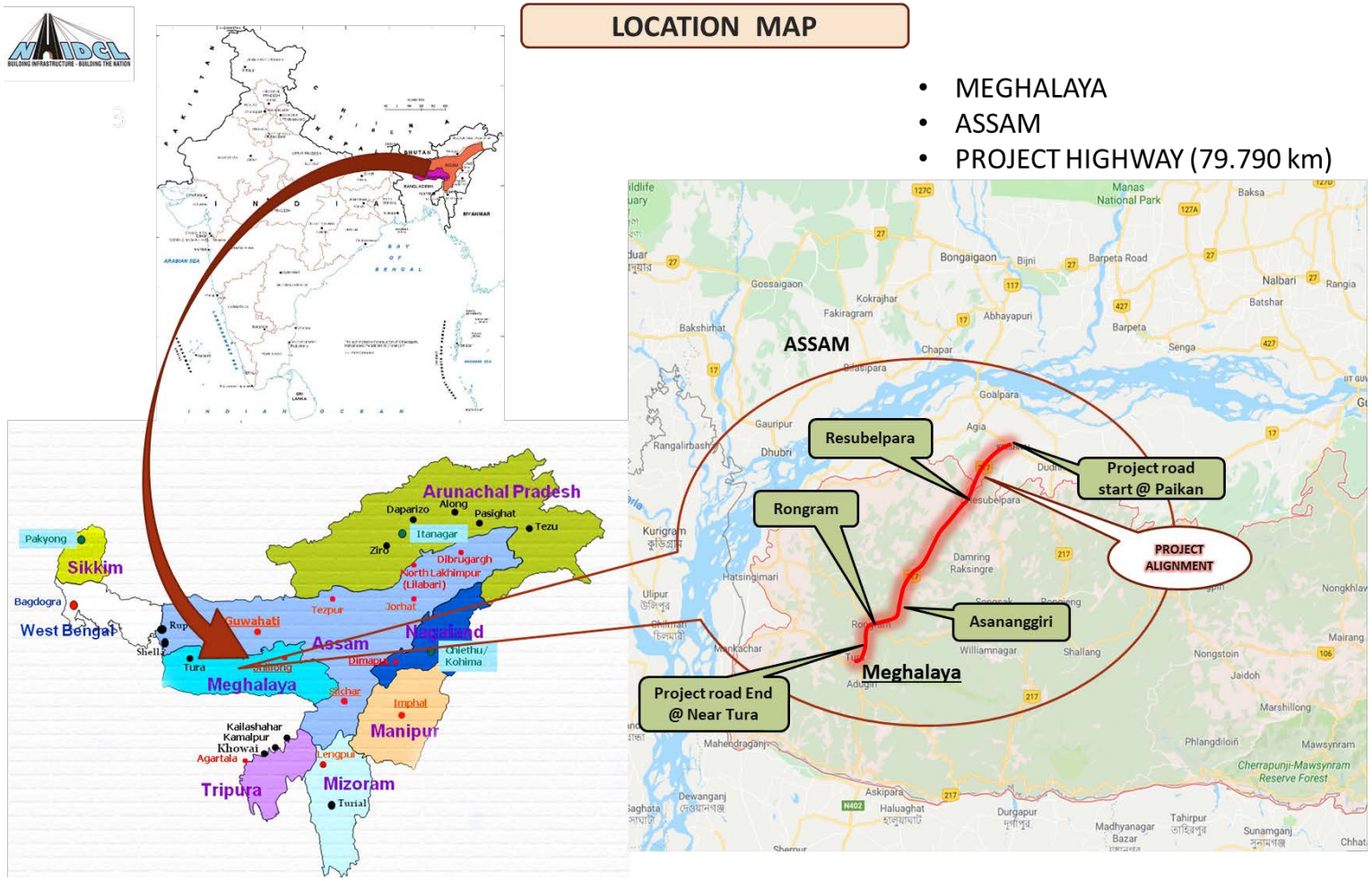
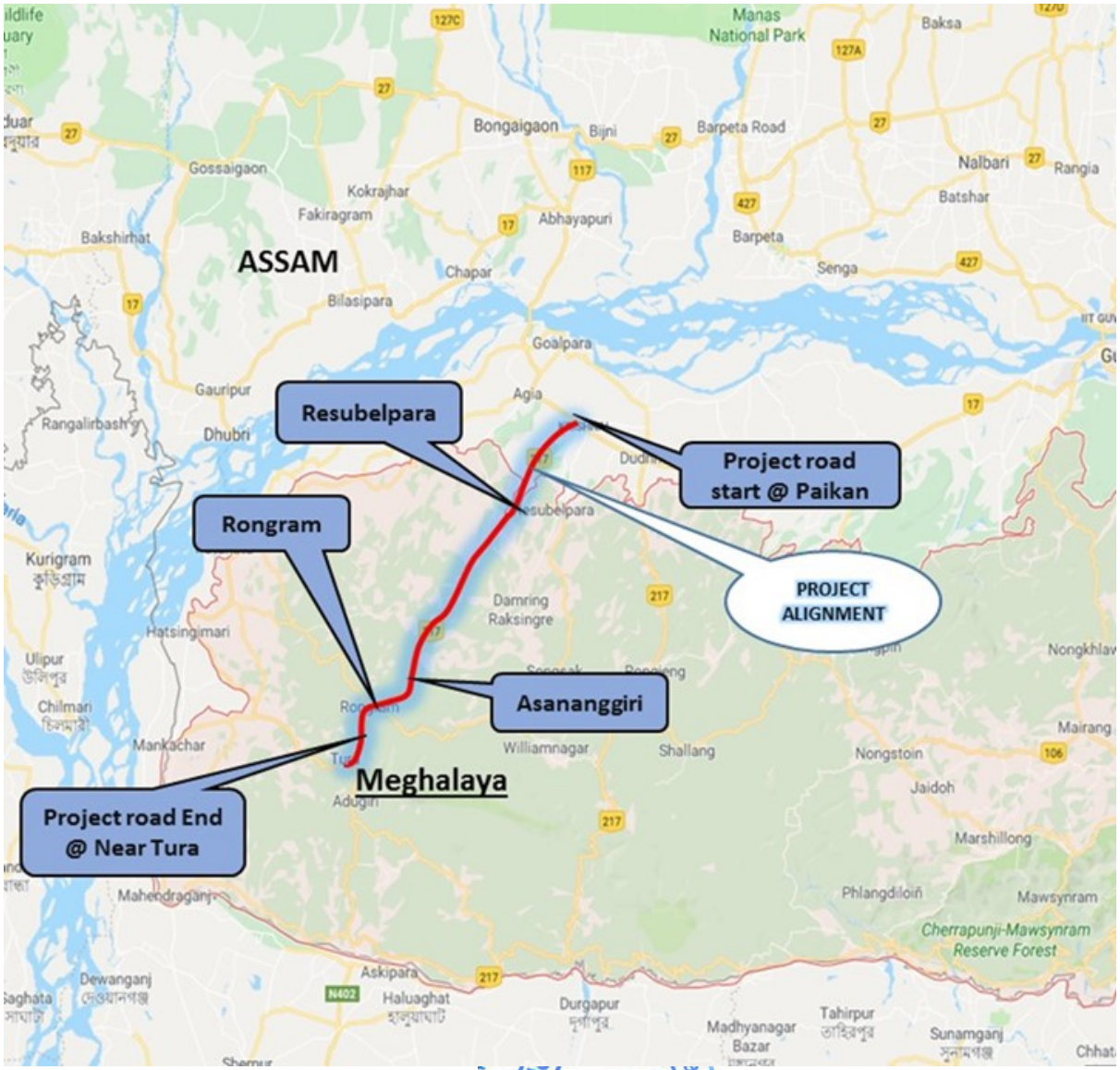


Figure 1-2: Existing Alignment of Project Highway all Packages



2 . Project overview

The Project Highway Package-1 is located in Goalpara District of Assam State. The existing Alignment is passing through Two Revenue Circle of Matiya and Balijana and 18 Revenue villages. The existing alignment of Project Highway Starts from Paikan at Km. 0/000 and end on Assam-Meghalaya Boarder at Km. 21/350. The existing alignment passing some small built-up Areas. The Project Highway has 2-lane flexible pavement in entire length. The Project Highway in Last 2 Km length East Side Meghalaya abutting.

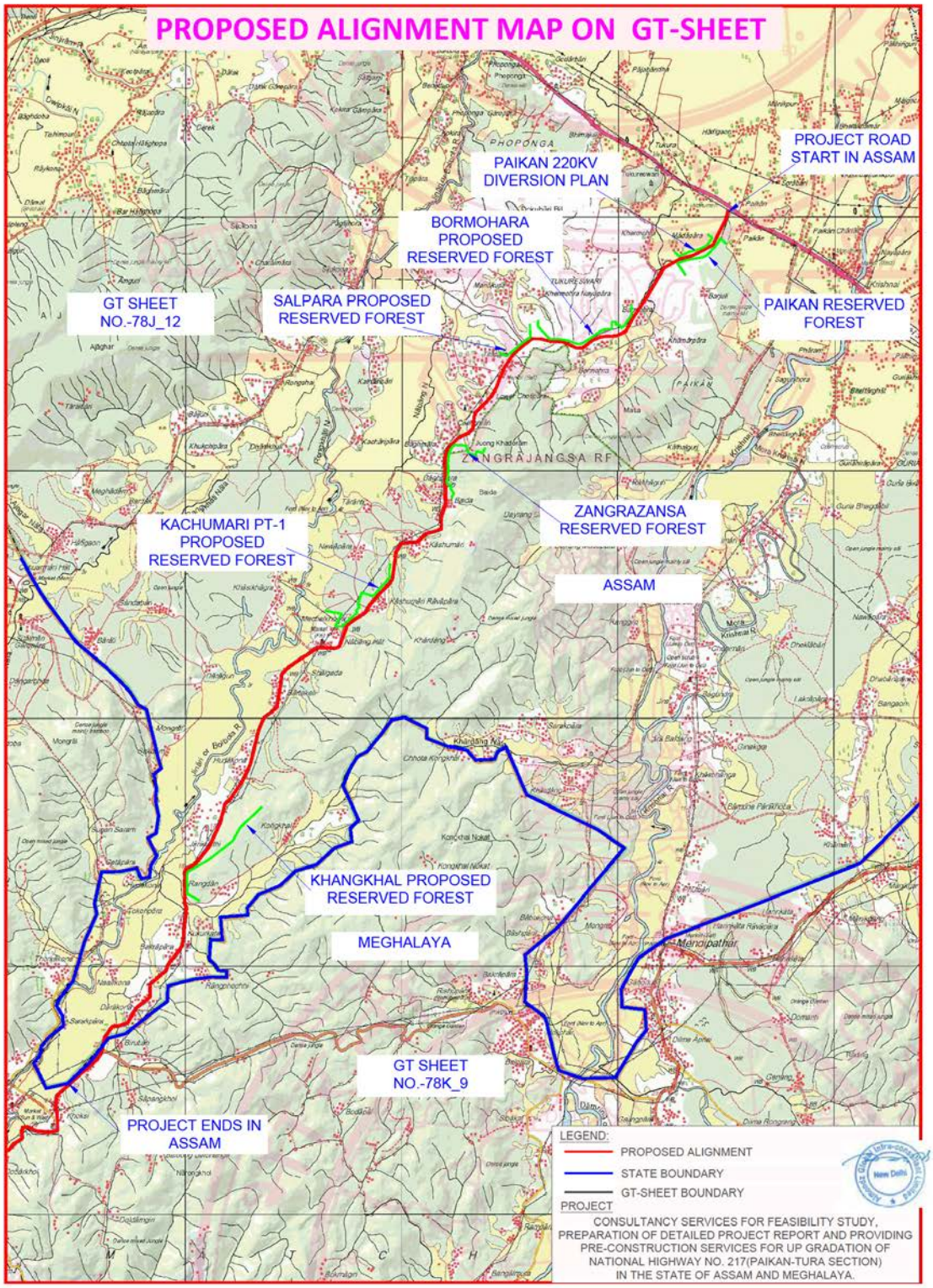
2.1 Key features of project

Table 2-1: Key features of project

Particulars	Existing Details
Terrain	Runs in Plain, Rolling terrain. Landuse is predominantly Agricultural, Forest, Barren land and some built up areas too.
ROW	Varies between 15-22.2 m
Carriageway Configuration	Two lanes of length 21.350 km
Geometry	Horizontal and Vertical Alignment of Project Road has lot of deficiencies
Pavement Condition	Mostly fair, some part of stretch is damaged.
Bridges Numbers	Major Bridge = 0 Minor Bridge = 7
Culverts Numbers	Pipe Culvert = 20 and Slab Culvert = 20
Side Drains	Exist in built-up stretches
Intersections/Junctions	Major =1 Minor Junction & Cross Road =40
Road Facility/Safety Feature	Safety installations are limited to speed breakers
Level Crossing/ROB/RUB	NIL
Breast Wall	500 m

2.2 Key plan of existing project stretch

Figure 2-1: Key plan of existing project road



3 . Traffic demands on project road

3.1 Traffic volume surveys

For the purposes of traffic projections and lane design, one individual section of road were considered:

Table 3-1: Classified Volume Count Survey

Sr. No.	Category Of Road	State	Location of Survey
1	NH 217	Assam	Barmohara At Ch. 3/900

Traffic volume surveys for the project road were carried out at 4 along the project road in the month of September 2019 to October 2019 and again in Month of May, 2021. The results are as follows:

Table 3-2: Average Daily Traffic

Vehicles	Barmohara At Ch. 3/900
Two wheeler	1172
Three wheeler	57
Car	1515
Mini Bus	170
Bus	31
LCV	413
2 Axle	58
Multi Axle	62
Tractor with Trailer	1
Others	143
Total Vehicle	3622
Total PCU	3764

3.2 Axle load survey

Axle load surveys were conducted at NH-217, at One location for Package-1, km 3+900 (Barmohara Pt-1), using Load Pad to understand the actual load spectrum of commercial vehicles plying on the project road. The results of the load survey, were converted to

Vehicle Damage Factor (VDF) using equivalency factors from IRC-37:2018 for the purpose of MSA calculations

Table 3-3: Axle load survey results

Sr. No.	Type of Vehicle	VDF @ 3/900
1	Bus	1.69
2	LCV	1.51
3	2 – Axle Truck	1.79
4	3 – Axle Truck	2.35
5	Multi Axle Truck	1.61
	Weightage VDF	1.73

3.3 Traffic volume forecast

Traffic volume forecast was developed using the Elasticity Model method and converted to Million Standard Axles (MSA) for the purposes of pavement design. Total Projected Traffic Volume for each of the locations of the project corridor are given in below Tables

Table 3-4: Projected traffic load on project road

Sr. No.	Years	Vehicles	PCU's
1	2019	3912	4169.5
2	2021	4784	5074.5
3	2026	7928	8312
4	2031	13187	13675
5	2036	22034	22644
6	2041	36999	37800.5
7	2046	62376	63523
8	2051	105530	105965

3.4 Turning movement surveys

Classified direction wise turning movement surveys were conducted at 5 intersections to determine the need for re-design and addition of structure at the intersection

Table 3-5: Turning movement survey results

Sr. No.	Location Details	Type	8 Hour TMC	Peak Hour TMC
			Total No. of Vehicle	Total No. of Vehicle
1	Start 0.000	3 Arm	4334	426

4 . Pavement and corridor surveys

4.1 Pavement condition and distress seen

The overall pavement condition Site has been inspected on visual basis. The pavement condition of road is good on the whole having good riding quality. In general, cracked area is around 15 –20%, patched area is about 5-10% and the average raveled area is 0% to 5%. Pot holes were only observed on the locations where water streams were crossing the road.

Table 4-1: Condition survey of existing pavement

ID	Section	Condition Year	Roughness IRI	Total Cracking Area (%)	Raveled Area (%)	Potholes(no /km)	Edge Break(m^2/ km)	Rut Depth (mm)
A-01	From Km 0.000 to Km 21/853	2019	4.1	16	15	8	12	2

4.2 Pavement composition

The detailed layer composition of the existing pavement was recorded at every pit and the observations have been presented in Annexure 6-6. Generally the existing pavement structure comprise of three layers namely wearing coarse, base course and sub-base course. The wearing course consists of bituminous material that may be termed as Bituminous Top (BT). The base course comprises of mixture of boulder/aggregate. The sub base course mainly comprises of aggregate/sand and murrum. The total thickness of the pavement varies from 310 mm to 370 mm with an average of 340 mm. The summary of the crust thickness is shown in below in Table.

Table 4-2: Composition of existing pavement

Section	Bituminous course (mm)		Granular course (mm)	
From Km 0.000 to Km 21/853	40	350	80	600

4.3 Pavement strength

FWD was carried out to test the strength of the existing pavement, and the characteristic deflection values have been calculated for each homogeneous section of road to enable design of an overlay for the road. The summary of strength of existing pavement

Table 4-3: Strength of existing pavement

Section	Chainage		Distance	Remaining mm
	Start	End	Km	
Section-1	0/000	21/350	21.350	2 MSA

The existing 2-lane Carriageway Flexible Pavement has some reaming life, However due to the proposed Horizontal and Vertical alignment improvements and widening of existing 2-lane to 4-lane will require complete demolition of existing pavement. So New flexible pavement need to be construction GSB wherever existing carriageway become part of proposed carriageway.

4.4 Sub-grade soil survey

Extensive review of available soil information and testing was done to understand the sub-grade characteristics. Summary of soil investigation surveys is as follows:

Table 4-4: Soil investigation survey results

Attribute	Results	Comments
Sub-grade CBR range (%)	7%- 8%	Low over large lengths of section
Degree of compaction (% of MDD)	93%-95%	Sufficient as per MoRTH guidelines
Swelling ratio (%)	6.4 to 39%	Significant variation seen across stretch

Table 4-5: Soil types observed

Soil type	% of length	Plasticity index	Comments
Sandy clay (SM)	40%	3.29 to 4.28	Poorly graded sandy clay mixture

5 . Improvement proposals

5.1 Proposed alignment

As per the Discussion with NHIDCL and Outcome of the Public consultation with all stake holders, the widening of existing 2-lane road to 4 lane has been planned along the existing road alignment only, except for curve improvement and minor realignment in some stretches. The existing road carriageway has been used most of the length.

As per site conditions due to elephant crossing at some locations and presence of built-up areas speed restrictions need to be adopted. The local and district administration were of the option that deficient curves should only be improved for minimum design speed 40 Kmph. So that Land acquisition can be minimized.

In built-up area the widening has been planned equally on both sides of the existing road alignment so that Minimum land is acquired for road project. The width of median be kept same in non-built-up area same as proposed in built-up area.

5.2 Bypasses proposed

It was informed that in Assam state No bypass has been proposed.

5.3 Road Geometry

The project road has been re-designed to accommodate the ruling design speed of 80 km/hr in Plain and Rolling Terrain. The Manual of Standards and Specifications for "Four Laning of Highways with Paved Shoulder published by Indian Roads Congress IRC: SP: 84-2019" or consultation with NHIDCL. Enabling this higher speed will require re-design and re-alignment of the road in certain sections. Initial all the curves were improved for minimum Design Speed of 80 KmpI. During the Public Consolation meeting it was discussed that due to elephant crossing at some locations and presence of built-up areas, speed restrictions need to be adopted. After discussions, the locals and district administration were of the opinion that deficient curves should only be improved for Maximum design speed 40 Kmph only. Locals and district administration insisted to follow relaxed norms if possible so as to have minimum Land acquisition. The villagers insisted that in built-up area the widening must be done equally on both sides of the existing road alignment so that equal land is acquired on both sides of the Alignment and dwellers on both sides of the Alignment are equally affected. The villagers also requested the width of median be kept same in non-built-up area as proposed in built-up area and extra 2.5 m paved shoulders may be reduced, due to the presence of agriculture's fields. Due to these suggestions overall land requirement may be reduced. The Competent Authority has approved the suggestion of Public Consolation meeting. Accordingly final alignment has been modified.

Table 5-1: Lane configuration planned for project road

Section	Chainage		Distance	Lane Configuration	TCS
	Start	End	Km		
Section-1	0/000	21/200	21.200	4-Lane	2X7.9 M +2.5 M Paved Shoulders

5.4 Widening scheme

Basis traffic information available, level of service requirements and consultation with NHIDCL, local authorities etc., the following lane configuration is adopted for the project road:

Table 5-2: Typical Cross Section Details

Sr. No.	Particular of TCS	TCS Codes
1	Four-lane Divided Highway without Service Road with raised Median in Built-up Area	TCS-1
2	Four-lane Divided Highway with raised Median widening & Reconstruction of existing 2-lane carriageway and construction of 2-lane New Carriageway /Construction of 4-lane road at realignment section upto 3.0 m Embankment heights	TCS-2
3	TYPICAL CROSS SECTION -3 Four-lane Divided Highway with raised Median widening & Reconstruction of existing 2-lane carriageway and construction of 2-lane New Carriageway /Construction of 4-lane road at realignment section more than 3.0 m Embankment heights	TCS-3
4	TYPICAL CROSS SECTION -4 Four-lane Divided Highway with raised Median widening & Reconstruction of existing 2-lane carriageway and construction of 2-lane New Carriageway /Construction of 4-lane road at realignment section more than 3.0 m Embankment heights on one side upto 3.0 m Embankment Height on Other side	TCS-4
5	TYPICAL CROSS SECTION -5 Four-lane Divided Highway with raised Median widening & Reconstruction of existing 2-lane carriageway and construction of 2-lane New Carriageway /Construction of 4-lane road at realignment section water logged areas	TCS-5
6	TYPICAL CROSS SECTION -6 Four-lane Divided Highway with raised Median in Cutting widening & Reconstruction of existing 2-lane carriageway and construction of 2-lane New Carriageway /Construction of 4-lane road at realignment section	TCS-6
7	TYPICAL CROSS SECTION -7	TCS-7

Sr. No.	Particular of TCS	TCS Codes
	Four-lane Divided Highway with raised Median in One side Hill and other Embankment with River protection widening & Reconstruction of existing 2-lane carriageway and construction of 2-lane New Carriageway /Construction of 4-lane road at realignment section	
8	TYPICAL CROSS SECTION -7 (Type-1) Four-lane Divided Highway with raised Median in One side Hill and other filling Embankment	TCS-7 (Type-1)
9	4-lane New Bridge	TCS-6
10	Existing 2-Lane Bridge retained with 2-lane bridge	TCS-9

Table 5-3: Chainage TCS Adopted

Chainagewise TCS details				
Sr. No.	**From**	**To**	**Design Length**	**TCS Code**
1	0.000	0.700	0.700	TCS-1
2	0.700	1.275	0.575	TCS-2
3	1.275	1.29	0.015	TCS-5
4	1.290	1.31	0.020	RCC Girder MNB
5	1.310	1.325	0.015	TCS-5
6	1.325	1.750	0.425	TCS-2
7	1.750	1.800	0.050	TCS-4
8	1.800	1.900	0.100	TCS-3
9	1.900	2.025	0.125	TCS-2
10	2.025	2.075	0.050	TCS-5
11	2.075	2.100	0.025	TCS-4
12	2.100	2.390	0.290	TCS-2
13	2.390	2.41	0.020	TCS-5
14	2.410	2.420	0.010	Slab MNB
15	2.420	2.700	0.280	TCS-5
16	2.700	3.000	0.300	TCS-1
17	3.000	3.650	0.650	TCS-2
18	3.650	4.200	0.550	TCS-1
19	4.200	4.275	0.075	TCS-3
20	4.275	4.350	0.075	TCS-2
21	4.350	4.425	0.075	TCS-4
22	4.425	4.600	0.175	TCS-2
23	4.600	4.725	0.125	TCS-3
24	4.725	4.825	0.100	TCS-2
25	4.825	5.000	0.175	TCS-4

26	5.000	5.075	0.075	TCS-2
27	5.075	5.175	0.100	TCS-4
28	5.175	5.275	0.100	TCS-6
29	5.275	5.475	0.200	TCS-7(Type-1)
30	5.475	5.650	0.175	TCS-3
31	5.650	5.775	0.125	TCS-2
32	5.775	5.875	0.100	TCS-4
33	5.875	5.900	0.025	TCS-2
34	5.900	6.600	0.700	TCS-1
35	6.600	6.825	0.225	TCS-4
36	6.825	6.925	0.100	TCS-7(Type-1)
37	6.925	6.975	0.050	TCS-4
38	6.975	7.025	0.050	TCS-7(Type-1)
39	7.025	7.075	0.050	TCS-6
40	7.075	7.225	0.150	TCS-7(Type-1)
41	7.225	7.250	0.025	TCS-4
42	7.250	7.370	0.120	TCS-3
43	7.370	7.380	0.010	Slab MNB
44	7.380	7.525	0.145	TCS-3
45	7.525	7.600	0.075	TCS-4
46	7.600	7.700	0.100	TCS-2
47	7.700	7.800	0.100	TCS-4
48	7.800	7.950	0.150	TCS-7(Type-1)
49	7.950	8.450	0.500	TCS-2
50	8.450	8.500	0.050	TCS-5
51	8.500	8.700	0.200	TCS-2
52	8.700	8.750	0.050	TCS-5
53	8.750	8.76	0.010	TCS-2
54	8.760	8.770	0.010	Slab MNB
55	8.770	8.854	0.084	TCS-2
56	8.854	8.866	0.012	Slab MNB
57	8.866	9.100	0.234	TCS-2
58	9.100	9.150	0.050	TCS-4
59	9.150	9.200	0.050	TCS-2
60	9.200	9.250	0.050	TCS-4
61	9.250	9.400	0.150	TCS-2
62	9.400	9.450	0.050	TCS-3
63	9.450	9.575	0.125	TCS-2
64	9.575	9.650	0.075	TCS-4
65	9.650	10.075	0.425	TCS-2
66	10.075	10.168	0.093	TCS-5
67	10.168	10.183	0.015	RCC Girder MNB

68	10.183	10.300	0.117	TCS-5
69	10.300	10.600	0.300	TCS-2
70	10.600	10.79	0.190	TCS-4
71	10.790	10.810	0.020	Slab MNB
72	10.810	10.950	0.140	TCS-4
73	10.950	11.075	0.125	TCS-2
74	11.075	11.125	0.050	TCS-5
75	11.125	11.225	0.100	TCS-2
76	11.225	11.325	0.100	TCS-4
77	11.325	11.550	0.225	TCS-2
78	11.550	11.600	0.050	TCS-3
79	11.600	11.850	0.250	TCS-2
80	11.850	11.956	0.106	TCS-4
81	11.956	11.970	0.014	Slab MNB
82	11.970	12.325	0.355	TCS-4
83	12.325	12.875	0.550	TCS-1
84	12.875	13.625	0.750	TCS-4
85	13.625	14.650	1.025	TCS-2
86	14.650	15.800	1.150	TCS-2
87	15.800	15.828	0.028	TCS-4
88	15.828	15.846	0.018	Slab MNB
89	15.846	16.125	0.279	TCS-4
90	16.125	16.275	0.150	TCS-4
91	16.275	16.650	0.375	TCS-4
92	16.650	17.025	0.375	TCS-2
93	17.025	17.100	0.075	TCS-4
94	17.100	17.275	0.175	TCS-2
95	17.275	17.325	0.050	TCS-4
96	17.325	17.450	0.125	TCS-2
97	17.450	18.025	0.575	TCS-7
98	18.025	18.100	0.075	TCS-4
99	18.100	18.150	0.050	TCS-7(Type-1)
100	18.150	18.225	0.075	TCS-4
101	18.225	18.25	0.025	TCS-3
102	18.250	18.280	0.030	BOX MNB
103	18.280	18.450	0.170	TCS-3
104	18.450	19.325	0.875	TCS-1
105	19.325	19.400	0.075	TCS-2
106	19.400	19.450	0.050	TCS-2
107	19.450	19.525	0.075	TCS-2
108	19.525	19.600	0.075	TCS-7(Type-1)
109	19.600	19.700	0.100	TCS-6

110	19.700	19.750	0.050	TCS-7(Type-1)
111	19.750	19.795	0.045	TCS-4
112	19.795	19.805	0.010	BOX MNB
113	19.805	20.075	0.270	TCS-4
114	20.075	20.600	0.525	TCS-1
115	20.600	20.675	0.075	TCS-4
116	20.675	20.800	0.125	TCS-4
117	20.800	20.850	0.050	TCS-4
118	20.850	20.875	0.025	TCS-7(Type-1)
119	20.875	20.975	0.100	TCS-6
120	20.975	21.200	0.225	TCS-4
	Total Length		21.200	

Basis availability of RoW and land acquisition constraints, a widening scheme has been proposed that makes optimum use of existing ROW and minimizes need for land acquisition in urban areas, a summary of which is given below:

5.5 Pavement design

5.5.1 Design period, loading and pavement type

Using the projected traffic, VDF values, lane and directional distribution factors, the design traffic loading used for the project is 20 MSA.

Through preliminary design and lifecycle comparisons, the type of pavement was chosen for construction with a design life of 20 years has been considered for design.

5.5.2 Design sub-grade strength

Considering the soil investigations conducted in the project road area, and the availability of suitable soil in the region, the following sub-grade strength has been assumed to vary from 7.0% to 8.0% for various sections of the highway.

5.5.3 Pavement Composition for New Carriageway

The pavement design has been carried out to arrive most economic Pavement for main carriageway. Composition.

1) Conventional Pavement Composition

The proposed pavement composition for the new sections carriageway basis "The Manual of Standards and Specifications for "Four Laning of Highways with Paved Shoulder published by Indian Roads Congress IRC:SP:84-2019", subgrade strength and design traffic is:

Table 5-4: Proposed pavement composition

Pavement Layer		Thickness in mm
Bituminous	BC	40
	DBM	80
Granular	WMM	250
	GSB	200
Total Thickness		570

Table 5-5: Pavement Composition for Main Carriageway Option 2

Pavement Layer		Thickness in mm
Bituminous	BC	50
Granular	Granular Crack Relief Layer AIL	100
	CTB	115
	CTSB	200
Total Thickness		465

Table 5-6: Pavement Composition for Main Carriageway Option 3

Pavement Layer		Thickness in mm
Bituminous	BC	30
	DBM	50
Granular	WMM	250
	CTSB	200
Total Thickness		430

5.5.4 Strengthening of existing pavement

The strengthening requirements for the existing pavement have been estimated from the deflection measurements and estimated traffic loadings. The designed overlay proposed is as below:

Table 5-7: Overlay thickness required

Section	Chainage	Distance	Characteristic deflection	Overlay thickness (mm)
NA				

5.6 Design of Structures

Along the project stretch, there are several bridges, culverts, under/overpasses and flyovers. All new bridges have been proposed with a footpath on left side of the traffic direction. Overall width of all new culverts has been proposed to equal to roadway width of the approaches. The outer most face of railing/parapet has been in line with the outer most edge of shoulder. A summary of the total number and proposed additions is given in the table below

Table 5-8: Improvement proposals for Bridges and Culverts

Sr. No.	Particular	Existing Structure	Proposed			Left out	Total Proposed Structures
			Widening	Reconstruction	New Additional		
1	Major Bridge	Nil	--	--	--	--	--
2	Minor Bridge	7	2	5	4		11
3	Pipe Culverts	20	--		--	--	Nil
4	Slab Culverts	20	--		--	--	Nil
5	Box Culverts	Nil	--	36	18	--	54

*Due to realignment at Assam Meghalaya Boarder Design alignment shifted toward Meghalaya, so the existing bridge has left out and new bridge has been considered in Package-2.

5.7 Intersections and Grade Separators

Based on the traffic and turning movement surveys conducted, 26 junctions have been identified for redesign or grade separation, the details of which are given below

Table 5-9: Details of the Junctions improvement plans

Sl. No.	Location of intersection(Design Chainage)	Type of intersection	Other features
(1)	(2)	(3)	(4)
Major Intersections			
1	0.000	T	
Minor Intersections			
1	0.170	T	Crossroad
2	0.285	Y	Crossroad
3	0.310	T	
4	0.510	T	
5	0.605	T	Paikan
6	1.225	T	
7	1.455	X	Crossroad
8	1.925	T	Kharmohara
9	2.725	T	Crossroad
10	2.925	Y	
11	3.340	T	Barmohara
12	3.380	X	Crossroad
13	3.695	T	
14	3.950	X	
15	4.850	T	
16	5.175	T	Bar Vita
17	5.950	T	
18	6.050	T	Crossroad
19	6.620	T	Crossroad
20	6.825	T	
21	8.375	X	Crossroad
22	8.645	X	Crossroad
23	149.330	T	
24	11.250	Y	Crossroad
25	11.380	T	
26	11.460	X	Crossroad
27	12.505	T	Crossroad
28	12.750	Y	
29	14.400	T	
30	14.530	T	
31	14.820	X	
32	14.875	T	Crossroad
33	15.415	T	
34	15.475	X	Crossroad
35	16.875	Y	
36	18.215	T	Crossroad

Sl. No.	Location of intersection(Design Chainage)	Type of intersection	Other features
(1)	(2)	(3)	(4)
37	18.500	T	Nibari
38	18.890	X	
39	20.480	Y	Crossroad
40	20.560	T	
41	20.910	X	Crossroad

5.8 Drainage

An effective and efficient drainage system has been proposed for entire project highway including structures and facilities to avoid water logging. The storm water from road and adjacent areas shall be intercepted and carried through road side drains to the nearest natural outfalls. RCC footpath cum Drain and Open side trapezoidal PCC lined cross section drain has been provided as per TCS for the project Highway in order to intercept surface water from the carriageway, shoulders and slopes.

5.9 Toll plazas

Based on the traffic surveys, O-D surveys and layout of project road, No Toll Plaza shall be provided. Toll plazas are proposed along the project road:

Table 5-10: Location of current and proposed toll plazas

Existing chainage	Design chainage	Location	Existing no of lanes	Proposed no of lanes
NA				

5.10 Slope Protection Works

The side slopes have been provided using suitable slope protection measures; such as Turfing & Vegetation, Stone pitching and Toe wall: drainage chutes, energy dissipation basin at toe of chutes wherever required along the Project Highway conforming to IRC guidelines and standard specifications have been proposed. At some

5.11 Project Facilities

The following Project facilities have been included in the Project.

- Traffic Control Devices and Road Safety Works;

  (a) Road Signs

  (b) Road Marking

  (c) Road Delineator

  (d) Reflective Pavement Markers (Road Studs)

(e) Roadside & Median Side Safety Barriers

- Pedestrian facilities;
- Land Scoping & Tree Plantation
- Project Facilities

  (a) Road Boundary Stone

  (b) Kilometre & 200 m Stone

  (c) Street Lighting

  (d) Truck lay-byes;

  (e) bus-bays and bus shelters;

  (f) Highway Petro Units

  (g) Emergency Medical Services Cranes;

  (h) Crane Services

  (i) Communication System
- Traffic Diversion during Construction
- Others

  (a) Utilities Ducts

6 . Environmental impact assessment

6.1 Impact and clearances needed

An environmental impact study was undertaken during the process of creating the detailed project report to understand impact of the project road on the surrounding ecology and environment. The Project Highway Length is approximately 79.0 Km. Hence, the Environmental Clearance (EC) is not required for the Project Highway under Schedule 7(f) as per S.O. 2559 (E), MoEF Notification of 22nd August 2013 (as amendment of 14th September 2006) i.e., Expansion of National Highways greater than 100 km involving additional right of way or land acquisition greater than 40m on the existing alignments and 60m on re-alignment or f bypasses. Hence No package out six does not attract Environment Clearance.

The proposed Project involves the acquisition of forest land in Package-1 in the Gaolpara District in State of Assam. The Forest Land has been identified along with forest & Revenue Department. Approximately 5.1034 Ha Reserve Forest Land need to be diverted. The joint verification has been done with forest & wildlife department. . The Online proposal has been uploaded on MOEF & CC. The approximately 3500 tree need to be cut. However, no loss of rare/threatened/endangered species of flora is envisaged. All impacts are site-specific and can be addressed through proven mitigation measures. Hence, the project is warranting an initial environmental examination (IEE). The EIA & EMP report has been prepared as per MOEF & CC Guidelines

The Project Highway Package-1 does not passing any Protected Area Network Hence, Wild Life clearance is not required. In this regard DFO has issued the necessary certificate. However the some elephant movement had been noticed. There six locations has been identified for Elephant crossing along with forest. The DFO has suggested some mitigation measures which has been incorporated in Draft DPR.

The Environmental Mitigation and Management Costs were developed based on the estimation of resources required to implement the mitigation measures proposed and also number of places where intervention is required. Environmental mitigation cost for the proposed project is Rs 6.0 Cr. Including Compensatory afforestation, Forest Diversion and Wildlife cost.

7 . Social impact assessment and Land acquisition

7.1 Social impact assessment

The existing 2-lane Road has RoW 15-22.5 m, which is inadequate for the proposed widening. The land width for 4-lane has been proposed 45 m and 30 m in Built-up and Rural Ares. The Project Highway require total 73.4007 Ha additional land out of that 15.440 Ha Private land. This will lead to the additional acquisition of 15.440 Ha across the states of Assam, in 18 villages in Goalpara district.

Preliminary interactions have been held with locals to understand their issues and concerns and help communicate the project plan and its impact on them. The key concerns of title and non-title holders centered on Compensation of Land and Assists

7.2 Land acquisition requirements

The state and district wise details and status of land acquisition as on the date of publishing of this report is as follows:

Table 7-1: Cost for the Land Acquisition

Sr. No.	Particular	Assam
1	Chainage	From Km 0/000 to Km. 21/ 200
2	Total Land Required for Project in Ha	90.9841
3	Land Available in Ha	17.5834
4	Land Need to be acquired in Ha	73.4007 Ha 15.440 (Private Land) +57.9607 ha Government including forest
5	Total Compensation (in Cr.) Lumsum	Rs. 25 Cr.

A total of Rs. 21 crores is expected to be awarded for the acquisition of land required for this project. The land acquisition process is underway with a total of One CALAs appointed.

7.3 Key risks envisaged in land acquisition

No Major risk has been envisaged in the Proposed Project Highway.

8 . Utilities shifting and clearances

Utilities belonging to user agencies have been identified that fall within the project road ROW and will need to be shifted to enable road construction. Shifting proposals have been submitted to the user agencies and initial estimates have been received from the concerned agencies. The process of site inspection, review and revision of the proposals for utilities shifting is in process.

To enable better management of utilities and installation going forward, all utilities are being shifted underground/into a utility corridor/out of the road RoW/ utilities trench is being planned as part of construction>

8.1 Utilities shifting estimates

Table 8-1: Key utilities shifting requirements

Sl No	Utility	Chainage affected	Agency	Shifting required	Estimated cost Cr.	Supervision	Current status
1	Electrical	Most of Project Highway	APDCL	Yes	Rs. 5.7526	Rs. 15.66 Lakhs	Final estimate has been submitted by line agency
2	Water Supply	At three locations	PHE	Yes	Rs. 0.2348	Rs 0.3 Lakhs	Final estimate has been submitted by line agency
			Total in Cr.		5.9874	Rs 15.96 Lakhs	

8.2 Total cost of utilities shifting

The total cost of utilities shifting for all the utilities identified in the road RoW is estimated to be with supervision charges of being paid as supervision charges to the concerned agencies.

9 . Project cost estimates

The cost estimates for the project has been carried out based on detailed design, bill of quantities, and the schedule of rates for NH BSR-2013-14 Assam. The summary of Cost estimate for various options has been worked out as follows

Table 9-1: Summary of project cost for Option 1

Conventional Pavement

SUMMARY OF COST ESTIMATE			
		Based on Assam NH BSR 2013-14	
S.N.	**PARTICULAR**	**Amount in Lacs**	**Amount in Cr.**
1	**PACKAGE 1**		
	BILL NO: 1 SITE CLEARANCE AND DISMANTELING	50.12	0.50
	BILL NO: 2 EARTHWORK	4724.44	47.24
	BILL NO: 3 SUB-BASE AND BASE COURSES	0.00	0.00
	a) GSB	2628.92	26.29
	b) WMM	2523.55	25.24
	c) CTSB	0.00	0.00
	d) CTB	0.00	0.00
	BILL NO: 4 BITUMINOUS WORKS - FLEXIBLE PAVEMENT	6286.92	62.87
	a) DBM	3875.89	38.76
	b) BC	2307.23	23.07
	BILL NO: 5 CULVERTS		
	(A)BOX CULVERTS	2118.51	21.19
	(B) Retaining Wall	719.77	7.20
	BILL NO: 6 BRIDGES		
	(A) MINOR BRIDGES		
	RCC Girder Minor Bridge	830.61	8.31
	Slab Minor Bridge	1902.98	19.03
	Box Minor Bridge	505.51	5.06
	Retaining Wall	566.84	5.67
	Repair of Slab MNB	26.78	0.27
	BILL NO: 7 DRAINAGE & PROTECTION WORK		

	BILL NO:7A Roadside Drains	914.60	9.15
	BILL NO:7B Protection Work	1652.36	16.52
	BILL NO: 8 TRAFFIC SIGNS, ROAD MARKINGS AND APPURTENANCES	4861.95	48.62
	BILL NO: 9 Passenger Shelter	28.00	0.28
	BILL NO: 10 Utility Duct	18.29	0.18
	BILL NO: 11 (STREET LIGHTING)	34.34	0.34
	Truck Lay By	62.94	0.63
	Junction Improvement	142.78	1.43
2	**TOTAL CIVIL COST as per 2013-14**	**36783.35**	**367.83**
	ADD PREMIUM @ 18.45% AS PER PWD NH WORKS NO NHR41/2019/48	**6786.53**	**67.87**
3	**Net CIVIL COST as per 2013-14**	43569.87	**435.70**
4	Utility Shifting		
	Electrical	575.26	5.75
	Water	23.48	0.23
5	**TOTAL Cost FOR PACKAGE**	**44168.61**	**441.69**
	Bid Price	**₹ 44,168.61**	**₹ 441.69**
6	**Bid Price without GST**	**₹ 39,436.26**	**394.36**
	GST @ 12%	**₹ 4,732.35**	**47.32**
7	CONTINGENCIES @2.8% of (6)	**₹ 1,104.22**	**₹ 11.04**
8	SUPERVISION CONSULTANCY CHARGES @ 3% of (6)	**₹ 1,183.09**	**₹ 11.83**
9	AGENCY CHARGES @3% of (6)	**₹ 1,183.09**	**₹ 11.83**
10	**TOTAL EPC CONSTRUCTION COST (6+7+8+9)**	**₹ 42,906.65**	**₹ 476.39**
11	Maintenance charge @ 3.5 % of Bid cost (6)	**₹ 1,380.27**	**₹ 13.80**
12	**TOTAL PROJECT CONSTRUCTION COST (INCLUDING MAINTENANCE)(10+11)**	**₹ 44,286.92**	**₹ 442.87**
13	**COST PER KM IN CRORES (ON PROJECT COST)**	**₹ 2,089.01**	**₹ 20.89**
14	**PRE-CONSTRUCTION COST /COST TO BE PAID BY AUTHORITY /**		
	(a) LAND ACQUISITION & R & R COST	**2500**	**₹ 25.00**
	(b) UTILITY AGENCIES SUPERVISION CHARGES	**16**	**₹ 0.16**
	(c) DIVERSION OF FOREST, WILDLIFE and Tree Cutting Cost	**600**	**₹ 6.00**
	(D)EMP COST	**0**	**₹ 0.00**
15	**SUB-TOTAL PRE-CONSTRUCTION COST**	**₹ 3,116.00**	**₹ 31.16**

16	**TOTAL CAPITAL COST**	**₹ 47,402.92**	**₹ 474.03**

Table 9-2: Summary of project cost for Option 2
Cement Treated Sub-Base & Base Pavement

SUMMARY OF COST ESTIMATE			
		Based on Assam NH BSR 2013-14	
S.N.	**PARTICULAR**	**Amount in Lacs**	**Amount in Cr.**
1	**PACKAGE 1**		
	BILL NO: 1 SITE CLEARANCE AND DISMANTELING	50.10	0.50
	BILL NO: 2 EARTHWORK	4750.86	47.51
	BILL NO: 3 SUB-BASE AND BASE COURSES	0.00	0.00
	a) GSB	186.02	1.86
	b) WMM	1109.83	11.10
	c) CTSB	3621.33	36.21
	d) CTB	1363.57	13.64
	BILL NO: 4 BITUMINOUS WORKS - FLEXIBLE PAVEMENT		
	a) DBM	0.00	0.00
	b) BC	3164.73	31.65
	BILL NO: 5 CULVERTS		
	(A)BOX CULVERTS	2118.51	21.19
	(B) Retaining Wall	719.77	7.20
	BILL NO: 6 BRIDGES		
	(A) MINOR BRIDGES		
	RCC Girder Minor Bridge	830.61	8.31
	Slab Minor Bridge	1902.98	19.03
	Box Minor Bridge	505.51	5.06
	Retaining Wall	566.84	5.67
	Repair of Slab MNB	26.78	0.27
	BILL NO: 7 DRAINAGE & PROTECTION WORK		
	BILL NO:7A Roadside Drains	914.59	9.15

	BILL NO:7B Protection Work	1652.16	16.52
	BILL NO: 8 TRAFFIC SIGNS, ROAD MARKINGS AND APPURTENANCES	4859.65	48.60
	BILL NO: 9 Passenger Shelter	28.00	0.28
	BILL NO: 10 Utility Duct	18.29	0.18
	BILL NO: 11 (STREET LIGHTING)	34.34	0.34
	Truck Lay By	27.54	0.28
	Junction Improvement	77.89	0.78
2	**TOTAL CIVIL COST as per 2013-14**	**28529.90**	**285.30**
	ADD PREMIUM @ 18.45% AS PER PWD NH WORKS NO NHR41/2019/48	**5263.77**	**52.64**
3	**Net CIVIL COST as per BSR 2013-14 after addition of premium at price level 2020-21**	**33793.67**	**337.94**
4	Utility Shifting		
	Electrical	575.26	5.75
	Water	23.48	0.23
5	**TOTAL FOR PACKAGE**	**34392.41**	**343.92**
	Bid Price	**₹ 34,392.41**	**343.92**
6	**Bid Price without GST**	**₹ 30,707.51**	**307.08**
	GST @ 12%	**₹ 3,684.90**	**36.85**
7	CONTINGENCIES @2.8% of (6)	**₹ 859.81**	**₹ 8.60**
8	SUPERVISION CONSULTANCY CHARGES @ 3% of (6)	**₹ 921.23**	**₹ 9.21**
9	AGENCY CHARGES @3% of (6)	**₹ 921.23**	**₹ 9.21**
10	**TOTAL EPC CONSTRUCTION COST (6+7+8+9)**	**₹ 37,094.67**	**₹ 370.95**
11	Maintenance charge @ 3.5 % of Bid cost (6)	**₹ 1,074.76**	**₹ 10.75**
12	**TOTAL PROJECT CONSTRUCTION COST (INCLUDING MAINTENANCE)(10+11)**	**₹ 38,169.43**	**₹ 381.69**
13	**COST PER KM IN CRORES (ON PROJECT COST)**	**₹ 1,800.44**	**₹ 18.00**
14	**PRE-CONSTRUCTION COST /COST TO BE PAID BY AUTHORITY /**		
	(a) LAND ACQUISITION & R & R COST	**2500**	**₹ 25.00**
	(b) UTILITY SHIFTING	**16**	**₹ 0.16**
	(c) DIVERSION OF FOREST & WILDLIFE COST	**600**	**₹ 6.00**
	(D)EMP COST	**0**	**₹ 0.00**
15	**SUB-TOTAL PRE-CONSTRUCTION COST**	**₹ 3,116.00**	**₹ 31.16**
16	**TOTAL CAPITAL COST**	**₹ 41,285.43**	**₹ 412.85**

Table 9-3: Summary of project cost for Option 3
Cement Treated Sub-base Pavement

SUMMARY OF COST ESTIMATE			
		Based on Assam NH BSR 2013-14	
S.N.	**PARTICULAR**	**Amount in Lacs**	**Amount in Cr.**
1	**PACKAGE 1**		
	BILL NO: 1 SITE CLEARANCE AND DISMANTELING	50.10	0.50
	BILL NO: 2 EARTHWORK	4768.15	47.68
	BILL NO: 3 SUB-BASE AND BASE COURSES		
	a) GSB	186.02	1.86
	b) WMM	1513.41	15.13
	c) CTSB	3603.93	36.04
	d) CTB	0.00	0.00
	BILL NO: 4 BITUMINOUS WORKS - FLEXIBLE PAVEMENT		
	a) DBM	2700.48	27.00
	b) BC	1729.60	17.30
	BILL NO: 5 CULVERTS		
	(A)BOX CULVERTS	2118.51	21.19
	(B) Retaining Wall	719.77	7.20
	BILL NO: 6 BRIDGES		
	(A) MINOR BRIDGES		
	RCC Girder Minor Bridge	830.61	8.31
	Slab Minor Bridge	1902.98	19.03
	Box Minor Bridge	505.51	5.06
	Retaining Wall	566.84	5.67
	Repair of Slab MNB	26.78	0.27
	BILL NO: 7 DRAINAGE & PROTECTION WORK		
	BILL NO:7A Roadside Drains	914.59	9.15
	BILL NO:7B Protection Work	1652.16	16.52

	BILL NO: 8 TRAFFIC SIGNS, ROAD MARKINGS AND APPURTENANCES	4859.65	48.60
	BILL NO: 9 Passenger Shelter	28.00	0.28
	BILL NO: 10 Utility Duct	18.29	0.18
	BILL NO: 11 (STREET LIGHTING)	34.34	0.34
	Truck Lay By	37.02	0.37
	Junction Improvement	95.26	0.95
2	**TOTAL CIVIL COST as per 2013-14**	28861.99	288.62
	ADD PREMIUM @ 18.45% AS PER PWD NH WORKS NO NHR41/2019/48	**5325.04**	**53.25**
3	**Net CIVIL COST as per 2013-14**	**34187.02**	**341.87**
4	Utility Shifting		
	Electrical	575.26	5.75
	Water	23.48	0.23
5	**TOTAL FOR PACKAGE**	**34785.76**	**347.86**
	Bid Price	**₹ 34,785.76**	**₹ 347.86**
6	**Bid Price without GST**	**₹ 31,058.72**	**310.59**
	GST @ 12%	**₹ 3,727.05**	**37.27**
7	CONTINGENCIES @2.8% of (6)	**₹ 869.64**	**₹ 8.70**
8	SUPERVISION CONSULTANCY CHARGES @ 3% of (6)	**₹ 931.76**	**₹ 9.32**
9	AGENCY CHARGES @3% of (6)	**₹ 931.76**	**₹ 9.32**
10	**TOTAL EPC CONSTRUCTION COST (6+7+8+9)**	**₹ 37,518.93**	**₹ 375.19**
11	Maintenance charge @ 3.5 % of Bid cost (6)	**₹ 1,087.06**	**₹ 10.87**
12	**TOTAL PROJECT CONSTRUCTION COST (INCLUDING MAINTENANCE)(10+11)**	**₹ 38,605.98**	**₹ 386.06**
13	**COST PER KM IN CRORES (ON PROJECT COST)**	**₹ 1,821.04**	**₹ 18.21**
14	**PRE-CONSTRUCTION COST /COST TO BE PAID BY AUTHORITY /**		
	(a) LAND ACQUISITION & R & R COST	**2500**	**₹ 25.00**
	(b) UTILITY SHIFTING	**16**	**₹ 0.16**
	(c) DIVERSION OF FOREST & WILDLIFE COST	**600**	**₹ 6.00**
	(D)EMP COST	**0**	**₹ 0.00**
15	**SUB-TOTAL PRE-CONSTRUCTION COST**	**₹ 3,116.00**	**₹ 31.16**
16	**TOTAL CAPITAL COST**	**₹ 41,721.98**	**₹ 417.22**

The cost of option-2 has been found to the lowest. The option-2 pavement has been recommended. The civil cost of per Km widening of 2-lane to 4-lane road excluding GST has been worked out for option-2 is Rs. 14.485 Cr. per Km. The above cost is well within the Normative cost (Rs. 14.42 Cr per Km to Rs. 15.08 Cr. Per Km) of MORTH circular issued on 25-04-2018.

10 .Economic & Financial analysis and Implementation

10.1 Economic & Financial

The EIRR of the project has been carried out using which more than 12 % of threshold limit. Similarly as per the financial analysis the Project Highway is financially not viable on PPP VGF model or it may not attract any investor for Hybrid annuity model Execution plan.

10.2 Packaging

Given the length of the project, the entire project is planned to be bid out in Single package.

10.3 Bidding mode and timelines

The authority has proposed to initiate bidding of the project under EPC upon reviewing the improvements planned and in consultation with NHIDCL, the design and construction period for this project has been arrived at 24 months from the date of appointment of the contractor. This also includes a traffic management and lane closure plan for the period of construction.

11 .Conclusions and recommendation

The development of project road shall improve transport efficiency of Assam and Meghalaya and also serve strategic defense purposes.

This will be realized by

(i) improving the region & highway network,

(ii) facilitating safe and appropriate road usage,

(iii) increasing efficiency of transport services

Project's immediate outcome will improve accessibility to social services and markets, increase fuel efficiency, reduce travel time and accidents, vehicle emissions and better employment opportunities outside agriculture, both through improved access to economic centers and increase industrial activities in the project area.

Apart from this, the developments of this road link enhance the land values many folds along the proposed Project Road.

The Project road meets the present and future requirements of the area in terms of services and utilities. Hence, looking at above potentials it is recommended that this Improvement of road should be done.