

## CHAPTER 0 EXECUTIVE SUMMARY

### 0.1 Objective

Public Works Department, Government of Tripura has decided to take up the development of newly declared NH-108A (tentative length 22.90km) to two lane NH Standards under NH(O), accordingly proposes to procure the services of a Technical Consultants for carrying out suitable feasibility Study and DPR and render consultancy services for proper structuring and implementation of following project on EPC Mode. To meet the requirement PWD, Tripura 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 NH-Division, PWD, Agartala Letter No. F.1 (Works)/EE/NH-DIV/AGT/441-48 dated 29<sup>th</sup> August, 2015.

After obtaining the Letter of Acceptance, the consultant team has done preliminary discussions with EE, PWD (NH), Santirbazar Division at his office on 3<sup>rd</sup> September, 2015 and made subsequent joint site visits on 9<sup>th</sup> September and 15<sup>th</sup> September, 2015 in presence of AE & JE PWD (NH), Santirbazar Division and JE, PWD Baikhora Sub-Division and EE & JE, PWD (NH), Santirbazar Division respectively. The Consultant team has also carried out detailed field Survey of the project stretch. After that the Consultant has prepared horizontal alignment plan as per IRC guidelines. The same has been verified by PWD officials at field level and minor changes have been made. After getting approval of Alignment plan from State PWD, a presentation has been given at MoRT&H, New Delhi on 06.04.2016 on horizontal alignment and feasibility report and the Alignment Plan of NH-108A has been approved by the Ministry vide letter No. NH-12011/02/2016/TR/P-8 dated June 08, 2016 (copy enclosed). Later on it has been decided by PWD, Government of Tripura, that the project will be implemented by NHIDCL and accordingly a tripartite supplementary Agreement has been made on 24<sup>th</sup> January, 2019 between NHIDCL, CETEST and PWD (NH), Government of Tripura.

This final detailed project Report has been drafted to meet all the various provisions of the TOR and subsequent discussions.

### 0.2 Project Road Description

The project road starts from Jolaibari (NH-44) and ends at Muhurighat LCS (Belonia). The entire project road runs through south Tripura district. Covering a total geographical area of 1514 square Kilometers, South Tripura is bordered by the Gomti district, Sipahijala district and Bangladesh. Belonia is the district HQ of South Tripura district. While Trishna Wildlife Sanctuary under Rajnagar Block and Pilak under Jolaibari have the potential to become major tourist attractions, Belonia and Sabroom Towns have the potential to become major export import hub. The project road passes through village / localities namely Jolaibari, Paschim Pilak, Muhuripur, Ratanpur, South Sonaichari, Jharjhari, Purba Sarasima, Sarasima and Belonia Municipal Council.

The start point of the project road is Jolaibari (96.602 Km of NH-44) and ends at Muhurighat LCS at Belonia (International Border with Bangladesh). The existing length of the road is 22.475Km. However, after design the proposed length comes out to be 21.412km. The existing features of the project road is listed below in **Table 0.1**

**Table 0.1: Existing Features**

Sl. No.	Item	Description
1	Terminal Points	Start Point : 96.602 Km of NH-44 near Jolaibari End Point :Muhurighat LCS near Belonia (Indo-Bangladesh Border) Existing Length : 22.475km
2	Connectivity	Through start point : Agartala, Jolaibari and Sabrum Through end point : Bangladesh, Agartala
3	Important Settlements	Jolaibari, Paschim Pilak, Muhuripur, Ratanpur, South Sonaichari, Jharjhari, Purba Sarasima, Sarasima and Belonia Municipal Council
4	Terrain	The project road passes through Plain/ Rolling terrain.
5	Land use pattern	The land use of the road stretch is mainly agricultural, some of stretches are forest and some of stretches having settlement and residential structures having Rural / semi-urban character.
6	Horizontal Geometry	Horizontal geometry is found to be poor with very sharp turns and reverse “S” curves are found at many locations causing discomfort to the drivers in most of the stretch of the alignment
7	Vertical Geometry	Vertical geometry is fair mostly except at few locations with poor sight distance
8	Pavement Condition	Generally Fair to poor
9	Existing Carriageway	Surface Type: Bituminous: Width: 3.5m in general, though at few stretches carriageway 7m width is found
10	Existing Shoulder	Type: Earthen; Width: 1.0m-2.5m (Both side)
11	Existing ROW	Varying from 9m to 26m
12	Bridges(Minor)	5 nos.
13	Culverts	98 nos.
14	ROB	1 no.
15	Existing Bypass	Nil
16	Submergence Stretch	Nil
17	Major Intersections (4nos.)	Jolaibari (3-legged, at km 0+000), Jolaibari (3-legged, at km 0+582), Jharjhari(3-legged, near km 16+100) Belonia (3-legged, near km 22+116)
18	Minor intersections	18 nos.
19	Existing Utilities	HT line, Electric poles, Transformer, OFC and Water Pipe Lines etc.
20	Forest Area	Total Forest land required to be diverted is 9.95 Hactares.

### 0.3 Traffic

To establish the traffic characteristics along the project road, Consultants have carried out 7 days Classified Traffic Volume Counts, Intersection Turning Movement Survey, Origin Destination survey, Axle Load survey, Speed and Delay survey, Pedestrian Crossing survey. The location of traffic survey and detailed analysis has been reported in Chapter-7

The Average Annual Daily Traffic (AADT) in the base year 2015 at two traffic survey count location is presented in **Table 0.2**.

**Table 0.2: The AADT in the Year 2015 for Two Homogeneous Sections**

Vehicle Type	Km 1+280	Km 17+300
Two Wheeler	502	934
Car/Jeep/Van/Taxi/Auto	459	1002
Mini Bus	14	46
Standard Bus	0	0
LCV	115	160
2-Axle Truck	84	112
3-Axle Truck	4	4
Multi-Axle	0	0
Tractor With Trailer	0	0
Tractor Without Trailer	0	0
Cycle	1357	1357
Cycle Rickshaw	0	1
Hand Cart	1	0
Bullock Cart	0	0
Horse Cart	0	0
<b>Total Motorized Vehicles (Number)</b>	<b>1179</b>	<b>2264</b>
<b>Total Non Motorized Vehicles (Number)</b>	<b>974</b>	<b>341</b>
<b>Total Motorized Vehicles (PCU)</b>	<b>881</b>	<b>1642</b>
<b>Total Non Motorized Vehicles (PCU)</b>	<b>509</b>	<b>179</b>
<b>Total Commercial Vehicle per day</b>	<b>219</b>	<b>328</b>
<b>Total PCU per day</b>	<b>1390</b>	<b>1821</b>

Considering 5% traffic growth rate as per IRC: 37, the projected traffic is estimated below:

**Table 0.4: Projected Traffic**

Year	Homogeneous Section-I (KM 0.000- KM 16.100)		Homogeneous Section-II (KM 16.100- KM 22.475)	
	Length- 16.100 km		Length- 6.245 km	
	No	PCU	No	PCU
2015	2153	1660	2604	2316
2018	2492	1922	3015	2682
2020	2747	2119	3324	2956
2025	3506	2705	4242	3773
2030	4475	3452	5414	4816
2033	5181	3996	6268	5575
2035	5712	4406	6910	6140

From the above tables it is revealed that projected PCU is not reach 18000 PCU throughout the design life of the road, which indicates that the project road will be safely operated with Level of service B if it is widened and upgraded with two-lane with 1.5m paved shoulder on both side configuration.

#### 0.4 Design of New Flexible Pavement Thickness

In **Innovative design method**, as per IRC: 37-2018, for adopted **Design Traffic =20 msa** and **design CBR =8%** calculated pavement thickness is given below in **Table 0.5**.

**Table 0.5: Recommended Flexible Pavement Thickness**

BC (mm)	BSM (mm)	CTSB (mm)
40	100	200

#### 0.5 Flexible Pavement Thickness in Reconstruction Stretch

Reconstruction of existing pavement is required due to proposed cutting and filling after finalization of vertical profile. Also in poor pavement surface stretch where extensive cracking, raveling, rutting, potholes etc. were visible at the pavement surface, reconstruction is recommended. Hence, a new pavement thickness for **Innovative design method** BC=40 mm, BSM=100 mm and CTSB=200 mm shall be provided on existing portion after removal of existing pavement layer up to a required depth based on the profile design with exposed pavement layer treated as sub-grade course after compaction.

#### 0.6 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.

Road side religious structures, graveyards, missionaries etc. have been mostly avoided by adjusting the alignment suitably and/or by eccentric widening. All major and minor junctions/intersections have been analysed with respect to vehicular movements and vehicular turning movements based on traffic study for providing appropriate grade for cross / turning traffic.

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

**Table 0.6: Salient Features of the Proposed Road**

Descriptions		Existing	Proposed																																																		
Terrain	:	Plain and Rolling terrain.	Plain and Rolling terrain.																																																		
Length	:	Existing Length = 22.475 Km	Proposed Length = 21.412 Km																																																		
Alignment	:	<p>The geometrics of existing Alignment is poor with very sharp turns and reverse "S" curves are found at many locations.</p> <p>Vertical geometry is fair mostly except at few locations with inadequate sight distance corresponding to ruling design speed.</p>	<p>All geometric deficiencies shall be identified with respect to design speed proposed for the project road and necessary corrective measures shall be proposed according to the relevant Horizontal and vertical Alignment Design standards .</p> <p>Details of realignment stretch:</p> <table> <tr> <th rowspan="2">Sl. No.</th><th colspan="2">Design Chainage(km)</th><th rowspan="2">Length(m)</th></tr> <tr> <th>From</th><th>To</th></tr> <tr> <td>1</td><td>0+860</td><td>1+050</td><td>190</td></tr> <tr> <td>2</td><td>1+900</td><td>3+470</td><td>1570</td></tr> <tr> <td>3</td><td>3+750</td><td>4+050</td><td>300</td></tr> <tr> <td>4</td><td>5+400</td><td>5+650</td><td>250</td></tr> <tr> <td>5</td><td>6+200</td><td>6+450</td><td>250</td></tr> <tr> <td>6</td><td>6+700</td><td>9+250</td><td>2550</td></tr> <tr> <td>7</td><td>9+700</td><td>10+500</td><td>800</td></tr> <tr> <td>8</td><td>10+700</td><td>11+900</td><td>1200</td></tr> <tr> <td>9</td><td>12+050</td><td>12+300</td><td>250</td></tr> <tr> <td>10</td><td>15+850</td><td>17+350</td><td>1500</td></tr> <tr> <td></td><td></td><td><b>Total =</b></td><td><b>8860</b></td></tr> </table>	Sl. No.	Design Chainage(km)		Length(m)	From	To	1	0+860	1+050	190	2	1+900	3+470	1570	3	3+750	4+050	300	4	5+400	5+650	250	5	6+200	6+450	250	6	6+700	9+250	2550	7	9+700	10+500	800	8	10+700	11+900	1200	9	12+050	12+300	250	10	15+850	17+350	1500			<b>Total =</b>	<b>8860</b>
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8	10+700	11+900	1200																																																		
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10	15+850	17+350	1500																																																		
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Design Speed	:	Plain / Rolling: 40-60kmph	Plain/Rolling : Ruling 100 kmph , Min 80kmph except at 6 locations where speed has been negotiated for site constraints.																																																		
Cross-Section	:	Surface Type: Bituminous: Width: 3.5m -7.5m, though carriageway 13m in 100 m stretch and 2x8.0m width in 200m stretch is found. earthen shoulder is found 0.5m-	<p><b><u>2 Lane with Paved Shoulder in Rural Area for Plain/Rolling Terrain(Reconstruction):</u></b></p> <p>Carriageway = 7.0m Paved Shoulder = 2 x 1.5m = 3.0m</p>																																																		

Descriptions	Existing	Proposed
	2.5m wide on either side.	<p>Earthen Shoulder = 2 x 2.0m = 4.0m Roadway Width= 14.0m</p> <p><b><u>2 Lane with Paved Shoulder at Realignment/Bypass Stretches for Plain/Rolling Terrain (Newconstruction):</u></b></p> <p>Carriageway = 7.0m Paved Shoulder = 2 x 1.5m = 3.0m Footpath = 2 x 2.0m = 4.0m Roadway Width = 14.0m</p> <p><b><u>2 Lane with Paved Shoulder at Built-up Area(Reconstruction)</u></b></p> <p>Carriageway = 7.0m Paved Shoulder = 2 x 2.5m = 5.0m Footpath cum Drain = 2x2.0m Roadway Width = 12.0m</p>
CBR Considered	: -	8%
Pavement Design Life	: Nil	Flexible Pavement-15 Years
Design msa	: Nil	12 msa <b>Adopted MSA = 20msa</b> (As per IRC 73-2015 (Page no-44,clause-5.4.1))
Pavement Condition	: Generally Fair to poor, also good condition is found near Belonia . No stretches were found with paved shoulders. Earthen shoulders on either side of the carriageway is found	<p><b>Proposed pavement Crust As per Innovative Design :</b></p> <p>For 20 msa design traffic &amp; 8% Design CBR Value, thickness of the flexible pavement (as per IRC:37-2018 ) as follows BC=40 mm, BSM=100 mm, CTSB=200mm Total Thickness=340mm.</p>
Bridges	: Total Minor Bridge = 5 nos.	<p><b>Total Minor Bridge = 6 nos.</b></p> <p>Minor Bridge (reconstruction) = 3 nos. Minor Bridge (retained) = 2 nos. (Good Condition) Minor Bridge (Under construction, retained) =1 no.</p>

Descriptions		Existing	Proposed
Culverts	:	<b>Total Culvert = 98 nos.</b> 35 HP culverts, 18 nos. slab culvert, 45 nos. Box culvert	<b>Total Culvert = 77 Nos.</b> 76 nos. Box culvert Reconstruction , 1 no Under construction box culvert Retained .
Protection Work	:	Nil	Total length of Retaining Wall = 970m
Longitudinal Drains		Total Masonry Drain = 7331 m  Total Earthen Drain = 5117 m	2.0m Width RCC Covered Drain = 7484 m  1.0m Width Earthen Drain = 34431 m
Bus – Bay	:	Nil	3 Locations both sides
Truck Lay Bye	:	Nil	Nil
ROW	:	Varying from 9m to 26m	Proposed ROW has been considered 20m in Built up Sections 30m in Rural Area.(depending upon embankment height and cutting slope ROW taken as per actual)
Major Intersection	:	4 nos Jolaibari (3-legged, at km 0+000), Jolaibari (3-legged, at km 0+582), Jharjhari(3-legged, near km 16+100) Belonia (3-legged, near km 22+116)	4 nos Jolaibari (3-legged, at km 0+000), Jolaibari (3-legged, at km 0+700), Jharjhari(3-legged, near km 15+550) Belonia (3-legged, near km 20+800)
Minor Intersection	:	18 nos.	20 nos.
ROBs	:	1 no	1 no Retained
Service Road	:	Nil	450m service road has been provided to access the Ratanpur PHC near existing ROB location
Total Civil Construction Cost (Rs.)	:	-	Civil cost including 1.043% WPI as per 2017 SOR <b>Rs. 158.67 Crore</b>

## 0.7 Cost Estimate & Packaging

The total Civil Construction Cost of the project comes out to be **Rs. 157.04 Crore** with per km construction cost is **Rs. 7.33 Crore** and Civil Construction Cost including 1.043% WPI comes out to be **Rs. 158.67 Crore** with per km construction cost is **Rs. 7.41 Crore**.

Meanwhile, after adding Maintenance cost (2.5% for 5 years), GST (6%), Contingency (2.8%), Agency

charges (3%), Supervision charges (3%), Escalation @5% per annum for 2.5 years (restricted to 10%), Total Construction Cost comes out to be **Rs.201.99 Crores** with per km project cost is **Rs. 9.43 Crore**.

After adding Departmental cost like Cost of Land Acquisition including compensation for Trees and Structures, Cost of NPV of Diverted forest land and Cost of Compensatory Afforestation, Cost of Avenue Plantation to be done by Forest Department, Cost of Boundary Pillar for demarcation of Forest land to be diverted, Cost of Extraction of Trees in Forest Land & Non-Forest land, and Utility Shifting cost, Total Capital Cost comes out to be **Rs. 276.49 Crore** with per km Capital cost is **Rs. 12.91 Crore**.

Summary of Cost Estimate of Civil works items bill wise is given below.

<b>Sl No.</b>	<b>Item of Work</b>	<b>Estimated Cost (INR)</b>	<b>per km cost in (crore)</b>	<b>% Of Total cost</b>
1	Site Clearance & Dismantling	6,933,094	0.03	0.44%
2	Earthwork	150,411,704	0.70	9.58%
3	CT Sub base & Shoulder	227,180,807	1.06	14.47%
4	Bituminous Courses	469,134,384	2.19	29.87%
5	Traffic Signs, Markings And Other Road Appurtenances	13,118,748	0.06	0.84%
6	Drainage & Protection Work			
a.	Drainage	121,196,081	0.57	7.72%
b.	Protection Work	64,522,223	0.30	4.11%
7	Project Facilities	19,643,009	0.09	1.25%
8	Culvert	411,874,543	1.92	26.23%
9	Minor Bridge	86,339,334	0.40	5.50%
	<b>Civil Construction Cost (As per SOR 2017)</b>	<b>1,570,353,927</b>	<b>7.33</b>	<b>100%</b>
<b>(A)</b>	<b>Civil Construction Cost including 1.043% WPI</b>	<b>1,586,732,718</b>	<b>7.41</b>	
	<b>Centages</b>			
(i)	Maintenance for 5 years, i.e 2.5% on civil cost (A)	39,668,318		
(ii)	Add 6.0% of (A)for GST	95,203,963		
(iii)	Add 2.8% of (A)for Contingency	44,428,516		
(iv)	Add 3% of (A) for Supervision Charges	47,601,982		



<b>Sl No.</b>	<b>Item of Work</b>	<b>Estimated Cost (INR)</b>	<b>per km cost in (crore)</b>	<b>% Of Total cost</b>
(v)	Add 3% of (A) for Agency Charges	47,601,982		
(vi)	Escalation @ 5% per Annum for 2.5 years (restricted to 10%) of (A)	158,673,272		
<b>(B)</b>	<b>Total Construction Cost</b>	<b>2,019,910,751</b>	<b>9.43</b>	
10	Cost of Land Acquisition (Without Forest Land) including compensation for Trees and Structures	602,628,771		
11	Cost of NPV of Diverted forest land and Cost of Compensatory Afforestation	15,772,301		
12	Cost of Avenue Plantation to be done by Forest Department	10,068,519		
13	Cost of Boundary Pillar for demarcation of Forest land to be diverted	670,676		
14	Cost of Extraction of Trees in Forest Land to be diverted	491,500		
15	Cost of Extraction of Trees in non-Forest Land	2,318,690		
16	Cost of Shifting of Utilities by Water Supply Department(DWS)	75,350,100		
17	Cost of Shifting of Utilities by Electricity Department(TSECL)	37,699,660		
<b>(C)</b>	<b>Total Departmental Cost</b>	<b>745,000,217</b>		
<b>(D)</b>	<b>Total Capital Cost</b>	<b>2,764,910,968</b>	<b>12.91</b>	

	<p>GOVERNMENT OF INDIA MINISTRY OF ROAD TRANSPORT &amp; HIGHWAYS</p>	<p>Transport Bhawan, 1, Parliament Street, New Delhi - 110001</p>
<p>NH-12011/02/2016/TR/P-8</p>		<p>Dated: May, 2016</p>
<p><b><u>OFFICE MEMORANDUM</u></b></p>		
<p><u>Sub: Alignment Plan for widening of 2-lane with paved shoulder of newly declared NH 108A from Jolaibari to Belonia (Length 22.900 km) in Tripura – Minutes of meeting</u></p>		
<p>Please find enclosed the minutes of the meeting held on 6.04.2016 under the chairmanship of ADG (II) at Transport Bhawan, New Delhi on the subject cited as above for information and further necessary action.</p>		
<p>Enclosure: As above</p>		
<p>(Saurabh Chaurasiya) Assistant Executive Engineer (NER) for Director General Road Development &amp; Spl. Secretary</p>		
<p>To</p>	<p>As per list</p>	

Minutes of meeting held under the Chairmanship of ADG(II) on 6<sup>th</sup> April, 2016 on  
Alignment Plan for widening of 2-lane with paved shoulder of newly declared NH 108A  
from Jolaibari to Belonia (Length 22.900 km) in Tripura - Minutes of meeting

List of participants is attached at Annexure-I

At the outset ADG (II) welcomed the participants.

The Consultant engaged by the State PWD gave presentation of the above said project. The brief of Alignment Plan for widening of 2-lane with paved shoulder of newly declared NH 108A from Jolaibari to Belonia (Length 22.900 km) in Tripura are as under:

- i) This road connects Jolaibari NH 44 to Belonia at International Border with Bangladesh.
- ii) The ROW available at site is about 9 to 15 m and proposed ROW is 20 m for Built up area and 30 m for rural/Open area.
- iii) The Minimum radius has been taken as 230 m except km 8.825 to 8.350 radius of 155 m due to under construction bridge & km 20.025 to 20.450 due to built up section of Kali Nagar Village in Belonia.
- iv) The Max. Gradient has been taken as 2.5%.
- v) The design speed has been taken as 100 to 80 km/hr except km 8.825 to 8.350, 65 km/hr speed due to under construction bridge at km 8.375 and km 20.025 to 21.412, 40 to 50 km/hr speed due to built up section of Kali Nagar Village in Belonia.
- vi) A ROB is under construction by Railway along the project road at km 11.755 and proposed alignment follow the centre line of the under construction ROB.
- vii) Total realignment length is about 10.350 km.
- viii) Four number of major junctions have been proposed at km 0(NH 44 bypass), km 0.700(existing NH 44), km 15.550 (SH towards Hrsiyamukh) and km 21.150 (Belonia town).

The State Government Tripura may be requested for preparation of estimate for pre-construction activities.

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Annexure-I

Officers from MoRT&H

Sl.No.	Name	Designation and Organization
1	Shri K.C. Varkeyachan	ADG II
2	Shri V.K. Rajawat	CE (NER)
3	Shri M.S. Sisodia	SE(NER-I)
4	Shri Samiran Saha	EE, RO,Guwahati
5	Shri Saurabh Chaurasiya	AEE(NER-I)

Officers from PWD

Sl.No.	Name	Designation and Organization
1	Shri Subrata Banik	SE, PWD , Tripura
2	Shri Rajat Baidya	EE, PWD , Tripura

DPR Consultant

Sl.No.	Name	Designation and Organization
1	Shri Anirban Malik	M/s CETEST Engineering Consultants