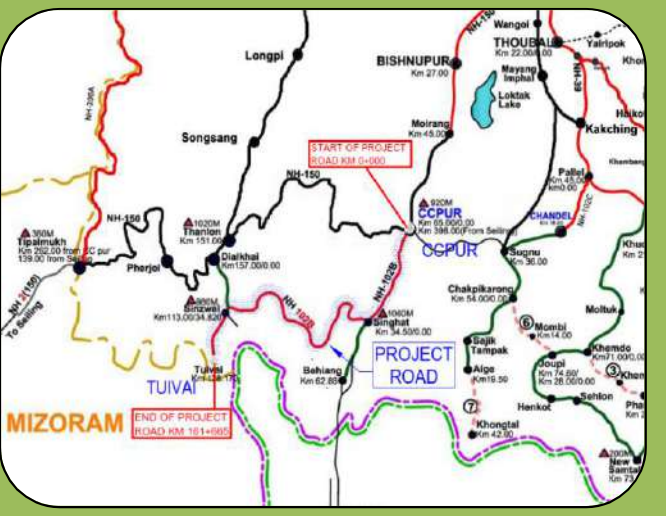
Consultancy Services for Carrying out Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services in respect of 2 laning of Churachandpur – Tuivai road Section(length = 162 km) on NH-102B (Manipur) on Engineering, Procurement and Construction mode in the state of Manipur. (Package No. NHIDCL/DPR/CT-IJ-TP/Manipur/ 2017)

STAGE: IV

FINAL DETAILED PROJECT REPORT
VOLUME I – MAIN REPORT
PACKAGE – IIIB (88+980 KM TO 103+525 KM)

National Highways & Infrastructure Development Corporation Ltd.

PTI Building, 3rd Floor, 4, Parliament Street, New Delhi-110001



C. E. Testing Company Pvt. Ltd.

124-A, NSC Bose Road, Kolkata -92

CET/4047/NHIDCL/NH-102B/FDPR Rev: R0 April, 2020

CONTENT

CHAPTER-1

EXECUTIVE SUMMARY

1.1 PROJECT BACKGROUND

National Highways and Infrastructure Development Corporation (NHIDCL) is a fully owned company of the Ministry of Road Transport & Highways (MoRT&H), Government of India. The company promotes, surveys, establishes, design, build, operate, maintain and upgrade National Highways and Strategic Roads including interconnecting roads in parts of the country which share international boundaries with neighboring countries. The regional connectivity so enhanced would promote cross border trade and commerce and help safeguard India's international borders. This would lead to the formation of a more integrated and economically consolidated South and South East Asia. In addition, there would be overall economic benefits for the local population and help integrate the peripheral areas with the mainstream in a more robust manner.

As a part of the above mentioned endeavor, National Highways & Infrastructure Development Corporation Limited (NHIDCL) has been entrusted with the assignment of Consultancy Services for Carrying out Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services in respect of 2 laning of Churachandpur – Tuivai road Section of NH-102B on Engineering, Procurement and Construction mode in the state of Manipur.

National Highways & Infrastructure Development Corporation Ltd. 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.

National Highways & Infrastructure Development Corporation Limited (NHIDCL), MoRT&H, New Delhi has appointed C.E. Testing Company Pvt. Ltd. (CETEST) as consultant to prepare the Detailed Project Report for the above road stretches vide Letter of Acceptance No. NHIDCL/DPR/MANIPUR/C-T/2016/389 dated 26.10.2017.

The project road starts from the Junction of NH -150 at New Lamka Town in Churachandpur and ends near Manipur and Mizoram state border at Tuivai in the district of Churachandpur. The existing length of the project road comes out as 161.445 km (as per topographic survey). The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E.

The project road lies in Churachandpur district of Manipur. The project road passes through plain/mountainous Terrain. The existing road is passing through Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and ends at Tuivai.

1.2 OBJECTIVES

The main objective of the Consultancy Service is to prepare the Detailed Project Report (DPR) for up gradation of existing road to 2-lane configuration from Churachandpur - Tuivai road Section of NH-102B in the State of Manipur ensuring:

- ✓ Minimum Land acquisition
- ✓ Enhanced road safety
- ✓ Minimum adverse impact on environment

Project preparation activities mainly comprises of six stages in accordance with Terms of reference (TOR)

- ✓ **STAGE 1**: Inception Report
- ✓ **STAGE 2**: Feasibility Report
- ✓ **STAGE 3**: LA & Clearances I Report
- ✓ **STAGE 4**: Detailed Project Report (DPR)
- ✓ **STAGE 5**: Technical Schedules
- ✓ **STAGE 6**: LA & Clearances II Report

The Final Detailed Project Report covers the work carried out by the Consultants up to Stage- 4 "Detailed Project Report (DPR)".

1.3 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

- ✓ No access control
- ✓ Fast Moving Vehicles conflicts with slow moving vehicles due to bad pavement condition
- ✓ Deficient road surface conditions (roughness)
- ✓ No proper Geometry of road alignment
- ✓ Uncontrolled roadside developments and encroaching the area under ROW
- ✓ Cross-drainage structure require to be improved through reconstruction

b) Safety

- ✓ Shoulder drop-off at places.
- ✓ Exposed roadside hazards, specially a protective part throughout the road stretch.
- ✓ Inadequate traffic signs.
- ✓ Blind Curve on the project road.

c) Road

- ✓ Fair - 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 40 km/hr. in roads for mountainous terrain
- ✓ Deficient curves and reverse curves in roads of plain terrain without transition length for reversal of elevation.

Linear Plan of Churachandpur-Tuivai Road:-

1.4 SALIENT FEATURES

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 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.

TABLE 1.1: SALIENT FEATURES OF THE PROPOSED ROAD

Descriptions		Existing	Proposed
START POINT	:	Thuangtam Village	At Thuangtam Village
END POINT	:	Mualnuam Village	Near Mualnuam Village
LENGTH	:	Existing Length = 15.330 Km (As per topographic survey)	Proposed Length =14.545 Km
TERRAIN	:	Mountainous Terrain – (15.330 km) 93.280 km to 108.610 km	Same as existing
ALIGNMENT		Alignment consists of Sharp, Zig Zag Curves with presence of Hair Pin bends. The average speed of the corridor is 25kmph. Longitudinal gradient is found steeper than the limiting gradient at many locations in mountainous terrain.	Proposed alignment has been designed based on the design speed adopted for Plain & mountainous terrain as per standard specified in IRC SP 73-2015 and hill road manual. The vertical gradient also restricted to the recommended limiting gradient prescribed in the above said IRC codes.

<table>
<tr><th>Descriptions</th><th></th><th>Existing</th><th>Proposed</th></tr>
<tr><td>DESIGN SPEED</td><td>:</td><td>Avg. speed 24 -25 kmph</td><td>Adopted Design Speed:
➢ Mountainous Terrain- 40kmph-60kmph
However, at hair pin bend locations design speed restricted to 20kmph</td></tr>
<tr><td>CROSS-SECTION</td><td>:</td><td>
<table>
<tr><th colspan="2">Chainage</th><th rowspan="2">Average Carriageway Width (m)</th></tr>
<tr><th>From (km)</th><th>To (km)</th></tr>
<tr><td>93.280</td><td>108.610</td><td>3.5</td></tr>
</table>
Earthen /Gravel Shoulder: 0.50 m –2.0 m
Total Formation width: 4.0 m to 14 m
</td><td><u>For Plain terrain</u>
(1) In Built-up Area
Carriageway = 7.0 m
Hard Shoulder = 2 x 1.5 m
Covered Drain cum Footpath = 2 x 1.0 m
Total Roadway Width = 12.0 m
(2) In Rural Area
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder = 2 x1.0m
Total Roadway Width = 12.00m
<u>For Mountainous terrain</u>
(3) In Built Up Area
Carriageway = 7.0 m
Hard Shoulder = 2 x 1.5 m
Covered Drain cum Footpath = 2 x 1.0 m
Total Roadway Width = 12.0 m
(4) In Rural Area (Both Side Valley)
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder in Valley Side = 2 x1.0m
Total Road Width = 12.00m
(5) In Rural Area (One Side Hill & Other Side Valley)
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder in Valley Side = 1 x1.0m
Total Road Width = 11.00m
(6) In through Cutting section
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Drain = 2 x 1.0 m
Total Road Width = 10.00m</td></tr>
<tr><td>CBR</td><td>:</td><td></td><td>Design CBR adopted =10%</td></tr>
<tr><td>TRAFFIC GROWTH RATE</td><td>:</td><td></td><td>7.5%</td></tr>
<tr><td>TRAFFIC</td><td>:</td><td>Base year traffic (Yr. 2019)
Total Vehicle in numbers = 576 nos.
Total Vehicles in PCU = 678 PCU
Total CVPD = 159 nos.</td><td>Projected traffic (Yr. 2042)= 3577 PCU
(2-lane configuration recommended)</td></tr>
<tr><td>PAVEMENT DESIGN LIFE</td><td>:</td><td></td><td>Flexible Pavement - 20 Years</td></tr>
<tr><td>DESIGN MSA</td><td>:</td><td></td><td>Calculated = 2 MSA
Adopted = 20 MSA (as per IRC:SP:73 guideline)</td></tr>
<tr><td>PAVEMENT THICKNESS</td><td>:</td><td>Existing Crust Thickness varies from 100-540 mm</td><td>For New/Widening & Strengthening portion
BC = 40 mm
DBM = 70 mm
WMM = 250 mm</td></tr>
</table>

Descriptions		Existing	Proposed
			GSB= 200 mm **Total = 560 mm**
BRIDGES	:	**Package - IIIB** Bridges (Total = Nil)	**Package – IIIB** Bridges (Total = Nil)
CULVERTS	:	**Package – IIIB** ➢RCC Slab Culvert = 42 Nos. ➢Hume Pipe Culverts = 40 Nos.	**Package - IIIB** Total Culvert proposed = 88 Nos. ➢Reconstruction with Box Culvert = 66 Nos. ➢ Existing culverts avoided= 16 nos. ➢New Box Culvert proposed = 22 Nos.
PROTECTION WORK	:	Breast Wall = 28 m Retaining Wall = 122 m Guard Wall = 20 m	**Package – IIIB** Length of Retaining Wall=2803m • Length of 1.5m Retaining Wall=100m • Length of 2.0m Retaining Wall=1031m • Length of 2.5m Retaining Wall=21m • Length of 3.0m Retaining Wall=660m • Length of 4.0m Retaining Wall=557m • Length of 6.0m Retaining Wall=435m Length of Breast Wall = 1105 m Length of Composite RE Wall = 162.3 m Metal Beam Crash Barrier = 2803 m Hydro seeding = 8838 Sq m Turfing = 12537 Sq m
LONGITUDINAL DRAINS	:	Length of Earthen Drain = 15330 m(on hilly side)	**Package - IIIB** Length of Covered Drain = 2524 m Length of Open Drain = 18085 m
BUS BAY WITH PASSENGER SHELTER	:	Nil	**Package – IIIB** 6 nos. at 3 Locations (Both Side) **Sl. No** | **Chainage (km)** | **Name of the habitation** | **Side** 1 | 90.970 | THUANGTAM VILLAGE | Both 2 | 99.760 | MUALNUAM VILLAGE | Both 3 | 100.925 | MUALNUAM VILLAGE | Both
MAJOR INTERSECTION	:	**Package – IIIB** Nil	**Package – IIIB** Nil
MINOR INTERSECTION	:	2 Nos.	2 Nos.
ROW	:	4.0 m to 16 m	Built-up Area = 14 m Rural Area = 18 m to 24 m
LAND DETAILS	:	**Package - IIIB** Available Land = 10.995 Ha.	**Package - IIIB** Total Land required to implement 2-lane proposal = 31.421 Ha. Land Available within PROW= 10.995 Ha. **Balance Land to be acquired = 20.426 Ha.**

Descriptions		Existing	Proposed
TOTAL CIVIL COST (RS.)	:	-	**Package – IIIB** Rs. 131.88 Cr. (Rs. 9.07 Cr/km)

1.5 COST ESTIMATES

For arriving at the unit rate, Schedule of Rate-2018 of Manipur Public Work Department has been adopted. The analysis of rate based on "Standard Data Book", published by ministry of road transport and highways, Government of India (MoRT&H). Leads for various materials considered for the rate analysis, are given in Table below:

TABLE 1.2: LEADS FOR VARIOUS CONSTRUCTION MATERIALS (PACKAGE – IIIB)

Sl. No.	Name of Material	Name of Source	Distance from Source to Project Road (Km)	Half of length of Project Road (Km)	Total Lead (Km)
1	Sand (Fine)	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
2	Filling Material	Local	-	-	10.00
3	Stone Metal	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
4	Stone Boulder	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
5	Stone Chips, Aggregate	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
6	Coarse Sand	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
7	Cement	Imphal	159	7	166.38
8	Steel	Imphal	159	7	166.38
9	Bitumen	Imphal	159	7	166.38
10	Bitumen Emulsion	Imphal	159	7	166.38
11	Structural Steel	Imphal	159	7	166.38
12	RCC Pipe	Imphal	159	7	166.38

ABSTRACT OF COST ESTIMATE
Package - IIIB
(Ch. 88.980 km to Ch. 103.525 km)

Length of Road (KM) : 14.545

DESCRIPTION OF WORKS		TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.)	% of Cost of Civil Works (% of C)
A.	**ROAD WORKS**			
1	Site Clearance and Dismantling	0.61	0.04	0.46%
2	Earth work , Subgrade and Erosion control	30.53	2.10	23.15%
3	Sub-Base & Base	29.45	2.02	22.33%
4	Bituminous Courses	16.31	1.12	12.37%
5	Junction Improvement (Major & Minor)	0.03	0.00	0.02%
6	Traffic signs, Road marking & other road	2.41	0.17	1.83%
7	Passenger Shelter	0.13	0.01	0.10%
8	Bus bay	0.87	0.06	0.66%
	Drainage and Protective Works			
9	Longitudinal Drains	11.20	0.77	8.49%
10	Retaining wall	13.47	0.93	10.21%
11	Breast wall	3.45	0.24	2.62%
12	Composite RE Wall	7.81	0.54	5.92%
B.	**BRIDGES & CULVERTS**			
13	Culvert	15.61	1.07	11.84%
C.	**COST OF CIVIL WORKS IN CRORE (AS PER SOR 2018)**	**131.88**	**9.07**	
D.	Maintenance for 5 years, i.e 2.5% on civil cost (C)	3.30		
E.	GST @ 12% of (C)	15.83		
F.	Contingencies @ 2.8% over Civil Cost (C)	3.69		
G.	Supervision Charges @ 3% of (C)	3.96		
H.	Agency Charges @3% of (C)	3.96		
I.	Escalation Cost @ 10% during Construction Period	13.19		
J.	**TOTAL CONSTRUCTION COST (C+D+E+F+G+H+I)=J**	**175.81**	**12.09**	
K.	**DEPARTMENTAL COST**			
a.	LA Cost	10.99		
b.	R&R Cost	5.18		
c.	Utility Shifting(Electrical+PHE)	0.66		
d.	Environmental Budget +FC Clearance	2.65		
e.	Cost of Dumping site for Muck Disposal	10.21		
L.	**Sub Total (K)**	**29.69**		
M.	**TOTAL PROJECT COST (K+L)=M**	**205.50**	**14.13**	

1.6 FINANCIAL ANALYSIS

The project fails to generate the desired level of return, even with a grant of 40% on TPC.

Thus the project does not qualify to be implemented on the BOT - Toll mode. It's recommended that the project to be implemented through EPC mode.

CHAPTER – 2
INTRODUCTION

2.1 INTRODUCTION& BACKGROUND

THE STATE

Manipur is one of the Border States in the northeastern part of the country having an international boundary of about 352km long stretch of land with Myanmar in the southeast. It is bounded by Nagaland in the north, Assam in the west and Mizoram in the south. It has a total area of 22,327 sqkm. It lies between 23.8°N to 25.7°N latitude and 93.5°E to 94.8°E longitude.

Geographically, the state of Manipur could be divided into two regions, viz. the hill and the valley. The valley lies in the central part of the state and the hills surround the valley. The average elevation of the valley is about 790m above the sea level and that of the hills is between 1500m and 1800m. The hill region comprises of ten districts viz. Senapati, Kangpokpi, Tamenglong, Noney, Churachandpur, Pherzawl, Chandel, Tengnoupal, Ukhrul, Kamjong and the valley region consists of six districts, viz. Imphal East, Imphal West, Thoubal, Jiribam, Kakching and Bishnupur. The hill districts occupy about 90 percent (20,089 sq. km.) of the total area of the state and the valley occupies only about tenth (2,238 sq. km) of the total area of the state.

THE ECONOMY

Manipur has a literacy rate of 79.21% (According to 2011 census) per cent. The main languages of the state are Meitei/Meeteilon (Manipuri), Tangkhul, Kabui Kuki, Hmar, Paite, Thadou, Bishnupriya Manipuri, English, Hindi and local dialects. There are forests of teak, pine, oak, uningthou, leihao, bamboo, and cane. Rubber, tea, coffee, and cardamom are grown in hill areas. Rice and cash crops make up the main vegetation cover in the valley. Agriculture is the main mode of living of the people. People of Manipur are also engaged in handloom sector which is the largest cottage industry in Manipur. The main vegetables and fruits are Cauliflower, Cabbage, Tomato, Pea & Litchi, cashew nuts, walnuts, orange, lemon, pineapple, papaya, peach, pear, banana and plum. The major minerals are Limestone, Asbestos, Copper, Lignite, Nickel, Chromites, and Salts etc. Small industries like Handlooms, Handicrafts, Sericulture, Food Processing, Bamboo Processing, IT, Hydro Power and Tourism are present in the state.

THE ENVIRONMENT

The climate of Manipur is largely influenced by the topography of this hilly region. Lying 790 meters above sea level, Manipur is wedged among hills on all sides. This northeastern corner of India enjoys a generally amiable climate, though the winters can be a chilly. The maximum temperature in the summer months is 32 °C (90 °F). In winter the temperature often falls below 0 °C (32 °F), bringing frost. Snow sometimes falls in hilly regions due to the Western Disturbance. The coldest month is January, and the warmest July.

The state is drenched in rains from May until mid-October. It receives an average annual rainfall of 1,467.5 millimeters (57.78 in). Rain distribution varies from 933 millimeters (36.7 in) in Imphal to 2,593 millimeters (102.1 in) in Tamenglong. The precipitation ranges from light drizzle to heavy downpour. The normal rainfall of Manipur enriches the soil and helps in agriculture and irrigation. The South Westerly Monsoon picks up moisture from the Bay of Bengal and heads toward Manipur, hits the eastern Himalaya ranges and produces a massive amount of rain. The climate is salubrious

with approximate average annual rainfall varying from 933 millimeters (36.7 in) at Imphal to 2,593 millimeters (102.1 in) at Tamenglong. The temperature ranges from sub 0 to 36 °C (32 to 97 °F).

POVERTY

As per the estimates, Manipur saw the highest rise of 9.2 percentage points in poverty between 2004-05 and 2009-10, followed by Mizoram (5.7 percentage points), Assam (3.5 percentage points) and Meghalaya (1 percentage point).

INDIGENOUS PEOPLE

The Meitei constitute a majority of the state's population. According to 1891 census Meitei were recorded as a forest tribe. In 1901 Meitei were listed as main tribe of Manipur. They live primarily in the state's valley region.

Besides the Meitei people, the Thadous have the second highest percentage of the population. The third is the Nagas who are further sub-divided into sub-tribes: Tangkhul,Maram, Poumai Naga, Sumi, Angami, Ao, Chakhesang, Chang, Khiamniungan, Konyak, Liangmai, Lotha, Pochury, Rongmei, Zeme, and Mao.

Different tribes are speaking in different language. These language are Meitei/Meeteilon (Manipuri), Tangkhul, Kabui Kuki, Hmar, Paite, Thadou , Bishnupriya Manipuri, English, Hindi and local dialects.

HIV/AIDS & HUMAN TRAFFICKING RISKS

Two out of the six high HIV-prevalence states in India – Manipur and Nagaland – are in the Northeast and now feature what epidemiologists call a 'generalized' epidemic with a strong IDU-HIV link. This is a larger challenge for Government and NGOs fighting the epidemic in the region in particular and the world at large.

According to estimates by the National Aids Control Organization (NACO – 2006) there are 50,000 IDUs injecting drug use in the region, the majority of them in Manipur, Nagaland, Mizoram and, of late, Meghalaya. Easy availability of drugs, stress arising from socio-political unrest and frustration born of the lack of employment opportunities for the growing educated youth mass in the region are often cited as the major causes of drug use a serious social disease.

2.2 SOCIAL ASSESSMENT

OBJECTIVE

The objective of Social Assessment report is to present a socio-economic profile of the subproject area with particular reference to indigenous people, communicable diseases especially HIV/AIDS, human trafficking, poverty level, local economy like agriculture, industry, health and educational status in accordance with guidelines and recommendations of Government of India and the State Government of Manipur in association with especially National Highways & Infrastructure Development Corporation Limited (NHIDCL).

PROJECT ROAD

The project road starts from junction of NH-150 at New Lamka town in Churachandpur and ends near Manipur and Mizoram state boder at Tuivai under Churachandpur District. The existing length of the project road is 161.445 km.

The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93°42'00.34" E. The End co-ordinate is Latitude 24°01'22.40" N and Longitude 93°15'12.64" E.

PROJECT DESCRIPTION

The project road lies in Churachandpur district of Manipur. Major portion of the project road passes through mountainous terrain with remaining portion located in plain terrain. This Road is passing through Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and ends at Tuivai.

PROJECT IMPACT AREA

The Project Impact Area (PIA) has been defined as the 2.5 km width of a band on both sides of the project road. In broad sense the PIA may be considered as Churachandpur district as a whole.

From Starting at New Lamka Town at Churachandpur (junction of NH 150) the road alignment passes through the Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and ends at Tuivai in the State of Manipur. The project road passes through about 41 nos. of villages. Though majority the area is not passing through any densely populated settlement, still the strip of land acquisition will affect road side properties.

THE PROJECT DISTRICTS

The project road passes through Churachandpur district of Manipur. Brief features of the district are summarized below:

CHURACHANDPUR DISTRICT

Churachandpur District, in the southwestern corner of Manipur, has an area of 4,570 sq. km. The district got its name “Churachandpur” from the Manipur king Churachand Maharaja. It is bounded by North latitudes $23^0$56'20.4”and $24^0$36'46.8”and East longitudes $92^0$58'12’’& $93^0$52'58.8’’. It is a hilly district with a very small percentage of the plain area. The district is bounded by Senapati district in the north, Bishnupur and Chandel districts in the east, Assam and Mizoram in the west and Myanmar on the south. The total population of the district as per 2011 census is 2,71,274. This district with its headquarters at Churachandpur has been divided into five blocks, i.e. Churachandpur, Thanlon, Henglep, Singhat and Parbung.

VITAL STATISTICS OF CHURACHANDPUR DISTRICTS

Description	Number (Census 2011)
Actual Population	274,143
Male	138,820
Female	135,323
Population Growth	20.29%
Area Sq. Km	4,570
Density/km2	60
Proportion to Manipur Population	9.60%
Sex Ratio (Per 1000)	975
Child Sex Ratio (0-6 Age)	948
Average Literacy	82.78
Male Literacy	86.97
Female Literacy	78.5
Total Child Population (0-6 Age)	37,445
Male Population (0-6 Age)	19,227
Female Population (0-6 Age)	18,218
Literates	195,935
Male Literates	104,013

Description	Number (Census 2011)
Female Literates	91,922
Child Proportion (0-6 Age)	13.66%
Boys Proportion (0-6 Age)	13.85%
Girls Proportion (0-6 Age)	13.46%

MAJOR INDICATORS OF THE SOCIAL PARAMETERS OF THE DISTRICT

1. Geography			
(i)Temperature	Maximum: 37^0C	Minimum: 10^0C	
(ii)Location	Latitude: $23^0$56'20.4"N-$24^0$36'46.8"N	Longitude: $92^0$58'12"E-$93^0$52'58.8"E	
(v)Rainfall	The average rainfall recorded in Churachandpur district is from 3080 mm to 597 mm.		
2. Administrative Units			
i. Sub Divisions	5 Nos.		
ii. Revenue Villages	540 Nos.		
iii. Assembly Area	6 Nos.		
3. Assembly Constituencies			
(i) 55-Tipaimukh			
(ii) 56-Thanlon			
(iii) 57-Henglep			
(iv) 58-Churachandpur			
(v) 59-Saikot			
(vi) 60-Singhat			
4. People			
i. Population as per 2011 census	Male: 1,53,421 Female: 1,17,853 Total: 2,71,274		
ii. Literacy Rate as per 2011 census	Male: 86.97% Female: 78.50% Average: 82.78%		
5. Area	4,570 Square km		
6. Forest	4,157 Square km		
7. Roads			
a) National Highway	2010-11	270 km	
b) State Highway	2010-11	58 km	
c) Major District & Rural Roads	2010-11	179.50 km	
d) Other District & Rural Roads	2010-11	20 km	
e) Rural Road/Agriculture Marketing Board Roads	2010-11	175 km	
f) Kachacha Road	2010-11	340 km	

INDIGENOUS PEOPLE DEVELOPMENT PLAN (IPDP)

Indigenous People Development Plan (IPDP) is an integral part of the Social, Economic and Resettlement Plan of any of the infrastructural projects taken up by the authorities when a considerable number Schedule Tribe population is affected or displaced from their natural habitat. IPDP is also required if after the completion of the project there would be substantial change in the region which might affect the traditional customary right over land of the tribal people or alter their lifestyle in such a manner that they are uprooted or not in a position to follow their tradition, culture or profess their customs or religion.

THE MITIGATION MEASURES OF HIV/AIDS & HUMAN TRAFFICKING RISKS

Awareness campaign should be conducted at regular intervals in the PIA and the road construction sites. Distribution of IEC materials, organizing audiovisual shows and street drama giving a proper idea of the menace of the disease should be undertaken by some reputed NGOs.

Village quacks and ANMs to be trained in detecting and responding to cases of HIV/AIDS at initial level. There should facility at PHCs / referral hospital preferably within PIA to detect the infected persons early.

Counseling by NGOs to be given free of charges to the poor migrating families to create awareness against possible spread of HIV/AIDS outside the area.

THE GENDER ISSUE

Along with men in the Project areas, women will benefit from (i) easier access to markets, (ii) increased local retailing opportunities, and (iii) easier access to health care centers and education facilities as well. Women may also benefit more than men from the increased access to schools and health centers.

2.3 PROJECT ROAD BENEFIT

Project Road strategically inter connects with state capital Imphal via NH-150. The development of the road as per 2-lane with hard shoulder can boost the agricultural and industrial development of the surrounding area which can be viewed as boosting economic growth and poverty reduction, bringing substantial social and economic development in the region.

The social benefits arising due to the project will be triggered off due to improved accessibility to various services such as easy access to markets, health facilities, schools, workplace etc which in turn increases the income of the locals, and ultimately elevating their standard of living. The possible direct and indirect positive impacts of the project are listed below.

- Road network will not only link the village communities to better national 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).
- 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.

Other benefits:

- It will give a major fillip to the quest for all weather connectivity.
- It will reduce travel time between towns and cities 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.

2.4 Overview of NHIDCL Organization & Activities

National Highways and Infrastructure Development Corporation is a fully owned company of the Ministry of Road Transport & Highways, Government of India. The company promotes, surveys, establishes, designs, builds, operates, maintains and upgrades National Highways and Strategic Roads including interconnecting roads in parts of the country which share international boundaries with neighboring countries. The regional connectivity so enhanced would promote cross border trade and commerce and help safeguard India's international borders. This would lead to the formation of a more integrated and economically consolidated South and South East Asia. In addition, there would be overall economic benefits for the local population and help integrate the peripheral areas with the mainstream in a more robust manner. An approximate aggregate length of 10,000 kms has been identified to begin with for development through this company. The company envisages creating customized and specialized skills in terms of addressing issues like complexities of geographical terrains and addressing extensive coordination requirements with security agencies. The company would also endeavor to undertake infrastructure projects including but not restricted to urban infrastructure and urban or city transport and to act as an agency for development of all types of Infrastructure. The company envisages working towards cross sharing of technical know-how and enhancing opportunities for business development with other nations and their agencies including the multilateral organizations and institutions.

The company also proposes to improve road connectivity and efficiency of the international trade corridor, by expanding about 500 KMs of roads in the North Bengal and Northeastern region of India to enable efficient and safe transport regionally with other South Asia Sub-regional economic Cooperation (SASEC) member countries. These projects are being funded by ADB (Asian Development Bank).

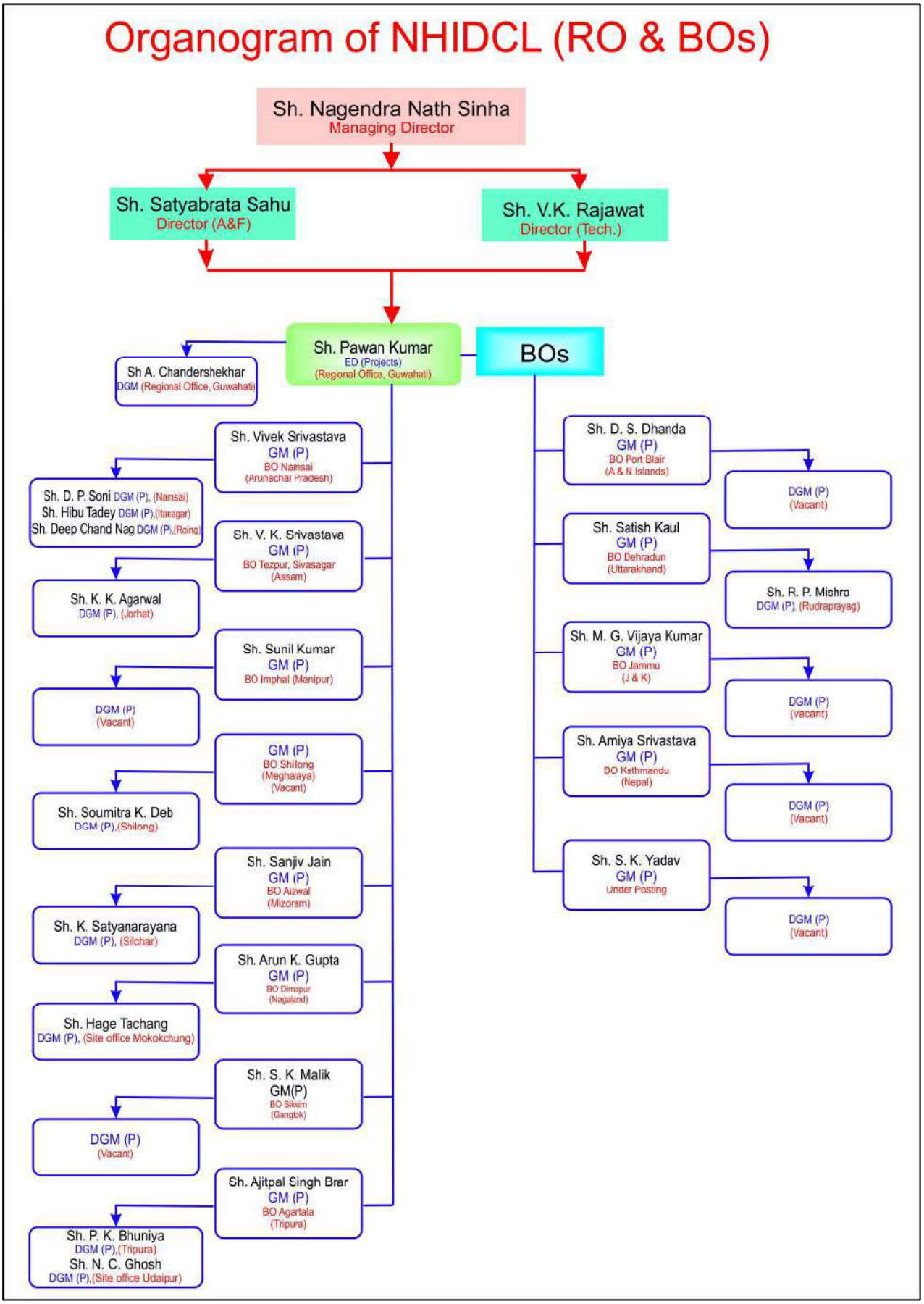
Mission of NHIDCL

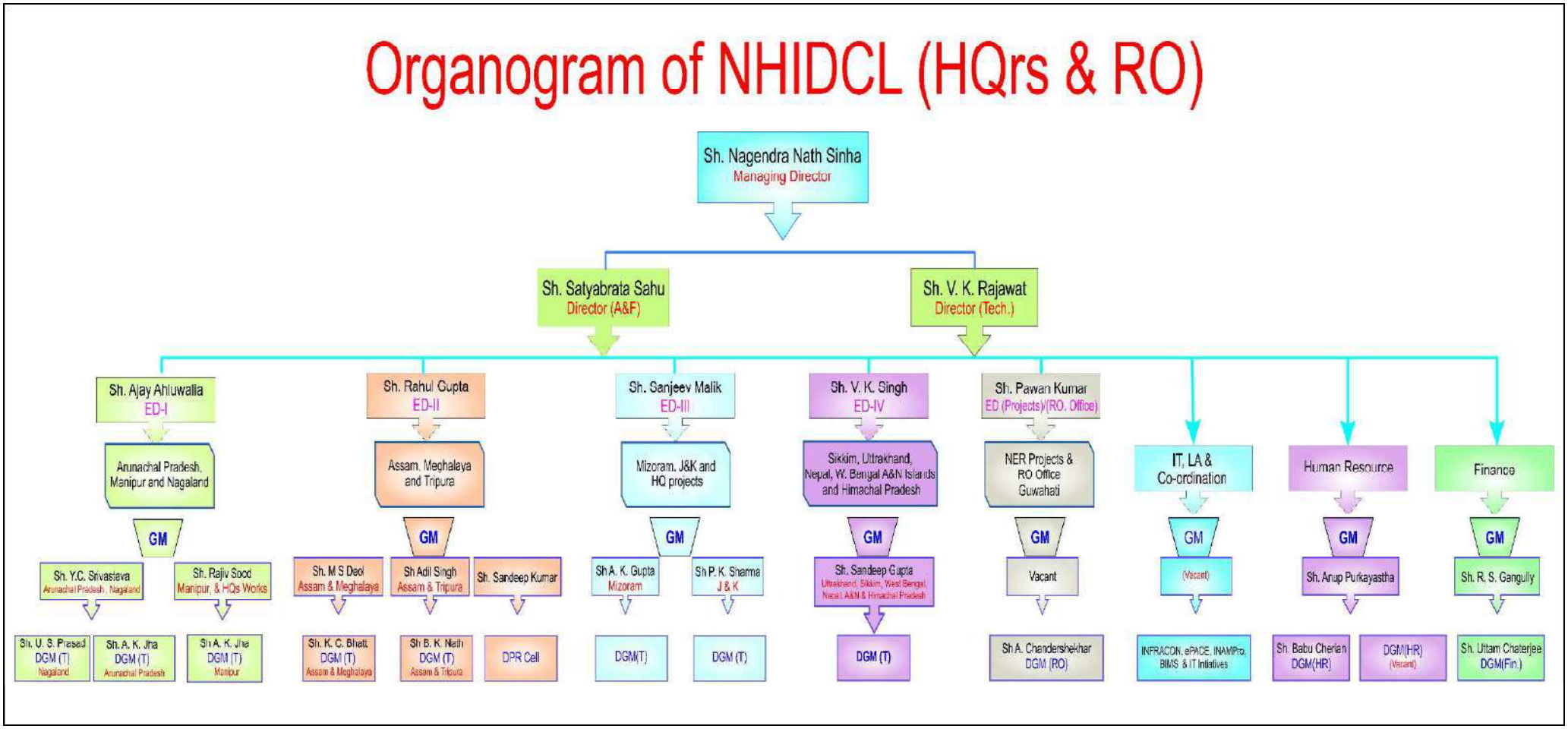
To be a professional company which works in most efficient and transparent manner and designs, develops & **delivers** infrastructure projects in a time bound basis for maximizing benefits to all stakeholders.

Vision of NHIDCL

To be an instrument for creation and management of infrastructure of the highest standard in the country with focus on the North East and Border areas and contribute significantly towards nation building.

Organizational Structure of NHIDCL is given below:





2.5 Objective

The main objective of the consultancy service is to establish the technical, economical, and financial viability of the project and prepare detailed project reports for rehabilitation and upgrading of the existing road to 2-Lane configuration.

The viability of the project shall be established taking into account the requirements with regard to rehabilitation, upgrading and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, rehabilitation and widening of existing and/or construction of new bridges and structures, road safety features, quantities of various items of works and cost estimates and economic analysis.

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 working drawings, detailed cost estimates, economic and financial viability analyses, environmental and social feasibility, social and environmental action plans as appropriate and documents required for tendering the project on commercial basis for international / local competitive bidding.

Preparation of detailed project should incorporate aspects of value engineering, quality audit and safety audit requirement in design and implementation.

Feasibility Report, clearly bring out through financial analysis the preferred mode of implementation on which the Civil Works for the stretches are to be taken up. Cost estimates along with feasibility report/detailed Project Report should be given.

2.6 Scope of Consultancy Services

The broad area of scope of consultancy services is highlighted below:

- As far as possible, the widening/improvement work of 2 lane proposal shall be within the existing right of way avoiding land acquisition, with the provision of bypasses wherever in urban areas and improvement to 2 lanes of the existing road is not possible. As will be required proposal for land acquisition to be taken up as per revenue records/maps for further processing of land acquisition.
- Environmental Impact Assessment, Environmental Management Plan and Rehabilitation and Resettlement Studies shall be carried out as per the requirement and suggestion of NHIDCL.
- Preparation of the bid documents including required schedules preferably for EPC mode of documents. To assist the NHIDCL and its Financial Consultant and the Legal Adviser by furnishing clarifications as required for the financial appraisal and legal scrutiny of the Project Highway and Bid Documents.
- Review of all available reports and published information about the project road and the project influence area;
- Environmental and social impact assessment, including such as related to cultural properties, natural habitats, Involuntary resettlement etc.;
- Public consultation, including consultation with Communities located along the road, NGOs working in the area, other stake-holders and relevant Govt. departments at all the different stages of assignment (such as inception stage, feasibility stage, preliminary design stage and once final design are concretized).
- Detailed reconnaissance & reflection in the report;
- Identification of possible improvements in the existing alignment and bypassing congested locations with alternatives, evaluation of different alternatives comparison on techno-economic and other considerations and recommendations regarding most appropriate option;

- Traffic studies including traffic surveys, Axle load survey and demand forecasting for next thirty years;
- Inventory and condition surveys for road;
- Inventory and condition surveys for bridges, cross-drainage structures, other structures, river bank training/protection works and drainage provisions;
- Detailed topographic surveys using mobile/aerial LiDAR or equivalent technology;
- Pavement investigations;
- Sub-grade characteristics and strength; investigation of required sub-grade and sub-soil characteristics and strength for road and embankment design all sub soil investigation;
- Identification of sources of construction materials;
- Detailed design of road, its x-sections, horizontal and vertical alignment and design of embankment of height more than 6m and also in poor soil conditions and where density consideration require, even lesser height embankment. Detailed design of structures preparation of GAD and construction drawings and cross-drainage structures and underpasses etc.
- Identification of the type and the design of intersections;
- Design of complete drainage system and disposal point for storm water.
- Value analysis / value engineering and project costing;
- Economic and financial analyses;
- Contract packaging and implementation schedule;
- Strip plan indicating the scheme for carriageway widening, location of all existing utility services (both over and underground) and the scheme for their relocation, trees to be felled, reports documents and drawings arrangement of estimates for cutting of trees and shifting of utilities from the concerned department;
- To find out financial viability of project for implementation and suggest the preferred mode on which the project is to be taken up.
- Preparation of detailed project report, cost estimate, approved for construction drawings, rate analysis, detailed bill of quantities, bid documents for execution of civil works through budgeting resources;
- Design of toll plaza and identification of their numbers and location and office cum residential complex including working drawings;
- Design of weighing stations, parking areas and rest areas;
- Any other user oriented facility en-route toll facility;
- Tie-in of on-going/sanctioned works of MORT&H/NHAI/other agencies;

Preparation of social plans for the project affected people as per policy of the lending agencies/Govt. of India R & R policy.

2.7 Stages of Submission

The project mainly comprises of 4 Stages from QAP/IR to DPR,

STAGE 1: Inception Report

STAGE 2: Feasibility Report

STAGE 3: LA & Clearances I Report

STAGE 4: Detailed Project Report (DPR)

2.8 Structure of Report

Detailed Project Report (DPR) consists of following volumes:

Volume – I: Main Report

- Chapter -1 :Executive Summary
- Chapter -2 : Introduction
- Chapter -3 : Project Description
- Chapter -4 : Engineering Surveys, Investigation and Analysis
- Chapter -5 : Social Analysis
- Chapter -6 : Traffic Surveys & Analysis
- Chapter -7 : Indicative Design Standards
- Chapter- 8: Cost Estimates
- Chapter -9 : Environmental Screening
- Chapter -10 : Road Safety Audit
- Chapter -11 : Financial Analysis
- Chapter -12 : Conclusions & Recommendations

Volume – IA: Appendix to Main Report

- Appendix-4.1: Road Inventory Survey
- Appendix-4.2 : Pavement Condition Survey
- Appendix-4.3 : Culvert Inventory Survey
- Appendix-4.4 : Bridge Inventory Survey
- Appendix-4.5 : List of TBM & GPS Point
- Appendix-6.1 : Classified Traffic Volume Count
- Appendix-6.2 : Turning Movement Count Survey
- Appendix-6.3: Axle Load Survey
- Appendix-6.4: Origin-Destination Survey
- Appendix-6.5: Pedestrian Count Survey
- Appendix-6.6: Speed Delay Survey

Volume – II: Design Report
(Part A: Road Works
Part B: Structure Works)
Volume – III: Materials Report
Volume – IV: Environmental Assessment Report including EMP and RAP
Volume – V: Technical Specification
Volume – VI: Rate Analysis
Volume – VII: Cost Estimates
Volume – VIII: Bill of Quantities
Volume – IX: Drawing Volume
Part A: Road Works
Part B: Bridge Works
Part C: Detailed Cross-sections

CHAPTER-3
PROJECT DESCRIPTION

3.1 EXISTING SCENARIO

3.1.1 START AND END POINT OF THE PROJECT ROAD

The name of the road as per offer and agreement is Churachandpur - Tuivai section of NH-102B starting from the junction of NH-150 (old NH-2) at New Lamka town at Churachandpur and ends near Manipur and Mizoram state border at Tuivai in the state of Manipur. The project road lies under Churachandpur district in the state of Manipur. The length of the road comes out 161.445 km (As per Topography Survey). The Project Road starts from Churachandpur and passes through major habitation Churachandpur, New Lamka, Singngat, Suangdoh and Sinzawl Village.

<table>
<tr>
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<tr>
<td>Origin Point at Churachandpur
(Ch. 0.000 km)</td>
<td>Terminating Point at Tuivai
(Ch. 161.445 km)</td>
</tr>
</table>

3.1.2 SETTLEMENT

The existing Road passes through village / localities namely Thuangtam and Mualnuam. Details are given below in Table 3.1:

TABLE 3.1: DETAILS OF SETTLEMENT/HABITATIONAL AREA

Sl. No.	Chainage		Length (m)	Name of the Village/ Town
	From (km)	To (km)		
Package - IIIB				
1	93.280	99.075	5.795	Thuangtam
2	99.075	108.610	9.535	Mualnuam
Total Length of Habitation = 15.330 km				

Habitation Area

3.1.3 LAND USE PATTERN

The project is located in the moderately high rainfall area with majority of the stretch passing through settlement area and forest area (90% stretch of the road length) in which 48% of the road length is passing through Eco-Sensitive Zone of Kailam Wildlife Sanctuary area. Remaining portion of the road stretch is passing through some settlement area. Details are given in Appendix to main report.

TABLE 3.2: DETAILS OF LAND USE

From (km)	To (km)	Terrain (Plain/Rolling/Hilly)	Land Use (Built-up/Agrt/Forest/Industrial/Barren)
Package IIIB			
93.280	108.610	Hilly	Forest(LHS=Hilly RHS=Valley)

3.1.4 RIGHT OF WAY (ROW)

The existing ROW varies from 4 m to 16 m for Churachandpur-Tuivai Road. This existing ROW is not sufficient to accommodate proposed 2-lanning proposal. Therefore additional land has to be acquired for implementing the improvement proposal. Details of existing ROW width of the section has been given below in Table 3.3.

TABLE 3.3: DETAILS OF EROW

Existing Chainage	Distance from ECL to EROW		Total EROW Length (M)
	Left side (M)	Right Side (M)	
Package - IIIB			
93.200	9	2.7	11.7
93.300	4.8	4.6	9.3
93.400	5	2.9	7.9
93.500	6.1	2.7	8.8

Existing Chainage	Distance from ECL to EROW		Total EROW Length (M)
	Left side (M)	Right Side (M)	
93.600	4.3	3.3	7.6
93.700	5.3	3.7	9
93.800	6.4	2.6	9
93.900	6.2	3.2	9.4
94.000	5.5	4.1	9.6
94.100	5.1	3.3	8.4
94.200	5.2	3.2	8.4
94.300	5.2	3.1	8.3
94.400	4.5	2.9	7.4
94.500	5.2	2.9	8.1
94.600	5.2	3.4	8.6
94.700	6.7	4.2	10.9
94.800	5.5	4.2	9.6
94.900	6.4	3.3	9.7
95.000	5.6	3.3	8.9
95.100	5.7	3	8.7
95.200	5.6	3.7	9.3
95.300	7.4	3.2	10.5
95.400	5.8	2.7	8.5
95.500	4.4	2.5	6.9
95.600	7.5	3.9	11.4
95.700	6.3	2.8	9.1
95.800	5.2	3.3	8.5
95.900	6.5	2.7	9.2
96.000	3.3	3.8	7.1
96.100	4.7	3.6	8.3
96.200	6.8	4	10.8
96.300	5.2	2.9	8.1
96.400	5.7	3.3	9
96.500	3.8	2.5	6.3
96.600	5.5	3.2	8.7
96.700	4.9	3.1	8
96.800	5	3.4	8.5
96.900	2.9	2.3	5.1
97.000	4.7	2.8	7.5
97.100	4.5	3.1	7.6
97.200	3.7	2.9	6.6
97.300	4.3	3	7.3
97.400	5	2.2	7.1
97.500	5	3.3	8.3
97.600	3.7	2.1	5.8
97.700	4.5	2.7	7.2
97.800	3.9	3.1	7
97.900	3.6	2.8	6.4
98.000	3.9	3.1	6.9
98.100	3.2	2.5	5.7

Existing Chainage	Distance from ECL to EROW		Total EROW Length (M)
	Left side (M)	Right Side (M)	
98.200	4.9	2.9	7.8
98.300	6.2	3	9.2
98.400	5.5	3.1	8.6
98.500	3.5	2.7	6.2
98.600	4.3	2.8	7.1
98.700	3.3	2.9	6.3
98.800	5.4	2.9	8.3
98.900	4.1	2.5	6.5
99.000	3.3	2.4	5.6
99.100	3.1	2.8	5.9
99.200	4.9	2.5	7.4
99.300	4.1	2.4	6.5
99.400	3.7	2.2	5.9
99.500	3.4	2.2	5.6
99.600	4.8	3.1	7.9
99.700	4.6	2.5	7.2
99.800	4.4	2.3	6.7
99.900	3.2	2.1	5.3
100.000	4.7	2.1	6.7
100.100	6.1	2.6	8.7
100.200	3.4	3.3	6.7
100.300	4.8	2.5	7.3
100.400	5.9	4.2	10.1
100.500	5.5	2.9	8.4
100.600	4.3	2.5	6.8
100.700	4.1	2.8	6.9
100.800	4.8	3.2	8
100.900	3.5	2.5	6
101.000	2.9	2.4	5.3
101.100	4.2	2.3	6.6
101.200	3.5	1.6	5.1
101.300	2.9	2.5	5.4
101.400	4.1	2.5	6.6
101.500	5.4	2.7	8.1
101.600	5.7	3.2	8.9
101.700	5.8	2.5	8.3
101.800	4.9	3.3	8.3
101.900	3.6	2.7	6.2
102.000	4.1	4.3	8.3
102.100	4.8	3	7.8
102.200	5.8	3.5	9.4
102.300	5.6	3.8	9.5
102.400	6.5	3.8	10.3
102.500	4.3	3.1	7.4
102.600	5.8	2.6	8.4
102.700	5.8	3.7	9.5

Existing Chainage	Distance from ECL to EROW		Total EROW Length (M)
	Left side (M)	Right Side (M)	
102.800	5.9	2.8	8.7
102.900	4.4	3	7.5
103.000	5.8	2.6	8.3
103.100	5.1	2.2	7.3
103.200	4	2	6
103.300	3.8	2.2	6
103.400	3	2.8	5.8
103.500	3.9	2.2	6.1
103.600	2.2	4.1	6.2
103.700	4.5	2.3	6.8
103.800	4.3	2.3	6.6
103.900	4.6	2.3	6.9
104.000	2	2.5	4.5
104.100	1.6	2.6	4.2
104.200	3.3	2.7	6
104.300	5.6	3.9	9.5
104.400	3.8	2.7	6.5
104.500	4.8	2	6.8
104.600	3.2	2.7	5.9
104.700	5.6	4.5	10.1
104.800	5.9	5.7	11.6
104.900	4.8	3	7.8
105.000	3.5	2.5	6
105.100	2.5	2.6	5.1
105.200	2.1	2.8	4.9
105.300	8.3	2.6	10.8
105.400	5.2	3.1	8.3
105.500	5.9	3.5	9.3
105.600	6.5	2.9	9.4
105.700	6.1	2.8	8.9
105.800	5.9	2.6	8.4
105.900	5.5	2.2	7.7
106.000	6	2.6	8.6
106.100	5.7	2.2	7.8
106.200	6	2.1	8.2
106.300	5.8	3	8.8
106.400	4.2	2.4	6.5
106.500	5.1	4.1	9.2
106.600	5.3	2.3	7.6
106.700	6.5	2.2	8.6
106.800	4.5	2.8	7.4
106.900	5.4	2.6	8
107.000	6	2.9	8.9
107.100	6.7	2.9	9.6
107.200	6.6	2.5	9.1
107.300	4.4	2.6	7

Existing Chainage	Distance from ECL to EROW		Total EROW Length (M)
	Left side (M)	Right Side (M)	
107.400	4.7	2.7	7.4
107.500	8	2.7	10.7
107.600	6.4	4	10.4
107.700	6	2.9	8.9
107.800	5.1	2.8	7.9
107.900	5.8	2.5	8.3
108.000	6	2.9	8.9
108.100	5.2	2.4	7.5
108.200	5.6	2.5	8
108.300	5.9	3	8.9
108.400	4.5	2.8	7.4
108.500	4.8	2.8	7.6
108.600	4.6	2.5	7.1

3.1.5 EXISTING ALIGNMENT

The horizontal alignment of the existing road consists of sub-standard sharp curves including zigzag curves and hair-pin bends. Also, there is no proper transition length for most of the horizontal curves including the zigzag ones require to be providing for super elevation. These deficiencies have been corrected during fixation of the horizontal alignment for the entire project road to conform to MoRT&H standards .The deficiency in gradient is also observed in case of vertical alignment of the existing road . Location of sharp/Blind curves and hairpin bends listed in Table 3.4.

TABLE 3.4: LOCATION OF SHARP/BLIND CURVES AND HAIRPIN BENDS

Type of Curves	Sl. No.	From (km)	To (km)
Sharp Curves/	1	93.280	100.00
Hair - Pin Bends	1	94.500	95.000
	2	98.000	108.610

3.1.6 EXISTING PAVEMENT

The existing road is mostly Intermediate/two Lane with earthen shoulder. The carriageway width of the existing road varies from 3.0 – 12.0 meter. Width of earthen shoulder varies from 0.50 – 2.0 meter. Hence, total formation width varies from 4.00 – 14.00 meter. Variation of road width is given below in Table 3.5:

TABLE 3.5: VARIATION OF EARTHEN ROAD WIDTH

Chainage		Average Carriageway Width (m)
From (km)	To (km)	
93.280	108.610	3.5

During topographic survey, it has been observed that restoration work was going on to improve present condition of the road. Details of restoration works are given below in Table 3.6

TABLE 3.6: DETAILS OF RESTORATION WORKS

Chainage		Length (Km)
From (km)	**To (km)**	
93.280	108.610	15.330
Total Length		**15.330**

The existing pavement condition along the road varies from fair (around 28% of project road) to poor (around 72% of project road). It has been observed that some portion of the stretch the existing pavement is partially damaged with cracks, potholes, raveling, rutting and considerable amount of patching and some stretches have been observed as fully exposed. BBD survey has been conducted at good pavement stretches listed below and according to that average characteristics deflection has been determined. The summary of deflection of existing pavement is given below in Table 3.7

TABLE 3.7: DEFLECTION SUMMARY OF EXISTING PAVEMENT

Summary of Pavement Deflection				
CHAINAGE (KM)		**DEFLECTION (MM/KM) LHS**	**DEFLECTION (MM/KM) RHS**	**AVERAGE DEFLECTION (MM/KM)**
FROM	**TO**			
21.000	22.000	0.656	0.715	0.685
33.000	34.000	0.610	0.665	0.638
80.000	81.000	0.475	0.769	0.622
81.000	82.000	0.502	0.814	0.658
82.000	83.000	0.910	0.833	0.872
108.000	109.000	0.633	0.651	0.642
109.000	110.000	0.810	0.485	0.648
116.000	117.000	0.698	0.485	0.592
117.000	118.000	0.648	0.672	0.660
118.000	119.000	0.521	0.848	0.685
119.000	120.000	0.465	0.568	0.517

Fair Condition of Pavement

Poor Condition of Pavement

3.1.7 EXISTING JUNCTION

There is 6 nos. major junction and 93 nos. minor junction in the project stretches. Details of junctions are given below in Table 3.8:

TABLE 3.8: LIST OF MAJOR JUNCTIONS

Sl. No.	Chainage (Km)	Name of Intersection	Type of Intersection	Leads To
Package - IIIB				
Nil				

3.1.8 EXISTING BRIDGES AND CULVERTS

BRIDGES:

There are 24 nos. of minor bridges (including 17 nos. of RCC slab bridge and 7 nos. of Bailey bridge) and 1 no. of major bridge (steel truss bridge) exist along the project stretch. Details are given in Table 3.9:

TABLE 3.9: DETAILS OF MINOR BRIDGES ALONG THE PROJECT ROAD

Sl. No.	Ext. Chainage (km)	Name of River/ Stream	Type of Bridge	Span Arrangement (Expansion joint to Expansion joint) (m)	Clear Roadway between kerbs (m)	Total outer to outer width of bridge
Package - IIIB						
Nil						

CULVERTS:

There are 611 nos. of existing culverts (including 345 nos. of Slab Culverts, 251 nos. of Pipe Culverts, 12 nos. of Box culverts and Type of 3 nos. of choked Culverts) on the project road. Details are given in Table 3.10.

TABLE 3.10: DETAILS OF CULVERTS ALONG THE PROJECT ROAD

Sl. No.	Survey Chainage (km)	Type of Structures (Pipe/ Slab/ Box/ Arch)	Span Arrangement (No. x Length) (M)	Carriageway Width (M)	Width of Culvert (M)
Package - IIIB					
1	93.587	HP	1 X 1.2M	3	3
2	93.866	HP	1 X 1.2M	3	3
3	94.106	HP	1 X 1.2M	2.5	2.5
4	94.417	SLAB	1 X 1.4M	2.7	2.7

Sl. No.	Survey Chainage (km)	Type of Structures (Pipe/ Slab/ Box/ Arch)	Span Arrangement (No. x Length) (M)	Carriageway Width (M)	Width of Culvert (M)
5	94.608	HP	1 X 1.2M	3	3
6	95.300	SLAB	1 X 2.6M	3.4	3.4
7	95.480	HP	1 X 2.0M	3	3
8	95.756	SLAB	1 X 1.7M	3.4	3.4
9	95.894	SLAB	1 X 1.9M	3	3
10	96.025	SLAB	1 X 1.9M	3	3
11	96.179	SLAB	1 X 2.6M	2.5	2.5
12	96.610	HP	1 X 1.2M	2.7	2.7
13	96.771	HP	2 X 1.2M	3	3
14	96.975	SLAB	1 X 1.8M	3.4	3.4
15	97.130	HP	1 X 1.2M	3	3
16	97.267	SLAB	1 X 4.2M	3	3
17	97.367	SLAB	1 X 2.5M	2.5	2.5
18	97.477	SLAB	1 X 1.4M	2.7	2.7
19	97.719	SLAB	1 X 2.6M	3	3
20	97.830	HP	1 X 1.2M	3.4	3.4
21	97.926	SLAB	1 X 2.7M	3	3
22	97.976	SLAB	1 X 2.1M	3	3
23	98.168	SLAB	1 X 2.2M	2.5	2.5
24	98.250	SLAB	1 X 2.2M	2.7	2.7
25	98.567	SLAB	1 X 2.2M	3	3
26	98.793	SLAB	1 X 2.4M	3.4	3.4
27	98.849	SLAB	1 X 2.3M	3	3
28	99.184	SLAB	1 X 2.5M	3.4	3.4
29	99.356	SLAB	1 X 2.5M	3	3
30	99.537	SLAB	1 X 2.5M	3	3
31	99.710	SLAB	1 X 2.3M	2.5	2.5
32	99.955	SLAB	1 X 2.4M	2.7	2.7
33	100.099	SLAB	1 X 2.1M	3	3
34	100.375	SLAB	1 X 2.3M	3.4	3.4
35	100.659	SLAB	1 X 2.4M	3.4	3.4
36	100.750	SLAB	1 X 4.5M	3	3
37	100.944	SLAB	1 X 2.3M	3	3
38	101.243	SLAB	1 X 2.4M	2.5	2.5
39	101.400	PIPE	1 X 1.2M	2.7	2.7
40	101.525	PIPE	1 X 1.2M	3	3
41	101.705	PIPE	1 X 1.2M	3.4	3.4
42	101.969	PIPE	1 X 1.2M	3	3
43	102.142	PIPE	1 X 1.2M	3.4	3.4
44	102.315	PIPE	1 X 1.2M	3	3
45	102.535	PIPE	1 X 1.2M	3	3
46	102.613	SLAB	1 X 2.5M	2.5	2.5
47	102.797	PIPE	1 X 1.2M	2.7	2.7
48	102.852	PIPE	1 X 1.2M	3	3

Sl. No.	Survey Chainage (km)	Type of Structures (Pipe/ Slab/ Box/ Arch)	Span Arrangement (No. x Length) (M)	Carriageway Width (M)	Width of Culvert (M)
49	103.145	SLAB	1 X 2.0M	3.4	3.4
50	103.271	PIPE	1 X 1.2M	3	3
51	103.379	PIPE	1 X 1.2M	3	3
52	103.570	SLAB	1 X 2.3M	2.5	2.5
53	103.852	SLAB	1 X 1.7M	2.7	2.7
54	104.115	PIPE	1 X 1.2M	3	3
55	104.300	PIPE	1 X 1.2M	3.4	3.4
56	104.670	PIPE	2 X 1.2M	3	3
57	104.820	SLAB	1 X 1.7M	3	3
58	105.113	PIPE	2 X 1.2M	2.5	2.5
59	105.174	SLAB	1 X 1.8M	2.7	2.7
60	105.387	PIPE	1 X 1.2M	3	3
61	105.610	PIPE	1 X 1.2M	3.4	3.4
62	105.732	PIPE	1 X 1.2M	3	3
63	105.852	SLAB	1 X 1.8M	3.4	3.4
64	105.994	PIPE	1 X 1.2M	3	3
65	106.140	PIPE	1 X 1.2M	3	3
66	106.421	PIPE	1 X 1.2M	2.5	2.5
67	106.540	SLAB	1 X 3.5M	2.7	2.7
68	106.658	PIPE	1 X 1.2M	3	3
69	106.926	SLAB	1 X 5.3M	3.4	3.4
70	107.270	SLAB	1 X 6.2M	3	3
71	107.410	SLAB	1 X 2.2M	3.2	3.2
72	107.495	SLAB	1 X 1.2M	3.4	3.4
73	107.524	PIPE	1 X 1.2M	3.1	3.1
74	107.676	PIPE	1 X 1.2M	2.9	2.9
75	107.782	PIPE	1 X 1.2M	2.7	2.7
76	107.837	PIPE	1 X 1.2M	2.5	2.5
77	107.919	PIPE	1 X 1.2M	2.7	2.7
78	108.040	PIPE	1 X 1.2M	3	3
79	108.194	PIPE	1 X 1.2M	3.4	3.4
80	108.277	SLAB	1 X 1.9M	3	3
81	108.368	PIPE	1 X 1.2M	3.2	3.2
82	108.470	PIPE	1 X 1.2M	3.4	3.4

3.1.9 FOREST STRETCH

Forest present along 140 km (86% of the total road length) in which 68 km (42% of the total road length) is passing through Eco - Sensitive Zone of Kailam Wildlife Sanctuary area.

Photograph of Road passing through Eco-Sensitive zone of Kailam Wildlife Sanctuary

3.1.10 ROADWAY DRAINAGE

Side drains are present in the few stretches in the built up area & unlined drain is also present in few stretches in the hill side. So, most of the portion of the project road stretch is being affected by rain water and seepage water from hilly portion due to poor condition of existing side drains. Details of existing length of the drain are given below:

- Length of Covered Drain = 4294 m (both side)
- Length of Lined Drain = 1100 m
- Length of Earthen Drain = 125000 m (on hill side)

3.1.11 PHOTOGRAPH OF EXISTING ROAD

Photograph of existing road corridor is presented below.

EXISTING ROAD PHOTOGRAPH

	
Churachandpur (Start point) (Ch:0.000 Km)	**Munnuam Village (Ch:4.550 Km)**
	
Mata Village (Ch. 6.420 Km)	**Panglian Village (Ch. 16.000 Km)**
	
Muallum Village (Ch. 26.000 Km)	**Salem Veng Village (Ch. 29.500 Km)**

Singngat Dwar (Ch. 34.200 Km)

Singngat Village (Ch. 35.000 Km)

Suangdoh (Ch. 64.500 km)

Lungthul (Ch. 69.500 km)

Songtal Village (Ch. 113.500 km)

Khuanggin Village (Ch. 136.500 km)

Major Intersection (Churachandpur) (Ch. 0.000 km)

Major Intersection (New Lamka) (Ch. 0.526 km)

Major Intersection (New Laka) (Ch. 1.840 Km)

Major Intersection (Singngat) (Ch. 34.175 km)

Major Junction at Sinzawl(Ch. 149.582 km)

	
Church beside the Road (Ch. 1.701 Km)	**School (Ch. 5.453 Km)**
	
Health Centre (Ch. 5.978 km)	**Indian Oil Petrol Pump (Ch. 8.985km)**
	
Stone Quarry (Ch. 7.880 Km)	**Grave Yard (Ch:22.105 Km)**

Grave Yard (Ch. 26.050 km)

Forest Beat Office (Ch. 26.435 km)

Assam Rifles (Ch. 33.760 Km)

Church (Ch. 34.120 Km)

Singngat Fire Sub-station (Ch. 34.378 Km)

Singngat Police Sation (Ch:34.865 Km)

Landslide (Ch. 123.873 km)

Sinking Zone (Ch. 130.984 km)

Slab Culvert (Ch. 1.531 Km)

Slab Culvert (Ch. 4.061 Km)

HP Culvert (Ch. 3.270 Km)

Box Culvert (Ch. 5.920 Km)

Slab Culvert (Ch. 35.494 Km)

Slab Culvert (Ch. 44.482 Km)

HP Culvert (Ch. 81.165Km)

HP Culvert (Ch. 148.698 km)

RCC Slab Bridge (Ch. 2.147 Km)

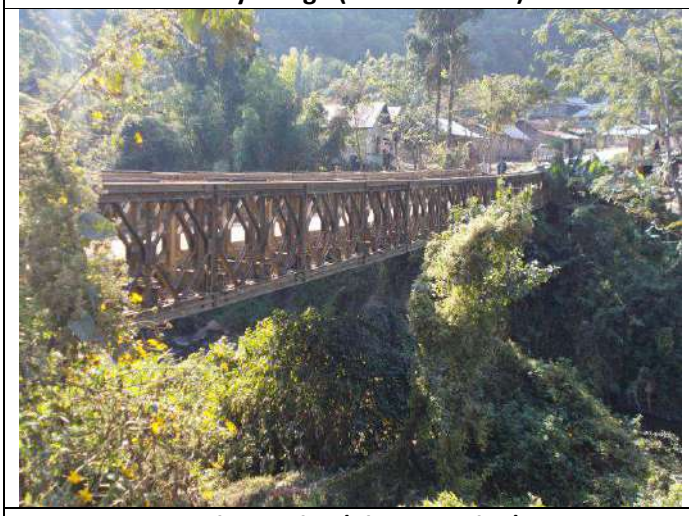
RCC Slab Bridge (Ch. 2.380 Km)

RCC Slab Bridge (Ch. 6.932 Km)

RCC Slab Bridge (Ch. 13.557 Km)

Bailey Bridge (Ch. 46.242 Km)

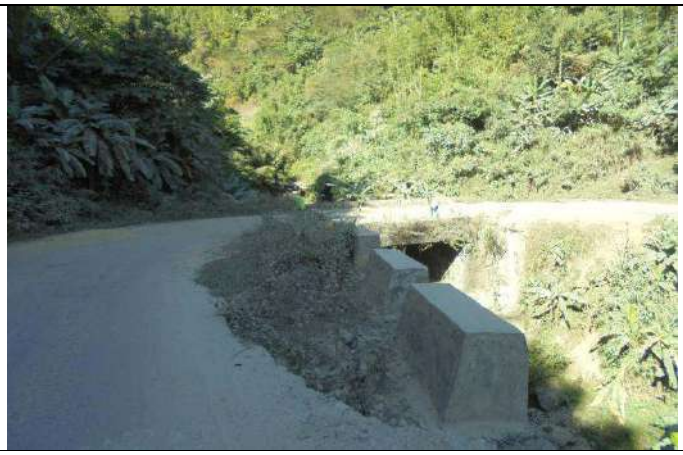
Bailey Bridge (Ch. 48.304 Km)



Bailey Bridge (Ch-69.023 km)

Steel Truss Bridge (Ch. 161.665 km)

Retaining Wall at Ch. 33.325 km



Guard Wall at Ch. 41.620 km

Guard Wall at Ch. 59.000 km

Guards Wall at Ch. 68.340 km

Guard Wall at Ch. 109.520 km

Guard Wall at Ch. 133.530 km

Photographs of Field Work

Bridge Inventory (Ch. 13.557 km)

Culvert Inventory (Ch. 37.452 km)

Bridge Inventory (Ch. 48.304 km)

Culvert Inventory (Ch. 55.168 km)

Culvert Inventory (Ch. 55.449 km)

Pavement Condition survey (Ch. 61.215 km)

Bridge Inventory (Ch. 63.436 km)

Inventory of Protective Works (Ch. 67.500 km)

Road Inventory (Ch. 70.000 km)

Culvert Inventory (Ch. 70.903 km)

Inventory of Sinking Zone (Ch. 117.234 km)

Inventory of Slab Culvert (Ch. 121.050 km)

3.2 DEVELOPMENT PROPOSAL

3.2.1 GEOMETRICS DESIGN

HORIZONTAL ALIGNMENT

The horizontal alignment has been designed as per the design speed recommended for mountainous terrain (i.e. Ruling speed = 60 Kmph & Limiting speed = 40 Kmph) except for the starting 2 km stretch where design speed has been increased to 80 kmph due to presence of plain terrain. However, design speed has been reduced up to 20 kmph in case of hair pin bends as per guideline of the Road Manual. The total design length of the project road is 145.984 Km.

Details of Horizontal Alignment Report are given below in Table 3.11.

TABLE 3.11: HORIZONTAL ALIGNMENT REPORT
Package-IIIB (Ch. 88.980 km to Ch. 103.525 km)

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
Package - IIIB														
						Transition	88936.260	88951.260		15				
772	541088.165	2670525.485	142	31	53.91"	Arc	88951.260	88986.013		34.753	20	Right	7.0	20
						Transition	88986.013	89001.013		15				
						Straight	89001.013	89084.084	83.071					
						Transition	89084.084	89109.084		25				
773	541218.993	2670392.801	92	57	46.01"	Arc	89109.084	89181.434		72.35	60	Left	6.7	30
						Transition	89181.434	89206.434		25				
						Straight	89206.434	89219.415	12.981					
						Transition	89219.415	89244.415		25				
774	541313.356	2670451.232	91	54	12.42"	Arc	89244.415	89259.516		15.1	25	Right	7.0	20
						Transition	89259.516	89284.516		25				
						Straight	89284.516	89358.168	73.652					
						Transition	89358.168	89388.168		30				
775	541416.915	2670351.835	92	33	16.52"	Arc	89388.168	89406.629		18.461	30	Left	5.9	20
						Transition	89406.629	89436.629		30				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	89436.629	89473.463	36.834					
						Transition	89473.463	89508.463		35				
776	541515.439	2670419.027	51	21	34.07"	Arc	89508.463	89527.247		18.784	60	Right	7.0	40
						Transition	89527.247	89562.247		35				
						Straight	89562.247	89624.566	62.319					
						Transition	89624.566	89654.566		30				
777	541665.889	2670412.665	113	31	56.39"	Arc	89654.566	89684.011		29.445	30	Left	5.9	20
						Transition	89684.011	89714.011		30				
						Straight	89714.011	89714.723	0.712					
						Transition	89714.723	89754.723		40				
778	541647.800	2670502.100	64	56	46.48"	Arc	89754.723	89771.399		16.676	50	Left	7.0	40
						Transition	89771.399	89811.399		40				
						Straight	89811.399	89855.135	43.736					
						Transition	89855.135	89880.135		25				
779	541526.034	2670537.668	33	5	56.68"	Arc	89880.135	89901.350		21.215	80	Right	7.0	40
						Transition	89901.350	89926.350		25				
						Straight	89926.350	89962.611	36.261					
						Transition	89962.611	89987.611		25				
780	541451.452	2670609.298	27	38	16.51"	Arc	89987.611	90001.200		13.59	80	Right	7.0	40
						Transition	90001.200	90026.200		25				
						Straight	90026.200	90026.920	0.720					
						Transition	90026.920	90061.920		35				
781	541417.183	2670682.534	59	15	43.23"	Arc	90061.920	90088.979		27.059	60	Left	7.0	40
						Transition	90088.979	90123.979		35				
						Straight	90123.979	90234.980	111.001					
						Transition	90234.980	90269.980		35				
782	541220.197	2670740.874	55	48	00.59"	Arc	90269.980	90293.414		23.434	60	Right	7.0	40
						Transition	90293.414	90328.414		35				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	90328.414	90396.225	67.811					
						Transition	90396.225	90436.225		40				
783	541146.440	2670884.959	65	16	09.77"	Arc	90436.225	90453.183		16.958	50	Left	7.0	40
						Transition	90453.183	90493.183		40				
						Straight	90493.183	90545.181	51.998					
						Transition	90545.181	90560.181		15				
784	540985.275	2670907.958	81	23	40.33"	Arc	90560.181	90644.623		84.442	70	Right	5.7	30
						Transition	90644.623	90659.623		15				
						Straight	90659.623	90672.080	12.457					
						Transition	90672.080	90687.080		15				
785	540968.077	2671007.134	33	25	32.10"	Arc	90687.080	90707.083		20.003	60	Left	6.7	30
						Transition	90707.083	90722.083		15				
						Straight	90722.083	90723.291	1.208					
						Transition	90723.291	90738.291		15				
786	540937.721	2671050.125	26	56	00.53"	Arc	90738.291	90760.897		22.606	80	Right	5.0	30
						Transition	90760.897	90775.897		15				
						Straight	90775.897	90797.516	21.619					
						Transition	90797.516	90827.516		30				
787	540922.127	2671128.965	28	50	41.56"	Arc	90827.516	90832.757		5.241	70	Right	7.0	40
						Transition	90832.757	90862.757		30				
						Straight	90862.757	90872.404	9.647					
						Transition	90872.404	90912.404		40				
788	540937.970	2671210.268	48	15	08.06"	Arc	90912.404	90914.512		2.108	50	Left	7.0	40
						Transition	90914.512	90954.512		40				
						Straight	90954.512	90992.975	38.463					
						Transition	90992.975	91027.975		35				
789	540887.015	2671322.454	78	31	22.19"	Arc	91027.975	91047.794		19.819	40	Right	7.0	30
						Transition	91047.794	91082.794		35				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	91082.794	91097.124	14.329					
						Transition	91097.124	91132.124		35				
790	540947.608	2671402.750	71	38	21.02"	Arc	91132.124	91147.137		15.014	40	Left	7.0	30
						Transition	91147.137	91182.137		35				
						Straight	91182.137	91233.496	51.358					
						Transition	91233.496	91253.496		20				
791	540904.507	2671521.971	27	14	58.06"	Arc	91253.496	91281.055		27.559	100	Right	7.0	40
						Transition	91281.055	91301.055		20				
						Straight	91301.055	91364.593	63.538					
						Transition	91364.593	91384.593		20				
792	540915.444	2671684.839	60	59	36.90"	Arc	91384.593	91471.047		86.454	100	Right	7.0	40
						Transition	91471.047	91491.047		20				
						Straight	91491.047	91516.689	25.643					
						Transition	91516.689	91536.689		20				
793	541024.726	2671742.626	25	17	07.87"	Arc	91536.689	91560.821		24.132	100	Right	7.0	40
						Transition	91560.821	91580.821		20				
						Straight	91580.821	91603.595	22.774					
						Transition	91603.595	91623.595		20				
794	541104.513	2671747.083	17	16	32.80"	Arc	91623.595	91633.747		10.152	100	Left	7.0	40
						Transition	91633.747	91653.747		20				
						Straight	91653.747	91725.737	71.990					
						Transition	91725.737	91750.737		25				
795	541233.163	2671799.964	111	46	22.56"	Arc	91750.737	91784.261		33.524	30	Left	5.9	20
						Transition	91784.261	91809.261		25				
						Straight	91809.261	91811.378	2.117					
						Transition	91811.378	91826.378		15				
796	541193.182	2671859.496	56	48	17.03"	Arc	91826.378	91851.035		24.657	40	Left	7.0	30
						Transition	91851.035	91866.035		15				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	91866.035	91886.855	20.820					
						Transition	91886.855	91926.855		40				
797	541104.836	2671857.630	46	33	50.28"	Arc	91926.855	91927.490		0.635	50	Right	7.0	40
						Transition	91927.490	91967.490		40				
						Straight	91967.490	91976.209	8.720					
						Transition	91976.209	92001.209		25				
798	541043.337	2671906.035	40	28	11.48"	Arc	92001.209	92011.526		10.317	50	Right	7.0	30
						Transition	92011.526	92036.526		25				
						Straight	92036.526	92065.012	28.486					
						Transition	92065.012	92080.012		15				
799	541022.871	2671996.104	24	6	06.37"	Arc	92080.012	92117.594		37.582	125	Left	5.7	40
						Transition	92117.594	92132.594		15				
						Straight	92132.594	92159.896	27.302					
						Transition	92159.896	92194.896		35				
800	540965.929	2672076.059	37	51	19.99"	Arc	92194.896	92199.539		4.642	60	Left	7.0	40
						Transition	92199.539	92234.539		35				
						Straight	92234.539	92331.757	97.219					
						Transition	92331.757	92356.757		25				
801	540805.584	2672136.458	35	19	16.98"	Arc	92356.757	92381.075		24.318	80	Right	7.0	40
						Transition	92381.075	92406.075		25				
						Straight	92406.075	92412.368	6.293					
						Transition	92412.368	92437.368		25				
802	540751.981	2672195.359	54	20	18.02"	Arc	92437.368	92459.787		22.419	50	Left	7.0	30
						Transition	92459.787	92484.787		25				
						Straight	92484.787	92523.853	39.066					
						Transition	92523.853	92548.853		25				
803	540650.250	2672195.593	41	50	06.17"	Arc	92548.853	92553.060		4.206	40	Left	7.0	30
						Transition	92553.060	92578.060		25				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	92578.060	92596.669	18.609					
						Transition	92596.669	92616.669		20				
804	540596.774	2672153.831	35	41	14.67"	Arc	92616.669	92621.583		4.915	40	Right	7.0	30
						Transition	92621.583	92641.583		20				
						Straight	92641.583	92693.089	51.506					
						Transition	92693.089	92708.089		15				
805	540496.987	2672145.798	106	15	56.64"	Arc	92708.089	92730.183		22.094	20	Right	7.0	20
						Transition	92730.183	92745.183		15				
						Straight	92745.183	92767.515	22.332					
						Transition	92767.515	92782.515		15				
806	540497.741	2672216.099	79	20	34.18"	Arc	92782.515	92795.211		12.696	20	Left	7.0	20
						Transition	92795.211	92810.211		15				
						Straight	92810.211	92864.457	54.247					
						Transition	92864.457	92884.457		20				
807	540386.167	2672278.945	158	3	20.91"	Arc	92884.457	92930.664		46.206	24	Right	7.0	20
						Transition	92930.664	92950.664		20				
						Straight	92950.664	92970.749	20.085					
						Transition	92970.749	92985.749		15				
808	540479.958	2672304.104	92	18	23.18"	Arc	92985.749	93002.970		17.221	20	Left	7.0	20
						Transition	93002.970	93017.970		15				
						Straight	93017.970	93028.535	10.565					
						Transition	93028.535	93053.535		25				
809	540478.609	2672363.228	29	23	25.82"	Arc	93053.535	93054.183		0.648	50	Left	7.0	30
						Transition	93054.183	93079.183		25				
						Straight	93079.183	93081.030	1.847					
						Transition	93081.030	93096.030		15				
810	540450.707	2672418.638	84	18	34.12"	Arc	93096.030	93132.531		36.502	35	Right	7.0	30
						Transition	93132.531	93147.531		15				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	93147.531	93280.075	132.544					
						Transition	93280.075	93295.075		15				
811	540595.967	2672547.439	36	55	29.32"	Arc	93295.075	93318.743		23.668	60	Left	6.7	30
						Transition	93318.743	93333.743		15				
						Straight	93333.743	93336.377	2.634					
						Transition	93336.377	93361.377		25				
812	540616.511	2672604.087	52	40	14.06"	Arc	93361.377	93373.148		11.771	40	Right	7.0	30
						Transition	93373.148	93398.148		25				
						Straight	93398.148	93402.150	4.003					
						Transition	93402.150	93427.150		25				
813	540668.602	2672633.092	17	54	54.87"	Arc	93427.150	93427.165		0.014	80	Left	7.0	40
						Transition	93427.165	93452.165		25				
						Straight	93452.165	93496.941	44.776					
						Transition	93496.941	93511.941		15				
814	540743.402	2672696.150	18	51	02.30"	Arc	93511.941	93538.066		26.126	125	Right	5.7	40
						Transition	93538.066	93553.066		15				
						Straight	93553.066	93576.106	23.040					
						Transition	93576.106	93591.106		15				
815	540822.451	2672743.089	149	54	49.68"	Arc	93591.106	93628.436		37.33	20	Left	7.0	20
						Transition	93628.436	93643.436		15				
						Straight	93643.436	93671.968	28.532					
						Transition	93671.968	93696.968		25				
816	540728.926	2672764.875	28	11	46.68"	Arc	93696.968	93701.495		4.527	60	Left	6.7	30
						Transition	93701.495	93726.495		25				
						Straight	93726.495	93766.675	40.180					
						Transition	93766.675	93791.675		25				
817	540623.779	2672735.803	82	52	29.94"	Arc	93791.675	93824.532		32.858	40	Right	7.0	30
						Transition	93824.532	93849.532		25				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	93849.532	93921.811	72.278					
						Transition	93921.811	93946.811		25				
818	540553.013	2672858.560	36	4	56.12"	Arc	93946.811	93953.298		6.488	50	Right	7.0	30
						Transition	93953.298	93978.298		25				
						Straight	93978.298	93987.033	8.734					
						Transition	93987.033	94012.033		25				
819	540555.767	2672930.336	51	40	35.31"	Arc	94012.033	94032.129		20.096	50	Left	7.0	30
						Transition	94032.129	94057.129		25				
						Straight	94057.129	94113.280	56.152					
						Transition	94113.280	94138.280		25				
820	540464.971	2673047.443	95	6	13.18"	Arc	94138.280	94196.274		57.994	50	Right	7.0	30
						Transition	94196.274	94221.274		25				
						Straight	94221.274	94250.266	28.992					
						Transition	94250.266	94280.266		30				
821	540549.830	2673140.632	97	12	20.69"	Arc	94280.266	94301.163		20.897	30	Left	7.0	30
						Transition	94301.163	94331.163		30				
						Straight	94331.163	94384.954	53.791					
						Transition	94384.954	94414.954		30				
822	540464.280	2673258.030	116	25	21.54"	Arc	94414.954	94456.072		41.119	35	Right	7.0	30
						Transition	94456.072	94486.072		30				
						Straight	94486.072	94534.536	48.464					
						Transition	94534.536	94559.536		25				
823	540581.172	2673322.444	97	41	57.70"	Arc	94559.536	94577.166		17.629	25	Left	7.0	20
						Transition	94577.166	94602.166		25				
						Straight	94602.166	94636.487	34.321					
						Transition	94636.487	94661.487		25				
824	540545.227	2673437.199	106	39	23.62"	Arc	94661.487	94710.947		49.46	40	Right	7.0	30
						Transition	94710.947	94735.947		25				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	94735.947	94740.564	4.617					
						Transition	94740.564	94765.564		25				
825	540629.420	2673468.930	57	29	04.93"	Arc	94765.564	94780.696		15.132	40	Left	7.0	30
						Transition	94780.696	94805.696		25				
						Straight	94805.696	94812.848	7.152					
						Transition	94812.848	94837.848		25				
826	540665.154	2673533.432	41	35	14.90"	Arc	94837.848	94856.398		18.55	60	Right	7.0	40
						Transition	94856.398	94881.398		25				
						Straight	94881.398	94902.219	20.821					
						Transition	94902.219	94927.219		25				
827	540739.681	2673571.244	31	18	05.48"	Arc	94927.219	94934.998		7.779	60	Right	7.0	40
						Transition	94934.998	94959.998		25				
						Straight	94959.998	94970.226	10.228					
						Transition	94970.226	94985.226		15				
828	540798.357	2673568.966	9	20	07.57"	Arc	94985.226	94994.666		9.44	150	Left	4.7	40
						Transition	94994.666	95009.666		15				
						Straight	95009.666	95055.111	45.445					
						Transition	95055.111	95080.111		25				
829	540898.023	2673585.911	110	56	39.74"	Arc	95080.111	95103.519		23.409	25	Left	7.0	20
						Transition	95103.519	95128.519		25				
						Straight	95128.519	95219.169	90.649					
						Transition	95219.169	95234.169		15				
830	540844.762	2673738.112	96	3	20.69"	Arc	95234.169	95269.463		35.295	30	Right	5.9	20
						Transition	95269.463	95284.463		15				
						Straight	95284.463	95289.967	5.504					
						Transition	95289.967	95304.967		15				
831	540895.506	2673762.808	12	31	38.04"	Arc	95304.967	95307.458		2.491	80	Left	7.0	40
						Transition	95307.458	95322.458		15				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	95322.458	95340.249	17.790					
						Transition	95340.249	95360.249		20				
832	540946.459	2673792.098	16	55	27.27"	Arc	95360.249	95369.787		9.538	100	Right	7.0	40
						Transition	95369.787	95389.787		20				
						Straight	95389.787	95467.716	77.929					
						Transition	95467.716	95492.716		25				
833	541074.601	2673824.013	32	38	15.78"	Arc	95492.716	95501.894		9.178	60	Right	7.0	40
						Transition	95501.894	95526.894		25				
						Straight	95526.894	95533.429	6.535					
						Transition	95533.429	95548.429		15				
834	541142.971	2673813.817	129	19	30.23"	Arc	95548.429	95578.572		30.143	20	Left	7.0	20
						Transition	95578.572	95593.572		15				
						Straight	95593.572	95595.407	1.835					
						Transition	95595.407	95610.407		15				
835	541127.772	2673868.225	56	31	44.06"	Arc	95610.407	95625.005		14.598	30	Left	5.9	20
						Transition	95625.005	95640.005		15				
						Straight	95640.005	95705.272	65.266					
						Transition	95705.272	95720.272		15				
836	540950.744	2673912.695	47	56	41.68"	Arc	95720.272	95872.631		152.359	200	Right	3.6	40
						Transition	95872.631	95887.631		15				
						Straight	95887.631	95946.219	58.588					
						Transition	95946.219	95986.219		40				
837	540854.593	2674094.687	76	41	35.17"	Arc	95986.219	96013.146		26.927	50	Right	7.0	40
						Transition	96013.146	96053.146		40				
						Straight	96053.146	96109.917	56.771					
						Transition	96109.917	96139.917		30				
838	540946.467	2674206.451	80	25	42.32"	Arc	96139.917	96152.029		12.112	30	Left	7.0	30
						Transition	96152.029	96182.029		30				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	96182.029	96206.115	24.086					
						Transition	96206.115	96231.115		25				
839	540895.766	2674288.703	48	44	04.89"	Arc	96231.115	96257.150		26.035	60	Left	7.0	40
						Transition	96257.150	96282.150		25				
						Straight	96282.150	96304.707	22.557					
						Transition	96304.707	96319.707		15				
840	540812.302	2674305.457	19	33	16.28"	Arc	96319.707	96338.836		19.129	100	Right	7.0	40
						Transition	96338.836	96353.836		15				
						Straight	96353.836	96396.250	42.414					
						Transition	96396.250	96416.250		20				
841	540725.648	2674360.692	129	10	59.12"	Arc	96416.250	96445.853		29.603	22	Right	7.0	20
						Transition	96445.853	96465.853		20				
						Straight	96465.853	96503.902	38.049					
						Transition	96503.902	96528.902		25				
842	540811.495	2674412.075	25	45	59.91"	Arc	96528.902	96530.885		1.983	60	Left	6.7	30
						Transition	96530.885	96555.885		25				
						Straight	96555.885	96570.376	14.490					
						Transition	96570.376	96585.376		15				
843	540850.611	2674453.509	17	22	26.00"	Arc	96585.376	96588.570		3.194	60	Right	6.7	30
						Transition	96588.570	96603.570		15				
						Straight	96603.570	96605.192	1.623					
						Transition	96605.192	96620.192		15				
844	540879.846	2674474.512	29	36	57.14"	Arc	96620.192	96625.868		5.676	40	Left	7.0	30
						Transition	96625.868	96640.868		15				
						Straight	96640.868	96680.616	39.748					
						Transition	96680.616	96700.616		20				
845	540920.546	2674543.122	28	17	19.21"	Arc	96700.616	96705.303		4.687	50	Right	7.0	30
						Transition	96705.303	96725.303		20				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	96725.303	96773.106	47.803					
						Transition	96773.106	96788.106		15				
846	541010.085	2674606.947	36	36	15.39"	Arc	96788.106	96836.992		48.887	100	Left	7.0	40
						Transition	96836.992	96851.992		15				
						Straight	96851.992	96859.058	7.066					
						Transition	96859.058	96874.058		15				
847	541040.118	2674673.025	58	42	29.15"	Arc	96874.058	96894.921		20.863	35	Right	7.0	30
						Transition	96894.921	96909.921		15				
						Straight	96909.921	96921.015	11.094					
						Transition	96921.015	96936.015		15				
848	541139.971	2674702.620	86	1	00.94"	Arc	96936.015	97026.104		90.09	70	Left	7.0	40
						Transition	97026.104	97041.104		15				
						Straight	97041.104	97135.497	94.393					
						Transition	97135.497	97150.497		15				
849	541123.854	2674886.869	22	33	43.95"	Arc	97150.497	97167.000		16.503	80	Right	7.0	40
						Transition	97167.000	97182.000		15				
						Straight	97182.000	97182.722	0.722					
						Transition	97182.722	97197.722		15				
850	541128.440	2674949.210	144	2	22.38"	Arc	97197.722	97233.002		35.279	20	Left	7.0	20
						Transition	97233.002	97248.002		15				
						Straight	97248.002	97389.934	141.932					
						Transition	97389.934	97424.934		35				
851	540947.950	2674824.286	43	12	34.57"	Arc	97424.934	97435.183		10.249	60	Right	7.0	40
						Transition	97435.183	97470.183		35				
						Straight	97470.183	97479.944	9.761					
						Transition	97479.944	97504.944		25				
852	540872.866	2674826.662	18	56	51.70"	Arc	97504.944	97506.400		1.456	80	Right	7.0	40
						Transition	97506.400	97531.400		25				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	97531.400	97531.756	0.355					
						Transition	97531.756	97556.756		25				
853	540814.746	2674845.256	51	40	26.85"	Arc	97556.756	97576.850		20.094	50	Left	7.0	40
						Transition	97576.850	97601.850		25				
						Straight	97601.850	97610.253	8.403					
						Transition	97610.253	97625.253		15				
854	540744.885	2674820.018	100	20	11.83"	Arc	97625.253	97654.033		28.78	25	Right	7.0	20
						Transition	97654.033	97669.033		15				
						Straight	97669.033	97673.656	4.623					
						Transition	97673.656	97688.656		15				
855	540719.398	2674873.979	23	56	35.62"	Arc	97688.656	97707.087		18.431	80	Left	7.0	40
						Transition	97707.087	97722.087		15				
						Straight	97722.087	97726.239	4.152					
						Transition	97726.239	97751.239		25				
856	540640.021	2674950.830	81	1	28.28"	Arc	97751.239	97853.512		102.273	90	Left	7.0	40
						Transition	97853.512	97878.512		25				
						Straight	97878.512	97976.856	98.345					
						Transition	97976.856	98001.856		25				
857	540455.722	2674846.749	43	17	53.51"	Arc	98001.856	98014.641		12.785	50	Right	7.0	30
						Transition	98014.641	98039.641		25				
						Straight	98039.641	98079.519	39.878					
						Transition	98079.519	98094.519		15				
858	540367.605	2674859.660	9	40	56.70"	Arc	98094.519	98100.642		6.124	125	Right	5.7	40
						Transition	98100.642	98115.642		15				
						Straight	98115.642	98133.435	17.793					
						Transition	98133.435	98148.435		15				
859	540310.427	2674877.767	38	4	05.76"	Arc	98148.435	98166.656		18.221	50	Left	7.0	30
						Transition	98166.656	98181.656		15				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	98181.656	98187.393	5.737					
						Transition	98187.393	98202.393		15				
860	540253.249	2674864.391	48	14	27.89"	Arc	98202.393	98229.491		27.098	50	Right	7.0	30
						Transition	98229.491	98244.491		15				
						Straight	98244.491	98245.222	0.731					
						Transition	98245.222	98260.222		15				
861	540211.167	2674886.847	20	35	13.39"	Arc	98260.222	98266.781		6.559	60	Right	6.7	30
						Transition	98266.781	98281.781		15				
						Straight	98281.781	98301.270	19.489					
						Transition	98301.270	98316.270		15				
862	540174.320	2674928.548	23	56	08.48"	Arc	98316.270	98322.158		5.888	50	Left	7.0	30
						Transition	98322.158	98337.158		15				
						Straight	98337.158	98351.395	14.238					
						Transition	98351.395	98366.395		15				
863	540127.085	2674955.932	34	16	44.83"	Arc	98366.395	98381.310		14.914	50	Right	7.0	30
						Transition	98381.310	98396.310		15				
						Straight	98396.310	98513.889	117.579					
						Transition	98513.889	98528.889		15				
864	540038.719	2675105.238	58	9	34.68"	Arc	98528.889	98564.643		35.754	50	Left	7.0	30
						Transition	98564.643	98579.643		15				
						Straight	98579.643	98589.419	9.776					
						Transition	98589.419	98614.419		25				
865	539957.524	2675125.099	124	19	56.29"	Arc	98614.419	98643.669		29.25	25	Right	7.0	20
						Transition	98643.669	98668.669		25				
						Straight	98668.669	98674.461	5.791					
						Transition	98674.461	98699.461		25				
866	539987.549	2675195.947	85	12	12.51"	Arc	98699.461	98711.638		12.177	25	Left	7.0	20
						Transition	98711.638	98736.638		25				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	98736.638	98788.050	51.413					
						Transition	98788.050	98803.050		15				
867	539917.153	2675268.399	11	4	12.35"	Arc	98803.050	98812.201		9.151	125	Left	5.7	40
						Transition	98812.201	98827.201		15				
						Straight	98827.201	98831.530	4.329					
						Transition	98831.530	98846.530		15				
868	539857.292	2675310.012	64	10	53.51"	Arc	98846.530	98909.943		63.413	70	Right	7.0	40
						Transition	98909.943	98924.943		15				
						Straight	98924.943	98956.549	31.606					
						Transition	98956.549	98986.549		30				
869	539855.981	2675425.413	79	7	21.83"	Arc	98986.549	98997.977		11.429	30	Left	5.9	20
						Transition	98997.977	99027.977		30				
						Straight	99027.977	99040.708	12.730					
						Transition	99040.708	99070.708		30				
870	539715.173	2675493.872	121	35	15.77"	Arc	99070.708	99189.255		118.547	70	Right	7.0	40
						Transition	99189.255	99219.255		30				
						Straight	99219.255	99224.864	5.609					
						Transition	99224.864	99249.864		25				
871	539807.271	2675610.800	63	3	10.98"	Arc	99249.864	99268.883		19.019	40	Left	7.0	30
						Transition	99268.883	99293.883		25				
						Straight	99293.883	99320.168	26.285					
						Transition	99320.168	99345.168		25				
872	539786.637	2675693.489	49	16	45.78"	Arc	99345.168	99345.971		0.803	30	Left	7.0	30
						Transition	99345.971	99370.971		25				
						Straight	99370.971	99374.219	3.248					
						Transition	99374.219	99389.219		15				
873	539743.590	2675718.963	18	0	46.93"	Arc	99389.219	99402.514		13.295	90	Right	7.0	40
						Transition	99402.514	99417.514		15				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	99417.514	99444.482	26.969					
						Transition	99444.482	99459.482		15				
874	539692.779	2675766.420	10	15	59.28"	Arc	99459.482	99471.360		11.878	150	Right	4.7	40
						Transition	99471.360	99486.360		15				
						Straight	99486.360	99655.607	169.247					
						Transition	99655.607	99680.607		25				
875	539556.010	2675944.997	42	52	14.44"	Arc	99680.607	99700.501		19.894	60	Left	7.0	40
						Transition	99700.501	99725.501		25				
						Straight	99725.501	99795.697	70.196					
						Transition	99795.697	99825.697		30				
876	539411.626	2675965.042	104	10	46.56"	Arc	99825.697	99850.245		24.548	30	Left	7.0	30
						Transition	99850.245	99880.245		30				
						Straight	99880.245	99887.461	7.216					
						Transition	99887.461	99902.461		15				
877	539401.540	2675870.498	69	12	36.27"	Arc	99902.461	99959.938		57.477	60	Right	7.0	40
						Transition	99959.938	99974.938		15				
						Straight	99974.938	99983.054	8.116					
						Transition	99983.054	100008.054		25				
878	539311.431	2675820.177	45	52	54.59"	Arc	100008.054	100055.125		47.071	90	Left	7.0	40
						Transition	100055.125	100080.125		25				
						Straight	100080.125	100148.902	68.777					
						Transition	100148.902	100168.902		20				
879	539259.397	2675692.046	12	11	06.26"	Arc	100168.902	100170.169		1.267	100	Right	7.0	40
						Transition	100170.169	100190.169		20				
						Straight	100190.169	100206.601	16.432					
						Transition	100206.601	100221.601		15				
880	539231.269	2675645.159	7	44	20.90"	Arc	100221.601	100226.862		5.261	150	Left	4.7	40
						Transition	100226.862	100241.862		15				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	100241.862	100251.071	9.209					
						Transition	100251.071	100266.071		15				
881	539212.136	2675604.821	7	52	43.94"	Arc	100266.071	100271.698		5.627	150	Right	4.7	40
						Transition	100271.698	100286.698		15				
						Straight	100286.698	100298.042	11.344					
						Transition	100298.042	100318.042		20				
882	539184.265	2675557.632	17	57	34.40"	Arc	100318.042	100329.387		11.345	100	Left	7.0	40
						Transition	100329.387	100349.387		20				
						Straight	100349.387	100361.673	12.286					
						Transition	100361.673	100376.673		15				
883	539171.226	2675502.147	44	56	56.32"	Arc	100376.673	100385.209		8.535	30	Left	5.9	20
						Transition	100385.209	100400.209		15				
						Straight	100400.209	100406.253	6.044					
						Transition	100406.253	100421.253		15				
884	539189.637	2675455.436	97	52	20.21"	Arc	100421.253	100440.416		19.164	20	Right	7.0	20
						Transition	100440.416	100455.416		15				
						Straight	100455.416	100459.984	4.567					
						Transition	100459.984	100474.984		15				
885	539148.816	2675430.459	31	11	09.77"	Arc	100474.984	100481.756		6.772	40	Left	7.0	30
						Transition	100481.756	100496.756		15				
						Straight	100496.756	100554.540	57.784					
						Transition	100554.540	100574.540		20				
886	539087.788	2675346.849	20	2	34.36"	Arc	100574.540	100589.521		14.981	100	Left	7.0	40
						Transition	100589.521	100609.521		20				
						Straight	100609.521	100620.441	10.920					
						Transition	100620.441	100645.441		25				
887	539064.453	2675281.484	35	33	24.38"	Arc	100645.441	100657.676		12.235	60	Right	7.0	40
						Transition	100657.676	100682.676		25				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	100682.676	100690.599	7.923					
						Transition	100690.599	100715.599		25				
888	539016.489	2675236.951	26	53	02.70"	Arc	100715.599	100718.752		3.153	60	Left	7.0	40
						Transition	100718.752	100743.752		25				
						Straight	100743.752	100778.997	35.245					
						Transition	100778.997	100808.997		30				
889	538981.436	2675148.632	74	21	40.12"	Arc	100808.997	100817.932		8.935	30	Left	7.0	30
						Transition	100817.932	100847.932		30				
						Straight	100847.932	101000.879	152.946					
						Transition	101000.879	101015.879		15				
890	539132.340	2675005.402	83	2	16.26"	Arc	101015.879	101029.864		13.986	20	Right	7.0	20
						Transition	101029.864	101044.864		15				
						Straight	101044.864	101134.028	89.164					
						Transition	101134.028	101154.028		20				
891	539060.053	2674889.586	18	5	23.47"	Arc	101154.028	101165.601		11.573	100	Right	7.0	40
						Transition	101165.601	101185.601		20				
						Straight	101185.601	101225.807	40.205					
						Transition	101225.807	101255.807		30				
892	538988.417	2674822.978	67	24	08.88"	Arc	101255.807	101261.098		5.292	30	Left	7.0	30
						Transition	101261.098	101291.098		30				
						Straight	101291.098	101300.070	8.971					
						Transition	101300.070	101315.070		15				
893	539001.164	2674762.189	32	0	05.41"	Arc	101315.070	101327.996		12.927	50	Left	7.0	30
						Transition	101327.996	101342.996		15				
						Straight	101342.996	101441.742	98.746					
						Transition	101441.742	101456.742		15				
894	539108.997	2674659.168	44	22	04.52"	Arc	101456.742	101484.332		27.59	55	Right	7.0	30
						Transition	101484.332	101499.332		15				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	101499.332	101511.957	12.625					
						Transition	101511.957	101526.957		15				
895	539118.012	2674593.109	39	59	29.39"	Arc	101526.957	101546.857		19.899	50	Left	7.0	30
						Transition	101546.857	101561.857		15				
						Straight	101561.857	101564.456	2.600					
						Transition	101564.456	101579.456		15				
896	539151.152	2674546.484	95	54	41.67"	Arc	101579.456	101606.306		26.849	25	Right	7.0	20
						Transition	101606.306	101621.306		15				
						Straight	101621.306	101641.029	19.723					
						Transition	101641.029	101676.029		35				
897	539083.837	2674471.127	98	17	45.09"	Arc	101676.029	101709.652		33.623	40	Left	7.0	30
						Transition	101709.652	101744.652		35				
						Straight	101744.652	101925.880	181.228					
						Transition	101925.880	101940.880		15				
898	539255.642	2674279.313	100	51	38.50"	Arc	101940.880	101961.087		20.207	20	Right	7.0	20
						Transition	101961.087	101976.087		15				
						Straight	101976.087	101993.996	17.908					
						Transition	101993.996	102008.996		15				
899	539208.494	2674233.134	86	4	02.71"	Arc	102008.996	102024.039		15.043	20	Left	7.0	20
						Transition	102024.039	102039.039		15				
						Straight	102039.039	102096.484	57.445					
						Transition	102096.484	102121.484		25				
900	539265.744	2674134.705	31	22	02.09"	Arc	102121.484	102140.281		18.797	80	Left	5.0	30
						Transition	102140.281	102165.281		25				
						Straight	102165.281	102248.099	82.818					
						Transition	102248.099	102263.099		15				
901	539386.018	2674063.629	87	31	14.95"	Arc	102263.099	102278.649		15.551	20	Right	7.0	20
						Transition	102278.649	102293.649		15				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
						Straight	102293.649	102343.459	49.810					
						Transition	102343.459	102368.459		25				
902	539349.625	2673969.634	22	50	42.09"	Arc	102368.459	102375.357		6.898	80	Left	7.0	40
						Transition	102375.357	102400.357		25				
						Straight	102400.357	102471.276	70.919					
						Transition	102471.276	102491.276		20				
903	539342.037	2673845.789	16	58	34.39"	Arc	102491.276	102500.905		9.629	100	Right	7.0	40
						Transition	102500.905	102520.905		20				
						Straight	102520.905	102663.965	143.060					
904	539279.794	2673662.579	9	46	36.28"	Arc	102663.965	102715.156		51.191	300	Left	Normal	40
						Straight	102715.156	102751.987	36.832					
						Transition	102751.987	102771.987		20				
905	539262.163	2673567.900	27	16	06.77"	Arc	102771.987	102799.580		27.593	100	Right	7.0	40
						Transition	102799.580	102819.580		20				
						Straight	102819.580	102891.682	72.102					
						Transition	102891.682	102921.682		30				
906	539186.942	2673453.547	63	48	32.64"	Arc	102921.682	102925.092		3.41	30	Left	7.0	30
						Transition	102925.092	102955.092		30				
						Straight	102955.092	102972.900	17.807					
						Transition	102972.900	102987.900		15				
907	539210.802	2673389.380	46	16	09.64"	Arc	102987.900	102997.126		9.227	30	Right	5.9	20
						Transition	102997.126	103012.126		15				
						Straight	103012.126	103027.834	15.707					
						Transition	103027.834	103052.834		25				
908	539195.166	2673327.839	36	27	49.93"	Arc	103052.834	103059.654		6.821	50	Left	7.0	30
						Transition	103059.654	103084.654		25				
						Straight	103084.654	103104.139	19.485					
						Transition	103104.139	103129.139		25				

HIP/CURVE NO.	HIP		DEFLECTION ANGLE			ELEMENT	START	END	LENGTH (m)	CHORD LENGTH (m)	RADIUS (m)	HAND OF ARC	SUPER ELEVATION (%)	DESIGN SPEED
	EASTING	NORTHING	DEG	MIN	SEC		CHAINAGE (m)	CHAINAGE (m)						
909	539213.408	2673253.588	23	18	32.23"	Arc	103129.139	103136.685		7.545	80	Right	7.0	40
						Transition	103136.685	103161.685		25				
						Straight	103161.685	103318.076	156.391					
						Transition	103318.076	103333.076		15				
910	539193.582	2673034.237	15	49	23.36"	Arc	103333.076	103373.309		40.233	200	Left	3.6	40
						Transition	103373.309	103388.309		15				
						Straight	103388.309	103490.097	101.788					
						Transition	103490.097	103505.097		15				
911	539216.186	2672866.003	91	27	57.82"	Arc	103505.097	103537.988		32.892	30	Right	5.9	20
						Transition	103537.988	103552.988		15				

3.2.2 PROPOSED CROSS SECTION DETAILS

Cross-section of the improved facility should be adequate to cater to the traffic expected over the design period and offer safe and convenient traffic operation at speeds consistent with the terrain conditions and functional classification of this road.

The cross-sectional parameters (land /shoulder width etc.) shall be as per standards specified in IRC SP: 73-2015. Following typical cross-sections have been envisaged for the subject road. Chainage wise cross-section details are given in Table 3.12 and Table 3.13.

TABLE 3.12: PROPOSED CROSS-SECTION DETAILS

TCS Type	Description	Length (m)
TCS 1	2 Lane carriageway with hard shoulder in built up area with both side footpath cum RCC covered drain (existing pavement)	1280
TCS 2	2 Lane carriageway with hard shoulder and one side toe wall & one side ret wall (existing pavement)	N/A
TCS 3	2 Lane carriageway with hard shoulder and one side toe wall (existing pavement)	N/A
TCS 4	2 Lane carriageway with hard shoulder in rural area (existing pavement)	50
TCS 4A	2 Lane carriageway with hard shoulder in rural area (realignment stretch)	N/A
TCS 5	2 Lane carriageway with hard shoulder and one side toe wall & one side trapezoidal drain (existing pavement)	N/A
TCS 5A	2 Lane carriageway with hard shoulder and one side toe wall & one side trapezoidal drain (realignment stretch)	N/A
TCS 6	2 Lane carriageway with hard shoulder and both side trapezoidal drain (existing pavement)	6365
TCS 6A	2 Lane carriageway with hard shoulder and both side trapezoidal drain (realignment stretch)	N/A
TCS 7	2 Lane carriageway with hard shoulder and one side trapezoidal drain (existing pavement)	3810
TCS 7A	2 Lane carriageway with hard shoulder and one side trapezoidal drain (realignment stretch)	N/A
TCS 8	2 Lane carriageway with hard shoulder and one side breast wall (existing pavement)	N/A
TCS 8A	2 Lane carriageway with hard shoulder and one side breast wall (realignment stretch)	N/A
TCS 9	2 Lane carriageway with hard shoulder and one side breast wall & one side drain (existing pavement)	N/A
TCS 9A	2 Lane carriageway with hard shoulder and one side breast wall & one side drain (realignment stretch)	N/A
TCS 10	2 Lane carriageway with hard shoulder and one side ret wall (existing pavement)	60
TCS 10A	2 Lane carriageway with hard shoulder and one side ret wall (realignment stretch)	N/A
TCS 11	2 Lane carriageway with hard shoulder and one side ret wall & one side drain (existing pavement)	1840
TCS 11A	2 Lane carriageway with hard shoulder and one side ret wall & one side drain (realignment stretch)	N/A
TCS 12	2 Lane carriageway with hard shoulder and one side ret wall & one breast wall (existing pavement)	525
TCS 12A	2 Lane carriageway with hard shoulder and one side ret wall & one breast wall (realignment stretch)	N/A
TCS 13	2 Lane carriageway with hard shoulder and both side ret wall (existing pavement)	210
TCS 13A	2 Lane carriageway with hard shoulder and both side ret wall (realignment stretch)	N/A
TCS 14	2 Lane carriageway with hard shoulder and one side toe wall & one side breast wall (existing pavement)	N/A
TCS 15	2 Lane carriageway with hard shoulder and both side breast wall (existing pavement)	295
TCS 15A	2 Lane carriageway with hard shoulder and both side breast wall (realignment stretch)	N/A

TCS Type	Description	Length (m)
TCS 16	2 Lane carriageway with hard shoulder and both side composite RE wall (existing pavement)	N/A
TCS 16A	2 Lane carriageway with hard shoulder and both side composite RE wall (realignment stretch)	55
TCS 17	2 Lane carriageway with hard shoulder and one side drain & one side composite RE wall (existing pavement)	N/A
TCS 17A	2 Lane carriageway with hard shoulder and one side drain & one side composite RE wall (realignment stretch)	55

TABLE 3.13: CHAINAGEWISE CROSS-SECTION DETAILS

Chainage		Length (m)	TCS Type
From (m)	To (m)		
Package - IIIB			
88980	89080	100	TCS-7
89080	89130	50	TCS-11
89130	91050	1920	TCS-6
91050	91250	200	TCS-1
91250	91775	525	TCS-7
91775	92000	225	TCS-6
92000	93225	1225	TCS-7
93225	93375	150	TCS-11
93375	93600	225	TCS-7
93600	93850	250	TCS-6
93850	93975	125	TCS-7
93975	94070	95	TCS-11
94070	94150	80	TCS-7
94150	94175	25	TCS-11
94175	94400	225	TCS-7
94400	94500	100	TCS-11
94500	94625	125	TCS-7
94625	94725	100	TCS-11
94725	94800	75	TCS-7
94800	94870	70	TCS-11
94870	95100	230	TCS-7
95100	95375	275	TCS-11
95375	95650	275	TCS-7
95650	95875	225	TCS-6
95875	95925	50	TCS-4
95925	96100	175	TCS-11
96100	96190	90	TCS-7
96190	96220	30	TCS-11
96220	96280	60	TCS-7
96280	96525	245	TCS-15
96525	96625	100	TCS-11
96625	96700	75	TCS-13

Chainage		Length (m)	TCS Type
From (m)	To (m)		
96700	96775	75	TCS-7
96775	96825	50	TCS-11
96825	96860	35	TCS-7
96860	96925	65	TCS-11
96925	96960	35	TCS-7
96960	97000	40	TCS-11
97000	97040	40	TCS-7
97040	97070	30	TCS-11
97070	97140	70	TCS-7
97140	97190	50	TCS-11
97190	97240	50	TCS-7
97240	97580	340	TCS-6
97580	97630	50	TCS-11
97630	97690	60	TCS-7
97690	98300	610	TCS-6
98300	98425	125	TCS-11
98425	98510	85	TCS-7
98510	98575	65	TCS-11
98575	98675	100	TCS-11
98675	98730	55	TCS-17A
98730	98825	95	TCS-11
98825	98900	75	TCS-13
98900	99020	120	TCS-6
99020	99175	155	TCS-12
99175	99230	55	TCS-16A
99230	99600	370	TCS-12
99600	99660	60	TCS-13
99660	99720	60	TCS-10
99720	100800	1080	TCS-1
100800	102050	1250	TCS-6
102050	102100	50	TCS-15
102100	103525	1425	TCS-6
Total Length = 14.545 Km			

3.2.3 ADOPTED PAVEMENT THICKNESS

New 2-lane road will be developed by upgrading existing road after necessary geometric improvement. Considering Design traffic of 20 msa and Design CBR of 10% following pavement thickness has been adopted over existing and New/Widening portion.

TABLE 3.14: PAVEMENT THICKNESS

Design CBR (%)	Design Traffic (MSA)	GSB (mm)	WMM (mm)	DBM (mm)	BC (mm)	Total Thickness (mm)	Sub-grade in New /widening portion (CBR-10%)
10%	20	200	250	70	40	560	500

Pavement Thickness as per IRC:37-2018

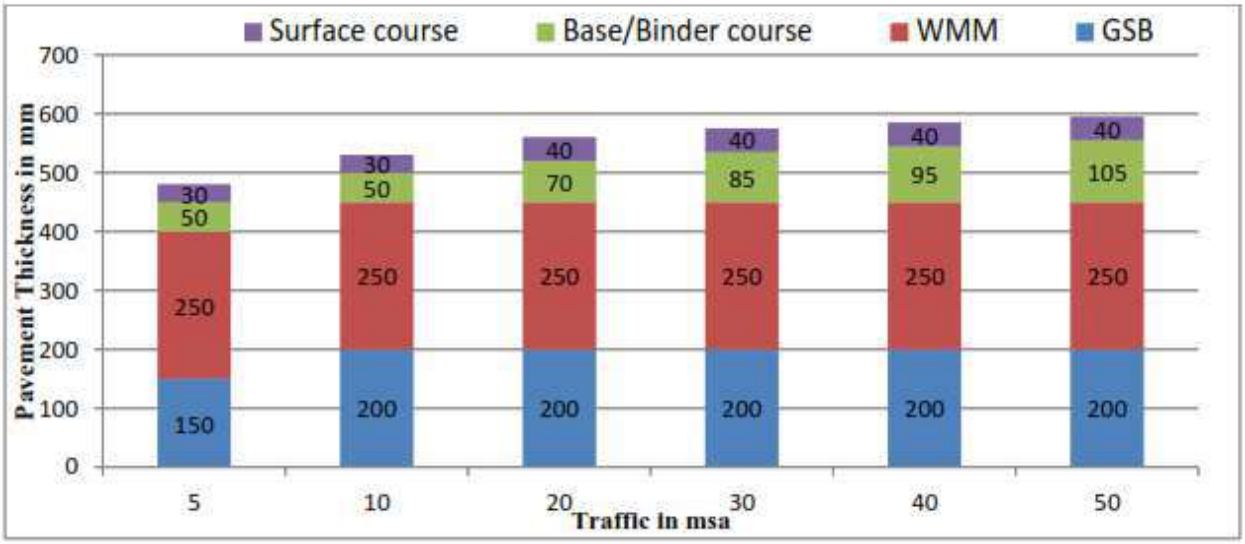


Figure 12.6 Catalogue for pavement with bituminous surface course with granular base and sub-base - Effective CBR 10% (Plate-6)

3.2.4 MUCK DISPOSAL

The muck from hill cutting and construction activities will be safely disposed at suitable locations. Principle adopted for selecting muck dumping areas was to avoid sensitive areas like dense vegetation, natural water courses and areas prone to landslides. During the selection of the dumping sites preference was given on the following aspects.

- The muck does not fall/flow into stream/river.
- Dumping sites should be at least 30 m (horizontal) away from the High Flood Level of the River/ stream.
- The sites are free from active landslides or creeps.
- The sites should not fall within pristine forest nor are these habitats of threatened species of flora and fauna.
- The sites are located close to its source in order to avoid long distance haulage.

Requirement of total muck disposal area has been given below in Table 3.15:

TABLE 3.15: DETAILS OF MUCK DISPOSAL AREA

Package	Quantity of Muck/Debris generated in Cum	Quantity of Muck with 30% swell factor in Cum	Total Quantity of Muck/Debris including swell factor in Cum	Estimated Quantity of Muck/Debris proposed to be utilized for Filling in cum	Estimated quantity of muck/debris proposed to be dumped in cum.	Estimated quantity of muck/debris dumped in Valley Side within our Proposed ROW in Cum	Estimated quantity of muck/debris dumped in other location in Cum	Avg. Dumping Height in M.	Avg. Dumping Area (Sq m.)	Avg. Dumping Area (Ha.)
IIIB	1505569.50	451670.85	1957240.35	427874.25	1529366.10	33297.00	1496069.10	20	74803.46	7.48

3.2.5 PROPOSED ROW

Proposed ROW varies from 20.00 m to 24.00 for rural area and 14.00 m for built-up area of the project stretch.

Package – IIIB

- Total Land required to implement 2-lane proposal = 31.421 Ha.
- Land Available within PROW= 10.995 Ha.
- **Balance Land to be acquired = 20.426 Ha.**

3.2.6 BRIDGES AND CULVERTS

BRIDGES

There are no bridges have been proposed along the project road. Improvement proposal of all the bridges are given below in Table 3.16:

TABLE 3.16: DETAILS OF MINOR BRIDGES

Sl. No.	Chainage (km)				Remarks for Proposal	Proposed	
	Survey Chainage (km)	Design Chainage (km)	Type of Structures (Bridge)	Span Arrangement		Bridge Type	Span Arrangement (No. x Span in m)
Package – IIIB							
Nil							

CULVERTS

There are 82 nos. of existing culverts (including 42 nos. of Slab Culverts and 40 nos. of Pipe Culverts) on the project road. However, due to geometric improvement 66 nos. existing culverts are reconstructed with box and remaining 16 nos. culverts are avoided and 22 nos. new RCC Box Culverts are proposed.
Improvement Proposals are given below in Table 3.17a & 3.17b:

TABLE 3.17a: DETAILS OF RECONSTRUCTION CULVERTS

Sl. No.	Survey Chainage (Km)	Design Chainage (km)	Existing Details		Proposal	
			Type of Structure	Span Arrangement (M)	Type of Structure	Span Arrangement [Span (M) X Height (M)] (No. of Cell)
Package-IIIB						
1	93.587	89.261	HP	1 X 1.2M	BOX CULVERT	2.0 X 2.0
2	93.866	89.508	HP	1 X 1.2M	BOX CULVERT	2.0 X 2.0
3	94.106	89.711	HP	1 X 1.2M	BOX CULVERT	2.0 X 2.0
4	95.300	90.835	SLAB	1 X 2.6M	BOX CULVERT	3.0 X 3.0
5	95.480	91.002	HP	1 X 2.0M	BOX CULVERT	2.0 X 2.0
6	95.756	91.268	SLAB	1 X 1.7M	BOX CULVERT	2.0 X 2.0
7	95.894	91.405	SLAB	1 X 1.9M	BOX CULVERT	2.0 X 2.0
8	96.025	91.529	SLAB	1 X 1.9M	BOX CULVERT	2.0 X 2.0
9	96.179	91.682	SLAB	1 X 2.6M	BOX CULVERT	3.0 X 3.0
10	96.610	92.104	HP	1 X 1.2M	BOX CULVERT	2.0 X 2.0

Sl. No.	Survey Chainage (Km)	Design Chainage (km)	Existing Details		Proposal	
			Type of Structure	Span Arrangement (M)	Type of Structure	Span Arrangement [Span (M) X Height (M)] (No. of Cell)
11	96.975	92.455	SLAB	1 X 1.8M	BOX CULVERT	2.0 X 2.0
12	97.130	92.595	HP	1 X 1.2M	BOX CULVERT	2.0 X 2.0
13	97.267	92.724	SLAB	1 X 4.2M	BOX CULVERT	4.0 X 4.0
14	97.367	92.824	SLAB	1 X 2.5M	BOX CULVERT	3.0 X 3.0
15	97.477	92.915	SLAB	1 X 1.4M	BOX CULVERT	2.0 X 2.0
16	97.719	93.120	SLAB	1 X 2.6M	BOX CULVERT	3.0 X 3.0
17	97.830	93.230	HP	1 X 1.2M	BOX CULVERT	2.0 X 3.0
18	97.926	93.319	SLAB	1 X 2.7M	BOX CULVERT	3.0 X 3.0
19	97.976	93.370	SLAB	1 X 2.1M	BOX CULVERT	2.0 X 2.0
20	98.168	93.560	SLAB	1 X 2.2M	BOX CULVERT	2.0 X 2.0
21	98.250	93.650	SLAB	1 X 2.2M	BOX CULVERT	2.0 X 2.0
22	98.567	93.948	SLAB	1 X 2.2M	BOX CULVERT	2.0 X 3.0
23	98.793	94.159	SLAB	1 X 2.4M	BOX CULVERT	3.0 X 3.0
24	98.849	94.216	SLAB	1 X 2.3M	BOX CULVERT	2.0 X 2.0
25	99.184	94.531	SLAB	1 X 2.5M	BOX CULVERT	3.0 X 3.0
26	99.356	94.686	SLAB	1 X 2.5M	BOX CULVERT	3.0 X 3.0
27	99.710	95.026	SLAB	1 X 2.3M	BOX CULVERT	2.0 X 2.0
28	99.955	95.250	SLAB	1 X 2.4M	BOX CULVERT	3.0 X 3.0
29	100.099	95.392	SLAB	1 X 2.1M	BOX CULVERT	2.0 X 2.0
30	100.375	95.646	SLAB	1 X 2.3M	BOX CULVERT	2.0 X 2.0
31	100.659	95.922	SLAB	1 X 2.4M	BOX CULVERT	2.0 X 2.0
32	101.243	96.427	SLAB	1 X 2.4M	BOX CULVERT	3.0 X 3.0
33	101.400	96.581	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
34	101.525	96.702	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
35	101.705	96.882	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
36	101.969	97.136	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
37	102.315	97.463	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
38	102.535	97.645	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
39	102.613	97.718	SLAB	1 X 2.5M	BOX CULVERT	3.0 X 3.0
40	102.797	97.899	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
41	102.852	97.955	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
42	104.820	99.866	SLAB	1 X 1.7M	BOX CULVERT	2.0 X 2.0
43	105.113	100.160	PIPE	2 X 1.2M	BOX CULVERT	2.0 X 2.0
44	105.174	100.220	SLAB	1 X 1.8M	BOX CULVERT	2.0 X 2.0
45	105.387	100.432	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
46	105.610	100.645	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
47	105.732	100.777	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
48	105.852	100.888	SLAB	1 X 1.8M	BOX CULVERT	2.0 X 2.0
49	105.994	101.030	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
50	106.140	101.175	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
51	106.421	101.453	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
52	106.540	101.586	SLAB	1 X 3.5M	BOX CULVERT	4.0 X 4.0
53	106.658	101.681	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0

Sl. No.	Survey Chainage (Km)	Design Chainage (km)	Existing Details		Proposal	
			Type of Structure	Span Arrangement (M)	Type of Structure	Span Arrangement [Span (M) X Height (M)] (No. of Cell)
54	106.926	101.944	SLAB	1 X 5.3M	BOX CULVERT	5.0 X 5.0
55	107.270	102.275	SLAB	1 X 6.2M	BOX CULVERT	5.0 X 5.0
56	107.410	102.410	SLAB	1 X 2.2M	BOX CULVERT	2.0 X 2.0
57	107.495	102.496	SLAB	1 X 1.2M	BOX CULVERT	2.0 X 2.0
58	107.524	102.521	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
59	107.676	102.640	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
60	107.782	102.743	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
61	107.837	102.797	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
62	107.919	102.875	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
63	108.040	102.995	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
64	108.194	103.134	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0
65	108.277	103.207	SLAB	1 X 1.9M	BOX CULVERT	2.0 X 2.0
66	108.368	103.292	PIPE	1 X 1.2M	BOX CULVERT	2.0 X 2.0

TABLE 3.17b: DETAILS OF NEW CULVERTS

Sl. No.	Survey Chainage (Km)	Design Chainage (km)	Existing Details		Proposal	
			Type of Structure	Span Arrangement (M)	Type of Structure	Span Arrangement [Span (M) X Height (M)] (No. of Cell)
Package-IIIB						
1	-	89.072	-	-	BOX CULVERT	2.0 X 2.0
2	-	89.625	-	-	BOX CULVERT	2.0 X 2.0
3	-	90.146	-	-	BOX CULVERT	2.0 X 2.0
4	-	90.235	-	-	BOX CULVERT	2.0 X 2.0
5	-	90.446	-	-	BOX CULVERT	2.0 X 2.0
6	-	91.845	-	-	BOX CULVERT	2.0 X 2.0
7	-	92.244	-	-	BOX CULVERT	2.0 X 2.0
8	-	93.004	-	-	BOX CULVERT	2.0 X 2.0
9	-	94.425	-	-	BOX CULVERT	2.0 X 2.0
10	-	95.188	-	-	BOX CULVERT	2.0 X 3.0
11	-	95.986	-	-	BOX CULVERT	2.0 X 2.0
12	-	96.175	-	-	BOX CULVERT	2.0 X 2.0
13	-	97.248	-	-	BOX CULVERT	2.0 X 3.0
14	-	98.134	-	-	BOX CULVERT	2.0 X 2.0
15	-	98.463	-	-	BOX CULVERT	2.0 X 3.0
16	-	98.718	-	-	BOX CULVERT	2.0 X 3.0
17	-	98.935	-	-	BOX CULVERT	2.0 X 2.0
18	-	99.114	-	-	BOX CULVERT	2.0 X 2.0
19	-	99.380	-	-	BOX CULVERT	2.0 X 2.0
20	-	99.641	-	-	BOX CULVERT	2.0 X 2.0
21	-	99.988	-	-	BOX CULVERT	2.0 X 2.0
22	-	102.184	-	-	BOX CULVERT	2.0 X 2.0

3.2.7 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. There are 3 nos. minor junctions in the project road.

TABLE 3.18: LIST OF MAJOR JUNCTIONS

Sl. No.	Chainage (Km)	Name of Junction	Type of Junction	Leads To
Package - IIIB				
Nil				

Minor Junctions:

- Package – IIIB: 2 Nos.

3.2.8 SERVICE ROADS

There is no Service Road proposed along the project stretch.

3.2.9 FOOTPATH AND COVERED DRAINS

Footpath cum RCC cover drain has been proposed in congested built up area for safe movement of pedestrian, Trapezoidal stone masonry open drain has been considered in scattered built-up area on both side of footpath for proper drainage purpose. Details are given below.

TABLE 3.20: DETAILS OF FOOTPATH CUM RCC COVER DRAIN

Chainage		Total Length(m)	Length of CD (m)	Net Length (m)	TCS	Side
From	To					
Package - IIIB						
91050	91250	200		400	TCS-1	Both
99720	100800	1080	18.2	2124	TCS-1	Both
Length of Covered Drain cum Footpath in Package - IIIB = 2524 m						

RR Masonry Trapezoidal open drain has been considered in hill side. The detail list of drain is given below.

TABLE 3.21: DETAILS OF RR MASONRY TRAPEZOIDAL OPEN DRAIN

Chainage		Total Length(m)	Length of CD (m)	Net Length (m)	TCS	Side
From	To					
Package - IIIB						
88980	89080	100	2.6	97	TCS-7	Single Side
89080	89130	50		50	TCS-11	Single Side
89130	91050	1920	24.64	3791	TCS-6	Both Side
91250	91775	525	11.64	513	TCS-7	Single Side
91775	92000	225	2.6	445	TCS-6	Both Side
92000	93225	1225	28.24	1197	TCS-7	Single Side
93225	93375	150	9.14	141	TCS-11	Single Side
93375	93600	225	2.6	222	TCS-7	Single Side
93600	93850	250	2.6	495	TCS-6	Both Side
93850	93975	125	2.7	122	TCS-7	Single Side
93975	94070	95		95	TCS-11	Single Side
94070	94150	80		80	TCS-7	Single Side
94150	94175	25	3.84	21	TCS-11	Single Side
94175	94400	225	2.6	222	TCS-7	Single Side
94400	94500	100	2.6	97	TCS-11	Single Side
94500	94625	125	3.84	121	TCS-7	Single Side
94625	94725	100	3.84	96	TCS-11	Single Side
94725	94800	75		75	TCS-7	Single Side
94800	94870	70		70	TCS-11	Single Side
94870	95100	230	2.6	227	TCS-7	Single Side
95100	95375	275	6.54	268	TCS-11	Single Side
95375	95650	275	5.2	270	TCS-7	Single Side
95650	95875	225		450	TCS-6	Both Side
95925	96100	175	2.6	172	TCS-11	Single Side
96100	96190	90	2.6	87	TCS-7	Single Side
96190	96220	30		30	TCS-11	Single Side
96220	96280	60		60	TCS-7	Single Side
96525	96625	100	2.6	97	TCS-11	Single Side
96700	96775	75	2.6	72	TCS-7	Single Side
96775	96825	50		50	TCS-11	Single Side

Chainage		Total Length(m)	Length of CD (m)	Net Length (m)	TCS	Side
From	To					
96825	96860	35		35	TCS-7	Single Side
96860	96925	65	2.6	62	TCS-11	Single Side
96925	96960	35		35	TCS-7	Single Side
96960	97000	40		40	TCS-11	Single Side
97000	97040	40		40	TCS-7	Single Side
97040	97070	30		30	TCS-11	Single Side
97070	97140	70	2.6	67	TCS-7	Single Side
97140	97190	50		50	TCS-11	Single Side
97190	97240	50		50	TCS-7	Single Side
97240	97580	340	5.3	669	TCS-6	Both Side
97580	97630	50		50	TCS-11	Single Side
97630	97690	60	2.6	57	TCS-7	Single Side
97690	98300	610	11.64	1197	TCS-6	Both Side
98300	98425	125		125	TCS-11	Single Side
98425	98510	85	2.7	82	TCS-7	Single Side
98510	98575	65		65	TCS-11	Single Side
98575	98675	100		100	TCS-11	Single Side
98675	98730	55	2.7	52	TCS-17A	Single Side
98730	98825	95		95	TCS-11	Single Side
98900	99020	120	2.6	235	TCS-6	Both Side
100800	102050	1250	24.8	2450	TCS-6	Both Side
102100	103525	1425	44.88	2760	TCS-6	Both Side
Length of RR Masonry Trapezoidal Drain in Package - IIIB = 18085 m						

3.2.10 ROAD MARKINGS/SIGNAGE/ROAD FURNITURE

Retro-reflective signage 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. Details are given in Volume-VII: Cost Estimate.

3.2.11 BUS BAY & PASSENGER SHELTER

6 nos. of Bus Bays with passenger shelter are provided at 3 habitation areas along the project road. Details of proposed Bus bay location are given below in Table-3.22:

TABLE 3.22: LIST OF BUSBAYS WITH PASSENGER SHELTER

Sl. No.	Design Chainage (km)	Name of the habitation	Side
Package - IIIB			
1	90.970	THUANGTAM VILLAGE	Both
2	99.760	MUALNUAM VILLAGE	Both
3	100.925	MUALNUAM VILLAGE	Both

3.2.12 PROTECTION WORK

For proper protection of proposed road on hill and valley side Breast Wall and retaining wall have been proposed from road safety point of view. Details of Breast Wall, Retaining Wall, Toe wall & Metal Beam Crash Barrier are given in Table 3.23, Table 3.24, Table 3.25 and Table 3.26 respectively.

TABLE 3.23: DETAILS OF BREAST WALL

Chainage		Total Length(m)	Length of CD (m)	Net Length (m)	TCS	Side
From	To					
Package - IIIB						
96280	96525	245	3.84	482	TCS-15	Both
99020	99175	155	2.6	152	TCS-12	Single
99230	99600	370		370	TCS-12	Single
102050	102100	50		100	TCS-15	Both
Length of Breast Wall in Package - IIIB = 1105 m						

TABLE 3.24: DETAILS OF RETAINING WALL

Chainage		Side	Avg. Height	CD Length	Length	Net Length	TCS
From	To						
Package - IIIB							
89080	89130	single	1.5		50	50	TCS-11
93225	93375	single	2	9.14	150	141	TCS-11
93975	94070	single	2		95	95	TCS-11
94150	94175	single	2.5	3.84	25	21	TCS-11
94400	94500	single	3	2.6	100	97	TCS-11
94625	94725	single	4	3.84	100	96	TCS-11
94800	94870	single	3		70	70	TCS-11
95100	95375	single	4	6.54	275	268	TCS-11
95925	96100	single	2	2.6	175	172	TCS-11
96190	96220	single	2		30	30	TCS-11
96525	96625	single	4	2.6	100	97	TCS-11
96625	96700	both	2		150	150	TCS-13
96775	96825	single	2		50	50	TCS-11
96860	96925	single	2	2.6	65	62	TCS-11
96960	97000	single	2		40	40	TCS-11
97040	97070	single	2		30	30	TCS-11
97140	97190	single	2		50	50	TCS-11
97580	97630	single	1.5		50	50	TCS-11
98300	98425	single	3		125	125	TCS-11
98510	98575	single	6		65	65	TCS-11
98575	98675	single	3		100	100	TCS-11
98730	98825	single	4		95	95	TCS-11
98825	98900	both	2		150	150	TCS-13
99020	99175	single	3	2.6	155	152	TCS-12

Chainage		Side	Avg. Height	CD Length	Length	Net Length	TCS
From	To						
Package - IIIB							
99230	99600	single	6		370	370	TCS-12
99600	99660	both	3	2.6	120	115	TCS-13
99660	99720	single	2		60	60	TCS-10
Length of 1.5m Retaining Wall=100m Length of 2.0m Retaining Wall=1031m Length of 2.5m Retaining Wall=21m Length of 3.0m Retaining Wall=660m Length of 4.0m Retaining Wall=557m Length of 6.0m Retaining Wall=435m							

TABLE 3.25: DETAILS OF TOE WALL

Chainage		Total Length(m)	Length of CD (m)	Net Length (m)	TCS	Side
From	To					
Package - IIIB						
Nil						

TABLE 3.26: DETAILS OF METAL BEAM CRASH BARRIER

Chainage		Total Length(m)	Length of CD (m)	Net Length (m)	TCS	Side
From	To					
Package - IIIB						
89080	89130	50		50	TCS-11	Single
93225	93375	150	9.14	141	TCS-11	Single
93975	94070	95		95	TCS-11	Single
94150	94175	25	3.84	21	TCS-11	Single
94400	94500	100	2.6	97	TCS-11	Single
94625	94725	100	3.84	96	TCS-11	Single
94800	94870	70		70	TCS-11	Single
95100	95375	275	6.54	268	TCS-11	Single
95925	96100	175	2.6	172	TCS-11	Single
96190	96220	30		30	TCS-11	Single
96525	96625	100	2.6	97	TCS-11	Single
96625	96700	75		150	TCS-13	Both
96775	96825	50		50	TCS-11	Single
96860	96925	65	2.6	62	TCS-11	Single
96960	97000	40		40	TCS-11	Single
97040	97070	30		30	TCS-11	Single
97140	97190	50		50	TCS-11	Single
97580	97630	50		50	TCS-11	Single
98300	98425	125		125	TCS-11	Single
98510	98575	65		65	TCS-11	Single
98575	98675	100		100	TCS-11	Single
98730	98825	95		95	TCS-11	Single

Chainage		Total Length(m)	Length of CD (m)	Net Length (m)	TCS	Side
From	To					
98825	98900	75		150	TCS-13	Both
99020	99175	155	2.6	152	TCS-12	Single
99230	99600	370		370	TCS-12	Single
99600	99660	60	2.6	115	TCS-13	Both
99660	99720	60		60	TCS-10	Single
Length of Metal Beam Crash Barrier in Package - IIIB = 2803 m						

TABLE 3.26: DETAILS OF COMPOSITE RE WALL

Chainage		Total Length(m)	Length of CD (m)	Net Length (m)	TCS	Side
From	To					
Package - IIIB						
98675	98730	55	2.7	52.3	TCS-17A	Single
99175	99230	55		110	TCS-16A	Both
Length of Composite RE Wall in Package - IIIB = 162.3 m						

HYDRO SEEDING OR VEGETATION

Hydro seeding or roadside vegetation will be provided through hill cutting portion for better stability and prevention of soil erosion. Details are given below.

Packages	Hydro seeding(Sqm)	Turfing(Sqm)
PKG-IIIB	8838	12537

3.2.13 FOREST PROPOSAL

Project road passes through unclassified forest. Forest Clearance proposal will be separately uploaded for that. Total Forest Land required is stated below:

Package – IIIB: 20.426 Ha. (Entire road passes through Eco-Sensitive zone of Kailam Wildlife Sanctuary)

Note

- Chainage wise distance of EROW from the existing centre line of the alignment of Churachandpur-Tuivai Road is given in Annexure 3(A) attached at the end of Volume – I: Main Report.
- Justification for abandoning the existing alignment of Churachandpur-Tuivai Road is given in Annexure 3(B) attached at the end of Volume – I: Main Report.
- Checklist for approval of road alignment of Churachandpur-Tuivai Road is given in Annexure 3(C) attached at the end of Volume – I: Main Report.

CHAPTER - 4
ENGINEERING SURVEYS, INVESTIGATION AND ANALYSIS

4.1 INTRODUCTION

Different types of field studies, engineering surveys and investigations are required to gather data and information for preparation of the report for the project road stretches. The aim of the investigations is to develop an adequate supportive database for selecting and preparing the most appropriate and economic proposal to meet the functional and structural efficiency of the road as well as safety requirements.

The following are the necessary engineering survey and investigations need to be carried out at site to assess the existing characteristics of the road:

(a) Reconnaissance Survey
(b) Road Inventory
(c) Pavement Condition Survey
(d) Inventory and Condition Survey of Existing Structures
(e) Topographical Survey
(f) Traffic Survey
(g) Benkelman Beam Deflection Test
(h) Sub-grade Investigation
(i) Quarry Material Survey
(j) Sub-Soil Exploration

4.2 ENGINEERING SURVEYS AND INVESTIGATIONS

4.2.1 RECONNAISSANCE SURVEY

The consultants made an in-depth study of the available maps of the project area and other relevant information collected. A detailed reconnaissance survey was conducted for the entire stretch of the project road and detail features such as land use, habitation, water routes, river, intersecting roads, utilities such as electrical lines (HT/LT), etc has been noted. The detailed ground reconnaissance of project influence area was utilized for planning and programming the detailed surveys and investigations.

4.2.2 ROAD INVENTORY

Detailed inventory of the project road stretches have been prepared through visual inspection with sample measurements to assess the existing status. Features like existing kilometerage, terrain, land use, width of pavement and shoulders, height of embankment, geometric deficiencies, important road junctions, railway level crossings, utilities, other roadside features etc. were recorded. The inventory is essentially included to collect physical information on the road and its environment for enabling preliminary assessment of the project. The existing road is mostly single lane with earthen shoulder with small stretch having two lane road. The details of these inventories are provided in Appendix: 4.1 of Main Report. Brief summary of the Carriageway & shoulder details are in Table 4.1.

TABLE 4.1: BRIEF SUMMARY OF CARRIAGEWAY AND SHOULDER DETAILS

From (km)	To (km)	Carriageway Width (m)	Shoulder width (m)
Package - IIIB			
93.280	93.500	3.7	0.4
93.500	94.000	3.7	0.4
94.000	94.500	3.7	0.4
94.500	95.000	3.7	0.4
95.000	95.500	3.7	0.4
95.500	96.000	3.7	0.4
96.000	96.500	3.7	0.4
96.500	97.000	3.7	0.4
97.000	97.500	3.7	0.4
97.500	98.000	3.7	0.4
98.000	98.500	3.7	0.4
98.500	99.000	3.7	0.4
99.000	99.500	3.7	0.4
99.500	100.000	3.7	0.4
100.000	100.500	3.7	0.4
100.500	101.000	3.7	0.4
101.000	101.500	3.7	0.4
101.500	102.000	3.7	0.4
102.000	102.500	3.7	0.4
102.500	103.000	3.7	0.4
103.000	103.500	3.7	0.4
103.500	104.000	3.7	0.4
104.000	104.500	3.7	0.4
104.500	105.000	3.7	0.4
105.000	105.500	3.7	0.4
105.500	106.000	3.7	0.4
106.000	106.500	3.7	0.4
106.500	107.000	3.7	0.4
107.000	107.500	3.7	0.4
107.500	108.000	3.7	0.4
108.000	108.500	3.7	0.4
108.500	108.610	3.7	0.4

4.2.3 PAVEMENT CONDITION SURVEY

Pavement condition survey has been carried out as per the standard format. The existing pavement surface is of bituminous type and surface condition along the road varies from fair to poor. Some portion of the stretches, the existing pavement is partially damaged with cracks, potholes, raveling, rutting and considerable amount of patching. Few stretches have been observed where bituminous layer is fully exposed. Detailed field study including pavement condition, shoulder condition,

embankment condition, drainage condition etc. were noted by visual means supplemented by sample measurements. The following measurements were involved:

- Cracking (as a percentage of paved carriageway area)
- Raveling (as a percentage of paved carriageway area)
- Pothole (as a percentage of paved carriageway area)
- Rut depth, mm
- Edge drop, mm

Shoulder and embankment conditions were determined visually and its extent will be noted. The details of the Pavement Conditions are provided in Appendix: 4.2 to the Main Report. Brief summary of existing pavement surface condition are in Table 4.2.

TABLE 4.2: BRIEF SUMMARY OF PAVEMENT CONDITION DETAILS

Good to Fair Condition	Poor Condition
From Km 93.280 to km 108.610= 15.330 km	**Nil**

4.2.4 INVENTORY AND CONDITION SURVEY OF EXISTING STRUCTURES

Inventory and condition survey of the existing bridges and culverts were carried out to identify their number, type, condition and hydrological aspects. Mainly visual inspection and dimensional measurements were carried out during this survey. Data were collected in the standard format. The exercise enabled to collect the visible as-built information to the extent possible and condition to assess the individual requirements of the existing structures enroute, like widening, repair and reconstruction. The details of culvert inventories and condition surveys are provided in Appendix: 4.3 and bridges in Appendix: 4.4 of Main Report. Brief summary of existing structures are in Table 4.3.

Table 4.3: Brief summary of Structure Details

Bridges (Nil)	
Type	**No.**
Bridges	Nil
Culverts (Total 82 nos.)	
Type	**No.**
RCC Slab Culverts	42 nos.
HP Culverts	40 nos.

4.2.5 TOPOGRAPHIC SURVEY

The specific objective of the topographical survey is to delineate accurately the complete existing natural and man-made features, so as to study and develop the existing road, creating an accurate Digital Terrain Model, which is also a fundamental requirement to design the highway through latest software. The detailed topographical survey for the existing road as well as realignment stretches were completed with fixing BM pillars according to the procedure outlined in the TOR. A list of TBM and GPS pillars established along the project road is given in Appendix: 4.5 of Main Report. Summary of BM, TBM and GPS pillar list are in Table 4.4.

TABLE 4.4: SUMMARY OF PILLARS DETAILS

❖ **BM Pillar List**

BM No.	Easting (m)	Northing (m)	R.L. (m)
Package-IIIB			
BM-113/3	537266.418	2672481.733	1196.231
BM-114/1	537238.121	2672288.169	1176.883
BM-114/2	537126.689	2672408.677	1170.549
BM-115/1	537326.005	2672804.083	1148.481
BM-115/2	537368.24	2672926.474	1140.501
BM-115/3	537474.737	2673155.944	1124.672
BM-115/4	537387.577	2673098.976	1113.397
BM-116/1	537142.878	2672864.716	1095.722
BM-116/2	536928.218	2672769.899	1083.743
BM-116/3	536766.337	2672747.297	1074.642
BM-117/1	536399.483	2672893.632	1055.233
BM-117/2	536175.026	2672833.292	1041.317
BM-117/3	536089.505	2672889.263	1030.666
BM-118/1	536018.805	2672593.337	1010.768
BM-118/2	535953.722	2672386.293	1002.252
BM-118/3	535956.693	2672257.129	990.633
BM-119/1	535801.226	2671889.247	973.57
BM-119/2	535799.797	2671976.43	961.564
BM-119/3	535851.572	2672277.5	945.467
BM120/1	535745.144	2672530.667	912.089
BM120/2	535706.204	2672415.619	900.947
BM120/3	535602.832	2672289.121	884.206
BM121/1	535370.147	2672024.012	863.145
BM121/2	535331.787	2671788.763	847.547
BM121/3	535320.539	2671596.823	837.263
BM122/1	535118.268	2671223.393	809.341
BM122/2	534925.546	2671252.592	802.547
BM122/3	534722.11	2671196.534	791.925
BM123/1	534502.579	2670897.982	768.631
BM123/2	534368.132	2670888.857	758.749
BM123/3	534284.249	2670663.13	745.858
BM124/1	534176.217	2670307.19	717.236
BM124/2	534077.08	2670215.539	702.989
BM124/3	534144.823	2670064.485	693.18
BM125/1	534303.426	2669869.394	675.817
BM125/2	534471.34	2669779.694	677.063
BM125/3	534612.454	2669813.357	673.87
BM126/1	535070.37	2669884.909	657.495
BM126/2	535313.634	2669801.575	649.787
BM126/3	535504.039	2669888.214	640.993

BM No.	Easting (m)	Northing (m)	R.L. (m)
Package-IIIB			
BM127/1	535547.724	2670213.667	624.794
BM127/2	535568.768	2670387.006	610.772
BM127/3	535534.025	2670614.322	612.86
BM128/1	535721.38	2670376.057	623.989
BM128/2	535776.789	2670109.334	628.998
BM128/3	535952.511	2669995.731	634.337
BM129/1	536142.89	2669696.359	615.657
BM129/2	536176.937	2669518.689	606.117
BM129/3	536074.163	2669529.488	605.571
BM-130/1	535645.543	2669686.012	615.979
BM-130/2	535546.535	2669524.429	616.029
BM-130/3	535451.558	2669399.349	620.008
BM-131/1	535481.974	2668969.94	632.834
BM-131/2	535483.941	2668826.051	631.572
BM-131/3	535402.07	2669022.806	630.532

❖ **TBM Pillar List**

TBM No.	Easting (m)	Northing (m)	R.L. (m)	Remarks
Package-IIIB				
TBM-J/48	541328.616	2670468.058	851.07	On the top of parapet
TBM-J/50	541504.592	2670418.964	863.23	On the top of parapet
TBM-J/49	541498.895	2670424.921	863.245	On the top of parapet
TBM-J/56	540901.638	2671522.359	966.445	On the top of parapet
TBM-J/54	540891.286	2671325.101	954.195	On the top of parapet
TBM-J/53	540883.883	2671328.669	954.68	On the top of parapet
TBM-J/52	540905.998	2671137.78	943.567	On the top of parapet
TBM-J/51	540913.562	2671134.712	943.583	On the top of parapet
TBM-S/45	540966.489	2670953.96	933.363	On the top of parapet
TBM-S/44	540974.646	2670954.405	933.552	On the top of parapet
TBM-S/57	540454.367	2673256.706	1089.239	On the top of parapet
TBM-S/56	540455.637	2673251.481	1088.963	On the top of parapet
TBM-S/55	540475.063	2673038.596	1088.151	On the top of parapet
TBM-S/54	540467.478	2673038.819	1088.642	On the top of parapet
TBM-J/56	540778.02	2672756.149	1069.892	On the top of parapet
TBM-J/57	540606.199	2672560.261	1053.51	On the top of parapet
TBM-J/58	540582.164	2672524.456	1052.819	On the top of guard wall
TBM-J/59	540530.352	2672504.385	1051.094	On the top of parapet
TBM-J/60	540536.403	2672501.209	1050.967	On the top of parapet
TBM-J/61	540457.531	2672420.397	1043.993	On the top of guard wall
TBM-S/53	540387.058	2672277.346	1036.852	On the top of parapet
TBM-S/52	540398.376	2672265.022	1036.291	On the top of guard wall

TBM No.	Easting (m)	Northing (m)	R.L. (m)	Remarks
Package-IIIB				
TBM-S/50	540622.999	2672161.533	1020.314	On the top of parapet
TBM-S/51	540628.377	2672155.437	1019.168	On the top of parapet
TBM-S/47	540900.019	2672079.998	1004.119	On the top of parapet
TBM-S/46	540904.25	2672086.876	1003.93	On the top of parapet
TBM-S/49	541016.992	2671992.405	996.19	On the top of parapet
TBM-S/48	541024.813	2671994.997	996.036	On the top of parapet
TBM-J/75	540743.087	2674826.748	1153.834	On the top of parapet
TBM-J/74	540738.167	2674820.379	1153.955	On the top of parapet
TBM-J/71	540915.052	2674816.919	1146.29	On the top of parapet
TBM-J/70	540916.723	2674824.864	1146.065	On the top of parapet
TBM-J/69	541040.677	2674668.629	1128.615	On the top of parapet
TBM-J/68	540917.136	2674545.178	1126.645	On the top of parapet
TBM-J/67	540726.676	2674356.796	1124.563	On the top of parapet
TBM-J/62	540950.357	2674200.046	1121.579	On the top of parapet
TBM-J/63	540868.385	2674019.022	1121.625	On the top of parapet
TBM-J/64	541101.57	2673882.576	1115.065	On the top of parapet
TBM-J/65	541101.652	2673874.523	1114.91	On the top of parapet
TBM-J/66	540972.09	2673795.288	1110.156	On the top of parapet
TBM-S/59	540548.94	2673432.289	1095.822	On the top of guard wall
TBM-S/58	540550.621	2673435.389	1095.842	On the top of parapet
TBM-S/61	540130.53	2674941.504	1173.466	On the top of parapet
TBM-S/60	540134.313	2674949.151	1173.465	On the top of parapet
TBM-S/62	540552.288	2674896.285	1159.708	On the top of parapet
TBM-S/63	540548.232	2674903.522	1159.643	On the top of parapet
TBM-J/73	540833.896	2674872.413	1150.63	On the plinth level of semi pucca hutment
TBM-J/72	540835.245	2674868.738	1150.635	On the plinth level of semi pucca hutment
TBM-S/69	539124.13	2674526.661	1167.277	On the top of guard wall
TBM-S/68	539130.452	2674531.292	1167.338	On the top of guard wall
TBM-S/70	539145.584	2674551.369	1167.643	On the top of parapet
TBM-S/72	539047.299	2674883.932	1177.708	On the top of guard wall
TBM-S/71	539053.048	2674877.472	1177.561	On the top of parapet
TBM-S/74	539127.548	2675004.298	1184.889	On the top of guard wall
TBM-S/73	539126.784	2674999.046	1184.618	On the top of guard wall
TBM-J/85	538991.489	2675183.466	1190.582	On the top of parapet
TBM-J/84	538998.573	2675194.384	1190.925	On the top of ground water tank
TBM-J/83	539068.625	2675279.301	1193.27	On the top of parapet
TBM-J/82	539192.525	2675453.155	1203.001	On the top of parapet
TBM-J/81	539193.876	2675450.182	1203.342	On the top of ground water tank
TBM-J/80	539267.251	2675698.219	1213.48	On the top of parapet
TBM-J/79	539260.512	2675703.422	1213.86	On the top of parapet
TBM-J/76	539346.636	2675845.412	1219.15	On the top of parapet
TBM-J/77	539348.498	2675838.865	1219.295	On the top of parapet

TBM No.	Easting (m)	Northing (m)	R.L. (m)	Remarks
Package-IIIB				
TBM-J/78	539405.92	2675939.014	1220.924	On the top of parapet
TBM-S/67	539529.356	2675949.74	1214.728	On the top of parapet
TBM-S/66	539529.65	2675957.824	1214.771	On the top of parapet
TBM-S/65	539818.693	2675444.125	1196.714	On the top of guard wall
TBM-S/64	539822.702	2675442.296	1196.713	On the top of guard wall
TBM-S/75	539246.032	2674281.981	1174.179	On the top of parapet
TBM-S/76	539253.48	2674285.963	1175.768	On the top of parapet
TBM-J/90	539206.48	2673383.555	1232.61	On the top of guard wall
TBM-J/89	539206.916	2673390.685	1232.115	On the top of guard wall
TBM-J/97	539216.464	2673492.143	1226.521	On the top of parapet
TBM-J/96	539261.204	2673554.411	1222.99	On the top of parapet
TBM-J/95	539255.305	2673559.714	1222.98	On the top of parapet
TBM-J/94	539281.45	2673608.482	1220.01	On the top of parapet
TBM-J/93	539273.729	2673609.229	1220.147	On the top of parapet
TBM-J/92	539338.03	2673819.079	1206.779	On the top of parapet
TBM-J/91	539347.713	2673844.035	1205.67	On the top of parapet
TBM-S/77	539389.589	2674057.434	1194.462	On the top of parapet
TBM-S/78	539381.27	2674058.157	1194.147	On the top of parapet
TBM-S/80	539204.271	2672862.65	1262.074	On the top of parapet
TBM-S/79	539211.113	2672857.063	1262.452	On the top of parapet
TBM-J/86	539206.583	2673096.085	1248.16	On the top of parapet
TBM-J/88	539206.059	2673182.348	1243.86	On the top of parapet
TBM-J/87	539213.371	2673179.432	1244.375	On the top of parapet

❖ **GPS Pillar List**

GPS No.	Easting (m)	Northing (m)	Elevation (m)
GPS-93	541638.119	2670400.439	869.178
GPS-94	540962.156	2671026.42	936.432
GPS-95	541080.146	2671738.672	979.355
GPS-95A	541229.881	2671781.32	983.579
GPS-96	540502.792	2672222.959	1029.72
GPS-97	540790.994	2672704.91	1065.308
GPS-98	540702.181	2673545.714	1098.387
GPS-99	541148.875	2673802.377	1113.765
GPS-100	540937.967	2674549.427	1126.142
GPS-100A	541018.132	2674614.949	1127.307
GPS-101	540808.248	2674871.782	1151.615
GPS-102	539992.187	2675180.032	1184.211
GPS-103	539396.183	2675965.661	1221.105
GPS-104	539047.321	2675270.465	1192.275
GPS-105	539134.753	2674532.752	1166.683
GPS-105A	539077.263	2674478.195	1165.889

GPS No.	Easting (m)	Northing (m)	Elevation (m)
GPS-106	539299.241	2673811.029	1207.847
GPS-107	539201.534	2673115.905	1246.306

The survey has been done involving the following sequential steps:

1. Establishing Bench Marks
2. Traversing and Leveling
3. Cross-section Surveying/Detailing

Following features were recorded during detailing, in general:

- ✓ Carriageway crown, carriageway edges and two intermediate carriageway points
- ✓ Roadway edges (shoulder break-points)
- ✓ Embankment toe-line
- ✓ Borrow pit / pond / ditch / toe drain profile, where present
- ✓ All break-points of natural ground
- ✓ Positions of individual entities such as trees, utility lines and poles, wells and tube wells, other pillars like ROW etc.
- ✓ Property lines and structures (with description)
- ✓ Salient points on bridges and culverts (e.g. abutment, headwall, inverts level, etc.)

The data for each survey point were recorded in terms of Northing, Easting, and Elevation. To ensure standardization of works of different survey teams and to facilitate further CAD works, a rational coding system was developed and used.

The survey data collected in the field was downloaded in text file format and converted to graphic files using suitable software.

4.2.6 TRAFFIC SURVEY

Following traffic surveys were conducted at site to estimate the present and future traffic of the project road.

- Classified traffic volume count survey
- Axle Loading Characteristics Survey
- Intersection Volume Count Survey
- Origin - Destination Survey
- Pedestrian count Survey
- Speed & Delay Survey

The details of the Traffic Survey Locations and Analysis are provided in Chapter - 7 of the Main Report.

4.2.7 BENKELMAN BEAM DEFLECTION SURVEY

The test has been carried out for 11 km on the basis of pavement condition survey. Appendix-4.6 shows the rebound deflections measured using Benkelman Beam method (as per IRC- 81:1997) and calculation of characteristic deflections which will be required for overlay design. **Table 4.5** represents the characteristic deflection along the existing road.

Table 4.5: Characteristic Deflection with Recommended Overlay Thickness

Existing Chainage (Km)		Length (m)	Average Characteristics deflection (mm)	Design MSA	Required BM (mm)	Equivalent BC+DBM (mm)	Recommended Overlay Thickness	
From	To						BC	DBM
0.000	1.000	1000	0.734	20	70	49	40	50
1.000	2.000	1000	0.627	20	70	49	40	50
21.000	22.000	1000	0.685	20	70	49	40	50
33.000	34.000	1000	0.638	20	70	49	40	50
80.000	81.000	1000	0.622	20	70	49	40	50
81.000	82.000	1000	0.658	20	70	49	40	50
82.000	83.000	1000	0.872	20	70	49	40	50
108.000	109.000	1000	0.642	20	70	49	40	50
109.000	110.000	1000	0.648	20	70	49	40	50
116.000	117.000	1000	0.592	20	70	49	40	50
117.000	118.000	1000	0.660	20	70	49	40	50
118.000	119.000	1000	0.685	20	70	49	40	50
119.000	120.000	1000	0.517	20	70	49	40	50

4.2.8 SUB-GRADE INVESTIGATION

Trial pits of size 1m x 1m were dug at the pavement shoulder interface at 0.5 km interval, extending through the pavement layers down to the sub-grade level to assess the following:

a) Visual classification of soil
b) Field density
c) Field moisture content
d) Atterberg Limits
e) Existing pavement composition
f) Available CBR

After the completion of field tests and collection of samples, the pits were backfilled with the excavated materials and compacted suitably so as not to discomfort the smooth movement of traffic of the existing road.

Analysis of Results

The results of field and laboratory investigations have been compiled in the form of tables and figures and summarized in Annexure - II of Volume III - Material Report. The factual results and the corresponding interpretations will be instrumental to assess the actual scenario of the existing road construction and will form a basis for the design of pavement structure. Summary of laboratory test result is given in Table 4.6

TABLE 4.6: SUMMARY OF LABORATORY TEST RESULT

2 Laning with paved shoulder of Churachandrapur-Tuivai Road Sec on NH-102B in Manipur			LABORATORY TEST RESULTS																			
SL NO	LOCATION / CHAINAGE (KM)	Sample No.	SIEVE ANALYSIS (% PASSING BY WEIGHT)						ATTERBERG LIMIT			I.S. CLASSI-FICATION	Differential Free swell Index %	Laboratory Compaction (Heavy)		SOAKED CBR AT 3 ENERGY LEVELS						SOAKED CBR AT 97 % OF MDD
																Test 1		Test 2		Test 3		
			20 mm	10 mm	4.75 mm	2.00 mm	425 m	75 m	LL (%)	PL (%)	PI (%)			MDD (gm/cc)	OMC (%)	DD (gm/cc)	Soaked CBR %	DD (gm/cc)	Soaked CBR %	DD (gm/cc)	Soaked CBR %	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	93.000	TP-187	89	76	66	59	42	33	32	22	10	SC	4.50	2.025	11.40	1.724	18.929	1.929	22.54	2.061	34.34	25.66
2	93.500	TP-188	73	64	56	46	38	25	Non Plastic			SM	2.00	2.155	9.80	1.875	16.717	2.067	20.72	2.173	35.17	23.88
3	94.000	TP-189	100	95	84	68	55	46	38	29	9	SC	3.00	1.985	13.25	1.694	9.749	1.887	14.76	1.966	29.00	21.65
4	94.500	TP-190	92	88	83	79	61	39	34	24	10	SC	5.00	1.967	12.53	1.655	8.885	1.801	14.45	2.003	28.63	21.97
5	95.000	TP-191	Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade																			
6	95.500	TP-192	Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade																			
7	96.000	TP-193	Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade																			
8	96.500	TP-194	Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade																			
9	97.000	TP-195	84	71	58	45	32	24	Non Plastic			SM	2.50	2.125	9.83	1.809	13.782	2.025	24.30	2.163	68.01	35.87
10	97.500	TP-196	87	78	70	63	37	23	Non Plastic			SM	2.00	2.116	10.42	1.785	11.943	1.981	20.47	2.096	46.61	36.79
11	98.000	TP-197	85	71	55	39	20	18	Non Plastic			SM	4.00	2.170	10.15	1.848	15.620	2.068	25.15	2.209	71.44	37.40
12	98.500	TP-198	81	66	56	45	32	21	Non Plastic			SM	1.75	2.164	9.39	1.827	11.385	2.043	20.32	2.181	64.78	38.33
13	99.000	TP-199	Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade																			
14	99.500	TP-200	100	99	95	88	69	59	36	22	14	CI	7.50	2.021	14.95	1.745	7.130	1.921	7.81	2.044	9.71	8.42
15	100.000	TP-201	100	96	91	83	69	62	38	24	14	CI	5.00	2.004	15.03	1.753	4.959	1.923	6.82	2.017	13.11	8.23
16	100.500	TP-202	100	97	94	90	76	66	40	23	17	CI	6.00	1.976	15.44	1.722	2.038	1.806	3.59	1.988	10.06	7.52
17	101.000	TP-203	100	96	93	89	77	65	41	24	17	CI	5.00	1.987	15.97	1.679	2.571	1.833	4.41	2.015	10.03	7.32
18	101.500	TP-204	100	100	90	82	75	70	40	23	17	CI	8.33	1.825	14.30	1.515	2.470	1.703	4.19	1.809	8.31	6.82
19	102.000	TP-205	100	100	91	82	74	68	39	23	16	CI	4.17	1.840	14.70	1.572	2.780	1.736	4.52	1.832	8.96	6.79
20	102.500	TP-206	100	86	76	63	54	48	31	19	12	SC	10.00	1.972	13.25	1.697	10.114	1.847	12.53	1.990	21.28	16.58
21	103.000	TP-207	100	96	89	71	45	29	Non Plastic			SM	0.00	2.246	12.46	1.874	18.092	2.121	23.98	2.262	40.74	30.80
22	103.500	TP-208	63	42	34	27	22	16	Non Plastic			GM	0.00	Modified proctor and CBR Test could not be possible due to Rock Bed/ Very high percentage of Rock pieces in subgrade								
23	104.000	TP-209	88	67	57	38	28	19	Non Plastic			SM	0.00	2.175	9.90	1.817	12.286	2.027	17.39	2.119	32.15	30.68
24	104.500	TP-210	94	76	60	47	32	23	Non Plastic			SM	0.00	2.230	10.62	1.937	14.355	2.112	22.10	2.242	50.33	33.17
25	105.000	TP-211	91	85	79	70	53	25	Non Plastic			SM	0.00	2.162	11.28	1.890	16.557	2.000	22.76	2.166	43.75	35.01
26	105.500	TP-212	100	87	76	67	57	26	Non Plastic			SM	0.00	1.945	12.50	1.575	16.996	1.879	25.37	1.953	27.65	25.60
27	106.000	TP-213	93	85	80	73	49	30	34	22	12	SC	3.00	2.147	11.75	1.823	15.902	2.029	18.94	2.160	28.85	23.01
28	106.500	TP-214	89	76	61	50	40	30	37	21	16	SC	4.55	2.040	10.75	1.761	8.689	1.957	13.01	2.005	25.43	18.65
29	107.000	TP-215	100	100	97	94	87	50	41	24	17	CI	6.98	1.927	14.80	1.600	3.138	1.798	5.10	1.910	10.11	8.30

2 Laning with paved shoulder of Churachandrapur-Tuivai Road Sec on NH-102B in Manipur													LABORATORY TEST RESULTS									
SL NO	LOCATION / CHAINAGE (KM)	Sample No.	SIEVE ANALYSIS (% PASSING BY WEIGHT)						ATTERBERG LIMIT			I.S. CLASSI-FICATION	Differential Free swell Index %	Laboratory Compaction (Heavy)		SOAKED CBR AT 3 ENERGY LEVELS						SOAKED CBR AT 97 % OF MDD
																Test 1		Test 2		Test 3		
			20 mm	10 mm	4.75 mm	2.00 mm	425 m	75 m	LL (%)	PL (%)	PI (%)			MDD (gm/cc)	OMC (%)	DD (gm/cc)	Soaked CBR %	DD (gm/cc)	Soaked CBR %	DD (gm/cc)	Soaked CBR %	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
30	107.500	TP-216	93	88	81	73	65	49	39	23	16	SC	5.00	1.885	13.29	1.647	5.052	1.744	8.21	1.889	16.28	12.92
31	108.000	TP-217	88	80	74	67	52	43	35	22	13	SC	5.50	1.915	12.16	1.663	11.827	1.814	14.08	1.925	21.45	16.97
32	108.500	TP-218	100	93	85	78	58	40	33	18	15	SC	4.00	2.181	13.20	1.813	10.106	2.023	12.45	2.206	22.53	17.55
33	109.000	TP-219	100	89	75	56	30	19	Non Plastic			SM	0.00	2.342	11.24	2.047	18.340	2.167	27.47	2.346	53.68	42.77

Composition of Existing Pavement

Existing crust thickness varies from 100mm to 540mm. The layer composition of the existing pavement noted from each excavated pit is given Annexure - I of Volume – III: Material Report.

4.2.9 QUARRY MATERIAL

The material investigation for road construction material required to be carried out to identify the potential sources of construction materials and to assess their general availability, engineering properties and quantities. This is one of the most important factors for stable, economic and successful implementation of the road program within the stipulated time. The material investigation is quite representative, but more exhaustive search may surely be explored by the contractors at the time of construction. For improvement work as well as for new construction the list of materials includes the following:

- Granular materials for sub-base works
- Crushed stone aggregates for base , bituminous surfacing and cement concrete works
- Sand for bituminous and cement concrete works, sub-base, filter materials and filling materials etc.
- Borrow earth/moorum materials for embankment, sub-grade and filling.

OBJECTIVE

The following are the basic objective to make material investigation:

- Source locations indicating places, kilometerage, availability and the status whether in operation or new source.
- Access to source, indicating the direction and nature of the access road i.e. left/ right of project road, approximate lead distance from the gravity center and type of access road.
- Ownership of land/ quarries, either government or private.
- Test results, indicating the quality of materials with respect to their suitability in construction.
- Probable use indicating the likely use of materials at various stages of construction work i.e. fill material, sub-grade, sub-base, base, bituminous surfacing and cross drainage structures.

The potential sources of construction materials were selected from consideration of the availability and suitability of the materials, easy access to the source and minimum hauling distance from the source in order to make the construction economical and feasible as far as possible. Details are given below:

Leads for Various Materials (Package – IIIB)

Sl. No.	Name of Material	Name of Source	Distance from Source to Project Road (Km)	Half of length of Project Road (Km)	Total Lead (Km)
1	Sand (Fine)	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
2	Filling Material	Local	-	-	10.00
3	Stone Metal	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
4	Stone Boulder	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
5	Stone Chips,	Tuivai River	21.61	7	28.88

Leads for Various Materials (Package – IIIB)

Sl.	Name of	Name of Source	Distance from	Half of length of	Total Lead
	Aggregate	(Near Khuanggin Village)			
6	Coarse Sand	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
7	Cement	Imphal	159	7	166.38
8	Steel	Imphal	159	7	166.38
9	Bitumen	Imphal	159	7	166.38
10	Bitumen Emulsion	Imphal	159	7	166.38
11	Structural Steel	Imphal	159	7	166.38
12	RCC Pipe	Imphal	159	7	166.38

4.2.10 BORROW AREA REQUIREMENT:

Package – IIIB:

Quantity of Earthwork in Cutting = 1023594 cum (Ref. Quantity Calculation for Road Works of Volume-VII: Cost Estimation)
Total ordinary Rock Cutting volume = 204719 cum
So, total quantity of Earthwork in soil = (1023594 – 204719) cum = 818875 cum

Amount of Earthwork can be used for filling of embankment from Roadway cutting material (considering 60% quantity of Earthwork in soil) = 491325 cum

Now, requirement of total Earthwork quantity in Filling is 292448 cum., which can be compensated from the suitable roadway cut material.

Therefore, no Borrow area soil is required for embankment construction in Package – IIIB of the project road.

4.2.11 MUCK DISPOSAL

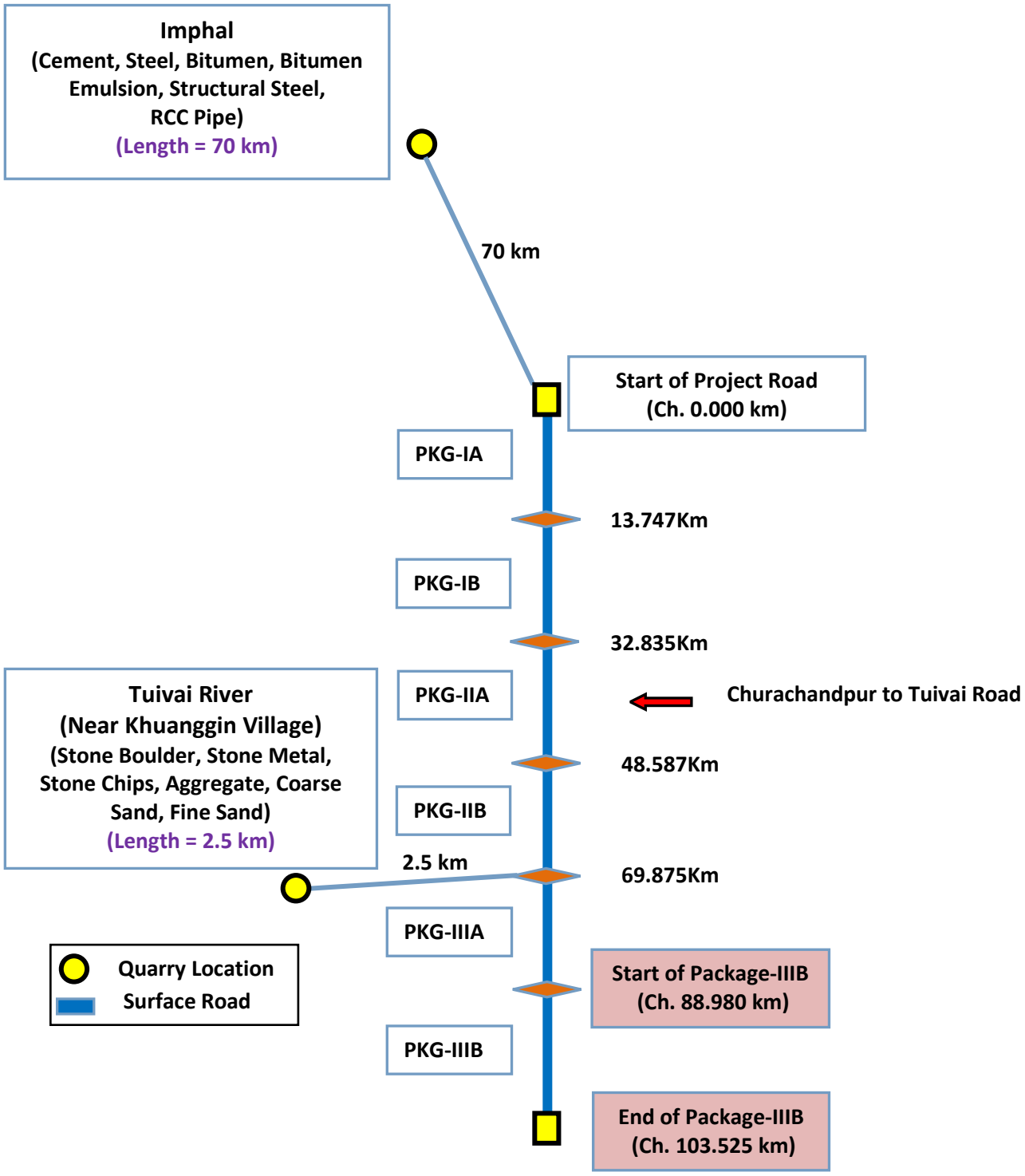
The muck from hill cutting and construction activities will be safely disposed at suitable locations. Principle adopted for selecting muck dumping areas was to avoid sensitive areas like dense vegetation, natural water courses and areas prone to landslides. During the selection of the dumping sites preference was given on the following aspects.

- The muck does not fall/ flow into stream/river.
- Dumping sites should be at least 30 m (horizontal) away from the High Flood Level of the River/ stream.
- The sites are free from active landslides or creeps.
- The sites should not fall within pristine forest nor are these habitats of threatened species of flora and fauna.
- The sites are located close to its source in order to avoid long distance haulage.

Details of Muck Disposal area has given below:

Package	Quantity of Muck/Debris generated in Cum	Quantity of Muck with 30% swell factor in Cum	Total Quantity of Muck/Debris including swell factor in Cum	Estimated Quantity of Muck/Debris proposed to be utilized for Filling in cum	Estimated quantity of muck/debris proposed to be dumped in cum.	Estimated quantity of muck/debris dumped in Valley Side within our Proposed ROW in Cum	Estimated quantity of muck/debris dumped in other location in Cum	Avg. Dumping Height in M.	Avg. Dumping Area (Sq m.)	Avg. Dumping Area (Ha.)
IIIB	1505569.50	451670.85	1957240.35	427874.25	1529366.10	33297.00	1496069.10	20	74803.46	7.48

Lead Chart for Material



4.2.12 PHOTOGRAPHS

Photographs of field activities are given below:

Road Inventory at Ch. Km 68+500

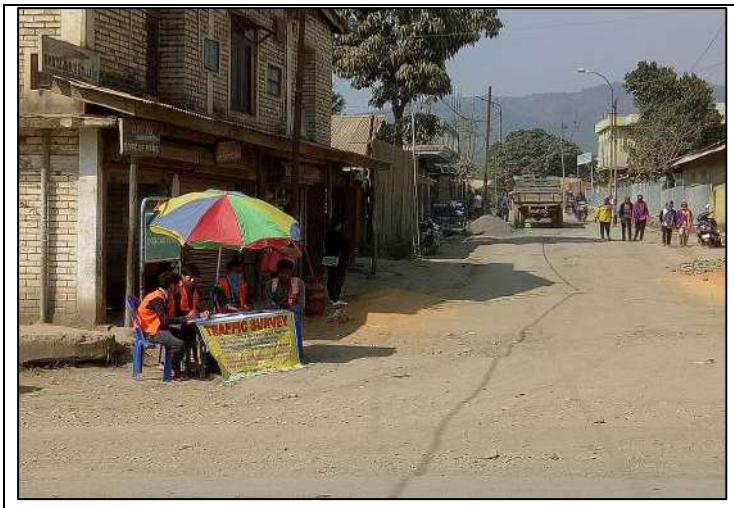
Pavement Condition Survey at Ch. Km 40+500

Culvert Inventory at Ch. Km 26+400

Bridge Inventory at Ch. Km 48+304

Topographic Survey at km 5+300

Trial Pit at km 14+100



TMC Survey

CTVC Survey

Axle Load survey

OD Survey

Pedestrian Survey

BBD Survey

CHAPTER-5
SOCIAL ANALYSIS

5.1 INTRODUCTION AND BACKGROUND

5.1.1 The Project

Manipur is one of the Border States in the north-eastern part of the country having an international boundary of about 353 kms. long stretch of land with Myanmar in the southeast. It is bounded by Nagaland in the north, Assam in the west and Mizoram in the south. It has a total area of 22327 sq. kms. It lies between 23.80 N to 25.70 N latitude and 93.50 E to 94.80 E longitude.

Geographically, the State of Manipur could be divided into two regions, viz. the hill and the valley. The valley lies in the central part of the State and the hills surround the valley. The average elevation of the valley is about 790 m above the sea level and that of the hills is between 1500 m and 1800m. Manipur earlier had 9 districts - Imphal West, Imphal East, Bishnupur, Thoubal, Ukhrul, Senapati, Tamenglong, Churachandpur and Chandel and the newly formed districts are Kangpokpi, Tengnoupal, Pherzawl, Noney, Kamjong, Jiribam and Kakching. The hill districts occupy about 90 percent (20089 sq km) of the total area of the State and the valley occupies only about tenth (2238 sq km) of the total area of the State. Imphal is the capital city of Manipur.

In the need of development of the newly created state the Government of India under the vehicle of National Highway Authority of India had initiated in constructing/upgrading the road conditions in the state. The district of Churachandpur in the state of Manipur, does not have any railway connectivity so there was an urgent requirement of the development of the roadways.

Realizing the above fact National Highways & Infrastructure Development Corporation Limited (NHIDCL) has taken up one prestigious road network improvement projects namely developing a road from Churachandpur to Tuivai (Mizoram Border). The upgraded road will connect Manipur (Churachandpur Town) and Mizoram at Tuivai. The Design road length is 145.984 km. The road starts Chrachandpur main town and end at Tuivai. The project road has distributed in nine packages. This Report elaborate and describe the Third package. Project road distribution as follows in **Table 5.1**

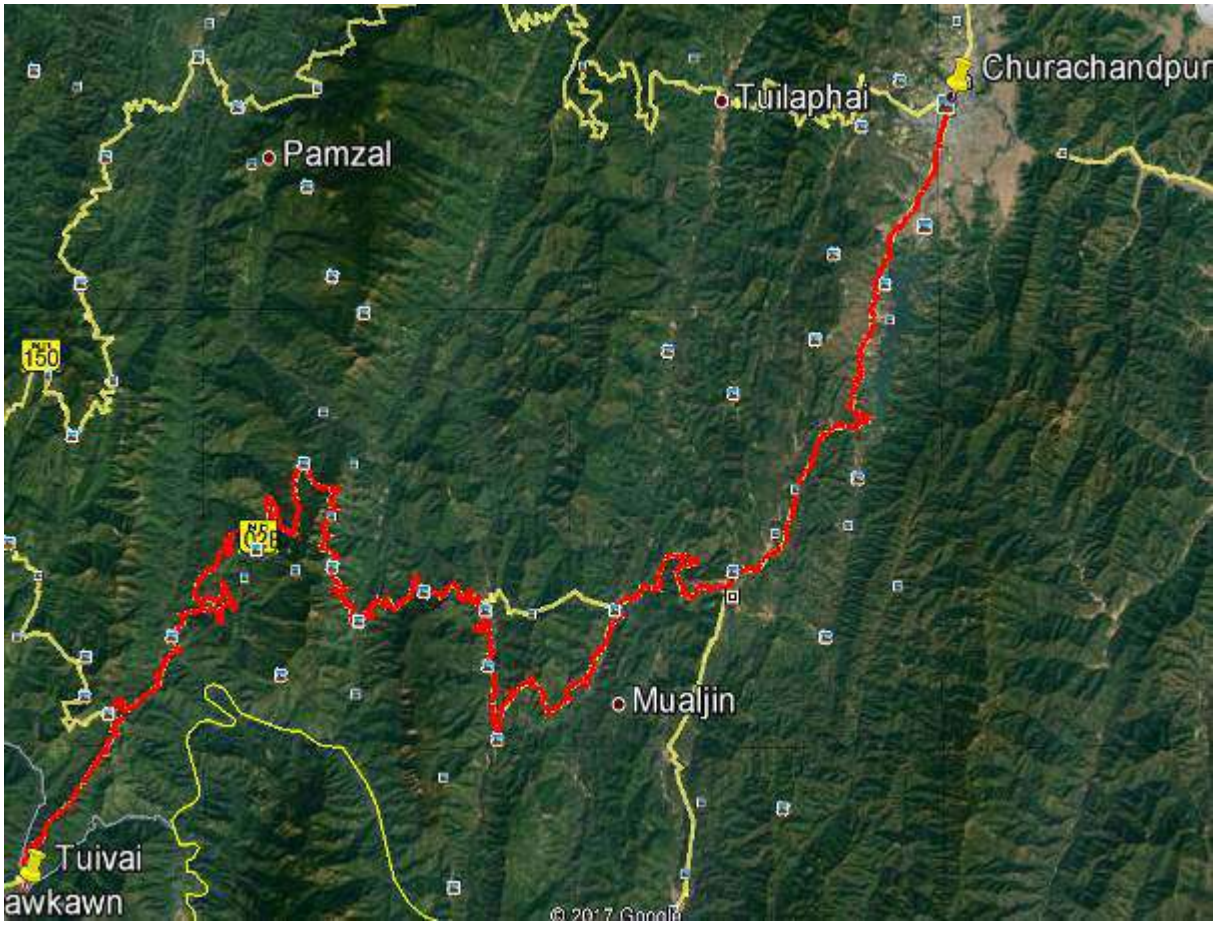
Table 5.1: Project Road Distribution

Existing Chainage (Km)		Design Chainage (Km)		Length (Km)	Package No.
From	To	From	To		
0+000	14+210	0+000	13+747	13.747	Pkg-IA
14+210	34+800	13+747	32+835	19.088	Pkg-IB
34+800	51+147	32+835	48+587	15.752	Pkg-IIA
51+147	73+000	48+587	69+875	21.288	Pkg-IIB
73+000	93+280	69+875	88+980	19.105	Pkg-IIIA
93+280	108+610	88+980	103+525	14.545	Pkg-IIIB
108+610	134+270	103+525	121+769	18.244	Pkg-IIIC
134+270	149+630	121+769	134+955	13.186	Pkg-IVA
149+630	161+445	134+955	145+984	11.029	Pkg-IVB

Provision of a high class access controlled facility for high mobility in the form of NH/SH may be useful in bypassing the city by external traffic, if it is not connected to the core by proper road network. It will not be helpful in decongesting the core area. Realizing this need NH has proposed 30 National Highways in its master plan. The National Highways not only provide connectivity between the cities but also serve as a connecting link between proposed townships and the cities. They also help in serving the traffic expected to be generated by the exploring activities in the outer municipalities. The NH with its service roads connected to the cities by National Highway network is expected to direct the development of Project Influence Area and will be a position to cater the travel demand patterns generated by these developments.

The National Highway Infrastructural Development Corporation Limited (NHIDCL) Manipur Wing planned to develop the major arterial roads to facilitate smooth traffic flow on existing major arterials and State Highways.

Figure 5.1: Depicting Map of the Project Road



Source: Google

Adequate attention has been given during the feasibility 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 involuntary resettlement impacts.

This Resettlement Plan (RP) is prepared to mitigate all unavoidable negative impacts caused due to the project, resettle the displaced persons and restore their livelihoods. This Full Resettlement Plan has been prepared on the basis of census survey findings and consultation with various stakeholders. The plan complies with NHIDCL policy for involuntary resettlement and rehabilitation.

5.1.2 Scope of Land Acquisition and Resettlement Impacts

Existing ROW does not cater to the codal provision of 24m ROW of Hill Road in open areas and 20m in built-up area and hence land is required to be acquired to adhere to the codal provision.

As discussed the scope of land acquisition is quite significant in the project because of availability of limited ROW and construction of two lane with paved shoulder new Bypasses / Realignment are suggested. According to the Land Acquisition Plan (LAP) for Package-IIIB prepared as a part of Project Report, 20.42 ha of Total land will be acquired for the project. 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.

As per requirement of the Resettlement Action Plan for Package-IIIB a 100% census survey of the likely affected Displaced Persons (DP) have been conducted again in March,2020 of affected land and non-land assets of the project has been taken up. The impacts can be broadly classified as (i) impacts on private land, (ii) impacts on private structures including (Encroachers and Squatters), (iii) impacts on livelihoods due to loss of private properties and (iv) loss of common property resources. The census survey reveals that altogether in 88 private structures units will be affected due to the project work. As per the socio economic survey, total household 60 comprising of 352 DPs will be affected (By Affected Structure) in the project. The details of project impacts as revealed in the study have been depicted in the following section and the summary of the project impacts are presented in the ***(Table 5.2)***.

Table: 5.2: Brief Summary of the Resettlement Impact of Package-IIIB

Sl.	Impacts	Number
1	Total land acquisition requirements (in ha)	20.42
2	Total no. of private Residential structures	61
3	Total no. of private Commercial structures	6
4	Total number of Residential cum Commercial structures	2
5	Total number of other private structure	19
6	Total No. of Affected Families by affected structure	60
7	Total Number of Vulnerable households affected of Affected structure	60
8	Total number of displaced persons (DPs)	352
9	Total number of affected Community / Government structures	17

Source: Census Survey on March, 2020

5.1.3 Stakeholders Consultation and Participation

Focus Group Consultations with various stakeholders were carried out during various phases of project preparation. Key person and focus group consultations at section of the society were arranged at the stage of project preparation to ensure peoples' participation in the planning phase of

this project and to treat public consultation and participation as a continuous two-way process. Aiming at promotion of public understanding and fruitful solutions of developmental problems such as local needs and problem and prospects of resettlement, various sections of DPs and other stakeholders were consulted through focus group discussions and individual interviews.

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. This report with the Entitlement Matrix after accepted by the EA and NHIDCL's would be available for disclosure on both EA's and National Highway's website.

5.1.4 Legal and Policy Framework

The legal framework and principles adopted for addressing resettlement issues in the Project have been guided by the proposed legislation and policies of the Government of Manipur, Government of India, Safeguard Policies and guidelines of National Highway's guidelines. Prior to the preparation of the Resettlement Plan, a detailed analysis of the proposed national and state policies was undertaken and an entitlement matrix has been prepared for the entire program. The section below provides details of the various national and state level legislations studied and their applicability within this framework. This RP is prepared based on the review and analysis of all applicable legal and policy frameworks of the country and National Highway policy requirements.

The objectives of the Resettlement Framework as per the policies are as follows: -

- To minimize displacement and to identify non-displacing or least-displacing alternatives.
- To plan the resettlement and rehabilitation of Project Affected Families, (PAFs) including special needs of Tribal and vulnerable sections.
- To provide better standard of living to DPs; and
- To facilitate harmonious relationship between the Requiring Body and DPs through mutual cooperation.
- The involuntary resettlement would be avoided wherever possible or minimized as much as possible by exploring project and design alternatives.
- The Project or all sub-projects under the program will be screened to identify past, present, and future involuntary resettlement impacts and risks.
- The scope of resettlement planning will be determined through a survey and/or census of displaced persons, including a gender analysis, specifically related to resettlement impacts and risks.
- Meaningful consultations with affected persons, host communities, and PIU will be carried out and all displaced persons will be informed of their entitlements and resettlement options participation in planning, implementation, and monitoring and reporting of resettlement programs will be ensured.
- Particular attention will be paid to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, and

those without legal title to land, and ensure their participation in consultations.

- An effective grievance redress mechanism will be established to receive and facilitate resolution of the displaced persons' concerns. The social and cultural institutions of displaced persons and their host population will be supported through proper planning. Where involuntary resettlement impacts and risks are highly complex and sensitive, compensation and resettlement decisions should be preceded by a social preparation phase.
- The livelihoods of all displaced persons will be improved or at least restored through (i) land-based resettlement strategies when affected livelihoods are land based where possible or cash compensation at replacement value for land when the loss of land does not undermine livelihoods, (ii) prompt replacement of assets with access to assets of equal or higher value, (iii) prompt compensation at full replacement cost for assets that cannot be restored, and (iv) additional revenues and services through benefit sharing schemes where possible.
- Physically and economically displaced persons will be provided with needed assistance, including (i) if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities, and extension of project benefits to host communities; (ii) Transportation support and development assistance, such as land development, credit facilities, training, or employment opportunities; and (iii) civic infrastructure and community services, as required.
- The standards of living of the displaced poor and other vulnerable groups, including women, will be improved to at least national minimum standards. In rural areas legal and affordable access to land and resources will be provided, and in urban areas appropriate income sources and legal and affordable access to adequate housing will be provided to the displaced poor.
- If land acquisition is through negotiated settlement, procedures will be developed in a transparent, consistent, and equitable manner to ensure that those people who enter into negotiated settlements will maintain the same or better income and livelihood status. If, however, the negotiated settlement fails, the normal procedure of land acquisition will be followed.
- Displaced persons without titles to land or any recognizable legal rights to land will be ensured that they are eligible for resettlement assistance and compensation for loss of non-land assets.
- A resettlement plan will be prepared elaborating on displaced persons' entitlements, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule.
- The draft resettlement plan, including documentation of the consultation process will be disclosed in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected persons and other stakeholders. The final resettlement plan and its updates will also be disclosed to displaced persons and other

stakeholders.

- Involuntary resettlement will be conceived and executed as part of a development project or program. Full costs of resettlement will be included in the presentation of project's costs and benefits. For a project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the project as a stand-alone operation.
- All compensation will be paid and other resettlement entitlements will be provided before physical or economic displacement. The resettlement plan will be implemented under close supervision throughout project implementation.
- Resettlement outcomes, their impacts on the standards of living of displaced persons will be monitored; it will be accessed whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Monitoring reports will be disclosed to DPs.
- Land acquisition for the project would be done as per National Highway Act, 1956 and the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014. To meet the replacement cost of land payment of compensation in revised rate.
- The uneconomic residual land remaining after land acquisition will be acquired as per the provisions of Land Acquisition Act. The owner of such land/property will have the right to seek acquisition of his entire contiguous holding/ property provided the residual land is less than the average land holding of the district.
- People moving in the project area after the cut-off date will not be entitled to any assistance. In case of land acquisition, the date of publication of preliminary notification for acquisition under RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014 will be treated as the cut-off date.
- All common property resources (CPR) lost due to the project will be replaced or compensated by the project.

The project will recognize three types of displaced persons like (i) persons with formal traditional 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 traditional rights nor recognized or recognizable claims to such land but occupying the land for than three years. The involuntary resettlement requirements apply to all three types of displaced persons.

5.1.5 Entitlements, Assistance and Benefits

The project will have three types of displaced persons i.e., (i) persons with formal legal/traditional 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 forma/traditional 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. The involuntary resettlement requirements apply to all three types of displaced persons.

Compensation eligibility is limited by a cut-off date as set for this project on the day of the beginning of the census survey which is March 2020. DPs who settle in the affected areas after the cut-off date will not be eligible for compensation. They, however, will be given sufficient advance notice, requested to vacate premises and dismantle affected structures prior to project implementation. Their dismantled structures materials will not be confiscated and they will not pay any fine or suffer any sanction.

Compensation for the lost assets to all displaced persons will be paid on the basis of replacement cost. Resettlement assistance for lost income and livelihoods will be provided to both title holders. Special resettlement and rehabilitation measures will be made available to the "Vulnerable Group" comprises of DPs living below poverty line (BPL), SC, ST, women headed households, the elderly and the disabled. The detail of the assistance and entitlements has been discussed in the following chapters.

5.1.6 Relocation of Housing and Settlements

The EA will provide adequate and appropriate replacement land and structures or cash compensation at full replacement cost for lost land and structures, adequate compensation for partially damaged structures, and relocation assistance, according to the Entitlement Matrix. The EA will compensate to the title holders for the loss of assets other than land, such as dwellings, and also for other improvements to the land, at full replacement cost.

5.1.7 Income Restoration and Rehabilitation

Due to loss of land and structures, many households shall lose their livelihoods or shall get economically displaced. The DPs losing their livelihoods includes titleholders land, agricultural labourers, agricultural tenants, and sharecroppers, DPs having commercial structures and employees of the affected structures. In the case of economically displaced persons, regardless of whether or not they are physically displaced, the EA will promptly compensate for the loss of income or livelihood sources at full replacement cost. The EA will also provide assistance such as credit facilities, training, and employment opportunities so that they can improve, or at least restore, their income-earning capacity, production levels, and standards of living to pre-displacement levels.

5.1.8 Resettlement Budget

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 in project implementation and other administrative expenses are part of the overall project cost. The unit cost for land 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. The total R&R budget for the Package-IIIB of proposed project RP

works out to Rs. **16.17 Cr** as per Avarage Market Rate.

5.1.9 Institutional Arrangements

For implementation of RP there will be a set of institutions involve at various levels and stages of the project. The Executing Agency (EA) for the Project is NHIDCL. They have already set up a Project Implementing Unit (PIU) headed by a General Manager(P)with Technical Manager and Deputy Manager (DGM) assisted by other staffs. This office will be functional for the whole Project duration. The EA, headed by GM(P) will have overall responsibility for implementation of the project and will also be responsible for the overall coordination among NHIDCL, Government of Manipur and PIU. For resettlement activities, PIU will do the overall coordination, planning, implementation, and financing. Project Implementation Unit (PIU) will be established at project level for the implementation of sub-projects.

5.1.10 Implementation Schedule

Implementation of RP mainly consists of compensation to be paid for affected structures and rehabilitation and resettlement activities. 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 following chapters. The cut-off date will be notified formally for titleholder as the date of LA notification. However, the sequence had change or delay had occurred due to circumstances beyond the control of the Project and accordingly the time can be adjusted for the implementation of the plan. The present implementation schedule may 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.

5.1.11 Monitoring and Reporting

Monitoring and reporting are critical activities in involuntary resettlement management in order to ameliorate problems faced by the DPs and develop solutions immediately. Monitoring is a periodic assessment of planned activities providing midway inputs. It facilitates change and gives necessary feedback of activities and the directions on which they are going. In other words, monitoring apparatus is crucial mechanism for measuring project performance and fulfilment of the project objectives.

PIU responsible for supervision and implementation of the RP will prepare monthly progress reports on resettlement activities and submit to EA. The Resettlement Expert under CSC would be responsible for monitoring of the RP implementation will submit a quarterly review report to determine whether resettlement goals have been achieved, more importantly whether livelihoods and living standards have been restored/ enhanced and suggest suitable recommendations for improvement. All the resettlement monitoring reports will be disclosed to DPs as per procedure followed for disclosure of resettlement documents by the EA. An External Monitor to be engaged to review and monitor the implementation process and time frame of the resettlement and rehabilitation of the DPs. The External Monitor may submit a biannual report on the progress of the implementation of the Resettlement action plan to NHIDCL.

5.2 PROJECT DESCRIPTION

5.2.1 General

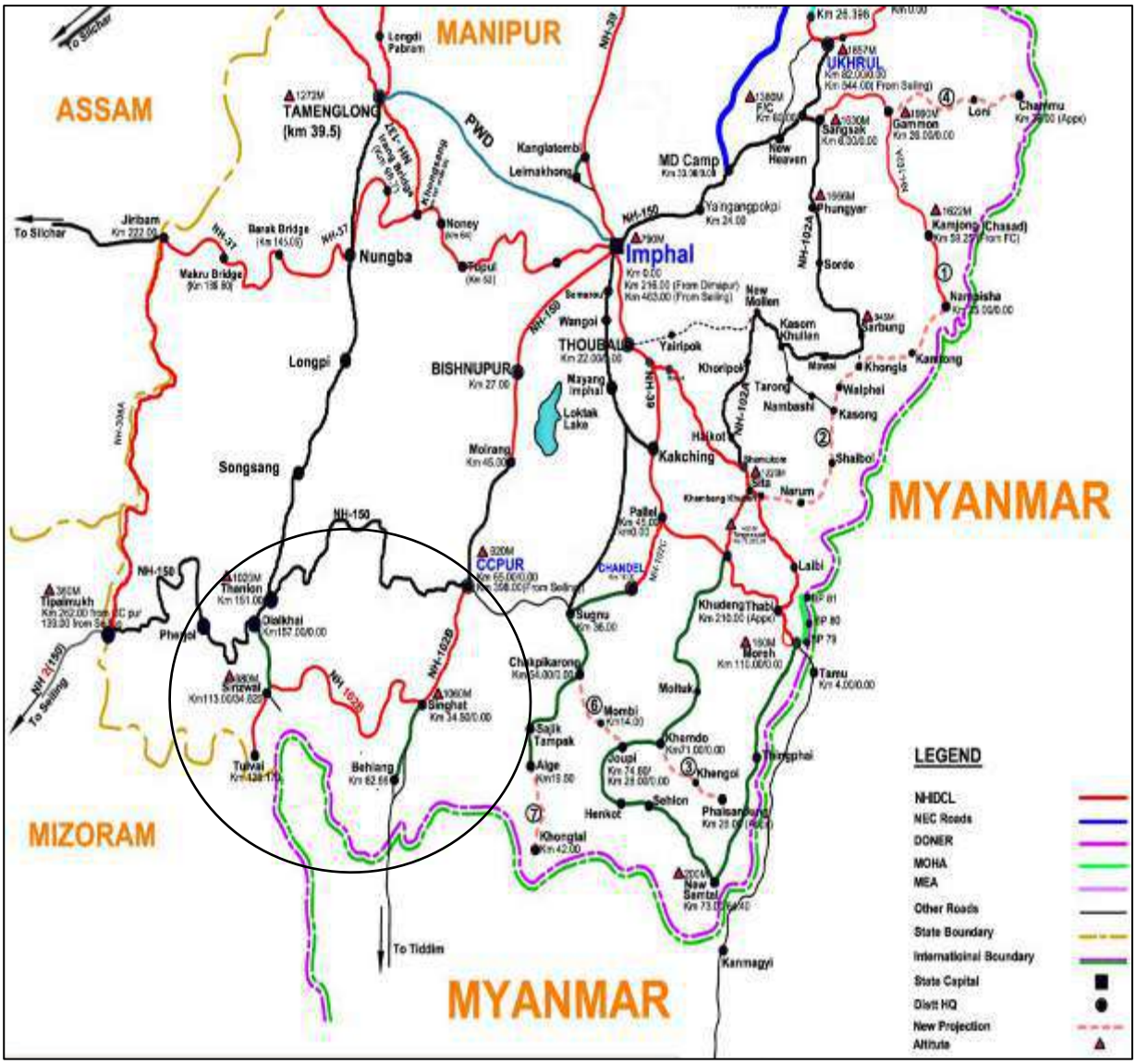
National Highway Infrastructure Development Company Limited has decided to prepare a Project Report for NH-102B with a minimum of 2-Lane with hard shoulder configuration starting from Churachandpur Town and ending at Tuivai (Mizoram Border) in the District of Churanchandpur, Manipur, on Engineering, Procurement & Construction (EPC) basis or SBD mode as will emerge out on preparation of Project Report.

5.2.2 The Project Road and its Location

The project road starts from Churachandpur Town (Junction of NH-102B and old NH-2) and ends at Tuvai in the district of Churanchandpur. As per design the total length of the project road comes out as 145.984 km. The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E. Most part of the District is in through mountainous / hilly terrain and very small portion. The topography is mostly rural in nature. This Road is passing through Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and Tuivai. The project road has distributed in four packages. This Report elaborate and describe the Third package. As per design chainage the 3rd (IIIB) package starts from Chainage 88.980 to 103.525 km and it lie on Churachandpur district only.

Existing ROW does not cater to the codal provision of 24m ROW of Hill Road in open areas and 20m in built-up area and hence land is required to be acquired to adhere to the codal provision.

Figure 5.2: Location Map



5.2.3 Profile of the Project Area

The project road section passes through Churachandpur districts of Manipur State. The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E.

5.2.4 The Profile of the District of Churachandpur

In 1972, Manipur state was divided into five districts namely Central, West, East, North and South districts. The Central district comprised the whole of the Imphal Valley and Jiribam Sub-Division. In the 1980s it was further divided into the three valley districts of Imphal, Bishenupur and Thoubal. The East, West, North and South districts later became the hill districts of Ukhrul, Tamenglong, Senapati and Churachandpur district respectively. A fifth hill district, Chandel, was carved out from the erstwhile East and South districts. These five are the homes to twenty-nine (29) recognized

Scheduled Tribes of Manipur. Among the hill districts, the fastest growing district headquarters and hill-town is that of Churachandpur. All the communities of Manipur live happily in small but noticeable sizes amongst the more populous tribal folk belonging to Chin, Kuki, Mizo, Naga and Zomiethnic groups -a mosaic of tribes, well laid out and glowing with life.

Churachandpur District, in the southwestern corner of Manipur, has an area of 4,570 sq. km. The district got its name "Churachandpur" from the Manipur king Churachand Maharaja. It is bounded by North latitudes 23056'20.4"and 24036'46.8"and East longitudes 92058'12''& 93053'58.8''. It is a hilly district with a very small percentage of the plain area. The district is bounded by Senapati district in the north, Bishnupur and Chandel districts in the east, Assam and Mizoram in the west and Myanmar on the south. The total population of the district as per 2011census is 2,71,274. This district with its headquarters at Churachandpur has been divided into five blocks, i.e. Churachandpur, Thanlon, Henglep, Singhat and Parbung.

Table 5.3: Churachandpur District

1. Geography			
(i) Temperature	Maximum: 37^0 C	Mininum: 10^0 C	
(ii) Location	Latitude: $23^0$56'20.4"N-$24^0$36'46.8"N	Longitude: $92^0$58'12"E-$93^0$53'58.8"E	
(iii) Rainfall	Average rainfall recorded in Churachandpur district is from 3080mm to 597mm.		
2. Administrative Units			
Sub Divisions	Revenue Villages	Assembly Area	
5 Nos.	540 Nos.	6 Nos.	
5. Area	4,570 Square kms		
6. Forest	4,157 Square kms		
7. Roads			
a) National Highway	2010-11	270 km	
b) State Highway	2010-11	58 km	
c) Major District & Rural Roads	2010-11	179.50 km	
d) Other District & Rural Roads	2010-11	20 km	
e) Rural Road/Agriculture Marketing Board Roads	2010-11	175 km	
f) Kachacha Road	2010-11	340 km	
7. Census			
Description	2011	2001	
Actual Population	274,143	227,905	
Male	138,820	117,232	
Female	135,323	110,673	
Population Growth	20.29%	29.36%	

Area Sq. Km	4,570	4,570
Density/km2	60	50
Proportion to Manipur Population	9.60%	9.94%
Sex Ratio (Per 1000)	975	944
Child Sex Ratio (0-6 Age)	948	968
Average Literacy	82.78	70.60
Male Literacy	86.97	77.70
Female Literacy	78.50	63.10
Total Child Population (0-6 Age)	37,445	30,879
Male Population (0-6 Age)	19,227	15,690
Female Population (0-6 Age)	18,218	15,189
Literates	195,935	139,080
Male Literates	104,013	78,871
Female Literates	91,922	60,209
Child Proportion (0-6 Age)	13.66%	13.55%
Boys Proportion (0-6 Age)	13.85%	13.38%
Girls Proportion (0-6 Age)	13.46%	13.72%

Source: Website of Manipur State

5.2.5 The Profile of the State of Manipur

Manipur is a state in north eastern India, with the city of Imphal as its capital. It covers an area of 22,347 square kilometres. The state is bounded in the north by Nagaland, in the south by Mizoram, Assam lies in the west and nation of Myanmar is bordering in the east. Manipur has a recorded history of kingship since 33 A.D. with the coronation of Pakhangba followed by a series of kings ruling over the kingdom of Manipur. The independence and sovereignty of Manipur remained uninterrupted until the Burmese invaded and occupied it for seven years in the first quarter of the 19th century (1819-25). In 1891 British Govt. brought it under its rule, and later on it was merged in the Indian Union as part "C" State on 15 October, 1949. This was replaced by a Territorial Council of 30 elected and 2 nominated members. In 1963, a Legislative Assembly of 30 elected and 3 nominated members was established under the Union Territories Act, 1962. Manipur attained full-fledged statehood on 21 January, 1972. With this, a Legislative Assembly consisting of 60 elected members was established.[1]

[1] Wikipedia

Figure 5.3: State Road Map

Physiographically, Manipur is characterised in two distinct physical regions – an outlying area of rugged hills and narrow valleys, and the inner area of flat plain, associated with residual mounds and undulating plains. These two regions are also conspicuous with respective distinct various flora and fauna. The Loktak lake is an important feature of the central plain. The hills cover about 9/10th of the total area of the State. Manipur Valley is about 790 metres above the sea level. The hill ranges are higher on the north and gradually diminish in height as they reach the southern part of Manipur. The valley itself slopes down towards the south. The highest peak is Mt. Iso of 2,994 m altitude near Mao.

Manipur state has four major river basins: the Barak River Basin (Barak Valley) in the west, the Manipur River Basin in central Manipur, the Yu River Basin in the east, and a portion of the Lanye River Basin in the north. The total water resources of Barak and Manipur river basins are about 1.8487 Mham. The Barak River, the largest of Manipur, originates in the Manipur Hills and is joined by a number of tributaries, all originating from surrounding hills. Rivers in the valley area are in mature stage and deposit their sediments in Loktak. The rivers in the hills cause land erosion and in rainy season turn into turbulent form.

According to 2011 census Manipur has a total population of 2,721,756 and ranked 22nd among Indian states. Its density of population is 115 persons per square kilometre. Population communities of Manipur comprise Meitei, Pangal, Naga, Kuki and Mizo. The Meitei, who live primarily in the

state's valley region, form the primary ethnic group (60% of the total population). They occupy about 10% of the total land area. The Muslims (the Meitei-Pangal) also live in the valley. The Kuki, Naga, Mizo and several other smaller tribal communities make up about 40% of the population but occupy the remaining 90% of the total area of Manipur.

5.2.6 Impact and Benefits

The road project is associated with some adverse impacts as well as some benefits. The major impacts of the road project include loss of land due to acquisition of land all along the project corridor and in Realignment. But it should be kept in mind that the project road strategically interconnects two major states namely Manipur and Mizoram. Boost in agricultural and industrial development 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 project will be triggered off due to improved accessibility to various services such as easy access to markets, health facilities, schools, workplace etc. which in turn increases the income of the locals, and ultimately elevating their standard of living. The possible direct and indirect positive impacts of the project are listed below.

- Road network will not only link the village communities to better national 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 in the form of traffic sign, Pavement marking and slope protection in the form of breast wall on hill side, Retaining/Toe wall on valley side etc.
- Rectification of geometric deficiencies (both Horizontal & Vertical).
- Provision of ROBs over railway crossings, if required.
- Provision of project facilities like bus bays, passenger shelters etc.
- Provision of crash barrier at Bridge approaches.
- Improvement of Major and Minor Intersections.

Other benefits: -

- It will give a major fillip to the quest for all weather connectivity.
- It will reduce travel time between towns and cities 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.

5.2.7 Minimizing Resettlement

As per the NH's guidelines, 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. Following are the general criteria adopted for the selection of the alignment:

- ❖ It should serve as uninterrupted traffic for proposed Tourist centres.
- ❖ It should provide linkage to other roads in the region.
- ❖ It should take in to account the future traffic growth and management.
- ❖ It should be coordinated with local and national development plans.
- ❖ It should minimize environment impact along the corridor.
- ❖ It should take in to consideration the opinions of local people in selection of
- ❖ Alignment.

The specific measures adopted for minimizing the resettlement impacts for the sub

Project is as follows:

- ❖ Exploration of alternate alignments in consultation with engineering team, concerned government departments and local community
- ❖ 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.

5.2.8 Scope and Objective of Resettlement Plan (RP)

The aim of this Resettlement Plan (RP) is to mitigate all such unavoidable negative impacts caused due to the project and resettle the displaced persons and restore their livelihoods. This Full Resettlement Plan has been prepared on the basis of project census survey findings and consultation with various stakeholders. The legal framework and principles adopted for addressing resettlement issues in the Project have been guided by the proposed legislation and policies of the Government of Manipur, Government of India, Safeguard Policies and guidelines of National Highway's guidelines. The issues identified and addressed in this document are as follows:

- Type and extent of loss of land/ non-land assets, loss of livelihood, loss of common property resources and social infrastructure.
- Impacts on indigenous people, vulnerable groups like poor, women and other disadvantaged sections of society.
- Public consultation and people's participation in the project.
- Proposed legal and administrative framework and formulation of resettlement policy for the project.
- Preparation of entitlement matrix, formulation of relocation strategy and restoration of businesses/income.
- R&R cost estimate including provision for fund and Institutional framework for the implementation of the plan, including grievance redress mechanism and monitoring & reporting.

5.2.9 Primary Responsibility for Land Acquisition & Resettlement

The NHIDCL Department, Manipur is the nodal agency for implementation of the proposed project. Therefore, the prime responsibility for land acquisition lies with the NHIDCL, Manipur. However, such land acquisition is normally done through the State Level District Administration and the compensation amount is deposited with the District Administration by the acquiring body for disbursement. Similarly, the resettlement of the affected population will be implemented by the NHIDCL, Manipur like it is being done in other projects. The NHIDCL do conduct RAP implementation through PIU. An independent External Monitor would be engaged to review and monitor the implementation process and time frame of the resettlement and rehabilitation of the DPs. The Monitor may submit a biannual report on the progress of the implementation of the Resettlement action plan to EA.

5.3 METHODOLOGY FOR IMPACT ASSESSMENT

This Chapter presents an analysis of the project impacts based on census survey data. The purpose of the analysis is to (a) develop profiles of DPs and communities affected by the project. (b) Identify the nature and types of losses. The following sections briefly describe the methods used to ascertain various types of impacts.

5.3.1 The Census Survey

The census survey was carried out in the month of November 2018 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, social profile of the project affected people, their poverty, their views about the project and also their views on various options of rehabilitation and resettlement. A questionnaire was used to collect detailed information on affected households/business for a full understanding of impacts in order to develop mitigation measures and resettlement plan for the DPs. A structured census questionnaire was used to collect detailed information on affected households/ properties for a full understanding of impacts in order to develop mitigation measures and resettlement plan for the DPs. 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
- ❖ Household characteristics, including social, economic and demographic profile
- ❖ Identification of titleholders
- ❖ Assessment of potential economic impact

The present census survey has covered 100% structures affected within the proposed ROW including private and customary owners. The additional information about the private land holders land is being collected from village Council. The results of census survey presented in the report will also be updated further after completion of landholders' data collection.

5.3.2 Land Acquisition Planning

The alignment was finalized as per the detailed engineering design. Initially, the numbers of affected villages were identified as per the alignment. The village boundary has been marked in topographic drawing. The improvement proposal of the alignment along with proposed ROW has been superimposed over topographic drawing, land area between proposed and existing ROW has been demarcated villagewise and kilometerwise. A Land Acquisition Plan (LAP) has been prepared accordingly.

5.3.3 Inventory of Assets

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 and documents were collected from the local village council 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 that are to be affected.

5.3.4 Survey of Affected Structures

Different types of structures will be affected by the road improvements. In order to assess market/ replacement value for the affected structures, the survey considered the types of construction, material used for roof, walls and floor; levels/ stories of structures, and land area of each structure.

5.3.5 Public Consultation

To ensure peoples' participation in the planning phase and aiming at promotion of public understanding and fruitful solutions of developmental problems such as local needs of road users and problem and prospects of resettlement, various sections of affected persons and other stakeholders were consulted through focus group discussions, individual interviews and formal and informal consultations. The vulnerable sections of DPs and women were also included in this consultation process.

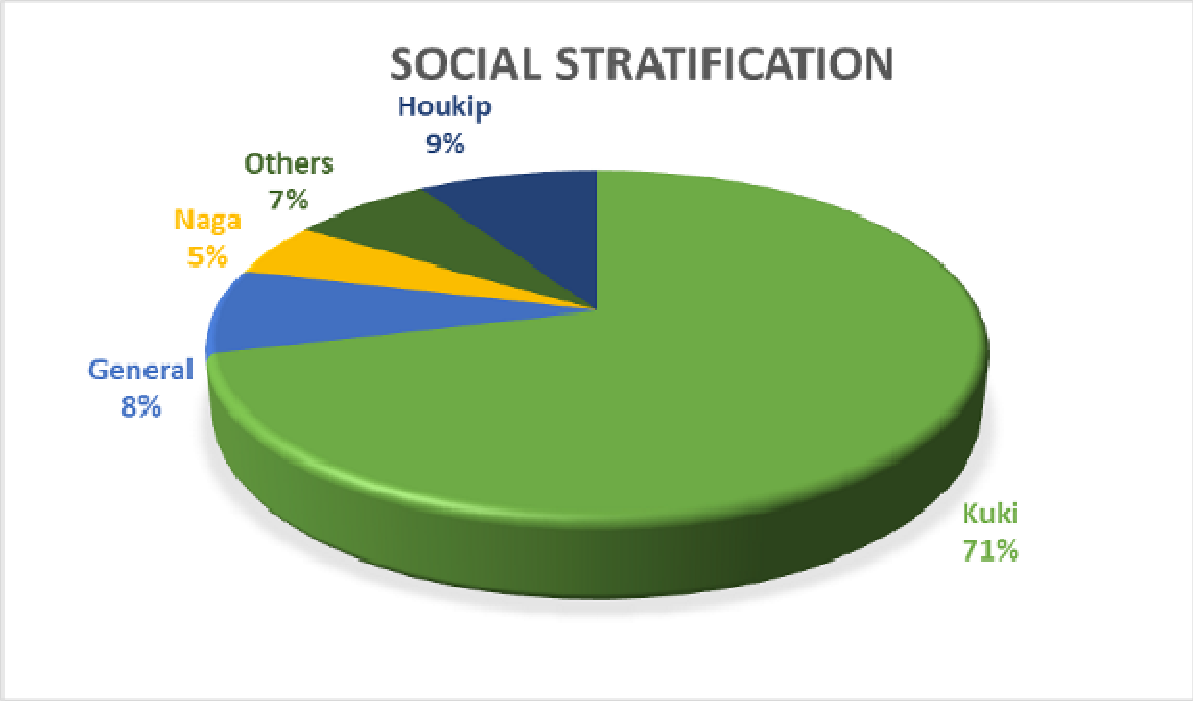
5.4 SOCIO ECONOMIC PROFILE OF THE PROJECT AREA

To understand the socio-economic profile of project area, the socio-economic information of DPs was collected through the Socio Economic Survey (SES) and Census survey. The total number of Displaced Household (DH) for Package-IIIB is 60 (Private Structure owner, Tenent & Employee in commercial Structures) occupying 88 private structures would be affected as per proposed ROW. The total number of Displaced Population (DP) 352 living within this affected structures (Including Private Structure, Tenent & Employee in commercial Structures). The gross findings of the survey are presented in the following sections.

5.4.1 Social Categories of the DPs

The social stratification of the project area shows the dominance of Kuki Tribes population with 71% households, 9% Houkip and 5% Naga tribes. The second stratum of the social grouping in the area is of General Caste population in the project area is 5% and Others population with 7% households. There are different tribes inhabited in the whole alignment of the proposed road. The Social stratification is depicted in **Figure 5.4**.

Figure 5.4: Social Categories of DPs along the Project Road

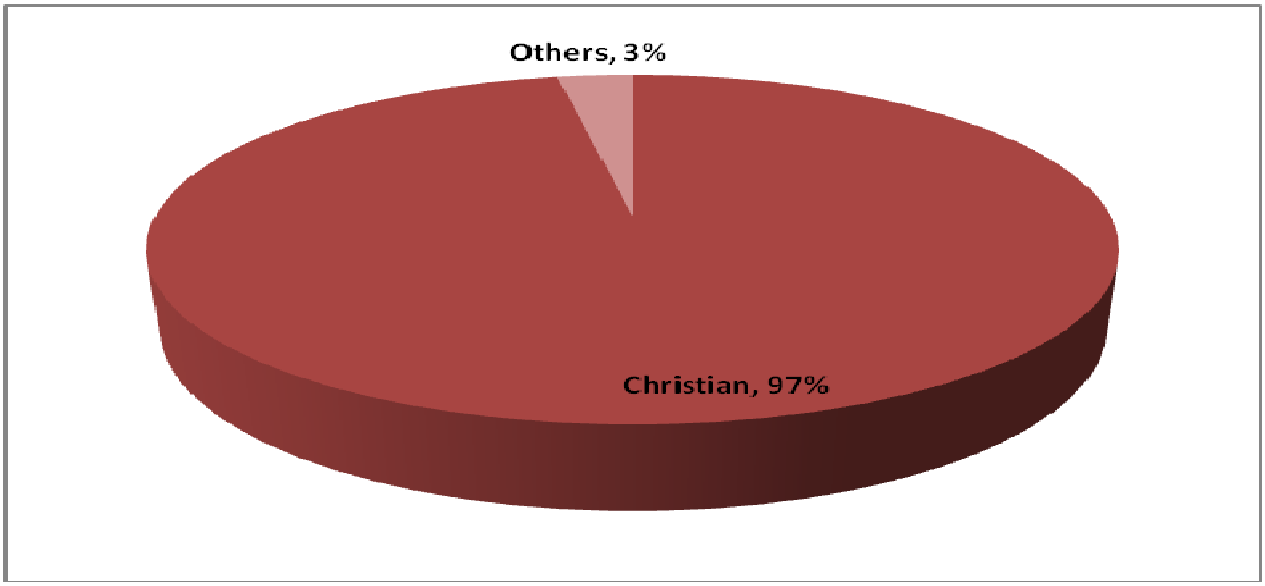


Source: Census Survey on March, 2020

5.4.2 Religious Categories of the Displaced Households

The project area is dominated by Christian community as they form 97% of the total Displaced Households (DH). There is only 3% household, who are others community are being affected by the Project. There are still very few household following animistic belief. The detail of the same is graphically represented in **Figure 5.5**

Figure 5.5: Religious Categories of DPs along the Project Road



Source: Census Survey on March, 2020

5.4.3 Number of Displaced Persons (DPs)

There are altogether 352 DPs (Including Private Structure, Tenent & Employee in commercial Structures), that are being affected by the project. It includes 51% males and 49% females. The number of DPs is substantially significant in the project area mainly because presence of joint family system and a large number of shareholders of landed properties.

5.4.4 Vulnerable Households being affected in the project

In the project area there are 100% households falling in the vulnerable category. In this project among other vulnerable group there, 100% households are ST category.

5.4.5 Annual Income Level of the Affected Households

The number of BPL population, is further strengthen from the data analysed on the basis of monthly income of the households, which reflects that there are no households, which are having an average monthly income of less than Rs. 30000/. About 36% DPs are having income in the range of Rs. 30000-50000, while 10% are earning in the range of Rs. 50000-100000. It has been observed that about 2% households are annually earning more than Rs. 100000/-. The average income level of households in the project area is summarized in the (***Table 5.4***).

Table 5.4: Annual Income Level of the Affected Households

Sl.	Annual Income Categories in (Rs)	Percentage
1	Less than 30000	52%
2	>30000 and <50000	36%
3	>50000 and <100000	10%
4	>100000	2%
	Total	**100%**

Source: Census Survey on March, 2020

5.4.6 Occupation by DPs

The occupational status of head of the households i.e. the primary occupation by the households reveals that 74% households are depending on agricultural or allied agricultural services, whereas about 11% of the population depends on business and this includes the business they are carrying out in the road side mainly shops. About .3% are engaged in Government or Private Service jobs. The details of occupations by the DPs are presented in the (***Table 5.5***).

Table 5.5: Occupational Status of DPs

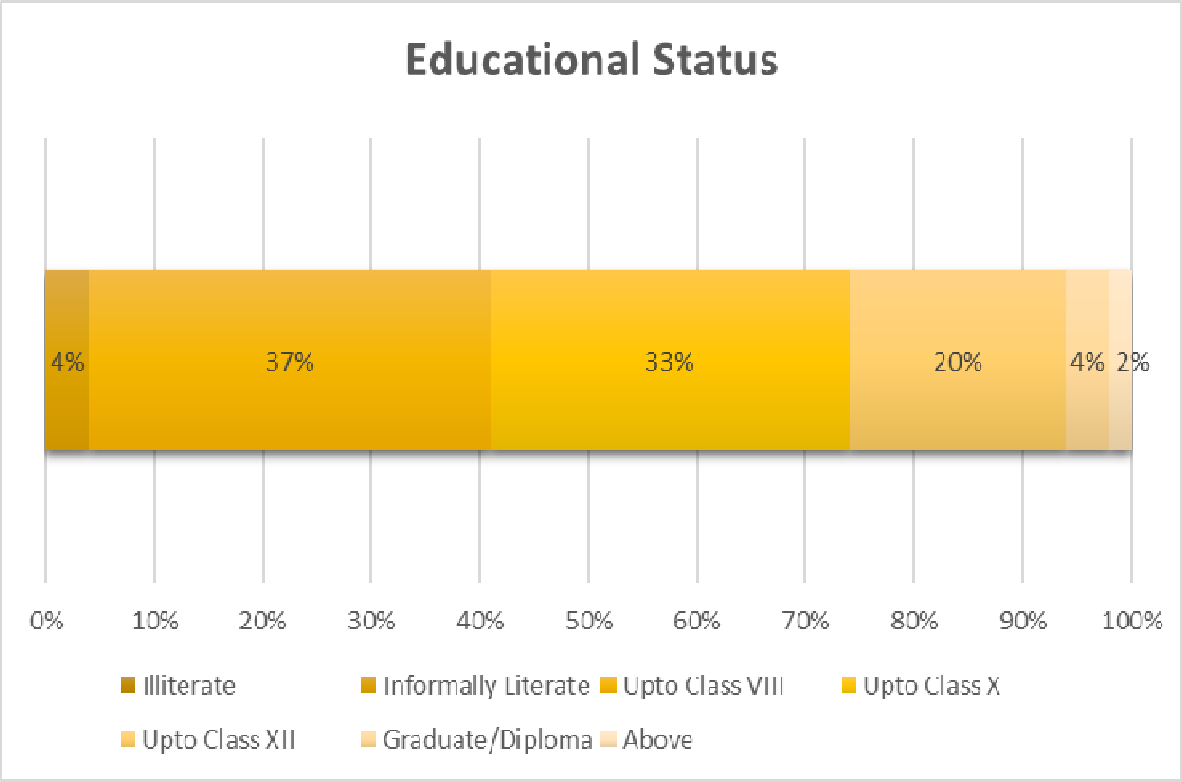
Sl.	Occupational Status of APs	Percentage
1	Government / Private Service	3%
2	Agriculture or allied agricultural	74%
3	Business	11%
4	Others	12%
	Total	**100%**

Source: Census Survey on March, 2020

5.4.7 Educational Status of DPs

The educational status of head of the households reveals that overall scenario of literacy level is not encouraging in the project area as significant percentage of population, i.e., 4% are Informally literate. Another 37% has attained the education up to Class VIII level. About 33% DPs are appeared class X; while very few (6%) have degree of master and above, which are presented in the (***Figure 5.6***).

Figure 5.6: Educational Status of DPs



Source: Census Survey on March, 2020

5.4.8 Impact on Indigenous People

The Scheduled Tribes (STs) in the project area is considered to be IP. The presence of ST population in the affected state as displaced person is more than 92%. The census survey reveals that the majority of the population belongs to the ST community, thus this is the mainstream population of the region.

5.4.9 Gender Impact and Mitigation Measures

The gender composition of DPs shows that the male accounts for 51% and female accounts for 49%. The gender disparity is not acute as the sex ratio among DPs i.e. 975 against state level statistic having 985 as per provisional census data of India, 2011.

Figure 5.7: Gender Ratio in study area

Source: Census Survey on March, 2020

The participation of women in FGDs during the census survey was not encouraging because of their shy nature and ignorance. Some of their specific concerns are summarized below.

The working women and girl students face lot of problem for travel, due to non-availability of good road and transport network. Especially in rainy season, the problem increases manifold which sometimes compels the girl students abstains from classes.

Only primary health centers (PHCs) are located at some villages and the quality of treatment and medical facilities are less than satisfactory. In emergency they have to reach hospitals at district headquarters only.

Health status will improve as they will be able to visit Govt. hospital at Imphal if sick and especially during pregnancy and will not have to depend on uneducated rural midwife for safe delivery, which are common in villages. Incidence of child mortality & maternal mortality rate will reduce with easy access to Govt. health care facility centres.

The women feel that their mobility will increase as market & relatives' places will be easily accessible for them as better road condition will induce more transport vehicles to operate. More shops, markets will open within the village approach area and as a result they will get quality leisure time at their disposal.

Women from poor families will get job opportunity during construction work as casual labour or at office. Besides, women can operate individual / family enterprise by opening small tea stalls, shops/eateries to provide meals to the construction labourers. This will enhance their family income as well as their entrepreneurial skill which may be useful in future.

Women labourers feel that improved road network will provide them with better job opportunity as they will be able to travel further and even can commute from home. Moreover, travel by public transport system, like Govt. bus service, will become cheaper and money saved on transport can be better utilized for household needs.

The girl students will be able to attain higher education at colleges, since journey time and cost will be greatly reduced and the girls can commute from home all by themselves free of hazard.

Women will not be affected negatively due to the program. Any negative impacts of the project on female-headed households will be taken up on a case-to-case basis and assistance to these households will be treated on a priority basis. During disbursement of compensation and provision of assistance, priority will be given to female-headed households. Additionally, women headed households are considered as vulnerable and provision for additional assistance (lump sum amount @ Rs. 25,000/- per affected households) has been made in the entitlement of the RP. Provision for equal wage and health safety facilities during the construction will be ensured by the EA. Therefore, the sub project activities will not have any negative impact on women.

5.5 DEFINITIONS

The Definition of various terms used in this Policy Document are as follows:

(a) "Administrator for Resettlement and Rehabilitation" means an officer not below the rank of District Collector of the State Government appointed by it for the purpose of resettlement and rehabilitation of the Project Affected Families of the Project concerned provided that if the appropriate Government in respect of the project is the Central Government, such appointment shall be made in consultation with the Central Govt.

(b) "affected zone", in relation to a project, means declaration of this Policy by the appropriate Government area of villages or locality under a project for which the land is being acquired under Land Acquisition Resettlement and Rehabilitation, 2013 or any other Act in force or an area that comes under submergence due to impounding of water in the reservoir of the project.

(c) "agricultural family" means a family whose primary mode of livelihood is agriculture and includes family of owners as well as sub-tenants of agricultural land, agricultural labourers, occupiers of forest lands and of collectors of minor forest produce.

(d) "agricultural labourer" means a person normally resident in the affected zone for a period of not less than three years immediately before the declaration of the affected zone who does not hold any land in the affected zone but who earns his livelihood principally by manual labour on agricultural land therein immediately before such declaration and who has been deprived of his livelihood.

(e) "Agricultural land" includes lands used or capable of being used for the purpose of-

agriculture or horticulture;

Dairy farming, poultry farming, pisciculture, breeding or livestock and nursery growing medical herbs.

raising of crops, grass or garden produce; and

Land used by an agriculturist for the grazing of cattle, but does not include land used for the cutting of wood only.

(f) "Appropriate Government" means, -

(i) In relation to acquisition of land for the purposes of the NHIDCL, the Central Government;

(ii) in relation to a project which is executed by Central Government agency(NHIDCL)/Central Government undertaking or by any other agency on the orders/directions of Central Government, the Central Government, otherwise the State Government and in relation to acquisition of land for other purposes, the State Government.

(g) 'BPL Family': The Below Poverty Line Families shall be those as defined by the Planning Commission of India from time to time.

(h) "Commissioner for Resettlement and Rehabilitation", in relation to a project, means the Commissioner for Resettlement and Rehabilitation appointed by the State Government not below

the rank of Commissioner/Secretary of that Government.

(i) "Displaced family" means any tenure holder, tenant, Government lessee or owner of other property, who on account of acquisition of his land including plot in the abadi or other property in the affected zone for the purpose of the project, has been displaced from such land or other property.

(j) "Family" means Project Affected Family consisting of such persons, his or her spouse, minor sons, unmarried daughters, minor brothers or unmarried sisters, father, mother and other members residing with him and dependent on him for their livelihood.

(k) "Holding" means the total land held by a person as an occupant or tenant or as both;

(l) "Marginal farmer" means a cultivator with an unirrigated land holding up to one acres or irrigated land holding up to half acres.

(m) "non-agricultural laborer" means a person who is not an agricultural laborer but is normally residing in the affected zone for a period of not less than three years immediately before the declaration of the affected zone and who does not hold any land under the affected zone but who earns his livelihood principally by manual labour or as a rural artisan immediately before such declaration and who has been deprived of earning his livelihood principally by manual labour or as such artisan in the affected zone.

(n) "Notification" means a notification published in the Official Gazette;

(o) "Occupiers" mean members of Scheduled Tribe community in possession of forest land prior to 25th October, 1980;

(p) "Project" means a project displacing 500 families or more enmasse in plain areas and 250 families or more enmasse in hilly areas, DDP blocks, areas mentioned in Schedule V and Schedule VI of the Constitution of India as a result of acquisition of land for any project.

(q) "displaced family" means a family/person whose place of residence or other properties or source of livelihood are substantially affected by the process of acquisition of land for the project and who has been residing continuously for a period of not less than three years preceding the date of declaration of the affected zone or practicing any trade, occupation or vocation continuously for a period of not less than three years in the affected zone, preceding the date of declaration of the affected zone.

(r) "Resettlement zone", in relation to a project, means the declaration of any area under our National Policy by the appropriate Government acquired or proposed to be acquired for resettlement and rehabilitation of Project Affected Families as a resettlement zone.

(s) "Requiring Body" shall mean any company, a body corporate, an institution, or any other organization for whom land is to be acquired by the appropriate Government, and includes the appropriate Government if the acquisition of land is for such Government either for its own use or for subsequent allotment of such land in public interest to a body corporate, institution, or any other organization or to any company under lease, license or through any other system of transfer of land to such company, as the case may be.

(t) "Small farmer" means a cultivator with an unirrigated land holding up to two acres or with an irrigated land holding up to one acres.

5.6 SCOPE OF LAND ACQUISITION AND RESETTLEMENT FOR PACKAGE-IIIB

5.6.1 Scope of Land Acquisition

As discussed earlier also the scope of land acquisition is quite significant in the project because of availability of limited ROW and construction of road as the applicable code for road construction. According to the Land Acquisition Plan (LAP) prepared as a part of Project Report (Package-IIIB), 20.42 ha of total land will be acquired for the sub-project. The area is excluding the area available within EROW. 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 estimates and census of 100% affected structures are discussed in the following sections which will be further updated after completion of landholder's data collection.

5.6.2 Uses of Affected Structure

During the census survey in addition to structures belong to private holders, large number of customary right holders were also enumerated along the proposed road. Based on the social survey data a total of 105 structures would be affected due to the improvement of the project road within the proposed RoW. Out of 105 affected structures, 61 are Residential, 8 are structures are of Commercial & Residential cum Commercial and there are 17 Community and Government structures as detailed in (***Table 5.6***).

Table 5.6: Uses of Affected Structure

Sl.	Type of Uses	No. of Properties	Percentage
1	Residential	61	58%
2	Commercial	6	6%
3	Residential cum Commercial	2	2%
4	Community structures	11	10%
5	Government Structure	6	6%
6	Other Private Structure	19	18%
	Total	**105**	100%

Source: Census Survey on March, 2020

5.6.3 Type of Construction of Affected Structure

The construction type of structures being affected in the project area is of various types such as temporary, semi-permanent and permanent. More than 85% of the structures are temporary. The details of type of constructions of the affected structures are summarized in the (***Table 5.7***)

Table 5.7: Type of Construction of Affected Structure

Sl.	Type of Construction	Total	Pecentage
1	Temporary	75	85%
2	Semi-permanent	4	5%
3	Permanent	3	3%

4	Pillar (22 No.s)	1	1%
5	Memory Stone	5	6%
	Total	**88**	100%

Source: Census Survey on March, 2020

5.6.4 Age of Structures Being Affected

To know the condition of structures, the age of structures being affected due to the project was enumerated during the census survey. Among 105 affected structures, 88.1% structures are constructed within 10 years only and another 11.9% structures are aged after 10 or more years. The details of age of affected structures are presented in the (***Table 5.8***).

Table 5.8: Age of Structures Being Affected

Sl.	Age of Structure	Percentage
1	Up to 10 Years	88.1%
2	Above10 Years	11.9%
	Total	**100%**

Source: Census Survey on March, 2020

5.6.5 Type of Commercial Structures Affected

Total 8 commercial & Residential-cum-Commercial structures affected in the sub-project, 75% structures are of shops, Kiosk at the road side. The details of structures are given in the (***Table 5.9***).

Table 5.9: Type of Commercial Establishment Affected

Sl.	Type of Structure	No. of Structure	Percentage
1	Commercial	6	75%
2	Residential Cum Commercial	2	25%
	Total	**8**	**100%**

Source: Census Survey on March, 2020

5.6.6 Type of Mixed Structures Affected

Out of 88 private structures there are 2 structures belong to mixed category i.e. residential and commercial type where the road side people doing some business and living also.

5.6.7 Type of Other Structures Affected

As per census survey findings, among the private and govrenment structures within the ROW many other type of structures like Store room, Private School, Toilet, Private Memorial Structure and Water Tank etc. affected in the project. (***Table 5.10 & 5.11).***

Table 5.10: Type of Other Private Structures Affected

Sl.	Type of Structure	No. of Structure	Percentage
1	Store room	2	10.53%
2	Private School	1	5.26%

3	Private Hall	1	5.26%
4	Water Tank	2	10.53%
5	Toilet	6	31.58%
6	Shed	1	5.26%
7	Pillar	1	5.26%
8	Private memorial stone	5	26.32%
	Total	**19**	**100.00%**

Source: Census Survey on March, 2020

Table 5.11: Type of Other Government Structures Affected

Sl.	Type of Structure	No. of Structure	Percentage
1	Water Tank	3	50%
2	Market Shed	1	17%
3	Waiting Shed	2	33%
	Total	**6**	**100.0%**

Source: Census Survey on March, 2020

5.6.8 Status of Ownership

As per census survey, in the sub-project 60 belong to Title-holders, whose structres are afftected by the project. The details of Ownership according to their legal status are given in the (***Table 5.12***).

Table 5.12: Status of Ownership

Sl.	Ownership Status	No. of Structure	Percentage
1	Private	60	92%
2	Community	2	3%
3	Government	3	5%
	Total	**162**	**100.0%**

Source: Census Survey on March, 2020

5.6.9 Scale of Impact on Structure

The severity of impact on any structure is determined by percentage of impact on the properties and the usable status of residual part of the structure. The impact percentage on the structures is being examined from its distance from the centre line and the total area of the structures. This analysis helps to know that whether the remaining part of the structure would serve any purpose. As per the collected information during the social survey it is found that the impact is Category A in most of the structures. The exact details for scale of impact on structures are given in (***Table 5.13***).

Table 5.13: Scale of Impact on Structure

Sl.	Scale of Impact	Percentage
1	Category A (more than 50%)	99%
2	Category B (less than 50% but more than 25%)	0%
3	Category C (less than 25% more than 10%)	1%
4	Category D (less than 10%)	0%
	Total	**100%**

Source: Census Survey on March, 2020

5.6.10 Loss of Livelihoods

Due to loss of structures many people will be losing their livelihoods and will be economically displaced. As per the census survey DPs losing livelihoods includes 4 owners of commercial structures and 2 owners of residential- cum- commercial structures where they perform business. The details of impact on livelihoods in the project are presented in the (***Table 5.14***).

Table 5.14: Loss of Livelihoods

Sl.	Loss	No. of Person	Percentage
1	Owners of Commercial Structure	4	67%
2	Owners of Residential cum Commercial Structure (TH)	2	33%
3	Commercial tenant	0	0%
4	Employee in commercial Structures	0	0%
	Total	**6**	**100%**

Source: Census Survey on March, 2020

5.6.11 Loss of Community Structures

During census, it was observed that there are 11 structures of community property resources are affected considering the Toe Line of Impact including community, religious and government properties within the proposed right of way as well as proposed ROW.

Table 5.15: Type of Affected Community Structures

Sl.	Type of Structure	No. of Structure	Percentage
1	Water Tank	2	18%
2	Church Office	1	9%
3	Urinal Shed	1	9%
4	Stair	1	9%
5	Retaining Wall	2	18%
6	Church	1	9%
7	Memory Stone	3	27%
	Total	**11**	**100.0%**

Source: Census Survey on March, 2020

5.6.12 Summary Project Impacts

As per findings of the (Package-IIIB) 100% census of affected land and non-land assets, the project impacts can be broadly classified as (i) impacts on private land, (ii) impacts on private structures (iii) impacts on livelihoods due to loss of private properties and (iv) loss of common property resources. From the analysis of impacts, it is noted that altogether 105 structures out of which only 2 residential cum commercial structures which will be affected due to the project work. As per the survey, total 88 structure sheltering about 60 households (Private structure owner, Tenent & Employee in commercial Structures) comprising of 352 DPs will be affected in the project. The details of project impacts are discussed in the following section and the summary project impacts are presented in the (***Table 5.16***).

Table 5.16: Summary Project Impacts

Sl.	Impacts	Number
1	Total land acquisition requirements (in ha)	20.42
2	Total no. of private Residential structures	61
3	Total no. of private Commercial structures	6
4	Total number of Residential cum Commercial structures	2
5	Total number of other private structure	19
6	Total No. of Affected Families by affected structure	60
7	Total Number of Vulnerable households affected of Affected structure	60
8	Total number of displaced persons (DPs)	352
9	Total number of affected Community / Government structures	17

Source: Census Survey on March, 2020

5.7 REHABILITATION AND RESETTLEMENT PLAN

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.

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 V 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.

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.

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.

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.
- families that are landless (not having homestead land, agricultural land, or either homestead or agricultural land) and below poverty line, but residing continuously for a period of not less than three years 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.

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.

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.

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.

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.

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.

The lands drawn up shall consist of: -

- Land available or acquired for the project and earmarked for this purpose
- Government wastelands arid 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.

However, the Administrator for Rehabilitation and Resettlement should ensure that such acquisition of land does not lead to another set of physically displaced 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.

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.

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 displaced persons in the resettlement area or areas.

(o) Such other particulars as the Administrator for Rehabilitation and Resettlement may consider necessary.

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.

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.

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, 1996 (40 of 1996).

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

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.

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, 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 Documents. On final notification of the rehabilitation and resettlement scheme or plan, it shall come into force.

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.

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 RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014 (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.

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.

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.

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.

5.8 REHABILITATION AND RESETTLEMENT BENEFITS FOR THE AFFECTED FAMILIES

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.

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 meter of land in rural areas, or one hundred and fifty square meter 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

Each affected below poverty line family which is without homestead land and which has been residing in the affected area continuously for a period of not less than three years preceding the date of declaration of the affected area and which has been involuntarily displaced from such area, shall be entitled to a house of minimum one hundred square meter carpet area in rural areas, or fifty square meter 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:

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.

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) or holder of Village Council Pass 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.

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.

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.

(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.

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.

The land or house allotted to the affected families under this policy shall be free from all encumbrances.

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.

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.

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.

Each affected family that is displaced 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 displaced 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.

Each affected person who is a rural artisan, small trader or self-employed person and who has been displaced 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.
- The affected persons shall be offered the necessary training facilities for development of

entrepreneurship, technical and professional skills for self-employment.

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.

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.

In case of a project involving land acquisition on behalf of a requiring body, each affected family which is involuntarily displaced 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.

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.

If land is acquired in cases of urgency under the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014, each affected family which is displaced 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.

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.

5.8.1 Rehabilitation and Resettlement benefits for Project Affected families belonging to the scheduled tribes and scheduled castes

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.

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 RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014, 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.

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.

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.

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.

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.

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.

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

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.

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.

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).

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.

5.8.2 Amenities and Infrastructural facilities to be provided at Resettlement areas

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.

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.

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

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 resettle den masseur 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.

5.8.3 Indexation of Rehabilitation grant and other benefits

The rehabilitation grants 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.

5.8.4 Periphery Development

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.

5.9 GENDER IMPACT AND MITIGATIVE MEASURES

5.9.1 Introduction

The social economical survey and census survey to the project sites identified some critical social issues related to gender impacts associated with project impacts. Typically, vulnerability is relatively higher among this group. Dislocation and loss of livelihood caused by road widening and development may further aggravate their disadvantaged situation, unless special attention is paid to them. This chapter particularly examines the issues from social safeguard considerations to develop specific mitigation measure.

5.9.2 Women's Participation in the Project

The gender composition of DPs shows that the male accounts for 51% and female accounts for 49%. The gender disparity is visible in lower sex ratio among DPs i.e. 975 against state level statistic having 985.

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. productive or gainful employment). In the project, women are affected in a variety of ways. For example, they face 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 would be the miseries for women. 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. 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, PIU 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.

5.9.3 HIV/ AIDS and Health Risks

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 2011, India has close to 4 million HIV infected people. This is less than one percent of the adult population but still more than any country in the region. It is estimated that HIV infection could grow to 5 percent of adult population – more than 57 million by

2016 without successful intervention. HIV infection is typically concentrated among the poor marginalized groups including sex workers, drug users, migrant laborers and truck drivers. These groups, 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. There is need to improve awareness level in the state, particularly in the project area. Information and education campaign on HIV/AIDS and other sexually transmitted diseases (STDs) will be conducted by PIU during project implementation. The campaign will target the project construction workers at campsites, truckers at truck stops and dhabas and the public at large along the alignment. The PIU 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 would ultimately lead to lowering the risk for the general community in the project affected area.

The Project Area is affected by HIV/AIDS as per NACO reports on 2011 on the study for 2005, 2006 and 2007 the district of the least HIV/AIDS affected districts and the district of Churachandpur lies in the Category A, the second standard HIV/AIDS affected districts of India. As per the guidelines of ADB's SPS 2009 and subsequent publications proper and effective Awareness campaign both in regard of Gender and HIV /AIDS is to be undertaken by the Project Proponent.

5.10 PUBLIC CONSULTATION

Public Consultations or community participation is an integral part and process of any projects 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 to control over these initiatives, decisions and resources. Community consultations also help to avoid opposition to the project, which is otherwise likely to occur. The Table briefly depicts the plan and implementation of Public Consultation and Disclosure of the Project.

Table 5.17: Public Consultation and Disclosure Implementation and Plan

Activity	Task	Timing (Date/ Period)	No of People	Agencies	Feedback/ Issues/ Concerns Raised	Remarks
Stakeholder Identification	Mapping of the project area					
Project information Dissemination	Distribution of information leaflets to Displaced persons (DPs)					
Consultative Meetings with DPs during Scoping Phase	Discuss potential impacts of the project					
Public Notification	Publish list of affected lands/sites in a local newspaper; Establish eligibility cut-off date					
Socio-Economic Survey	Collect socioeconomic information on DP's perception on the project					
Consultative Meetings on Resettlement Mitigation Measures	Discuss entitlements, compensation rates, grievance redress mechanisms					
Publicize the resettlement plan (RP)	Distribute Leaflets or Booklets in local language					
Full Disclosure of the RP to DPs	Distribute RP in local language to DPs					
Web Disclosure of the RP	RP posted on NHIDCL and/or EA website					
Consultative Meetings during DMS	Face to face meetings with DPs					
Disclosure after Detailed Measurement Survey (DMS)	Disclose updated RP to DPs					
Web Disclosure of the Updated RP	Updated RP posted on NHIDCL and/or EA website					

The overall objectives of the consultation program in preparing RAP were to disseminate project information and to incorporate public and DP's views in Resettlement and Environmental Action Plans, which are guided by specific objectives like:

- ❖ Awareness amongst stakeholders by disclosing the updated R.P. according to GOI's

involuntary resettlement policy.

- ❖ Improvement in project design minimising potential conflicts and delays in implementation.
- ❖ Facilitate development of appropriate and acceptable entitlement options.
- ❖ Increase project sustainability.
- ❖ Reduce problems of institutional co-ordination.
- ❖ Make the R&R process transparent and reduce leakage.
- ❖ Increase re-settler commitment, ensure effectiveness and sustainability of the income restoration strategies, and improve coping mechanisms.
- ❖ Creating sense of belongingness among the stakeholders.

5.10.1 Identification of the stakeholders

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 assessment ensured that information is disseminated to all the DPs 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 vulnerable groups.

Certain issues conditioned the participation of the stakeholders, as follows:

- ❖ Who might be affected (positively or negatively) by the proposed development?
- ❖ Who are voiceless for whom special efforts may have to be made?
- ❖ Who are representatives of those likely to be affected?
- ❖ Who is responsible for what is intended?
- ❖ Who can make what is intended more effective through their participation or less effective by their non-participation or outright opposition?
- ❖ Who can contribute financial and technical resources?
- ❖ Whose behaviour has to change for the effort to succeed?
- ❖ 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 DPS, project beneficiaries and project implementing agencies. Secondary stakeholders included other individuals and groups, with an interest in the project, viz., the NHIDCL, the highway users etc.

5.10.2 Discloser of Project Information

The sharing of information is essential for sustainable development. It stimulates public debate on and broadens understanding of development issues, and enhances transparency and accountability

in the development process. It also strengthens public support to improve the lives of people, facilitates collaboration among the many parties involved in development, and improves the quality of projects and programs. It is now accepted everywhere that the expanded access to information by the public will enhance the dialogue on development, and make an important contribution to efforts to reduce poverty and promote sustainable development. In this development project the discloser of project information (during the feasibility stage) to the public in general and to the people who are likely to be impacted negatively in particular have been done by way of consultation process. During the consultation session it was observed that the local people are aware of this project through local newspaper, published from time to time.

5.10.3 Consultations for Determining Principle

The consultation process is not only targeted at project information dissemination to the people but another important aspect covered is determining of principle for formulating an entitlement frame work and eligibility policy for the project. The consultation process throws light of the people's expectations, aspirations etc. from the project as well as their expectations in terms of compensation and assistance from the project in case of adverse impacts.

5.10.4 Participants at different levels

The extent or the likely level of adverse impacts was one of the major criteria in deciding locations for public consultation sessions. The consultation programme has been tiered and conducted at several levels, such as:

- ❖ Heads of the households, likely to be impacted
- ❖ Members of the households, likely to be impacted
- ❖ Clusters of DPS
- ❖ Villagers
- ❖ Village Panchayats
- ❖ Local voluntary organisations and CB0s/NG0s
- ❖ Government agencies and departments

5.10.5 Levels of Consultation

The enactment of the participation and consultations with the stakeholders has been done at different levels throughout the project preparation stage. The Public Consultation was carried out at various stages of project preparation: Social Screening stage and Feasibility stage.

5.10.6 Consultation during Project Preparation

The Census Survey Team carried out preliminary consultations through Focus Group Discussions (FGD) and meetings with the DPs as well as the general public in the project area. FGDs were conducted primarily in settlements with problems of traffic congestion, dense informal/squatter settlement, close junctions and road intersections, and concentration of DPs. During the survey,

intensive discussion and consultation meetings were conducted with large number of DPs in nearly every affected village wherein policy related issues; displacements and other related issues were discussed. Suggestions and comments by DPs were incorporated in the project road design as well as the policy measures for resettlement management. Public discussions were conducted at important points, where people could assemble in large numbers. Panchayat members were contacted to inform the people. The Team also had informal meetings with village head, panchayat and other district level government officials, leaders of local level organization /association, trucker's association, and village women groups.

Illustration of Public Consultation meetings at our project corridor are tagged below:

Chairman and all the officials of the Village Council explain the local people about the project and its impacts and also promised that they would extend their co-operation in our Project work. During the implementation of the project.

Suggestions are given below:

- Village authority has satisfied as the proposed alignment would be built minimizing resettlement impact in the locality.
- Local People satisfied that the proposed alignment would be increase connectivity.

The meeting ended with vote of thanks to chair.

5.10.7 Plan for further Consultation in the Project

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. PIU 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:

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.

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.

During the implementation of RP, PIU will organize public meetings, and will appraise the communities about the progress in the implementation of project works, including awareness regarding road construction.

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.

To make reasonable representation of women in the project planning and implementation they will be specifically involved in consultation.

5.10.8 Information Disclosure

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 displaced 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.

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 (Manipuri) and distributed to DPs.

.OBJECTIVES and POLICY FRAME WORK

This Resettlement Plan (RP) has been prepared in accordance with National Highway Safeguard Policies and RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014. Policies are designed to protect the rights of the affected persons and communities. The primary objectives of the RP are to mitigate the adverse impacts of the project and to assist the displaced persons (DPs) in resettlement and restoration of their income and livelihoods.

The legal framework and principles adopted for addressing resettlement issues in the Project have been guided by the proposed legislation and policies of the GOI, the state Government of Manipur, National Highway Authority of India and in accordance with the principles of NHIDCL. Prior to the preparation of the Resettlement Plan, a detailed analysis of the proposed national and state policies was undertaken and an entitlement matrix has been prepared for the entire program. The section below provides details of the various national and state level legislations studied and their applicability within this framework. This RP is prepared based on the review and analysis of all applicable legal and policy frameworks of the country and NHIDCL's policy requirements. A summary of applicable acts and policies is presented in the following paragraphs and the detailed policy review and comparison is provided in the entitlement matrix.

5.10.9 Objectives of the Policy

The objectives of the Policy are as follows: -

To minimize displacement and to identify non-displacing or least-displacing alternatives;

To plan the resettlement and rehabilitation of Project Affected Families, (PAFs) including special

needs of Tribal and vulnerable sections;

To provide better standard of living to DPs; and

To facilitate harmonious relationship between the Requiring Body and DPs through mutual cooperation.

5.10.10 The National Highways Act

For LA, the Act defines the various DPs of the process as follows: (i) section 3A - power to acquire land; (ii) 3B - power to enter for surveys; (iii) 3C - hearing of objections; (iv) 3D - declaration of acquisition; (v) 3E - power to take possession; (vi) 3F - power to enter into the land where land has vested in the central government; (vii) 3G - determination of amount payable as compensation; and (viii) 3F - deposit and payment of amount. The Act requires that the processes must be completed within a year from 3A to 3D. The acquisition process is faster due to central government co-ordination and provision for arbitration or power of civil court for trying any LA-related dispute. Although NHAI Act significantly reduces the time frame for acquisition, the rules and principles of compensation are derived from the LA Act of 1894 amended from time to time. The Act covers only legal title holders and provides for: (i) market value of the land; (ii) a solarium of 30% on the market value for compulsory acquisition; (iii) additional amount for trees, crops, houses or other immovable properties; (iv) damage due to severing of land, residence, place of business; (v) compensation to sharecroppers for loss of earning; and (vi) an interest of 12% on the market value from the date of notification to award.

The LA Act does not address many of the social and economic issues associated with displacement and resettlement of 'illegal" or non-titled informal settlers/squatters. However, in many donor-funded or DFBOT (Design Finance Built Operate Transfer) projects, EA assisted affected and/or displaced persons even without any legal title. The impacts of the present project are also on the roadside SBEs/households - people who are "non titled" informal dwellers and encroachers.

5.10.11 Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013.

The Government of India (GoI) in December 2013 had enacted RFCTLARR Act, 2014 in accordance to Manipur RFCTLARR Rules, 2014 from 1st January 2015. It recognizes the following essential features:

- That Displaced Households (DHs) not only lose their lands, other assets and livelihoods, they also experience adverse psychological social/cultural consequences.
- The need to minimize large-scale displacement and where displacement and where inevitable, resettlement and rehabilitation has to be handled with care. This is especially necessary for tribal, small and marginal farmers and women.
- That cash compensation alone is often inadequate to replace agricultural land, homesteads and other resources. Landless labour, forest dwellers, tenants, artisans are not eligible for cash compensation. The need to provide relief especially to the rural poor (with no assets) and marginal farmers, SCs/STs and women; the revised draft of NPRR include poor (BPL) and deprived groups, vulnerable, an ex-gratia of Rs 20,000/- for linear acquisition, per family.

- The importance of dialogue between DFs and the administration; responsible for resettlement for smoother implementation of projects R&R.

Displaced agricultural labourer who has been working for a period of minimum three years and who used to earn his livelihood by working on the land which is now under acquisition and who has become jobless because of the acquisition, shall be entitled for onetime payment of two hundred days' wages as fixed by the govt. under minimum wages act and shall also be entitled for National/State level job card under National Rural Employment Guarantee Program.

The policy specifies that the entire cost for Resettlement and Rehabilitation, in addition to the cost of acquisition of land shall be borne by the respective requisitioning authorities. The Requisitioning Authority shall deposit an amount equivalent to 0.5 percent of the estimated cost of land under acquisition for the project to the Collector-cum-Administrator, Resettlement and Rehabilitation through a bank draft subject to maximum of Rs. 2 lacs (Two lacs) only. This amount shall be over and above the amount paid for establishment expenditure under LAA. This additional amount shall be paid for outsourcing the work of survey for Resettlement, Monitoring, Stationeries, POL and other incidentals like vehicle, Computer, Computer Operator, Amins, Drafts man, Chainman etc.

5.10.12 NHIDCL Policy of Social Safeguard

The NHIDCL Guidelines for Confirmation of Environmental and Social Considerations refer not only to the natural environment, but also to social issues such as involuntary resettlement and respect for the human rights of indigenous peoples.

The objective of the Guidelines is to encourage project proponents seeking funding from NHIDCL to implement appropriate environmental and social considerations in accordance with the Guidelines. In doing so, it endeavours to ensure transparency, predictability and accountability in its confirmation of environmental and social considerations.

One of the basic principles of Guidelines regarding confirmation of environmental and social considerations is that the responsibility for environmental and social considerations for the project shall be that of the project proponent. NHIDCL confirms environmental and social considerations by undertaking screening, environmental review, and monitoring and follow ups.

Environmental and social considerations required for funded projects cover underlying principles, examination of measures, scope of impact to be examined, compliance with laws, standards and plans, social acceptability and social impacts, involuntary resettlement, indigenous peoples and monitoring.

The following are summary of requirements under the Guidelines. Social acceptability and social impacts

Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which the project is planned. For projects with a potentially large environment impact, sufficient consultations with stakeholders, such as local residents, must be conducted via disclosure of information from an early stage where alternative proposals for the project plans may be examined. The outcome of such consultations must be

incorporated into the contents of the project plan; and

Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor and ethnic minorities who are susceptible to environmental and social impact and who may have little access to the decision-making process within society.

5.10.13 Involuntary resettlement

Involuntary resettlement and loss of means of livelihood are to be avoided where feasible, exploring all viable alternatives. When, after such examination, it is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected;

People to be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents, etc., in a timely manner. The project proponents, etc. must make efforts to enable people affected by project, to improve their standard of living,

Income opportunities and production levels, or at least to restore them to pre project levels. Measures to achieve this may include: providing land and monetary compensation for losses (to cover land and property losses), supporting the means for an alternative sustainable livelihood, and providing expenses necessary for relocation and re-establishment of community at relocation sites; and

Appropriate participation by the people affected and their communities must be promoted in the planning, implementation and monitoring of involuntary resettlement plans and measures against the loss of their means of livelihood.

5.10.14 Indigenous peoples

When a project may have adverse impact on indigenous peoples, all of their rights in relation to land and resources must be respected in accordance with the spirit of the relevant international declarations and treaties. Efforts must be made to obtain the consent of indigenous peoples after they have fully informed.

5.10.15 National Highway Policy of Social Considerations

The NHAI Guidelines for Confirmation of Environmental and Social Considerations refer not only to the natural environment, but also to social issues such as involuntary resettlement and respect for the human rights of indigenous peoples.

The objective of the Guidelines is to encourage project proponents seeking funding from MoRTH or Funding Agency to implement appropriate environmental and social considerations in accordance with the Guidelines. In doing so, it endeavors to ensure transparency, predictability and accountability in its confirmation of environmental and social considerations.

One of the basic principles of Guidelines regarding confirmation of environmental and social considerations is that the responsibility for environmental and social considerations for the project shall be that of the project proponent. NHIDCL confirms environmental and social considerations by

undertaking screening, environmental review, and monitoring and follow ups.

Environmental and social considerations required for funded projects cover underlying principles, examination of measures, scope of impact to be examined, compliance with laws, standards and plans, social acceptability and social impacts, involuntary resettlement, indigenous peoples and monitoring.

The following are summary of requirements under the Guidelines.

Social acceptability and social impacts

Projects must be adequately coordinated so that they are accepted in a manner that is socially appropriate to the country and locality in which the project is planned. For projects with a potentially large environment impact, sufficient consultations with stakeholders, such as local residents, must be conducted via disclosure of information from an early stage where alternative proposals for the project plans may be examined. The outcome of such consultations must be incorporated into the contents of the project plan; and

Appropriate consideration must be given to vulnerable social groups, such as women, children, the elderly, the poor and ethnic minorities who are susceptible to environmental and social impact and who may have little access to the decision-making process within society.

5.10.16 Policy Framework for this Project

Based on the above analysis of applicable legal and policy frameworks of the country and in consistent with state policy requirements the broad resettlement principle for this project shall be the following:

The involuntary resettlement would be avoided wherever possible or minimized as much as possible by exploring project and design alternatives.

The Project or all sub-projects under the program will be screened to identify past, present, and future involuntary resettlement impacts and risks. The scope of resettlement planning will be determined through a survey and/or census of displaced persons, including a gender analysis, specifically related to resettlement impacts and risks.

Meaningful consultations with affected persons, host communities, PIU will be carried out and all displaced persons will be informed of their entitlements and resettlement options. DP's participation in planning, implementation, and monitoring and reporting of resettlement programs will be ensured.

Particular attention will be paid to the needs of vulnerable groups, especially those below the poverty line, the landless, the elderly, women and children, and Indigenous Peoples, and those without legal title to land, and ensure their participation in consultations.

An effective grievance redress mechanism will be established to receive and facilitate resolution of the displaced persons' concerns. The social and cultural institutions of displaced persons and their host population will be supported through proper planning. Where involuntary resettlement impacts and risks are highly complex and sensitive, compensation and resettlement decisions should be

preceded by a social preparation phase.

The livelihoods of all displaced persons will be improved or at least restored through (i) land-based resettlement strategies when affected livelihoods are land based where possible or cash compensation at replacement value for land when the loss of land does not undermine livelihoods, (ii) prompt replacement of assets with access to assets of equal or higher value, (iii) prompt compensation at full replacement cost for assets that cannot be restored, and (iv) additional revenues and services through benefit sharing schemes where possible.

Physically and economically displaced persons will be provided with needed assistance, including (i) if there is relocation, secured tenure to relocation land, better housing at resettlement sites with comparable access to employment and production opportunities, integration of resettled persons economically and socially into their host communities, and extension of project benefits to host communities; (ii) Transportation support and development assistance, such as land development, credit facilities, training, or employment opportunities; and (iii) civic infrastructure and community services, as required.

The standards of living of the displaced poor and other vulnerable groups, including women, will be improved to at least national minimum standards. In rural areas legal and affordable access to land and resources will be provided, and in urban areas appropriate income sources and legal and affordable access to adequate housing will be provided to the displaced poor.

If land acquisition is through negotiated settlement, procedures will be developed in a transparent, consistent, and equitable manner to ensure that those people who enter into negotiated settlements will maintain the same or better income and livelihood status. If, however, the negotiated settlement fails, the normal procedure of land acquisition will be followed.

Displaced persons without titles to land or any recognizable legal rights to land will be ensured that they are eligible for resettlement assistance and compensation for loss of non-land assets.

A resettlement plan will be prepared elaborating on displaced persons' entitlements, the income and livelihood restoration strategy, institutional arrangements, monitoring and reporting framework, budget, and time-bound implementation schedule.

The draft resettlement plan, including documentation of the consultation process will be disclosed in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected persons and other stakeholders. The final resettlement plan and its updates will also be disclosed to displaced persons and other stakeholders.

Involuntary resettlement will be conceived and executed as part of a development project or program. Full costs of resettlement will be included in the presentation of project's costs and benefits. For a project with significant involuntary resettlement impacts, consider implementing the involuntary resettlement component of the project as a stand-alone operation.

All compensation will be paid and other resettlement entitlements will be provided before physical or economic displacement. The resettlement plan will be implemented under close supervision throughout project implementation.

Resettlement outcomes, their impacts on the standards of living of displaced persons will be monitored; it will be accessed whether the objectives of the resettlement plan have been achieved by taking into account the baseline conditions and the results of resettlement monitoring. Monitoring reports will be disclosed to DPs.

Land acquisition for the project would be done as per both National Highway Safeguard Policies and the RFCTLARR ACT, 2013 in accordance to Manipur RFCTLARR Rules, 2014. To meet the replacement cost of land payment of compensation in revised market rate.

The uneconomic residual land remaining after land acquisition will be acquired as per the provisions of Land Acquisition Act. The owner of such land/property will have the right to seek acquisition of his entire contiguous holding/ property provided the residual land is less than the average land holding of the district.

People moving in the project area after the cut-off date will not be entitled to any assistance. In case of land acquisition, the date of publication of preliminary notification for acquisition under the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014 will be treated as the cut-off date.

All common property resources (CPR) lost due to the project will be replaced or compensated by the project.

The project will recognize three types of displaced persons like (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. The involuntary resettlement requirements apply to all three types of displaced persons.

5.10.17 Methodology for Determination of Valuation of Assets

All lands proposed to be acquired under this project will be compensated as per replacement cost. Land surveys to determine compensation rates will be conducted on the basis current land use and assessment of market value. Records as they are on the cut-off date will be taken into consideration while determining the current use of land. The EA will determine the replacement cost as per RFCTLARR ACT, 2013 in accordance to Manipur RFCTLARR Rules, 2014 based on market survey and in consultation with DPs. After notification for acquisition as per National Highway Safeguard Policies, the EA will negotiate with DPs for voluntary acquisition and ensure payment of additional registration cost and solatium to all DPs. The EA will ensure that the rates established for the project are sufficient to purchase the same quality and quantity of land in the specific area.

The compensation for houses, buildings and other immovable properties will be determined on the basis of replacement cost as on date without depreciation. The EA will determine the replacement cost of structures in consultation with the owners by assessing (i) sources and cost of materials, whether the materials are locally available; (ii) type of shops (private or state-owned); (iii) distance to be traveled to procure materials; (iv) obtaining cost estimates through consultation with three contractors/suppliers in order to identify cost of materials and labor; (v) identifying the cost of

different types of houses of different categories and compare the same with district level prices.

Cash compensation for properties belonging to the community if opted by the community, will be provided to enable construction of the same at new places through the community/ local self-governing bodies / appropriate authority in accordance with the modalities determined by such bodies / authority to ensure correct use of the amount of compensation.

Compensation for trees will be based on their market value. Loss of timber trees will be compensated at their replacement cost while the compensation for the loss of fruit bearing trees will be calculated as annual produce value for at next 15 years depending on the nature of crops/trees.

5.10.18 Procedure and Steps of Land Acquisition

The land acquisition in this project context will be accordingly the RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014, along with additional provision made under RFCTLARR ACT, 2013 in accordance to Manipur RFCTLARR Rules, 2014. The process for land acquisition in the project will be as follows:

- ❖ All the land identified for the project will be placed under the RFCTLARR ACT, 2013 in accordance to Manipur RFCTLARR Rules, 2014 and a notification with Government's intension to acquire land will be issued by the District Collector (DC).
- ❖ Objections if any must be made within 30 days to the District Collector by the landowners.
- ❖ The land will be then placed under the LA Authority where a declaration will be made by the Government for acquisition of land for public purpose.
- ❖ The DC will take steps for the acquisition, and the land is placed and notice will be issued by the DC in the name of persons interested.
- ❖ Once the land is placed under the EA will negotiate with DPs for voluntary acquisition to ensure payment of additional registration cost and solatium to all DPs.
- ❖ The DC will make declaration of award and disburse the compensation to the DPs

5.11 ENTITLEMENTS, ASSISTANCE AND BENEFITS

5.11.1 Definition of DPs and Eligibility

The project will have three types of displaced 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. The involuntary resettlement requirements apply to all three types of displaced persons. DPs entitled for compensation, assistance and rehabilitation provisions under the sub project are:

All DPs losing land either covered by formal legal title, recognizable title, or without legal status;

Tenants and sharecroppers whether registered or not;

Owners of buildings, crops, plants, or other objects attached to the land; and DPs losing business, income, and salaries

Compensation eligibility is limited by a cut-off date as set for this project on the day of the beginning of the census survey which is March, 2020 or as decided by the EA. DPs who settle in the affected areas after the cut-off date will not be eligible for compensation. They, however, will be given sufficient advance notice, requested to vacate premises and dismantle affected structures prior to project implementation. Their dismantled structures materials will not be confiscated and they will not pay any fine or suffer any sanction.

5.11.2 Entitlements

The entitlement provisions various categories of DPs in terms loss of land house and income as per census survey are detailed below:

Agricultural land impacts will be compensated at replacement cost. Cash compensation at replacement cost will be determined according to RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014. If the residual plot(s) is (are) not viable, i.e., the DP becomes a marginal farmer, three options are to be given to the DP, subject to his acceptance which are (i) The DP remains on the plot, and the compensation and assistance paid to the tune of required amount of land to be acquired, (ii) Compensation and assistance are to be provided for the entire plot including residual part, if the owner of such land wishes that his residual plot should also be acquired by the EA, the EA will acquire the residual plot and pay the compensation for it and (iii) If the DP is from vulnerable group, compensation for the entire land by means of land for land will be provided if DP wishes so, provided that land of equal productive value is available. All fees, stamp duties, taxes and other charges, as applicable under the relevant laws, incurred in the relocation and rehabilitation process, are to be borne by the EA.

Loss of homestead /Commercial land will be compensated at replacement cost. Cash compensation at replacement cost will be determined according to RFCTLARR Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014. All fees, stamp duties, taxes and other charges, as applicable under the relevant laws, incurred in the relocation and rehabilitation process, are to be borne by the EA.

Loss of Structures Residential/Commercial/Other will be compensated at replacement value with other assistance. The details on the determination of compensation will be as (i) Compensation of structure will be paid at the replacement cost to be calculated as per latest prevailing basic schedules of rates (BSR) without depreciation or the replacement cost, (ii) Shifting assistance of Rs. 50,000/-, (iii) Right to salvage material from demolished structure and frontage etc., and (iv) Rental assistance as per the prevalent rate in the form of grant to cover maximum three month rentals.

Loss of rental accommodation by the tenants will be compensated as rental assistance and shifting assistance. The details assistance will be as per (i) Rental assistance for both residential & commercial tenants as per the prevalent rate in the form of grant to cover maximum three month rentals, (ii) Additional structures erected by tenants will also be compensated and deducted from owner's compensation amount, (iii) Shifting assistance based on type of house and household assets, (iv) Any advance deposited by the tenants will be refunded from owners total compensation package to the tenant on submission of documentary evidences and (v) Right to salvage material from demolished structure and frontage etc. erected by tenants

Loss of Trees will be compensated to Land holders, Share- croppers and Lease holders based on the market value to be computed with assistance of horticulture department. This can further be detailed in specific ways such as (i) Advance notice to DPs to harvest fruits and remove trees, (ii) b) For fruit bearing trees compensation at average fruit production for next 15 years to be computed at current market value and (iii) For timber trees compensation at market cost based on kind of trees

Loss of Crops will be compensated to Land holders, Share- croppers and Lease holders based on the market value to be computed with assistance of agricultural department. The detailed compensation methods are (i) Advance notice to DPs to harvest crops and (ii) In case of standing crops, cash compensation at current market cost to be calculated of mature crops based on average production.

Loss of Livelihood due to Loss of primary source of income will be compensated through rehabilitation assistances. There are various categories of entitled persons under this category which are (i) Titleholders losing income through business, (ii) Titleholders losing income through agriculture, (iii) Wage earning employees indirectly affected due to displacement of commercial structure, (iv) Agricultural labourer/share-cropper and (v) Licensed mobile vendors and kiosk operators. Details of entitlements for the above categories are described below:

Title holders losing their business establishment due to displacement will be provided rehabilitation assistance through a lump sum Transportation allowance of Rs. 9,000/-

Titleholders losing income through agriculture will be provided with the rehabilitation assistance which are (i) Training Assistance will be provided for income generating vocational training and skill up gradation options as per DPs choice at the rate of Rs. 5,000 per affected household to those households losing their primary source of income and (ii) Employment opportunity for DPs in the road construction work, if available and if so desired by them.

Wage earning employees indirectly affected due to displacement of commercial structure will be assisted through rehabilitation assistance which are; (i) persons indirectly affected due to the employer having being displaced, on case-by-case, based on local wage rates for three months, (ii)

Employment opportunity for DPs in the road construction work, if available and if so desired by them, or (iii) National/State level job card under National Rural Employment Guarantee Program.

Rehabilitation assistance for Agricultural labourer/share-cropper will be paid as per the details such as (i) Assistance is to be paid as per the prevailing local wage rates for 100 days., (ii) b) Employment opportunity for DPs in the road construction work, if available and if so desired by them, or (iii) National/State level job card under National Rural Employment Guarantee Program.

Licensed mobile vendors and kiosk operators will be provided with the rehabilitation assistance which are (i) Mobile vendors are not eligible for compensation or assistance (ii) Those mobile vendors in possession of a permit from local authorities to operate in the affected area will be treated as kiosks operators, (iii) Kiosk operators and vendors licensed to operate from affected locations will be entitled to a one time lump sum assistance of Rs. 10,000/-.

Loss of community infrastructure/common property resources will be compensated either by cash compensation at replacement cost or reconstruction of the community structure in consultation with the affected community

Additional Assistance to vulnerable groups (Vulnerable households including BPL, SC, ST, WHH, disabled and elderly) will be paid with Special Assistance which will be one time lump sum assistance of Rs. 20,000/ to vulnerable households. This will be paid above and over the other assistance(s) as per this entitlement matrix.

Other Unanticipated Impacts (Temporary impact during construction like disruption of normal traffic, damage to adjacent parcel of land / assets due to movement of heavy machinery and plant site) will be compensated to either individual or community in the form of (i) The contractor shall bear the cost of any impact on structure or land due to movement of machinery during construction or establishment of construction plant and (ii) All temporary use of lands outside proposed RoW to be through written approval of the landowner and contractor. Location of Construction camps by contractors in consultation with RCD.

Any unanticipated impacts (if any) due to the project will be documented and mitigated based on the spirit of the principle agreed upon in this entitlement matrix.

5.11.3 Entitlement Matrix

Compensation for the lost assets to all displaced persons will be paid on the basis of replacement cost. Resettlement assistance for lost income and livelihoods will be provided to title holders. Special resettlement and rehabilitation measures will be made available to the “Vulnerable Group” comprises of DPs living below poverty line (BPL), SC, ST, women headed households, the elderly and the disabled. An Entitlement Matrix has been formulated, which recognizes and lists various types of losses resulting out of the project and specific compensation and resettlement packages.

Table 5.18: Entitlement Matrix

Sl.	Impact Category	Entitlements		Implementation Guidelines
PART I.TITLE HOLDERS-Compensation for Loss of Private Property				
1	Loss of Land (agricultural, homestead, commercial or otherwise)	1.1	Compensation for land at Replacement Cost or Land for land, where feasible	Land will be acquired by the competent authority in accordance with the provisions of RFCTLARR Act, 2013. Replacement cost for Land will be, higher of(i) market value as per Indian Stamp Act, 1899 for the registration of sale deed or agreements to sell, in the area where land is situated; or(ii)average sale price for similar type of land, situated in the nearest village or nearest vicinity area, ascertained from the highest 50% of sale deeds of the preceding 3years; or (iii) consented amount paid for PPPs or private companies. Plus 100%solatium and 12%interest from date of notification to award. The multiplier factor adopted by GoM for land in rural area, based on the distance from urban area to the affected area, will be applied. In case of severance of land, house, manufactory or other building, As per Section 94(1), the whole land and /or structure shall be acquired, if the owner so desires.
2	Loss of Structure (house, shop, building or immovable property or assets attached to the land)	2.1	Compensation at replacement cost	The market value of structures and other immovable properties will be determined by replacement cost and/or PWD on the basis of relevant PWD Schedule of rates (SR)N as on date without depreciation. Plus 100% solatium For partly affected structures, the DP will have the option of –claiming compensation for the entire structure, if the remaining portion is unviable.

PART II. REHABILITATION AND RESETTLEMENT- Both Land Owners and Families Whose Livelihood is Primarily Dependent on Land Acquired				
3	Loss of land	3.1	Employment to at least one member per affected family in the project or arrange for a job in such other project as may be required after providing suitable training and skill development in the required field and at a rate not lower than the minimum wages provided for in any other law for the time being in force. Or One-time payment of Rs.5,00,000/-for each affected household. Or Annuity policy that shall pay Rs, 2000/- per month for 20 years with appropriate indexation to CPIAL	
		3.2	Monthly subsistence allowance of Rs, 3000/-per month for a period of one year to affected households who require to relocate due to the project	
		3.3	Transportation assistance of Rs, 50,000/- for affected households who require to relocate due to the project	
		3.4	One time assistance of Rs, 25,000/- to all those who loss a cattle shed	
		3.5	One time Resettlement Allowance of Rs, 50,000/- for affected house \hold who have to relocate	
		3.6	Additional onetime assistance of Rs, 50,000/-to scheduled caste and scheduled tribe families who are displaced from scheduled areas and who require to relocate due to the project	

4	Loss of Residence	4.1	An alternative house for those who have to relocate, as per IAY specification in rural areas and constructed house/flat of minimum 50sq.m. in urban areas or cash in lieu of house if opted (the cash in lieu of house will be Rs, 70,000/-in the line with GoI IAY standards in rural areas and Rs, 1,50,000 in case of urban areas) , for those who do not have any homestead land and who have been residing in the affected areas continuously for a minimum period of 3years	Stamp Duty and registration charges will be borne by the project in case of new houses or sites.
		4.2	Employment to at least one number per affected family in the project or arrange for a job in such other project as may be required after providing suitable training and skill development in the required field and at a rate not lower than the minimum wages provided for any other law for the time being in force. Or One Time payment of Rs, 5,00,000/- for each affected household Or Annuity policy that shall pay Rs, 2000/- per month or 20 years with appropriate indexation to CPIAL	
		4.3	Monthly subsistence allowance of Rs, 3000/- per month for a period of one year to affected households who require to locate due to the project	
		4.4	Transportation assistance of Rs, 50,000/- for affected households who require to relocate due to the project	
		4.5	One time assistance of Rs, 25,000/-to all those who lose a cattle shed	
		4.6	One time assistance of Rs, 25,000/- for each affected family of an artisan or self-employed and who has to relocate	

		4.7	One time Resettlement Allowance of Rs, 50,000/-for affected household who have to relocate	
		4.8	Additional onetime assistance of Rs, 50,000/-to scheduled caste and scheduled tribe families who are displaced from scheduled areas and who require to relocate due to the project	
		4.9	Right to salvage affected materials.	
5	Loss of shop /trade /commercial structure	5.1	Employment to at least one number per affected family in the project or arrange for a job in such other project as may be required after providing suitable training and skill development in the required field and at a rate not lower than the minimum wages provided for in any other law for the Or One-time Payment of Rs,5,00,000/-for each affected household Or Annuity policy that shall pay Rs, 2000/-per month for 20 years with appropriate indexation to CPIAL	
		5.2	Monthly subsistence allowance of 3000/- per month for a period of one year to affected household who require to relocate due to the project	
		5.3	Transportation assistance of Rs, 50,000/-for affected household who require to relocate due to the project	
		5.4	One time assistance of Rs, 25,000/-for each affected family of an artisan or self-employed or small trader and who has to relocate	
		5.5	One time Resettlement Allowance of Rs, 50,000/-for affected household who have to relocate	

		5.6	Additional onetime assistance of 50,000/-to scheduled caste and scheduled tribe families who are displaced from scheduled areas and who require to relocate due- to the project	
		5.7	Right to salvage affected materials	
PART IV.IMPACT TO VULNERABLE HOUSEHOLD				
8	Vulnerable Household	8.1	Training for skill development. This assistance includes cost of training and financial assistance for travel/conveyance and food.	One adult member of the affected household, whose livelihood is affected, will be entitled for skill development. The PIU will identify the number of eligible vulnerable displaced persons during joint verification and updating of the RP and will conduct training need assessment in consultations with the DPs so as to develop appropriate training programmes suitable to the DPs skill and the region. Suitable trainers or local resources will be identified by PIU in consultation with local training institutes.
		8.2	One time assistance of Rs,25,000/-to DHs who have to relocate	
PART V.IMPACT DURING CIVIL WORKS				
9	Impact to structure / assets/tree/crops	9.1	The contractor is liable to pay damages to assets/tree/crops in privet/public land, caused due to civil works	The PIU will ensure compliance
10	Use of private land	10.1	The contractor should obtain prior written consent from the landowner and pay mutually agreed rental for use of private land for storage of material or movement of vehicles and machinery or diversion of traffic during civil works	
PART VI. COMMION PROPERTY RESOURCES				
11	impact to common property resources such as places of worship, community buildings, schools, etc.	11.1	Relocation or restoration, if feasible, or cash compensation at replacement cost.	
12	Utilities such as water supply, electricity, etc.	12.1	Will be relocated and services restored prior to commencement of civil works	The PIU will ensure that utilities are relocated prior to commencement of civil works in that stretch of the road corridor in accordance with the civil works schedule

PART VII. UNFORSEEN IMPACT
Unforeseen Impacts encountered during implementation will be addressed in accordance with the principles of RFCTLARR2013/ Safeguard policy Guidelines of Multilateral Institutions

5.12 GRIEVANCE REDRESS CELL

There is a need for an efficient grievance redressal mechanism, which will assist the DPs in resolving queries and complaints. Any disputes will be addressed through the grievance redressal mechanism.

Formation of Grievance Redressal Cell (GRC) is most important for grievance redressal and it is anticipated that most, if not all grievances, are settled by the GRC. Detailed investigation will be undertaken which may involve field investigation with the concerned DPs. The GRCs are expected to resolve the grievances of the eligible persons within a stipulated time.

The GRCs will continue to function, for the benefit of the DPs, during the entire life of the project including the defects liability period. The response time prescribed for the GRCs is 15 days. The GRC will meet once in a fortnight to expedite redressal of grievances.

People are not debarred from moving to the court for issues including those related to R&R Entitlement. However, it is expected that the GRCs will play a very crucial role in redressing grievances of the DPs, and will help the implementation of the project as scheduled.

5.12.1 Constitution of Grievance Redressal Committee (GRC)

The committee will comprise of representatives of PIU; public representatives (viz., Member of Parliament, Member of Legislative Assembly, etc.) from respective district; representative of women group, squatters and vulnerable DPs; line department and affected persons especially women as well as the representative of respective District Administration. Minimum participation of women in GRC will be 33%. At least two persons from each group will be there in the GRC. The functions of the GRC will be:

- To provide support for the DPs on problems arising out of Land/ Property acquisition.
- To record the grievances of the DPs, categorizes and prioritize and solve them within a month.
- To inform PIU of serious cases within an appropriate time frame; and
- To report to the aggrieved parties about the development regarding their grievance and decision of PIU.

5.12.2 Operational Mechanism

It is proposed that GRC will meet regularly (at least once in 15 days) on a pre-fixed date (preferably on first 7th day of the month). The committee will look into the grievances of the people and will assign the responsibilities to implement the decisions of the committee. The committee will deliver its decision within a month of the case registration.

The mechanism will be based on proposed laws. The Grievance Redressal Cell (GRC) will be set up at each district. Grievance not resolved amicably at the district level will be routed through PIU to the GRC. Arbitrator may also be appointed for unresolved cases. Arbitrator will be selected by PIU.

The various queries, complaints and problems that are likely to be generated among the DPs will

primarily relate to disputes of ownership of assets, identification of legal heirs of deceased property owner and other non-land related issues.

The PIU and office of NHIDCL will act as Public Information Centres, which will be in possession of all documents relating to the Project including compensation packages and grievance redressal procedures, and will provide any information regarding compensation and grievance redressal.

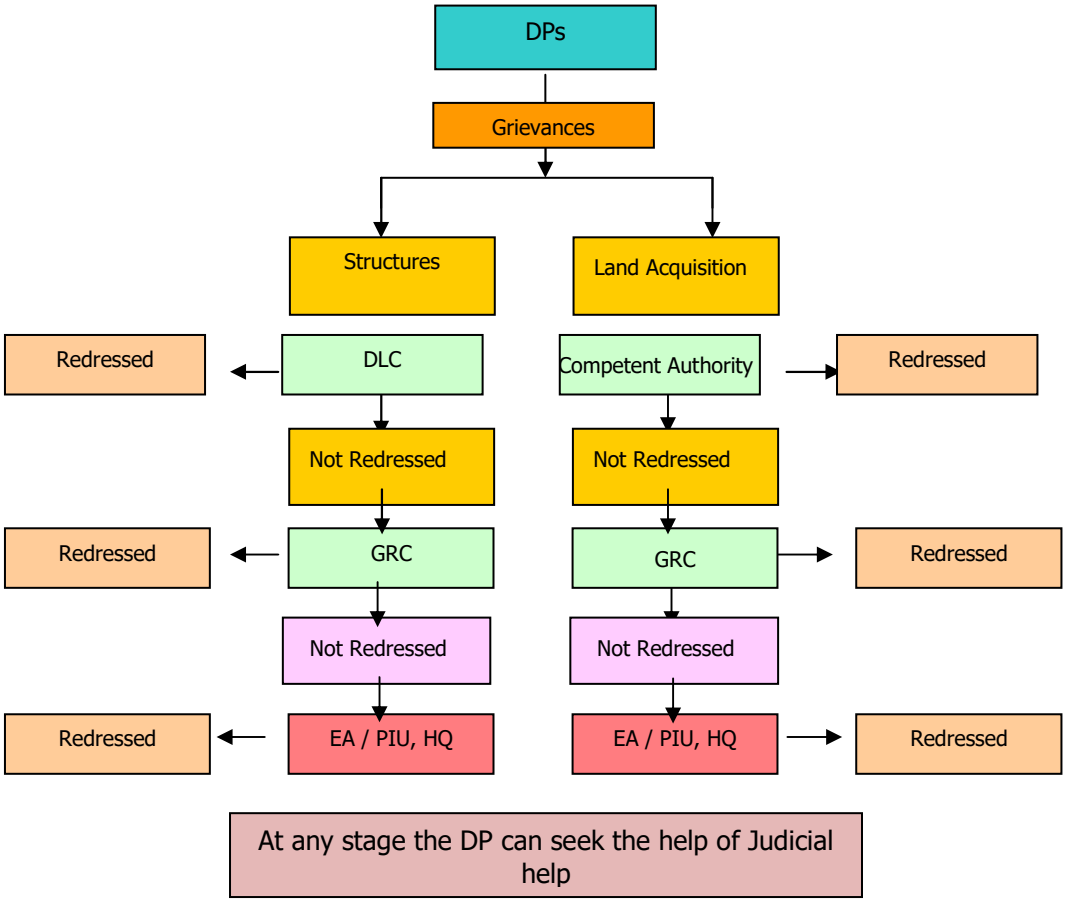
Through public consultations, the DPs will be informed that they have a right to grievance redressal. The DPs can present their grievances or queries to the GRC. The PIU will act as an in-built grievance redressal body.

5.12.3 Grievance Redressal Mechanism for DPs

The successive grievance redressal stages are illustrated in the flow chart shown below:

Flow Chart

Levels of Grievance Redressal



District Level Committees: The first stage will be District Level Committees (DLCs). The DPs will be encouraged to be part of DLCs composed of:

- ❖ Representatives of affected persons;
- ❖ Panchayat members of the affected villages; and
- ❖ PIU's Field worker

33% participation of women from affected families and full participation of women from the women headed households will also be encouraged.

The DLCs will meet at regular intervals as decided by the community, specifically for grievance redressing purposes at a pre-decided date, time and place. The DPs can be formally present in these meetings and discuss their queries and grievances. At the community level, the committee will have the power to resolve matters either by providing information or agreeing on a follow-up action. It may also reject some grievances for not being legitimate. However, it will have to explain to the AP, the premise for not recording the grievance. Legitimate grievances, which the DLC is unable to resolve, will be taken to the GRC, which will then take the necessary action after reviewing the findings of a thorough investigation. The DLC will maintain a register of all queries and grievances, and the subsequent action taken.

The DPs will present their grievance, concerning compensation for structures / land and R&R assistance to the DLC. The DLC will examine the grievance, and where required will review with DRO/CA and will do utmost to reach an amicable settlement to the satisfaction of the DPs.

5.12.4 Role of NHIDCL/EA Headquarters

The DPs, who would not be satisfied with the decision of the GRC, will have the right to take the grievance to the NHIDCL/EA Head Office for its redressal. Failing the redressal of grievance at NHIDCL/EA, the DPs will take the case to Arbitration. The Arbitrator(s) will be independent but appointed by NHIDCL. Taking grievances to arbitration and Judiciary will be avoided as far possible and the PIU will make utmost efforts at reconciliation at the GRC level.

5.13 INCOME RESTORATION MEASURES

5.13.1 Introduction

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.

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) or/and engaged in small business enterprises (vehicle repairing shops, small hotels, other rural/semi urban small activity based shops, commercial squatters etc.) as displaced 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.

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.

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.

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 PIU. The project affected families eligible for Income Restoration is shown in table below:

Table 5.19: Income Restoration for displaced persons

Sl.	Loss	No. of Person	Percentage
1	Owners of Commercial Structure	4	67%
2	Owners of Residential cum Commercial Structure (TH)	2	33%
3	Commercial tenant	0	0%
4	Employee in commercial Structures	0	0%
	Total	**6**	**100%**

Source: Census Survey on March, 2020

The project will assist the DPs in liaison with PIU, 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.

5.13.2 Self-Employment Generation Scheme

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

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 PIU 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 PIU 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.

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.
- ❖ 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.

5.13.3 Option of self-employment and EA's Assistance

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.

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.

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 PIU and the DLCs will vet appeals.

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

Survey of marketing opportunities by the PIU 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 PIU.

PIU 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 PIU 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 PIU.

R&R cell in collaboration with the PIU 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.

5.13.4 Market Feasibility Study

No business enterprise or income restoration program will sustain until and unless it is based on the market need and demand. Hence, EA through it's PIU 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.

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 will facilitate marketing facilities support through backward and forward linkages in order to make the self-employment schemes successful and will conduct periodical monitoring of these units over the implementation period and will take midterm correction measures if required. For marketing purposes, the PIU 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 PIU will have to be gradually phase out their involvement.

5.13.5 Training Needs of DPs

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 PIU. 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. PIU shall carry out the detail exercise of skill mapping and training need assessment before finalization of any training schemes.

5.13.6 Comprehensive Training Policy

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

5.13.7 Training of DPs

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 PIU. 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 PIU will coordinate the process.
- DPs shall request the EA for participation in a particular training in consultation with the PIU. 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.

5.13.8 Training Mechanism

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

- Regular survey of perceived training needs of DPs by PIU 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 PIU 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 PIU.
- Preparation of list of trainees (phase wise) by the PIU in collaboration with the DLCs and R&R Cell.
- Awareness generation and information dissemination on the schemes by the PIU 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 PIU. The PIU will submit the information to the R&R cell, for inclusion in the R&R database.

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 that the funds for training are utilized in best possible ways.

5.13.9 Women's Needs & Participation

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.

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 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.

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: -

- The independent agency for monitoring and evaluation will have 33% representation of women key professionals and technical support team.

5.13.10 Measures towards income restoration and uplift of vulnerable people

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.
- 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.

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/displaced 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 PIU 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.

5.13.11 Short-Term Income Restoration Activities

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. 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
  - PIU
  - DLC/GRC
  - Training Institutions
  - M&E Agency

5.13.12 The Process

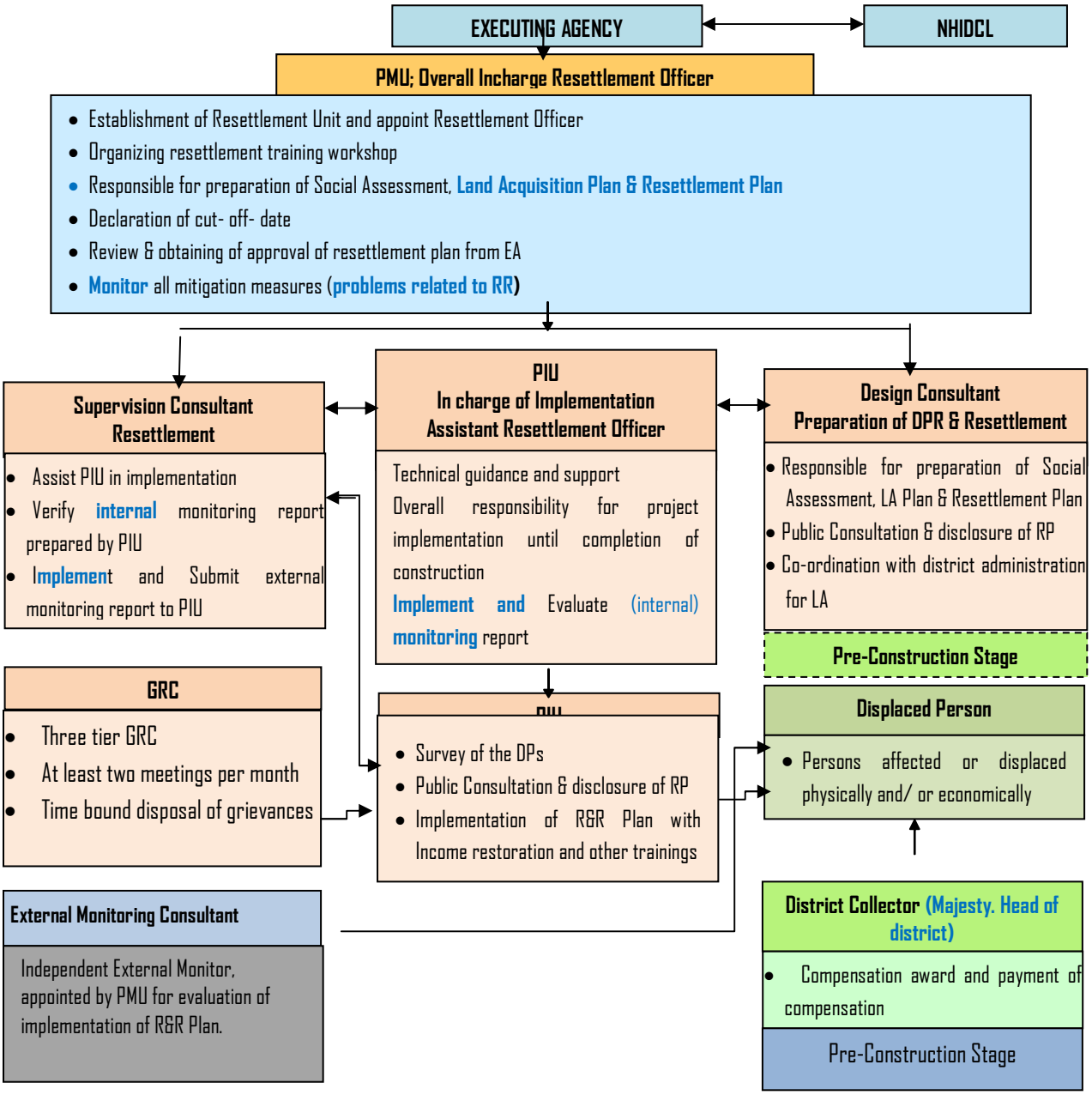
EA will initiate the following activities to commence and implement the RP:

- ❖ Establish PIU and field offices
- ❖ Orientation and awareness seminars for Project Implementation Unit (PIU).
- ❖ Appointment of external monitoring and evaluation consultants

Effective RP implementation will require institutional relationships & responsibilities, rapid organizational development & collaborative efforts by EA, State Govt. 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. The ESDU at the apex level will have overall responsibility for policy guidance, coordination, contingency planning, monitoring and overall reporting during RP implementation.

The Organogram for the R&R cell is given in (***Figure no. 5.8***):

Figure 5.8: Implementation Structures for RAP



5.14 INSTITUTIONS FOR PLANNING & IMPLEMENTATION OF RP

5.14.1 Introduction

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:

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

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

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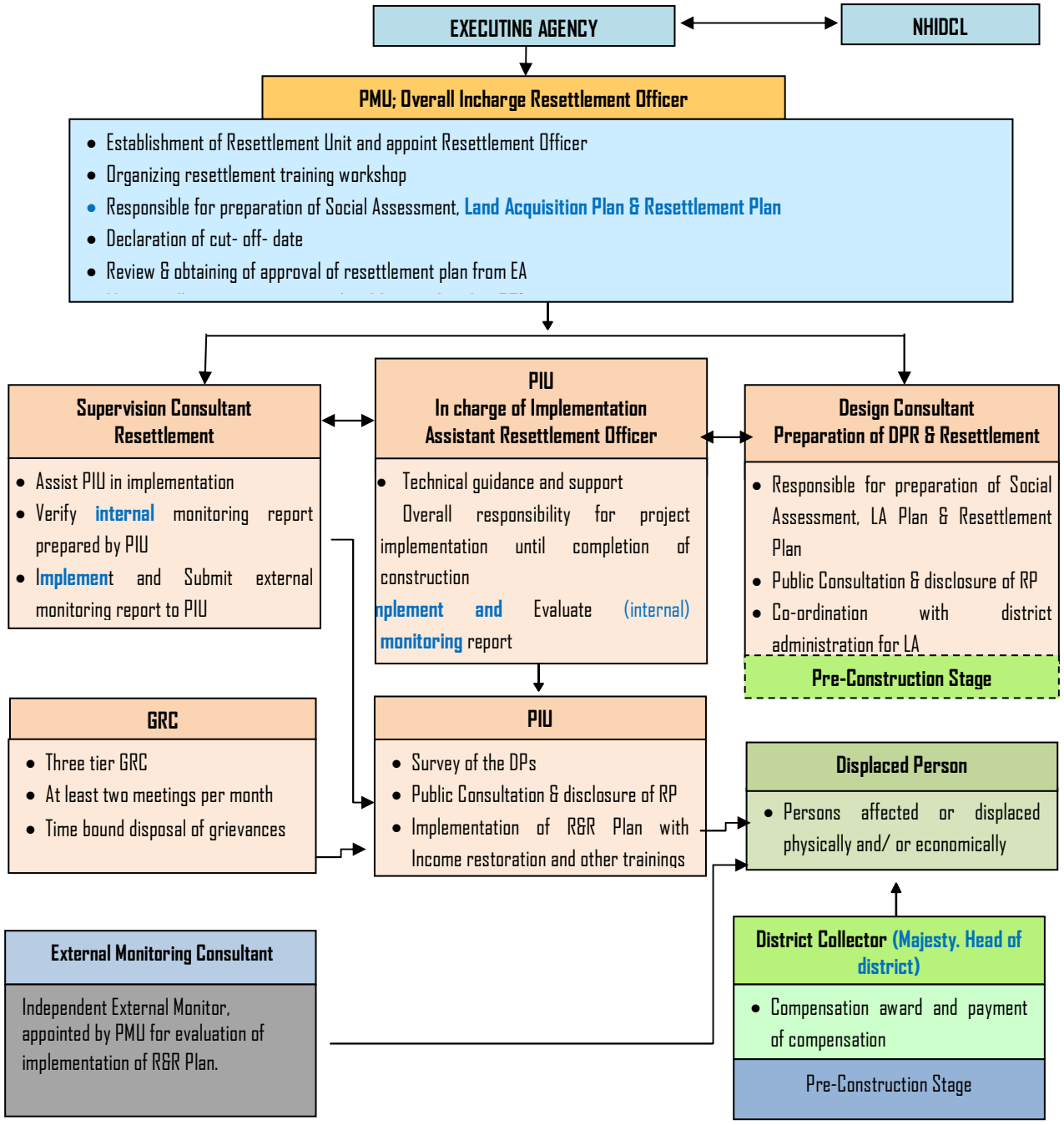
The ESDU at the apex level will have overall responsibility for policy guidance, coordination, and contingency planning, monitoring and overall reporting during RP implementation.

Figure 5.9: Institutional arrangement for RAP



5.14.3 Roles and Responsibilities

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

5.14.3.a At Corporate Level

The Project Director: -

- 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.

EA: -

- Co-ordinate the implementation of R&R activities with **corporate** and field staff.
- Review the micro plans prepared by the PIU.
- Review monthly progress report.
- Monitor the progress on R&R and land acquisition.
- Advice PIU/M&E Agency on policy related issues during implementation.
- Ensure early release of money to PIUs for R&R activities.

5.14.4 Project Implementation Unit (PIU)

This unit will coordinate the process for land acquisition. Relocation and rehabilitation, distribution of project provided assistance and DPs access to government programs.

- 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

5.14.5 RP Implementation Field Offices and Tasks

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.

5.14.5.a District Resettlement and Rehabilitation Officer (DRRO)

- Co-ordinate with District Administration and PIU for land acquisition and R&R.
- Translation of R&R policy in local language.
- Prepare pamphlets of the policy.

- ❖ Printing of the policy and identity cards for the DPs.
- ❖ 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 DPs who may have not been covered during the census survey; facilitate the opening of joint accounts in local banks to transfer assistance for R&R for DPs and organize disbursement of cheques for assistance in the affected area in public.
- ❖ Monitor physical and financial progress on land acquisition and R&R activities.
- ❖ Participate in regular meetings.
- ❖ Organize Bi-monthly meetings with the PIU to review the progress on R&R.
- ❖ Review micro plan & monthly reports submitted by PIU.

5.14.6 District Level Committee (DLC)

RP will be implemented through District Level Committees that will be established in the districts of Churachandpur in Manipur. The committee would include District Magistrate or his representative, District Land Acquisition Officer, Pradhan of Panchayat Samities, representative of affected villages including women, representative of Revenue Department, Line Departments, PWD, Mining Departments, people's representatives, and representatives of affected population. The formation of DLCs would be facilitated by PIU. 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.

The DLC would also: (i) meet regularly at pre-decided dated specifically for grievance redressing purpose; (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.

5.14.6.a Coordination with Other Agencies and Organizations

R&R Cell 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.

Income restoration will be sole responsibility of the Project Authority. PIU will facilitate linkages to be established with the agencies implementing centrally sponsored poverty alleviation programs to restore the income of DPs.

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 DPs and to achieve the desired results expected from implementation of RP.

The Revenue Department 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. The representative of these departments/agencies will be in contact with the R&R Cell, which will facilitate the integration of the various agencies, involved in the R&R process.

5.15 RESETTLEMENT AND REHABILITATION BUDGET

5.15.1 Introduction

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, 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.

5.15.2 Compensation

5.15.2.a Private Agricultural Land:

The unit rate for agricultural land has been estimated as per Land Acquisition Resettlement and Rehabilitation Act, 2013 in accordance to Manipur RFCTLARR Rules, 2014 and National Highway Authority of India Act, 1956. To meet the replacement cost of land compensation will be calculated over updated land rate with additional as registration cost plus solatium or as decided by District Magistrate. 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.

5.15.2.b Residential/ Commercial and other structures:

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 or market value.
- 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 Manipur, 2016 and/or the

market values.

The average estimated rate for permanent structures without land has been calculated at Rs. 16,218/m^2, semi-permanent structures have been calculated at Rs. 12,448/m^2, and temporary structures have been calculated at the rate of Rs. 3,769/m2. The compensation for boundary walls at per running metre is Rs. 6,244/ per metre.2

5.15.3 Assistance

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/-.

Rental Assistance: Rental assistance to titleholder (structures) and tenants in structures will be provided in the form of grants to cover maximum three months' rentals @ Rs. 4,000/- per month.

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.

Training Assistance to Agricultural Titleholders: Training Assistance will be provided for income generating vocational training and skill up-gradation options as per DPs choice at the rate of Rs. 5,000/- per affected household to those households losing their primary source of income.

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. 146/- for 100 days.

Rehabilitation Assistance to Agricultural Labourers/Sharecroppers: Agricultural Labourers/ Sharecroppers will be provided with assistance as per the prevailing local wage rate for 100 days @ Rs. 173/- per day.

Assistance to Vulnerable Households: One time lump sum assistance of Rs. 50,000/- will be paid to each vulnerable households. (This will be paid above and over the other assistance(s) as per the entitlement matrix).

5.15.4 Compensation for Community and Government Property

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. 3,00,000/- per structure is made in the budget to rebuild are enhance the ambience of these structures. However, any religious or community structure requires full relocation will be compensated in replacement rate.

5.15.5 RP Implementation and Support Cost

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

[2] Annexure attached.

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 other interest groups besides PIU.

5.15.6 Source of Funding and Fund Flow Management

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 PIU will be involved in facilitating the disbursement process and rehabilitation program.

5.15.7 R&R Budget

A detailed indicative R&R cost is given in Table

Table 5.20: Estimates of Entitlements for Package-IIIB

Item	Rate (as per Minimum Guidance Value)	Rate (as per Avarage Market Rate)	Total Area (Ha)	Cost (as per Avarage Market Rate)
	(in Rs. Per Ha)	(in Rs. Per Ha)		(in Rs.)
I. Compensation for loss of Private Property				
1. Loss of Land (agricultural, homestead, commercial or otherwise)				
Effective Average Cost of Urban Land	2152780	32291700	0	0
Effective Average Cost of Rural Land	107639	5381950	20.42	109,899,419.00
			Sub Total (A)	**109,899,419.00**
2. Loss of Structure (house, shop, building or immovable property or assets attached to land				
Type of Structure	**Rs. Per Sqm**	**Area Sqm**		
Permanent	16218	6.83	110,768.94	
Semi-Permanent	12448	215.58	2,683,539.84	
Temporary	3769	4521.84	17,042,814.96	
Compound Wall	6244	0	-	
Pillar (In Numbers)	1500	22	33,000.00	
Memorial Structure (In Numbers)	32000	5	160,000.00	
		Subtotal (B)	**20,030,123.74**	
		100% Solatium for Structure (C)	**20,030,123.74**	
II. Rehabilitation and Resettlement (Land owners & families dependent on Land)				
3. Loss of Residence				
Special Cash Assistance of Rs. 5 lakhs	500,000.00	0	-	
Shifting Assistance to DPs	50,000.00	0	-	
Subsistence Allowance for 12 months	36,000.00	0	-	
Additional Assistance to Vulnerable Groups	50,000.00	0	-	
One Time Resettlement Allowance	50,000.00	0	-	
		Subtotal (D)	**-**	
4. Loss of Shop/trade/commercial structure				
Special Cash Assistance of Rs. 5 lakhs	500,000.00	0	-	
Subsistence Allowance for 12 months	36,000.00	0	-	
Additional Assistance to Vulnerable Groups	50,000.00	0	-	
Transitional Allowance	50,000.00	0	-	
One Time Resettlement Allowance	50,000.00	0	-	
		Subtotal (E)	**-**	
III. Impact to Standing Crops and Trees				
Average cost of the fruit bearing trees	0	0	0	
		Subtotal (F)	0	

IV. Impact to Vulnerable Household			
One time Assistance who have to relocate	25,000.00	0	0
		Subtotal (G)	0
V. Impact to Tenant during Construction			
Subsistence Allowance for 3 months	18,000.00	0	0
Rental Assistance of Rs. 9,000	9,000.00	0	0
		Subtotal (H)	**0**
VI. Community/Government Property			
Religious Structures	250,000.00	1	250,000.00
School/Community Property/office	100,000.00	13	1,300,000.00
Memorial Structure	32,000.00	3	96,000.00
Cost of structure in lieu of community Land	250,000.00	0	-
		Subtotal (I)	**1,646,000.00**
VIII. Unforeseen Impacts			
Contingency of 5%	Total of (A to I)	5%	7,580,283.32
		Subtotal (J)	**7,580,283.32**
IX. Implementation of RAP			
Support for implementation of RAP (lumpsum)[9]	2,225,000.00	1	2,225,000.00
M & E consultant (lumpsum)	240,000.00	1	240,000.00
		Subtotal (K)	**2,465,000.00**
		Grand Total(L) = (A to K)	**161,650,949.80**

Source: Census Survey on March, 2020

The above estimate is based on rates vide Entitlement Matrix as per the norms of RTFCLARR 2013 and in accordance with National Highway Authority of India's Policies. The total project R and R Cost is Rs. **16.17 Cr** as per Avarage Market Rate.

5.16 IMPLEMENTATION SCHEDULE

5.16.1 Introduction

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.

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.

5.16.2 Schedule for Project Implementation

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.

Project Preparation Phase

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 NHIDCL; 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.

5.16.3 RP Implementation Phase

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.

5.16.4 Monitoring and Reporting Period

As mentioned earlier the internal monitoring will be the responsibility of PMU, PIU 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.

5.16.5 R&R Implementation Schedule

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. 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 project road has been divided into four 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.

Table 5.21: Implementation Schedule of NH

	2017												2018												2019												2020					
	1Q			2Q			3Q			4Q			1Q			2Q			3Q			4Q			1Q			2Q			3Q			4Q			1Q			2Q		
	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	1	2	3	4	5	6
Project Preparation Stage																																										
Scree project impact										■	■	■																														
Public Consultation on alignment										■	■	■																														
Prepare Land Acquisition Plan										■	■	■																														
Carry out Census Survey													■	■	■																												
Prepare Resettlement Plan (RP)													■	■	■																												
RP Implementation Stage																																										
Obtaing RP approval from NHIDCL																■	■	■																									
Disclosure of RP																■	■	■	■	■	■	■	■	■																		
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																						■	■	■	■	■	■															
Rehabilitation of DPs																	■	■	■	■	■	■	■	■	■	■	■	■														
Monitoring and Reporting Period																																										
Internal monitoring and reporting													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Hiring Construction Supervision Consultant																			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
External monitoring and reporting																			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						

5.17 MONITORING AND EVALUATION

5.17.1 Introduction

Monitoring is a periodic assessment of planned activities providing midway inputs, facilitates changes and gives necessary feedback of activities and the directions on which they are going, whereas Evaluation is a summing up activity at the end of the project, assessing whether the activities have actually achieved their intended goals and purposes. In absence of an effective monitoring strategy it would be impossible to ensure that all anticipated benefits and entitlements reach DPs in time and in an efficient grievance free manner. It will be a systematic and continuous process of collecting and analysing information about the progress of the project and a tool for identifying strengths and weaknesses within a project. Resettlement monitoring will include the collection, analysis, reporting and use of information about the progress of resettlement, based on the RP. Monitoring in resettlement will focus on restoration of income and standard of living of the affected persons as the primary focus. Several key activities such as delivery of entitlements will also be monitored. EA will have two tiers (Internal and External) monitoring system.

5.17.2 The Internal Monitoring

The internal monitoring will be handled by PIU. A monitoring cell will be established in PIU with individuals having appropriate skills and capacity. A comprehensive and relevant database and management 'information system (MIS) will be established and updated periodically for monitoring various activities of the project. The RP information generated through various surveys like census, baseline socio-economic, land and structures will become important input of the information system. Effective Monitoring will help accomplish this task and facilitate appropriate changes in resettlement implementation based on the information obtained, through routine collection of data. Therefore, EA will develop a monitoring plan that covers all essential stages of resettlement i.e. preparatory stage, relocation stage & rehabilitation stage.

PIU, EA will form independent monitoring cell which will work at the time of Project Implementation.

5.17.3 Key Indicators of Monitoring

EA, considering the importance of the various stage of project cycle, will handle the monitoring at each stage as stated below:

5.17.4 Preparatory Stage

During the pre-relocation phase of resettlement operation, monitoring is concerned with administrative issues such as, establishment of resettlement unit, budget, land acquisition, consultation with DPs in the preparation of resettlement plan, payments of entitlements due, grievance redressal, and so on.

- ❖ The key indicators for monitoring at this stage will be:

- Conduct of baseline survey
- Consultations
- Identification of DP and the numbers
- Identification of different categories of DPs and their entitlements
- Collection of gender disaggregated data
- Inventory & losses survey
- Asset inventory Entitlements
- Valuation of different assets
- Budgeting
- Information dissemination
- Institutional arrangements
- Implementation schedule review, budgets and line items expenditure

5.17.5 Relocation Stage

Monitoring during the relocation phase covers such issues as site selection in consultation with DPs, development of relocation sites, assistance to DPs (especially to vulnerable groups) in physically moving to the new site. Likewise, aspects such as adjustment of DPs in the new surroundings, attitude of the host population towards the new-comers and development of community life are also considered at this stage. The key indicators for monitoring will be:

- Payment of compensation
- Delivery of entitlement
- Grievance handling
- Land acquisition
- Preparation of resettlement site, including civic amenities '(water, sanitation, drainage, paved streets, electricity)
- Consultations
- Relocation
- DPs who do not relocate
- Payment of compensation
- Livelihood restoration assistance.

5.17.6 Rehabilitation Stage

Once DPs have settled down at the new sites, the focus of monitoring will be on issues of economic recovery programmes including income generating schemes (IGSs), acceptance of these schemes by

DPs, impact of IGSs on living standards, and the ability of the new livelihood patterns. The key indicators for monitoring will be:

- Initiation of income generation activities
- Provision of basic civic amenities and essential facilities in the relocated area
- Consultations
- Assistance to enhance livelihood and quality of life

5.17.6.a The most crucial components/indicators to be monitored are specific contents of the activities and entitlement matrix.

- Input and output indicators related to physical progress of the work will include items as:
- Training of PIU, ROs and other staff completed
- Public meetings held
- Census, assets inventories, assessments and socio-economic studies completed.
- Meeting of DLCs
- Meeting of GRCs
- Grievance redresses procedures in-place and functioning.
- Compensation payments disbursed.
- Shops space allotted.
- Relocation of DPs completed.
- Employment provided to DPs.
- Community development activities completed.
- Infrastructure repaired, bus stands, water and sanitation facilities provided.
- Village roads repaired.
- Training of DPs initiated.
- Income restoration activities initiated.
- Number of families displaced and resettled.
- Extent of government land identified and allotted to the DPs.
- Monitoring and evaluation reports submitted.

5.17.7 Reporting Mechanism

As stated earlier one of the main roles of PIU will be to oversee proper and timely implementation of all activities in RP. Internal Monitoring will be a regular activity for PIU and Rehabilitation Manager will oversee the timely implementation of R&R activities. Internal Monitoring will be carried out by the PIU (through the R&R Cell) and its agents, PIU will prepare monthly/quarterly reports on the

progress of RP Implementation. PIU will collect information from the project site and assimilate in the form of monthly progress to access the progress and results of RP implementation and adjust work programme where necessary, in case of delays or problems. Both monitoring and evaluation will form parts of regular activities and reporting on this will be extremely important in order to undertake mid-way corrective DPs. The reports can broadly be classified as:

- Progress reports during Implementation of the RP
- Qualitative reports highlighting the qualitative aspects
- Financial reports
- Evaluation reports based on benefits and impact of assistance provided.

5.17.8 Resources Requirement and Database Management

For the PIU to function, EA will allocate adequate financial resource towards office space, computers, transport and staff budget. The following essential requirements will be planned:

- Annual budget for Monitoring
- Office space
- Tables, chairs and furniture.
- Computer dedicated to the monitoring unit
- Transport
- Administrative support staff
- Appropriate technical staff
- Add on database management

5.17.9 External or Independent Monitoring

External (or Independent) monitoring will be hired to provide an independent periodic assessment of resettlement implementation and impacts to verify internal monitoring, and to suggest adjustment of delivery mechanisms and procedures as required. A social and economic assessment of the results of delivered entitlements and measurement of the income and standards of living of the DPs before and after resettlement will be integral components of this monitoring activity.

To function effectively, the organization responsible for external monitoring will be independent of the governmental agencies involved in resettlement implementation. The agency will submit monthly and quarterly monitoring reports. Mid-term and final evaluation will be done by the agency to find out if the R&R objectives have been achieved as against the performance impact indictors.

5.17.10 Scope of Work of External Monitor:

- Examine and verify internal monitoring system and suggest changes.
- Prepare independent reports based on monitoring visits.

- Major recommendations for remedial actions.
- Major recommendations for policy changes.
- Maintenance of database.

5.17.10.a Detail Activities to be undertaken by External Monitor:

The scope of activities will include but not be limited to:

- Verification of internal reports, by field check of delivery of the following:
- Payment of compensation including its levels and timing.
- Land readjustment.
- Preparation and adequacy of resettlement sites.
- House construction.
- Provision of employment, its adequacy and income levels.
- Training.
- Rehabilitation of vulnerable groups.
- Infrastructure repair, relocation or replacement.
- Enterprise relocation, compensation and its adequacy.
- Transition allowances.

5.17.11 Property and demographic survey of the following affected persons:

- 100% census survey of persons who were severely affected by Project works and have relocated either to group resettlement sites or preferred to self-relocate.
- 20% sample survey of persons who had property, assets, incomes and activities marginally affected by Project works and did not relocate.
- 20% sample survey of those affected by off-site project activities by contractors' subcontractors, including employment, use of land for contractor's camps, pollution, public health etc.
- Generate gender disaggregated socio-economic data, socio-economic condition, needs and priorities of women etc.

5.17.12 Evaluation of Delivery and Impacts of Entitlements

- Identify the categories of impacts and evaluate the quality and timeliness of delivery of entitlements (compensation and rehabilitation measures) for each category of impact. He/she will ensure that how the entitlements were used and examine impact and adequacy to meet the specified objectives of the RP.
- Ensure the quality, sufficiency of funds and on-time delivery of entitlements according to RP. Also verify other monitoring reports prepared during implementation by an independent

source.

- Establish by appropriate investigative and analytical techniques, the pre-and post- Project socio-economic conditions of the affected people. In the absence of baseline socio-economic data on income and living standards, and given the difficulty of DPs having accurate recollection of their pre-Project income and living standards, develop some quality checks on the information to be obtained from the DPs. Such quality checks could include verification by neighbours and local village leaders. The methodology for assessment should be very explicit.

5.17.13 Evaluation of Consultation and Grievance Procedures

Identify, quantify and qualify the types of conflicts and grievances reported and resolved and the consultation and participation procedures.

5.17.14 Declaration of Successful Implementation

Provide a summation of whether involuntary resettlement was implemented (a) in accordance with the RP, and (b) in accordance with Policy on Involuntary Resettlement.

5.17.15 Actions Required

Describe any outstanding actions that are required to bring the resettlement into compliance with Policy on Involuntary Resettlement. Describe further mitigation measures needed to meet the needs of any affected person or families judged and/or perceiving themselves to be worse off as a result of the Project.

Provide a timetable and define budget requirements for these supplementary mitigation measures and detail the process of compliance monitoring and final "signing off" for these DPs.

5.17.16 Reporting Cycle/Frequency

PIU is responsible for supervision and implementation of the RP & will prepare monthly progress reports on resettlement activities. The external M&E expert will submit bi-annual review directly to EA and determine whether resettlement goals have been achieved, more importantly whether livelihoods and living standards have been restored/enhanced and suggest suitable recommendations for improvement.

5.17.17 Participation of affected people in M&E

The general approach to be used is to monitor activities and evaluate impacts ensuring participation of all stakeholders especially women and vulnerable groups. Monitoring tools would include both quantitative and qualitative methods:

- Baseline household survey of a representative sample, disaggregated by gender and vulnerable groups to obtain information on the key indicators of entitlement delivery, efficiency, effectiveness, impact and sustainability. 20% percent random sample of DPs will be covered.

- Focused Group Discussions (FGD) that would allow the monitors to consult with a range of stakeholders (local government, resettlement field staff, PIU, community leaders and DPs).
- Key informant interviews: select local leaders, village workers or persons with special knowledge or experience about resettlement activities and implementation.
- Community public meetings: open public meetings at resettlement sites to elicit: -
- Information about performance of various resettlement activities.
- Structured direct observations: field observations on status of resettlement
- Implementation, plus individual or group interviews for crosschecking purposes.
- Informal surveys/interviews: informal surveys of DPs, host village, workers, resettlement staff, and implementing agency personnel using non-sampled methods. In the case of special issues, in-depth case studies of DPs and host populations from various social classes will be undertaken to assess impact of resettlement.

5.17.18 Impact on Women

The project will have both positive and negative impact on the women of the region. The women, by virtue of their biological difference, enjoy a low privilege status in the society as compared to their male counterpart. Any negative impact of the project would have greater magnitude on this less privileged class of the society. It is imperative to have a continuous monitoring and evaluation of implication of RP implementation on the women.

5.18 CONCLUSION

The Government of Manipur has taken up the initiative to develop, maintain the highways and other district roads of the State of Manipur under the big push of agricultural as well as tourist growth and increase of trade with outer world where the intensity of traffic has increased considerably and there is necessity for augmentation of capacity for safe and efficient movement of traffic. One such project is the development for 2-laning of NH-102B from Churachandpur to Tuivai for a length of 145.984 km (design chainage).

The project road starts from Churachandpur Town (Junction of NH-102B and old NH-2) and ends at Tuvai in the district of Churanchandpur. As per design the total length of the project road comes out as 145.984 km. The Start co-ordinate of the project is Latitude 24°20'46.44" N and Longitude 93° 42'00.34" E. The End co-ordinate is Latitude 24° 01'22.40" N and Longitude 93°15'12.64" E. Most part of the District is in through mountainous / hilly terrain and very small portion. The topography is mostly rural in nature. This Road is passing through Churachandpur, New Lamka, Munnuam, Mata village, Muallam, Bulian, Singngat, Suangdoh, Tuimai, Lungthul, Mualnuam, Sinzawl and Tuivai. The project road has distributed in four packages. This Report elaborate and describe the Third(IIIB) package. As per the design chainage the 3rd package(IIIB) starts from Chainage 88.980 to 103.525 km and it lie on Churachandpur district only.

Existing ROW does not cater to the codal provision of 24m ROW of Hill Road in open areas and 20m in built-up area and hence land is required to be acquired to adhere to the codal provision.

A project census survey was carried out to identify the persons both private owners and customary right holders 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 cut-off date is finalized as March, 2020.

The public consultation on the focus groups and the stakeholders give the opportunity to address issues, which were already resolved after making appropriate changes in design and alternative finalisation. The stakeholders become aware of the development schemes and at the same time influence and share to control over these initiatives, decisions and resources. Community consultations also help to avoid opposition to the project, which is otherwise likely to occur.

Decisions regarding providence of the resettlement and rehabilitation entitlement would be done as per the guidelines of EA and Government of India. The DPs may go to the Grievance Redressed Cell and to the Arbitrator as per the provision laid in the Guidelines. It may be noted that the redress to the grievances of the DPs may be done with consideration.

In the total SIA, there is very little impact of resettlement and rehabilitation programmes as there is no major impact in their livelihood and their socio economic as well as cultural way of life of the people of these areas. Out of the 60 DHs (Private Structure owner, Tenent & Emploeey of commercial Structute), there would be only major impact on 2 DHs, who are both residential and commercial have to be shifted.

According to the proposed alignment of the Project Road the estimated cost for the various categories of Affected Persons for different purpose is based on rates vide Entitlement Matrix as per

the norms of RTFCLARR 2013 and in accordance with National Highway Authority of India's Policies. The total project R and R Cost is Rs. **16.17 Cr** as per Avarage Market Rate

The Resettlement Impact is summarized in Tabular format.

Table 5.22: Resettlement Impacts for Package-IIIB

Sl.	Impacts	Number
1	Total land acquisition requirements (in ha)	20.42
2	Total no. of private Residential structures	61
3	Total no. of private Commercial structures	6
4	Total number of Residential cum Commercial structures	2
5	Total number of other private structure	19
6	Total No. of Affected Families by affected structure	60
7	Total Number of Vulnerable households affected of Affected structure	60
8	Total number of displaced persons (DPs)	352
9	Total number of affected Community / Government structures	17

Source: Census Survey on March, 2020

The widening of the NH gives an immense scope of development of the region in regards of easy accessibility. Other than the development of the agricultural sector there would be easy accessibility of the other industrial and consumerable products to the region and the finished Handicrafts and cottage industrial products with the rest the country as well as for International Market. The socio – economic status of the region is being changing drastically with inflow venture and human capital. The changing climate of the socio – economic and political scenario of the state of Manipur with the working culture of the people with a huge supply of local skilled and unskilled labourers would increase the scope of developments by manifolds. Infrastructural investment such as the NH 102B would remove the bottle neckness of development and help in taking a huge positive leap of sustainable socio- economic growth of the region.

NH – 102B

CHURACHANDPUR-TUIVAI ROAD

(CHURACHANDPUR DISTRICT)

LAND AND STRUCTURE DETAILS

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
1		88+980-94+430, 91+070-91+075	BOTH/RIGHT	Thuangtam	Mualnuam	THP-1	G CHINKHANLIAN S/O G KAIKHANTHANG	8497 8403 8648	Private	R-101	WATER TANK	-	PERMANENT	2.66	2.66		
2	Only structure	90+920-90+930	RIGHT	Thuangtam	Mualnuam	THP-1	GENNEIHKHUP S/O SUANTINLAM	5037 7694 4510	Private	R-98	RESIDENTIAL	GF	TEMPORARY	97.28	97.28		
3	Only structure	90+925-90+930	LEFT	Thuangtam	Mualnuam	THP-1	GOVERNMENT	Not Applicable	Government	CPR-10	WATER TANK	-	PERMANENT	2.52	2.52	Not Applicable	
4	Only structure	90+935-90+945	RIGHT	Thuangtam	Mualnuam	THP-1	NENGSOANKAP S/O ZAMZACHIN	5942 0833 5329	Private	R-99	RESIDENTIAL	FF	TEMPORARY	61.75	61.75		
										R-99	RESIDENTIAL	GF	TEMPORARY	61.75	61.75		
5	Only structure	91+050-91+060	RIGHT	Thuangtam	Mualnuam	THP-1	LAMLEMSANG S/O LAMZAGEN	6686 8537 4928	Private	R-100	RESIDENTIAL	GF	TEMPORARY	54	54		
6	Only structure	91+070-91+080	LEFT	Thuangtam	Mualnuam	THP-1	KHAMLIANTHANG PAITE S/O NGULZALAM PAITE	8869 5854 4112	Private	L-47	RESIDENTIAL	GF	TEMPORARY	70.68	70.68		
7	Only structure	91+090-91+100	LEFT	Thuangtam	Mualnuam	THP-1	G CHINKHANLIAN S/O G KAIKHANTHANG	8497 8403 8648	Private	L-48	RESIDENTIAL	GF	TEMPORARY	55.5	55.5		
8	Only structure	91+100-91+110	RIGHT	Thuangtam	Mualnuam	THP-1	D GINZALAM S/O TUALKHOSONG	4850 5444 5905	Private	R-102	RESIDENTIAL	GF	TEMPORARY	75.2	75.2		

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
9	Only structure	91+110-91+125	RIGHT	Thuangtam	Mualnuam	THP-1	K CHINLIAN S/O KHAMZAPAU	3907 6253 1797	Private	R-103	RESIDENTIAL	GF	TEMPORARY	97.68	97.68		
10	Only structure	91+175-91+185	LEFT	Thuangtam	Mualnuam	THP-1	KAMKHANLAL S/O NGULZALAM	3152 2211 8514	Private	L-49	RESIDENTIAL	GF	TEMPORARY	53.2	53.2		
11	Only structure	91+200-91+220	LEFT	Thuangtam	Mualnuam	THP-1	V DONGSUANKHAM S/O NGULZALAM	6169 4275 6266	Private	L-50A	RESIDENTIAL	GF	TEMPORARY	67.34	67.34		
										L-50B	RESIDENTIAL-STORE ROOM	GF	TEMPORARY	4.05	4.05		
12	Only structure	91+220-91+235	RIGHT	Thuangtam	Mualnuam	THP-1	LIAMNZAPAU S/O THANGKHOGIN	8424 5353 4494	Private	R-104	RESIDENTIAL	GF	TEMPORARY	35.34	35.34		
13	Only structure	91+235-91+250	RIGHT	Thuangtam	Mualnuam	THP-1	NGULKHOPAU S/O KHATSEANTHANG	9076 1363 6271	Private	R-105	RESIDENTIAL	GF	TEMPORARY	56.05	56.05		
14	B4 (Only Plantation)	97+370-97+540, 97+805-97+962	RIGHT/LEFT	Mualnuam	Mualnuam	MUP-1	G KHAMKHANSUAN S/O G KAIKHOMANG	3700 0251 2928	Private	-	-	-	-	-	-		-
15	Only structure	99+770-99+880	LEFT	Mualnuam	Mualnuam	MUP-1	C/O-L.SONGKHOGIN S/O THUAMKAM	2967 1008 2597	Private	CPR-11A	TOILET	-	SEMI-PERMANENT	4	4		
										CPR-11B	WATER TANK	-	PERMANENT	1.17	1.17		

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
										CPR-11C	SCHOOL	GF	SEMI-PERMANENT	194.3	194.3		
16	Only structure	99+950-99+965	RIGHT	Mualnuam	Mualnuam	MUP-1	THANGBIAKIM D/O LUANKHOTUAN	4603 4029 1300	Private	R-106A	RESIDENTIAL	GF	TEMPORARY	71.04	71.04		
										R-106B	MEMORY STONE	-	MEMORY STONE				
17	Only structure	99+975-99+985	RIGHT	Mualnuam	Mualnuam	MUP-1	S. KAMKHANMUAN S/O THIANZATHANG	2011 5535 2276	Private	R-107	RESIDENTIAL	GF	TEMPORARY	46.62	46.62	Not Present	
18	Only structure	99+990-100+000	LEFT	Mualnuam	Mualnuam	MUP-1	PAULIANDING GUITE S/O G KHAMKHANSUAW	7970 8251 9491	Private	L-51	RESIDENTIAL	GF	TEMPORARY	41.61	41.61		
19	Only structure	100+000-100+010	RIGHT	Mualnuam	Mualnuam	MUP-1	T GINKHOZAM S/O THUALKAM	4332 8422 9680	Private	R-108	RESIDENCIAL CUM COMMERCIAL	GF	TEMPORARY	91.52	91.52		
20	Only structure	100+020-100+040	LEFT	Mualnuam	Mualnuam	MUP-1	G GOUKHOPAU S/O LATE TUALKHOZAM	2031 8201 1641	Private	L-52	RESIDENTIAL	GF	TEMPORARY	82.6	82.6		
21	Only structure	100+020-100+040	RIGHT	Mualnuam	Mualnuam	MUP-1	DALKHANLIAN S/O LATE LUANKHOTOAN	9176 8266 7282	Private	R-109A	RESIDENTIAL	GF	TEMPORARY	117.45	117.45		

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
										R-109B	RESIDENTIAL-STORE ROOM	GF	TEMPORARY	10.8	10.8		
22	Only structure	100+050-100+060	RIGHT	Mualnuam	Mualnuam	MUP-1	LALZALIAN S/O NGULKHOGIN	5757 5828 1602	Private	L-53	RESIDENTIAL	GF	TEMPORARY	57.42	57.42		
23	Only structure	100+050-100+060	RIGHT	Mualnuam	Mualnuam	MUP-1	T PAUZAMOI S/O KAMLIAN	6846 2950 9403	Private	R-141	RESIDENTIAL	GF	TEMPORARY	81.75	81.75		
24	Only structure	100+065-100+090	LEFT	Mualnuam	Mualnuam	MUP-1	THIANBIAKLAL S/O KAMLIAN	4750 4926 7677	Private	L-54	RESIDENTIAL	GF	TEMPORARY	85.5	85.5		
										L-54	RESIDENTIAL	FF	TEMPORARY	85.5	85.5		
25	Only structure	100+070-100+080	RIGHT	Mualnuam	Mualnuam	MUP-1	T PAUCHINSIAM S/O TONGZATHANG	3124 2517 3854	Private	R-111	RESIDENCIAL CUM COMMERCIAL	GF	TEMPORARY	128.82	128.82		
26	Only structure	100+080-100+090	RIGHT	Mualnuam	Mualnuam	MUP-1	SUANROUMUAN S/O LIANZATHANG	4071 8266 9706	Private	R-112	COMMERCIAL	GF	TEMPORARY	62.72	62.72		
27	Only structure	100+080-100+130	RIGHT	Mualnuam	Mualnuam	MUP-1	T GINKHOTUAN S/O T VAIKHOGIN	7090 6362 1554	Private	R-113A	RESIDENTIAL	GF	TEMPORARY	109.76	109.76		
										R-113B	HOTEL	GF	TEMPORARY	22.62	19.14		

C.E. TESTING CO. PVT. LTD. KOLKATA 700 092 12A, N.S.C. BOSE ROAD

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
										R-113C	RESIDENTIAL	GF	TEMPORARY	61.32	61.32		
28	Only structure	100+090-100+100	LEFT	Mualnuam	Mualnuam	MUP-1	THANGLIANSANG S/O GOUKAM	3265 0783 4705	Private	L-55	RESIDENTIAL	GF	TEMPORARY	56	56		
										L-55	HOTEL	FF	TEMPORARY	56	56		
29	Only structure	100+140-100+150, 100+246-100+260	RIGHT/ RIGHT	Mualnuam	Mualnuam	MUP-1	G KHAMKHANSUAN S/O G KAIKHOMANG	3700 0251 2928	Private	R-114	COMMERCIAL	GF	TEMPORARY	26.4	26.4		
										R-118	RESIDENTIAL	GF	TEMPORARY	68.44	68.44		
30	Only structure	100+150-100+160, 100+310-100+300, 100+325-100+335, 100+365-100+368	LEFT/LEFT/LEFT /RIGHT	Mualnuam	Mualnuam	MUP-1	C/O-MANGMUANLAL GUITE S/O LT. G HAUKHANLIAN	6331 9059 4232	Community	L-56	WATER TANK	-	PERMANENT	5.44	5.44		
										R-115	URINAL SHED	-	SEMI-PERMANENT	8.88	8.88		
										L-63	RETAING WALL	-	RETAING WALL	16.1	16.1		

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
										L-64	WATER TANK	-	PERMANENT	2.16	2.16		
31	Only structure	100+158-100+163	LEFT	Mualnuam	Mualnuam	MUP-1	MANGMUANLAL GUITE S/O LT. G HAUKHANLIAN	6331 9059 4232	Private	L-57	TOILET	-	PERMANENT	3	3		
32	Only structure	100+165-100+225, 100+168-100+175	LEFT/RIGHT	Mualnuam	Mualnuam	MUP-1	C/O-TGINKHOTUAN S/O T VAIKHOGIN	7090 6362 1554	Community	L-58A	OFFICE OF CHURCH	GF	PERMANENT	67.26	45.43		
										L-58B	CHURCH	GF	PERMANENT	391.02	107.73		
										L-58B	CHURCH	FF	SEMI-PERMANENT	391.02	107.73		
										L-58C	STAIR	-	PERMANENT	31.11	31.11		
										L-58D	RETAING WALL		RETAING WALL	54.4	54.6		
										L-58E	MEMORY STONE						
										R-116	MEMORY STONE	-	MEMORY STONE				

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
33	Only structure	100+190-100+203, 100+760-100+765	RIGHT/LEFT	Mualnuam	Mualnuam	MUP-1	GOVERNMENT		Government	CPR-12	MARKET SHED	GF	TEMPORARY	79.98	79.98		
										CPR-19	WATER TANK	-	PERMANENT	7.28	7.28		
34	Only structure	100+190-100+195, 100+310-100+320	RIGHT/LEFT	Mualnuam	Mualnuam	MUP-1	H KHAMKHALIAN S/O THONZATHANG	5016 5055 2579	Private	R-117	MEMORY STONE	-	MEMORY STONE				
										L-62A	URINAL SHED	-	SEMI-PERMANENT	2.76	2.76		
										L-62B	HALL	GF	TEMPORARY	163.76	163.76		
										L-62B	PILLER	-	PILLER	58.24	58.24		
35	Only structure	100+220-100+235	LEFT	Mualnuam	Mualnuam	MUP-1	N GOUKHANGIN S/O PHUNGZAMANG	4146 3228 5549	Private	L-59	RESIDENTIAL	GF	TEMPORARY	80.37	80.37		
										L-59	RESIDENTIAL	FF	TEMPORARY	48.45	48.45		
36	Only structure	100+260-100+270	LEFT	Mualnuam	Mualnuam	MUP-1	GOULAL S/O CHINZAKAP	3392 7131 5589	Private	L-60	RESIDENTIAL	GF	TEMPORARY	107.67	107.67		
										L-60	RESIDENTIAL	FF	TEMPORARY	107.67	107.67		

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
37	Only structure	100+280-100+290	RIGHT	Mualnuam	Mualnuam	MUP-1	THANGZALAL S/O KHANKAM	3395 6477 9412	Private	R-119	RESIDENTIAL	GF	TEMPORARY	52.56	52.56		
38	Only structure	100+290-100+300	LEFT	Mualnuam	Mualnuam	MUP-1	PAUNELSON S/O PUMKAI	6491 7233 4085	Private	L-61	RESIDENTIAL	GF	TEMPORARY	80.91	80.91		
39	Only structure	100+305-100+318	RIGHT	Mualnuam	Mualnuam	MUP-1	KAMKHANLAL S/O NGULZALAM	3972 8598 5058	Private	R-120	RESIDENTIAL	GF	TEMPORARY	94.08	94.08		
40	Only structure	100+335-100+355	RIGHT	Mualnuam	Mualnuam	MUP-1	NENGKHANTHANG S/O DAMKHANENG	2679 7789 5497	Private	R-121A	RESIDENTIAL	GF	TEMPORARY	103.2	103.2		
										R-121B	MEMORY STONE	-	MEMORY STONE				
										R-121C	RESIDENTIAL-STORE ROOM	GF	TEMPORARY	8.4	8.4		
41	Only structure	100+355-100+365	RIGHT	Mualnuam	Mualnuam	MUP-1	PAUKHOTUAN S/O VAICHIN	4025 7648 1881	Private	R-122	RESIDENTIAL	GF	TEMPORARY	65.32	65.32		
42	Only structure	100+375-100+385	RIGHT	Mualnuam	Mualnuam	MUP-1	NENGKHAGIN S/O GINZAPAU	3179 6945 0363	Private	R-123	RESIDENTIAL	GF	TEMPORARY	107.35	107.35		

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
43	Only structure	100+380-100+390	LEFT	Mualnuam	Mualnuam	MUP-1	T LUANKHOPAU S/O T CHINTHANG	2295 1074 7797	Private	L-65	RESIDENTIAL	GF	TEMPORARY	57.75	57.75		
44	Only structure	100+400-100+410	LEFT	Mualnuam	Mualnuam	MUP-1	T SAUKHOGIN S/O KAINGUL	9387 9362 1459	Private	L-66	RESIDENTIAL	GF	TEMPORARY	30	30		
										L-66	RESIDENTIAL	FF	TEMPORARY	53.25	53.25		
45	Only structure	100+405-100+418	RIGHT	Mualnuam	Mualnuam	MUP-1	THANGLUNG S/O LATE KIMGOU	8519 0717 8044 5	Private	R-124	RESIDENTIAL	GF	TEMPORARY	62.41	62.41		
46	Only structure	100+460-100+470	RIGHT	Mualnuam	Mualnuam	MUP-1	K SUTZACHIN S/O GINZASONG	3600 2984 4083	Private	R-125	COMMERCIAL	GF	TEMPORARY	18	18		
47	Only structure	100+470-100+480	RIGHT	Mualnuam	Mualnuam	MUP-1	CHINZAHAU S/O ZAMKHOHEN	4731 6742 6141	Private	R-126	RESIDENTIAL	GF	TEMPORARY	38.88	38.88		
48	Only structure	100+480-100+490	RIGHT	Mualnuam	Mualnuam	MUP-1	K SUTZACHIN S/O GINZASONG	3600 2984 4083	Private	R-127A	STORE ROOM	GF	TEMPORARY	12	12	Not Present	
										R-127B	MEMORY STONE	-	MEMORY STONE				
49	FROM SDO	100+480-100+495	LEFT	Mualnuam	Mualnuam	MUP-1	M. KHAMKHOLIAN GUITE	8331 7839 3563	Private	L-68	RESIDENTIAL	GF	TEMPORARY	27.75	27.75	Not Present	

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
50	Only structure	100+490-100+500	RIGHT	Mualnuam	Mualnuam	MUP-1	PAUKHANKHUAL S/O T KAIZANANG	2579 6324 9941	Private	R-128A	RESIDENTIAL	GF	TEMPORARY	72.32	72.32		
										R-128B	TOILET	-	TEMPORARY	8.1	8.1		
51	Only structure	100+505-100+515	RIGHT	Mualnuam	Mualnuam	MUP-1	TZAM KHANGIN S/O SUANKAM TONSING	7533 7053 6292	Private	R-129	RESIDENTIAL	GF	TEMPORARY	66.49	66.49		
52	Only structure	100+515-100+525	LEFT	Mualnuam	Mualnuam	MUP-1	PUMSUM S/O KHAM KHOTHANG	5640 3728 5285	Private	L-69	RESIDENTIAL	GF	TEMPORARY	56	56		
										L-69	RESIDENTIAL	FF	TEMPORARY	63	63		
53	Only structure	100+525-100+535	RIGHT	Mualnuam	Mualnuam	MUP-1	PAUZAMUAN S/O SONGZALIAN	3133 6284 5011	Private	R-130	STORE ROOM	GF	TEMPORARY	6	6		
54	Only structure	100+570-100+580, 100+580-100+590	LEFT /LEFT	Mualnuam	Mualnuam	MUP-1	GOVERNMENT	Not Applicable	Government	CPR-16	WATER TANK	-	PERMANENT	3.52	3.52	Not Applicable	
										CPR-17	WAITING SHED	-	SEMI-PERMANENT	9	9		
										CPR-18	WAITING SHED	-	TEMPORARY	3.78	3.78		
55	Only structure	100+570-100+580, 100+585-100+590, 100+600-	RIGHT/ RIGHT/ RIGHT	Mualnuam	Mualnuam	MUP-1	MANGMUANLAL GUITE S/O LT. G HAUKHANLIAN	6331 9059 4232	Private	R-131	RESIDENTIAL	GF	SEMI-PERMANENT	14.49	14.49		

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
		100+610								R-132	RESIDENTIAL	GF	TEMPORARY	23.31	23.31		
										R-134	SHED		TEMPORARY	7.22	7.22		
56	Only structure	100+590-100+600	RIGHT	Mualnuam	Mualnuam	MUP-1	M GINKHANTHANG S/O GULKAM	3970 1820 3584	Private	R-133	RESIDENTIAL	GF	TEMPORARY	10.5	10.5		
57	Only structure	100+600-100+610	LEFT	Mualnuam	Mualnuam	MUP-1	PAUBIAKLAL S/O GINTHIANSIAM	2212 1989 7346	Private	L-70	COMMERCIAL	GF	TEMPORARY	39.96	39.96		
										L-70	RESIDENTIAL	FF	TEMPORARY	88.56	88.56		
58	Only structure	100+610-100+620	RIGHT	Mualnuam	Mualnuam	MUP-1	KAMKHANLAN S/O T GINKHAM	5778 4996 6791	Private	R-135	RESIDENTIAL	GF	TEMPORARY	53.72	53.72		
59	Only structure	100+625-100+640	RIGHT	Mualnuam	Mualnuam	MUP-1	H NENGKHANLAL S/O SONGZALIAN	6706 9529 5117	Private	R-136A	RESIDENTIAL	GF	TEMPORARY	92.88	92.88		
										R-136B	MEMORY STONE	-	MEMORY STONE				
60	Only structure	100+680-100+700	RIGHT	Mualnuam	Mualnuam	MUP-1	LAMTHANSANG S/O PAUZAMUAN	4877 9787 4493	Private	R-137A	RESIDENTIAL	GF	TEMPORARY	42.56	42.56		

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
										R-137B	TOILET	-	TEMPORARY	2.08	2.08		
61	Only structure	100+705-100+715	RIGHT	Mualnuam	Mualnuam	MUP-1	CHINGSOMKIM W/O KHOITHIANMUAN	5991 3944 8136	Private	R-138	RESIDENTIAL	GF	TEMPORARY	93.1	93.1		
62	Only structure	100+740-100+753	RIGHT	Mualnuam	Mualnuam	MUP-1	LIANSUANLAL VALTE S/O V GOUPAU	6626 5422 3602	Private	R-139	RESIDENTIAL	GF	TEMPORARY	48.84	48.84		
63	Only structure	100+760-100+770	LEFT	Mualnuam	Mualnuam	MUP-1	M. LIANKHANMANG S/O M. TUALKAM	7191 6823 9054	Private	L-71X	RESIDENTIAL	GF	TEMPORARY	66.15	66.15		
64	Only structure	100+760-100+770	RIGHT	Mualnuam	Mualnuam	MUP-1	KHUPZAGIN S/O VEITHANG	6822 2370 6470	Private	R-140	RESIDENTIAL	GF	TEMPORARY	87.36	87.36		
65	Only structure	100+775-100+900	LEFT	Mualnuam	Mualnuam	MUP-1	THANGZAHAU S/O NGULKAM	4563 9046 0470	Private	L-72	RESIDENTIAL	GF	TEMPORARY	72.8	72.8		
66	Only structure	100+785-100+795	RIGHT	Mualnuam	Mualnuam	MUP-1	DAMKHANKHAN S/O LALZAGIN		Private	R-142A	RESIDENTIAL	GF	TEMPORARY	45	45		
										R-142B	TOILET	-	TEMPORARY	2.4	2.4		
67	B10 (Only Plantation)	100+830-100+935	LEFT	Mualnuam	Mualnuam	MUP-1	T DONGZACHIN S/O VUNGKHAM	3927 2733 3221	Private	-	-	-	-	-	-		-

sl. No.	Remarks	Chainage	Side	Village	Sub-Division	Plot No.	Owner's Name	Aadhar No	Ownership	Structure No	Usage	Floor No.	Type of Structure	Total area (Sqm/M)	Affected Area (Sqm/M)	Owner's Photograph	Structure's Photograph
68	B11 (Only Plantation)	100+836-100+986	LEFT	Mualnuam	Mualnuam	MUP-1	G KHAMKHANSUAN S/O G KAIKHOMANG	3700 0251 2928	Private	-	-	-	-	-	-		-
69		101+182-101+451	LEFT	Mualnuam	Mualnuam	MUP-2	V. NENGKHENIA S/O V HAUZAKNAM	5929 1518 5314	Private	-	-	-	-	-	-		-
70		101+182-101+331	RIGHT	Mualnuam	Mualnuam	MUP-3	THANGSUANIAL VALTE S/O LATE KAMKHOPAU VALTE	5736 4995 8917	Private	-	-	-	-	-	-	Not Present	-
71	B12 (Only Plantation)	101+450-101+500	LEFT	Mualnuam	Mualnuam	MUP-1	G KHAMKHANSUAN S/O G KAIKHOMANG	3700 0251 2928	Private	-	-	-	-	-	-		-
72		102+282-103+525	BOTH	Mualnuam	Mualnuam	MUP-4	KHEN P TOMBING S/O SINKHOKAM	9686 3229 3449	Private	-	-	-	-	-	-	Not Present	-
73		94+430-101+182, 101+331-102+282, 101+451-102+282	BOTH /RIGHT /LEFT	Mualnuam	Mualnuam	MUP-1	MANGMUANLAL GUITE S/O LT. G HAUKHANLIAN	6331 9059 4232	Private	-	-	-	-	-	-		-

ACRONYMS

AROa	:	Assistant Resettlement Officer
AWC	:	Anganwadi Centre
BDO	:	Block Development Officer
BPL	:	Below Poverty Line
BSR	:	Basic Schedule Rates
CPR	:	Common Property Resource
DC	:	District Commissioner
DGM	:	Deputy General Manager
DPR	:	Detailed Project Report
EA	:	Executing Agency
EPC	:	Engineering, Procurement and Construction
FGD	:	Focus group discussions
GoI	:	Government of India
GP	:	Gram Panchayat
GRC	:	Grievance Redressal Committee
GSB	:	Paved sub base
HIV/AIDS	:	Human Immunodeficiency virus / Acquired immunodeficiency syndrome
IA	:	Implementing Agency
ICDS	:	Intregreted Child Development Service
ICDS	:	Integrated Child Development Services
KII	:	Key Informant Interview
MT	:	Motorized traffic
NGO	:	Non-Government Organization
NH	:	National Highway
NHIDCL	:	National Highway Infrastructural Development Corporation Limited
NMT	:	Non-motorized traffic
NRRP	:	National Rehabilitation and Resettlement Policy
OBC	:	Other Backward Castes
PHC	:	Primary health centre
PMU	:	Project Monitoring Unit
PIU	:	Project Implementation Unit
PT	:	Pedestrian traffic
R&R	:	Resettlement and Rehabilitation
RCD	:	Road Construction Department
SC	:	Scheduled Castes
SH	:	State Highway
ST	:	Scheduled Tribes
WHH	:	Women Headed Household

CHAPTER - 6
TRAFFIC SURVEYS AND ANALYSIS

6.1 INTRODUCTION

The National Highways & Infrastructure Development Corporation Limited (NHIDCL) has been entrusted with the assignment of Consultancy Services for Carrying out Feasibility Study, Preparation of Detailed Project Report and providing pre-construction services in respect of 2 laning of Churachandpur - Tuivai road section on NH-102B on Engineering, Procurement and Construction mode in the state of Manipur.

The project road starts from 3-legged junction of NH-102B and NH-150 (old NH-2) at New Lamka in Churachandpur and ends near Manipur-Mizoram state border at Tuivai village in the district of Churachandpur. This road is passing through Churachandpur town, New Lamka town, Munnuam village, Mata village, Muallam village, Bulian village, Singngat village, Suangdoh village, Tuimai village, Lungthul village, Mualnuam village, Sinzawl village and ends at Tuivai village. As per preliminary study the total length of the project road comes out as 161.349 km.

6.2 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 informed to Client.
- 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 network study.
- To carry out Intersection count survey (1day x 12 hours) at Major Intersections along the project road.
- To carry out OD and 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.

6.3 TRAFFIC SURVEYS

In order to understand the characteristics and the volume of traffic using the project road, data on existing road network, traffic volume 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.

6.3.1 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 as two homogeneous sections.

Homogeneous Section I : Km 0+000 to Km 74+000 (Churachandpur – Lungthul)
Homogenous Section II : km 74+000 to km 161+665 (Lungthul – Tuivai)

6.3.2 CLASSIFIED TRAFFIC VOLUME COUNT LOCATIONS

Locations have been considered for classified Traffic volume counts (7days x 24hrs). The locations are:

- ✓ **At Churachandpur on old NH 02 (Now NH 150) (Near Ch. 0+000 km)**
- ✓ **At Buallian (Ch. 5+500 km)**
- ✓ **At Singngat (Ch. 34+175 km)**
- ✓ **At Khuanggin (Ch. 135+500 km)**
- ✓ **At Sinzawl (Ch. 149+200 km)**

6.3.3 TURNING MOVEMENT COUNT SURVEY LOCATIONS

Five major intersections were identified on the project road corridor. 1 Day x 12 hour turning movement count survey was carried out at following five intersections on the project road. The intersection points taken into consideration are as follows:

- ✓ **3-legged intersection at Churachandpur (Ch. 0+000 Km)**
- ✓ **4-legged intersection at New Lamka (Ch. 0+526 Km)**
- ✓ **4-legged intersection at New Lamka (Ch. 1+840 Km)**
- ✓ **3-legged intersection at Singngat (Ch. 34+175 Km)**
- ✓ **3-legged intersection at Sinzawl (Ch. 149+582 Km)**

6.3.4 AXLE LOAD SURVEY LOCATION

Axle Load survey (2 days x 24hrs) has been conducted at two locations which are as follows:

- ✓ **At Churachandpur on NH 102B (Ch. 0+500 Km)**
- ✓ **At Sinzawl on NH 102B (Ch. 149+200 km)**

6.3.5 ORIGIN DESTINATION SURVEY LOCATION

Origin Destination survey (1day x 24hrs) has been conducted at two locations which are as follows:

- ✓ **At Churachandpur on NH 102B (Ch. 0+000 Km)**
- ✓ **At Sinzawl on NH 102B (Ch. 149+200 km)**

6.3.6 PEDESTRIAN SURVEY LOCATION

Pedestrian survey (1day x 12 hrs.) has been conducted at six locations along the road stretch which are as follows:

- ✓ **At Churachandpur (Ch. 0+000 Km)**
- ✓ **At Mata (Ch. 7+250 Km)**
- ✓ **At Singngat (Ch. 34+155 Km)**
- ✓ **At Maokot (Ch. 48+300 Km)**
- ✓ **At Suangdoh (Ch. 64+200 km)**
- ✓ **At Sinzawl (Ch. 148+450 km)**

Detailed Traffic Survey Schedule is mentioned in Table 6.1

TABLE 6.1: TRAFFIC SURVEY SCHEDULE

Sl.	Type of Survey	Nos. Proposed	Locations
1	Classified Traffic Volume Count	5	• **ATCC-1** at Churachandpur on old NH-2 (Near Ch. 0+000 km) • **ATCC-2** at Buallian(Ch. 5+500 km) • **ATCC-3** at Singngat (Ch. 34+175 km) • **ATCC-4** at Khuanggin (Ch. 135+500 km) • **ATCC-5** at Sinzawl (Ch. 149+200 km)
2	Turning Movement Count Survey	5	• **TMC-1** at Churachandpur (Ch. 0+000 km) • **TMC-2** at New Lamka (Ch-0+526 km) • **TMC-3** at New Lamka (Ch-1+840 km) • **TMC-4** at Ch-34+175 (Singngat) • **TMC-5** at Ch. 149+582 km (Sinzawl)
3	Axle Load Survey	2	• **Axle-1** at Churachandpur (Ch.0+500) • **Axle-2** at Sinzawl (Ch. 149+200 km)
4	Origin-Destination Survey	2	• **OD-1** at Churachandpur (Ch.0+000) • **OD-2** at Sinzawl (Ch. 149+200 km)
5	Pedestrian Count/Animal Cross Traffic Count Survey	6	• **Pedestrian-1** at Churachandpur (Ch.0+000 km) • **Pedestrian-2** at Mata (Ch.7+250 km) • **Pedestrian-3** at Singngat (Ch.34+155 km) • **Pedestrian-4** at Maokot (Ch.48+300 km) • **Pedestrian-5** at Suangdoh (Ch.64+200 km) • **Pedestrian-6** at Sinzawl (Ch.148+450 km)
6	Speed & Delay Survey	162 Km	• Total Project Stretch

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. A traffic survey location map is given in Figure 6.1

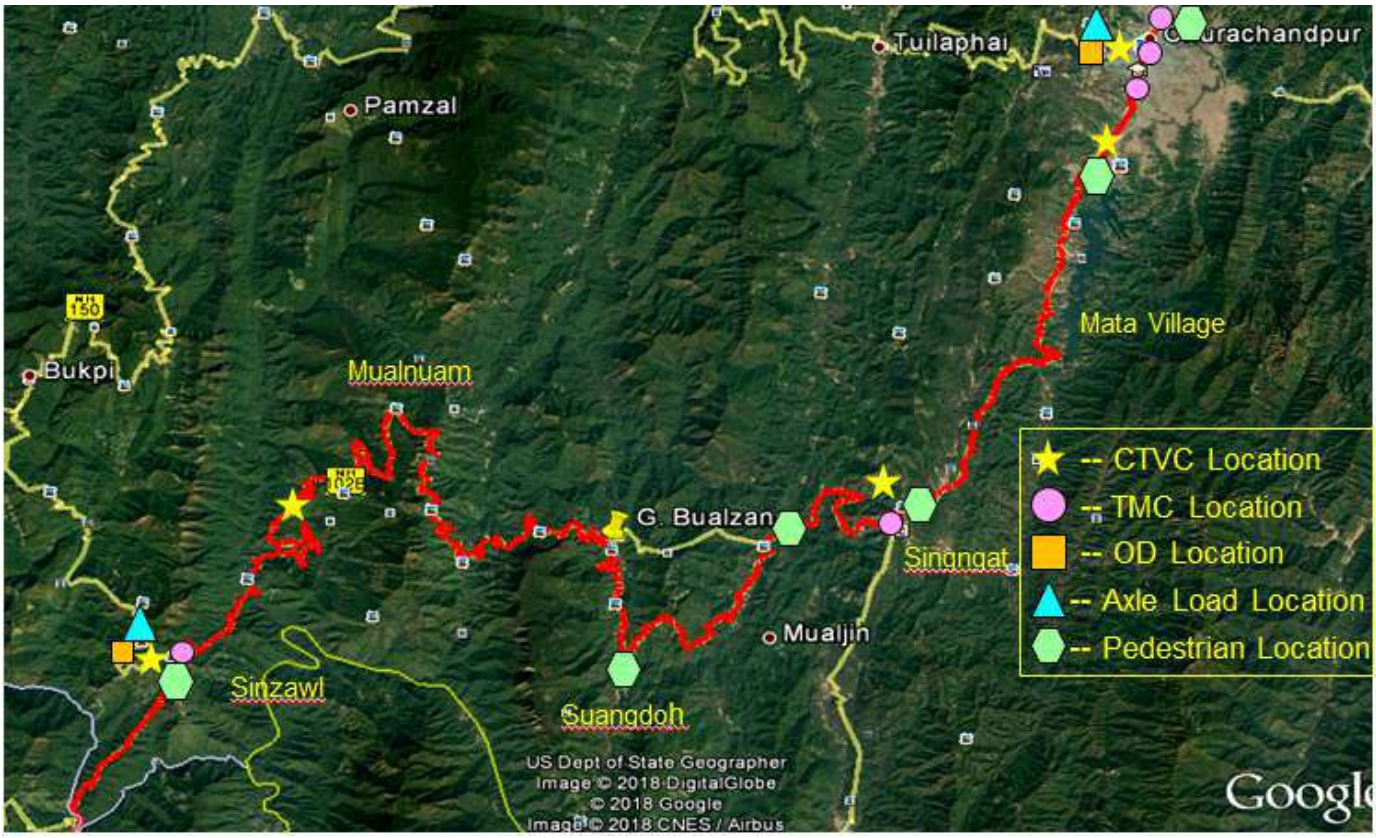


Fig 6.1: Location Map of Traffic Survey

6.4 CLASSIFIED TRAFFIC VOLUME COUNTS

Classified directional traffic volumes were conducted with ATCC for 7 days 24 hours at five identified locations on the project road which are as follows:

- ✓ **At Churachandpur on old NH 02 (Now NH 150) (Near Ch. 0+000 km)**
- ✓ **At Buallian (Ch. 5+500 km)**
- ✓ **At Singngat (Ch. 34+175 km)**
- ✓ **At Khuanggin (Ch. 135+500 km)**
- ✓ **At Sinzawl (Ch. 149+200 km)**

Classified directional traffic volumes were conducted to obtain the following.

- Average Daily Traffic (ADT)
- Temporal Variation
- ✓Daily Variation
- ✓Hourly Variation
- Directional Distribution
- Traffic Composition

- Seasonal Variation

✓Annual Average Daily Traffic (AADT)

✓Peak Season AADT

The details of the above are presented in the following sections.

6.4.1 AVERAGE DAILY TRAFFIC (ADT)

The traffic volumes counted in 15 minute intervals have been aggregated to one-hour volumes. These are presented in Appendix to Main Report. 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-108: 1996 have been considered. For ready reference, the PCU Factors considered in the analysis are given in Table-6.2

TABLE 6.2: PCU FACTORS CONSIDERED FOR THE STUDY

Sl. No.	Vehicle Type		PCU Factor
1	**Two Wheeler**		0.50
2	**Car/Jeep/ Van/Taxi/ Auto**		1.00
3	**BUS**	Mini	1.50
4		Standard	3.00
5	**LCV**		1.50
6	**Truck**	2-Axle	3.00
7		3 -Axle	3.00
8		Multi-Axle	4.50
9	**Agricultural Tractor**	With Trailer	4.50
10		Without Trailer	1.50
11	**Cycle**		0.50
12	**Cycle Rickshaw**		2.00
13	**Hand Cart**		3.00
14	**Animal Drawn**	Bullock Cart	8.00
15		Horse	4.00

The summary of ADT, as observed on the Project Road, in terms of vehicles and PCUs at different survey locations is given in Table 6.3.

TABLE 6.3: ADT (FEBRUARY 2018) AS OBSERVED ON THE PROJECT ROAD

Vehicle Type	On Old NH-2	Buallian (Ch. 5+500 km)	Singngat (Ch. 34+175 km)	Khuanggin (Ch. 135+500)	Sinzawl (Ch. 149+200)
Two Wheeler	10235	166	116	1	2
Car/Jeep/Van/Taxi/Auto	11173	190	74	11	12
Mini Bus	11	5	1	0	0
Standard Bus	30	6	5	0	0
LCV	383	65	68	13	12
2-Axle	205	61	49	21	4

Vehicle Type	On Old NH-2	Buallian (Ch. 5+500 km)	Singngat (Ch. 34+175 km)	Khuanggin (Ch. 135+500)	Sinzawl (Ch. 149+200)
3-Axle	5	1	1	0	0
Multi-Axle	0	0	0	0	0
Tractor With Trailer	1	0	0	0	0
Tractor Without Trailer	14	0	0	0	0
Cycle	211	3	4	0	0
Cycle Rickshaw	255	0	0	0	0
Hand Cart	4	1	0	0	0
Bullock Cart	0	0	0	0	0
Horse Cart	0	0	0	0	0
Total Motorized Vehicles (Number)	22059	495	315	46	30
Total Non Motorized Vehicles (Number)	469	4	4	0	0
Total Vehicles(Number)	22528	499	318	46	30
Total Motorized Vehicles (PCU)	17631	583	401	93	44
Total Non Motorized Vehicles (PCU)	627	4	2	0	0
Total Vehicles(PCU)	18258	587	403	93	44
Total Commercial Vehicle per day(Number)	636	138	124	34	16

6.4.2 TEMPORAL VARIATION

Analysis has been carried out to understand the following parameters on temporal variation of traffic on the Project Road

- Hourly variation of traffic, and
- Peak Hour Factor (PHF)

The results and findings from the above analysis are given below.

Daily Variation

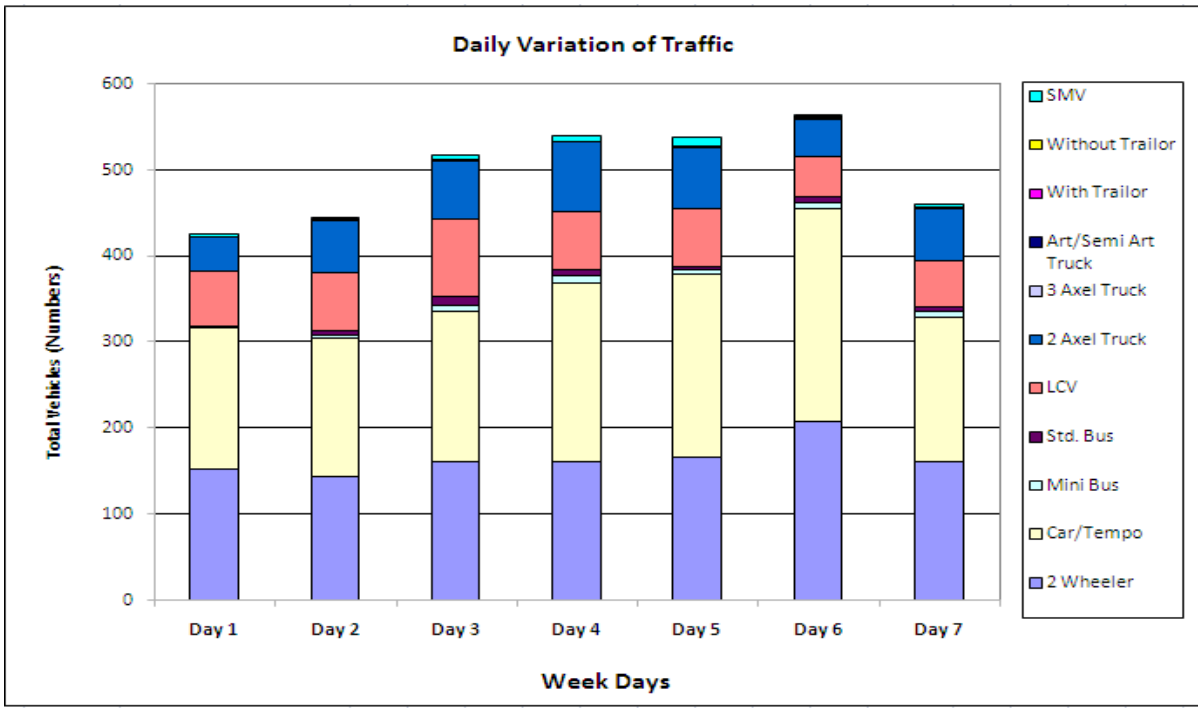


Figure 6.2: Daily Variation of Traffic at 5+500 Km in Vehicles per Day

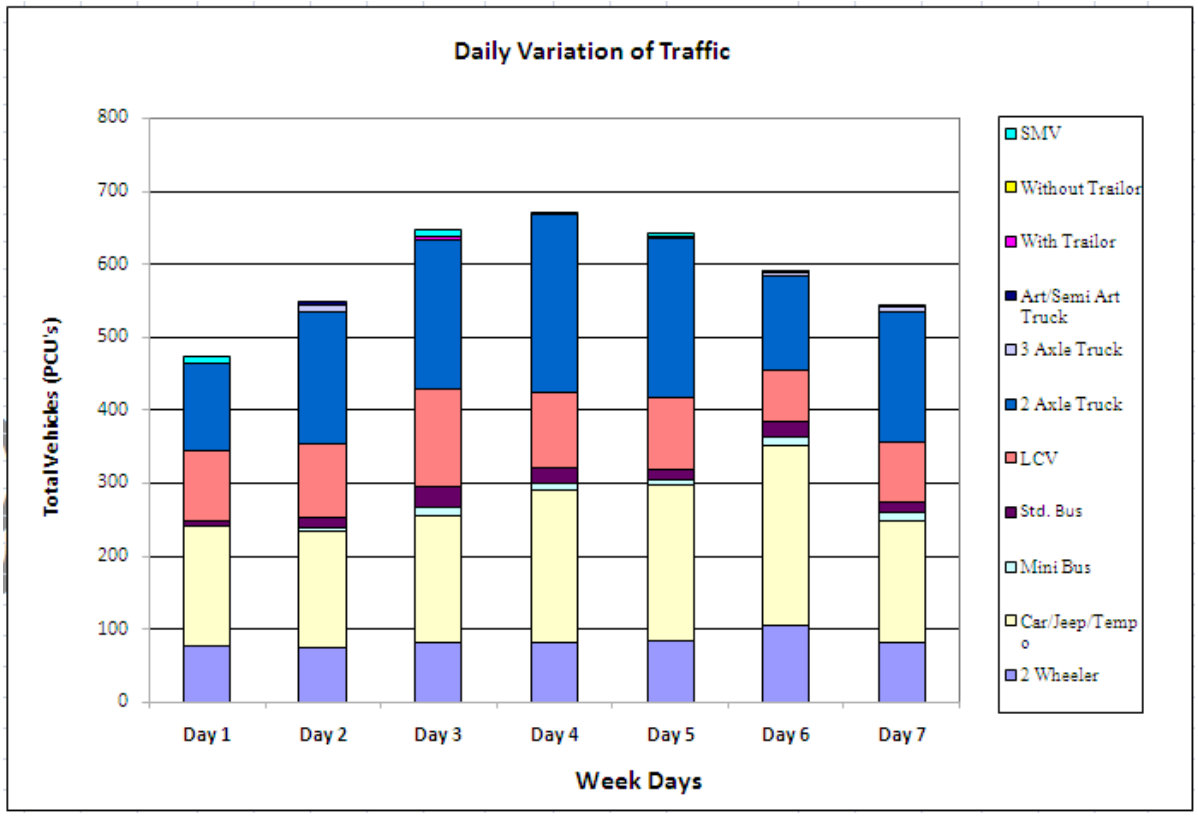


Figure 6.3: Daily Variation of Traffic at 5+500 Km in PCU per Day

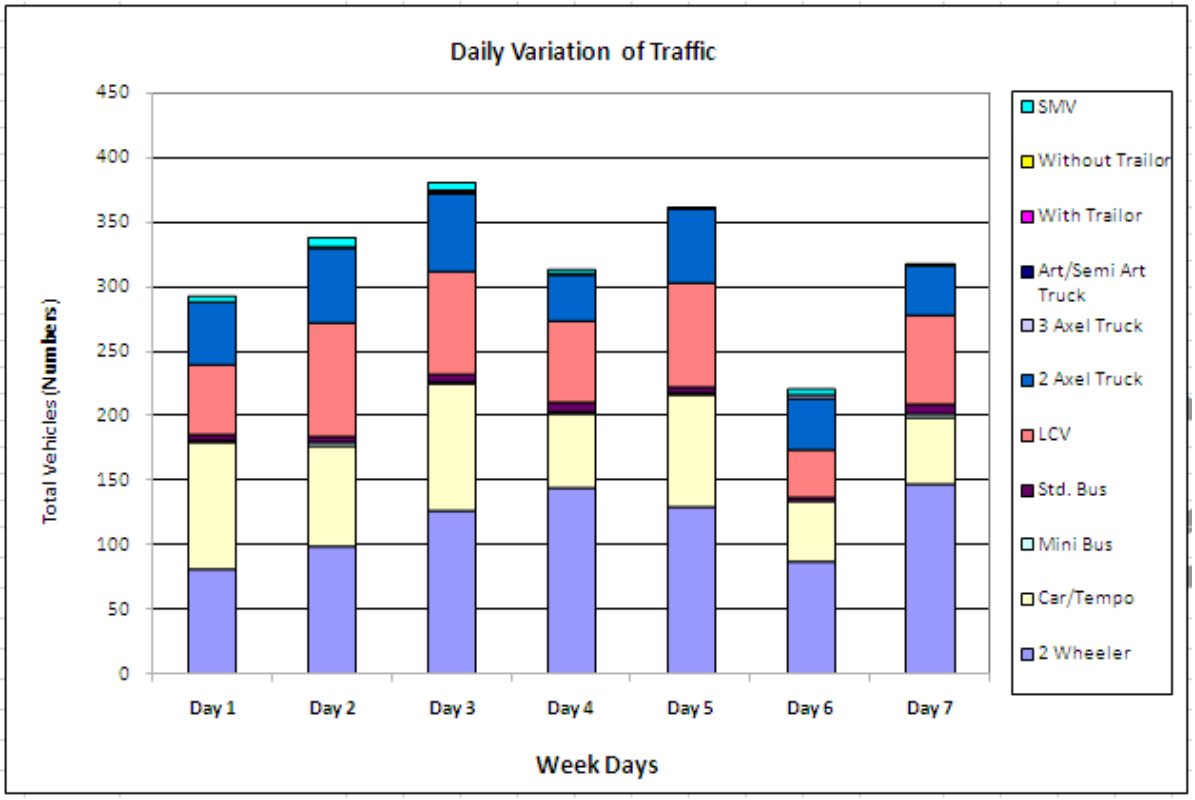


Figure 6.4: Daily Variation of Traffic at 34+175 Km in Vehicles per Day

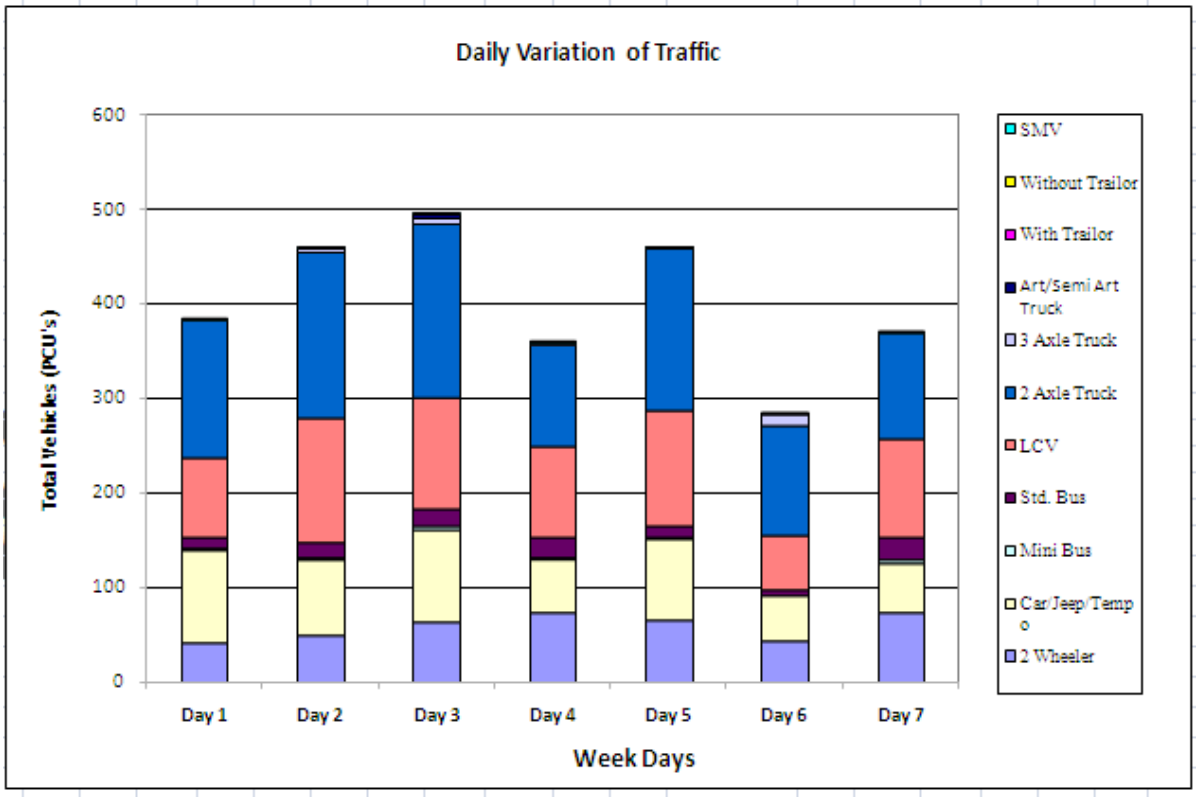


Figure 6.5: Daily Variation of Traffic at 34+175 Km in PCU per Day

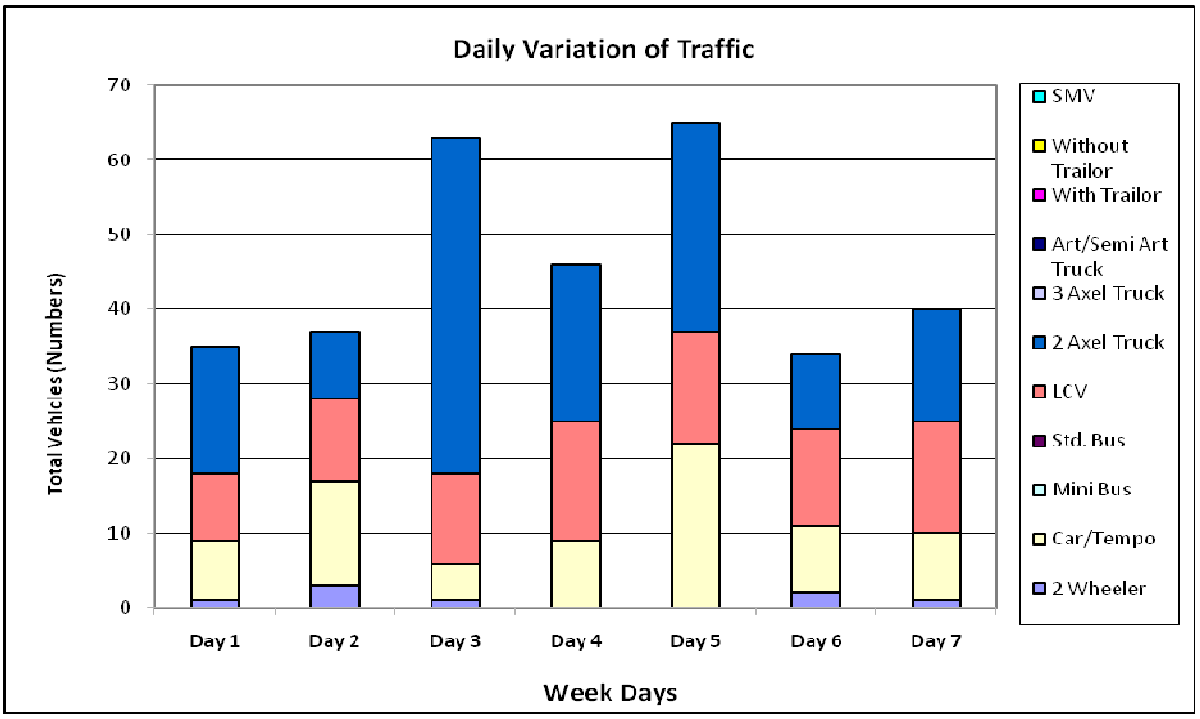


Figure 6.6: Daily Variation of Traffic at 135+500 Km in Vehicles per Day

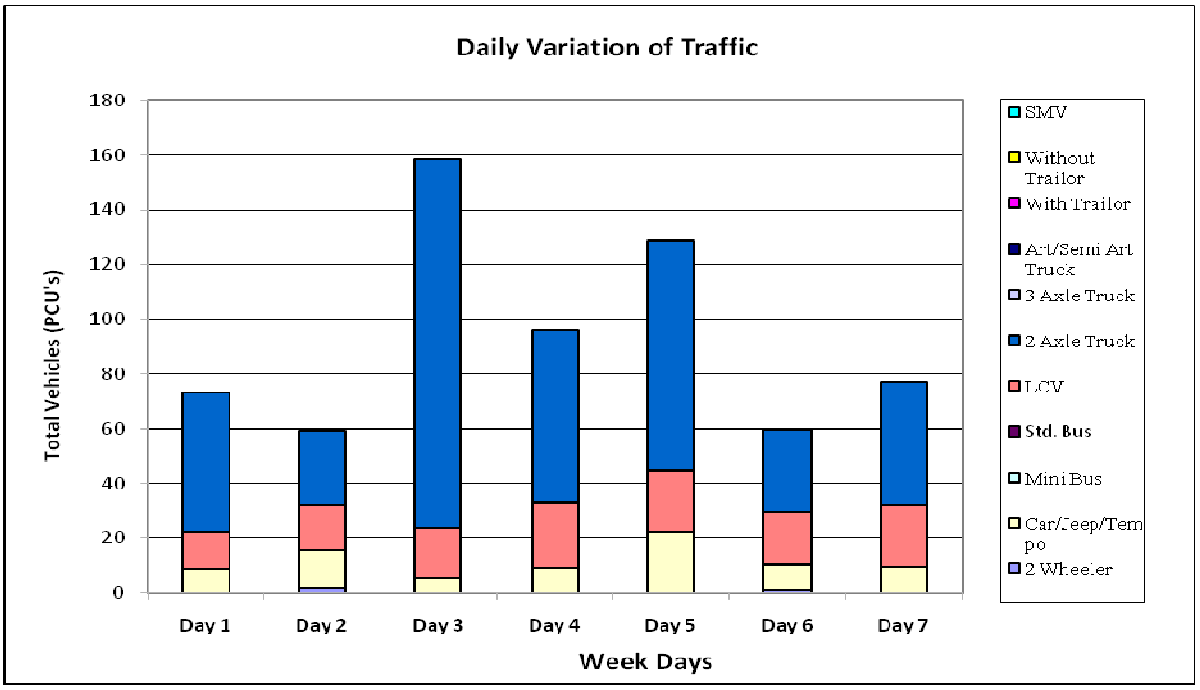


Figure 6.7: Daily Variation of Traffic at 135+500 Km in PCU per Day

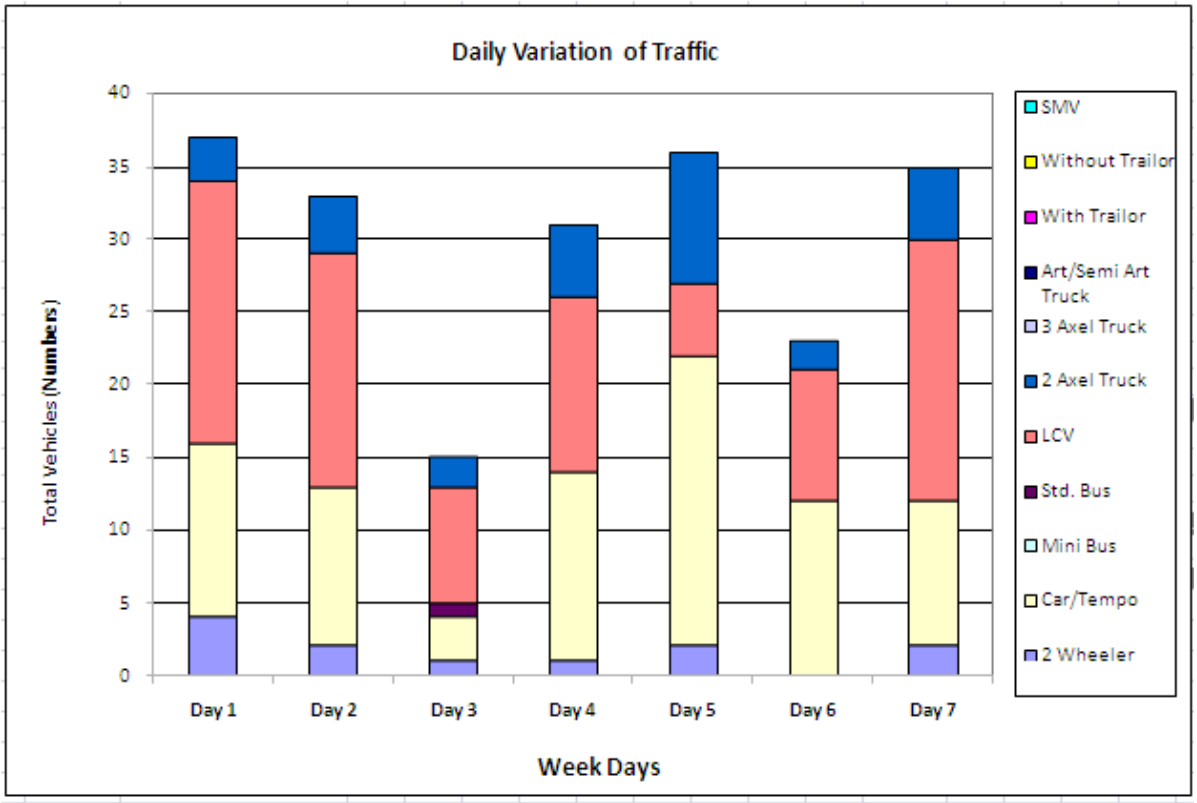


Figure 6.8: Daily Variation of Traffic at 149+200 Km in Vehicles per Day

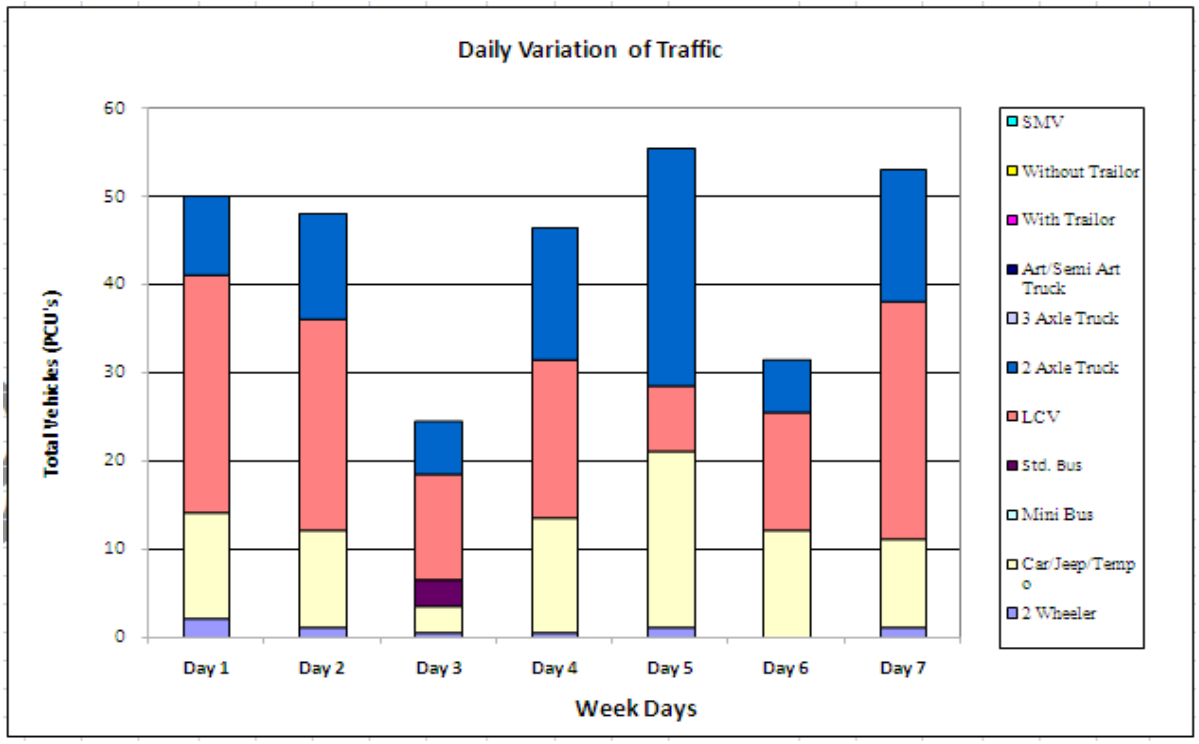


Figure 6.9: Daily Variation of Traffic at 149+200 Km in PCU per Day

From the above figure, the following conclusions are made:

- At location-2, Chainage 5.500 km near Buallian the daily variation of fast moving vehicle in number is within 13.80 % to -14.50% and in PCU is within 14.38% to -20.69% with respect to average daily traffic.

  The daily variation of slow moving vehicle in number is 100% and in PCU is within 100 % with respect to average daily traffic.
- At location-2, Chainage 34.175 Km near Singngat ,the daily variation of fast moving vehicle in number is within 19.53% to -31.02% and in PCU is within 23.23% to -29.48% with respect to average daily traffic.

  The daily variation of slow moving vehicle in number is within 68.00% to -72.00% and in PCU is within 68.00% to -72.00% with respect to average daily traffic.
- At location-3, Chainage 135.500 Km near Khuanggin ,the daily variation of fast moving vehicle in number is within 42.19% to -25.63% and in PCU is within 70.30% to -36.61% with respect to average daily traffic.
- At location-4, Chainage 149.200 Km Sinzawl, the daily variation of fast moving vehicle in number is within 23.33% to -50.00% and in PCU is within 25.73% to -44.50% with respect to average daily traffic.

Hourly Variation

Similar to daily variation, analysis has also been carried out for hourly variation. 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.

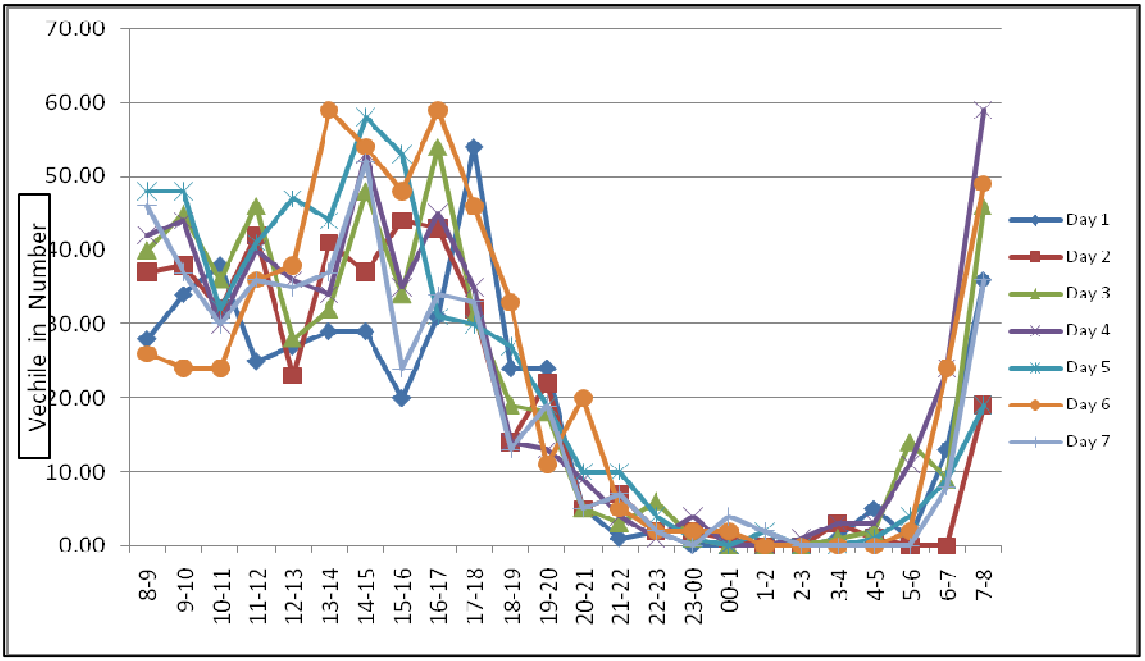


Figure 6.10: Hourly Variation of Traffic at 5+500 Km in Vehicles per Day

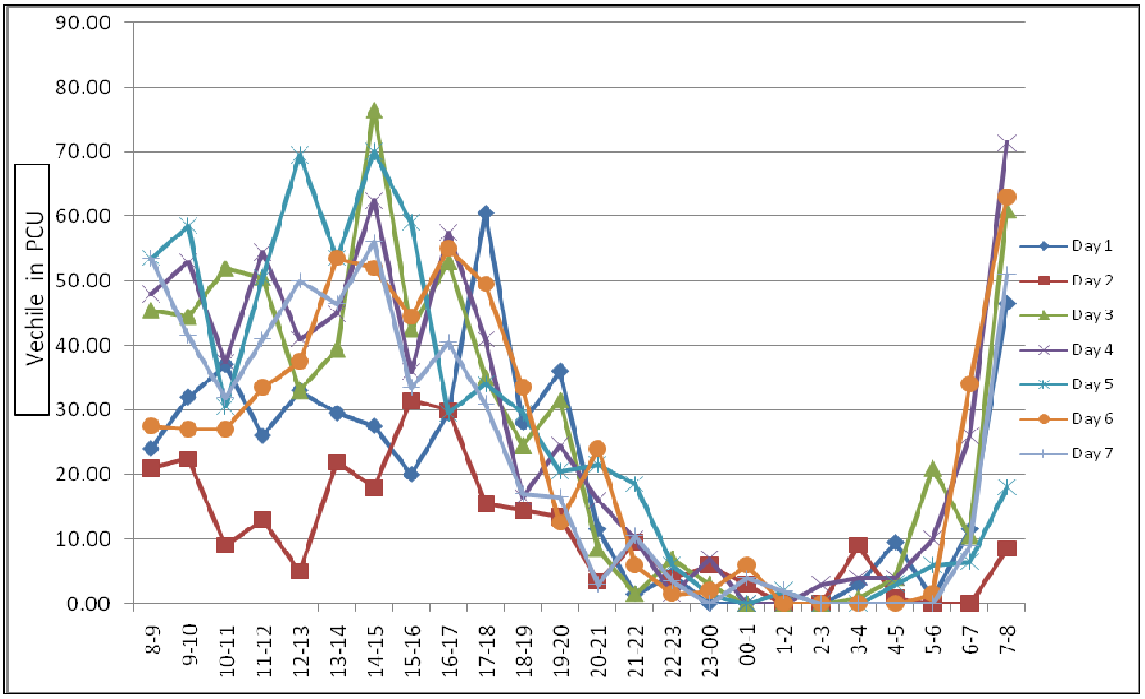


Figure 6.11: Hourly Variation of Traffic at 5+500 Km in PCU per Day

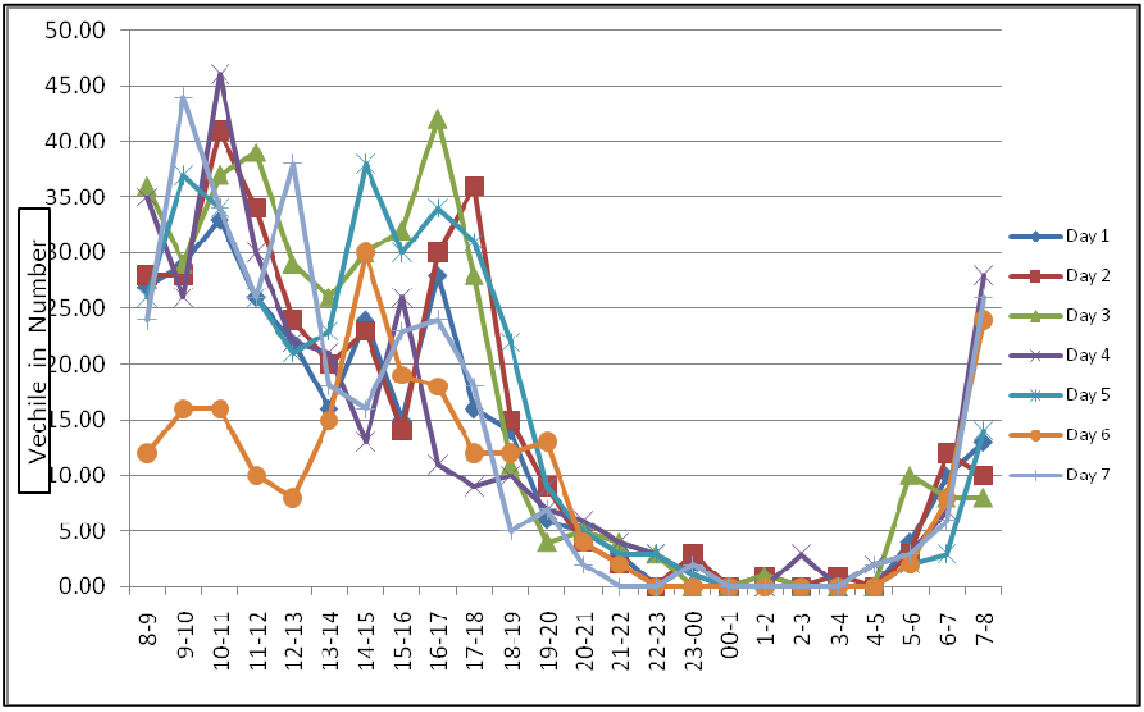


Figure 6.12: Hourly Variation of Traffic at 34+175 Km in Vehicles per Day

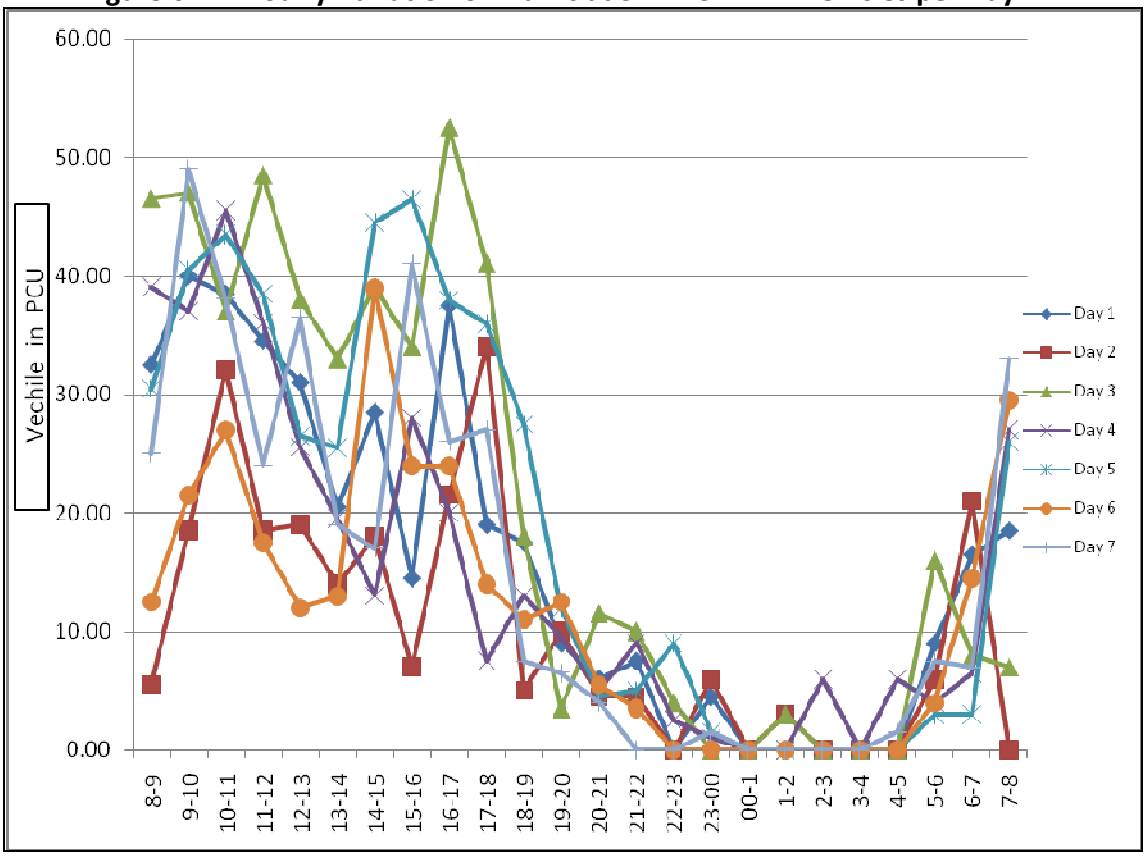


Figure 6.13: Hourly Variation of Traffic at 34+175 Km in PCU per Day

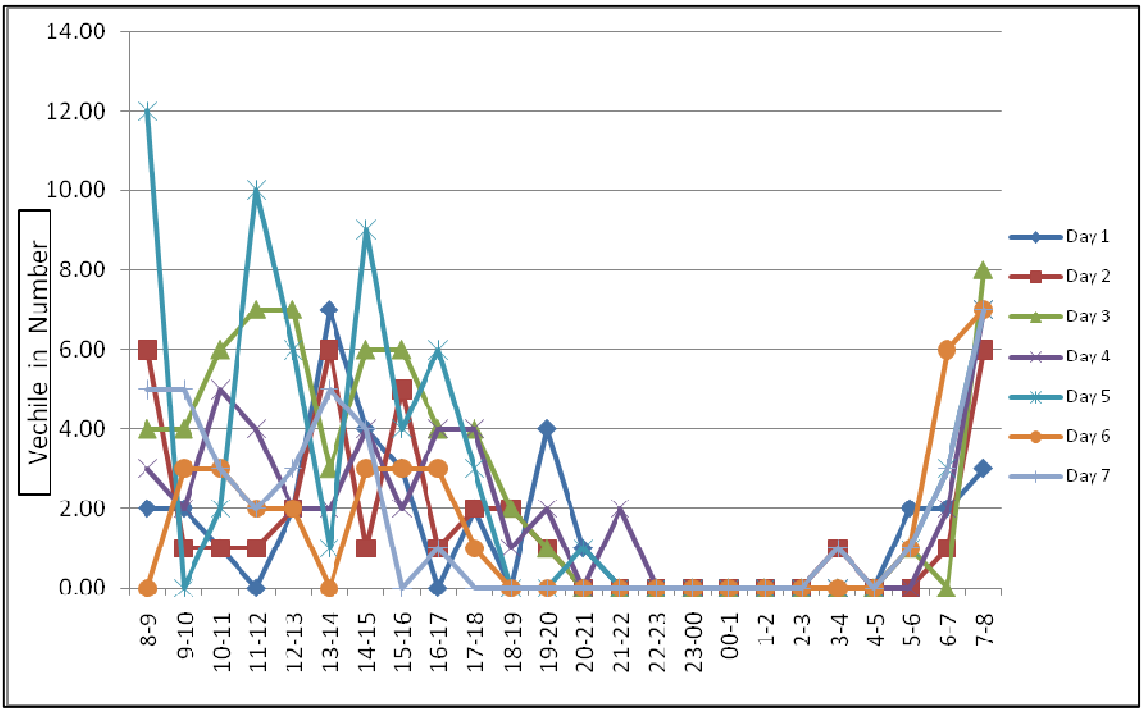


Figure 6.14: Hourly Variation of Traffic at 135+500 Km in Vehicles per Day

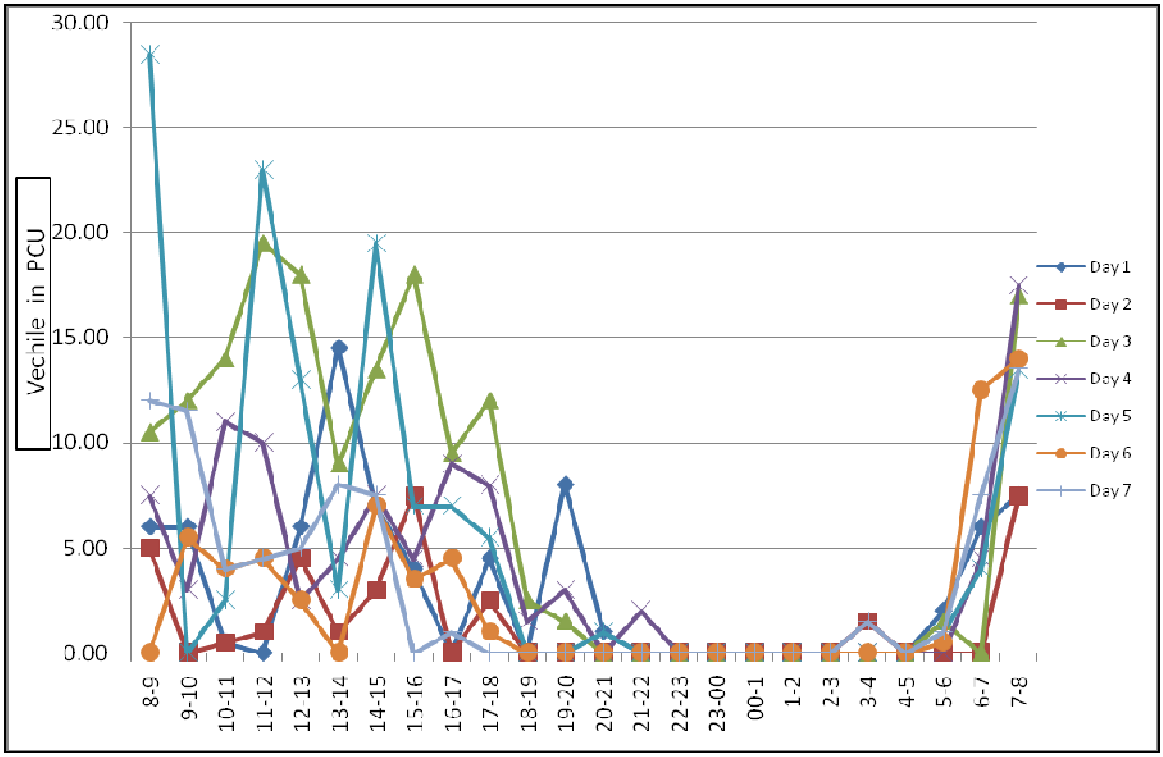


Figure 6.15: Hourly Variation of Traffic at 135+500 Km in PCU per Day

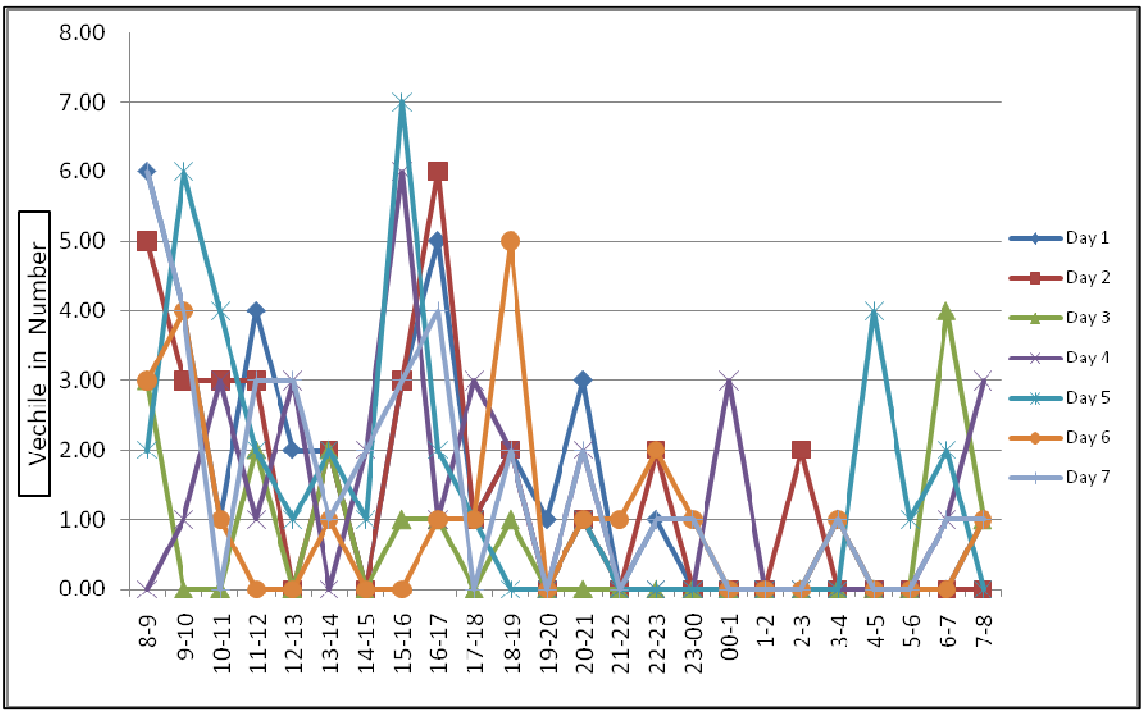


Figure 6.16: Hourly Variation of Traffic at 149+200 Km in Vehicles per Day

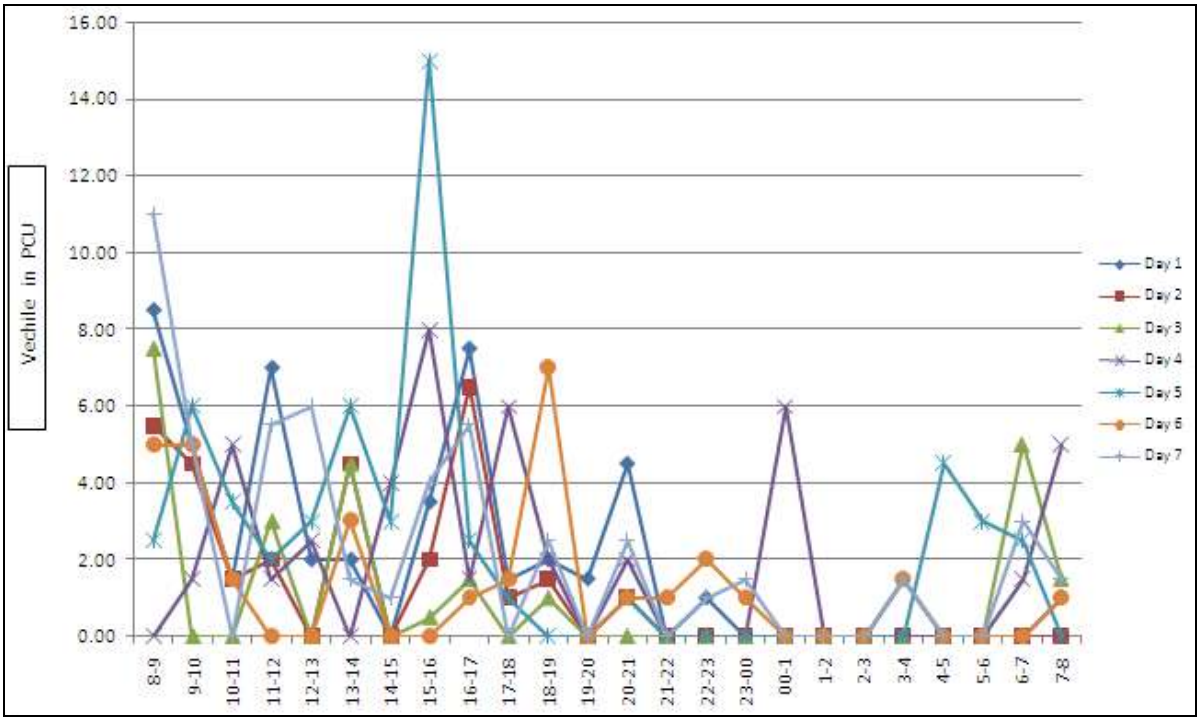


Figure 6.17: Hourly Variation of Traffic at 149+200 Km in PCU per Day

From these above figures on hourly variation the following can be derived:
The passenger traffic found 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.

6.4.3 Directional Distribution

The directional distribution observed at the count stations on the Project Road have been presented in **Table 6.4**.

Table 6.4: Directional Distribution

Time Interval (Hour)		Km 5+500				Km 34+175				Km 135+500				Km 149+200			
		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)	
From	To	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
8	9	167	193	46.45%	53.55%	201	127	61.37%	38.63%	84	108	43.60%	56.40%	72	109	39.61%	60.39%
9	10	179	209	46.12%	53.88%	214	176	54.81%	45.19%	96	111	46.38%	53.62%	87	107	44.82%	55.18%
10	11	221	193	53.38%	46.62%	192	234	45.06%	54.94%	131	121	52.09%	47.91%	117	115	50.32%	49.68%
11	12	204	206	49.76%	50.24%	170	198	46.19%	53.81%	96	121	44.21%	55.79%	82	120	40.69%	59.31%
12	13	206	148	58.19%	41.81%	168	168	50.00%	50.00%	105	102	50.61%	49.39%	94	87	51.93%	48.07%
13	14	185	178	50.96%	49.04%	130	150	46.42%	53.58%	98	108	47.45%	52.55%	78	95	45.09%	54.91%
14	15	265	199	57.11%	42.89%	145	178	44.89%	55.11%	113	123	47.88%	52.12%	99	104	48.64%	51.36%
15	16	173	172	50.15%	49.85%	156	140	52.71%	47.29%	101	95	51.53%	48.47%	98	83	54.14%	45.86%
16	17	200	205	49.38%	50.62%	210	142	59.66%	40.34%	115	82	58.52%	41.48%	112	89	55.75%	44.25%
17	18	160	198	44.62%	55.38%	157	135	53.86%	46.14%	99	78	56.09%	43.91%	85	73	53.80%	46.20%
18	19	59	91	39.33%	60.67%	73	48	60.17%	39.83%	34	19	64.15%	35.85%	31	24	56.36%	43.64%
19	20	85	104	44.95%	55.05%	53	40	57.07%	42.93%	43	19	69.11%	30.89%	37	13	73.74%	26.26%
20	21	26	45	36.17%	63.83%	29	33	46.72%	53.28%	17	11	61.82%	38.18%	20	17	53.42%	46.58%
21	22	18	28	39.13%	60.87%	10	32	24.10%	75.90%	7	6	56.00%	44.00%	7	4	66.67%	33.33%
22	23	5	21	19.61%	80.39%	6	6	52.17%	47.83%	4	1	80.00%	20.00%	8	1	88.89%	11.11%
23	0	7	17	29.17%	70.83%	13	10	57.78%	42.22%	7	1	87.50%	12.50%	9	1	89.47%	10.53%
0	1	5	3	62.50%	37.50%	1	0	100.00%	0.00%	1	0	100.00%	0.00%	1	6	14.29%	85.71%
1	2	0	2	0.00%	100.00%	0	6	0.00%	100.00%	0	0	0.00%	0.00%	0	0	0.00%	0.00%
2	3	0	3	0.00%	100.00%	3	3	50.00%	50.00%	0	0	0.00%	0.00%	3	0	100.00%	0.00%
3	4	1	18	5.26%	94.74%	2	2	42.86%	57.14%	2	4	30.00%	70.00%	3	2	60.00%	40.00%
4	5	15	8	65.91%	34.09%	6	6	50.00%	50.00%	1	3	28.57%	71.43%	1	3	28.57%	71.43%

Time Interval (Hour)		Km 5+500				Km 34+175				Km 135+500				Km 149+200			
		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)		Traffic (PCU)		Directional Distribution (%)	
From	To	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
5	6	27	10	72.97%	27.03%	17	32	34.69%	65.31%	6	4	57.89%	42.11%	2	3	40.00%	60.00%
6	7	33	46	41.67%	58.33%	22	58	27.50%	72.50%	20	21	49.38%	50.62%	16	15	52.46%	47.54%
7	8	207	136	60.44%	39.56%	77	103	42.74%	57.26%	66	83	44.11%	55.89%	34	57	37.36%	62.64%
Total		**2444**	**2428**	**50.16%**	**49.84%**	**2050**	**2021**	**50.36%**	**49.64%**	**1242**	**1217**	**50.52%**	**49.48%**	**1092**	**1125**	**49.26%**	**50.74%**

The overall directional distribution is 50:50 at Km 5+500, 50:50 at Km 34+175, 51:49 at Km 135+500 and 49:51 at Km 149+200 considering the traffic flow at all the count stations.

6.4.4 TRAFFIC COMPOSITION

While detailed traffic counts are presented in Appendix to Main Report, for ready reference and easier appreciation, the composition of traffic at various count locations has been shown in Figure 6.18, 6.19, 6.20 & 6.21.

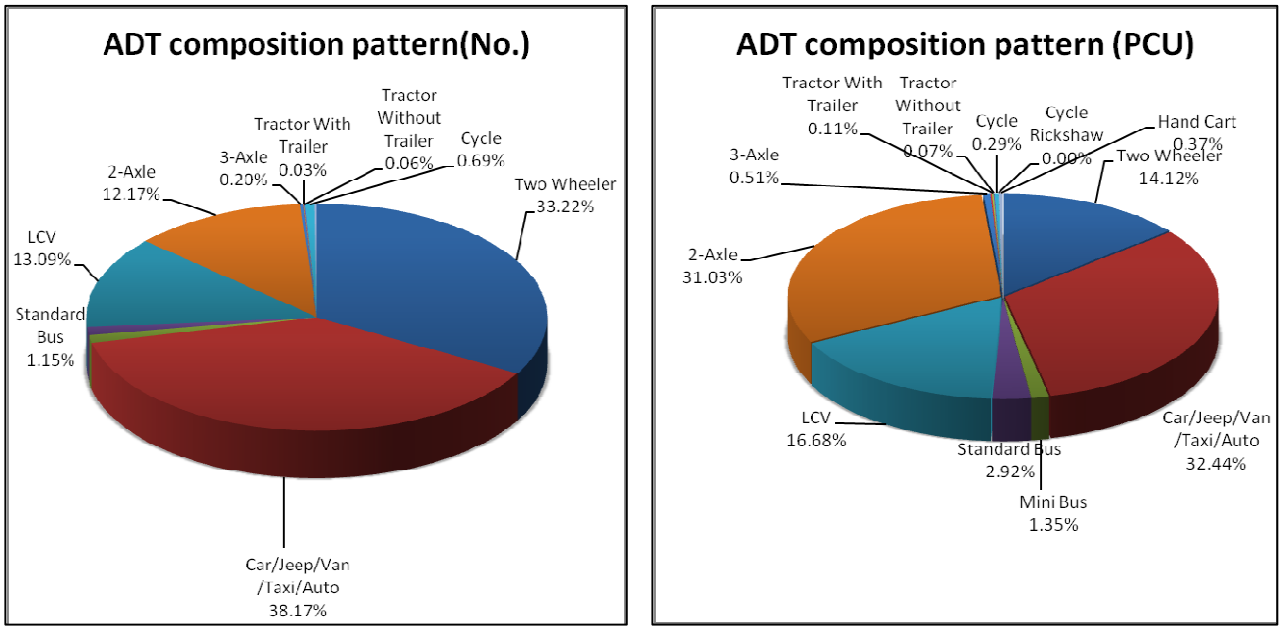


Figure 6.18: Traffic Composition (5+500 km)

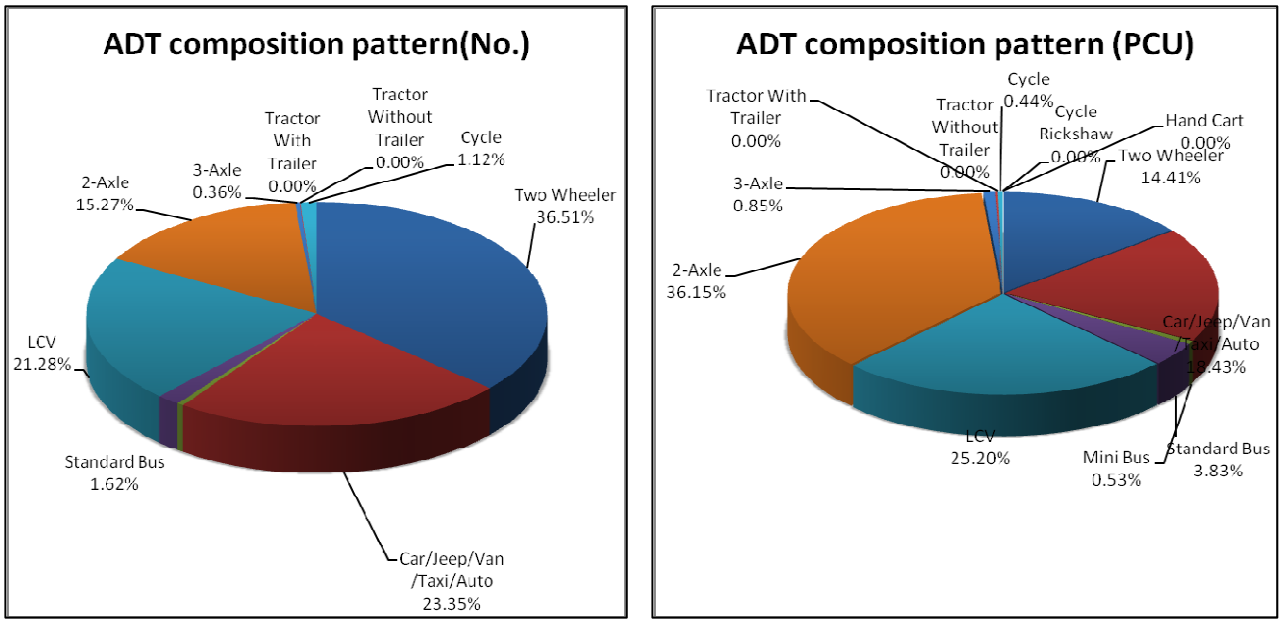


Figure 6.19: Traffic Composition (34+175 km)

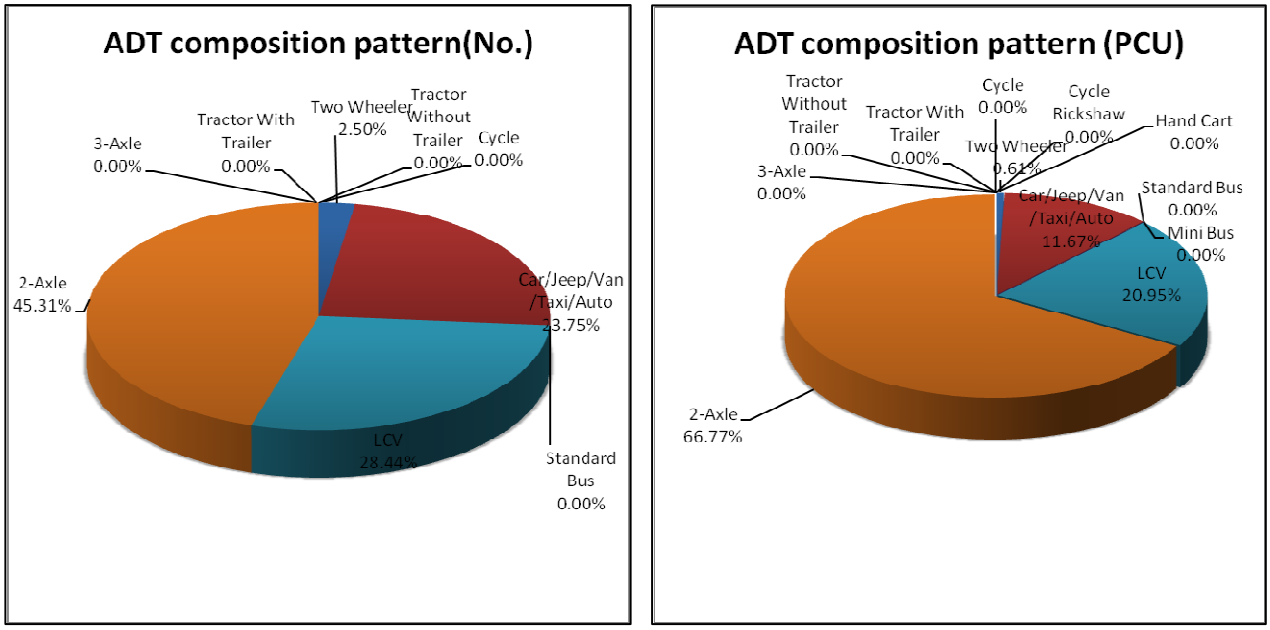


Figure 6.20: Traffic Composition (135+500 km)

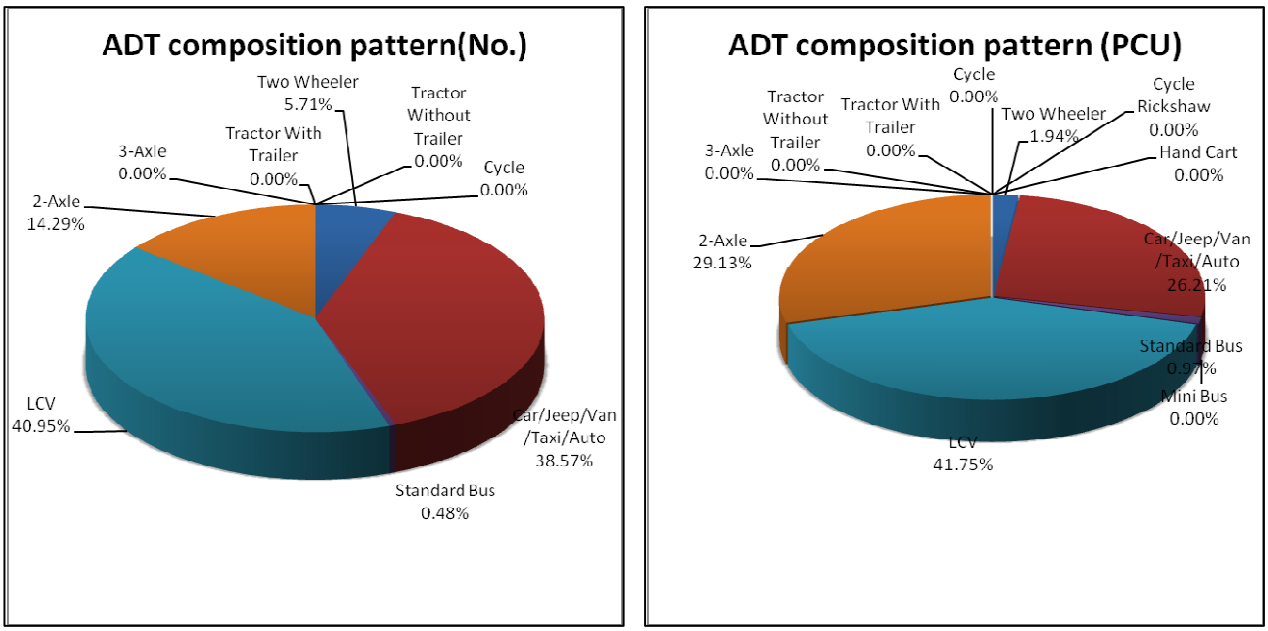


Figure 6.21: Traffic Composition (149+200 km)

From the above figures it can be seen that car & two wheelers comprise about 39-50% of total traffic whereas 2-axle & 3-axle trucks comprise about 1-3% of total traffic on the project road.

The traffic composition shown in the above figures has been summarized in Tables 6.5(a), Tables 6.5(b), Tables 6.5(c) and Tables 6.5(d)

Table 6.5(a): Traffic Composition at km 5+500

Type of Vehicle	% of Total	ADT
Two Wheeler	33.22	166
Car/Jeep/Van/Taxi/Auto	38.17	190
Mini Bus	1.06	5
Standard Bus	1.15	6
LCV	13.09	65
2-Axle	12.17	61
3-Axle	0.20	1
Multi-Axle	0.03	0
Tractor With Trailer	0.03	0
Tractor Without Trailer	0.06	0
Cycle	0.69	3
Cycle Rickshaw	0.00	0
Hand Cart	0.14	1
Bullock Cart	0.00	0
Horse Cart	0.00	0

Table 6.5(b): Traffic Composition at km 34+175

Type of Vehicle	% of Total	ADT
Two Wheeler	36.51	116
Car/Jeep/Van/Taxi/Auto	23.35	74
Mini Bus	0.45	1
Standard Bus	1.62	5
LCV	21.28	68
2-Axle	15.27	49
3-Axle	0.36	1
Multi-Axle	0.04	0
Tractor With Trailer	0.00	0
Tractor Without Trailer	0.00	0
Cycle	1.12	4
Cycle Rickshaw	0.00	0
Hand Cart	0.00	0
Bullock Cart	0.00	0
Horse Cart	0.00	0

Table 6.5(c): Traffic Composition at km 135+500

Type of Vehicle	% of Total	ADT
Two Wheeler	2.50	1
Car/Jeep/Van/Taxi/Auto	23.75	11
Mini Bus	0.00	0
Standard Bus	0.00	0
LCV	28.44	13
2-Axle	45.31	21
3-Axle	0.00	0
Multi-Axle	0.00	0
Tractor With Trailer	0.00	0
Tractor Without Trailer	0.00	0
Cycle	0.00	0
Cycle Rickshaw	0.00	0
Hand Cart	0.00	0
Bullock Cart	0.00	0
Horse Cart	0.00	0

Table 6.5(d): Traffic Composition at km 149+200

Type of Vehicle	% of Total	ADT
Two Wheeler	5.71	2
Car/Jeep/Van/Taxi/Auto	38.57	12
Mini Bus	0.00	0
Standard Bus	0.48	0
LCV	40.95	12
2-Axle	14.29	4
3-Axle	0.00	0
Multi-Axle	0.00	0
Tractor With Trailer	0.00	0
Tractor Without Trailer	0.00	0
Cycle	0.00	0
Cycle Rickshaw	0.00	0
Hand Cart	0.00	0
Bullock Cart	0.00	0
Horse Cart	0.00	0

6.4.5 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 one petrol pumps on the project road. The petrol and diesel fuel sale data for the years 2016-2017 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 February, the above factors for the month of February is considered. The fuel sales figures at the filling station in the region are presented season wise in Table 6.6 – 6.8.

TABLE 6.6: SUMMARY OF PETROL SALES DATA AT FUEL STATION

Petrol Sales Data (in Litre)			
Year	Month	Fuel Stations	
		M/S Niangchin Service Station	Avg. Sales Per Station (Lt.)
2016	Apr	12000	12,000
2016	May	12000	12,000
2016	Jun	12000	12,000
2016	Jul	12000	12,000
2016	Aug	12000	12,000
2016	Sep	12000	12,000
2016	Oct	12000	12,000
2016	Nov	12000	12,000
2016	Dec	12000	12,000
2017	Jan	12000	12,000
2017	Feb	12000	12,000
2017	Mar	12000	12,000

TABLE 6.7: SUMMARY OF DIESEL SALES DATA AT FUEL STATION

Diesel Sales Data (in Litre)			
Year	***Month***	***Fuel Stations***	
		M/S Niangchin Service Station	***Avg. Sales Per Station (Lt.)***
2016	Apr	90000	90,000
2016	May	90000	90,000
2016	Jun	90000	90,000
2016	Jul	90000	90,000
2016	Aug	90000	90,000
2016	Sep	90000	90,000
2016	Oct	90000	90,000
2016	Nov	90000	90,000
2016	Dec	90000	90,000
2017	Jan	90000	90,000
2017	Feb	90000	90,000
2017	Mar	90000	90,000

TABLE 6.8: SUMMARY OF SEASONAL VARIATION FACTOR (PETROL AND DIESEL)

Month	***Avg. Sales (Lt.)***		***Avg. Seasonal Correction Factor***		***Peak Seasonal Correction Factor***	
	Petrol	***Diesel***	***Petrol***	***Diesel***	***Petrol***	***Diesel***
Jan	12,000	90,000	1.00	1.00	1.00	1.00
Feb	12,000	90,000	1.00	1.00	1.00	1.00
Mar	12,000	90,000	1.00	1.00	1.00	1.00
Apr	12,000	90,000	1.00	1.00	1.00	1.00
May	12,000	90,000	1.00	1.00	1.00	1.00
Jun	12,000	90,000	1.00	1.00	1.00	1.00
Jul	12,000	90,000	1.00	1.00	1.00	1.00
Aug	12,000	90,000	1.00	1.00	1.00	1.00
Sep	12,000	90,000	1.00	1.00	1.00	1.00
Oct	12,000	90,000	1.00	1.00	1.00	1.00
Nov	12,000	90,000	1.00	1.00	1.00	1.00
Dec	12,000	90,000	1.00	1.00	1.00	1.00
Avg. Sale per Month	12,000	90,000				

Average Seasonal Correction Factor for Petrol operated vehicles =	1.00
Average Seasonal Correction Factor for Diesel operated vehicles =	1.00
Average Seasonal Correction Factor to be considered for both type of vehicles =	**1.00**
Peak Seasonal Correction Factor for Petrol operated vehicles =	1.00
Peak Seasonal Correction Factor for Diesel operated vehicle =	1.00
Peak Seasonal Correction Factor to be considered for both type of vehicles =	**1.00**

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 tables:

An average of ASCF (1.00) and average of PSCF (1.00) has been calculated based on petrol and diesel sales percentage of total fuel consumption on the project road are applied on ADT.

6.4.6 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. AADT of project road is used for capacity assessment are given in the following Table 6.9.

TABLE 6.9: ESTIMATES OF AADT AS OBSERVED ON THE PROJECT ROAD (FEBRUARY 2018)

	AADT				
Vehicle Type	**NH 150 (On Old NH-2)**	**Buallian (Ch. 5+500 km)**	**Singngat (Ch. 34+175 km)**	**Khuanggin (Ch. 135+500 km)**	**Sinzawl (Ch. 149+200)**
Two Wheeler	10235	166	116	1	2
Car/Jeep/Van/Taxi/Auto	11173	190	74	11	12
Mini Bus	11	5	1	0	0
Standard Bus	30	6	5	0	0
LCV	383	65	68	13	12
2-Axle Truck	205	61	49	21	4
3-Axle Truck	5	1	1	0	0
Multi-Axle	0	0	0	0	0
Tractor With Trailer	1	0	0	0	0
Tractor Without Trailer	14	0	0	0	0
Cycle	211	3	4	0	0
Cycle Rickshaw	255	0	0	0	0
Hand Cart	4	1	0	0	0
Bullock Cart	0	0	0	0	0
Horse Cart	0	0	0	0	0
Total Motorized Vehicles (Number)	22059	495	315	46	30
Total Non Motorized Vehicles (Number)	469	4	4	0	0

AADT					
Vehicle Type	**NH 150 (On Old NH-2)**	**Buallian (Ch. 5+500 km)**	**Singngat (Ch. 34+175 km)**	**Khuanggin (Ch. 135+500 km)**	**Sinzawl (Ch. 149+200)**
Total Vehicles (Number)	22528	499	318	46	
Total Motorized Vehicles (PCU)	17631	583	401	93	44
Total Non Motorized Vehicles (PCU)	627	4	2	0	0
Total Vehicles (PCU)	18258	587	403	93	44
Total Commercial Vehicle per day(Number)	636	138	124	34	17

6.4.7 TRAFFIC GROWTH RATES

As per IRC: SP 48:1998, Hill road manual, 7.5% growth of traffic is considered for hill road when past data is not available.

6.4.8 TRAFFIC PROJECTION FOR HOMOGENEOUS SECTION – I (KM 0+000 TO KM 74+000)

Table 6.10: Traffic Projection of homogeneous section-I

Year	Growth Factors	AADT															Total in Numbers	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 Trailor	Agri. Tract. Without Trailor	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2017	7.5%	166	190	5	6	65	61	1	0	0	0	3	0	1	0	0	498	587
2018	7.5%	178	204	5	6	70	66	1	0	0	0	3	0	1	0	0	535	630
2019	**7.5%**	**192**	**220**	**6**	**7**	**75**	**70**	**1**	**0**	**0**	**0**	**3**	**0**	**1**	**0**	**0**	**576**	**678**
2020	7.5%	206	236	6	7	81	76	1	0	0	0	4	0	1	0	0	619	729
2021	7.5%	222	254	7	8	87	81	1	0	0	0	4	0	1	0	0	665	783
2022	**7.5%**	**238**	**273**	**7**	**9**	**93**	**88**	**1**	**0**	**0**	**0**	**4**	**0**	**1**	**0**	**0**	**715**	**842**
2023	7.5%	256	293	8	9	100	94	2	0	0	0	5	0	2	0	0	769	905
2024	7.5%	275	315	8	10	108	101	2	0	0	0	5	0	2	0	0	826	973
2025	7.5%	296	339	9	11	116	109	2	0	0	0	5	0	2	0	0	888	1046
2026	7.5%	318	364	10	12	125	117	2	0	0	0	6	0	2	0	0	955	1124
2027	7.5%	342	392	10	12	134	126	2	0	0	0	6	0	2	0	0	1026	1209
2028	7.5%	368	421	11	13	144	135	2	0	0	0	7	0	2	0	0	1103	1299
2029	7.5%	395	453	12	14	155	145	2	0	0	0	7	0	2	0	0	1186	1397
2030	7.5%	425	486	13	15	166	156	3	0	0	0	8	0	3	0	0	1275	1502
2031	7.5%	457	523	14	17	179	168	3	0	0	0	8	0	3	0	0	1371	1614
2032	7.5%	491	562	15	18	192	180	3	0	0	0	9	0	3	0	0	1474	1735
2033	7.5%	528	604	16	19	207	194	3	0	0	0	10	0	3	0	0	1584	1866
2034	7.5%	568	650	17	21	222	209	3	0	0	0	10	0	3	0	0	1703	2005
2035	7.5%	610	698	18	22	239	224	4	0	0	0	11	0	4	0	0	1831	2156
2036	7.5%	656	751	20	24	257	241	4	0	0	0	12	0	4	0	0	1968	2318
2037	7.5%	705	807	21	25	276	259	4	0	0	0	13	0	4	0	0	2115	2491
2038	7.5%	758	868	23	27	297	279	5	0	0	0	14	0	5	0	0	2274	2678
2039	7.5%	815	933	25	29	319	299	5	0	0	0	15	0	5	0	0	2445	2879
2040	7.5%	876	1003	26	32	343	322	5	0	0	0	16	0	5	0	0	2628	3095
2041	7.5%	942	1078	28	34	369	346	6	0	0	0	17	0	6	0	0	2825	3327
2042	**7.5%**	**1012**	**1159**	**30**	**37**	**396**	**372**	**6**	**0**	**0**	**0**	**18**	**0**	**6**	**0**	**0**	**3037**	**3577**

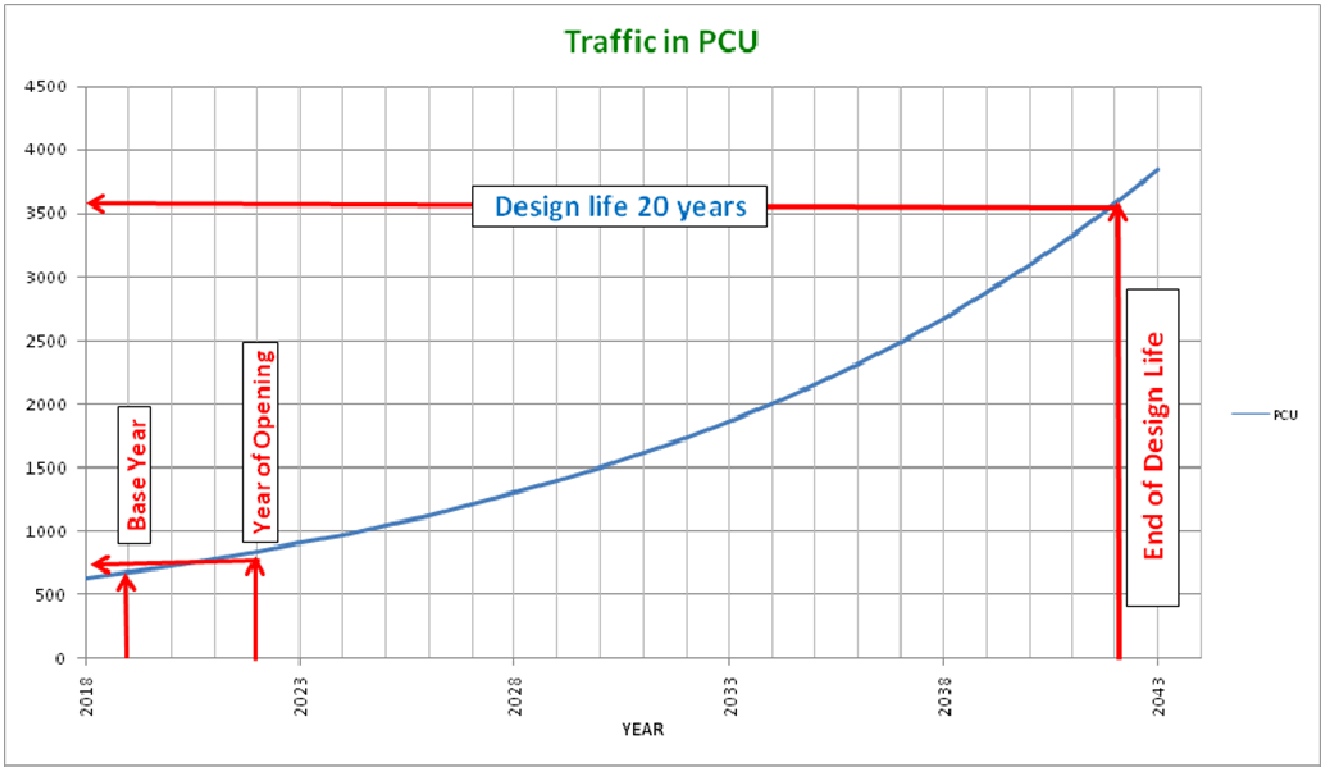


Fig: 6.22 Traffic Projection of homogeneous section-I (KM 0+000 TO KM 74+000)

From the traffic projection table 6.10, the projected traffic of homogeneous section – I considering 20 years of design life of pavement comes out as 3577 PCU. Therefore 2-lane is found adequate to cater this projected traffic with level of service B

6.4.9 TRAFFIC PROJECTION FOR HOMOGENEOUS SECTION – II (KM 74+000 TO KM 161+665)

Table 6.11: Traffic Projection of homogeneous section-II

Year	Growth Factors	AADT															Total in Numbers	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	Cycle	Cycle Rickshaw	Hand Cart	Bullock Cart	Horse Cart		
2017	7.5%	1	11	0	0	13	21	0	0	0	0	0	0	0	0	0	46	94
2018	7.5%	1	12	0	0	14	23	0	0	0	0	0	0	0	0	0	49	101
2019	**7.5%**	**1**	**13**	**0**	**0**	**15**	**24**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**53**	**109**
2020	7.5%	1	14	0	0	16	26	0	0	0	0	0	0	0	0	0	57	117
2021	7.5%	1	15	0	0	17	28	0	0	0	0	0	0	0	0	0	61	126
2022	**7.5%**	**1**	**16**	**0**	**0**	**19**	**30**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**66**	**135**
2023	7.5%	2	17	0	0	20	32	0	0	0	0	0	0	0	0	0	71	145
2024	7.5%	2	18	0	0	22	35	0	0	0	0	0	0	0	0	0	76	156
2025	7.5%	2	20	0	0	23	37	0	0	0	0	0	0	0	0	0	82	168
2026	7.5%	2	21	0	0	25	40	0	0	0	0	0	0	0	0	0	88	180
2027	7.5%	2	23	0	0	27	43	0	0	0	0	0	0	0	0	0	95	194
2028	7.5%	2	24	0	0	29	47	0	0	0	0	0	0	0	0	0	102	208
2029	7.5%	2	26	0	0	31	50	0	0	0	0	0	0	0	0	0	110	224
2030	7.5%	3	28	0	0	33	54	0	0	0	0	0	0	0	0	0	118	241
2031	7.5%	3	30	0	0	36	58	0	0	0	0	0	0	0	0	0	127	259
2032	7.5%	3	33	0	0	38	62	0	0	0	0	0	0	0	0	0	136	278
2033	7.5%	3	35	0	0	41	67	0	0	0	0	0	0	0	0	0	146	299
2034	7.5%	3	38	0	0	44	72	0	0	0	0	0	0	0	0	0	157	321
2035	7.5%	4	40	0	0	48	77	0	0	0	0	0	0	0	0	0	169	346
2036	7.5%	4	43	0	0	51	83	0	0	0	0	0	0	0	0	0	182	371
2037	7.5%	4	47	0	0	55	89	0	0	0	0	0	0	0	0	0	195	399
2038	7.5%	5	50	0	0	59	96	0	0	0	0	0	0	0	0	0	210	429
2039	7.5%	5	54	0	0	64	103	0	0	0	0	0	0	0	0	0	226	461
2040	7.5%	5	58	0	0	69	111	0	0	0	0	0	0	0	0	0	243	496
2041	7.5%	6	62	0	0	74	119	0	0	0	0	0	0	0	0	0	261	533
2042	**7.5%**	**6**	**67**	**0**	**0**	**79**	**128**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**281**	**573**

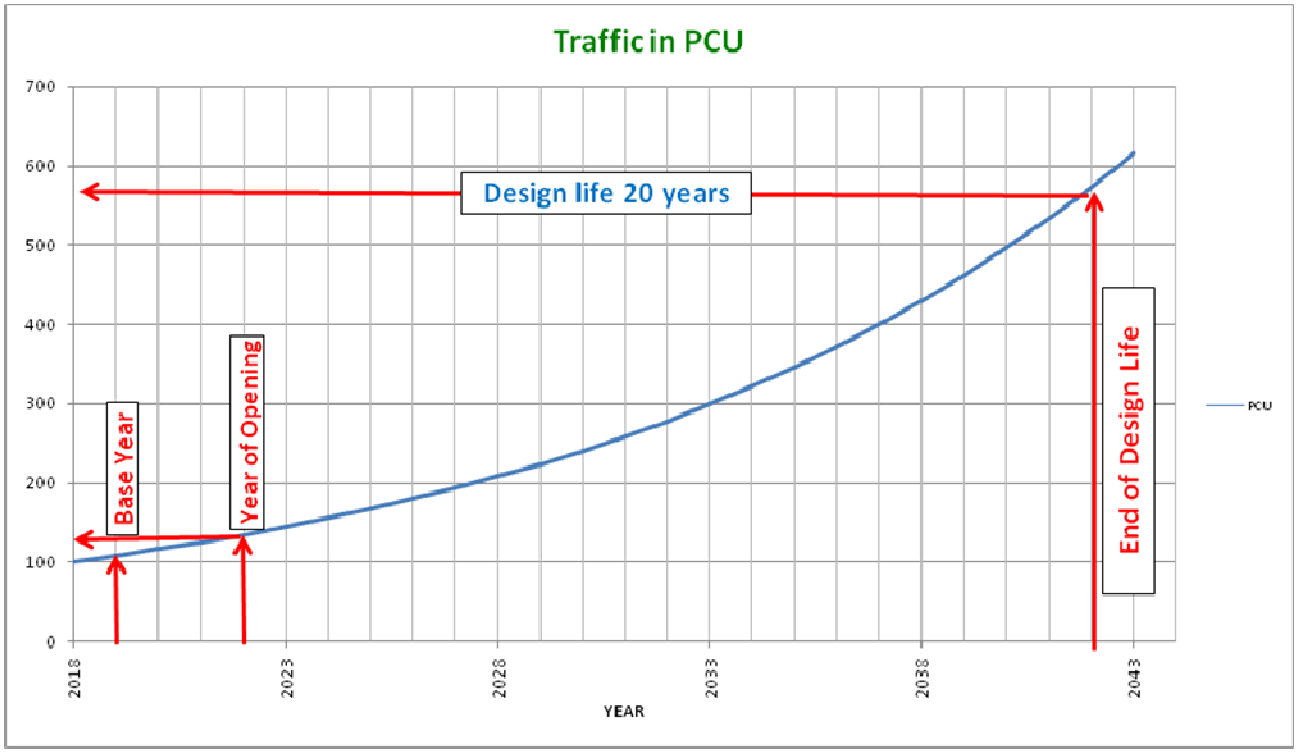
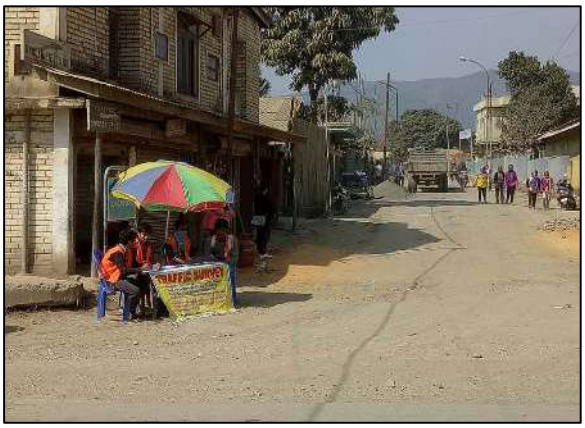


Fig: 6.23 Traffic Projection of homogeneous section-II (KM 74+000 TO KM 161+665)

From the traffic projection table 6.11, the projected traffic of homogeneous section – II considering 20 years of design life of pavement comes out as 573 PCU. Therefore 2-lane is found adequate to cater this projected traffic with level of service B.

INTERSECTION TURNING MOVEMENT COUNTS

Intersection turning movement surveys were carried out at the identified 5 major intersections on the project road. The locations considered for intersection turning movement surveys is described earlier. However for ready reference these are listed once again:



- ✓ **3-legged intersection at Churachandpur (Ch. 0+000 Km)**
- ✓ **4-legged intersection at New Lamka (Ch. 0+526 Km)**
- ✓ **4-legged intersection at New Lamka (Ch. 1+840 Km)**
- ✓ **3-legged intersection at Singngat (Ch. 34+175 Km)**
- ✓ **3-legged intersection at Sinzawl (Ch. 149+582 Km)**

Classified directional turning movements were counted at each of the above five intersections for 1day x 12 hours. Trained enumerators have carried out these surveys under close supervision of Traffic Expert. The details on the turning movement counts are given in **Annexure-7.** The peak hour flows (in vehicles and PCUs) have been presented in Figures 6.24 to 6.33. 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 Annexure. As per IRC: 62-1976, grade separator should be provided at intersection of divided rural highway if the ADT (fast moving vehicles only) on the cross road within the next 5 years exceed 5000. Where these traffic figures will reach within next 20 years, the need for such facility should be kept in view for future construction.

TABLE 6.12: SUMMARY OF PEAK HOUR AND FORECAST OF INTERSECTION FLOWS

Sl. No.	Name of Intersection	Type	As per IRC 62-1976, Grade Separator should be provided at intersection of divided rural highway if ADT (fast vehicles) at the cross roads within the next 5 years exceeding 5000 nos.						Requirement of proposed improvement
			ADT crossing the through traffic						
			2018	2019	2020	2021	2022	2023	
1	Churachandpur (0.000 km)	3-Legged	845	887	932	978	1027	1078	Not Required
2	New Lamka (0.526 km)	4-Legged	1339	1406	1476	1550	1628	1709	Not Required
3	New Lamka (1.840 km)	4-Legged	277	291	305	321	337	354	Not Required
4	Singngat (34.175 km)	3-Legged	41	43	45	47	50	52	Not Required
5	Sinzawl (149.582 km)	3-Legged	2	2	2	2	2	3	Not Required

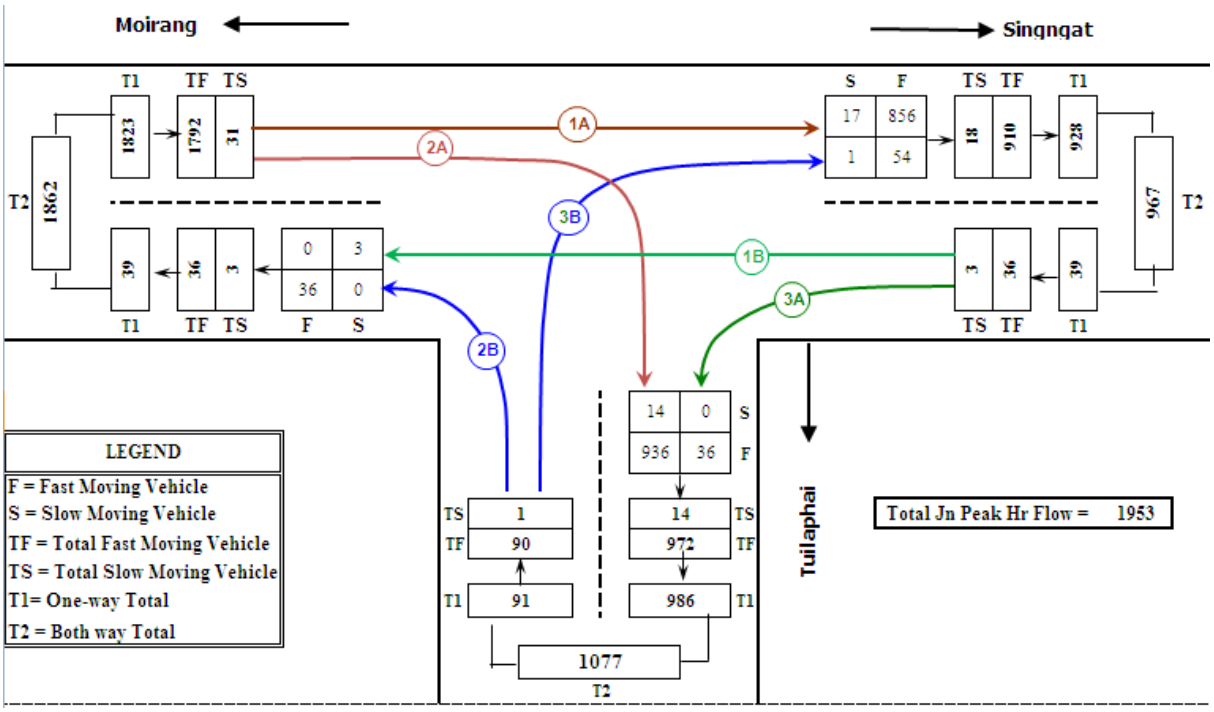


Fig 6.24: Peak hour traffic in Number at Ch. 0+000 Km at Churachandpur Junction

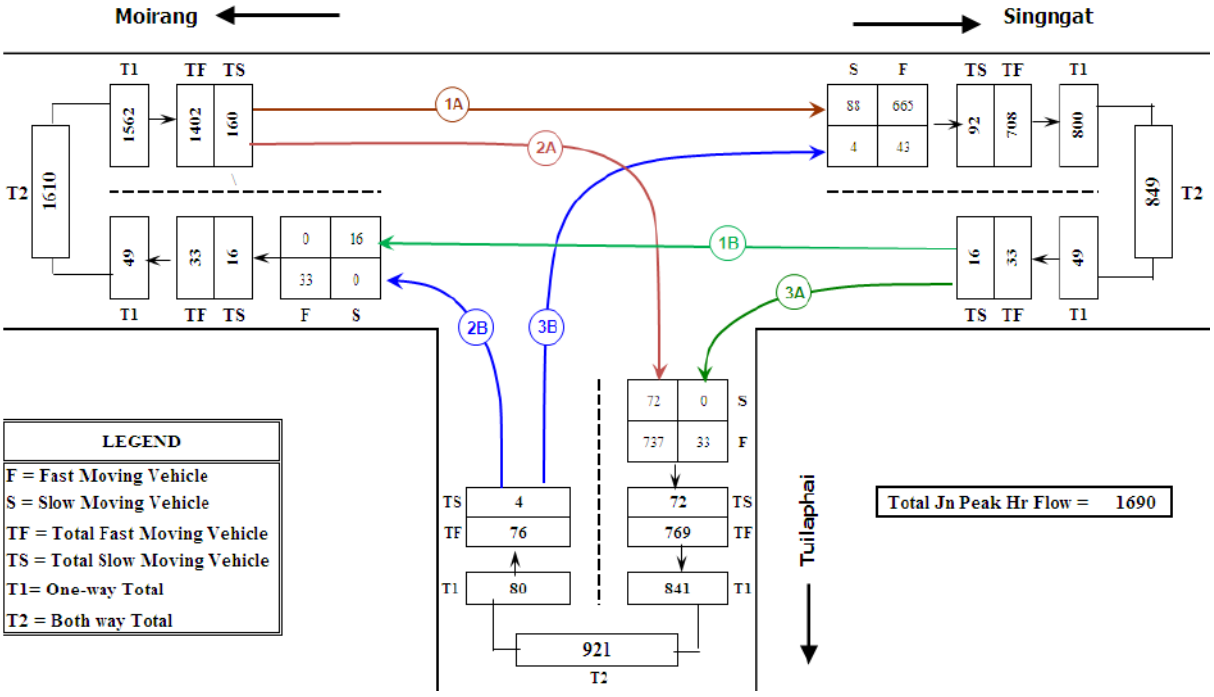


Fig 6.25: Peak hour traffic in PCU at Ch. 0+000 Km at Churachandpur Junction

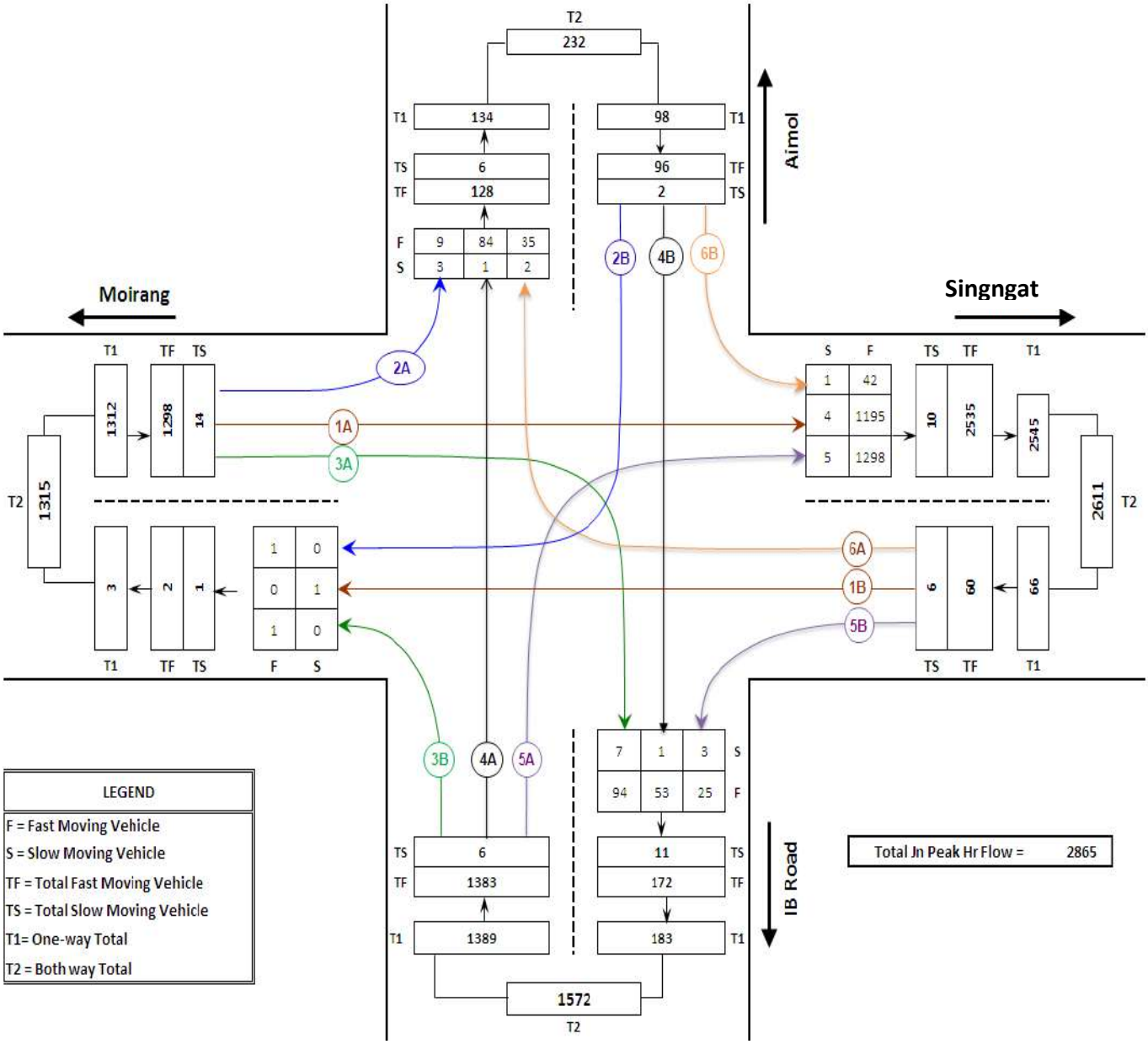


Fig 6.26: Peak hour traffic in Number at Ch. 0+526 Km New Lamka Junction

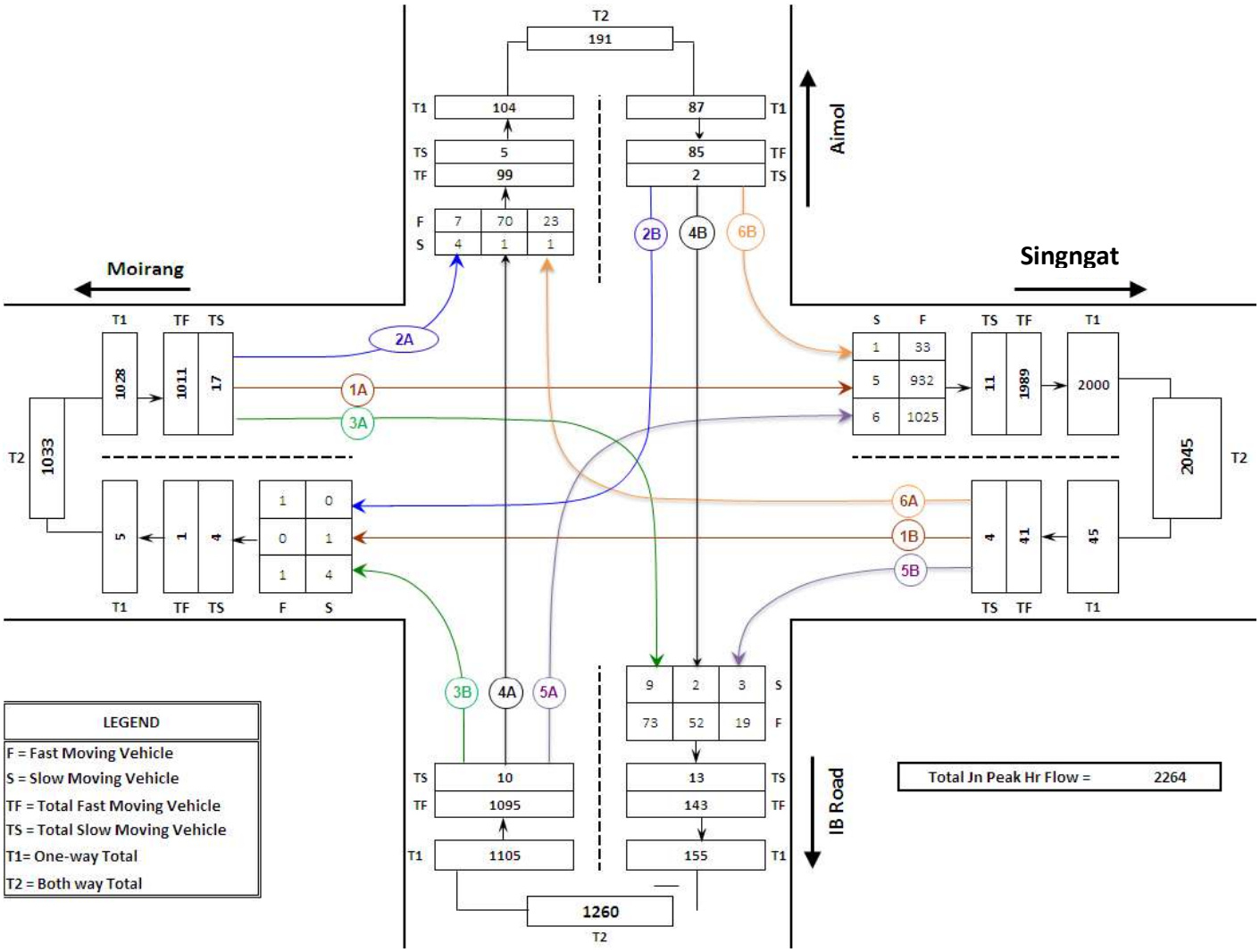


Fig 6.27: Peak hour traffic in PCU at Ch. 0+526 Km New Lamka Junction

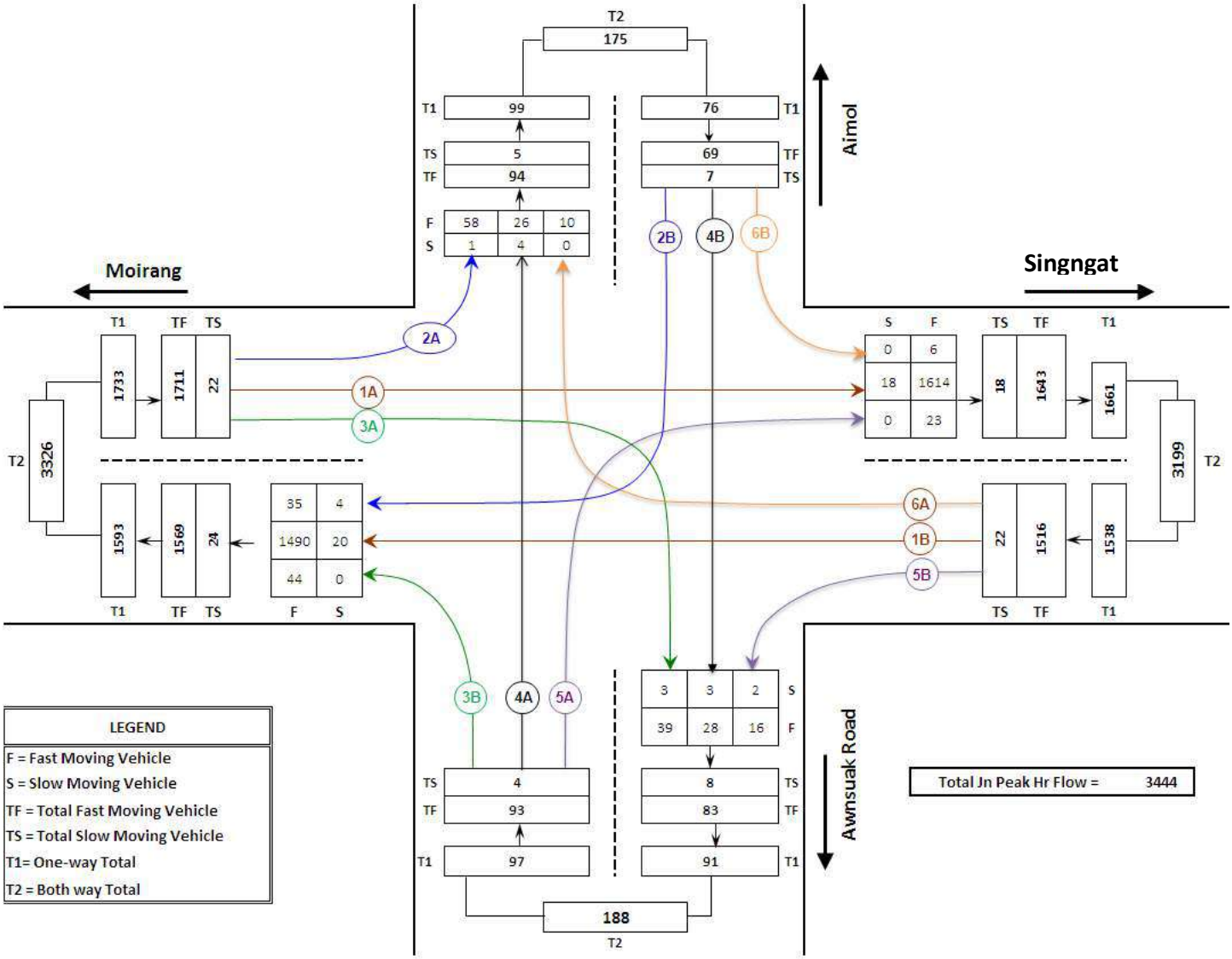


Fig 6.28: Peak hour traffic in Number at Ch. 1+840 Km New Lamka Junction

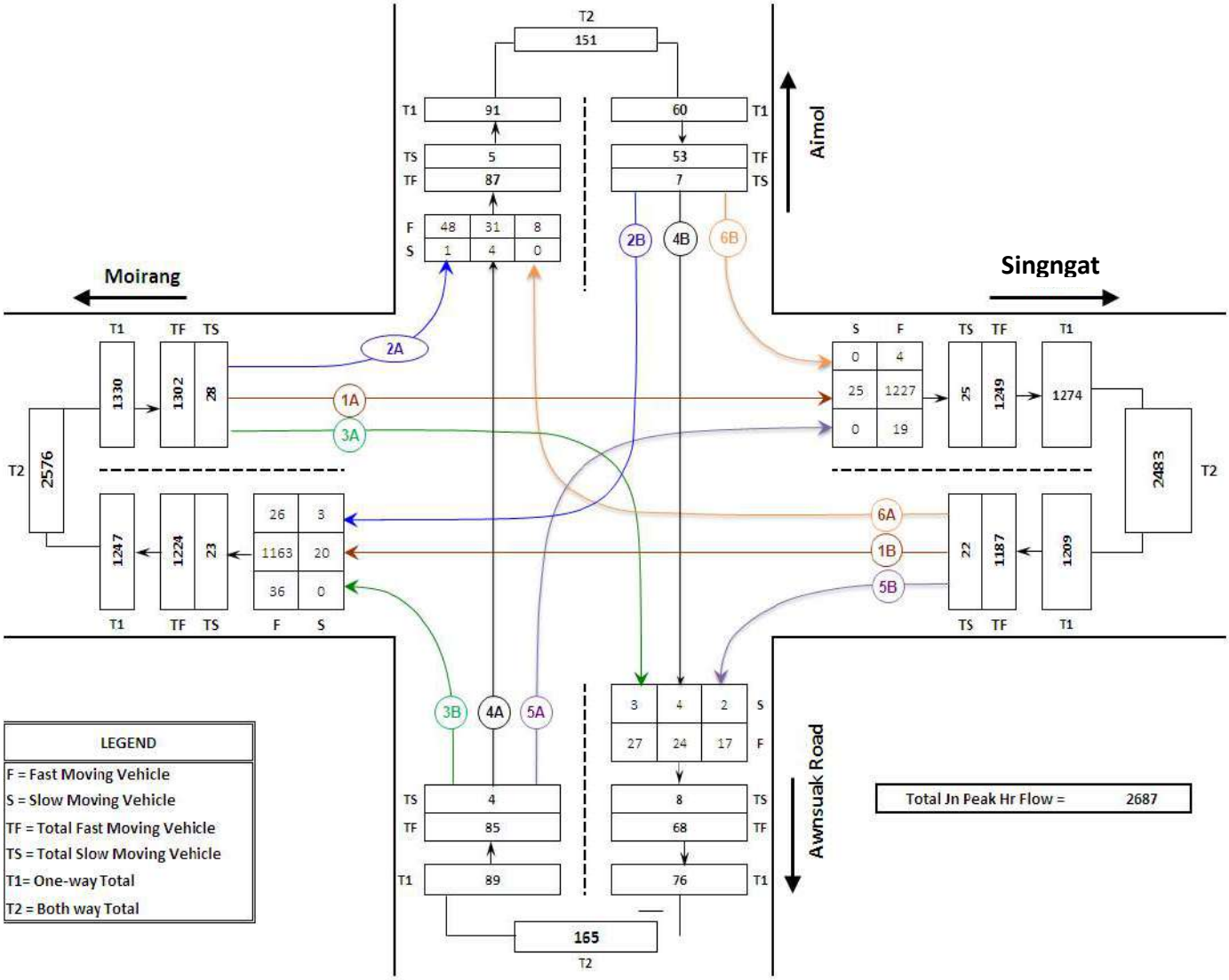


Fig 6.29: Peak hour traffic in PCU at Ch. 1+840 Km New Lamka Junction

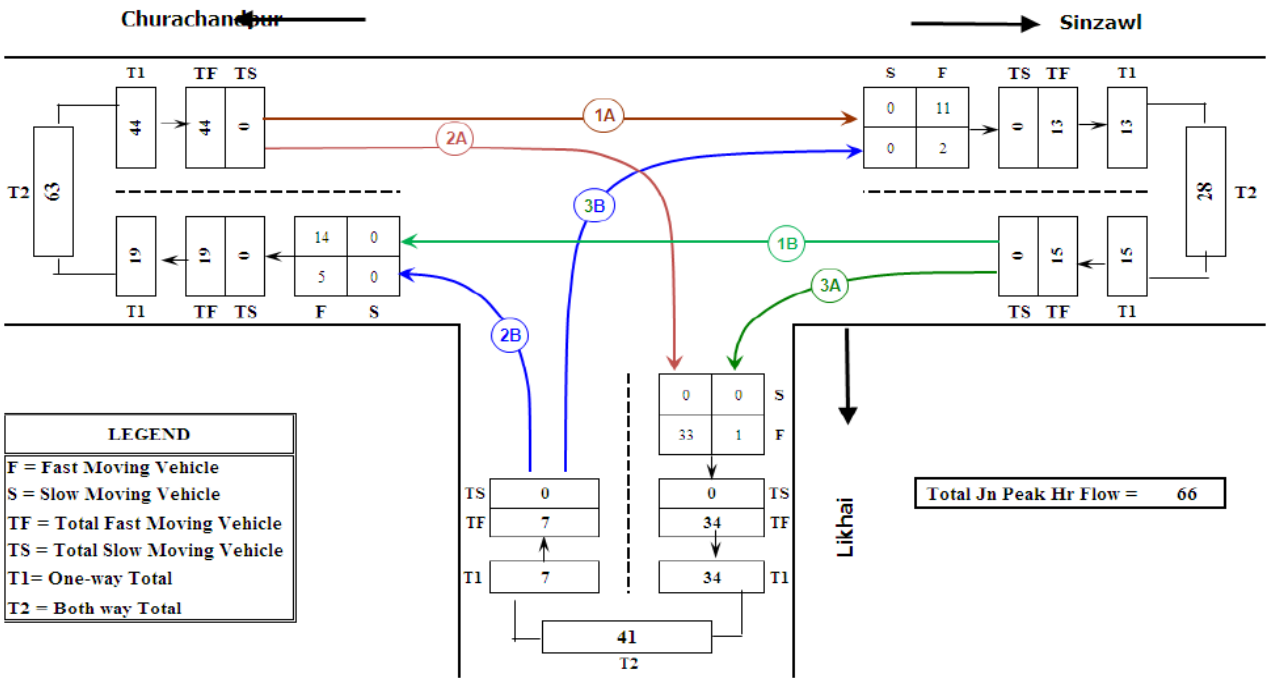


Fig 6.30: Peak hour traffic in Number at Ch. 34+175 Km Singngat Junction

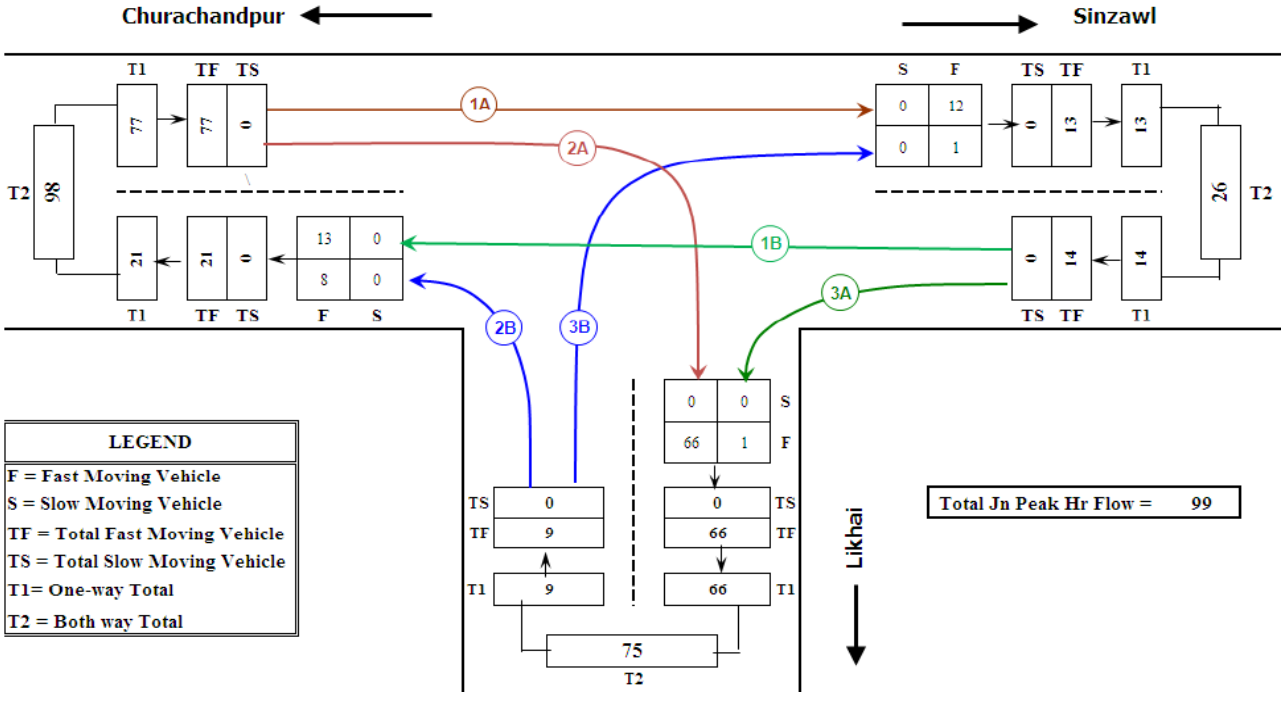


Fig 6.31: Peak hour traffic in PCU at Ch. 34+175 Km Singngat Junction

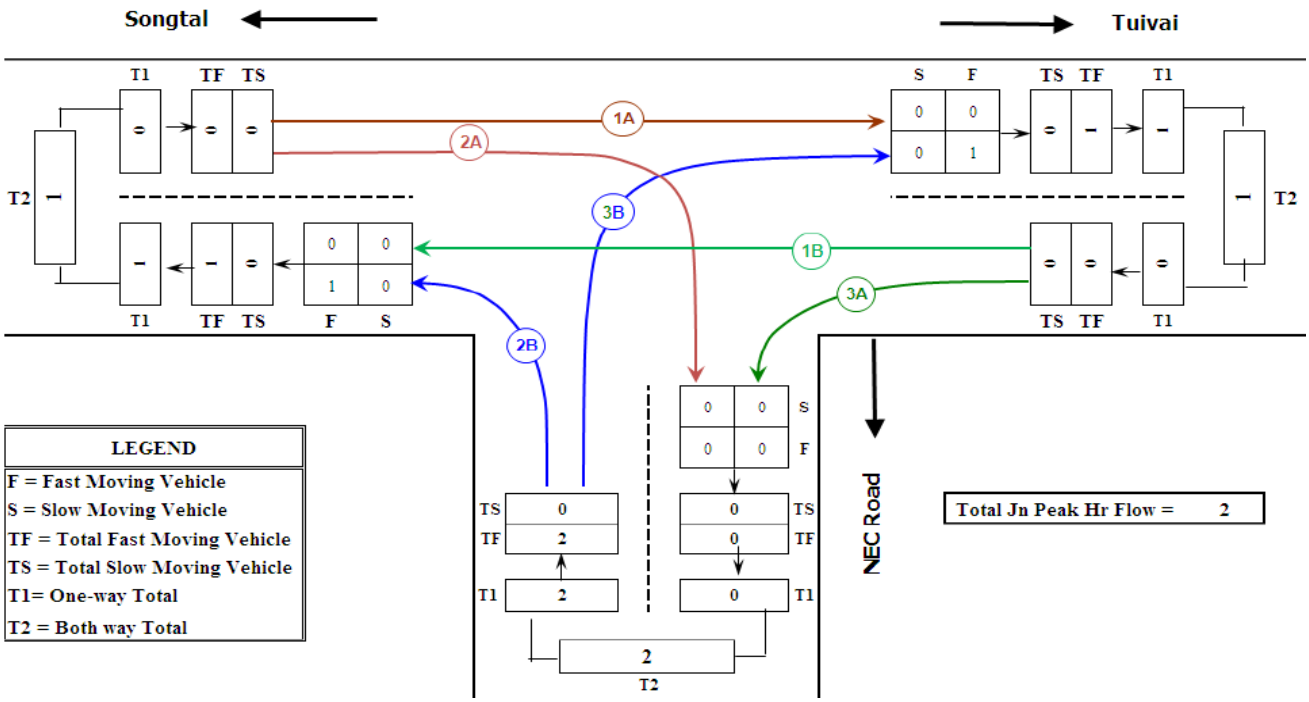


Fig 6.32: Peak hour traffic in Number at Ch. 149+582 Km Sinzawl Junction

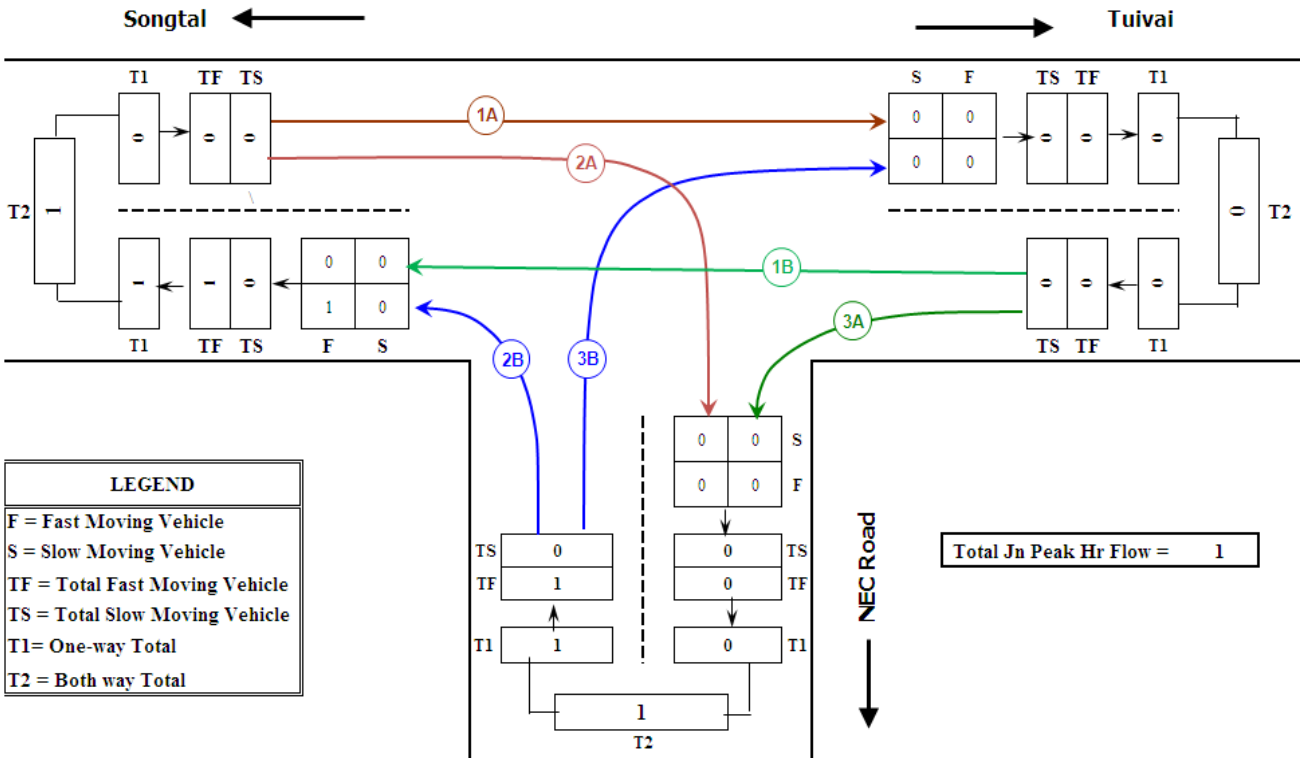


Fig 6.33: Peak hour traffic in PCU at Ch. 149+582 Km Sinzawl Junction

6.6 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 near

- ✓ **At Churachandpur on NH 102B (Ch. 0+000 Km)**
- ✓ **At Sinzawl on NH 102B (Ch. 149+200 km)**

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 6.13(a) and 6.13(b) show the ADT and the sample size (both in absolute numbers and in percentage terms) captured during the survey on NH 102C at CH 0+000 andat CH. 149+200 Km.

Table 6.13 (a): On NH 102B at Ch. 0+000 km

Road Name : NH 102B					**Date - 09.02.2018**
Location : Churachandpur				**Time**	**8.00am to 8.00 am**
Vehicle Type	**Sample Collected**	**Actual Volume**	**Exp. Fact.**	**Composition**	**Sample Size %**
Car	348	9652	27.74	61.48	4
LCV	141	452	3.21	24.91	31
Bus	8	46	5.75	1.41	17
2 - Axle	69	298	4.32	12.19	23
3 - Axle	1	5	5.00	0.18	20
Total	**566**	**10448**			**5%**

Table 6.13 (b): On NH 102B at Ch. 149+200 km

Road Name : NH 102B					**Date - 19.02.2018**
Location : SINZAWL				**Time**	**8.00am to 8.00 am**
Vehicle Type	**Sample Collected**	**Actual Volume**	**Exp. Fact.**	**Composition**	**Sample Size %**
LCV	12	12	1.00	75.00	100
Bus	0	0	0.00	0.00	0
3-Axle	0	0	0.00	0.00	0
2 - Axle	4	5	1.25	25.00	80
Total	**16**	**17**			**94%**

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 6.14(a) and in Table 6.14(b)

Table 6.14(a): Zone code for OD at Churachandpur on NH 102B

Zone Code	Name of Zone
1	Near Project Road (Churachandpur, Mata, Singngat, Belpuan, Belpong, Bollaing, Butllar, Dragging, Ferjai, Haijai, Kanway, Laging, Melun, Mullam, Phazala, Toubong, Mualtan, Bualian)
2	North side of Project Road (Imphal, Kotline, Fuirang, Kandouvong, Moirang, Salbunu, Topanog, Tollen, Tuibong, Zenhong, Belpuna, Dhiza, Haizang, Phaila)

Table 6.14(b): Zone code for OD at Sinzawl on NH 102B

Zone Code	Name of Zone
1	Near Project Road (Churachandpur, Songtal, Khauggin, Singngat, Khawsei, Sinzawl, Tuima, Lungthul L, Khodgsei)
2	South side of Project Road (Aizawl, Ngopa, Malkonta)

D. TRAVEL PATTERN

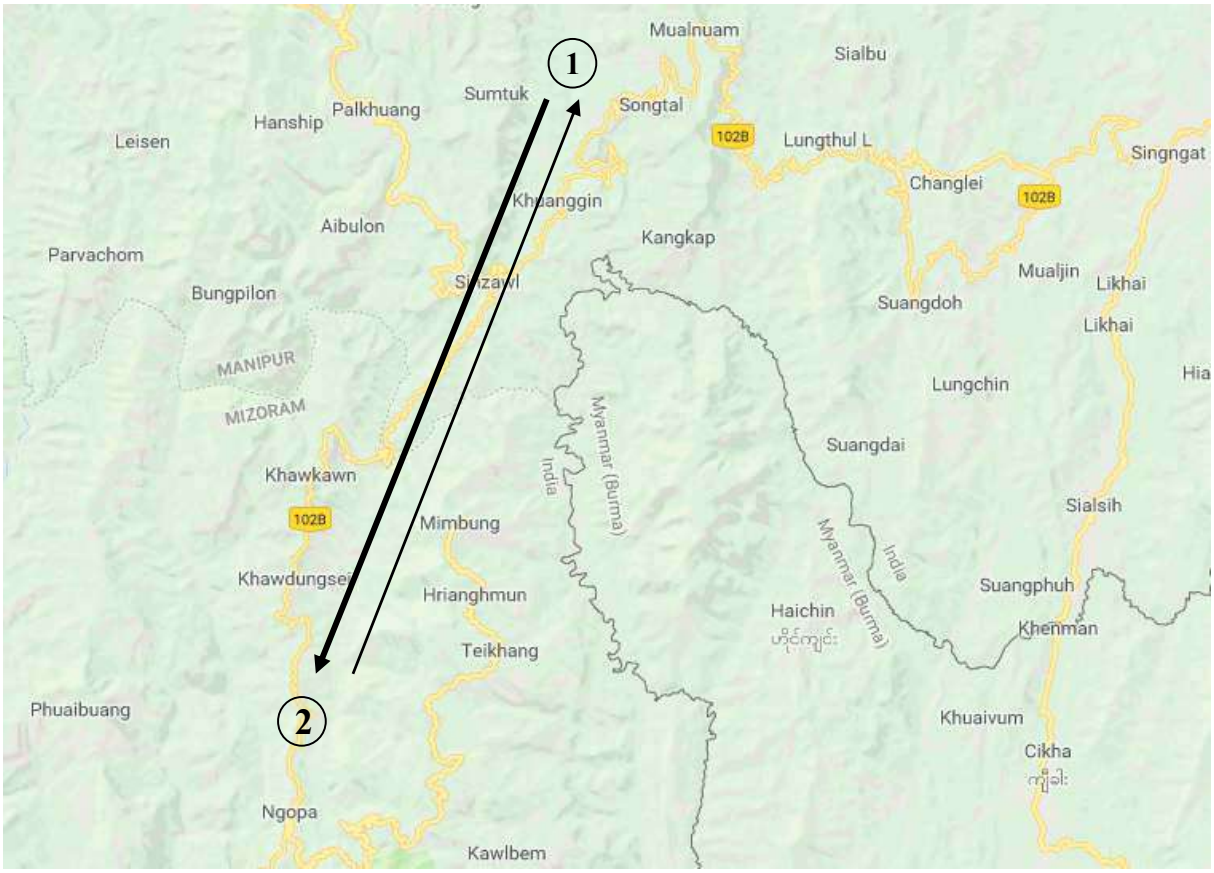
The origins and destinations of various types of vehicles observed at the O-D survey locations have been analyzed for O-D Matrices as per the Zoning System presented above. Details OD calculations are given in a separate Appendix.

Table 6.15: On NH 102B at Churachandpur

Count of All Vehicles	Destination Zone		
Origin Zone	**1**	**2**	**Grand Total**
1	62	116	178
2	189	206	395
Grand Total =	251	322	573
Local Traffic = 87%			

Table 6.16: On NH 102C at Sinzawl

Count of All Vehicles	Destination Zone		
Origin Zone	1	2	**Grand Total**
1	9	11	20
2	9	0	9
Grand Total =	18	11	29
Local Traffic = 91%			



From the above tables, the following travel pattern on the project road can be deduced:

- For OD on NH 102B at Churachandpur, it has been seen that most of the traffic has been produced from zone 1 and zone2 & mostly are local traffic.
- For OD on NH 102B at Sinzawl, it has been seen that most of the traffic has been produced from zone 1and zone 2 & mostly are local traffic.

6.5 PEDESTRIAN COUNT SURVEY

Pedestrian count survey was conducted at the following location to obtain the number of pedestrians crossing the Project road.

- ✓ **At Churachandpur (Ch. 0+000 Km)**
- ✓ **At Mata (Ch. 7+250 Km)**
- ✓ **At Singngat (Ch. 34+155 Km)**
- ✓ **At Maokot (Ch. 48+300 Km)**
- ✓ **At Suangdoh (Ch. 64+200 km)**
- ✓ **At Sinzawl (Ch. 148+450 km)**

Analysis of Pedestrian count survey data is presented below in Table 6.17 to 6.22 respectively.

LOCATION OF SURVEY STATION : On NH-102B **(Churachandpur)**
DATE & DAY OF SURVEY : **06.02.2018**
ROAD NAME- NH-102B

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Churachandpur	8:00	to	9:00	41	37	22	10	78	32	110
	9:00	to	10:00	55	46	16	14	101	30	131
	10:00	to	11:00	68	54	14	17	122	31	153
	11:00	to	12:00	53	61	9	15	114	24	138
	12:00	to	13:00	42	38	15	12	80	27	107
	13:00	to	14:00	55	41	11	9	96	20	116
	14:00	to	15:00	42	57	12	12	99	24	123
	15:00	to	16:00	57	35	17	10	92	27	119
	16:00	to	17:00	39	23	11	9	62	20	82
	17:00	to	18:00	15	9	5	5	24	10	34
	18:00	to	19:00	10	5	2	6	15	8	23
	19:00	to	20:00	1	2	0	2	3	2	5
TOTAL				478	408	134	121	886	255	1141
HOURLY AVERAGE PEDESTRIAN				40	34	11	10	74	21	95
PEAK HOURLY PEDESTRIAN	8.00 AM	to	9.00 AM	114		24		138		153

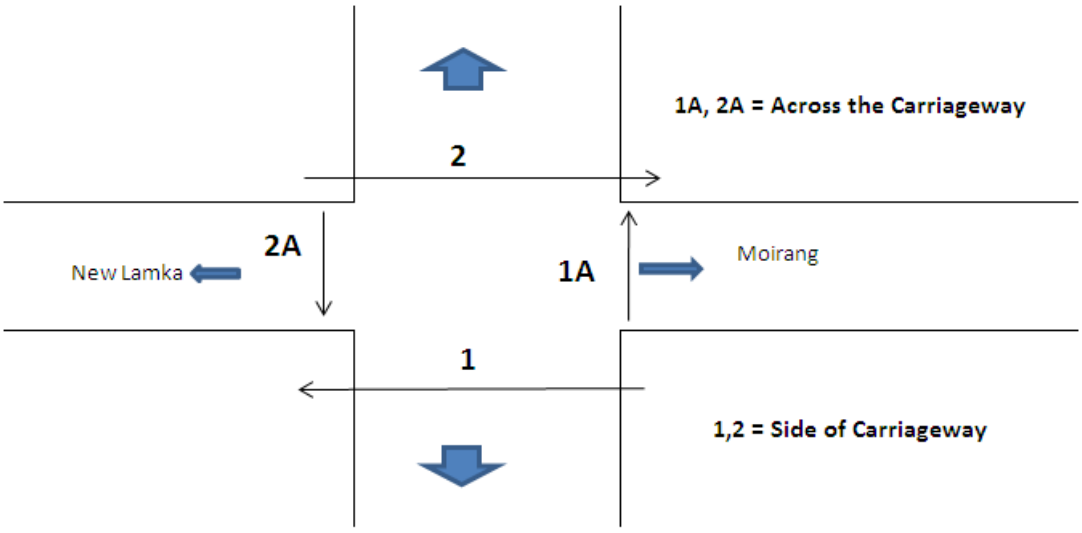


Table 6.17: Pedestrian Count Survey at 0+000 km

LOCATION OF SURVEY STATION :	On NH-102B	(Mata Village)	
DATE & DAY OF SURVEY :	**07.02.2018**		
ROAD NAME-	NH-102B		

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Mata Village	**8:00**	to	**9:00**	6	4	4	9	10	13	23
	9:00	to	**10:00**	14	13	5	7	27	12	39
	10:00	to	**11:00**	16	10	10	4	26	14	40
	11:00	to	**12:00**	11	9	7	2	20	9	29
	12:00	to	**13:00**	11	13	2	3	24	5	29
	13:00	to	**14:00**	6	8	1	10	14	11	25
	14:00	to	**15:00**	10	11	3	2	21	5	26
	15:00	to	**16:00**	9	18	4	2	27	6	33
	16:00	to	**17:00**	11	10	2	0	21	2	23
	17:00	to	**18:00**	4	3	2	2	7	4	11
	18:00	to	**19:00**	2	4	0	0	6	0	6
	19:00	to	**20:00**	0	0	0	0	0	0	0
TOTAL				100	103	40	41	203	81	284
HOURLY AVERAGE PEDESTRIAN				8	9	3	3	17	7	24
PEAK HOURLY PEDESTRIAN	**10.00 AM**	to	**11.00 AM**	21		2		23		40

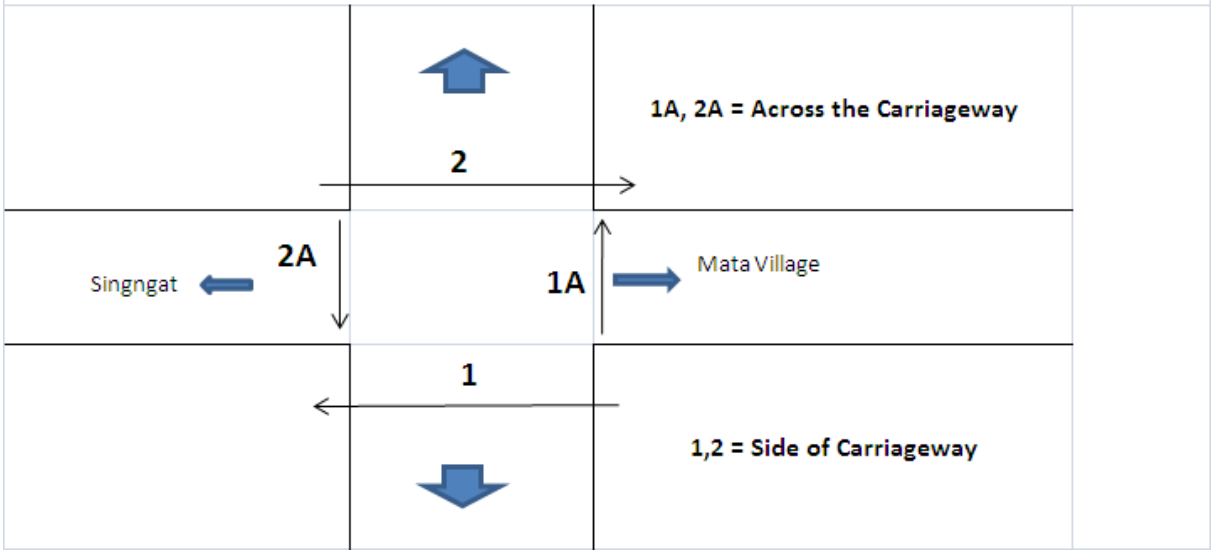


Table 6.18: Pedestrian Count Survey at 7+250 Km

LOCATION OF SURVEY STATION :	On NH-102B	**(Singngat)**									
DATE & DAY OF SURVEY :	**08.02.2018**										
ROAD NAME-	NH-102B										

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Singngat	**8:00**	to	**9:00**	11	13	6	12	24	18	42
	9:00	to	**10:00**	13	23	12	14	36	26	62
	10:00	to	**11:00**	20	18	13	11	38	24	62
	11:00	to	**12:00**	11	13	17	16	24	33	57
	12:00	to	**13:00**	10	9	10	9	19	19	38
	13:00	to	**14:00**	15	12	13	14	27	27	54
	14:00	to	**15:00**	23	10	8	10	33	18	51
	15:00	to	**16:00**	12	10	8	8	22	16	38
	16:00	to	**17:00**	15	11	9	13	26	22	48
	17:00	to	**18:00**	10	9	6	9	19	15	34
	18:00	to	**19:00**	6	9	3	6	15	9	24
	19:00	to	**20:00**	3	5	0	3	8	3	11
TOTAL				149	142	105	125	291	230	521
HOURLY AVERAGE PEDESTRIAN				12	12	9	10	24	19	43
PEAK HOURLY PEDESTRIAN	**11:00**	to	**12:00**	24		33		57		62

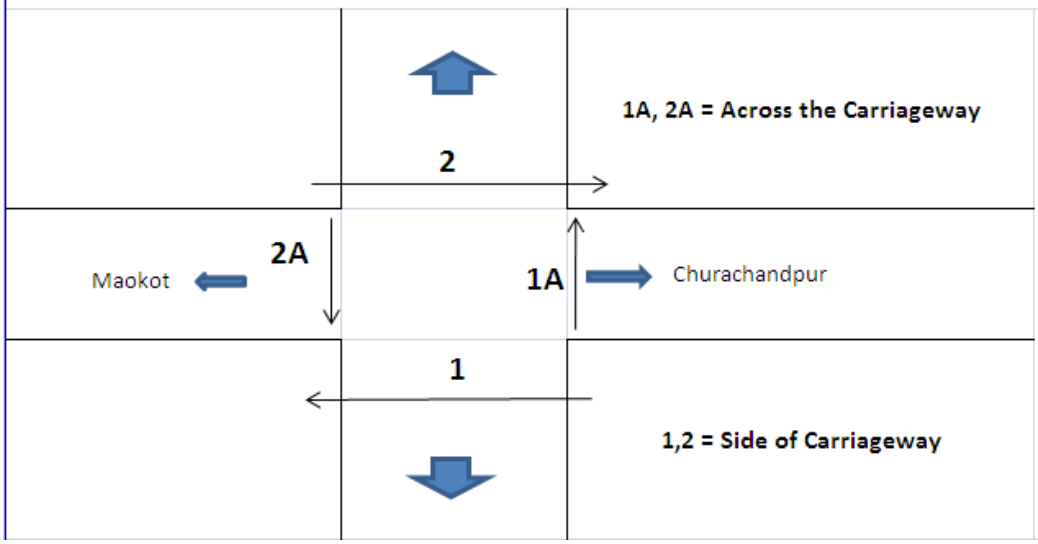


Table 6.19: Pedestrian Count Survey at 34+155 Km

LOCATION OF SURVEY STATION :			On NH-102B	**(Maokot)**							
DATE & DAY OF SURVEY :			**10.02.2018**								
ROAD NAME-			NH-102B								
PLACE	**COUNT HOURS**				**Side of Carriageway**		**Across the Carriageway**		**Total**		**Total(in all direction)**
					1	**2**	**1A**	**2A**	**1+2**	**1A+2A**	
Maokot	**8:00**	to	**9:00**		6	3	5	2	9	7	16
	9:00	to	**10:00**		6	6	7	7	12	14	26
	10:00	to	**11:00**		11	7	9	9	18	18	36
	11:00	to	**12:00**		7	2	6	3	9	9	18
	12:00	to	**13:00**		6	6	2	1	12	3	15
	13:00	to	**14:00**		4	9	2	6	13	8	21
	14:00	to	**15:00**		7	4	3	2	11	5	16
	15:00	to	**16:00**		7	6	1	7	13	8	21
	16:00	to	**17:00**		8	4	2	2	12	4	16
	17:00	to	**18:00**		2	1	3	6	3	9	12
	18:00	to	**19:00**		1	4	1	0	5	1	6
	19:00	to	**20:00**		0	1	1	1	1	2	3
TOTAL					65	53	42	46	118	88	206
HOURLY AVERAGE PEDESTRIAN					5	4	4	4	10	7	17
PEAK HOURLY PEDESTRIAN	**10.00 AM**	to	**11.00AM**		9		9		18		36

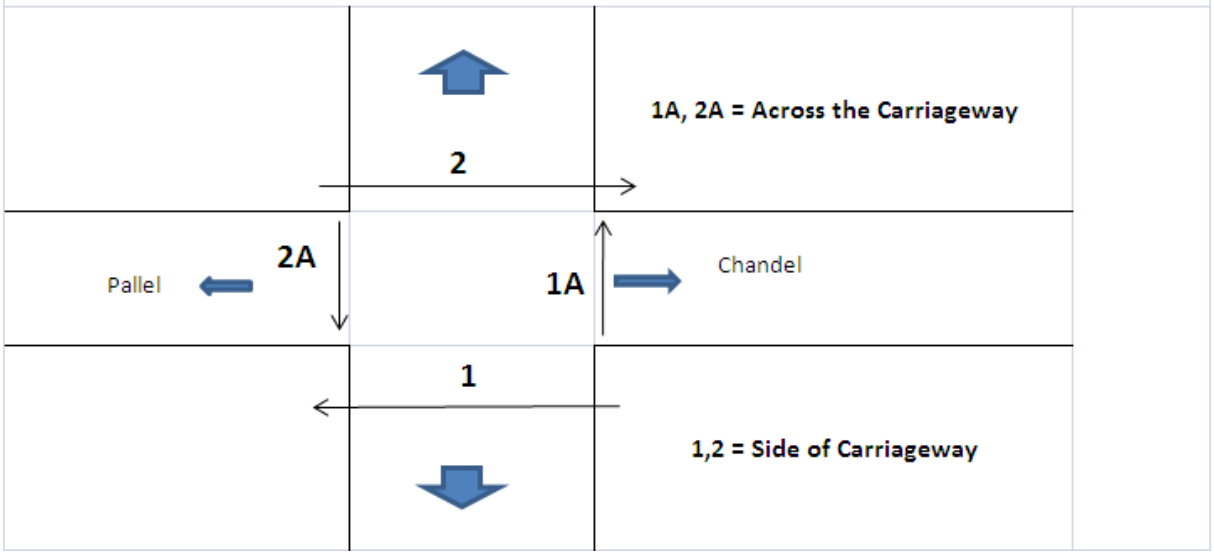


Table 6.20: Pedestrian Count Survey at 48+300 Km

LOCATION OF SURVEY STATION :	On NH-102B	**(Suangdoh)**								
DATE & DAY OF SURVEY :	12.02.2018									
ROAD NAME-	NH-102B									

PLACE	COUNT HOURS			Side of Carriageway		Across the Carriageway		Total		Total(in all direction)
				1	2	1A	2A	1+2	1A+2A	
Suagdoh	**8:00**	to	**9:00**	7	9	3	2	16	5	21
	9:00	to	**10:00**	10	11	3	4	21	7	28
	10:00	to	**11:00**	13	13	5	7	26	12	38
	11:00	to	**12:00**	8	6	5	2	14	7	21
	12:00	to	**13:00**	9	10	1	5	19	6	25
	13:00	to	**14:00**	10	9	2	1	19	3	22
	14:00	to	**15:00**	12	10	7	5	22	12	34
	15:00	to	**16:00**	9	11	5	7	20	12	32
	16:00	to	**17:00**	6	7	1	5	13	6	19
	17:00	to	**18:00**	5	6	2	2	11	4	15
	18:00	to	**19:00**	3	5	1	2	8	3	11
	19:00	to	**20:00**	1	2	0	1	3	1	4
TOTAL				93	99	35	43	192	78	270
HOURLY AVERAGE PEDESTRIAN				8	8	3	4	16	7	23
PEAK HOURLY PEDESTRIAN	**10.00 AM**	to	**11.00AM**	14		7		21		38

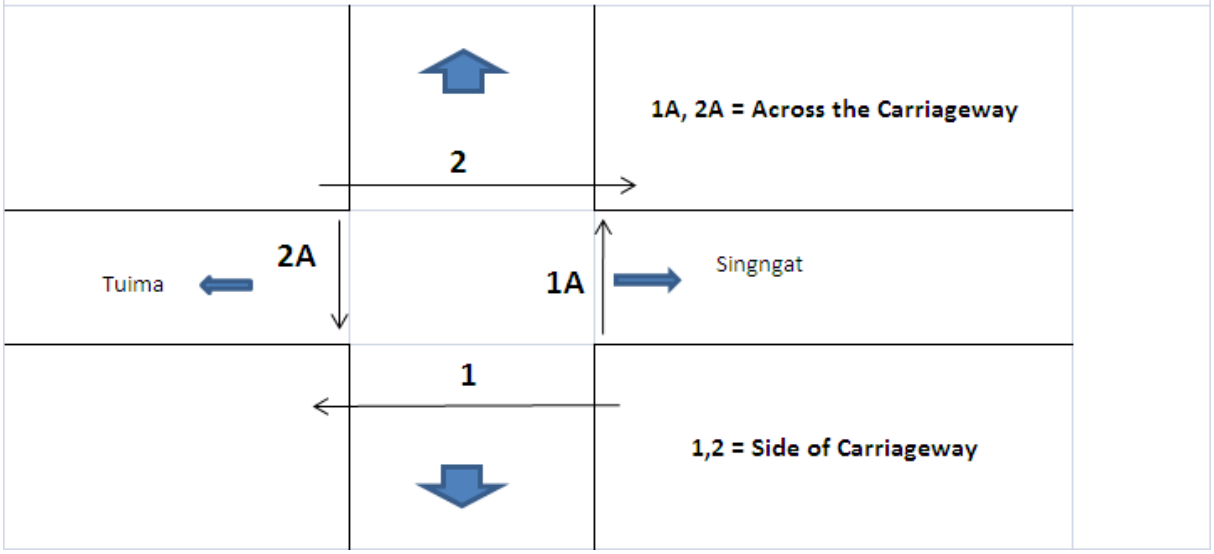


Table 6.21 : Pedestrian Count Survey at 64+200 Km

LOCATION OF SURVEY STATION :	On NH-102B	**(Sinzawl)**								
DATE & DAY OF SURVEY :	17.02.2018									
ROAD NAME-	NH-102B									
PLACE	**COUNT HOURS**			**Side of Carriageway**		**Across the Carriageway**		**Total**		**Total(in all direction)**
				1	**2**	**1A**	**2A**	**1+2**	**1A+2A**	
Suagdoh	**8:00**	to	**9:00**	6	6	3	5	12	8	20
	9:00	to	**10:00**	6	8	5	7	14	12	26
	10:00	to	**11:00**	10	11	2	9	21	11	32
	11:00	to	**12:00**	3	7	3	6	10	9	19
	12:00	to	**13:00**	8	6	1	2	14	3	17
	13:00	to	**14:00**	8	4	0	2	12	2	14
	14:00	to	**15:00**	5	7	3	3	12	6	18
	15:00	to	**16:00**	7	7	7	1	14	8	22
	16:00	to	**17:00**	5	8	2	2	13	4	17
	17:00	to	**18:00**	4	2	2	3	6	5	11
	18:00	to	**19:00**	3	1	0	1	4	1	5
	19:00	to	**20:00**	0	0	1	1	0	2	2
TOTAL				65	67	29	42	132	71	203
HOURLY AVERAGE PEDESTRIAN				5	6	2	4	11	6	17
PEAK HOURLY PEDESTRIAN	**9.00 AM**	to	**10.00AM**	10		9		19		32

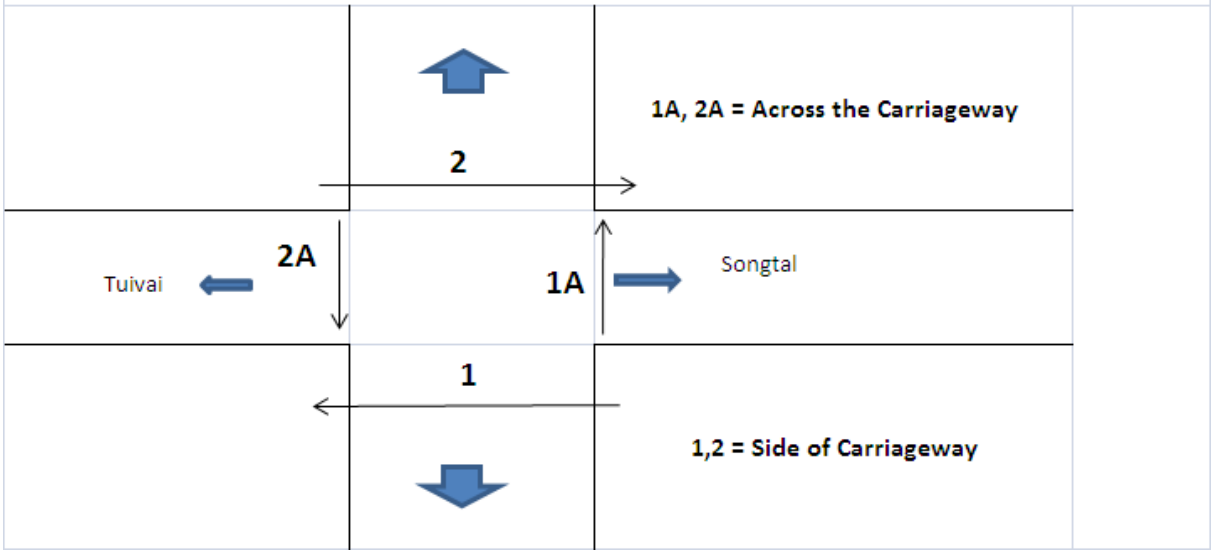


Table 6.22: Pedestrian Count Survey at 148+450 Km

TABLE-6.23: TOTAL CROSS PEDESTRIAN AT PROJECT ROAD

Location	Total Cross Pedestrian (TCP)	Peak Hr. Pedestrian (P)	Total Motorised Traffic during Pedestrian Peak Hour (V)	$P.V^2$	Limiting value of $P.V^2$
Km 0+000	1141	110	1695	0.919336	$1X10^8$
Km 7+250	284	40	34	0.000161	$1X10^8$
Km 34+155	521	57	49	0.000792	$1X10^8$
Km 48+300	206	36	34	0.000208	$1X10^8$
Km 64+200	270	38	34	0.000138	$1X10^8$
Km 148+450	203	26	3	0.00000108	$1X10^8$

6.6 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 at the following locations:

These surveys were carried for 2 day x 24 hrs on

- ✓ **At Churachandpur on NH 102B (Ch. 0+500 Km)**
- ✓ **At Sinzawl on NH 102B (Ch. 149+200 km)**

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 6.24(a) and Table 6.24(b) which summarizes the VDF observed on the Project Road. Details of VDF Calculation are produced in Appendix to Main Report.

Table 6.24(a): On NH 102B at Churachandpur (VDF Calculation)

TYPE OF VEHICLES	VDF			
	UP		DOWN	
	VDF	Frequency	VDF	Frequency
3 Axle truck	**3.79**	**5**	**9.15**	**3**
2 Axle truck	**1.27**	**67**	**2.18**	**73**
LCV	**0.00**	**69**	**0.00**	**62**
Bus	**0.13**	**16**	**0.17**	**11**
TOTAL		**157**		**149**
WEIGHTED VDF IN EACH DIRECTION	**0.68**		**1.27**	
Max. WEIGHTED VDF	**1.27**			
WEIGHTED VDF OF COMMERCIAL VEHICLE			**1.27**	

Table 6.24(b): On NH 102B at Sinzawl (VDF Calculation)

TYPE OF VEHICLES	VDF			
	UP		DOWN	
	VDF	Frequency	VDF	Frequency
3 Axle truck	**0.00**	**0**	**0.00**	**0**
2 Axle truck	**2.81**	**4**	**1.68**	**8**
LCV	**0.001**	**9**	**0.000**	**7**
Bus	**0.000**	**0**	**0.000**	**0**
TOTAL		13		15
WEIGHTED VDF IN EACH DIRECTION	**0.86**		**0.89**	
Max. WEIGHTED VDF	**0.89**			
WEIGHTED VDF OF COMMERCIAL VEHICLE				**0.89**

Hence, maximum VDF value 1.27 has been adopted for calculation of design msa of the project road.

6.7 SPEED DELAY SURVEY

Speed Delay Survey was conducted for the entire project road to determine the average journey speed on the existing road. The calculation for determination of Average Journey Speed and Delay Time is shown below:

Table 6.25: Speed Delay Survey (Churachandpur - Tuivai)

Section :	One		From :	Churachandpur		To :	Tuivai						
Direction	Journey Time		Stopped Delay		No. of Vehicles			Overtaking (-) Overtaken (ny)	Average journey Time in min. (tw)	Average Journey Time from opp. Stream (ta)	Average Volume q= (na + ny) / (ta+tw)	Average Journey Time t = tw - (ny/q)	Length of Travel in km (L)	Average Journey Speed = L/t x 60 (km/hr)
	Min	Sec	Min	Sec	Over-taking	Over - taken	From opp. Direction (na)							
C-T	460	50	6	32	6	2	85	6.33	463.46	453.58	0.11	405.9	162	24
	470	20	6	15	10	2	106							
	459	15	7	5	10	3	85							
Total	1390	25	19	52	26	7	276							
Mean	463	28	6	37	8.66	2.33	92							
T-C	446	40	7	10	3	-	92	5.67	453.58	463.46	0.1	396.88	162	24.5
	452	40	6	45	14	4	76							
	461	25	8	40	8	1	67							
Total	1360	45	22	35	25	8	235							
Mean	453	35	7	31	8.33	2.66	78.33							

The average speed of travel from Churachandpur to Tuivai is 24 Km/hr and from Tuivai to Churachandpur is 24.5 Km/hr.

Detail calculation of Speed Delay Survey is given in **Annexure– 7**.

6.8 ESTIMATION OF DESIGN ESA

- Traffic growth rate (Both direction): 7.5 %
- Vehicle Damage Factors (F): 1.27
- Lane Distribution Factor (D): 0.50

(i) ESA Computation for Homogeneous Section-I (from Km 0+000 to Km 74+000)

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=184

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) =1.27

n: Design life in years = 20

r: Annual growth rate of commercial vehicles in decimal =0.075

= [(365*[(1+r) ^n-1]*A*D*F)/r = 3 msa

(ii) ESA Computation for Homogeneous Section-II (from Km 74+000 to km 161+665)

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 = 46

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) =1.27

n: Design life in years = 20

r: Annual growth rate of commercial vehicles in decimal =0.075

= [(365*[(1+r) ^n-1]*A*D*F)/r = 1 msa

As per IRC: SP 73-2015 (Para-5.4.1, Page No-44), 20 msa (minimum) is adopted for pavement design.

So, Pavement design has been done considering design traffic 20 msa.

CHAPTER - 7
INDICATIVE DESIGN STANDARDS

7.1 GEOMETRIC DESIGN STANDARDS (FOR HIGHWAYS)

PROPOSED DESIGN BASIS

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 HORIZONTAL ALIGNMENT

7.2.1 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 project road lies in mountainous terrain (i.e. cross slope of the ground more than 25 percent) and the geometric standards relevant to mountainous terrain as per IRC: SP: 48-1998 & IRC: SP: 73-2015 will be adopted.

7.2.2 DESIGN STANDARD

In general the design standard follows the provisions in the Hill Road Manual (IRC: SP-48-1998) and manual of specifications & standards for two laning of highways IRC: SP -73-2015.

7.2.3 DESIGN SPEED

The project is for up-gradation of existing road has been made to raise to NH standard with 2- lane with paved shoulder having design speed of 40 kmph to 60 kmph in mountainous terrain follows the provisions in Hill Road Manual (IRC: SP-48-1998) & two lane manual (IRC:SP:73:2015). However the design speed can be reduced up to 20 Kmph in hair pin bend location.

Nature of Terrain	Design Speed(km/h)	
	Ruling	Minimum
Mountainous	60	40

7.2.4 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. On hill roads, 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 distance**	**Intermediate sight distance**
60	90	180
50	60	120
40	45	90
30	30	60
20	20	40

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

7.2.5 RIGHT-OF-WAY (ROW)

Desirable target width of road land (ROW) is as follows:

For Mountainous terrain:

Open Area	Built up Area
24 m	20 m

7.2.6 CROSS SECTIONAL PARAMETERS

<u>For Plain terrain</u>

(1) In Built-up Area at plain terrain

Carriageway	= 7.0 m
Hard Shoulder	= 2 x 1.5 m
Covered Drain cum Footpath	= 2 x 1.0 m
Total Road Width	= 12.0 m

(2) In Rural Area at Plain Terrain

Carriageway	= 7.0m
Hard Shoulder	= 2 x 1.5m
Earthen Shoulder	= 2 x1.0m
Total Road Width	= 12.00m

<u>For Mountainous terrain</u>

(3) In Built Up Area at Mountainous terrain

Carriageway	= 7.0 m
Hard Shoulder	= 2 x 1.5 m
Covered Drain cum Footpath	= 2 x 1.0 m
Total Road Width	= 12.0 m

(4) In Rural Area Mountainous Terrain
(Both Side Valley)

Carriageway	= 7.0m
Hard Shoulder	= 2 x 1.5m
Earthen Shoulder in Valley Side	= 2 x1.0m
Total Road Width	= 12.00m

(5) In Rural Area Mountainous Terrain
(One Side Hill & Other Side Valley)

Carriageway	= 7.0m
Hard Shoulder	= 2 x 1.5m
Earthen Shoulder in Valley Side	= 1 x1.0m
Total Road Width	= 11.00m

(6) For Through Cutting portion

Carriageway	= 7.0m
Hard Shoulder	= 2 x 1.5m
Drain	= 2 x 1.0 m
Total Road Width	= 10.00m

WIDENING OF CARRIAGEWAY AT CURVE

On horizontal curves with radius upto 300 m, width of pavement and roadway shall be increased as per the table given below:

Radius of Curve	Extra Width
75-100 m	0.9 m
101-300 m	0.6 m

7.2.7 CROSS-SLOPE/CAMBER

Bituminous surfacing has been proposed. The pavement in the straight reaches is to be provided with a crown in middle and surface on either side is to have slope of 2.5% towards edge. 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 hard shoulders is to be at least 0.5% more than that of carriage way subject to a minimum of 3.0% and cross slope of earthen shoulder shall be of 3.5% for proper surface runoff. Paved shoulders and shoulders on super-elevated sections is to have the same cross fall as the pavement.

7.2.8 MINIMUM RADIUS OF HORIZONTAL CURVES

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.

RADII OF HORIZONTAL CURVES

The desirable minimum and absolute minimum radii of horizontal curves for various classes of terrain are given in the table below:

Name of the terrain	Desirable minimum radius	Absolute minimum radius
Mountainous & Steep	150 m	75 m

7.2.9 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) $Ls = \frac{0.0215\ V^3}{CR}$

Where, Ls = 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 superelvation (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 of to make the road appear unsightly. The formula for minimum length of transition on this basis for Mountainous and Plain Terrain are :

$Ls = 1.0\frac{V^2}{R}$ and $Ls = 2.7\frac{V^2}{R}$

7.2.10 SUPERELEVATION

Super elevation provided on horizontal curves is based on the following formula:

$$e = \frac{V^2}{225R}$$

Where

e = super elevation (meter/meter)

V = speed (km/hr)

R = radius (meters)

Super elevation shall be limited to 7%, if radius of curve is less than the desirable minimum. It shall limited to 5% if the radius is more than desirable minimum.

7.2.11 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 (meter/meter)

f = Coefficient of side friction between vehicle tyre and pavement (taken as 0.15)

R = Radius in meters

7.2.12 SET-BACK DISTANCE AT HORIZONTAL CURVES

Set-back distance from the centerline of the carriageway for obtaining requisite sight distance across the inside of horizontal curves is calculated from following equation (vide **figure-7.1** for definitions) :

$$M = R - (R - N)\cos\theta$$

where,

θ = $S/2(R-N)$ radians

m = the minimum set-back distance from centerline of the road to sight obstruction in meters at middle of the curve

r = radius of centerline of the road in meters

n = distance between the centerline of road and the inside lane in meter (n = 1.5 may be taken considering possible widening at curve)

s = stopping sight distance (minimum), intermediate sight distance (if feasible)

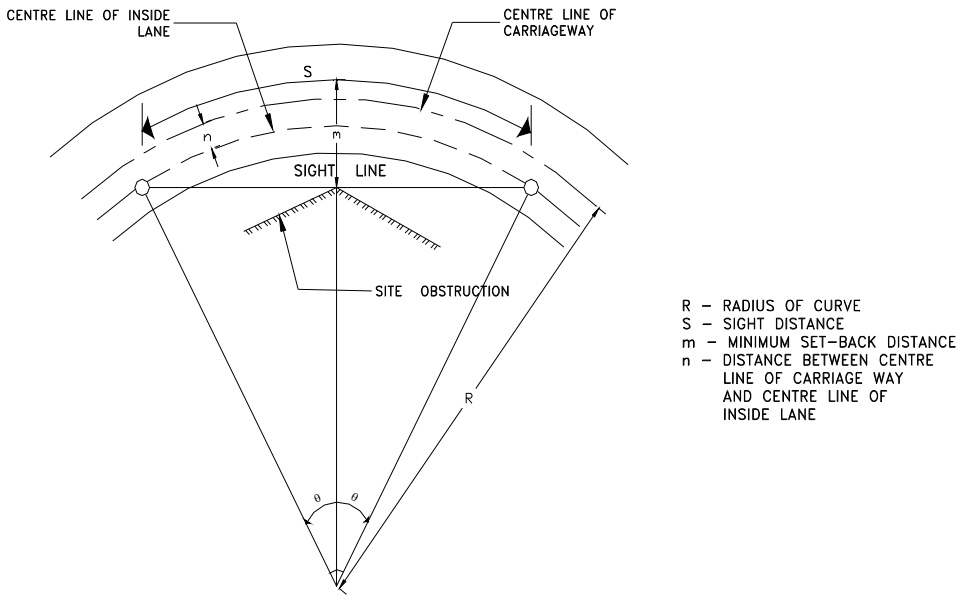
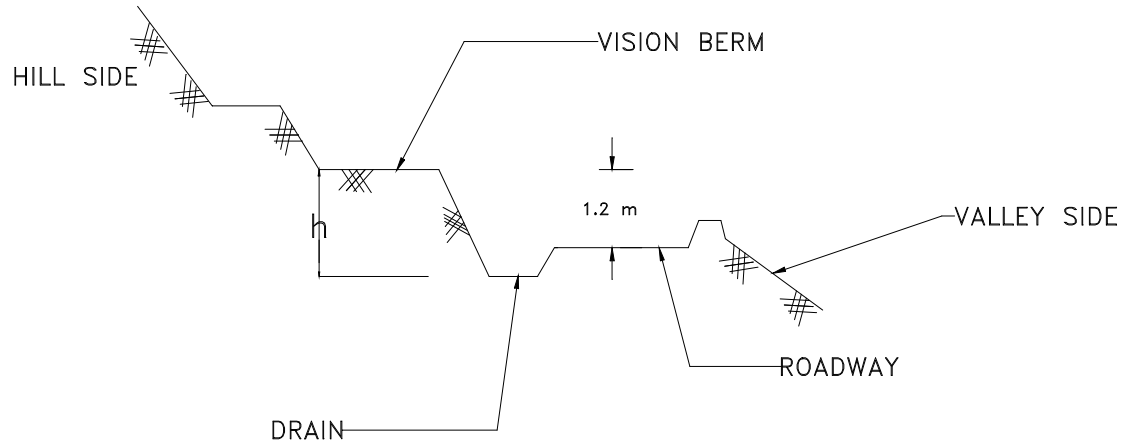
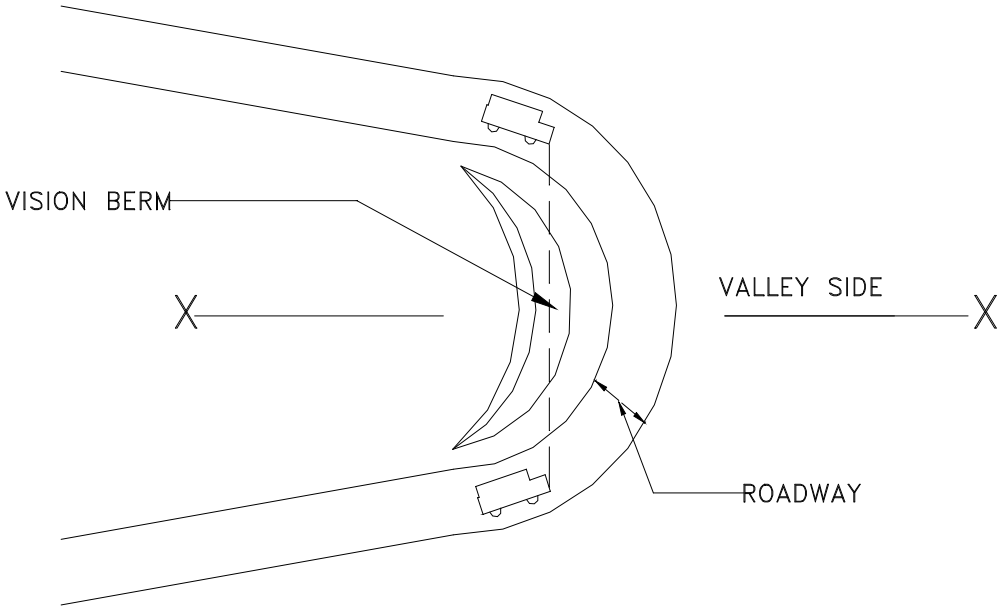


FIG. 7.1: VISIBILITY AT HORIZONTAL CURVES

Provision of lateral clearance with intermediate sight distance is often not economically feasible in hill roads. However, vision berms, as shown in **figure-7.2**, may be provided by benching on hill sides in curves to provide better sighting of vehicles wherever considered necessary.



SECTION AT X–X



PLAN

FIG: 7.2 VISION BERMS

7.3 VERTICAL ALIGNMENT

7.3.1 GRADIENT

The project road should provide for a smooth longitudinal profile. Grade change should not be to frequent as to cause kinks and visual discontinuities in the profile. The ruling and limiting gradients are given below:

Classification of Gradient	Mountainous terrain	Steep terrain
i) Ruling gradient	5.0 %	6.0%
ii) Limiting gradient	6.0%	7.0%

Long sweeping vertical curves shall be provided at all grade changes.

7.3.2 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:

For Hill Road:

Design Speed (km/hr)	Maximum Grade Change (%) not requiring a vertical curve	Minimum Length of -vertical curve (m)
Up to 35	1.5	15
40	1.2	20
50	1.0	30

7.3.3 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 metres

S = Sight distance in metres

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

$$L = 2S - \frac{9.6}{N}$$

7.3.4 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

$$L = 2S - \frac{1.5 + 0.035\,S}{N}$$

In both cases,

N = Deviation angle i.e. the algebraic difference between the two grades

L = Length of parabolic vertical curve in meters

S = Stopping sight distance in meters

7.3.5 HAIR-PIN BENDS

Hair-pin Bends are designed as a circular curve with transition curves at each end. The following design criteria are adopted for design of Hair-pin Bends:

Minimum design speed	= 20 km/hr
Minimum roadway width at apex for NH/SH	= 11.5m for Double Lane
Minimum radius for inner curves	= 14.0 m
Minimum length of transition	= 15.0 m
Minimum gradient	= 0.5 % (1 in 200)
Maximum gradient	= 2.5 % (1 in 40)
Maximum super elevation	= 7%

Inner and outer edges of the roadway should be concentric with respect to the centre line of the pavement and preferably the full roadway width should be surfaced.

7.4 FLEXIBLE PAVEMENT DESIGN STANDARD

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

Step6: 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.

Methodology flow chart for the design of new Flexible pavement has been shown in **Figure 7.3**

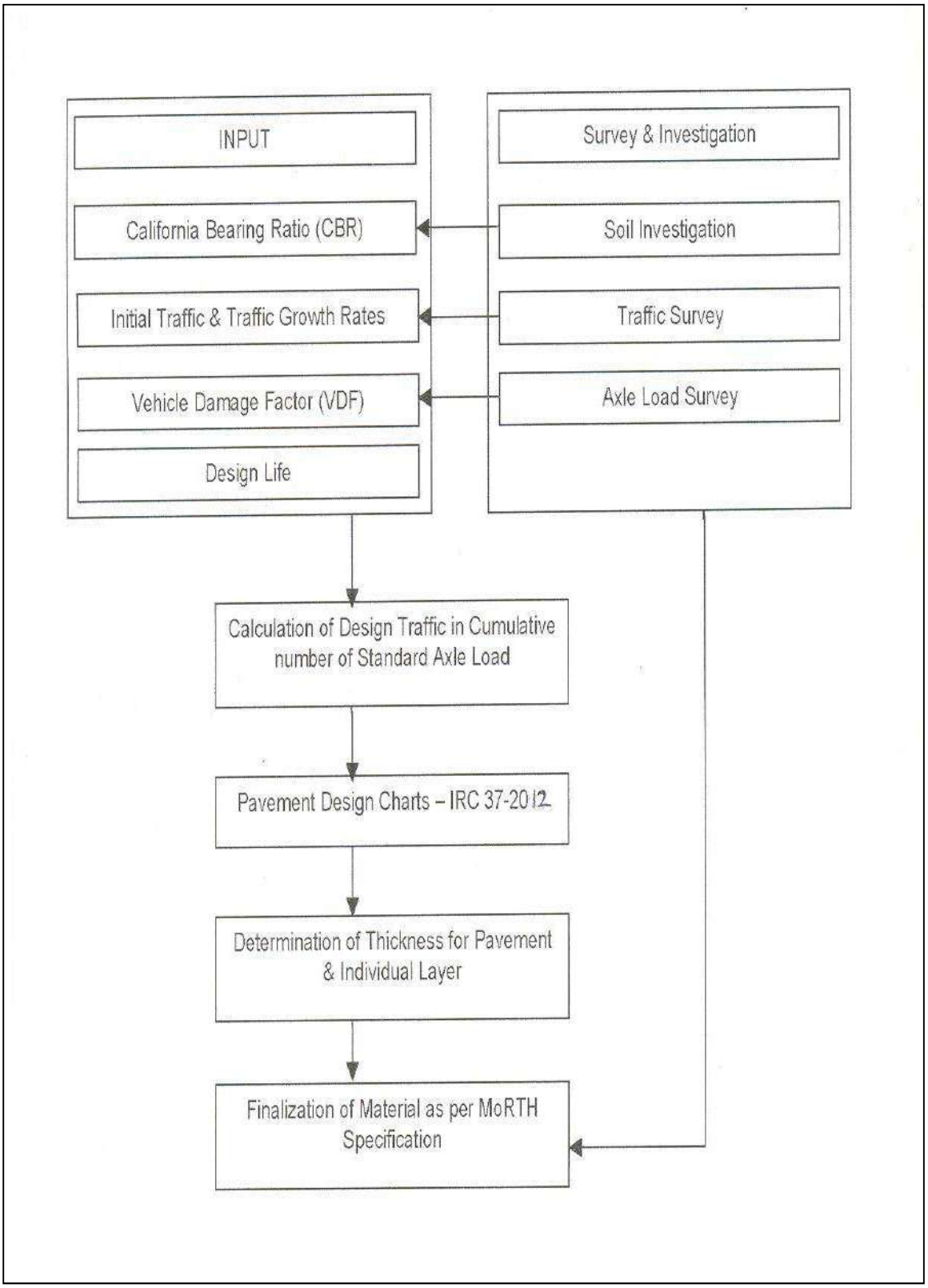


Figure 7.3: Methodology Flow Chart for Design of New Flexible Pavement

7.5 GEOMETRIC DESIGN STANDARDS FOR BRIDGES AND CROSS-DRAINAGE STRUCTURE

7.5.1 SPECIFICATIONS

The project will use the MORT&H specifications for Road and Bridge Works (Fifth Revision). Where there are no appropriate standards within the MORT&H guidelines, AASHTO specifications may be utilized.

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	
Bars (TMT/H.Y.S.D)	IS: 1789
Prestressing Steel:	
Uncoated stress relieved low relaxation	
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: 78-2000 and IRC-SP: 33-1989

7.5.2 DESIGN STANDARDS

GEOMETRIC DESIGN

i) The overall width (out to out of kerb) of the deck slab will be kept equal to the top width of the approach embankment.

ii) The span arrangement and span lengths provided will be such that piers/abutments are in line with those of the existing bridges/culverts and ensure smooth flow of water. The new 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.

7.5.3 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 +single lane of class A whichever produces worst effect. IRC Class Special vehicle will also be considered in design of structures.

ii) LL on footpath will be taken as 5 KN/m²

iii) Environmental loadings such as earth pressure, water current, seismic forces and temperature effect will be taken as per IRC/BIS Codes. 15-1893 will be followed in evaluating dynamic increment of earth pressure.

7.5.4 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:45-1972 - Recommendations for estimating the Resistance of soil Below Maximum scour level in the Design of Well
- IRC:SP:84-2014 - Four Lane Highway with Paved Shoulder Manual
- 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.

7.5.5 SEISMIC DESIGN

The project road falls in Seismic Zone V, as per the classification specified in IRC: 7. All bridges will be designed for Seismic forces as per clause 219 of the said code.

7.5.6 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.

ϕ = 30°

δ = 20°

γ_d = 20 KN/m³

γ_{sub} = 10 KN/m³

A 600 mm thick granular material filter behind abutment and adequate weep holes in abutment walls will be provided for proper drainage.

7.5.7 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-13-2004 will be used to check the adequacy of the waterways provided. Synthetic unit hydrograph method as developed by CWC will be used if relevant subzone flood estimation reports are available in time.

7.5.8 FOUNDATIONS:

For major bridges, either well or pile foundation and for minor bridges well, pile or open foundation will be adopted based on the soil boring data for those bridges.

7.5.9 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.

7.5.10 SUPERSTRUCTURE:

I) MORT&H standard drawings of 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) **EXPANSION JOINTS**:

Buried type expansion/strip seal joints as per MORT&H standard will be used.

V) **WEARING COURSE**:

65mm thick asphaltic concrete wearing course will be adopted.

vi) **APPROACH SLAB:**

R.C. approach slabs, 3.50 m long and 300 mm 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 MORT&H. A leveling course, 10 cm thick in M-20 / M-15 grade concrete will be used under the approach slab.

VI) **DRAINAGE SPOUTS**

100mm ~ drainage spout will be used for deck drainage at least one on both sides of carriageway per span.

viii) **TMT REINFORCEMENT AND PRESTRESSING CABLES:**

Fe-500 high yield strength deformed bars conforming to IS-1786 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.

7.5.11 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 appropriate length will be provided in all bridges and culverts to stop the spilling of earth into the waterway,

ii) Flooring will be provided over 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 chances of scouring,

iv) The perimetral cut-off walls will also increase the effective depth of foundation in addition to their protective functions.

CHAPTER – 8
COST ESTIMATES

8.1 GENERAL

Cost estimates 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 based on the detailed engineering designs and detailed drawings presented in drawing volume.

8.2 QUANTIFICATION

The construction items covered in cost estimates includes twelve different heads as:

- ✓ Site Clearance and Dismantling
- ✓ Earth work, Sub grade & Erosion Control
- ✓ Sub-Base & Base Courses
- ✓ Bituminous Courses
- ✓ Junction Improvement (Major & Minor)
- ✓ Traffic signs, Road marking & other road appurtenances
- ✓ Bus bay & Passenger Shelter
- ✓ Drainage and Protective Works
- ✓ Bridges & Culverts

8.3 UNIT RATES

For arriving at the unit rate, Schedule of Rate-2018 of Manipur Public Work Department with 5% escalation per annum for 2 years has been adopted. The analysis of rate based on "Standard Data Book", published by ministry of road transport and highways, Government of India (MoRTH).

On this Schedule of Rate the basic rates of materials and labours were finalized after careful consideration of data collected from the market.

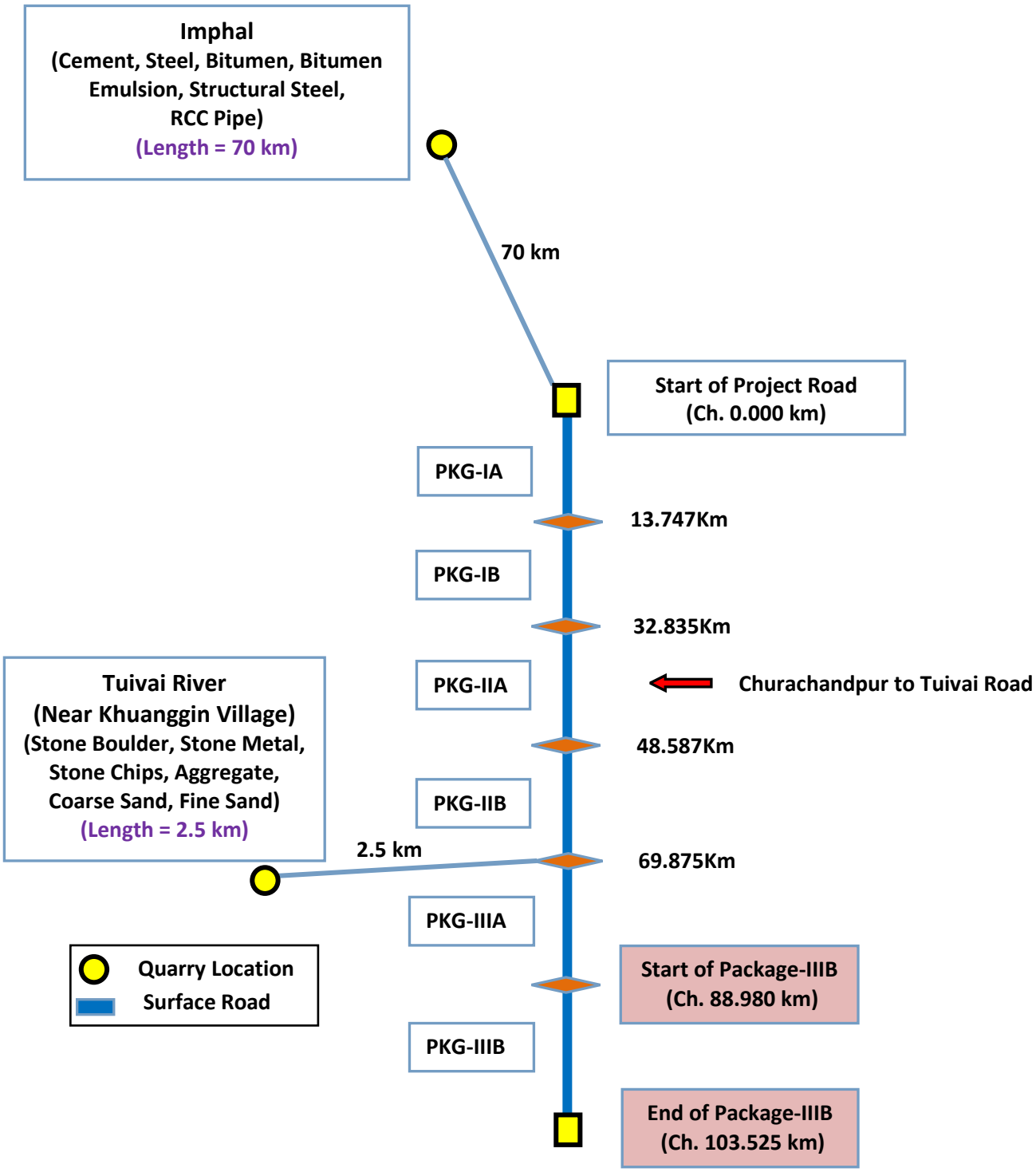
Leads for various materials for both the corridors, considered for the rate analysis, are given in Table below:

TABLE 8.1: LEADS FOR VARIOUS MATERIALS (Package – IIIB)

Sl. No.	Name of Material	Name of Source	Distance from Source to Project Road (Km)	Half of length of Project Road (Km)	Total Lead (Km)
1	Sand (Fine)	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
2	Filling Material	Local	-	-	10.00
3	Stone Metal	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
4	Stone Boulder	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
5	Stone Chips, Aggregate	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
6	Coarse Sand	Tuivai River (Near Khuanggin Village)	21.61	7	28.88
7	Cement	Imphal	159	7	166.38

Sl.	Name of	Name of Source	Distance from	Half of length of	Total Lead
8	Steel	Imphal	159	7	166.38
9	Bitumen	Imphal	159	7	166.38
10	Bitumen Emulsion	Imphal	159	7	166.38
11	Structural Steel	Imphal	159	7	166.38
12	RCC Pipe	Imphal	159	7	166.38

Lead Chart for Material



8.4 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. 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.

8.5 BRIDGES AND CULVERTS

The quantification of various items of work has been detailed out from the drawings.

8.6 ROAD INTERSECTIONS

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.

8.7 BUS BAYS AND BUS SHELTERS

6 nos. of Bus Bays are provided at 3 nos. of locations of the project road. Quantification for construction of pavement at these locations has been done along with road construction and quantification for providing shelter, footpath, markings etc. have been separately made.

8.8 SAFETY BARRIERS

Crash Barriers have been provided on the outer side of carriageway on deep valley side.

8.9 TRAFFIC SIGNS, MARKINGS AND OTHER APPURTENANCES

Road Signs: Traffic signs are important features of traffic control devices and transmit visually vital information to drivers and ensure increased safety and efficiency in free flow of traffic. All these signs shall be of informatory nature. All signs shall be retro-refectories type. Quantification for road signs have been done based on the locations of intersections and other features along the corridor.

Road Markings would be done with thermoplastic paints with reflective bands. It will consist of lane line and edge line. The details of Lane markings are shown Drawings volume.

The other items covered under this sub-head are road furniture like km stones, 5th km stones, Hectometer stones, delineators, and boundary stones. They are to be laid as per IRC specifications over the entire length of the road

Delineators have been proposed depending upon the proposed radii of the horizontal alignment and height of embankment or valley site. The delineator posts have been proposed near all curves of radii less than 1000 m, with spacing given as per IRC. The delineators, guard posts/pillars will be painted with alternate black and white paint bands and reflectors will be provided in each post.

8.10 ABSTRACT OF COST

Package – IIIB

(Ch. 88.980 km to Ch. 103.525 km)

Length of Road (KM) : 14.545

DESCRIPTION OF WORKS		TOTAL COST (IN Cr.)	COST PER KM. OF TOTAL ROAD LENGTH (IN Cr.)	% of Cost of Civil Works (% of C)
A.	**ROAD WORKS**			
1	Site Clearance and Dismantling	0.61	0.04	0.46%
2	Earth work , Subgrade and Erosion control	30.53	2.10	23.15%
3	Sub-Base & Base	29.45	2.02	22.33%
4	Bituminous Courses	16.31	1.12	12.37%
5	Junction Improvement (Major & Minor)	0.03	0.00	0.02%
6	Traffic signs, Road marking & other road	2.41	0.17	1.83%
7	Passenger Shelter	0.13	0.01	0.10%
8	Bus bay	0.87	0.06	0.66%
	Drainage and Protective Works			
9	Longitudinal Drains	11.20	0.77	8.49%
10	Retaining wall	13.47	0.93	10.21%
11	Breast wall	3.45	0.24	2.62%
12	Composite RE Wall	7.81	0.54	5.92%
B.	**BRIDGES & CULVERTS**			
13	Culvert	15.61	1.07	11.84%
C.	**COST OF CIVIL WORKS IN CRORE (AS PER SOR 2018)**	**131.88**	**9.07**	
D.	Maintenance for 5 years, i.e 2.5% on civil cost (C	3.30		
E.	GST @ 12% of (C)	15.83		
F.	Contingencies @ 2.8% over Civil Cost (C)	3.69		
G.	Supervision Charges @ 3% of (C)	3.96		
H.	Agency Charges @3% of (C)	3.96		
I.	Escalation Cost @ 10% during Construction	13.19		
J.	**TOTAL CONSTRUCTION COST**	**175.81**	**12.09**	
K.	**DEPARTMENTAL COST**			
a.	LA Cost	10.99		
b.	R&R Cost	5.18		
c.	Utility Shifting(Electrical+PHE)	0.66		
d.	Environmental Budget +FC Clearance	2.65		
e.	Cost of Dumping site for Muck Disposal	10.21		
L.	**Sub Total (K)**	**29.69**		
M.	**TOTAL PROJECT COST (K+L)=M**	**205.50**	**14.13**	

CHAPTER – 9
ENVIRONMENTAL SCREENING & PRELIMINARY ENVIRONMENTAL ASSESSMENT

9.1 ENVIRONMENTAL SCREENING

Environmental screening of the project is aimed to (i) recognize the applicability of relevant environmental legislations for the project (ii) identify the environmental issues that should be taken into account due to project interventions (ii) provide input to the engineering design team to consider various alternatives in the critical areas to (iv) determine the magnitude of potential environmental at planning/design stage (iii) identify need for further environmental studies like Initial Environmental Examination and Environmental Impact Assessment (EIA) and iv) suggest enhancement measures, if any.

9.2 RECONNAISSANCE SURVEY

Reconnaissance survey was done to determine the extent of environmental study, design the nature of the environmental survey to be carried out along the road alignment. This will facilitate to identify valued environment components, key stakeholders and key informants. Reconnaissance survey and initial consultations also recognized the need to conduct any additional study like bio-diversity assessment and wild-life movement etc.

9.3 APPROACH AND METHODOLOGY FOR IEE/EIA

- **Review of Country's Legal Framework:** India has a well-defined policy/legal framework for 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 will be prepared for all environmental features viz. terrain, land-use, landslide and erosion prone stretches, 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 comprised of university researchers. Similarly, floral survey was also carried out. Baseline monitoring was conducted at the locations for which data was not available in environmental assessment report conducted by 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) and Nagaland Space Application Centre (NSAC) etc. Recent Google images has been captured to view environmental features at regional scale.
- **Public Consultation:** Meaningful consultations were organized with the PWD, local people/beneficiary population to know the level of project acceptability, understand their concerns, apprehensions, and overall opinion. Information were gathered about 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 project design and formulate mitigation measures and environmental management plan.

- **Other Tools, Surveys and Studies:** Assessment of land use/land cover map of larger area beyond the project site will be prepared for better planning and decision-making before creating any physical infrastructure in the region. Remote sensing and Geographic Information System (GIS) based land use map of the study area (10 km buffer) will be prepared through recent satellite imagery. A rapid bio-diversity assessment will be carried out to generate baseline on floral and faunal elements in the project area. The survey will also help in assessing impact on any rare threatened or endangered species of floral species in the project area. Rapid bio-diversity assessment will also recognize wild life movement along across and impact due to improvement work.
- **Assessment of Potential Impacts:** The assessment of the type, nature, direct, indirect, cumulative or induced impacts and their significance to the physical, biological, and socio-economic components of the environment will be done to ascertain whether the project is environmentally sustainable or not. Nature of impacts will be classified as significant, insignificant, short-term, long-term, reversible, irreversible etc. After identification of nature and extent of impacts, mitigation measures will be suggested.
- **Preparation of the Environment Management Plan:** The project specific Environment Management plan will be formulated with an aim to avoid, reduce, mitigate, or compensate for adverse environmental impacts/risks and propose enhancement measures. This includes
  a. Mitigation of potentially adverse impacts
  b. Monitoring of impacts and mitigation measures during project implementation and operation
  c. Institutional capacity building and training
  d. Compliance to statutory requirements
  e. Integration of EMP with Project planning, design, construction and operation.
- **Environment Monitoring Plan:** The monitoring and evaluation are critical activities in implementation of the project. Monitoring involves periodic checking to ascertain whether activities are going according to plan or not. It provides the necessary feedback for project management to ensure project objectives are met and on schedule. The reporting system is based on accountability to ensure that the environmental mitigation measures are implemented. 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, CO, 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 EA Capacity to address the environmental concern of the project:** EIA will 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 (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 will be allocated under the Construction Supervision Consultant budget.

9.4 COUNTRY'S LEGAL FRAMEWORK AND REGULATORY REQUIREMENTS

The Government of India has laid out various policy guidelines, acts and regulations for the safeguard and conservation environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of environment. As per this Act, the responsibility to administer the legislation has been jointly entrusted to the Ministry of Environment and Forests (MoEF) and the Central Pollution Control Board (CPCB)/Manipur State Pollution Control Board in the present context. Table below presents all relevant policies/acts/rules and regulations and its applicability to the project.

Applicable National Laws and Regulations for the Project

Sl.	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
1	Environment Protection Act-1986	To protect and improve overall environment	Yes	It is umbrella legislation and notifications, rules and schedules are promulgated under this act.	MoEF. (Govt. of Manipur) State Gov. SPCB

Sl.	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
2	Environmental Impact Assessment Notification,14th Sep-2006[1] and its amendments	To accord environmental clearance to new development activities listed in schedule of EIA notification.	No	Project road is >100km but does not involve additional right of way greater than 40m in existing alignment and 60 m in bypass and realignment section.	MoEF. SEIAA
3	Fly Ash Notification, 1999 as amended upto 17th August 2003:	Reuse large quantity of fly ash discharged from thermal power plant to minimize land use for disposal	No	No thermal power plants within 100 km	MoEF
4	Office memorandum dated 18.05.12,by MoEF in view of Apex Court order dated 27.2.2012	Conserve top soil, aquatic biodiversity, hydrological regime etc. by haphazard and unscientific mining of minor minerals	Yes	In case of renewal of quarries and opening of new borrow areas	SEIAA
5	National Environment Appellate Authority Act (NEAA) 1997	Address Grievances regarding the process of environmental clearance.	Yes	Grievances if any will be dealt with, within this act.	NEAA

[1]**Category A-i)** New National High ways; and ii) Expansion of National High ways greater than 100 KM, involving additional right of way greater than 40m in existing alignment and 60 m in bypass and realignment section.

Category B-i) All new state High ways; and ii) Expansion projects in hilly terrain (above 1000 m above mean sea level and/or ecologically sensitive areas.

Note: A general condition applies to both of the above category: "Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 5 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries".

Sl.	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
6	Forest Conservation Act (1980)[2]	To check deforestation by restricting conversion of forested areas into non-forested areas	Yes	Road widening and improvement work requires diversion of significant forest land	Tree removal will be guided as per state government rules.
7	Air (Prevention and Control of Pollution) Act, 1981	To control air pollution by & Transport controlling emission of air Department. Pollutants as per the prescribed standards.	Yes	For construction; for obtaining NOC for establishment of hot mix plant, workers' camp, construction camp, etc.	SPCB
8	Water Prevention and Control of Pollution) Act1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards	Yes	This act will be applicable during construction for (establishments of hot mix plant, construction camp, workers' camp, etc.	SPCB
9	Noise Pollution (Regulation and Control Act) 1990	The standards for noise for day and night have been promulgated by the MoEF for various land uses.	Yes	This act will be applicable as vehicular noise on project routes required to assess for future years and necessary protection measure need to be considered in design.	SPCB
10	Public Liability and Insurance Act 1991	Protection form hazardous materials and accidents.	Yes	Contractor need to stock hazardous material like diesel, Bitumen, Emulsions etc.	----
11	Explosive Act 1984	Safe transportation, storage and use of explosive material	Yes	Blasting may be involved in some locations	Chief Controller of Explosives
12	Minor Mineral and concession Rules	For opening new quarry.	Yes	Regulate use of minor minerals like stone, soil, river sand etc.	District Collector

Sl.	Act / Rules	Purpose	Applicable	Reason for Applicability	Authority
13	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules1989	To check vehicular air and noise pollution.	Yes	These rules will be applicable to road users and construction Machinery.	Motor Vehicle Department
14	National Forest Policy1952 National Forest Policy(Revised) 1988	To maintain ecological stability through conservation and restoration of biological diversity.	Yes	This policy will be applicable as project intervention requires forest land to be acquired.	Forest Department, GoI and Govt. of Manipur
15	The Mining Act	The mining act has been notified for safe and sound mining activity.	Yes	The construction of project road will require aggregate through mining from riverbeds and quarries	Department of mining. State Govt. of Manipur
16	The Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996	To regulate the employment and conditions of construction workers and to provide for their safety, health and welfare measure and for other matter incidental thereto	Yes	A large number of construction workers skilled, semiskilled or unskilled will be employed temporarily during Construction Phase of the project	Ministry of Labor and Employment

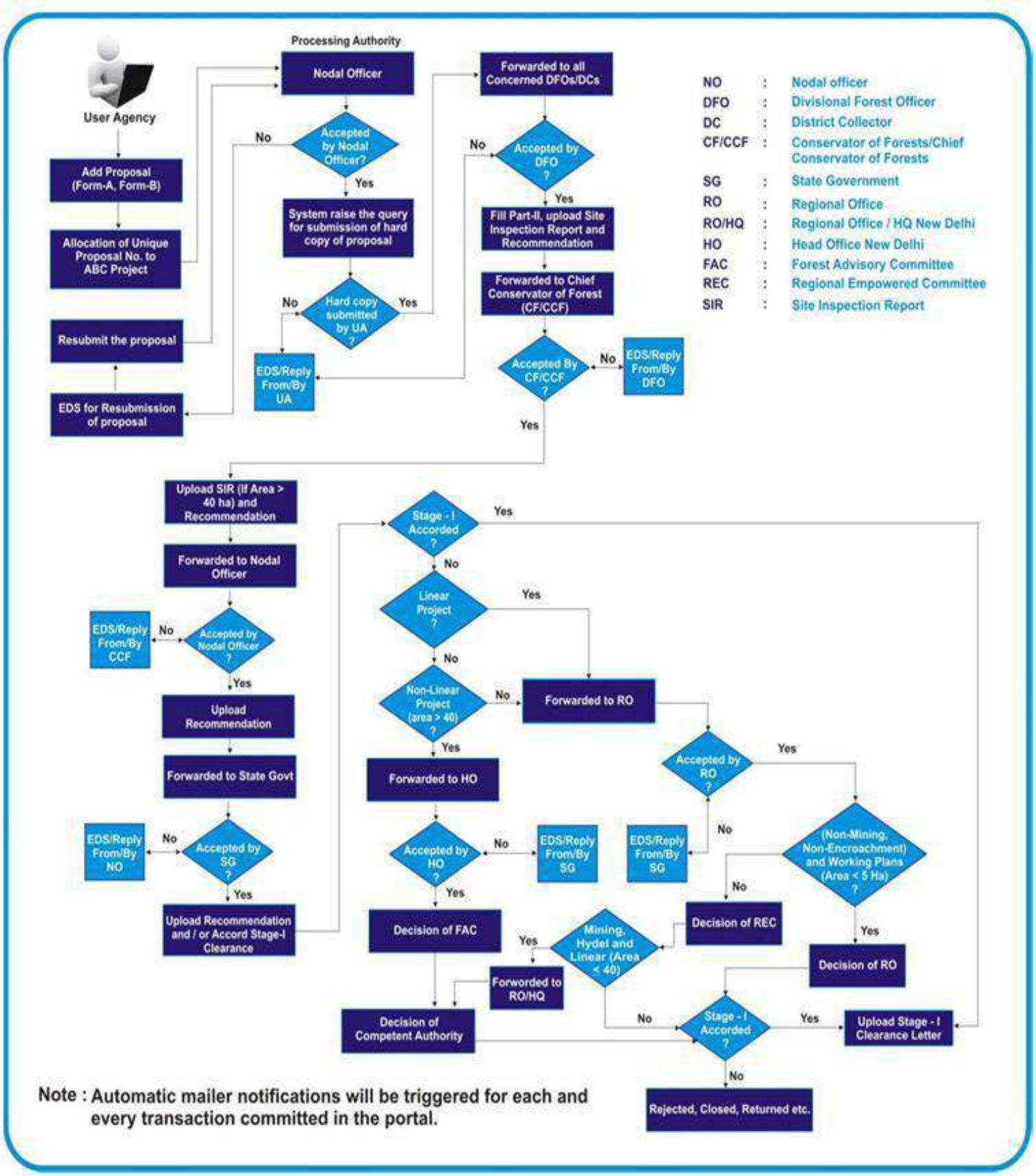
Recent Policy Initiatives: Ministry of Environment & Forest (MoEF) vide O.M. No. L-11011/47/2011-IA.II(M) dated 18th May, 2012 in view of the Order of Hon'ble Supreme Court dated 27.2.2012 in I.A. no. 12-13 of 2011 in SLP (C) no. 19628-19629 of 2009 in the matter of : Deepak Kumar etc. Vs State of Haryana and others has informed that it has been decided in the MoEF that: (i) All mining projects of minor minerals including their renewal, irrespective of the size of the lease would henceforth require prior environment clearance. (ii) Mining projects with lease area up to less than 50 ha including projects of minor mineral with lease area less than 5 ha would be treated as category „B" as defined in the EIA Notification, 2006 and will be considered by the respective State/ UT Level Environment Impact Assessment Authority (SEIAAs). (iii) All the respective SEIAAs in dealing with the applications regarding environment clearance should be disposed within ten days from the date of receipt of the applications in accordance with law. All State Governments should take action as per the decision of the MoEF.

Procedure for Forest Clearance: MOEFCC has initiated online submission and disposal of forest clearance cases. The detail procedure is available on ministry website http://forestsclearance.nic.in/ However, the work-flow is unchanged which has been illustrated in Figure 1.

The proposed road from Churachandpur -Tuivai is divided into four packages. Out of four packages, Package-III is passing through Kailam Wildlife Sanctuary and its eco-sensitive zone. Hence, wildlife clearance is required for this project.

Procedure and workflow for wild life clearance is enclosed below:

Figure 1: Procedure and Work Flow for Forest Clearance



STEPS AND PROCEDURE FOR OBTAINING BORROW AREA PERMIT

Steps	Activities
1	Contractor identifies the Borrow Area (BA) quantity based on prospective BA identified in F/S/DPR
2	Contractor identifies the Borrow pits with quantity and raise Request for Inspection (RFI) to IE/CSC.
3	IE/CSC inspects borrow pit in the presence of Environmental Engineer of contractor and land owner with his lease document.
4	Contractor takes the sampling of soil in identified pit and test in lab. IE/CSC approves the pit based on the test report (Moisture contents, particle size etc.)
5	Contractor makes the agreement with land owner and get NOC from Gram Panchayat if necessary
6	If BA is more than 5Ha (B1 category), contractor submit application for clearance to State Environment Impact Assessment Authority (SEIAA) the project is treated as B1 EIA and Public Hearing needs to be carried out.
7	If BA is < 5Ha (B2 category), contractor submit application in Form 1M, Prefeasibility report and approved mine plan to District Environment Impact Assessment Authority (DEISAA). DEIAA gives clearance base on the recommendation of District Environment Appraisal Committee (DEAC).
8	Contractor pays Royalty amount to state government at the prescribed rate.
9	Contractor submit Borrow Area Redevelopment plan to IE/CSC.
10	Contractor raise RFI to IE/CSC for Borrow pit excavation
11	Contractor fulfils the compliance of EC agency observations if any.
12	Contractor will maintain haul road and ensure for fugitive dust suppression
13	Contractor does sampling of each pit at the time of excavation test and gets approval of IE/CSC.
14	Contractor raises RFI to IE/CSC before closing the pit.
15	Contract reclaims borrow pit as per owner agreement and gets clearance from him.

Key Considerations prior to selection of Borrow Areas

- Cluster shall be formed if the distance between peripheries of one lease to the other and is less than 500m in homogenous mineral area.
- Minimum distance between two clusters is 500 meters.
- Maximum depth of excavation 2000mm from existing ground level.
- In case of fertile land; 15 cm top soil is stock piled, further up to max.30 cm depth.
- Maintain 5m distance from the toe of the final section of the road/Embankment.
- BA should not be dug within 1500 m of village. If unavoidable should not exceed 30 cm in depth.
- Ridges not less than 8m width shall be left an interval of not exceeding 300m.

8.5 MUCK DUMPING PLAN

Selection of Dumping Sites

The muck from hill cutting and construction activities will be safely disposed at suitable locations. Principle adopted for selecting muck dumping areas was to avoid sensitive areas like dense vegetation, natural water courses and areas prone to landslides. During the selection of the dumping sites preference was given on the following aspects.

- The muck does not fall/ flow into stream/river.
- Dumping sites should be at least 30 m (horizontal) away from the High Flood Level of the River/ stream.
- The sites are free from active landslides or creeps.
- The sites should not fall within pristine forest nor are these habitats of threatened species of flora and fauna.
- The sites are located close to its source in order to avoid long distance haulage.

Details of Proposed Muck disposal area has given below:

Muck Disposal Estimate										
Package	Quantity of Muck/Debris generated in Cum	Quantity of Muck with 30% swell factor in Cum	Total Quantity of Muck/Debris including swell factor in Cum	Estimated Quantity of Muck/Debris proposed to be utilized for Filling in cum	Estimated quantity of muck/debris proposed to be dumped in cum.	Estimated quantity of muck/debris dumped in Valley Side within our Proposed ROW in Cum	Estimated quantity of muck/debris dumped in other location in Cum	Avg. Dumping Height in M.	Avg. Dumping Area (Sqm.)	Avg. Dumping Area (Ha.)
IIIB	1505569.50	451670.85	1957240.35	427874.25	1529366.10	33297.00	1496069.10	20	74803.46	7.48

Muck Disposal Plan

The loosely held muck can lead to the rise in SPM levels, sedimentation load in the river body and phyto-retardation of the nearby vegetation. Therefore, it requires stability with appropriate methods to avoid the subsequent ecological problems. The muck disposal plan involves both engineering and biological measures that depend on the eco-climatic conditions. A considerable amount of muck can be used as filling material at various project components, area/ bench development works and also as aggregates/boulders. Rest of the muck to be dumped and rehabilitated at designated dumping sites. For retaining the dumped material along the hill slopes, crated boulder toe walls will be constructed. Excavated muck would be dumped and compacted at these dumping areas with stable slopes. Planting/grass turf should be done for additional safety of slopes. The toe walls shall be kept at least 30 m away from the high flood level.

Muck Rehabilitation Plan

The muck rehabilitation plan involves both engineering and biological measures that depend on the terrain and eco-climatic conditions. Stability of the loosely held muck requires appropriate method of consolidation and biological measures so that the muck is not easily eroded leading to subsequent ecological problems.

Engineering measures

Crated boulder walls should be provided at the toe of each Muck Dumping Area and a minimum distance of 30m (horizontal) will be maintained from the High Flood Level (in case of Muck Dumping Yard near any water body). These toe walls will provide stability to the slope of dumped muck besides arresting spread of muck beyond the designated area.

Biological measure

Vegetation cover controls the hydrological and mechanical effects on soils and slopes. Therefore, biological measures to stabilize the loose slope are essential. However, such measures are dependent on the local environmental conditions. The stages in implementation of such measures are discussed below.

Selection of Plant Species

Different plant species may be utilized for different ecological and engineering functions. Grasses are more suited for armoring the loose soil surface and shrubs or trees hold the soil up to the deeper level. The selection of plant species used for rehabilitation of soil/muck must take into account the climatic, soil and drainage conditions of the site. The dumping sites of project road are located in the altitudinal range of 1300 to 1600 m. The area has sub-tropical climate and major part of the precipitation is received during April to September. The period from November to February is relatively dry. Considering all these factors as well as the existing natural vegetation in the area, the species recommended for plantation are Chir pine, alder, broom grass, bamboo etc.

Planting of Trees

The selected species will be planted on the slopes of muck dumping areas. The plantation can be carried out in lines across the slope, usually following the contour to prevent the development of rill and trap material moving down the slope. Brush layers, fascines and palisades can be used because of their uses *i.e.* controls erosion, catches debris and provides strong, fibrous root reinforcement. Different plant species when used together will provide increased stability. Grasses planted in a line across a slope will provide a continuous chain of support in retaining debris, reinforcing soil of the area. Plant saplings may be raised on biodegradable pots and transplanted as such. The plantation should be done during monsoon season. The pit size has been recommended as 45 x 45 x 45 cm for trees and 30 x 30 x 30 cm for shrubs with some soil rich in nutrients. Compost from the local organic waste can be used. An integrated biotechnological approach will be very useful for sustenance and growth of plants. This approach involves the following steps:

- Assessment of the nutrient status of the soil and evaluation of the physical and chemical properties of the dumped material.
- Formulation of the appropriate blend of organic waste and soil to enhance the nutrient status of the rhizosphere.
- Isolation and screening of specialized strains of mycorrhizal fungi, rhizobium, azobacter and phosphate solubilizer (bio-fertilizer inoculums) which can be best suited for the dumped material.
- Mass culture of plant specific bio-fertilizer and mycorrhizal fungi.
- Plantation of dumping sites/areas using identified blend and bio-fertilizer inoculums.

The rich soil and farmyard manure requirement for nearly 100 pits will be about 1 cubic meter with approximate weight of 200 kg. The saplings will be planted at 3 m intervals along the contour and 5 m across it. Wherever terracing shall be prescribed, the same will be done on terraces at 3m intervals leaving one-meter space from the edge of the terrace. About 1100 seedlings shall be planted per Ha depending on the space available at the site. Shrubs and herbs will be planted in the interspaces. The required saplings will be locally procured from State Forest Department/ private nurseries on the prevalent rates.

Fencing

After rehabilitation of muck the dumping areas need to be protected for some time, from grazing by domestic animals, livestock, sheep and goats. For this reason fencing over the muck deposits is required. Barbed wire

strands with two diagonal strands, clamped to wooden/concrete posts placed 3 m apart is proposed for this purpose. Both the ends of the wooden fence posts should be coated with coal tar to ensure longevity of the intervention.

Applicable Indian Road Congress (IRC) Codes to the Project Road: Key IRC guidelines have been summarized that have a direct/indirect bearing on the environmental management during design and construction stages.

Applicable Indian Road Congress (IRC) Codes

S. No	Code Title/Theme	Code
1	Guidelines on requirement of environmental clearance for road projects	IRC:SP:93-2011
2	Guidelines on Landscaping and tree plantation	IRC:SP: 21-2009
3.	Guidelines for EIA of Highway projects	IRC:104-1988
4.	Guidelines for Borrow area identification, use and its rehabilitation	IRC:10-1961
5	Guidelines for Pedestrian Facilities	IRC: 103 -1988
6.	Ribbon developments on highways and its prevention	IRC: SP: 1996
7.	Manual on Landscaping of road	IRC: SP: 21-1979
8.	Report on recommendations of IRC Regional workshops on highway safety	IRC: SP: 27-1984
9.	Road safety for Children (5-12 years old)	IRC: SP: 32-1988
10.	Guidelines on road drainage	IRC: SP: 42-1994
11	Highway safety code	IRC: SP: 44-1994
12	Guidelines for safety in construction zones	IRC: SP: 55-2001
13	Hill road manual	IRC: SP-48-1998
14	Recommended practice For treatment of embankment slopes and erosion control	IRC: 56–1974

9.6 EXISTING BASELINE ENVIRONMENTAL CONDITIONS

Manipur has a total geographical area of 22,327 Sq. Km. of which 90% are hilly regions, largely, characterised by dense forests and inaccessible terrains. The valley (Plain area) at the centre surrounded by the hills claims 10% only. The valley area is cadastrally surveyed while only some parts of the hills are surveyed. As part of peculiarity of this physical feature of the area, 61.54 of the total population is in the valley while 38.45 per cent in the hill districts. Besides the state is surrounded by equally backward states on the north and west; Nagaland and Mizoram while on the south there is Myanmar, a very less developed country. The positive "spill-over" effects of development are visibly limited. The length of international border shared by the state is 352 kms accounting for 41.21% of the total length of the border. This peculiar location has been a visible handicap on the perceptible process of development of the state.

Rainfall: The rainfall in the state is around 1435 mm. Monsoon confers upon Manipur a very handsome rain as seen below: -

- South-West monsoon (June-Sept.) - 825 mm
- Post monsoon period (Oct. to Dec.) - 151 mm
- Winter monsoon (Jan. to Feb.) - 52 mm
- Pre monsoon (March – May) - 407 mm
- **Total - 1435 mm**

Geology: Geologically, Manipur belong to the young folded mountains of the Himalayan system. The rocks in the state vary from upper Cretaceous to the present alluvium. The oldest rocks found in the state are mainly confined in the eastern part of the state close to Indo-Myanmar border and the rocks are grouped as cretaceous rocks consisting of chromites (Epilates), serpentine etc. Availability of Asbestos, Chromite, Copper ore, Coal, Big iron, Lignite, Lime stone, Nickel ore and petroleum is reported in some parts of the state.

Soil: The soil of the state is of two major types – residual and transported, which cover both the hill and plain of the State. The residual soils are either laterized or non-laterized. The laterized red soils covering an area of 2,500 sq. km. in the Barak drainage on the Western slope of Manipur. It contains rich portion of nitrogen and phosphate, a medium acidity and lesser amount of Potash. The old alluvial is brought down by river Barak basin and Jiri river and their tributaries from their lateritic water ship hills. The compact and less permeable soils contain higher quantity of potash, fair amount of nitrogen and phosphorus with medium acidity. The transported soils are of two types – alluvial and organic. The alluvial soils cover 1600 sq. km. in the valley. This soils have general clayey warm texture and grey to pale brown colour. They contain a good proportion of potash and phosphate, a fair quantity of nitrogen and organic matter and are less acidic. The organic soils cover the low lying areas of the valley. With dark grey colour and clayey loam texture, these peaty soils have high acidity, abundance of organic matter, a good amount of nitrogen and phosphorus but are poor in potash. The hill soils are more or less rich in organic carbon (1 to 3%) in the top soil, but poor in available phosphorus and potash. They are acidic in nature.

Following figures are enclosed in GIS Environment to visualize the following features in the surrounding region of Churachanpur- Tuivai road

Fig. 9.1: Land use and Land Cover Information

Fig. 9.2: Drainage Information

Fig. 9.3: Elevation Map

Fig. 9.4: Digital Terrain Model

Fig. 9.5: Slope Map

9.7 GENERIC AND SITE-SPECIFIC KEY IMPACTS IDENTIFIED DURING SCREENING

➢ Pre-construction Impacts:

There will be diversion of forest cover for widening the existing road. Private Land also needs to be acquired for widening since the existing road is intermediate/two lane configuration. Road design has considered all major preconstruction impacts and taken avoidance measures at an early stage of planning.

(i) **Alignment**: Final alignment has been determined to minimize land acquisition, impact on structures, archaeological/cultural sites, interference with water sources, shifting of existing utilities etc.

(ii) **Water bodies:** construction of culverts and bridges in during lean flow period. If technically not feasible toe walls/retaining walls have been proposed. Aggregate will be procured from existing licensed quarries.

(iii) **Tree Cutting:** Proposed to restrict tree cutting to formation width..

(iv) **Construction material Sourcing:** Borrow areas have been identified at non-agricultural land. Quarrying is not proposed.

(v) **Dust and air pollution:** No new borrow areas/quarry sites to be opened for the project. Aggregates will be sourced from existing licensed quarries. Waste disposal sites and asphalt mixing sites have been sited away from populated areas.

(vi) **Noise and Vibration:** Time regulation for blasting and construction near sensitive receptors and residential areas. There are two existing crusher plant in adjacent to proposed road.

(vii) **Soil Erosion, Cut and fill:** The design attempted to equalise cut and fill. Adequate erosion control measures included in design.

(viii) **Construction Camp and Waste Disposal:** No such facility is sited near any water bodies, forest area and settlements.

(ix) **Natural Hazards:** The project area is located in seismic zone V which is very high damage risk zone. Relevant IS codes shall be adopted while designing the civil structures to sustain the earthquake of highest magnitude in Seismic zone V. Retaining walls and breast walls need to be provided at all potential landslide locations.

➢ Generic impacts attributable to any road up-gradation projects are:

(i) Increase of local air pollution and noise level due to construction and site clearance activities, earthworks, borrowing and quarrying, operation of hot mix plants etc;

(ii) Deterioration of surface water quality due to silt run-off, spillage from vehicles and discharge from labour camps;

(iii) Health impacts from labour camps;

(iv) Disruption to access/traffic;

(v) Occupational health and community safety. Operation stage impacts anticipated are road accidents, accidental spillage, submergence/overtopping of CD structures, water logging due to blockade of side drains, increased air pollution and noise level, survival of compensatory afforestation and avenue plantation etc.

All these are mainly associated with maintenance and monitor of effectiveness of mitigation measures taken during design and construction stage. Executing agency is mandated to undertake regular maintenance of the road conditions and its appurtenances.

Besides above, since the project is located in a mountainous terrain, following site-specific impacts achieves greater attention need to be addressed in detail during further stages of study.

➢ Site Specific Potential Impacts due to Road up-gradation and widening

- **Landslides:** The lithology of the project area combined with high rainfall makes the hill slopes unstable. Destabilization of slopes due to hill cutting may cause extensive erosion resulting to siltation in nearby water bodies may invite impact on properties. Hence, suitable protection measures are recommended viz.

(i) Retaining walls for stabilization of uphill, (ii) Breast walls for down slopes and (iii) Parapet walls/guard posts/railings/edge stones. Some Bio-engineering measures like bamboo terracing, bamboo crib walls, and bamboo knitting a slope, (ii) contour trenching, (iii) series of check dams on hill slopes etc. may also be recommended for slope stabilization. In addition to controlling soil erosion, this will generate employment to local people, manifold saving against masonry structures, increase productivity of hill slopes and reduce carbon emissions.

- **Soil Erosion/Silt Runoff:** Soil erosion may take place near cutting areas, at mountainous and uncompacted embankment slope, and wherever vegetation is cleared. Soil erosion may have cumulative effect viz. siltation, embankment damage, drainage problem etc. Loss of soil due to run off from earth stock-piles may also lead to siltation. Need for opening borrows areas and quarries are not anticipated since abundant material will be available from hill cutting. However, if requirement emerged, 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. Opening of new quarries is not envisaged due to the proposed project. 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 localised sedimentation level increase and dispersion of pollutants present in the dredged material in the river water.
- **Blasting:** In case if blasting is required the blasting operation may cause noise and vibration, destabilization of rock units and safety hazard and physical damage to downhill inhabitants, assets and properties. In forest areas, it may pose adverse impacts on faunal elements. Blasting, if required shall be restricted to daytime only. Blasting should be carried out as per "The Explosive Act, 1884 and the rules, 1983" pertaining to procurement, transport, storage, handling and use of explosives. Blasting schedules shall be carried out as per pre announced scheduled which shall be also displayed in advance in areas where residents may be affected by the blasting operations. Red danger flags shall be displayed prominently in all directions during the blasting operations. The flags shall be planted 200 m and 500 m from the blasting site in all directions for blasting at. People, except those who actually light the fuse, shall be prohibited from entering this area, and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing, a warning siren being sounded for the purpose. The Contractor shall notify each public utility body having services in proximity to the site of the work of his intention to use explosives. The Contractor shall adequately compensate in a timely manner for any damage to property/services and life caused by their blasting"
- **Debris Disposal**: Cutting the hillside to widen a road invariably generates debris. Disposing of this debris in the hilly areas is a challenging task as loose debris can potentially cause landsides, lead to unsightly scarring, and cause the hill slopes where it is dumped to lose their productivity. Although the road's technical design had reduced the generation of debris significantly by filling the valley portions with the debris however significant amount would still need to be disposed.

Dumping sites have been tentatively identified keeping in mind requisite environmental consideration viz. distance from water body, distance from forest and vegetated areas etc. during preliminary survey which needs further examinations viz its ownership and their consent and other technical considerations.

A fairly large proportion of people use hill slopes for agriculture where they still follow the traditional practice of 'jhum', or shifting cultivation, a 'slash and burn' method of cultivation that requires large tracts of land. The productivity of these slopes would therefore need to be retained and any land acquisition for project work or the disposal of debris would need to be done in close consultation with the local people since significant part of the land is jointly owned and administered by the community.

- **Alteration of Surface Water Hydrology/Drainage:** Diversion of rivers and major streams construction is not envisaged. Reconstruction/new construction of culverts will be done during lean flow period. Diversion of some nallahs may be required for a very short period. Their courses will be brought back to original within no time once construction is finished.
- **Ecological Resources:** There are no national parks, wildlife sanctuaries or any other similar eco-sensitive areas in the project area. Major portion of the project road is passing through unclassified/open mixed jungle. Wildlife movement is not reported along/across the project road. A rapid bio-diversity assessment will be carried out to generate baseline on floral and faunal elements in the project area. The survey will also help in assessing impact on any rare threatened or endangered species of floral species in the project area. Rapid bio-diversity assessment will also recognize wild life movement along across and impact due to improvement work. Tree enumeration will be conducted to identify no of trees likely to be affected. The list will include Girth size and species of all affected trees. Risk of forest fire cannot be ruled out due to uncontrolled burning of grasses/shrubs for clearance of ROW, fuel accumulation due to accidental spillage or improper storage of explosives.

Based on the above findings and valued environmental components identified, the EIA report during later stage of submission will addressed all key concerns/issues adequately and accordingly an EMP will be formulated which may form part of the BOQ as desired by NHIDCL.

FIG. 9.1: LANDUSE/ LANDCOVER MAP

Proposed Alignment: Churachandpur - Tuivai

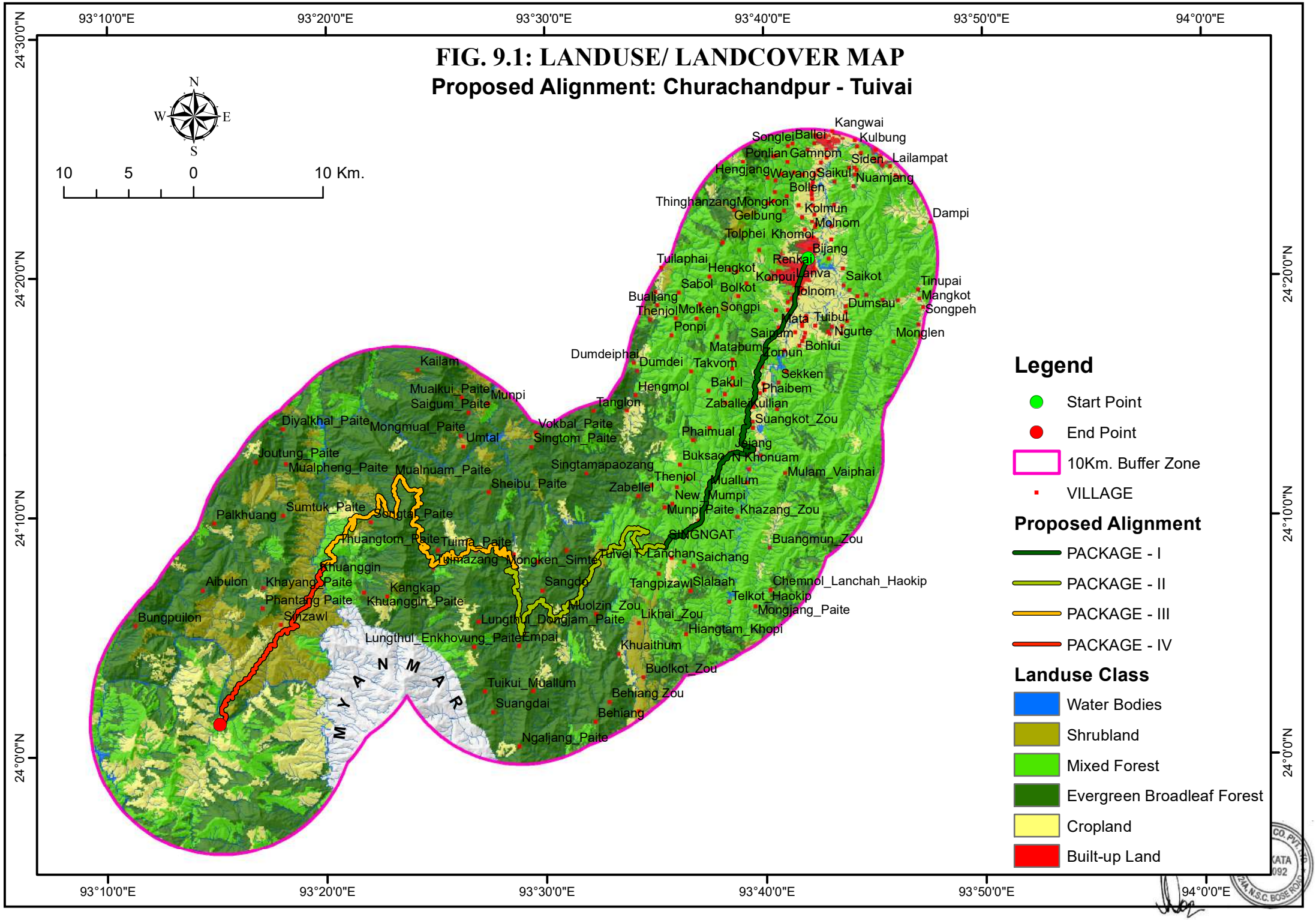


FIG. 9.2: DRAINAGE MAP

Proposed Alignment: Churachandpur - Tuivai

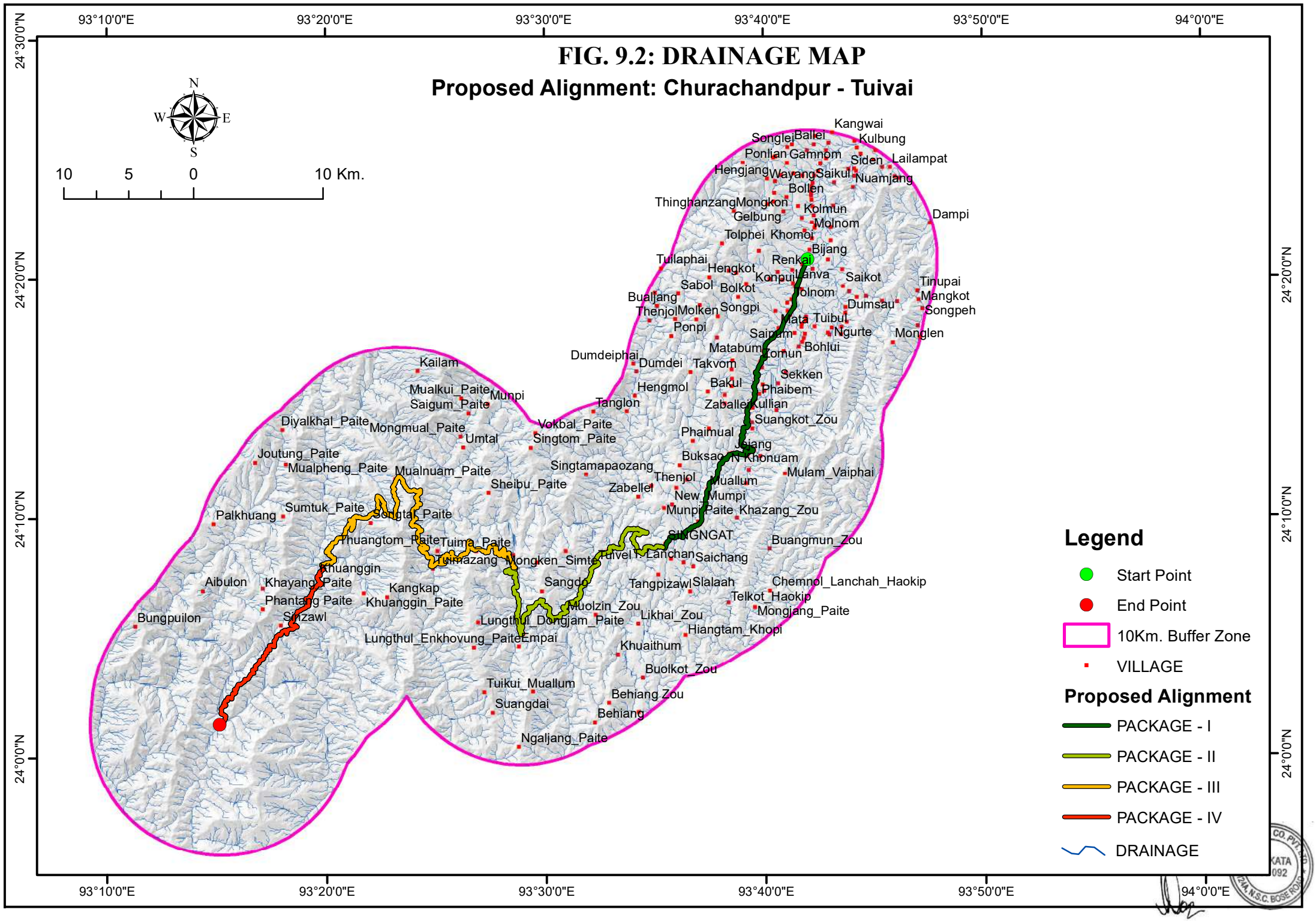


FIG. 9.3: DIGITAL ELEVATION MODEL

Proposed Alignment: Churachandpur - Tuivai

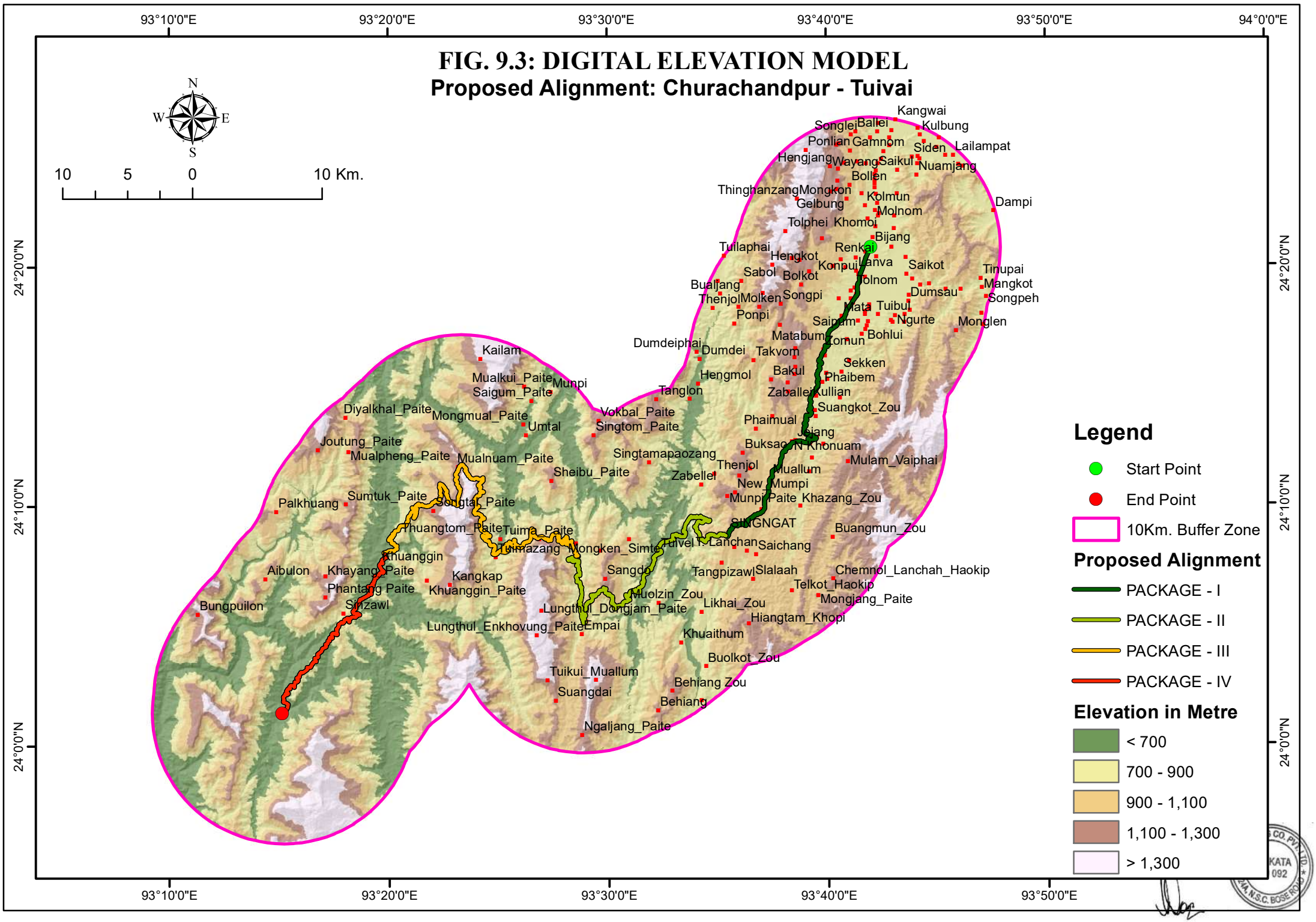


FIG. 9.4: DIGITAL TERRAIN MODEL

Proposed Alignment: Churachandpur - Tuivai

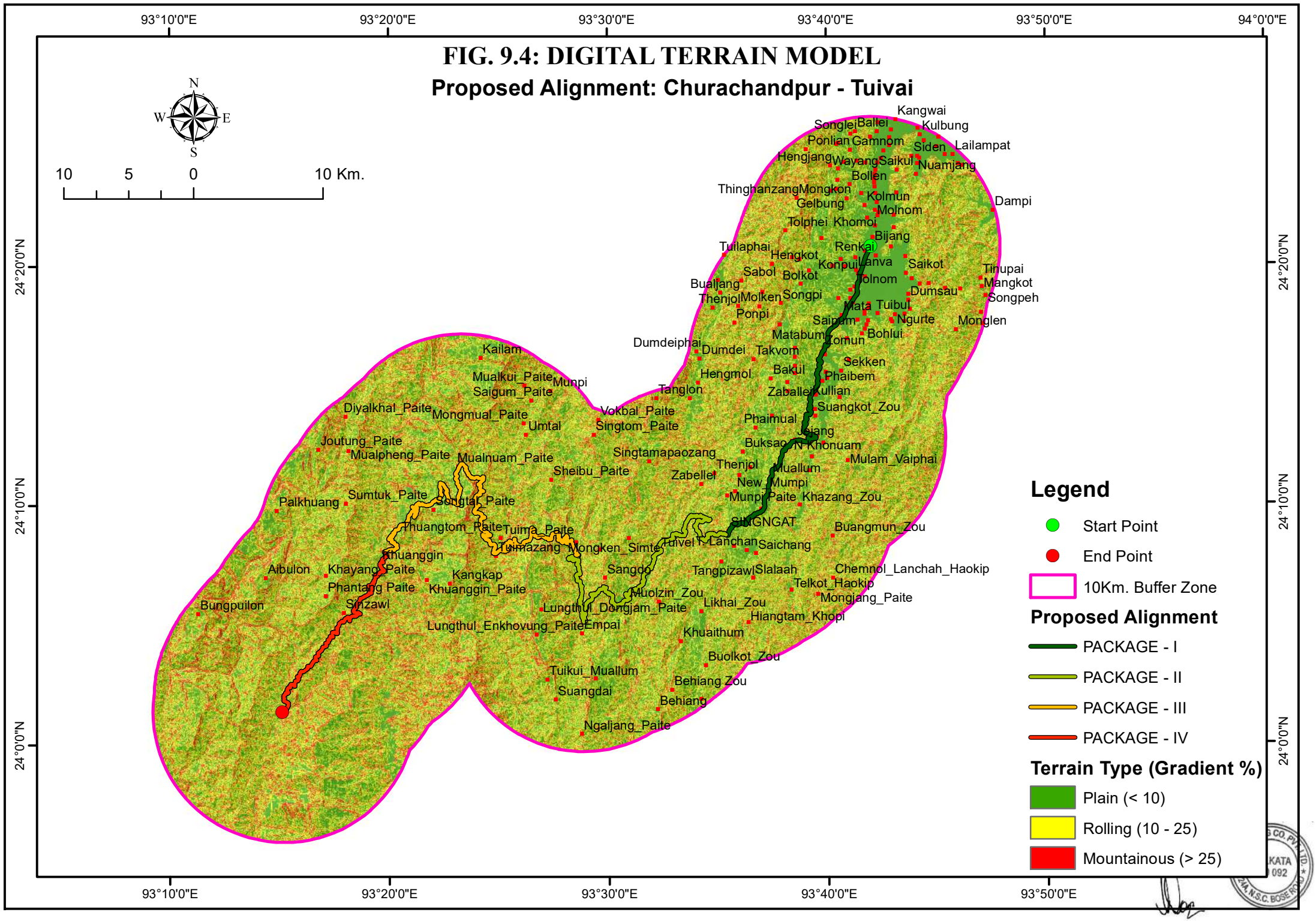
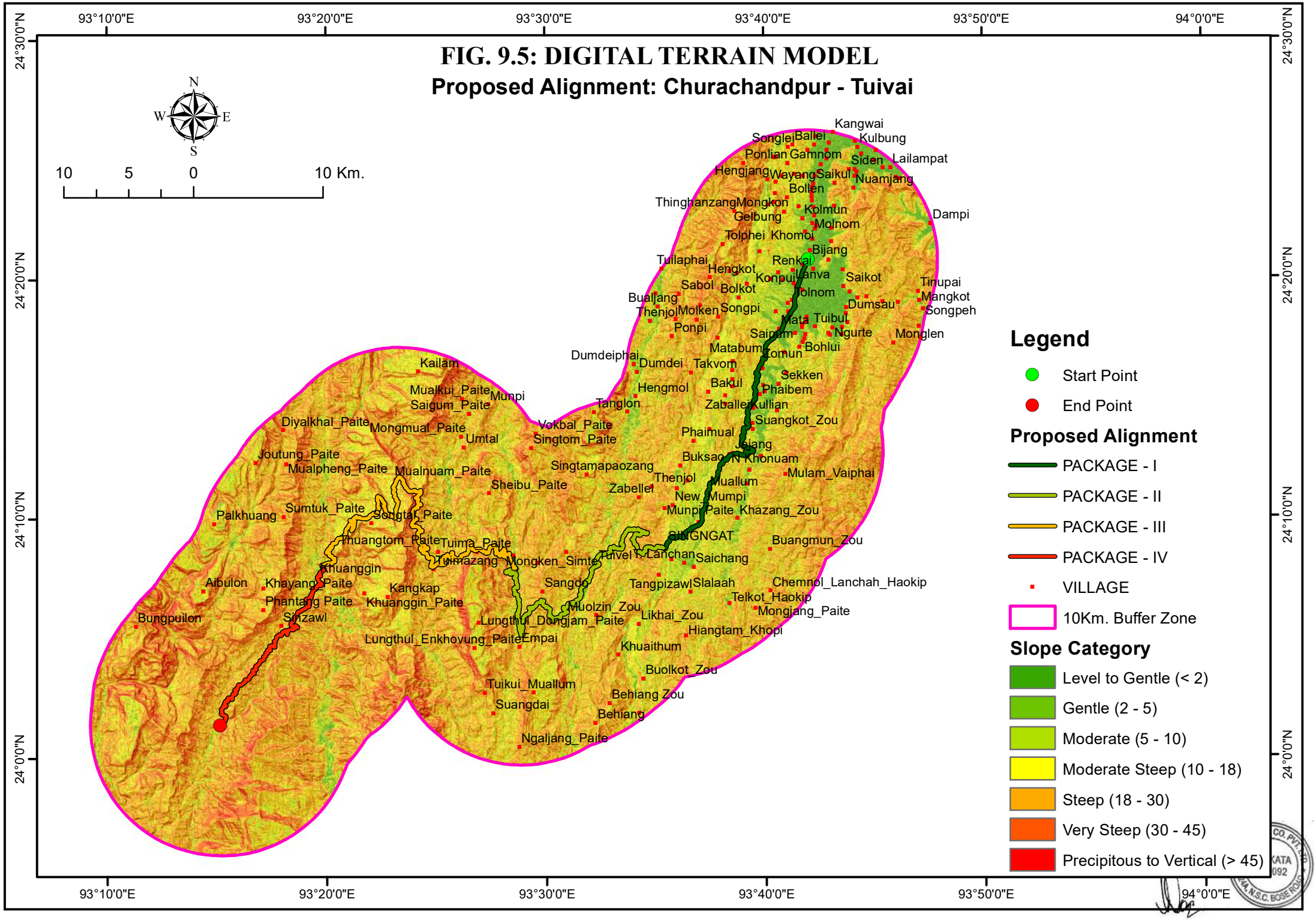


FIG. 9.5: DIGITAL TERRAIN MODEL

Proposed Alignment: Churachandpur - Tuivai



Legend

- Start Point
- End Point

Proposed Alignment

- PACKAGE - I
- PACKAGE - II
- PACKAGE - III
- PACKAGE - IV
- VILLAGE
- 10Km. Buffer Zone

Slope Category

- Level to Gentle (< 2)
- Gentle (2 - 5)
- Moderate (5 - 10)
- Moderate Steep (10 - 18)
- Steep (18 - 30)
- Very Steep (30 - 45)
- Precipitous to Vertical (> 45)

CHAPTER-10
ROAD SAFETY AUDIT

10.1 INTRODUCTION

Road Safety Audit (RSA) is a formal procedure for assessing accident potential and safety performance in the provision of new road schemes and schemes for the improvement and maintenance of existing roads.

However, its systematic application can also ensure that a growing awareness about good road safety principles is achieved throughout in highway planning, design, construction and maintenance organisation. The essential elements of the definition are that it is:

a) A formal process and not an informal check,
b) Carried out by persons who are independent of the design and construction, IRC: SP: 88-2010
c) Carried out by persons with appropriate expertise, experience and training, and
d) Restricted to road safety issues.

Road engineers will apply quality assurance techniques by established procedures and regularly check the details of their own work. This regular checking includes checking safety aspects. This type of assessment, however, is not 'road safety auditing' because it is not done with a 'fresh pair of eyes' and it probably is not applying road safety engineering skills and experience required for the task. Road safety audit, on the other hand, is a 'step-by-step' process, performed at all stages. An independent road safety audit of the design is sought, to permit independent road safety engineering advice to be input, for the benefit of the future road users. Presently, it has become practice of involving safety engineers during the life of project, liaising informally with professionals of all disciplines at all stages, from feasibility/concept stage to completion. In turn, quality assurance can be applied to the providers of road safety audit services.

Road safety is now recognized as a major socio-economic concern in India. Increasing traffic volumes, the rapid growth in two and three wheeled traffic, higher speeds due to construction improvement / rehabilitation of roads has increased safety problem. A Road Safety Audit (RSA) is the safety performance examination of a road section through experienced road safety expert. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users. The road safety audit investigates general safety conditions, focuses on specific concerns or users. This also includes pedestrian safety as well as safety of transport use.

10.2 ROAD SAFETY AUDIT AND QUALITY ASSURANCE

Road safety audit is an important aspect of Quality Assurance (QA), applied to the implementation of a road project. It is a management process in which the provider of goods or services assures the customer or client of the quality of those goods or services, without the customer or client having to check each time.

Quality assurance is done by the implementation, in the organization, of a set of procedures designed to ensure that agreed standards are met. Quality assurance procedures for the design and implementation

of new road or traffic projects are to input road safety engineering expertise into the design. Often the client and the customer are the same person or organization. In case of roads, the client for whom the road is designed and built is usually the highway authority, whereas the customer is the road user. A road safety audit is undertaken for the highway authority to ensure that the customer is afforded a level of protection from unsafe design and construction.

'Getting it right the first time' is the underlying theme of quality assurance. Road safety audits seek to ensure the road operates 'right the first time' once it opens and that the road users make fewer mistakes. Quality assurance is a continuous process. So far as the safe design of roads is concerned, quality assurance starts with a safety culture in an organization. While designing a road, engineers will apply quality assurance techniques by established procedures and regularly check the details of their own work. This regular checking includes checking safety aspects. This type of assessment, however, is not 'road safety auditing' because it is not done with a 'fresh pair of eyes' and it probably is not applying road safety engineering skills and experience required for the task. Road safety audit, on the other hand, is a 'step-by-step' process, performed at all stages. An independent road safety audit of the design is sought, to permit independent road safety engineering advice to be input, for the benefit of the future road users. Presently, it has become practice of involving safety engineers during the life of project, liaising informally with professionals of all disciplines at all stages, from feasibility/concept stage to completion. In turn, quality assurance can be applied to the providers of road safety audit services.

10.3 OBJECTIVE OF ROAD SAFETY AUDIT

Road safety audit must assess projects on the basis of road user knowledge, attributes and skills, day/night and wet and dry road conditions. Safety audit is only a study of safety aspects and an auditor may indicate road safety problems inherent in designs that conform to our road standards. This is due to the fact that our road standards are an expression of a socio-economic balance between road safety, accessibility, environment and economy.

The goal of road safety audit is to ensure that all new road projects – and major operating and maintenance activities on existing roads-are assessed from the standpoint of road safety, so that any parameters of the project that are unsuitable from the standpoint of road safety are Corrected in time. The benefits of conducting road safety audit are that:

- The likelihood of accidents on the road network can be reduced,
- The severity of accidents can be reduced,
- Road safety is given greater prominence in the minds of road designers and traffic engineers,
- The need for costly remedial work is reduced, and
- The total cost of a project to the community, including accidents, disruption and trauma, is minimized.

The cost of road safety audit and the consequent cost of changing a design are significantly less than the cost of remedial treatments after works are constructed. It is easier to change the lines/alignment or so on a plan than to move concrete structures. With less remedial work included in a highway authority's work program, budgets can be kept down or the same money can be utilized more effectively.

10.4 ROAD SAFETY AUDIT: WHAT IS DONE AND NOT DONE

ROAD SAFETY AUDIT IS:

a) Minimizing the likelihood of crashes occurring through safety-conscious planning and design;
b) Ensuring that, if a crash occurs, then the likelihood of the injury is minimized (such as provision of anti-skid surfacing and crash barriers);
c) Ensuring that safety related design criteria (e.g. critical sight distances) have been met;
d) Managing risks, such that the risk of major safety problems occurring is less than the risk of minor problems occurring;
e) Reducing the whole-life cycle costs of a design (unsatisfactory designs are expensive to correct after they are built);
f) Minimizing the risk of crashes on the adjacent road network (particularly at intersections) as well as on the new road scheme;
g) Enhancing the importance and relevance of road safety engineering in highway design work and to enhance consideration for the safety of all categories of road users in all new and existing schemes.

ROAD SAFETY AUDIT IS NOT:

a) A way of assessing or rating a project as good or poor;
b) A means of ranking or justifying one project against others in a works program;
c) A way of rating one option against another;
d) An accident investigation;
e) A redesign of a project;
f) Something to be applied only to high cost projects or only to projects involving safety problems;
g) The Name you use to describe informal checks, inspections or consultations;
h) An opportunity to raise subjective concerns.

10.5 SAFETY AUDITORS

To be effective, the safety audit needs to be carried out by specialists, who are independent of the design process. In this way auditors will be taking a fresh look at the project without the distraction of having been involved in their design. Road safety audit involves one set of professionals checking the work of other professionals. Crucial factor is that auditors should be independent and impartial. Road safety auditor must not question the justification for a project but must bring to light its consequences on road safety and endeavor to ensure that the project as presented in the brief is as safe as possible. Auditors need to be objective in their assessments, yet sensitive to the fact that no one likes criticism. Designers and clients need to consider audit recommendations objectively as brought out from the audit outcome.
Expertise and experience in road safety engineering are the essential ingredients in any road safety audit team. This should be linked to an understanding of:

- Traffic engineering and traffic management, and
- Road design and road construction techniques

A person who has an understanding of road user behavior and human perception is also likely to be able to develop road safety audit skills. This understanding is in fact a desirable skill because of the interactive nature of road user behavior with the road environment. An audit team leader must not only have knowledge and skills in road safety engineering, but also should have received training and participated in a number of audits. It is expected that the safety auditors will apply due diligence in identifying the deficiencies and evolving audit recommendations which should be supported with reasons.

The Authority, which engage safety auditors should ensure that the team leader has:

• Adequate road safety engineering experience for the stage of the audit,

• Successfully completed a recognized audit training course,

• At least five years' experience in a relevant road design, road construction or traffic engineering field, and

• Undertaken at least three road safety audits including design stage, etc.

It is not practical or necessary to have a multi-member team conducting an audit. An audit of a low budget project, a road safety audit by more than two persons may not be justified. For large projects, three persons are needed whereas for small projects two persons will be required.

10.6 ORGANISATIONS INVOLVED IN ROAD SAFETY AUDIT

Road Safety Audit Road Safety Audit is based on the principle of an independent review. Road safety audit process reveals that three parties will be involved in this process-Client, Designer and Auditor. For the Public Private Partnership projects (PPP) the client would be both the Govt, and the Concessionaire with their respective obligations as provided in the Concession Agreement. One fundamental idea is that disagreements between the designer and the auditor are resolved not by the designer but by the client. So it is an interaction between different parties, whose roles are predefined at specific stages. In India, for large and small projects client may be National Highways Authority of India (NHAI)/Ministry of Road Transport and Highways/NHIDCL/concerned Public Works Departments (PWD). Designer may be one consultant and Auditor may be another consultant/Govt. institution approved by the Authority. Main functions of the key players in road safety audit are shown in Table 10.1.

Role of designer

Designer is responsible for planning/designing the project. Designer bears the responsibility for ensuring that a road safety audit is conducted and that the necessary measures are agreed on the basis of the auditor's recommendations and/or the client's decisions. The designer is also responsible for ensuring that the audit input information is unambiguously defined and that all circumstances are described in an easily understandable manner. For existing roads, it is the responsibility of operating organisation of the relevant highway authority which requests the auditor to prepare accident analysis of the project and which arranges for the road operator to be notified about the results of the audit. The project manager, or design engineer should be responsible for initiating the safety audit process for each scheme and for responding to the audit. The role of the designer is thus to:

- Attend commencement and completion meetings.
- Bring out the action proposed in response to the audit report and its recommendations and to document these proposed actions.

•Implement the decisions given by the client on the proposed action by amending the original design

•Feed the experience back into the designer's organization and to avoid similar design problems recurring.

TABLE 10.1 MAIN FUNCTIONS OF THE KEY PLAYERS IN ROAD SAFETY AUDIT

Key Player	Main Functions
Project Owner (Govt. and/or Concessionaire)	• Expresses a commitment to road safety • Provides funding and resources • Considers safety audits and reviews as an essential quality control requirement • Commissions audits and reviews at appropriate times • Selects road safety audit team • Facilitates the response to the recommendations of audits and reviews and arranges implementation of recommendations that are accepted • Attends commencement and completion meetings
Design Team	• Attends commencement and completion meetings • Provides relevant information to safety team • Acts upon and documents response to recommendations of audit
Safety Audit Team	• Identifies safety issues in the proposed design • Makes constructive recommendations to enhance safety • Documents safety issues and recommendations • Holds commencement and completion meetings with the client and design team

Role of client

Client is one who allots the project to the designer and owns the project. As the party responsible for the basic conditions of the project, it is the task of the client to decide in cases where the designer and auditor disagree. Disagreements are presented to the client who conveys its decision to the designer and the auditor. Road operator assumes this responsibility in case of existing roads. The client should be responsible for ensuring that clear terms of reference are laid down to cover the whole range and scope of audit and for commissioning audits at appropriate stages. The role of the client is thus to:

- Select an appropriate auditor,
- Provide all the relevant and necessary documents, and
- Hold a commencement meeting with the auditor and the client.

Role of auditor

Auditor's responsibility is to carefully review the presented project material in its entirety, in the light of best road safety expertise and from the viewpoints of all relevant road users. Auditor also indicates all circumstances that cause misgivings concerning road safety. Persons designated as Road Safety Auditors work with, and have experience of, road accident analyses and road accident reduction. Auditors must

be familiar with road planning, design and construction work and must undertake to keep their expertise up-to-date.

Auditors should comply with the terms of reference. They should comment only on the safety implications of schemes and provide constructive recommendations as to how any potential difficulties can be resolved. The role of the auditor is thus to:

- Review all the documents and audit the drawings and designs,
- Inspect the site (including during night time),
- Repeat these two steps,
- Prepare a report,
- Hold a completion meeting with the designer or client or both,
- Participate in the meeting organized by the client sequel to designers reactions in the Auditor's Report.

10.7 WAYS OF ORGANIZING A ROAD SAFETY AUDIT

There are many ways of organizing a road safety audit. However, the two essential attributes of road safety auditor are that the person should be skilled and independent. Practically, two options are there for conducting a road safety audit:

- Audit by specialist auditors,
- Audit by those within the original design team or by other road designers.

In case of audit by specialist auditors, team needs to be a separate entity from the normal road design functions of an organization and team members should not, except for the purpose of an audit, be involved with the design of the project. There needs to be a clear understanding, prior to commencement of an audit, about how the audit findings and recommendations will be dealt with. Someone has to consider the safety recommendations and resolve the inevitable trade-offs i.e., project cost, road capacity, likelihood of severity of accidents, etc. In every case where an audit recommendation is rejected, the reasons must be stated and documented. Other ways of dealing with audit recommendations can include:

- A requirement that each recommendation must be formally considered by the client with a view to its acceptance in a normal course and the work cannot proceed to the next stage until formal written approval has been issued by the client based on the recommendations of the audit team.
- The audit recommendations are considered by the designers, or by the project manager. This has the risk that the safety concerns may be rationalized away, in the atmosphere of keeping the project moving with minimal changes.

Instead of using specialist auditors, another designer or design team could undertake the audit. This approach may be applicable in organisations, which have sufficient road design work to have two or more separate design teams. This separation provides a level of independence. But this arrangement does not provide for the one essential ingredient in any road safety audit experience in road safety engineering. Using auditors from within the same organisation also has its limitations. It may be

considered that the original designer can audit his or her own designs, on the basis that this is better than nothing. However, this option does not meet requirement of independence. Experience shows that no matter how concerned a designer or design team is about road safety, it is almost inevitable that they will be too close to the issues in the design to apply the 'fresh pair of eyes' needed to inquire into design policies, approaches or details. A more effective way to organize a road safety audit is to engage specialist auditor(s) who is(are) independent and possess requisite road safety engineering skills and experience. The independence of the RSA Team is vital to ensure that the design team does not influence the recommendations of the Safety Audit and, therefore, compromise safety at the expense of other issues. This, however, does not mean that there should not be any interaction between the Design Team and the Safety Auditors. A meeting between Safety Auditors at the start and at the end of the audit process would be useful and Safety Auditors could be asked to provide advice on safety issues during the design. However, the independence of the Audit Team is critical and should not be compromised.

10.8 STAGES OF ROAD SAFETY AUDIT (RSA)

As per the scope of works RSA needs to be performed in the following stages:

- During Feasibility Study Stage (planning stage)
- On completion of Preliminary Design Stage
- On completion of Detailed Design Stage

This report is related to safety audit report at feasibility study stage (planning stage). The audit team reviewed proposed design from road safety perspective and checked the following aspects. RSA related to construction stage and monitoring existing road stage is not discussed here.

10.9 ASPECTS TO BE CHECKED

Broadly following items have been checked or reviewed during the feasibility study stage based on site data, existing road and proposed designs.

- Safety and operational implications of proposed alignment and junction strategy with particular references to expected road users and vehicle types likely to use the road.
- Width options considered for various sections.
- Departures from standards, if any and accordingly actions taken.
- Provisions of pedestrians, cyclists and intermediate transport.
- Safety implications of the schemes beyond its physical limits, i.e., how the scheme fits into its environs and road hierarchy

Road Safety Audit is a formal procedure that uses extensive safety engineering knowledge to identify safety deficiencies in road sections. A broad experience in road, traffic and safety engineering needs to be acquired to ensure that a Road Safety Auditor has the knowledge and ability to refer back to the basic principles in road safety, and propose appropriate mitigation measures. Following points are generally adequately clarified during a road safety audit.

- Confusion or ambiguity due to design layout for road users that could lead to potential road traffic accidents
- Insufficient information for road users

- Improper visibility, or an obstruction to road view s of road users
- Hazards in layout create or obstacles to road users that could contribute to an increased risk of injuries

In the above cases safety of the scheme may be compromised and remedial measures may be required to remove this potential or actual deficiency. Road users need to perceive and process vast amounts of sensory and visual information to negotiate a road layout. On the other hand role of designer is to provide a safe road environment that should:

- provide adequate information for road users of the layout and conditions ahead;
- provide adequate warning of hazards or unusual layouts ahead;
- provide positive control of road users passage through conflict points or unusual sections;
- provide a road performance that can nullify road user's errors or inappropriate behavior;
- provides clear, concise and phased release of road user information;
- provides a consistent standard of road design and traffic control;
- Provides adequate warning of hazards.

Desirable minimum Design Standards should be used wherever possible and advance information and warning should be used to inform road users of the layout ahead. However, driver overload must be avoided as it may cause road users to focus too much on the unimportant data and shed vital information. Conflicting information, an over abundance of road signs or a lack of delineation can cause overload. Therefore a "safer" road environment can be defined as a layout that:

It is important that a road improvement caters for all road users. Often the needs of the motorist are incorporated within a scheme whilst the needs of the vulnerable user are ignored. The vulnerable road users that need to be considered are: pedestrians – the old, young and those with mobility or sight impairment; cyclists – children, commuters and leisure users and motorcyclists.

Each vulnerable road user has different needs from the road network. In the habitation environment the pedestrian is likely to be the principal user and designs must incorporate safe crossing locations, adequate visibility to and from the crossings and appropriate lighting. In addition to the needs of vulnerable road users, particular attention should be paid to the needs of trucks, buses or other specialist vehicles.

Safe road design varies from the urban to the rural road network; and a number of external factors can create a situation in which a safe road in one location becomes unsafe due to external factors. These factors can include traffic volumes, population density, noise, or road user familiarity. The function of a road should be clear to all road users, and a well planned and defined road hierarchy can assist in providing a safe road network. The design speed can also be an important factor in influencing the safety of a road and should be appropriate to the location, local road users and level of private access control.

One important aspect to the safety of junctions is that layout as well as control method need to be simple and clear, with defined priorities for all road users. The assumption that 'straight on' traffic has priority is widely accepted and it needs to be remembered that alterations to this, despite reinforcement with signs and lines can still be confusing if visual clues such as fences, kerbing or lighting remain unchanged. It is important to attempt to make any minor approach perpendicular to the main road. Y-junctions with acute angles should be avoided. These angled junctions pose problem for road

users, including restriction of forward and side visibility. Similarly, it is advisable to avoid intersections on the inside of bends as foliage often encroaches into sight lines after several years. Roundabouts used as a form of junction control have their own rules and design requirements. One of the primary requirements in good roundabout design is that the radius is tighter on the entry than the exit. This ensures a slow entry and lower circulating speed. Visibility is a key requirement for all junction types, all road users need to see and be seen by others. Care should be taken with fixing street furniture and vegetation within visibility splays. Vulnerable road users often experience difficulties during crossing at junctions. It is important that their needs are provided for and that safe crossing places are implemented where required.

The relationship between cross-sectional elements (carriageway, shoulders, etc.) and safety is affected by the type and volume of traffic, and also by the surrounding environment. Lane widths can be critical in affecting safety, where they are too narrow vehicles may collide on horizontal curves, and there may also be inadequate space for two wheeled vehicles. Where lane widths are too wide the alignment may encourage excess speed. On high speed links there is a safety benefit to be gained by the provision of a hard shoulder and central reserve gaps should be of adequate width, depending on the size of vehicles turning. Vehicles parked on the carriageway affect the road environment, layout and consequently safety. Safety problems experienced with parked vehicles are:

- Parked vehicles causing physical obstructions which are sideswiped or run into
- Parked vehicles causing sudden braking or nose-to-tail shunts
- Parked vehicles which deflect oncoming vehicles into adjacent vehicle paths
- Parked vehicles blocking visibility for any road user
- Parked vehicles between which pedestrians emerge

To reduce the risk of parked vehicles contributing to an accident it is important that designs should minimize parking in main traffic lanes. Trees and foliage can greatly enhance the environmental impact of the street scene. However, left un-maintained, they can also restrict visibility considerably. In addition to this, saplings grow into large trees, which can provide an unforgiving road hazard in the event of a road traffic accident. With the above discussions and study / analysis of the project road sections safety issues that have been conceived are presented below in Table 10.2.

TABLE 10.2: ROAD SAFETY ISSUES

Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
A1. General	Departure from Standards	Average journey speed of the corridor is 25kmph with presence of sharp, zigzag curves and hairpin bends.	Proposed alignment has been designed based on the design speed adopted for mountainous terrain as per standard specified in IRC SP 73-2015 and hill road manual (Refer Plan & Profile Drawing CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/PP and Horizontal Alignment Report CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/HAR)	Considering mountainous and plain terrain in general design speed has been adopted as:- **for Plain Terrain** Design Speed Ruling = 100 kmph, Limiting = 80 Kmph, **For Mountainous Terrain** Design Speed Ruling = 60 kmph, Limiting = 40 Kmph However, speed has been reduced upto 20 kmph in case of hair pin bends

<table>
<tr><th rowspan="2">Content</th><th rowspan="2">Items</th><th colspan="2">Observation with respect to Safety</th><th rowspan="2">Remarks</th></tr>
<tr><th>Existing Situation</th><th>Proposed Situation</th></tr>
<tr><td></td><td>Cross sectional Variation</td><td>
<table>
<tr><th colspan="2">Chainage</th><th rowspan="2">Avg. Crw. Width (m)</th></tr>
<tr><th>From (km)</th><th>To (km)</th></tr>
<tr><td>93.280</td><td>108.610</td><td>3.5</td></tr>
</table>
Earthen Shoulder/Gravel Shoulder: 0.50 m – 2.0 m
Total Formation width: 4.0 m to 14 m</td><td><u>For Plain terrain</u>
(1) In Built Up Area
Carriageway = 7.0 m
Hard Shoulder = 2 x 1.5 m
Covered Drain cum Footpath = 2 x 1.0 m
Total Roadway Width = 12.0 m
(2) In Rural Area
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder = 2 x1.0m
Total Roadway Width = 12.00m
<u>For Mountainous terrain</u>
(3) In Built Up Area
Carriageway = 7.0 m
Hard Shoulder = 2 x 1.5 m
Covered Drain cum Footpath = 2 x 1.0 m
Total Roadway Width = 12.0 m
(4) In Rural Area (Both Side Valley)
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder in Valley Side = 2 x1.0m
Total Roadway Width = 12.00m
(5) In Rural Area (One Side Hill & Other Side Valley)
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Earthen Shoulder in Valley Side =1 x1.0m
Total Roadway Width = 11.00m
(6) In Through Cutting section
Carriageway = 7.0m
Hard Shoulder = 2 x 1.5m
Drain = 2 x 1.0 m
Total Roadway Width = 10.00m
For cross-sectional parameters refer TCS Drawing
CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/TCS</td><td>Extra widening has been provided on the curves having radius less or equal to 300m.</td></tr>
</table>

Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
	Drainage	Existing drainage condition is poor with improper camber and longitudinal gradient of carriageway and shoulder.	Efficient drainage system is provided along the project road including structure and outfall facility. For quick disposal of precipitations, carriageway and shoulder have the requisite camber and longitudinal gradient. The water from road and adjacent areas to be intercepted and carried through roadside drains to natural outfall. RCC Covered Drain has been provided for effective drainage in built up area. RR Masonry trapezoidal open drain has been provided in hill side for effective surface drainage. Length of covered drain and trapezoidal drain provided is given below: **Package - IIIB** Length of Covered Drain = 2524 m Length of Open Drain = 18085 m For drainage details refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/TCS And CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/MISC-07	
	Climatic Conditions	Generally Temperature varies from 5°C to 35°C. The average annual rainfall is 1036 mm.		HFL has been considered to fix road top level at bridge location.

Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
	Landscaping	Landscaping on the existing road is not proper due to irregular spacing of trees & absence of proper protection work in hill and valley side.	Proper Road side Plantation is being provided. Protection work shall be given on Hill as well as Valley side. The details are given below: **Package - IIIB** Length of Retaining Wall=2803m • Length of 1.5m Retaining Wall=100m • Length of 2.0m Retaining Wall=1031m • Length of 2.5m Retaining Wall=21m • Length of 3.0m Retaining Wall=660m • Length of 4.0m Retaining Wall=557m • Length of 6.0m Retaining Wall=435m Length of Breast Wall = 1105 m Length of Composite RE Wall = 162.3 m Metal Beam Crash Barrier = 2803 m For details of Retaining Wall & Breast wall, refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/ MISC- 06 Application of Hydro-seeding has been calculated on cut slope of hill section and the area comes out as: • **Package – IIIB:** 8838 Sq m	Trees and vegetations on the site should be properly trimmed and removed if required so that these should not interfere with the overhead services, clear view of signs and efficiency of roadway lighting. A regular program of pruning of the offending trees shall be under-taken as a part of the maintenance operation. Trees shall be selected based on the soil, temperature, rainfall, water level and should be deep rooted to avoid any damage to the pavement crust., rainfall, water level and should be deep rooted to avoid any damage to the pavement crust.
	Service Apparatus	Existing utilities like Electric poles, Transformer, High Tension Line, and Telephone Pole etc. are found along the existing road.	Existing utilities affected due to widening of road shall be relocated at proposed utility corridor within the proposed ROW. Utility corridor is shown in TCS drawing. (Refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/TCS	It will be safe during maintenance

Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
	Lay-byes	No Bus bay and truck lay-byes have been observed along the project road.	Bus bays (6 nos.) at 3 locations are proposed near built-up location for smooth movement of traffic. For typical details of bus-bay and passenger shelter, refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/ MISC- 08 & 09	
	Footpaths	No footpaths are observed along the existing road.	Footpaths cum drains of width 1.0 m are considered in the built-up location. The length of footpath is mentioned below: **Package - IIIB** Length of Footpath = 2524 m (For details, refer drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/TCS)	Footpaths are provided for smooth and safe movement of pedestrian.
	Pedestrian Crossings	No pedestrian crossings are observed along the existing road.	Pedestrian crossings are provided at major intersections and other locations like schools, religious structure etc. where substantial conflicts exist between Vehicular and Pedestrian movement	Installation of proper traffic sign/ signal near pedestrian crossings is mandatory. Pedestrian guard rails may be required to guide people
	Access	Existing situation shows maximum access to the private property.	Private access should be minimized directly from the proposed carriageway by providing footpath at built up locations	Private access needs be minimized to maintain the design speed of the corridor as well safe passage to traffic and persons
	Emergency vehicles	Emergency vehicle have not been found along the existing corridor.	It is proposed to provide Emergency vehicles to operate within a certain time frame along the project road.	
	Public Transport	Existing traffic survey shows that 2 wheeler and car/Jeep/Van are the major public transport compare to bus and minibus along the existing road.	After improvement of road to 2-lane with hard shoulder trucks and public transport like bus and minibus etc. will ply on the proposed road along with motorized and non-motorized other vehicles.	Refer Chapter 6: Traffic Survey and Analysis

Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
	Future Widening	Varies from 7m to 13 m	Proposed ROW required for Rural area = 18.00 to 24.00 m Built-up area = 14.00 m Therefore, land acquisition is required to accommodate future 2 lane proposal.	
	Staging of Contracts	Total project will be executed in nine packages.	Design Length of PKG-IIIB of the project road will be 14.545 km.	
	Adjacent Development	Major portion of the alignment consists of single lane bituminous road.	Proposed shoulder on both sides of the carriageway can be used for the movement of slow moving vehicle during emergency as well as parking for stalled vehicle.	(Refer TCS drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/TCS)
A2. Local Alignment	Visibility	Visibility is not proper in many places as the existing profile of the route does not follow required sight distances (horizontal as well as vertical).	In general Intermediate Sight distance is being followed for proposed 2-lane road.	In stretches where intermediate sight distance is not available the profile shall be designed with stopping sight distance and overtaking prohibited traffic sign shall be installed in that location.
	New/Existing Road Interface	Interface with other roads are not smooth with improper horizontal and vertical profile.	New/Existing road interface shall be designed with proper geometry and vertical profile as per codal provision so that the vehicle can moved smoothly & safely.	
	Safety Aids on Steep Hills	Existing alignment shows there is no proper safety in hill and valley section along the project route.	Requirement of Retaining wall, Breast wall, Toe wall have been considered as protective structures for traffic as the proposed road is passing mostly through mountainous terrain.	

Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
A3. Junction	Minimize potential conflicts	Existing junctions are not properly developed with insufficient turning radius and absence of road signage as well as markings.	Major and minor junctions to be developed with proper turning radius, signage and markings to minimize potential conflict between pedestrians and vehicles	Junctions should be developed with proper traffic sign and markings.
	Layout	Layout of the junctions are not proper	Layout of the proposed junctions are to be made with proper turning radius, acceleration/deceleration lane, island and median etc.	These are designed as per respective IRC guidelines and land acquisition to be kept absolute minimum.
	Visibility	Visibility of the existing junctions are not proper	To improve the visibility of the proposed junction's vertical profile of the road shall be designed with intermediate sight distance. If it is not found it should be taken care that at least stopping sight distance should be available throughout.	Traffic Sign at junctions should informative enough.
A4. Non-Motorized road users provisions	Adjacent Land Pedestrians Cyclists Non motorized vehicles	Major portion of the alignment consists of single lane road	For smooth movement of non motorized road users, pedestrians and cyclist paved shoulder has been proposed on both side of the carriageway. Also in built up stretches 1.0 m wide footpath cum drain has been proposed for less conflict between fast moving vehicle and pedestrians, cyclists etc.	Refer TCS drawing no. CET/4047/NHIDCL/NH-102B/CT/FDPR/PKG-IIIB/TCS
A5. Signs and Lighting	Lighting	Insufficient Lighting shall be found in built up areas.	Lighting shall be provided on major junctions, built-up stretches and bus bays locations.	
	Signs/ Markings	Insufficient signs found on existing road. Markings are not found in the existing road.	Traffic Signs and Road Markings are provided on the proposed road for safe guidance of traffic.	For typical details of road sign and marking. Refer TCS drawing no. CET/4047/NHIDCL/NH-102B/CT/DDPR/PKG-IIIB/ MISC- 02 & 03 respectively
A6. Constructi	Build-ability	Guidelines for safety during construction need to be followed as per IRC: SP-55. Traffic control devices have to be provided as per		

Content	Items	Observation with respect to Safety		Remarks
		Existing Situation	**Proposed Situation**	
on and Operation	Operational	requirements during construction time. Few of these are: barricading, signs and delineators.		
	Network Management			

CHAPTER - 11
FINANCIAL ANALYSIS

11.1 General

The financial viability analysis for the proposed road forms the basis for assessing whether the project is attractive enough for private sector participation. The analysis ascertains the viability of the investment proposal on BOT format. A provision of maximum 40% government grant is also considered if the project fails to achieve the desire result on BOT format. The financial analysis covers aspects like financing through debt and equity, loan repayment, debt servicing, taxation, depreciation, etc. The viability is evaluated in terms of the Project IRR [Financial Internal Rate of Return (FIRR) on total investment] and the Equity IRR (FIRR on equity investment), using discounted cash flow analysis, where both costs and revenues have been indexed to take account of inflation.

11.2 Tollable Traffic

All motorised vehicles (other than two and three wheelers) on the road would be tolled except certain categories of toll-exempt vehicles such as certain government vehicles, ambulances, fire brigades, etc. Leakage of vehicles from toll plaza has taken as 0% of the total traffic on the road, since the volume is low. According to the guidelines of the MCA, growth rate of traffic is considered as 5% per annum.

11.3 Capital Cost and Phasing

The capital cost of the project relates to construction cost and includes civil works cost for Road, Bridges / CD Structures & Approach roads, Junction Improvement, Project Facilities, Traffic Sign & Road Appurtenances etc. Under BOT format, the government has to provide ROW land free of cost and encumbrances to the concessionaire. The cost for environmental mitigation measures would be borne by the concessionaire. Hence, costs other than for civil works cost and environmental mitigation cost, viz. LA, R&R, afforestation and utility shifting are taken to be borne by executing authority. In order to arrive at the cost for financial analysis, various other components have to be considered, which are discussed in the following paragraphs.

Base Cost

The base cost for financial analysis comprises the cost to the BOT concessionaire and excludes the cost to executing authorities. It includes civil construction cost and pre-operative expenses. The base cost is at 2019 prices.

Other Cost

With a view to account for inflation, Financial Cost comprising processing fee, sponsor's contingency etc, Interest during construction, the base costs have been escalated at a rate of 25

percent on Civil Cost as per MCA guidelines.

Landed Project Cost

The total landed cost of the project is the cost at the time of commissioning and includes aggregates of civil cost, financial overheads, escalation costs and interest during construction (IDC).

Project Cost Summary

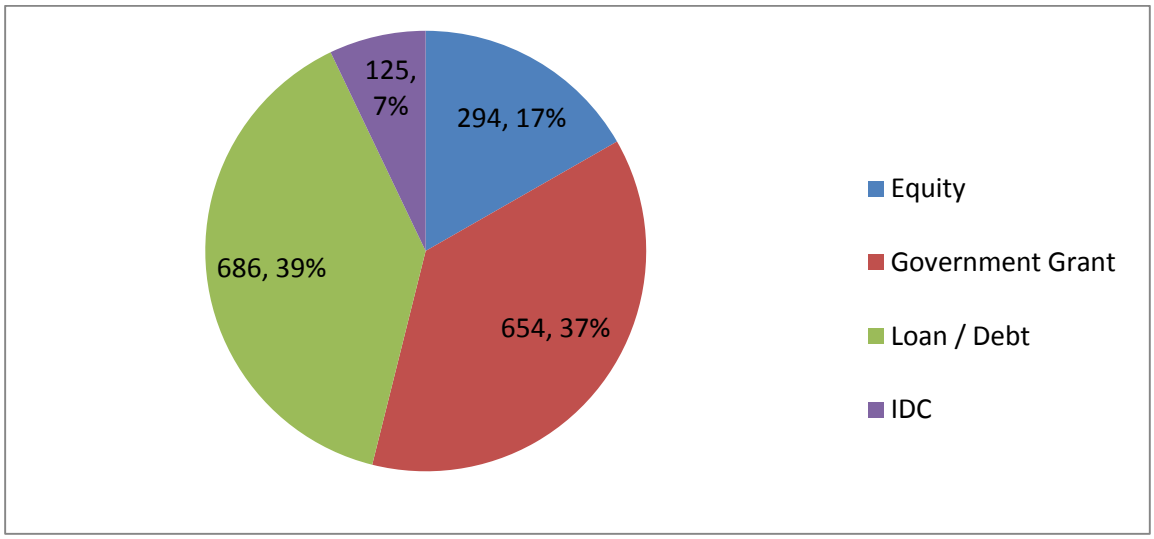
Sl.	Items		Rs. Cr.
A	Total civil cost		1407
B	25% of Civil cost for contingency, supervision, financing cost and interest during construction	Others	227
		IDC	125
C	Total Project Cost		1759

The construction is phased over three years (2020-2022). Cost Phasing would be 30%, 40% & 30% over 3 years.

Under BOT arrangement the permissible maximum limit of viability gap funding is 40% of capital investment.

Grant, Loan & Equity Requirement - during construction *(Rs Crore)*

	Total
Equity	294
Government Grant	654
Loan / Debt	686
IDC	125
Total Project Cost	1759



11.4 Operations and Maintenance Cost

Operation and maintenance cost as considered in the financial analysis is as follows:

- Annual Maintenance @ 0.5% of the Civil Cost on every year
- Periodic Maintenance @ 2% of the Civil Cost at every 5 years
- Toll Collection Expenses @ Rs 5.00 Lacs/year per Toll Plaza
- Office Expenses @ Rs 5.00 Lacs/year per Toll Plaza
- Patrolling, Electricity Expenses @ Rs. 0.40 Lacs/km/year

11.5 Basic Assumptions of Financial Model

Financial viability analysis has been done using a financial model. The model projects the key financial statements of the private investor over the concession period. A concession period of 20 years has been considered. Depreciation of capital items is calculated by using two methods, viz. the Written Down Value (WDV) Method and the Straight Line Method (SLM). The WDV method favours income shielding and is, therefore, used only to calculate taxes payable by the concessionaire. A tax holiday (i.e. 100 percent tax exemption on profits) for a block of 10 years has been assumed as per the Government's latest incentives for encouraging investments in the road sector. These tax incentives must be availed within the first 20 assessment years of operation. The corporate tax rate, at 33.23% is adopted for the analysis. Minimum Alternative Tax (MAT) rate of 19.93% on the book profit is also considered where there is no corporate tax. Summary of assumptions are as below

Operating Year to Traffic	2024 Start
Operating Period	20 Years
PPP Finishes at the end of	2044 End
Construction Start Year	2021 Start
Construction Time	3 Years
Construction End Year	2023 End
Expected Inflation	5%
Year of Accounting	2019
Corporate Tax Rate	33.23%
Minimum Alternate Tax (MAT)	19.93%
Tax Exemption Start	2022
Tax Exemption Length	10 Years
Cost of Equity	15%
No. of Lanes	2 Lane
No. of Toll Plaza	1 No.
Loan Term	20 Years
Moratorium	5 Years
Long Term Loan Rate	12%

VGF as % of Capex	40%
Debt/Equity Ratio	70%

11.6 Project Revenue

The toll revenue has been calculated for all categories of fast moving vehicles using the project road viz. Car, Bus, LCV, HCV and MAV. The toll rates considered for the analysis are based on existing practices for National Highways.

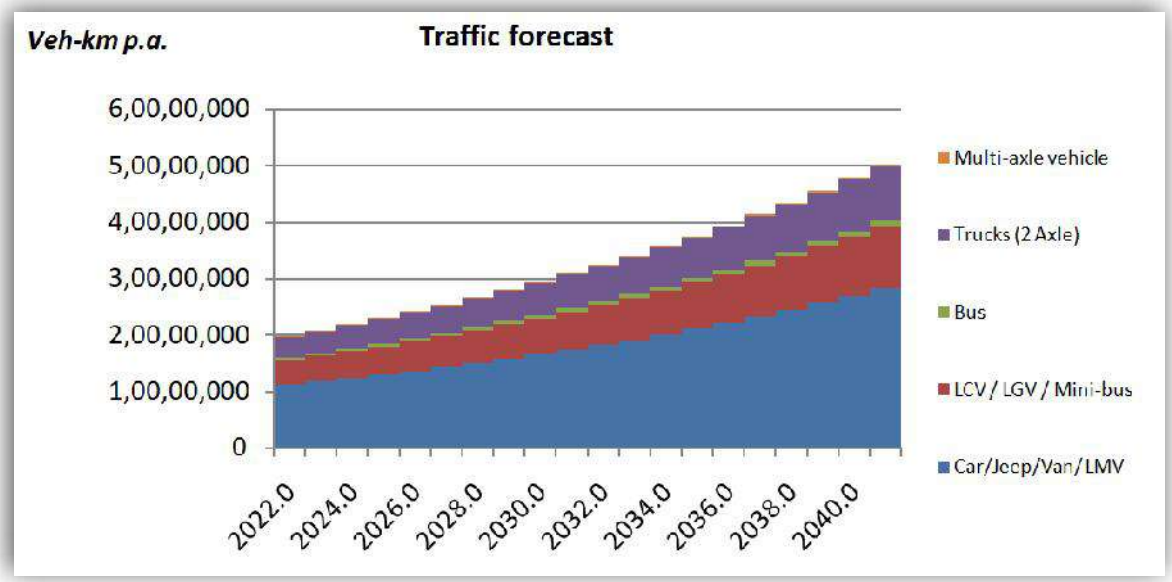
The fees structure / toll rate has been taken from National Highways Fee (Determination of Rates and Collection) Rules, 2008 and Amendment Rules, 2014 (dated 16th January 2014) –

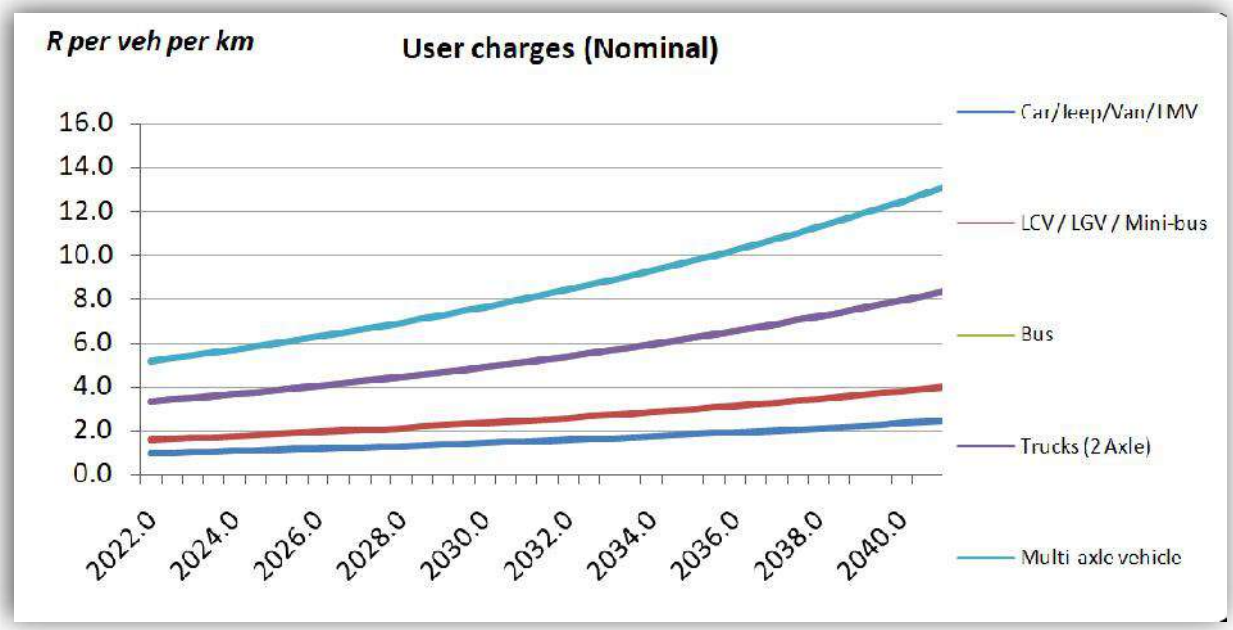
For structures more than 60m, 10 times of the length has been considered
For Bypasses, 1.5 times of the length considered

Toll Rate for 2007-08 base year for 4-Lane National Highway,

Vehicle Type	Base Rate of Fee per Km (In Rs.)
Car, Jeep, Van & LMV	0.65
LCV, LGV, Mini Bus	1.05
Bus, Truck	2.20
HCM, EME, MAV	3.45
Oversized	4.20

Toll Rate for 2-Lane National Highway is 60% of that of 4-Lane National Highway (refer sub rule 3 of Principal Rule 4)
Toll Rates are revised based on WPI as per Rule 5 of (Determination of Rates and Collection) Rules, 2008 and modified subsequently.





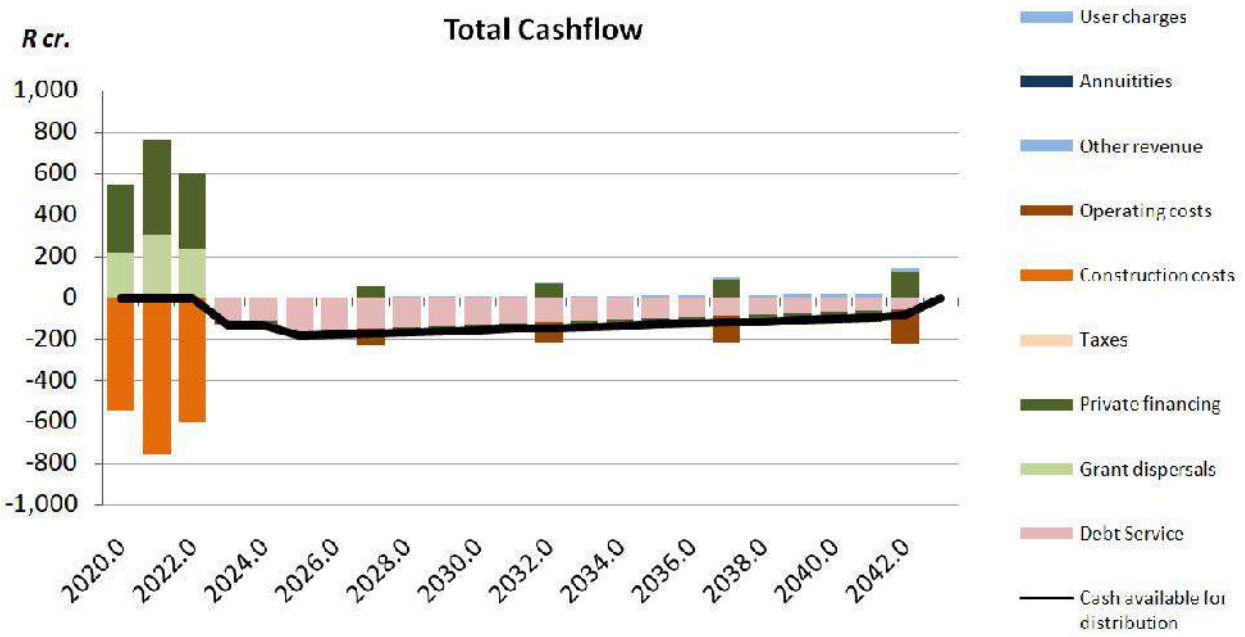
11.7 Financial Viability on BOT – Toll Mode

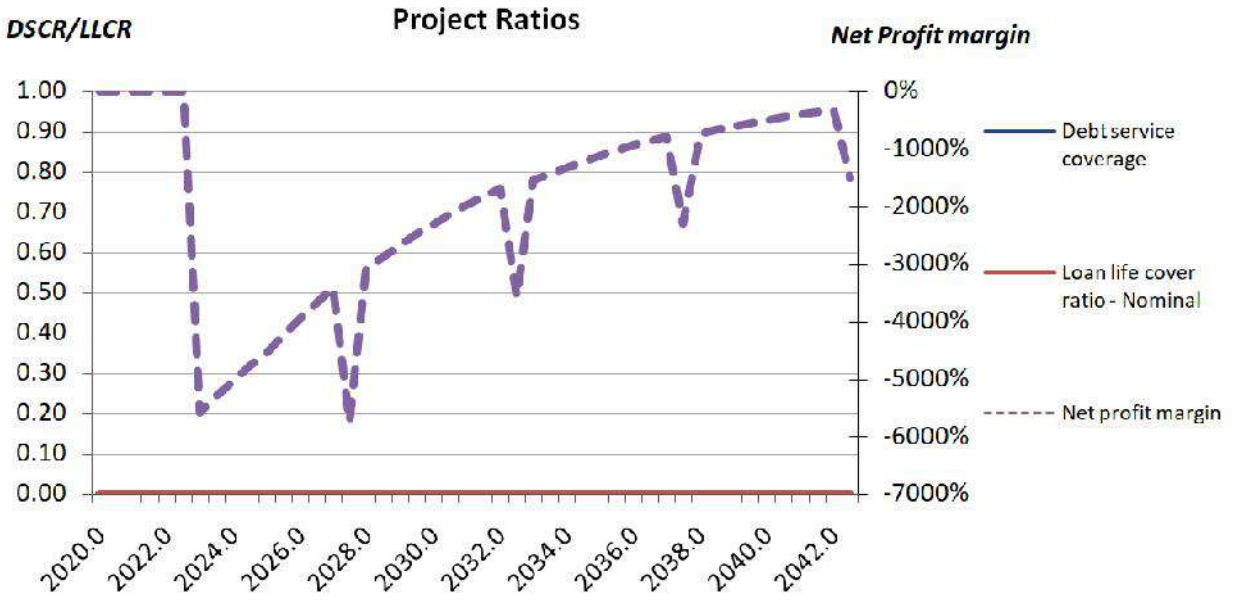
To assess whether the project is commercially viable, the returns to investors, in terms of Project IRR and the Equity IRR, are compared with the target IRRs. The target IRR for the present investment proposal is considered as 15% on equity investment. Since the investment proposal without any government proposal does not yield any result, a 40% grant is considered in the analysis. The entire grant will be provided as equity support.

Results of Financial Analysis on BOT - Toll Basis

Project NPV	Rs cr.	-953
Project IRR	%	Low (Can't be calculated)
Equity NPV	Rs cr.	-240
Equity IRR	%	Low (Can't be calculated)

The return on the proposed investment is not enough even after a VGF of 40% on the TPC as equity support. Thus the project fails on the financial viability.





11.8 Conclusion

The project fails to generate the desired level of return, even with a grant of 40% on TPC. **Thus the project does not qualify to be implemented on the BOT - Toll mode. It's recommended that the project to be implemented through EPC mode.**