Government of India
Ministry of Road Transport & Highway

NAME OF THE WORK :-SPECIALISED CONSULTANCY SERVICES FOR 'GOOD FOR TENDER' DESIGN BASED ON DETAILED INVESTIGATIONS, ESTIMATION, SURVEY, COSTING AND PREPARATION OF TECHNICAL SCHEDULES OF EPC DOCUMENTS FOR CONSTRUCTION OF MOREH BYPASS ON NH-39 NEAR INDO-MYANMAR BORDER IN THE STATE OF MANIPUR.

Detailed Project Report

Volume I – Main Volume

DECEMBER 2018

Consultants:-

M/s Choice Consultancy Services Pvt. Ltd.

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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

National Highways & Infrastructure Development Corporation Limited (NHIDCL) has decided to implement the construction of **Moreh Bypass from AH-02 & NH-39 to ICP gate at Indo-Myanmar border** in the State of Manipur on EPC Mode. To meet the project requirement NHIDCL has appointed Choice Consultancy Services Pvt. Ltd. (CCSPL) as consultant vide Letter of Acceptance No. NHIDCL /Manipur/ DPR /Moreh-Bypass /2016, Dated 23/08/2016 to prepare the Detailed Project Report for the proposed Construction of Moreh Bypass from AH-02&NH-39 to ICP Gate at Indo-Myanmar Border (2.52Km in Length) in the State of Manipur in 2-lane with paved shoulder standard.

1.2 MOREH BYPASS

The existing Bypass road starts from AH-02 & NH-39 to ICP gate at Indo-Myanmar border, of length 2.940 km. The Start co- ordinate of the project is Latitude 24°15'20.17"N and Longitude 94°17'28.69"E. The End co- ordinate is Latitude 24°14'15.76"N and Longitude 94°18'5.28"E.

The existing Moreh Bypass road passes through villages M-Chanou Village, Gamnom Village, Moulmom Village, T.L.Haijang Village, G.Moulhoi Village and ends at ICP gate at Indo-Myanmar border.

1.3 SOCIO ECONOMIC PROFILE OF MANIPUR

Manipur covers an area of 22,327 sq km and lies between latitude 23° 80' N to 25°68' N and longitude 93°03' E to 94°78' E bordering Myanmar to the east, Nagaland to the north, Assam to the west and Mizoram to the south. The hill ranges occupy 90 per cent of the total geographical area and completely surround the oval-shaped central valley, which has an area of 2,230 sq. km. The altitude of the state above mean sea level varies from 790-2020 m. The two major river systems in the state are the Barak drainage system (part of Bramhaputra drainage) and the Chindwin system. Monsoon climate and rainfall spreads from April to October. Mean maximum temperature varies from 24°C (January) to 33°C (May) and mean minimum temperature from 2°C (January) to 20°C (August). Annual rainfall in the state is 76.9 cm. The major mineral found in the state is limestone.

Physiographically, Manipur can be characterized as two distinct physical regions: an outlying area of rugged hills and narrow valleys, and the inner area representing the

features of flat plain topography with all associated landforms. The total forest cover is 17,086 sq km (as per the Forest Survey of India 2003), constituting about 77.12 per cent of the total geographical area. The majority of the forest area is of the category unclassified Forest (76.6 per cent), with a small percentage of Protected Forest area (8.4 per cent). There are 14 major lakes (wetlands) in the state, forming a major part of the area under wetlands. Broadly, there are four types of forests: (i) Tropical Semi-evergreen (ii) Dry Temperate, (iii) Subtropical Pine, and (iv) Tropical Moist Deciduous.

Manipur in northeast India is a small beautiful state with Imphal as its capital. The name Manipur literally means "Land of Jewels" and the state has a rich culture which can be seen in martial arts, dance, theatre and sculpture. Renowned for its greenery and pleasant climate, Manipur has been a popular tourist destination.

Manipur has been at the crossroads of Asian economic and cultural exchange for more than 2,500 years. It has long connected the Indian subcontinent to Southeast Asia, enabling migration of people, cultures and religions.

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 state is the birth place of the game Polo which was known as Sagol Kangjei or Pulu and is also famous for its Manipuri dance the Ras Lila created by Rajashree Bhagyachandra. Manipur also boosts of its rich culture and tradition. People of Manipur are very enthusiastic about their traditional art and dance forms. Ras Lila is the highest expression of artistic genius, devotion and excellence. Manipur is a land of festivities. Throughout the year different festivals are celebrated by the different tribes of the state.

Followings are some facts & figures regarding the state:

Table 1.1: Manipur at Glance

Location	Approximately lies between 23.8^{o} to 25.68^{o} latitude, North of Equator and between the longitudinal lines 93.03^{o}E to 94.78^{o}E.
Area	22,327 Sq. km.
Capital	Imphal (790 m above sea level)
District	Bishnupur, Churachandpur, Chandel, Imphal East, Senapati, Tamenglong, Thoubal, Ukhrul and Imphal West
Population	28,55,794 (According to 2011 cencus)
Density of Population	128 persons per sq.km.
Male	14,38,586

Female	14,17,208
Sex Ratio	985 (Female per 1000 Male)
Main languages	Meitei/Meeteilon(Manipuri), Tangkhul, Kabui Kuki, Hmar, Paite, Thadou , Bishnupriya Manipuri, English, Hindi and local dialects
Tribes	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 subtribes: Tangkhul, Maram, PoumaiNaga, Sumi,Angami, Ao, Chakhesang, Ch ang, Khiamniungan, Konyak, Liangmai,Lotha, Pochury, Rongmei, Zeme and Mao.
Literacy	79.21% (According to 2011 census)
Per capita income	Rs. 36,474/- (2012-2013)
Climate	Annual Rainfall 76.9 cm
Temperature	15^{o} C to 32^{o} C in Summer &4^{o} C to 28^{o} C in Winter
Surfaced Roads Length	National Highways - 968 km, out of which the length of NH under PWD, Manipur is 283 kms only. The remaining 685 km is under BRO. State Highways - 668 km
Crops	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.
Fruits	Litchi, cashew nuts, walnuts, orange, lemon, pineapple, papaya, peach, pear, banana and plum.
Vegetable	Cauliflower, Cabbage, Tomato, Pea etc.
Major Minerals	Limestone, Asbestos, Copper, Lignite, Nickel, Chromites, Salts etc.
Forests	17,086 sq km (76.6% of total land area).
Industries	Handlooms, Handicrafts, Sericulture, Food Processing, Bamboo Processing, IT, Hydro Power and Tourism.

1.4 DIFFICULTIES AND ISSUES

The following major difficulties 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

- Deficient road surface conditions (roughness)
- No proper Geometry of road alignment
- Culvert requiring rehabilitation and reconstruction

b) Safety

- Exposed roadside hazards.
- Inadequate traffic signs.
- Blind Curve on the project road

c) Road

- Poor pavement condition and structurally inadequate.
- Shoulder functionally and structurally inadequate.
- Cross drainage - poor condition and inadequate.
- Curve radius less than what is required for the ruling Design speed of 40 km / hr. in roads for steep terrain.
- Deficient curves and reverse curves in roads of plain terrain without transition length for safe reversal of elevation.

1.5 SALIENT FEATURES

This relates to the most suitable alignment to bypass the Moreh town 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.

Pavement design options including flexible pavement for strengthening and reconstruction of existing pavement and their life cycle costs are designed using design methods & guidelines of IRC.

All major and minor junctions/intersections have been analyzed with respect to vehicular movements and vehicular turning movements based on traffic study for

providing appropriate at-grade junction.

Table 1.2: Salient Features of the Proposed Road

	Existing	Proposed
Terrain	Mountainous / Steep	Mountainous / Steep
Length	Existing Length = 2.940 Km	Total Design Length =2.520 Km
	(As per survey)	
Alignment	The horizontal alignment of the existing road has many sub-standard and sharp curves including reverse S-curves. There is also deficiency in transition length as per MORTH standards. The vertical alignment of the existing road is also deficient along most of the alignment in respect of proper gradient.	Most of the horizontal curves including the reverse ones have been improved to achieve required design speed and super elevation reversal for riding safety and comfort in conformation to MORTH standards. The vertical alignment of the existing road is proposed as per Hill Road Specification.
Design Speed	Avg. 10-20Kmph	Ruling = 40 km/h, Limiting = 30 Km/h, Hair Pin Bend = 20 km/h
Cross-Section	Carriageway: 3.00 m- 4.50m	Proposed Road Cross Sections
		I. Open country - Mountainous terrain with retaining wall a. Carriage Way Width - 7.00m b. Paved Shoulder Width - 2x1.5m c. Roadway Width - 10.0m **II. Open country - Mountainous terrain without retaining wall** a. Carriage Way Width - 7.00m b. Paved Shoulder Width - 2x1.5m c. Earthen Shoulder Width - 1.0m (valley side) d. Roadway Width - 11.0m
CBR Considered	-	10%
Pavement Design Life	-	Flexible Pavement
Design MSA	-	Adopted MSA = 20 MSA as per IRC SP 73 2015 clause no. 5.4.1
Flexible Pavement Crust Thickness for new construction	Existing is of WBM	**Proposed Pavement Crust**
		Km 0.000 to Km 2.520
		BC: 40mm, DBM: 80mm, WMM: 250mm, GSB:200mm,

	Existing	Proposed
		Subgrade: 500mm.
Bridges	Major Bridge – Nil, Minor Bridge – 1No. Span = 2x12.0m.	a. Major Bridge = Nil
		b. Minor Bridge = 1 Nos. (Existing Bridge can be retained)
Culverts	Total Culvert =15 Nos.	Reconstruction of Existing Culvert.
	a. Pipe Culvert = 5 Nos. b. Box Culvert =10Nos.	a. Box Culvert=13 Nos.
Protection Work	Length of Retaining Wall = NA Length of Breast Wall = NA	Length of Retaining Wall = 70m Length of Breast Wall =1605.95m
Longitudinal Drains	Total Length of Lined Drain	Total Drain Length =1605.95m
Truck Lay Bye	Nil.	1 Location: Near Moreh Market, At existing CH: 1.730Km. & Proposed CH: 1.660Km.
ROW	5m to 13m.	Proposed ROW is 20m and 24m in general. However in hill cutting section impacted land boundary has been calculated from toe line to toe line of both side rather than general ROW requirement.
Land Details	Available land 0.819 Ha	Land to be acquired 6.552 Ha.
Forest Proposal	The alignment is passing through Yangangpokpi Lokchao Wildlife Sanctuary (YLWLS).	Online forest and wild life proposal was submitted. And same is under progress.
Major Intersection	2Nos.	2Nos.
Minor Intersection	6 Nos.	6 Nos., Village Roads.
Flyover	Nil	Nil
Grade Separator	Nil	Nil
Underpasses (VUP	Nil	Nil
Cattle/Pedestrians)	Nil	Nil
ROBs	Nil	Nil
RUBs	Nil	Nil
Service Road	Nil	Nil
Toll Plaza	Nil	Nil
Total Project Cost (Rs.) in Crores.	-	40.03Crores

1.6 COST ESTIMATES

The cost estimate has been made on the basis of Manipur schedule of rates for national highway works-2018. While estimating the project cost, designs and drawings are taken into accounts. Beside construction work, estimates for social impact mitigation are estimated separately.

Table 1.3: Summary of Cost Estimate

Sr. No.	Description Of Works	Total Cost (In Lakhs.)	Cost Per Km. of Total Road Length (In Lakhs.)
A	**ROAD WORKS**		
1	Site Clearance and Dismantling	5.43	2.15
2	Earth work , Subgrade and Erosion control	528.35	209.66
3	Sub-Base & Base	878.21	348.50
4	Junction Improvement (Major & Minor)	48.04	19.06
5	Traffic signs, Road marking & other road appurtenances	48.72	19.33
6	Truck Lay bye	296.24	117.55
7	Building in Truck Lay Bye	78.95	31.33
8	**Drainage and Protective Works**		
a	Longitudinal Drains	43.01	17.07
b	Retaining wall	0.00	0.00
c	Breast wall	686.01	272.23
B	**BRIDGES & CULVERTS**		
8	Box Culverts	374.59	148.65
C	**COST OF CIVIL WORKS**	**2987.539**	**1185.53**
D	Add contingencies @ 2.8% of C	83.651	33.19
E	C + D	3071.191	1218.73
F	Maintainance Cost @2.5%	76.780	30.47
G	Escalation charges 5% for 1 year (Of C)	149.377	59.28
H	Add 3% of E for road supervision work	92.136	36.56
I	Add 3% of E for Agency Charges	92.136	36.56
J	**Total Project Cost (E+F+G+H+I)**	**3481.619**	**1381.59**
K	**Total Project cost per Km (in Cr. /Km)**	**1381.595**	**548.25**
L	Add 15% of TPC for LA, US etc.	522.243	207.24
M	**Total Capital Cost**	**4003.861**	**1588.83**

2 NHIDCL STRUCTURE AND ACTIVITIES AND PROJECT FINANCING

2.1 OVER VIEW

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 km 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 knowhow 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). Organizational Structure of NHIDCL is given below:

2.2 NHIDCL STRUCTURE

NHIDCL Structure is as shown in figure below;

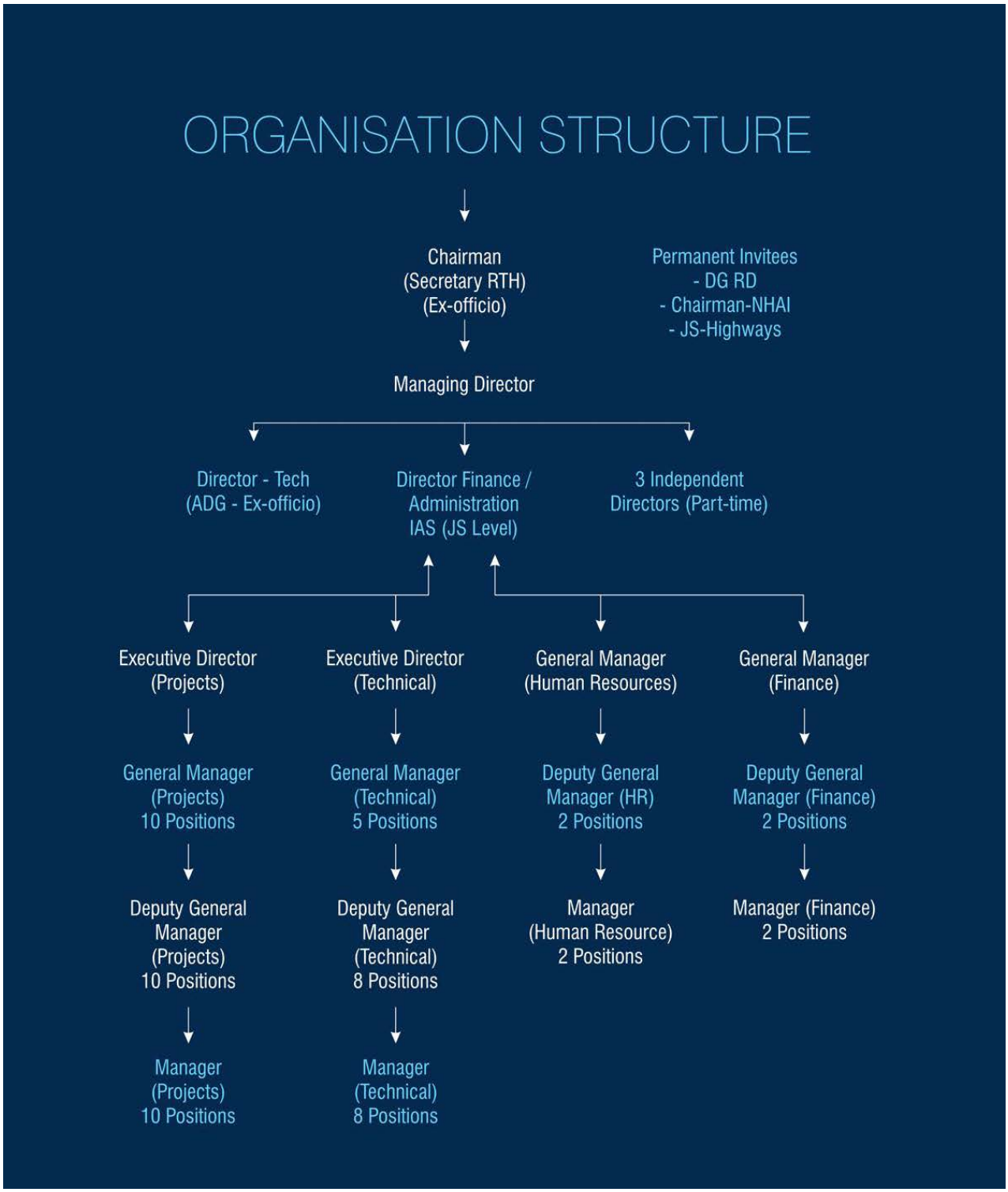


Figure 2-1: Structure of NHIDCL

2.3 ACTIVITIES IN MANIPUR

Table 2.1: Status of Activities going on in Manipur as on November 2016

Sl. No.	NH	Name of project	Road Length (km)	Estimated Cost (Rs. in crore)	TPC	Consultant	Status
1	102C	Pallel-Chandel Section of NH-102C	18	40			1. Maintenance work of Pallel Chandel completed. 2. Consultancy for DPR preparation for all the three road will be awarded in Nov. 2016.
2	102A	Shangshak-Nampisha Bharat Mala Project (BMP)	90	903			
3		Two laning with paved shoulders from Dimapur-Maram-Peren (Manipur & Nagaland)	116	1162			
4	137	2 laning of Tamenglong-Khonsang road(SARDP-NE)	40	1150		M/s PNG Planning & Structural Consultant Pvt. Ltd.	1.Draft for DPR 2 laning of the road is received and being finalized 2. Land Acquisition (LA) & Forest Clearance (FC) under progress. State Govt need to be expedite the Land Acquisition (LA) & Forest Clearance (FC) and submit the estimate in Nov 2016 enabling

Sl. No.	NH	Name of project	Road Length (km)	Estimated Cost (Rs. in crore)	TPC	Consultant	Status
							NHIDCL to invite bid for civil work during this Financial Year.
5	102A	Ukhrul -Toloi-Tadubi, NH-102A, NH(O)	115	1600		M/s CE Testing	DPR received Land Acquisition (LA) estimate awaited from State Govt. Once received proceeding for ADB funding shall be initiated.
6	53	Improvement of NH-53 between Imphal and Jiribam	220	2200		M/s CDM Smith	The Appointed DPR consultant failed to deliver. Contract terminated. New Consultant will be appointed by Feb 2017.
7	39	(i) Improvement of Imphal -Moreh section with alternate route under ADB funding	95	869			(i) Final DPR received. (ii) Land Acquisition (LA) estimate awaited from State Govt. (iii) In absence of Land Acquisition (LA) estimate proceeding for loaning from ADB is hampering. (iv) Work is planned for Award in April 2016 subject to Land Acquisition (LA) & Forest Clearance (FC).
		(ii) Alternate route under ADB funding	59				
8	State Road	Two laning with paved shoulders	150	1509			Financial Bid Opened.

Sl. No.	NH	Name of project	Road Length (km)	Estimated Cost (Rs. in crore)	TPC	Consultant	Status
		from Hafflong-Tamenglong Via Lia Sang & Tausem (ADB)					Contract negotiation is in progress.
9	53	Two laning with paved shoulders from Jiribam to Tipaimukh (ADB)	105	1135			
10	150	Four laning Imphal-Moirang, NH-150 (ADB)	45	456			
11	202	Two laning with paved shoulders from Ukhrul-Jessami (ADB)	114	1200			
12	39	Moreh Bypass{NH(O)}	3	20			DPR for 2 laning with paved shoulder under preparation and likely to be completed by Dec 2016. State Govt need to provide Land Acquisition (LA) estimate by Dec 2016.
13	102B	Rehabilitation/Strengthening of existing road Churachandpur-Singhat-Sinzawl-Tuivai sector from Km 0.00 to Km 34.500 {NH(O)}	35	48			(i) Work for carrying out Rehabilitationwill be started in Dec 2016.
14		Rehabilitation/Strengthening of existing road Churachandpur-Singhat-Sinzawl-					Contract Awarded for Civil work of Rehabilitation. (ii) Appointed

Sl. No.	NH	Name of project	Road Length (km)	Estimated Cost (Rs. in crore)	TPC	Consultant	Status
		Tuivai sector from Km 34.00 to Km 103.00 {NH(O)}					Date is 22 july 2016. (iii) Work in progress.
15	102B	Rehabilitation/Strengthening of existing road from Km 103.50 to Km 162.00{NH(O)}	59	80			(i) Work for carrying out Rehabilitationwill be started in Dec 2016.
16	102B	Rehabilitation/Strengthening of existing road Churachandpur-Tuima--Tuivai{NH(O)}	162				Consultancy services for preparation of DPR to be awarded by Feb 2017
17	53	Barak Makru Bridge	1				1. Contract for civil work is under award and work can commence in Dec/Jan if in cumbrance free land provided by State Govt. 2. Funds for Land Acquisition (LA) is being deposited shortly with State Govt.
18	102A	Restoration/Reconstruction of Ukhrul-Toloi-Tadubi road section from Km 0.00 to Km 28.00 covering 28 Km length on NH- 102A in the state of Manipur.	28	4	4	M/s Bhartiya Infra Project Ltd.	1.M/s Bhartiya Infra Project Ltd. is identified as L1 bidder. Contract signed and letter to proceed issued. 2. NHIDCL is carrying out Maintenance of existing Single lane road and work is commencing

Sl. No.	NH	Name of project	Road Length (km)	Estimated Cost (Rs. in crore)	TPC	Consultant	Status
							shortly.
19	102A	Restoration/Reconstruction of Ukhrul-Toloi-Tadubi road section from Km 28.00 to Km 50.00 covering 22 Km length on NH- 102A in the state of Manipur.	22	15	15	M/s Shongvah Thanmi	1.M/s Shongvah Thanmi is identifieda s lowest bidder. Contract signed and letter to proceed issued. 2. NHIDCL is carrying out Maintenance of existing Single lane road and work is commencing shortly.
20	102A	Restoration/Reconstruction of Ukhrul-Toloi-Tadubi road section from Km 50.00 to Km 70.00 covering 20 Km length on NH- 102A in the state of Manipur.	20	11	11	M/s Bhartiya Infra Project Ltd.	1.M/s Bhartiya Infra Project Ltd. is identified as L1 bidder. AA & FS awaited. Contract signed and letter to proceed issued. 2. NHIDCL is carrying out Maintenance of existing Single lane road and work is commencing shortly.
21	102A	Restoration/Reconstruction of Ukhrul-Toloi-Tadubi road section from Km 70.00 to Km 90.00 covering 20 Km length on NH- 102A in the state of Manipur.(Re-tender)	20	16	16	-	Bids re-invited with bid due date as 02.12.2016
22	102A	Restoration/Recons	25	15	15	-	Bids re-invited

Sl. No.	NH	Name of project	Road Length (km)	Estimated Cost (Rs. in crore)	TPC	Consultant	Status
		truction of Ukhrul-Toloi-Tadubi road section from Km 90.00 to Km 115.00 covering 25 Km length on NH-102A in the state of Manipur.(Re-tender)					with bid due date as 02.12.2016

2.4 PROJECT FUNDING

Roads are one of the single most important development demands from the NE States. Density of roads in NER is far less than the national average. NER Vision 2020 and XIth Five Year Plan also emphasise criticality of expansion, maintenance and improvement of the road network at all levels from NH to rural roads and even porter tracks to provide the essential basis for trade and economic development. Even though the road network per capita is significantly higher in NER related to the rest of the country, the road length per unit area is low.

Therefore, construction of roads at all levels in NER is of the highest priority to the Central and State Governments. A massive programme of road construction and improvement has been taken up by the Government for NER from different sources.

A rough estimate of the funds that are likely to be spent on Transport sector during the XIth Five Year Plan has been made. It includes the following:

- The Plan allocation made by the 8 States of the North East India for the Transport sector;
- The Plan allocation for the North Eastern Region by the Department of Road Transport and Highways;
- The total Plan allocation for the North Eastern Region by the Department of Rural Development on roads;
- As advised by the Planning commission, 90% of the allocation on the Transport sector of the State Government has been taken as for roads;
- It includes approximately Rs.2000 crore each that might be contributed by BRO, NEC and Ministry of DONER.
- The amount allocated for the XIth Five Year Plan for the Department of Road Transport and Highways and the Department of Rural Development has been estimated at 10% for the North Eastern States.

Roads are funded at different levels and by a plethora of Departments and Ministries of State and Central Government for NER. The various categories of roads are:

- National Highway
- State Highway
- Major District Roads
- Other District Roads
- Rural Roads
- Forest Roads
- Urban Roads
- Border Roads
- General Staff (GS) Roads
- Strategic Roads

The organizations that are involved in funding/constructing/ maintaining roads are numerous as are the schemes and projects under which these are done. Some of these schemes are:

Under Ministry of Road Transport and Highways

- National Highway (Original)
- Maintenance &Repairs of NH
- Central Road Fund for State Roads
- Inter State Connectivity
- Roads of Economic Importance
- Special Accelerated Road Development Programme for North Eastern Region (SARDP-NE)
- Arunachal Package of Roads

Under Ministry of Rural Development

- Mahatma Gandhi National Rural Employment Guarantee Scheme (NREGA)
- Pradhan Mantri Gram Sadak Yojana (PMGSY)
- Roads funded by NABARD
- Agriculture Link Roads

Under Ministry of DONER

- North Eastern Council (NEC)
- Non-Lapsable Central Pool of Resources (NLCPR)

Under Ministry of Urban Development

- Jawaharlal Nehru National Urban Renewal Mission (JNNURM)
- Urban infrastructure Development Scheme for Small & Medium Towns
- Integrated Development of Small & Medium Towns (IDSMT)
- Lumpsum Provision for the Projects/Schemes for the Benefit of North Eastern Region and Sikkim

Planning Commission

- Additional/Central Assistance
- Special Packages for different areas

- Roads from State Government's own budget
- Roads being constructed by Autonomous District Councils, Zila Parishads

Ministry of Defence

- Strategic Roads by BRO

Ministry of Home Affairs

- Border Area Development Project (BADP)
- Hill Area Development Project (HADP)
- Border Roads

Ministry of Panchayati Raj

- Backward Region Grant Fund (BRGF)

Multi-lateral and bi-lateral funding agencies

- World Bank
- ADB
- Others

3 PROJECT BACKGROUND

3.1 ABOUT NATIONAL HIGHWAY-39:

The Highway connect Imphal-Moreh earlier known as NH-39 has been renamed as NH-102 (as per letter no. NH 14019/9/2007-P&M dated 28th April 2010 By Ministry of Road Transport & Highways (P & M section)). The highway starts from it's junction with NH-2 near Imphal and terminating near Moreh (Indo-Myanmar border) in Manipur state. This road stretch is one of the most important links connecting India and Myanamar as well as adjoining countries like Thailand.

The India–Myanmar–Thailand (IMT) trilateral highway is a highway under construction that will connect Moreh (at NH-39), India with Mae Sot, Thailand via Myanmar. The road is expected to boost trade and commerce in the Asian–India Free Trade Area, as well as with the rest of Southeast Asia.

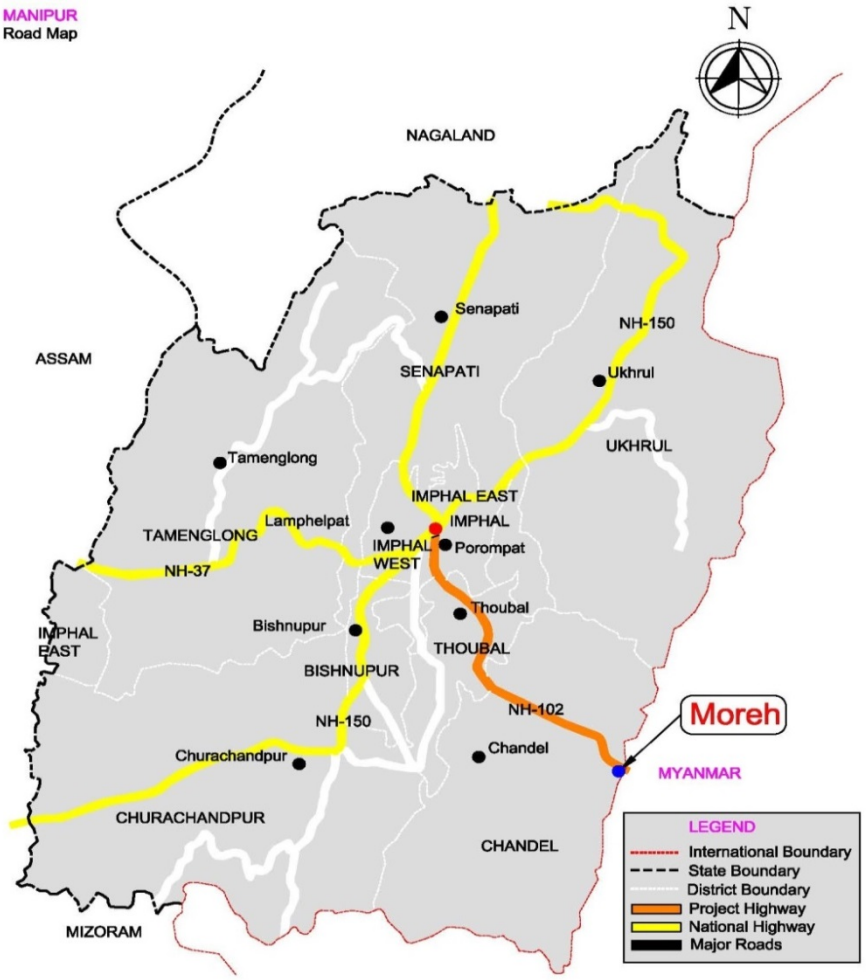


Figure 3-1: Manipur Road Map

3.2 PROJECT LOCATION

The proposed Moreh bypass road falls within Chandel district, in the state of Manipur near indo-Myanmar border.

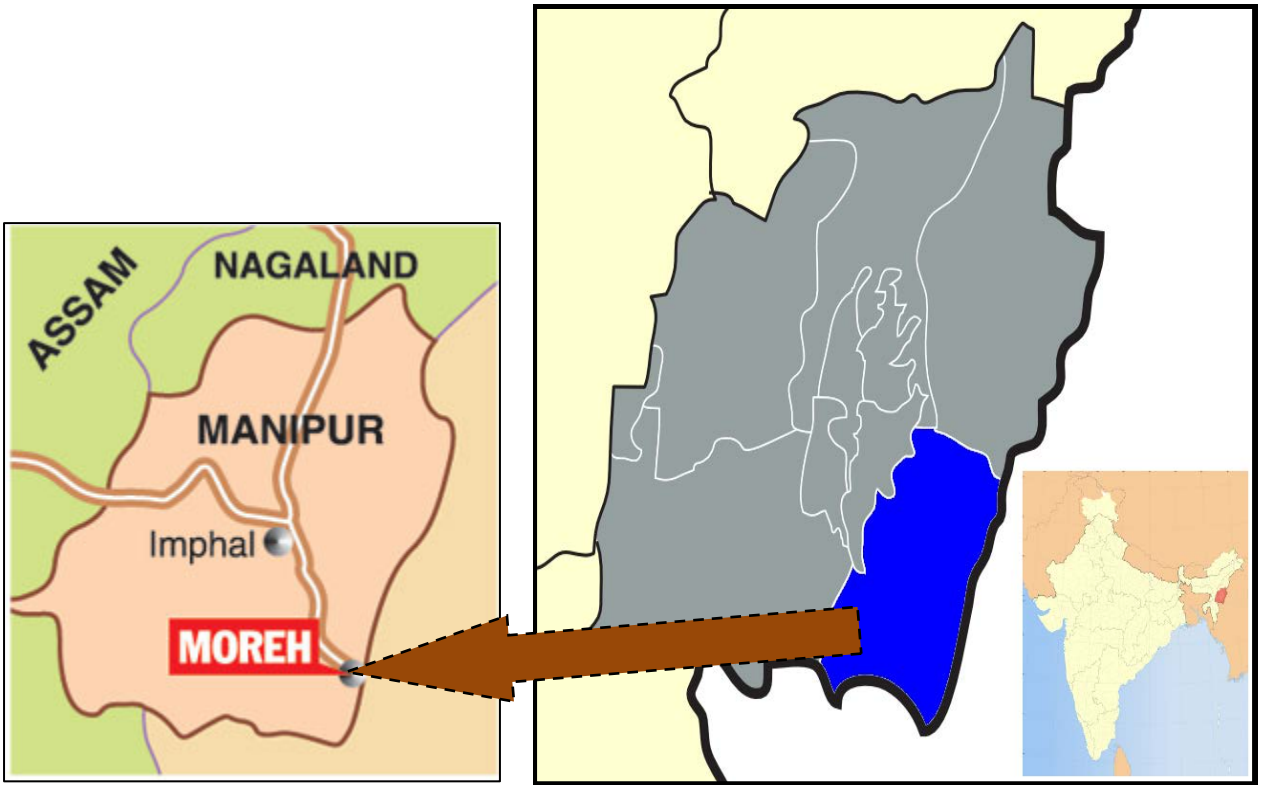


Figure 3-2: Project Location Map

3.3 PROJECT DESCRIPTION:

The proposed Moreh Integrated check post will facilitate speedy movement of export-import consignments and reduce any inconvenience to the general public from any increase in trade. But the existing bypass which joins it with national highway is in very poor condition. If the bypass facilitates smooth riding and speedy movement; the ICP will get more importance. There were three alternatives we studied to bypass the Moreh town and below shown realignment of existing bypass are finalized by the client. Existing and proposed alignments are shown in below figures:

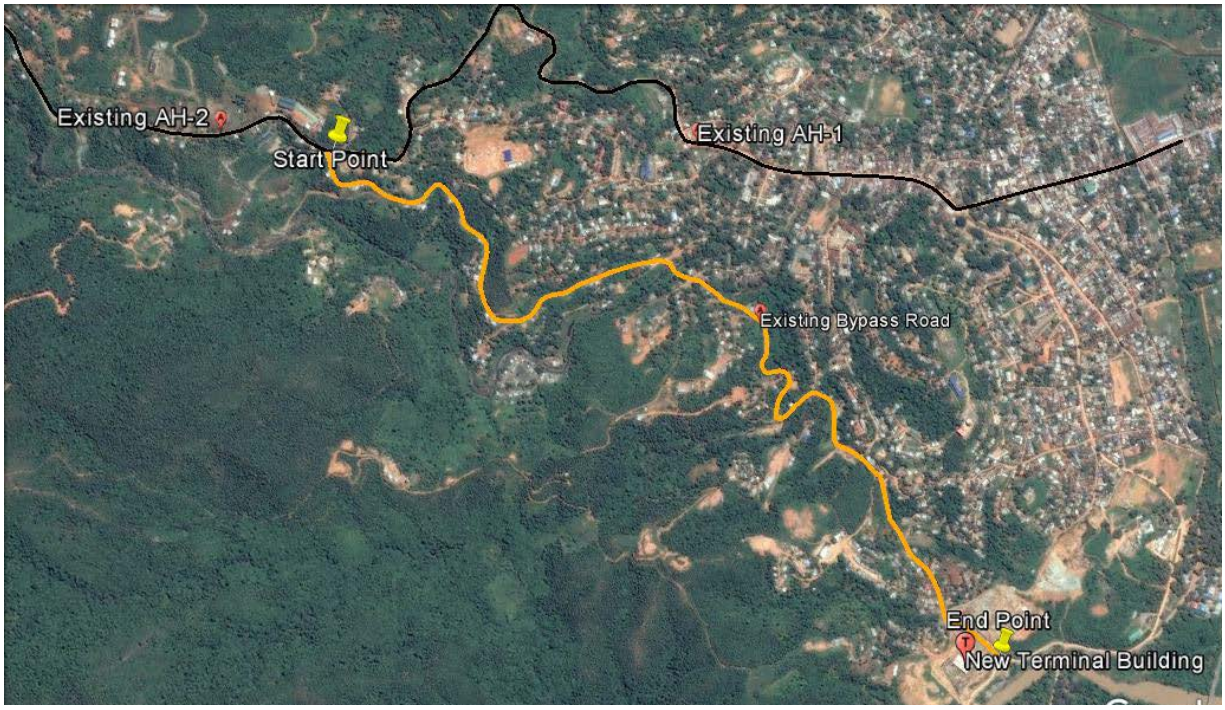


Figure 3-3: Key Map Showing Existing Alignment

Figure 3-4: Key Map Showing Proposed Alignment

Start point of the Project

Starting junction of the project

Minor Bridge

Minor Bridge

Minor Bridge Approach

Road Condition

Culvert near ICT

Road Condition

ICT Terminal Building

Warehouse at the ICT Terminal under

Retaining wall near ICT

End point -India Mynmar Friendship Bridge

Figure 3-5: Project Site Photographs

3.4 TERRAIN

Existing Bypass: Existing bypass road alignment starts from AH-02 & NH-39 to ICP gate at Indo-Myanmar border (near new terminal building). It goes from right side of Asian Highway-02. The alignment passes through Lalkai veng, Hai jang, Lhangkichoi, Vanleng Moul, Phainom veng. Total length of approx. 3.75m wide stretch is 2.940 Km has hilly & rolling terrain.

3.5 LAND USE

The largest proportion of land abutting the alignment is hilly, heavily vegetated followed by built-up areas.

3.6 BUILT – UP AREAS

The existing bypass passes through Lalkai veng - Hai jang - Lhangkichoi - Vanleng Moul - Phainom veng. The built up areas falls in stretch are as follows-

Table 3.1: Location of built up Areas.

Sl No.	Location	Existing Chainage
1	Hai Jang	0/700
2	Phainom Veng	2/400

The bypass is required to be provided due to following reasons

- To connect integrated check post by national highway 39 (Asian Highway).
- To avoid vehicle movement in congested zone for making safe movement.
- Ease and speedy movement.
- To enhance the geometric deficiency.

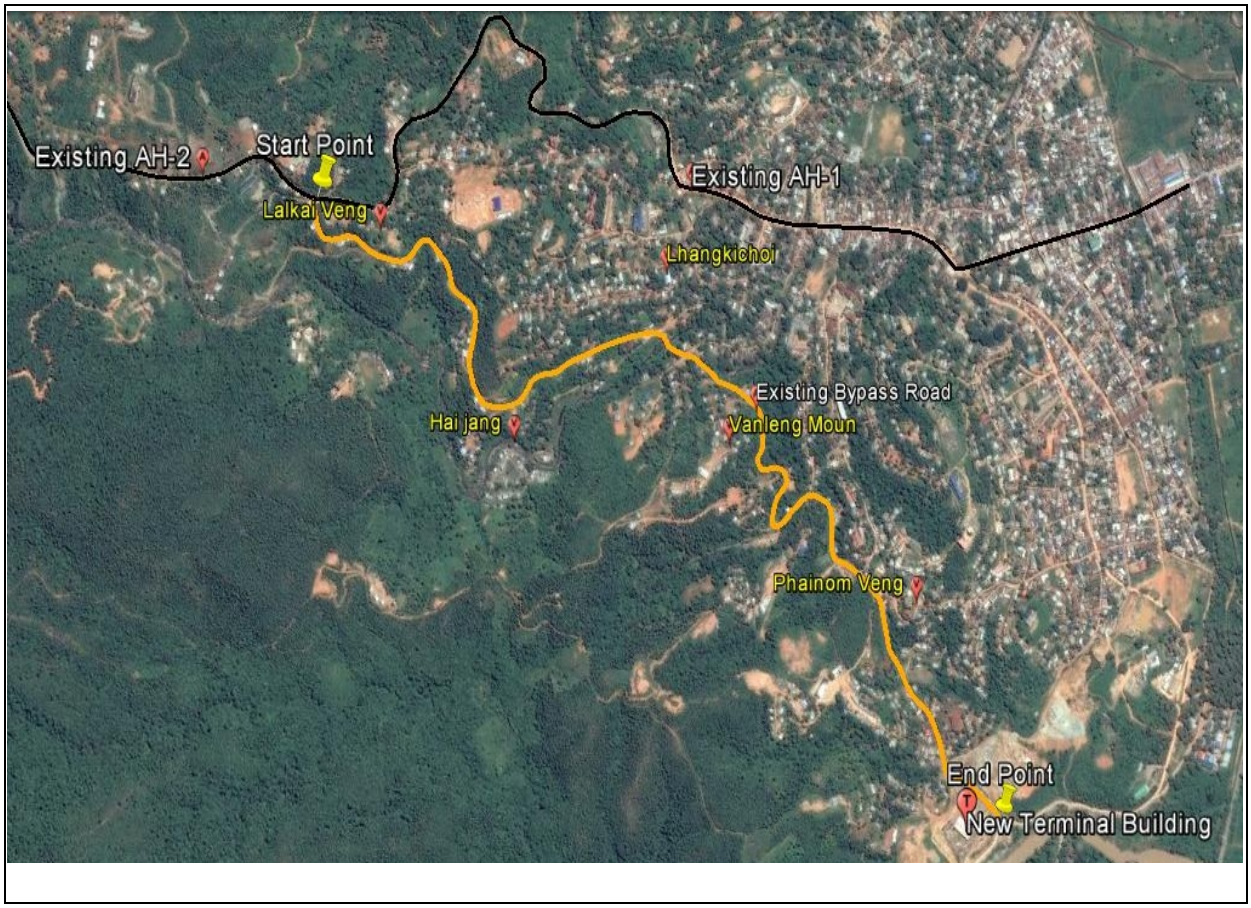


Figure 3-6: Details of Villages of Project Corridor

Considering the above causes bypass / realignment of bypass may be proposed along the existing bypass. The existing bypass is passing through various villages.

3.7 CARRIAGEWAY WIDTH

Existing project road is bituminous road for a length of 300m in the start and after that earthen type road of 2.80m to 4.25m width. There is a substantial variation in the profile of the carriageway along the existing carriageway. The pattern of existing carriageway for existing bypass is shown below in the following Table.

Table 3.2: Existing Carriageway Width

Kilometer		Carriage way width in meters
From	To	
0/000	200	4.25
0/200	0/400	3.50
0/400	0/600	4.10
0/600	0/800	4.30
0/800	1/000	3.30
1/000	1/200	3.50

Kilometer		Carriage way width in meters
From	To	
1/200	1/400	3.75
1/400	1/600	2.80
1/600	1/800	3.25
1/800	2/000	3.75
2/000	2/200	3.75
2/200	2/400	3.50
2/400	2/600	3.70
2/600	2/940	3.75

3.8 HORIZONTAL ALIGNMENT

Most of the places the alignment is over steep curves and sharp bends which would need improvement as per the geometric requirement of NH Two lane/Four lane specifications. In accordance with provisions of IRC SP: 73-2015, the existing alignment would be examined and realignment is suggested where improvements are essential.

3.9 VERTICAL CURVES

The vertical geometry is an issue of significance due to existing terrain and cross drainage structures. This issue will be reviewed and modified once the details of topographical survey are available.

3.10 PAVEMENT CONDITION

The existing pavement is generally flexible in nature except in some area where no road is available. The average carriageway width of the road has 3.75 meters without earthen shoulders on either side. Visual inspection of the road showed a very bad surface condition. Approximate 20-30 % of the highway accepts damaged riding surface but existing bypass road isn't in good condition and new construction of the same can be recommended. The details on above are given in following table.

Table 3.3: Pavement Condition along the alignment

Kilometer		Pavement Details	Type of Surface
From	To		
0/000	0/300	The pavement condition is very poor, cracks and vertical settlement observed.	Bituminous surface
0/300	2/940	An earthen roadway of an average width 3.75m. There are so many potholes on road due to improper drainage system, lac of design etc.	Earthen surface

The pavement is showing signs of distress, due to:

- Lack of pavement drainage.
- Inadequate pavement thickness and composition.
- Inadequate maintenance.
- The defects noticed are:
- Cracking (alligator, transverse, longitudinal, edge)
- Rutting, Raveling
- Potholes, rain cuts.

Figure 3-7: Pavement Condition of the Project Highway

3.11 SOIL AND SUBSOIL

The soil cover of Moreh can be broadly classified into two types namely; Red ferruginous soil which is seen in the hilly area and alluvial soil in the valley area. The soil of valley regions commonly contains small fragments of rocks, loam, sandy clay and sand and they are quite diverse.

3.12 UTILITIES ALONG THE PROJECT HIGHWAY

Electricity Poles were noticed in certain places running on the outer edge of the ROW. It is proposed to examine provision of additional utilities e.g. Truck lay bay passenger facilities where required and other passenger amenities.

3.13 BRIDGES AND CROSS DRAINAGE STRUCTURES

Table 3.4: Summary of Existing Bridges and Culverts

S. N.	Type of Cross Drainage Structures	Number

1	Minor Bridge	1
2	Box Culverts	10
3	Pipe Culverts	5

The inventory data for the existing cross drainage structures, culverts and bridges were carried out. The existing bypass road has 1 Minor bridge and 15 Culverts, the summary of the same is given below in following Table.

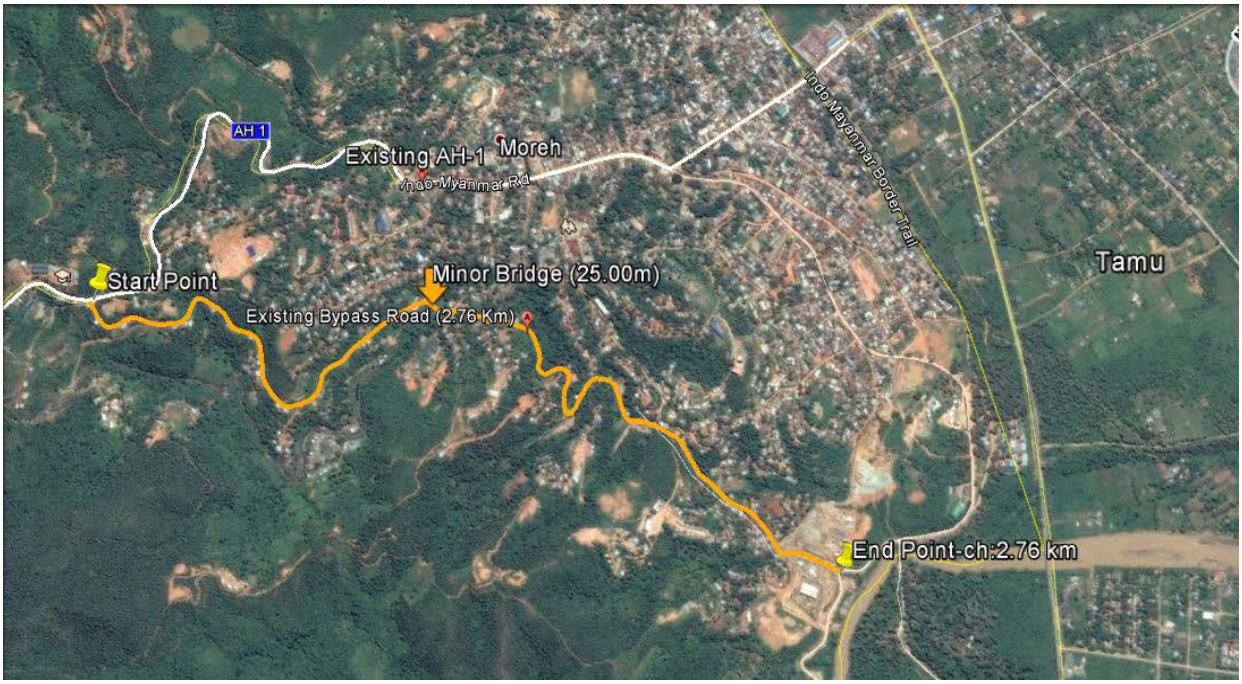


Figure 3-8: Bridges on Existing Bypass


MB
CH:0839


MB
CH:0845


MB
CH:0838


MB
CH:1248


MB
CH:1253


H29

Figure 3-9: Photographs of Structures on the existing project corridor

3.14 LEVEL CROSSING AND ROB

The project road does not have any railway level crossing.

4 SOCIO ECONOMIC PROFILE OF THE PROJECT AREAS

4.1 MANIPUR IN GENERAL

Manipur, one of the states situated in the North Eastern Region of India, is an isolated hill-girt state stretching between 92°58´E to 94°45´E longitudes and 23°50´N to 25°42´N latitudes. It is a charming place encircled by nine hill ranges on all sides with a small and beautiful oval shaped valley at the center. The State has 352 kms. long international border with Burma (Myanmar) to the south-east and 502 kms. long border with the adjacent states of Nagaland on the north, Cachar District of Assam on the west and Chin Hills (Myanmar) and Mizoram on the south and the south-west and Surma Tract and upper Chindwin of Myanmar (Burma) on the East. The altitude of the State above the mean sea level varies from 790 metres to 2020 metres. It has sub-tropical temperate climate. The annual rainfall of Manipur, as recorded by ICAR, Lamphelpat is 1657.2 mm. in 2015. The State has a salubrious climate.

Manipur, though tiny in size, has a distinct history of its own. The recorded history of Manipur can be obtained from the State Royal chronicle called the Cheitharol Kumpaba which covers the period from 33 AD to 1890 AD. During this period, altogether 74 (seventy four) kings ruled the State, of which Nongda Lairen Pakhangba (33 AD to 154 AD) was the first and last was Kulachandra. Manipur was then a tiny independent kingdom.

Manipur lost her independence to the British India in the year 1891. From 1892 onwards it became a princely native state under the political control of Government of British India. Accordingly, the administration of the state came under the influence of a political agent by vesting all executive powers in him. This British Paramouncy continued till 1947 in which India got independence.

According to a merger agreement signed on 21st September, 1949 between Maharaja Budhachandra, the then king of Manipur and the government of India, the state was merged into India as a part "C" State on the 15th October, 1949 and administered by the President of India through a Chief Commissioner. Manipur ceased to be a part "C" State on the 1st November, 1956 and became a Union Territory under the Union Territorial Council Act, 1956. The Territorial Council consisting of 30 elected members and 2 (two) nominated members was constituted on 16-8-1957. However, the Territorial Council was replaced by all Territorial Legislative Assembly of 30 members and 2 (two) nominated members from 23-7-1963. Manipur became a full-fledged state within the Indian Union with a Governor as the Head of the state on the 21st January, 1972 and the members of the Legislative Assembly was increased to 60. The first popular Ministry, after attaining statehood, was installed on March 20, 1972.

4.2 STATE PROFILE

Manipur has a geographical area of 22,327 sq.kms. which constitutes 0.7 % of the total land surface of India. Ninety Percent of the total geographical area of the state i.e. 20,089

sq.kms. is covered by hills, the remaining area is a small valley covering only 2,238 sq.kms. and accounting for only one-tenth of the total area of the state.

According to final figures of the 2011 population census, the population of the state is 28.56 lakhs registering a population density of 128 per sq.km. The population has increased by 5.62 lakhs during the decade 2001 to 2011. Out of the 28.56 lakh population, 3.41 % are scheduled castes communities and 40.88 % are of scheduled tribes. There is apparent disparity in the level of income and consumption between the rich and the poor, between the urban elite and the rural poor, between the haves and have-nots and between the public living in the hills and in the valley.

The state has 51 towns (28 statutory towns and 23 census towns) and 2,582 village (2515 Habited and 67 Un-inhabited) as per 2011 census (final). Imphal is the capital city of Manipur. About 48 kms. away from Imphal towards south-east lies the Loktak Lake, the largest fresh water lake in the North-Eastern Region of India. This lake which covers an area of 216 sq.kms., is the biggest natural source of fish supply which is one of the important food items of the people of the state.

4.3 TOPOGRAPHY/PHYSIOGRAPHY

Physiographically Manipur may be characterised in two distinct physical regions – an outlying area of rugged hills and narrow valleys, and the inner area of flat plain, with all associated land forms. These two areas are not only distinct in respect of physical features but are also conspicuous with regard to various flora and fauna. The valley region would have been a monotonous, featureless plain but for a number of hills and mounds rising above the flat surface. The Loktak Lake is an important feature of the central plain. The total area occupied by all the lakes is about 600 km². The altitude ranges from 40 m at Jiribam to 2,994m at Mt.Iso Peak near Mao Songsong.

Major portion of the state is covered by hill ranges. Topographically the state is divided into three major regions: a) Hills, b) Imphal Valley and c). Barak Basin. The Imphal valley which is around 48.3 km in length and 32.2 km in breadth lies in the centre of the state. Several hill ranges 6 dotted the valley, the biggest being the Langol Hill Range. The hills are generally irregular serrated ridges, occasionally rising into conical peaks and flattened cliffs.

The major rivers of Manipur are Barak River and the Turela Achonba River which is also known as Imphal or Manipur River. Imphal River is the longest river and it also collects excess water from the Loktak Lake and flows to join the streams of Ningthee and chindwin river of Myanmar. The other major rivers of Manipur are Thoubal, Fril, Sekmai, Kongba, Chakpi, Khuga and Nambol. Many small streams also flow in the hill.

4.4 SOIL

The soil cover can be divided into two broad types, viz. the red ferruginous soil in the hill area and the alluvium in the valley. The soil generally contains small rock fragments, sand and sandy clay and are of varieties. The top soils on the steep slopes are very thin. In the

plain areas, especially flood plains and deltas, the soil is of considerable thickness. Soil on the steep hill slopes is subjected to high erosion resulting into formation of sheets and gullies and barren rock slopes. The normal pH value ranges from 5.4 to 6.8.

The soil cover of Manipur can be broadly classified into two types namely; Red ferruginous soil which is seen in the hilly area and Alluvium soil in the valley area. The soil of valley regions commonly contains small fragments of rocks, loam, sandy clay and sand and they are quite diverse. The steep slopes consist of a very thin Top soil and these top soils of steep slopes are subjected to high soil erosion which results in culverts and infertile rocky slopes.

4.5 DISTRICTS

The state of Manipur splits up naturally into two tracts viz. the hills and the dales. The hill comprises of Seven districts namely:

i) Kangpokpi
ii) Tengnoupal
iii) Pherzawl
iv) Noney
v) Kamjong
vi) Jiribam
vii) Kakching

4.6 DEMOGRAPHIC FEATURES

Population of a country is its most important asset and demographic indicator. The population of Manipur as per 2011 census was 28.56 lakhs comprising 14.39 lakhs of males and 14.17 lakhs of females. Population of Manipur constitutes nearly 0.24 % of the total population of India. The density of population of Manipur as per 2011 census was 128 persons per sq.km. as against 103 persons per sq. km. in 2001 census. The sex ratio for the state as a whole has improved from 974 females per 1000 males in 2001 to 985 females per 1000 males in 2011.

The population growth rate of Manipur is found to be higher than that of India. The population growth rate of Manipur in 2011 is 24.50 % as against All India growth rate of 17.70 %.

In terms of literacy, Manipur ranks fifth among the North Eastern States of India as per the final figures of the 2011 census. The literacy rate has increased from 70.50 % in 2001 to 76.94 % in 2011. Among the males, it has increased from 80.30% in 2001 to 83.58 % in 2011, whereas among females, it has increased from 60.50% in 2001 to 70.26 % in 2011.

4.7 STATE DOMESTIC PRODUCT

The State Domestic Product and the per capita income reflect overall performance of the state's economy during a given period.

The Gross State Domestic Product (GSDP) of Manipur for 2013-14 at current prices is estimated to be Rs. 14,323 crores as against Rs. 12,697 crores for the year 2012-13 registering an increase of 12.82 %. At constant (2004-05) prices, GSDP in 2013-14 is estimated at Rs. 8,330 crores as against Rs. 7,843 crores in the previous year showing an increase of 6.22 %. The average annual exponential growth rates between 2004-05 to 2013-14 are worked out to be 11.40 % and 5.38 % for current and constant prices respectively.

The Net State Domestic Product (NSDP) at current prices for the year 2013-14 is estimated at Rs. 12,559 crores as compared to Rs. 11,131 crores for 2012-13 registering an increase of 12.83 % over the previous year. Per capita income at current prices is worked out to be Rs. 41,573 in 2013-14 as compared to Rs. 37,656 in 2012-13 indicating an increase of 10.40 %.

And the Net State Domestic Product (NSDP) at constant (2004-05) prices for the year 2013-14 is placed at Rs. 7,263 crores, which is higher than that of the preceding year by about 6.23 %. The per capita income at constant (2004-05) prices for the year 2013-14 is estimated at Rs. 24,042 which is higher than that of the preceding year by about 3.94 %.

4.8 PRICE SITUATION

Prices serve as signals to producers and consumers. It is the value of goods and services in terms of money. Prices represent the terms on which people and firms exchange different commodities. In fact, households buy goods and sell factors of production where firms/businesses sell goods and buy factors of production. Everything has a price and price level played an important role in the economy of a Country/State. The rising trend of prices in the state continued to be a matter of great concern for the economy of the state.

4.9 BUDGETARY POSITION

State Budget shows the complete picture of the estimated receipts and expenditure of the State. Aggregate receipt is estimated to be Rs. 32,258.46 crores in 2015-16 (BE) including Rs. 8657.86 crores of revenue receipts and Rs. 23600.61 crores of capital receipts (including Public Account). The revenue receipts is estimated to decrease by 13.10 % in 2015-16 (BE) over the previous year 2014-15 (RE) and capital receipt also is estimated to increase by 1.15 %. The overall decrease in receipts is accounted to be 3.12 %. The aggregate expenditure (revenue and capital disbursements) in 2015-16 is anticipated to be Rs.31715.27 crores which is about 2.61 % less than that of 2014-15. The overall saving anticipated during the financial year 2015-16 is Rs. 543.19 crores.

4.10 PLAN SIZE

Out of the total proposed outlay of Rs. 8,154 crores for the Eleventh Five Year Plan (2007-12), Rs. 2,425.92 crores is proposed for the annual plan, 2009-10. During the Tenth Plan (2002-07), the State's allotment as approved by the Planning Commission was Rs. 2,804 crores which is about 15.55 % more than the size of the Ninth Five Year Plan. However, the actual expenditure incurred during 2002-03, 2003-04, 2004-05, 2005-06 and 2006-07 were

Rs. 197.27 crores, Rs. 286.62 crores, Rs. 601.05 crores, Rs. 667.27 crores and Rs. 1,045.56 crores respectively.

Out of the total Proposed outlay of Rs.8,154 crores of the Eleventh Plan, the highest priority is given to Social Services with Rs. 3,246.56 crores which is 39.60% of the total outlay followed by Energy with Rs. 1,498.71 crores and Irrigation & Flood Control with Rs. 772.38 crores.

In the Agreed outlay of Rs.1,660.00 crores for the Annual Plan, 2008-09, Irrigation and Flood Control has been given an outlay of Rs.267.20 crores (16.10 %). The Energy sector received Rs.123.50 crores (7.44 %). Industry and Minerals sector has been given an outlay of Rs.90.36 crores (5.44 %). The transport sector is provided with an outlay of Rs.26.75 crores (1.61%). The outlay for the other sectors were Rs.595.56 crores (35.88 %) for General Economic Services, Rs.42.30 crores (2.55 %) for Rural Development, Rs.67.19 crores (4.05 %) for the Special Area Programmes, Rs.25.40 crores (1.53 %) for Science, Technology and Environment and Rs.26.56 crores (1.60 %) for Agriculture and Allied Activities. The Social Service sector including Education, Health, Water Supply and Welfare of scheduled tribes and castes etc., has been given an outlay of Rs.382.69 crores (23.05 %). The General Services sector is provided with an outlay of Rs.12.50 crores i.e., 0.75 %t of the total outlay.

For the Twelfth five year plan (2012-17), projected outlay of Rs. 20,457.91 crores has been proposed. General Economic Services gets with Rs. 394.45 and Top Priority at social services with Rs. 10,554.26 crores and Irrigation & Flood Control with Rs. 3,159.41 crores.

4.11 AGRICULTURE AND ALLIED SECTOR

Agriculture sector has a vital place in the economy of the state. It contributes a major share to the State Domestic Product. 52.81 % of the workers in Manipur are engaged as cultivators and Agricultural labourers. However, the performance of agriculture in the state mainly depends on timely rainfall and weather conditions. Permanent cultivation is generally practised in the valley districts while terrace cultivation is practised in some pockets of the hills where jhuming or shifting cultivation is widely adopted in most of the hills. Rice is the staple food and is grown in hill and plain areas and it accounts for about 98 % of the total foodgrain production of the State in 2012-13. The production of rice in 2014-15 is estimated at 4.82 lakh tonnes which is more than the preceding year's rice output of 4.77 lakh tonnes. In case of maize, production in 2014-15 is estimated to be 11.32 thousand tonnes as against 11.55 thousand tonnes in the preceding year.

4.12 HORTICULTURE

Manipur is suitable for the development of horticulture. Besides, there is ample scope for bringing more land under fruit cultivation in the hill areas. Even in the plains, soil conditions are conducive to production of citrus fruits, banana, guava, peaches, apricot, papaya etc. There is sufficient scope for cultivation of pineapples in the medium high range of the hills in Manipur. The major fruits grown in the state are pineapple, orange, lemon, banana, guava, peaches etc. Now-a-days apples are grown in the hills of Manipur. For the promotion of

healthy growth of horticulture in Manipur, it is essential to develop horticultural marketing. The average annual production of fruits and vegetables during the year 2013-14 was 5.16 lakh MT and 2.64 lakh MT respectively.

4.13 LIVESTOCK

According to the livestock census conducted in 2012, there were 6.93 lakhs livestock in Manipur. Of these 2.64 lakhs were cattle, 0.66 lakhs were buffaloes and 2.77 lakhs were pigs. The poultry population was recorded to be 24.80 lakhs. The main livestock productions in the state are milk, egg and meat. The total milk production in 2014-15 was 82.17 thousand tonnes which was 0.58 % greater than the production of 81.70 thousand tonnes in 2013-14. The estimated production of eggs in 2014-15 was numbering at 1,130.96 lakhs showing a decrease of 2.95 % over the production of 1,165.31 lakhs in 2013-14. The estimated meat production for the year 2014-15 was 26.57 thousand tonnes which was more than 45.83 % over the production of 18.22 thousand tonnes in 2013-14.

4.14 FOREST

The state has vast area of forest covering as much as 17,418 sq.kms. which forms about 78% of the total geographical area of the state. The actual area under forest is about 15% higher than the recorded forests area of the state. Of the total forests area, reserved forests and protected forests accounts for 1,467 sq.kms. and 4,171 sq.kms. during 2012-13.

The remaining 11,780 sq.kms. is treated as 'Unclassed forest'. The important major forests products are timber, firewoods, bamboos, cane etc. The production of timber other than teak has shown a decline from 2.98 thousand cubic metres in 2012-13 to 5.22 thousand cubic metres in 2013-14.

4.15 FISHERIES

Though the state has no marine fishery, it has vast inland fishery resources like ponds, tanks, natural lakes, marshy areas, swampy areas, rivers, reservoirs, submerged cropped land, low lying paddy fields etc. The target source of fish is the Loktak Lake. The production of fish in Manipur for the year 2014-15 was estimated to be 32.00 thousand tonnes as against the 28.00 thousand tonnes in 2013-14.

4.16 RURAL DEVELOPMENT

Manipur lives in villages. The rural population constitutes about 70.79 % of the total population according to the final figure of the Population Census, 2011. Enhancement in the quality of life of the economically weaker sections of the society has been one of the basic objectives of development planning of the state. In order to achieve this goal a number of programmes viz., MREGS (Mahatama Rural Employment Guaranteed Scheme), SGSY (Swarnjayanti Gram Swarozgar Yojana), SGRY (Sampoorna Grameen Rozgar Yojana), IAY(Indira Awaas Yojana), PMGY (Pradhan Mantri Gramodaya Yojana), PMGSY (Pradhan Mantri Gram Sadak Yojana) etc. have been implemented in the state. These programmes

ensure minimum wage to rural workers and enable them to acquire assets and income through Self-employment ventures. Under MGNREGS 5.12 lakhs canal Job Card has been issued during 2014-15. Houses Constructed and upgraded under IAY and Roads Constructed under PMGSY is shown in table no. 6.4 and 6.5.

4.17 MANUFACTURING

Inspite of the fact that Manipur is endowed with mineral and forest resources, industrialisation has been painfully slow in the state. This is because of shyness of capital, acute transport bottleneck, shortage of power and lack of entrepreneurial activity and technical skills. Despite persistent efforts made by the Government, the state continues to be an industrially backward state. Various policies and programmes with the provisions of packages of incentives and concessions could do little in this regard. Almost all the public undertaking industries of the state were facing financial problems and there was paucity of fund for maintenance. So the Government has decided to wind up at least five of its loss making industries as the proposals for privatisation also fails as there were no takers.

Manipur Cycle Corporation Ltd. (MCCL), Manipur Cement Ltd. (MCL), Manipur Spinning Mills Corporation Ltd. (MSMCL), Manipur Pulp and Allied Products Ltd. (MPAPL) and Manipur Drugs and Pharmaceutical Ltd. (Govt. Sector) are the public undertaking industries to be wind up. The only industrial activity worth the name in the state is handloom and handicrafts. The handloom industry accounts for a good number of female workers in the working population. The products are in great demand within the state and also even in the national and international markets.

Small Scale Industries (SSI) is an important segment of the economy of the state. It is contributing substantially in the form of production, employment and export, thus playing a vital role in fulfilling the socio-economic objectives. For speedy growth of small-scale industries, Government had brought about simplifications in the SSI registration procedures. By the end of March 2006, the number of registered permanent SSI stood at 10,264. During the year, 2014-15, the number of registered establishments in MSME (Part II) is 198 with an investment of Rs. 2643.32 crores in plants and machineries and providing employment to at least 2245 persons where annual production was estimated to be Rs.183.72 crores.

4.18 INDO MYANMAR BORDER TRADE

The Indo Myanmar Border Trade was operationalised from 12th April, 1995. The Central Government is making an effort to frame a policy for development of trade with South East Asia under India's Look East Policy. In connection with the border trade, the then Union Minister of State visited Imphal and Moreh on 29th September, 2006 and announced for development of Moreh Town by creating an integrated Check Post (ICP) adjacent to international boundary within Land Customs Station, Moreh. The State Government was entrusted the task of acquiring land measuring 45.50 acres at the cost of about Rs. 125 crores. With the objective of promoting people to people contact for promotion of the bilateral trade, a team of Myanmar delegation visited Manipur on 28th February, 2007 and

also a one-day interaction programme was held on 1st March, 2007 at Imphal by the traders and officials of both sides.

4.19 SERICULTURE

Manipur has 4 (four) varieties of Silk viz., Mulberry, Eri, Muga and Oak Tasar. To provide employment particularly to womenfolk, Manipur Sericulture Project was initiated with the assistance of the Government of Japan through Government of India, 94.71% plantation was achieved. With the help of Central Silk Board, the Catalytic Development Programme (CDP) has been implemented since 2003-04. The production of cocoon during the year 2013-14 is Mulberry – 1056.00, Eri-440.90 MT, Tasar-119.85 lakh nos. and Muga- 32.00 lakh nos.

4.20 TRANSPORT AND COMMUNICATION

The state has neither railways nor navigable waterways and the transport system is synonymous with road communication. The only major functional railhead linking Manipur with the rest of India is at Dimapur town of Nagaland state which is 215 kms. away from Imphal. A railhead has been extended from Silchar to Jiribam. It covers only 1.5 kms. Of railway line over the state of Manipur. Manipur has air links with Kolkata, New Delhi, Silchar, Guwahati and Aizawl.

The state has a very poor road communication facility. Highways/Roads are regarded as arteries and veins of a state which are essential for its overall growth. The main artery of communication is the 325 kms. long National Highway No.39 connecting Imphal with Dimapur in the neighbouring state of Nagaland. From Imphal it runs in the south-east for another 110 kms. to the International border town of Moreh on the Indo-Myanmar border. The transport cost on this road is very high in view of transport service during night time and one-way trade movement because of little exports from Manipur. Another road of considerable economic importance is the 225 kms. long National Highways No. 53 viz. New Cachar Road, connecting Imphal with Silchar in Assam via Jiribam on the western fringe of the Manipur valley. The National Highways covering 967 kms. by the end of March, 2005 constituted 11.18 % of the total road length of the state and the State Highways covering 668 kms. accounts for 7.72 % of the total road length of the state. The state had a total road length of 8,648 kms. of which the length of surfaced and unsurfaced roads were 4,573 kms. And 4,075 kms. respectively.

4.21 BANKING

The need for a well-developed banking system in the economic life of a state can hardly be exaggerated. The number of offices of commercial banks in Manipur during 2013 was 115 including 50 in Rural, 35 in Semi-Urban and 30 in Urban area. The deposit in all scheduled commercial Banks during the year 2013 is Rs. 5,35,500 lakhs and 1,46,900 lakhs respectively. The average population per bank offices of the state was about 39 thousands according to the Report on Quarterly Statistics on Deposits and Credit of Scheduled Commercial Banks brought out by the Reserve Bank of India. The per capita deposits and per capita credit were to the tune of Rs.19,167 and Rs.5,258 respectively in 2013.

4.22 EDUCATION

Education, being the base for the development of human resources, improving those infrastructures related with it continued to be one of the main objectives of the state Government. Implementation of various programmes, schemes/projects has been taken up to achieve overall quality education. The total number of educational institutions (Schools, Colleges, Universities) in the state during the year 2002-2003 stood at 4284 showing an increase of 2.41 % over that of the previous year. The total number of educational institutions (excluding Colleges and Universities) in the state is 3979 during the year 2009-2010. The enrolment of school students has increased by 17.09 % during 2002-2003 over that of the previous year. While the overall literacy rate was 59.89 % in 1991, 70.50 % in 2001, it has increased to 76.94 % in 2011 census. The teacher pupil ratio was 1:10 during the year 2009- 2010.

In 2007, free text books worth Rs. 3.96 crores was provided to 2,76,120 students (SC/ST) of class I to VIII under the Sarva Shiksha Abhiyan (SSA) scheme.

4.23 HEALTH SERVICES

Medical facilities in the state were mainly provided by the state Government. Medical and Health care facilities were available to the people of Manipur through a network of 550 hospitals/dispensaries with a total manpower of 888 (2005-06) doctors and 1,055 (2005-06) nurses, midwives and dias. The number of beds available was 1609 in 2010-11. Out of 1193.3 thousands patients treated in 2014-15, 65.3 thousands were indoor patients while 1128.0 thousands were outdoor patients.

4.24 WATER SUPPLY

The National Water policy aims at providing safe drinking water and basic sanitations to all sections of the society with special attention to the needs of the people of the rural and urban areas. Under the Rural water Supply Programme (centrally sponsored scheme of Minimum Need Programme (MNP) and Accelerated Rural Water Supply Programme (ARWSP), 2749 habitation are covered as on 1.4.2014. Out of which only 72.79 % of the habitation were fully covered while 22.99 % were partially covered. To bridge the gap between the demand and supply of safe drinking water in the urban areas, a project report for augmentation of water supply for Imphal city phase–I has been formulated. During the Ninth Plan, the extension of existing Kangchup plant has been commissioned under Externally Aided Project (EAP) with French assistance.

4.25 SANITATION

With the objective of improving the sanitary condition of Imphal City, Sewerage Project with French Assistance has been started and targeted for completion in October, 2009. The project was taken up at an estimated cost of Rs. 134.75 crores (Rs. 92.21 crores and Rs. 41.54 crores as State and EAP components respectively) covering Imphal Municipal Ward No. 1, 2, 3, 4, 5, 6, 14, 15, 24, 25 and 26. The expenditure expected to be incurred during

2007-08 was Rs. 13.50 crores under the State Plan and Rs. 3.36 crores under EAP component. The work is being continued and the completion is targeted by March, 2012.

4.26 TOURISM

The state has immense scope for promotion of tourism. It has a salubrious climate, exotic greenery and rich flora besides the rich culture. Keibul Lamjao National Park, the only habitat of Brow Antlered Deer, on the bank of Loktak lake, INA (Indian National Army) Memorial at Moirang, Siroi National Park at Ukhrul, Loktak lake, the biggest fresh water lake in the North-East of India, Khongjom War Memorial at Khongjom are the major tourist spots of the state. Efforts are being made to develop an eco-tourism park at Nongmaiching and Sadu Chiru waterfalls as tourist sports. During the year 2014-15, 2,900 foreign tourist and 1,34,584 domestic tourist came to the state.

4.27 EMPOWERMENT OF WOMEN

To empower women and bring them into the mainstream, an enabling environment with requisite policies and programs, institutional machineries at various levels and adequate resources has been created. There is substantial increase in the number of educated women in the state. From a mere 0.04 female literacy rate in 1901, it rose to 60.50 % as per 2001 census and 70.26 % in 2011 census.

4.28 EMPLOYMENT SITUATION

Employment situation in the state is not much encouraging as compared to other states of India. As per the employment exchange statistics, the number of persons newly registered in 17 employment Exchanges in the state during the year 2014-15 was 23,861 persons. The number of persons on live register of all employment exchanges stood at 7,25,529 persons as on 31st March, 2015.

Economic Census is the complete count of all entrepreneurial units located within the Geographical boundaries of the country. Six Economic Censuses have been conducted in the year 1977, 1980, 1990, 1998, 2005 and 2013. As per the provisional results of the Sixth Economic Census 2013, there are 2,17,673 establishments in the State engaged in different economic activities other than crop production and plantation. Out of which, 62.94 % are in the rural areas and 37.06 % in the urban areas. Total number of persons working in all the enterprises is found to be 3,87,880 of which 2,42,447 and 1,45,433 workers are respectively engaged in economic activities operated in rural and urban areas of the state.

4.29 POVERTY

The number of person below poverty line is 3.76 lakhs (22.3%) and 0.20 lakhs (3.3%) in the rural and urban Manipur respectively according to 61st Round (2004-05) of NSS.

4.30 MOREH

Moreh is a town located on the India-Myanmar border in the Chandel district of the Indian state of Manipur. The name literally means "I'm tired" in Burmese. The town is inhabited by Kuki people by historic land allocation in the Kabow Valley together with a sizeable number of Tamil, Nepali, Naga, Meitei, Punjabi, Telugu, Bihari, Marwari and Pangals. Previously, Moreh was in the Kabow Valley Zone. The town is an important and rapidly developing trade point in India on the border with Myanmar, with the town of Tamu being close to the border.

Moreh is already a huge commercial hub, and economists suggest that it could become another bustling city in the next couple of decades. Moreh is already seen as the commercial capital of Manipur and India's Gateway to South-East Asia.

In 2007, according to The Economist, Moreh was to gain a branch railway via Imphal.

The Indo-Myanmar Friendship Bridge in Moreh connects India to Kalewa in Myanmar's Sagaing Division. The highway on the Myanmar side is intended to run up to Mandalay but it is in bad shape. Indian planners hope the rail link to Moreh will eventually be connected to the Myanmar railway system, allowing onward connectivity to Thailand and China.

Demographics: - in the 2011 india census, moreh had a population of 16,847. Males were 8,670 while 8,177 were females. Moreh had an average literacy rate of 71.47%, lower than the state average of 76.94%: male literacy was around 79.52%, and female literacy was 62.88%. In moreh, 14.58% of the population was under 6 years of age. The female sex ratio was 943 compared with the state average of 985. The child sex ratio was around 985 compared with the manipur state average of 930.

Economy:- moreh plays a key role in the development of economy of the state. There are 40 tradable items under the barter trade mechanism through moreh (India -myanmar border). Major exports include cement, engineering goods, transport equipment, motor cycles, iron and steels, medicine, chemicals and allied products, cotton yarn, etc. The major items now imported from myanmar through barter mechanism are betel nuts, turmeric, red kidney beans (rajma), kuth roots, gram, resin, dry ginger, etc. The volume of trade at moreh-tamu border point in 2001-02 was ` 95.48 million and in 2009-10 ` 298.19 million - an average increase of 39% p.a. further, ministry of finance, govt. Of India has also cleared the operational of "normal trade" through land customs station, Moreh.

India's "look east" policy and several new measures taken by both the central and state governments to promote and enhanced trade link with SE Asia, provide Manipur with a competitive advantage. In recognition of the potential of Moreh, the government of India has notified an ICP at Moreh.

Integrated check post (ICP) moreh:- the proposed moreh integrated check post will facilitate speedy movement of export-import consignments and reduce any inconvenience to the general public from any increase in trade from india's look east policy. The state government has identified 18.41 hectares (45.50 acres) of land near gate no.1 within

customs notified area. Rites, a central public sector undertaking have prepared a DPR for moreh ICP costing 136 crores and are under the process of implementation.

The proposed center shall have (i) immigration department, (ii) local police including women constables for immediate security, (iii) land customs department, (iv) customs preventive department, (v) forests, (vi) narcotics & drug control department, (vii) postal department, (viii) bank counter, (ix) telecom, (x) animal quarantine, (xi) plant quarantine, (xii) quality certification inspection agencies/export promotion councils, (xiii) trade facilitation counter and trade related public bodies, (xiv) food testing lab, (xv) truck parking facility, (xvi) staff quarters, basic amenities such as canteen, truck drivers' rest house, etc....

As Moreh shares a border with Myanmar, It is a transit point for trafficking illicit drugs to the international market.

Road to Thailand:- India's foreign minister met with Myanmar's construction minister in Delhi on the 22nd Feb 2012, and spoke about opening a highway between Moreh, in India, and the Myanmar-Thai border near mae sot. Indian prime minister Manmohan Singh and u Thein Sein have set a deadline of 2016 to provide trilateral road connectivity, that would make it possible to drive from India to Thailand via Myanmar.

Trans-Asian railway: - As of 2012, all freight traffic from Asia to Europe goes by sea. The Trans-Asian railway will enable containers from Singapore, china, Vietnam, Cambodia, India, Bangladesh, Myanmar, Thailand and Korea to travel over land by train to Europe. The southern corridor of the trans-Asian railway is of prime interest to India. It connects Yunnan in China and Thailand with Europe via turkey and passes through India.

There is a general understanding between India and Myanmar that their railways will be interconnected via a 346-km line section that will extend from kalay in Myanmar to Jiri bam in India via the border point at Tamu /Moreh, India.

The proposed route will enter India through Tamu and Moreh, then enter Bangladesh through Mahisasan and Shahbajpur and again enter India from Bangladesh at Gede. On the western side, the line will enter Pakistan at Attari. There is a 315 kilometers (196 mi) missing link on this route in the India - Myanmar sector; of this, 180 kilometres (110 mi), in india, is between Jiri bam in Manipur and tamu, Burma in Myanmar. The rail link between Jiri bam and Tapul / Imphal has been sanctioned by indian railways, but that is unlikely to be completed before 2016. In 2011, construction work was in progress in a 97 kilometers (60 mi) stretch between Jiri bam and Tupul/Imphal. India's ministry railway has also approved the Tapul/Imphal to Moreh, India/Tamu, Burma link.

Highways in Moreh: With a view to make it more systematic, all the national highways of India linking different states have been renamed in line with the system followed in the USA. According to a notification issued by the ministry of road transport and highways in April 2010 year, the national highways have been given new numbers. The new highway numbering system would indicate the direction and location of the highways.

The Imphal-Dimapur highway, earlier known as NH-39 has been renamed as NH-2. This highway will start from Dibrugarh, Assam and pass through Mokokchung, Wokha, Kohima, Imphal and Churachandpur before terminating at Tuivang, Mizoram. Moreover, the Imphal-

Moreh road has been renamed as NH-102.

The India–Myanmar–Thailand (IMT) trilateral highway is a highway under construction that will connect Moreh, India with Mae sot, Thailand via Myanmar. The road is expected to boost trade and commerce in the Asian, as well as with the rest of Southeast Asia.

Highways in Manipur: The total length of this highway is 700 km, and is the third national highway passing through the state of Manipur, together with NH 53 and NH 39. This highway has been proposed to connect three bordering states in northeast India, viz. Mizoram (141 km), Manipur (523 km) and Nagaland (36 km).

5 IMPROVEMENTAL PROPOSAL FOR PROJECT ROAD

5.1 OBJECTIVE

The main aim of the consultancy service is to establish the technical, economic and financial viability of the project and prepare detailed methodology adopted while preparing detailed Project Report for Construction of Moreh Bypass in state of Manipur on EPC mode. The project road lies in Tengnoupal districts of Manipur. Feasibility of the project shall be established on the requirements with regard to rehabilitation, up gradation and improvement of road based on the following activities:-

- Highway Design,
- Pavement Design,
- Design of Service Roads (if required),
- Type of Intersections & development,
- CD & Bridge design
- Rehabilitation & Widening of Existing CD Works & Bridges,
- Road Safety Feature,
- Quantities and Cost Estimates.
- Social & Environmental Impacts

5.2 INITIAL ACTIVITIES

5.2.1 Secondary Data Collection and Review

During the project several secondary data have been collected/in the process of procurement and they are as follows:
Average Fuel sales Data of Petrol & Diesel and Refuel Point is as follows:

Table 5.1: Average Fuel sales Data of Petrol & Diesel and Refuel Point

Month	Avg. Sales (Lt.)	
	Petrol	Diesel
Jan	56,621	209,778
Feb	44,766	162,538
Mar	47,421	170,114
Apr	38,438	197,760
May	62,693	192,391
Jun	48,824	139,923
Jul	35,897	131,630
Aug	38,476	131,678
Sept	31,712	92,956
Oct	37,779	145,672
Nov	31,476	207,366
Dec	53,265	205,097

The data thus collected are reviewed and taken up further AADT calculations.

5.2.2 Reconnaissance Survey

The following documents and data have been collected in the process of procurement during the reconnaissance survey by the team:

- Climate of the area surrounding the project road
- Year of original construction, year and type of major maintenance/rehabilitation works.
- Type and location of existing utility services
- Survey and evaluation of locally available construction materials

5.2.3 Standards and Code of Practices

All activities related to field studies, design and documentation have been done as per the latest guidelines/circulars of the MORT&H and relevant publications of the Indian Roads Congress (IRC).

5.3 TRAFFIC SURVEY

Classified volume count for Moreh Bypass road was surveyed; following is the result of CTVC survey.

Table 5.2: Classified volume count for Moreh Bypass

Vehicle category	Moreh Bypass
Two Wheeler	1333
Car / Jeep / Van / Taxi	1116
Three Wheeler	1670
LCV	114
Govt. Bus	4
Pvt. Bus	4
Mini Bus	3
Tractor	0
Tractor With Trolly	0
2 - Axle	27
3 - Axle	11
Multi-Axle Truck	0
Total Fast Moving	**4282**

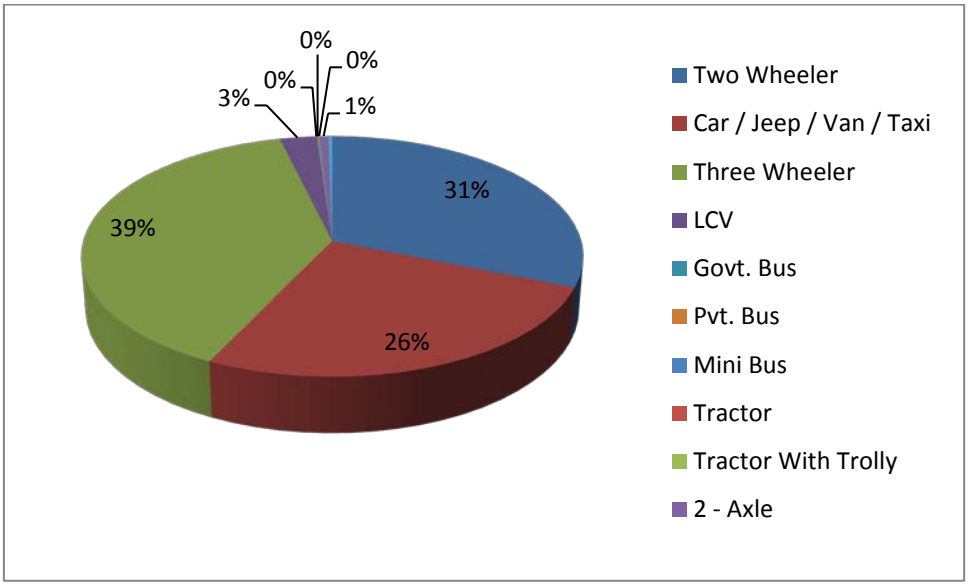


Figure 5-1: Classified volume count for Moreh Bypass

As calculated the traffic in MSA it is found around 1.02 MSA. Calculation part of traffic is in Design Volume.

5.4 CROSS SECTIONS

5.4.1 Right-of-way (ROW)

Desirable target width of road land (ROW) for Moreh Bypass is to be 20m to 24m.

5.4.2 Cross Sectional Parameters:

1. Open country - Mountainous terrain with retaining wall.
a) Carriage Way Width - 7.00m
b) Paved Shoulder Width - 2x1.5m
c) Roadway Width - 10.0m

2. Open country - Mountainous terrain without retaining wall
a) Carriage Way Width - 7.00m
b) Paved Shoulder Width - 2x1.5m
c) Earthen Shoulder Width - 1.0m (valley side)
c) Roadway Width - 11.0m

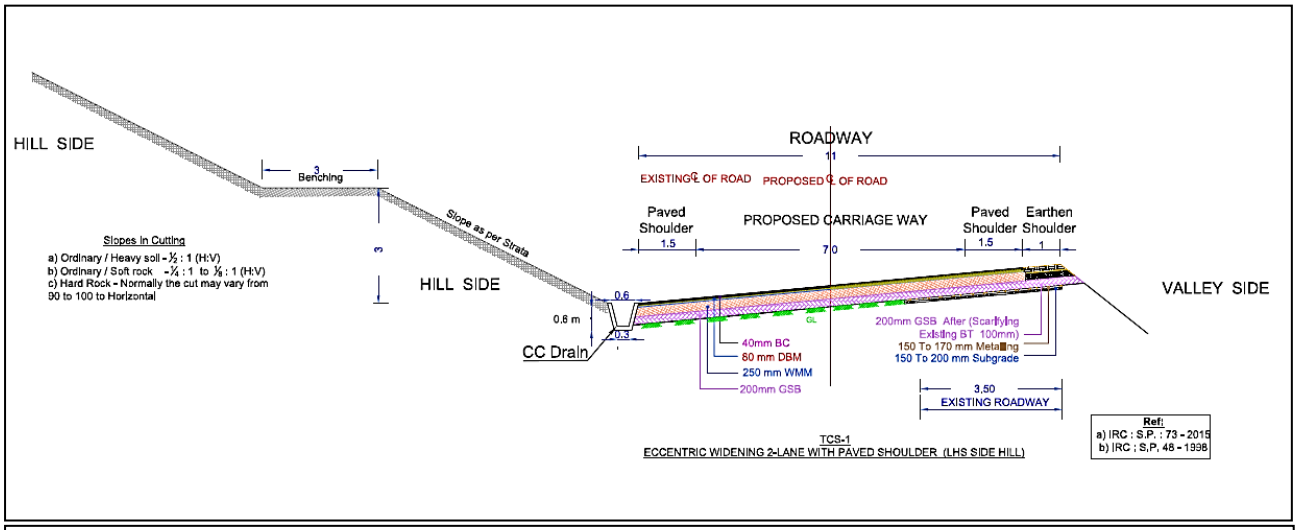
5.4.3 Typical cross section:

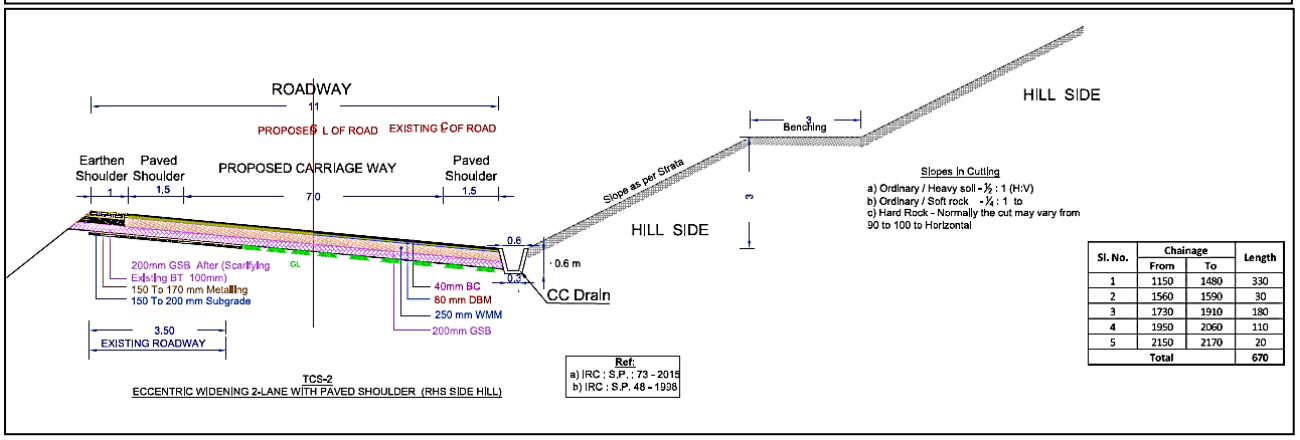
As per site condition there are four typical cross sections for Moreh Bypass road, consisting the 7m carriageway, 1.5m paved shoulders at both sides and earthen shoulders at valley side. Schedule of typical cross sections is as follows;

Table 5.3: Schedule of typical cross sections

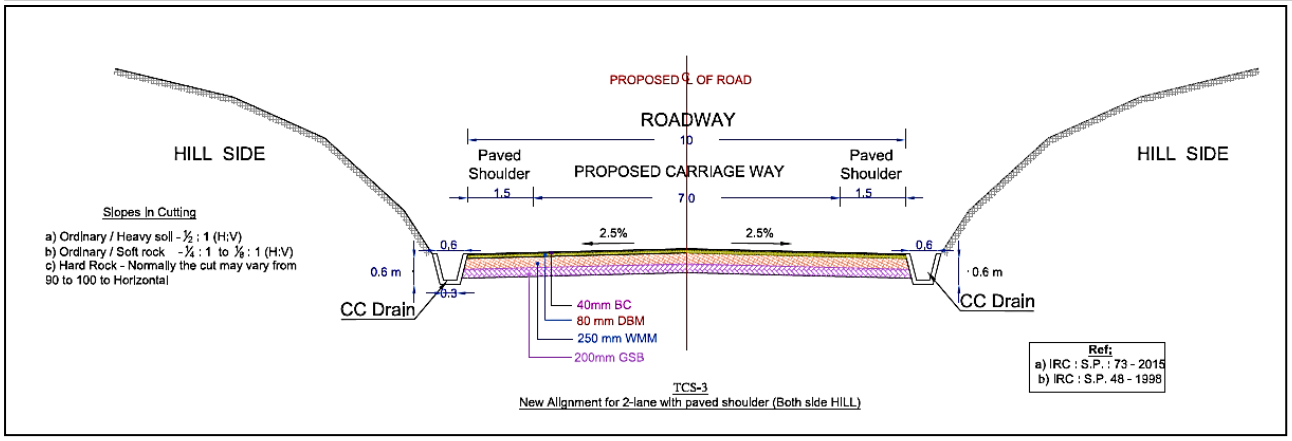
Sl. No.	Chainage		Length	TCS Type	Description
	From	To			
1	0	200	200	Type-1	Eccentric Widening 2-Lane with Paved Shoulder (LHS Hill)
2	200	250	50	Type-3	New Alignment for 2-Lane with Paved Shoulder (Both Side Hill)
3	250	300	50	Type-1	Eccentric Widening 2-Lane with Paved Shoulder (LHS Hill)
4	300	350	50	Type-5	New Alignment for 2-Lane with Paved Shoulder (Both Side Fill)
5	350	380	30	Type-1	Eccentric Widening 2-Lane with Paved Shoulder (LHS Hill)
6	380	410	30	Type-5	New Alignment for 2-Lane with Paved Shoulder (Both Side Fill)
7	410	490	80	Type-1	Eccentric Widening 2-Lane with Paved Shoulder (LHS Hill)
8	490	520	30	Type-5	New Alignment for 2-Lane with Paved Shoulder (Both Side Fill)
9	520	650	130	Type-1	Eccentric Widening 2-Lane with Paved Shoulder (LHS Hill)
10	650	1150	500	Type-3	New Alignment for 2-Lane with Paved Shoulder (Both Side Hill)
11	1150	1480	330	Type-2	Eccentric Widening 2-Lane with Paved Shoulder (RHS Hill)
12	1480	1560	80	Type-5	New Alignment for 2-Lane with Paved Shoulder (Both Side Fill)
13	1560	1590	30	Type-2	Eccentric Widening 2-Lane with Paved Shoulder (RHS Hill)
14	1590	1630	40	Type-5	New Alignment for 2-Lane with Paved Shoulder (Both Side Fill)
15	1630	1730	100	Type-3	New Alignment for 2-Lane with Paved Shoulder (Both Side Hill)
16	1730	1910	180	Type-2	Eccentric Widening 2-Lane with Paved Shoulder (RHS Hill)
17	1910	1950	40	Type-3	New Alignment for 2-Lane with Paved Shoulder (Both Side Hill)
18	1950	2060	110	Type-2	Eccentric Widening 2-Lane with Paved Shoulder (RHS Hill)
19	2060	2150	90	Type-5	New Alignment for 2-Lane with Paved Shoulder (Both Side Fill)
20	2150	2170	20	Type-2	Eccentric Widening 2-Lane with Paved Shoulder (RHS Hill)
21	2170	2390	220	Type-3	New Alignment for 2-Lane with Paved Shoulder (Both Side Hill)
22	2390	2510	120	Type-5	New Alignment for 2-Lane with Paved Shoulder (Both Side Fill)
23	2510	2520	10	Type-1	Eccentric Widening 2-Lane with Paved Shoulder (LHS Hill)

The typical cross sections for Moreh Bypass road are as shown in figures;





Sl. No.	Chainage From	Chainage To	Length
1	1150	1480	330
2	1560	1590	30
3	1730	1910	180
4	1950	2060	110
5	2150	2170	20
Total			670



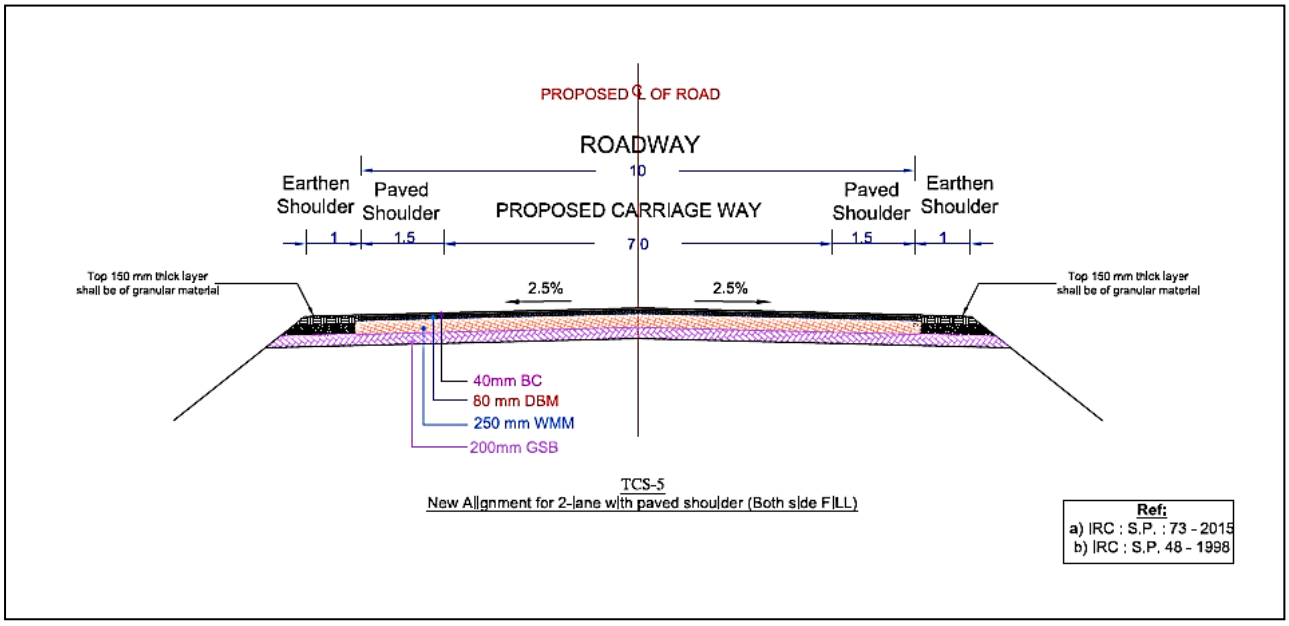


Figure 5-2: Typical cross sections

5.5 SOIL PROPERTIES

Nature of soil present at existing condition where proposed road is to be constructed also has a significant consideration in the pavement design. The trial pits (1.5m x 1.5m xl.5m) has been taken on existing shoulder and widening side to determine the suitability of data for sub-grade material. The details of trial pits results are enclosed in separate Geotechnical Report. The summary of trial pits results are given below.

Table 5.4: CBR of subgrade

Chainage	CBR %	MDD g/cc	OMC%
0+450	7.34	1.921	16.17
1+550	8.12	1.780	17.05
2+000	7.68	1.907	16.25

The details of soil characteristics and test results are as follows.

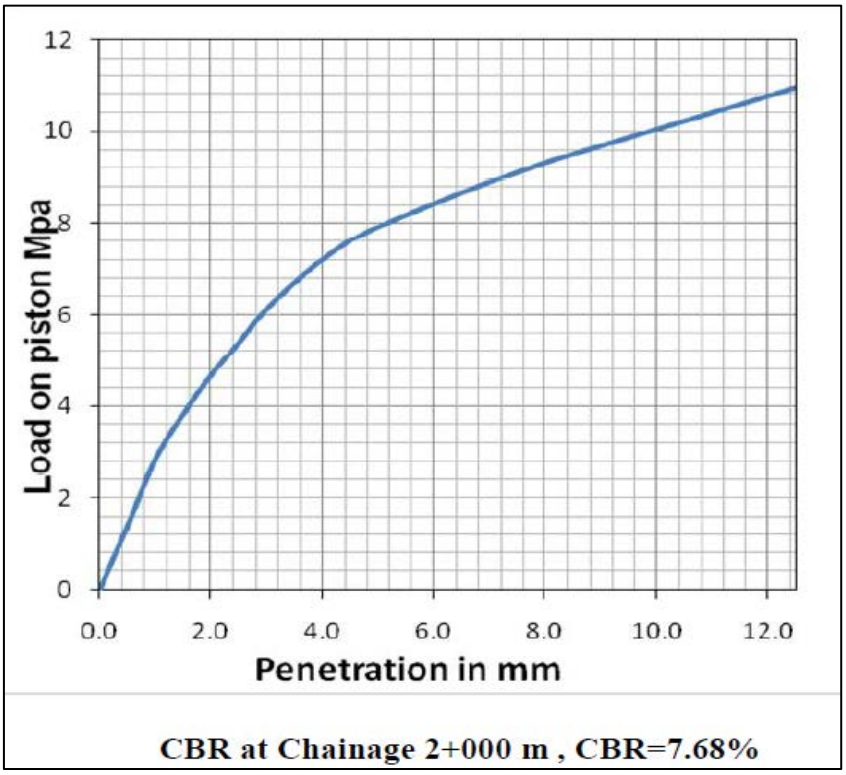


Figure 5-3: CBR at CH 2+000

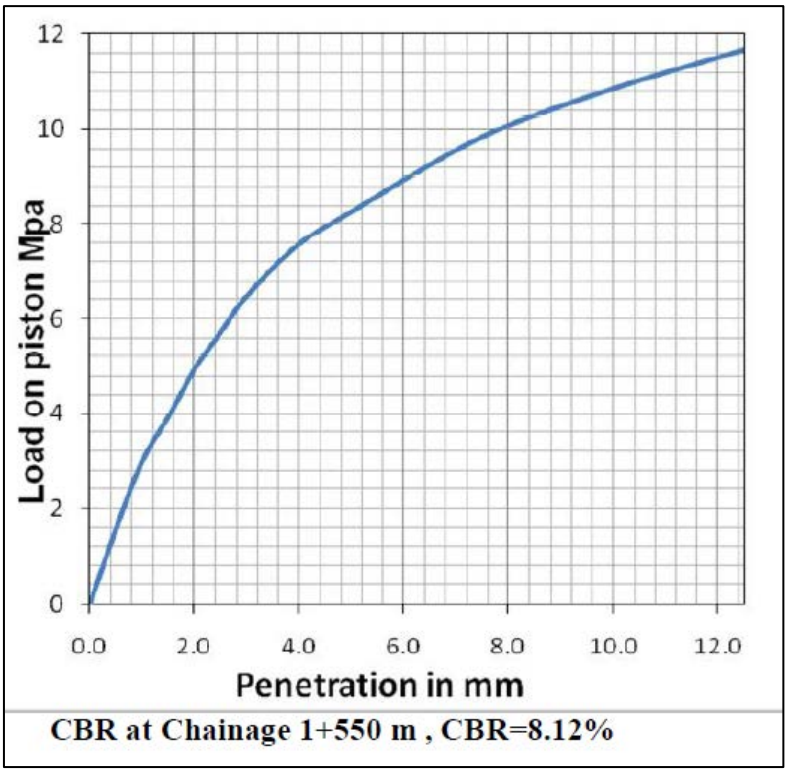


Figure 5-4: CBR at Chainage 1+500

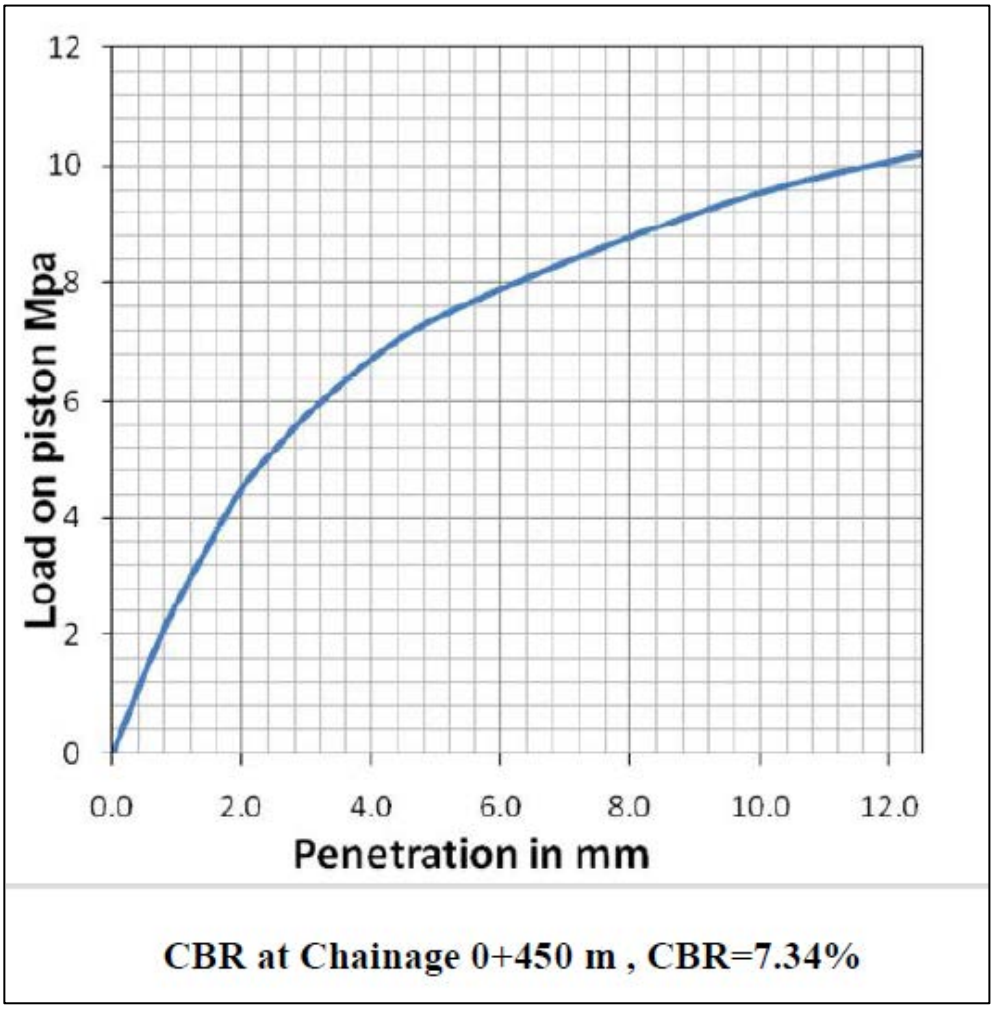


Figure 5-5: CBR at 0+450

5.5.1 SUB-GRADE AND SUB-BASE

5.5.1.1 Sub-grade

The strength of sub-grade is expressed in terms of modulus of sub-grade reaction, k. The modulus of sub grade reaction is determined by CBR tests.

The sub-grade soil strength is dependent on moisture condition. As the minimum subgrade strength is obtained at the worst moisture condition, CBR test is conducted for 4 days soaked CBR for the assessment of design strength. An approximate idea of k-value of a homogeneous soil sub-grade may be obtained from its soaked CBR value as per the following correlation.

Table 5.5: CBR test result

Chainage (Km)	Soaked C.B.R. of soil at Existing	Recommendation
0+450	7.34	
1+500	8.12	
2+000	7.68	

Note - Excavated sub-grade material CBR less than *6%* but having MDD >15.2 can be used as embankment layer at BC soil location.

5.5.2 SUBGRADE ON WIDENING SIDE

It is also noted from the laboratory results that the CBR value of soil at widening side is not suitable for sub-grade however it can be used as embankment foundation. The foundation has to be compacted as per MORT&H specification Table 300-2 which the compaction should be 95% of lab density. The required density for the embankment material is also should satisfy the density requirement of embankment material as per MORT&H, Table 300-1.

The trial pits results at widening side can be found in separate Geotechnical report. However the summary of results and recommendations are given below.

(Ref. MORT&H, Table 300-1, Page-64)

Table 5.6: Embankment Details

S. No	Type of Work	Max. Lab Dry Density
1	Embankment up to 3m	Not Less Than 15.2 KN/Cu.m
2	Embankment > 3m	Not Less Than 16.0 KN/Cu.m
3	Subgrade and earthen shoulders/verges/backfill	Not Less Than 17.5 KN/Cu.m

Table 5.7: Subgrade (Ref. MORT&H, Table 300-2, Page-66)

S. No	Type of Work/Material	% Compaction of Max. Lab Dry Density
1	Sub-grade and earthen shoulder	Not Less Than 97%
2	Embankment	Not Less Than 95%
3	Expansive Clays a) Sub-grade and 500 mm portion just below the sub-grade b) Remaining portion of embankment	Not Allowed Not Less than 90-95%

5.6 PAVEMENT CRUST DETAILS

Flexible pavements respond to a wheel load as a very flexible material (Bitumen) over softer materials (Sub Base and Sub Grade). A flexible pavement is modelled as an elastic multilayer structure. Stresses and strains at critical locations are computed using a linear layered elastic model. Tensile strain, Ct, at the bottom of the bituminous layer and the vertical subgrade strain, 6V, on the top of the subgrade are conventionally considered as critical parameters for pavement design to limit cracking and rutting in the bituminous

layers and non-bituminous layers respectively. The computation also indicates that tensile strain near the surface close to the edge of a wheel can be sufficiently large to initiate longitudinal surface cracking followed by transverse cracking much before the flexural cracking of the bottom layer if the mix tensile strength is not adequate at higher temperatures.

The design traffic for Moreh bypass was calculated and the same is in million satandard axles i.e 1.02MSA. Minimum MSA that should be considered for National Highways as per IRC SP 73: 2015 wise clause no. 5.4.1 is 20.0 MSA. For 10% CBR plate 7 from IRC 37-2012 page no. 28 gives crust thickness as follows;

GSB	200	mm
WMM	250	mm
DBM	80	mm
BC	40	mm
Total	**570**	**mm**

6 ENVIRONMENTAL SCREENING AND PRELIMINARY ENVIRONMENTAL ASSESSMENT

As per Government of India regulations Environmental Clearance is not required for the project but clearance from National Board for Wildife and Forest Clearance for Central Government is required. The categorization has been done based on environmental screening and assessment of likely impacts while the environmental impact assessment ascertains that it is unlikely to cause any significant environmental impacts. Few impacts were identified attributable to the proposed project, all of which are localized and temporary in nature and easy to mitigate.

Total 2.52 km length of project road passes through Yangoupokpi Lokchao Wildlife Sanctuary (YLWLS). There are no other ecologically sensitive areas along the project road neither there are any archaeological/protected monument located in the project vicinity. The land use pattern around the proposed alignment is predominantly forest land and builtup.

The significant adverse impacts of the road section upgrading are:

- Impacts on surrounding area due to tree cutting (807) for the proposed road construction;
- Impacts do to conversion of about 6.552 hectare of forest land for non-forest purpose;
- Temporary impact on land and air environment due to locating construction camp;
- Temporary impact on land, air and water environment due to establishing and operating construction plants (Hot Mix Plant and Diesel Generator [DG] sets);
- Impact on biophysical environment due to quarry operation;
- Impacts on roadside flora and fauna particularly as road is passing through Yangoupokpi Lokchao Wildlife Sanctuary (YLWLS);
- Impact on air quality, water quality, drainage, road users due to construction activities of project road ;
- Impact on land and water environment due to disposal of waste materials; and
- Impact on occupational health and safety due to all onsite and offsite construction works.

In general, the project received immense support from local people. The local people appreciated that besides providing an all-weather efficient connectivity to large rural populations and improving the traffic scenario in the region, it will bear out several other socio-economic positive benefits.

The environmental impact assessment of the project ascertains that the project is unlikely to cause any significant environmental impacts. The Executing Agencies (MoRTH and NHIDCL) shall ensure that EMP and EMoP are included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract.

7 COST ESTIMATES

7.1 GENERAL

Mainly cost estimate plays an important role while preparing economic analysis and financial feasibility of the project. Estimated cost and time period required for project helps to prepare proper work plan for execution of project. While estimating the project cost, the environmental impacts and their mitigations have been taken in to accounts. Besides construction some provisions has been made for social and environmental mitigations.

The cost estimate is based on standard design and drawing.

7.2 QUANTIFICATION

The construction items covered in cost estimates includes different heads as:

- Site Clearance and Dismantling.
- Earth work & Subgrade.
- Sub-Base & Base.
- Bituminous Courses.
- Traffic signs, Road marking & other road appurtenances.
- Junction Improvement.
- Truck Lay bye.
- Drainage and Protective Works.
- Bridges & Culverts.

7.3 UNIT RATES

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 (MoRTH). On this Schedule of Rate the basic rates of materials and labors were finalized after careful consideration of data collected from the market.

7.4 PROJECT COSTING

The cost of the road portion has been worked out based on the cross-sections, plan and profile and other drawings for widening and strengthening of the project road.

It is proposed that the excavated earth available from the cutting and reconstructed road sections would be used for the embankment construction and median / island filling. Adjustments have accordingly been made in the quantification of fill materials.

Locations of pavement reconstruction as identified in the pavement design and suitably quantified for dismantling and new crust composition. Extent of improvements to the cross roads at junctions has been considered up to the limits of proposed right of way.

Quantification for road drainage has been in accordance with the recommendations of designs and drawings.

7.5 BRIDGES AND CULVERTS

The quantification of various items of work has been detailed out from the drawings.

7.6 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.

7.7 TRUCK LAY BYE

The truck lay byes shall, in general, be located near check barriers, interstate borders, places of conventional stops of the truck operators, etc. The location of the truck lay bye has been identified on the basis of field survey and shall have adequate space for facilities considering future growth.

Safety Barriers

W-Beam Crash Barriers have been provided on the outer side of carriageway on deep valley side.

7.8 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 1000m, 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.

7.9 SOCIAL COSTS

Since the widening options for the corridor has not been limited to within the existing ROW, all the affected properties have been categorized as encroachments. Social cost for acquisition of land, replacement value of religious structures, hand pumps and wells falling within the corridor of direct impact has been separately estimated.

7.10 ENVIRONMENTAL COSTS

The major Environmental Mitigation costs for compensatory afforestation, redevelopments of quarries, provision of safety equipment at quarries and post project monitoring at sensitive locations has been separately estimated.

7.11 TOTAL PROJECT COST

Table 7.1: Cost Estimate

Sr. No.	Description Of Works	Total Cost (In Lakhs.)	Cost Per Km. of Total Road Length (In Lakhs.)
A	**ROAD WORKS**		
1	Site Clearance and Dismantling	5.43	2.15
2	Earth work , Subgrade and Erosion control	528.35	209.66
3	Sub-Base & Base	878.21	348.50
4	Junction Improvement (Major & Minor)	48.04	19.06
5	Traffic signs, Road marking & other road appurtenances	48.72	19.33
6	Truck Lay bye	296.24	117.55
7	Building in Truck Lay Bye	78.95	31.33
8	**Drainage and Protective Works**		
a	Longitudinal Drains	43.01	17.07
b	Retaining wall	0.00	0.00
c	Breast wall	686.01	272.23
B	**BRIDGES & CULVERTS**		
8	Box Culverts	374.59	148.65
C	**COST OF CIVIL WORKS**	**2987.539**	**1185.53**
D	Add contingencies @ 2.8% of C	83.651	33.19
E	C + D	3071.191	1218.73
F	Maintainance Cost @2.5%	76.780	30.47
G	Escalation charges 5% for 1 year (Of C)	149.377	59.28
H	Add 3% of E for road supervision work	92.136	36.56
I	Add 3% of E for Agency Charges	92.136	36.56
J	**Total Project Cost (E+F+G+H+I)**	**3481.619**	**1381.59**
K	**Total Project cost per Km (in Cr. /Km)**	**1381.595**	**548.25**
L	Add 15% of TPC for LA, US etc.	522.243	207.24
M	**Total Capital Cost**	**4003.861**	**1588.83**

8 LAND ACQUISITION PLAN & CLEARANCES

8.1 GENERAL

The preliminary land acquisition plan is being prepared. Applications for procurement of cadastral maps are submitted to revenue department.

8.2 LETTERS FROM LAND REVENUE DEPARTMENT

Manipur Land Revenue & Land Reforms Act is not completely applicable in the project area and Land Records are Revenue maps are not available with Concerned DS & LR, GoM. Due to the current unrest in the region, the survey could be taken up by the land records department. The activity shall be taken up as soon as normalcy returns in the region.

8.3 NEW DISTRICT FORMATION TENGNOUPAL

The formation of new district Tengnoupal has resulted in resubmission of all the project clearances. All the clearance proposals were submitted under Chandel District.

8.4 CLEARANCES

Online applications for forest and wildlife clearances have been applied on 14th dec, 2016. It may take some time as per the procedure of the respective departments.

9 ECONOMIC ANALYSIS

9.1 APPROACH AND METHODOLOGY OF ECONOMIC ANALYSIS

9.1.1 Approach

The economic evaluation has been carried out within the broad framework of social cost-benefit analysis assuming the project life for a period 30 years. The economic feasibility of the project has been sought to maximize the economic returns on investment. There will be reduction in road user costs of motorized traffic (MT) on the existing parallel roads, which are likely to be affected in consequence of construction of Moreh Bypass road. The economic savings at significant level in the following areas are expected to occur due to introduction of the Moreh Bypass road.

- Vehicle traffic congestion
- Journey time of passengers and goods

The economic analysis has been based on comparison of costs and benefits under two scenarios 'without the Improvement of Moreh Bypass road project' and 'with the Improvement of Moreh road project'. All costs and benefits are valued in monetary terms and expressed in economic prices to have the analysis on resource based frame-work. The analysis is made corridor-wise as well as project-wise. The results are expressed in terms of Economic Internal Rate of Return (EIRR) and Economic Net Present Value (ENPV).

9.2 STEPS OF ECONOMIC ANALYSIS

The objective of the cost-benefit economic analysis is to identify and quantify the benefits and costs associated with the project in respect to introduction of the Moreh Bypass road (km 0+000 to 2+520).

The following steps have been followed:

1st: Step: Identification of homogeneous sections

2nd Step: Running of **Improvement** module of HDM-4 version 1.3 model to determine trade off from traffic benefits between improved Moreh Bypass road and the unimproved Moreh Bypass road.

3rd Step: Determination of IRR and NPV at economic prices

9.2.1 Methodology

The analysis period of the project has been taken as 30 years from 2017 – the year from which construction is expected to start.

Table 9.1: Construction Program

	Moreh Bypass
Cost estimation Year	2018
Construction Period (months)	12
Construction Start Year	2019
Construction End Year	2020
Open to Traffic	2020
Phasing of construction cost (%)	
Year 1	100

9.2.2 Framework of Analysis

The following scenarios are considered for the economic analysis.

- **"Without improvement of Moreh Bypass road Project" (Base Strategy):**

This is the 'without improvement of Moreh Bypass road project' situation where the traffic on the existing roads, which are likely to continue with routine maintenance works in the analysis, this is the base strategy against which the new construction is compared.

- **"With improvement of Moreh Bypass road in Place"**

This is the 'with up gradation of Moreh Bypass road project' situation where the traffic on the existing roads, which is likely to be affected by the improvement of the Moreh Bypass road. In this case the future traffic volume on the roads is assumed to continue at a lower rate to flow along the existing roads. In the analysis, this alternative is compared against the base strategy. The 'with up gradation of Moreh Bypass road project' situation helps to determine the highest levels of benefits.

- **Benefits Calculation**

The reductions in dis-benefits lead to savings. The total savings expressed in quantitative terms are the total benefits arising from the Moreh Bypass road. The total quantitative benefits and costs at economic prices determine IRR and NPV of the Moreh Bypass road project.

9.2.3 Model for Estimation of Benefits

The following model has been employed to estimate the aforesaid benefits.

1. Identification of homogeneous sections of Moreh Bypass road.
2. Estimation of present traffic volume on the Moreh Bypass road
3. Estimation traffic growth rate.
4. Estimation of diversion potential of traffic to Moreh Bypass road from alternative roads.
5. The time values are used in the VOC estimation.

6. Usual maintenance provisions and costs in with and without conditions have been considered.
7. The model used for analysis is **Improvement** module of HDM-4 version 1.3
8. These help to estimate total road user costs with Moreh Bypass road project in terms of lesser congestion cost, time cost, etc.
9. EIRRs of the sections have been estimated with HDM but the EIRR of the entire project has been obtained also taking together all the sections
10. EIRR and NPV Estimation with the sum of benefits from
    - VOC savings which include congestion, fuel etc
    - Time savings

All together give Total Net Benefits for the Moreh Bypass road project. The Total Net Benefits is considered against economic cost of project to determine on Economic EIRR and ENPV at 12%.

9.2.4 Corridors

Details of the New Corridors of the Moreh Bypass road project considered for the analysis are detailed below in Table 9.2**.**

Table 9.2: Moreh Bypass road - sections

Section No.	From	To	Existing Length (km)	Improved Length (km)	Remarks
1	0+000	2+520	2.940	2.52	2LPS
Project			**2.940**	**2.520**	

Economic Analysis has been carried out for two options i.e (1) Existing Length = 2.940 km and (2) Improved/Up graded Length = 2.520 km. However the cost difference is very nominal; hence same cost is adopted for both options.

9.3 PROJECT COST

9.3.1 Conversion to Economic Prices and Distribution of Cost

The Planning Commission suggested SCF (Standard Conversion Factor from financial price to economic price) of 0.90 has been applied to financial costs of non-traded items (the inputs or items which are not traded internationally, that is, whose border prices are not obtained) to calculate economic prices for goods and commodities; and shadow wage rate factor of 0.85 has been used to obtain the economic costs of unskilled labour. It is considered that out of total construction cost 30% is cost of

unskilled labour and 70% is the cost of non-traded items. So the factor 0.885 [(0.9 x 0.7) + (0.85 x 0.30)] has been applied straight to the financial prices to convert to economic prices.

9.3.2 Components of Cost

The Capital Costs of the proposed Moreh Bypass road Project including the phasing of investment during the construction period have been considered in this preliminary report on ***tentative basis*** as details investigation and estimation not yet available**.** The components of costs include the following:

- Corridor-wise construction cost including soft costs
- Land cost
- R & R cost
- Taxes and duties
- Environment management cost during construction
- Others

The summary of project cost at Financial Prices is given in Table 9.4**.**

The changes in the length of the sections in pre- and post-improvement conditions are reflected in Table 9.3**.** The costs at financial prices are given in Table 9.4**.** The economic cost per km at 2016 prices has been considered for the sections are given below in Table 9.5.

Table 9.3: Changes in Length after Improvement

Section No.	From	To	Unimproved Length (km) Option 1	Improved Length (km)Option 2
1	Bypass start	Bypass end	2.940	2.520
Project			**2.940**	**2.520**

Table 9.4: Summary of cost estimate (at 2016 prices)

Section. No	Description	Construction Cost (Rs in crore) at Financial prices
1	Moreh Bypass	40.03
	Total cost	40.03

Table 9.5: Per Km Construction Cost at economic prices

Section No	Description	Length (km)	Civil Construction Cost (Rs in crore) at Financial prices	Civil cost + R&R + Util. + LA Cost (Rs in crore) at Financial prices	Construction Cost /km (Rs in Cr.) at Financial Prices
1	Moreh Bypass	2.520	29.88	40.03	15.89

9.3.3 Maintenance Cost

The maintenance works considered in the analysis include:

- Annual Routine maintenance
- Periodic Maintenance
- Overlaying

Details of the maintenance program followed for the project roads under different situations along with their unit rates, followed in the analysis, are summarized below in Table 9.6. The maintenance works costs adopted in the analysis are those which have been established under long practices. The financial costs pertaining to maintenance operations have been converted into economic costs by applying the Conversion Factor of 0.885.

Table 9.6: Cost of Maintenance work

Maintenance Type	Interval /Intervention Level	Rs Cost /sq m (All rates given below is per Sq m area)
Crack Sealing	2 no/Km	20
Routine edge repairs	1 sq m/km	52
Routine potholes patching	1no./km	260
Thin Overlay	>5, <10 years	400
Heavy Patching (after improvement)	>15 years	700
Slurry seal	10% cracking	50
Joint sealing	3 years	46.02

9.4 TRAFFIC SPECIFIC PARAMETRIC VALUES

The following economic unit costs parametric values in consultations with the Design Consultants, used as HDM Model inputs for carrying out economic analysis.

Table 9.7: Vehicle Economics at Economic Prices

Vehicle type	Unit cost		Time value (per hour)				
	Vehicles	Tires	Maintenance	Crew cost	Working	Non-working	Cargo time
			Labour		Passenger	Passenger	
2 Wheeler	80000	300	80	43.75	100	30	
3 Wheeler	150000	500	80	43.75	75	25	
Mini bus	400000	800	150	43.75	125	35	
Car	285000	375	93.75	35.42	187.5	62.5	
Bus	450000	800	150	43.75	125	35	
LCV	450000	800	187.5	45.83			187.5
2 Axle Truck	600000	1100	212.5	45.83			395.83
3 Axle Truck	850000	1100	212.5	45.83			395.83
MAV	1000000	1200	212.5	45.83			395.83
Agriculture Tractor/Trailors	1100000	3000	212.5	45.83			395.83
Petrol (Rs/lt)	53						
Diesel(Rs/lt)	39						
Lubricant(Rs/Kg)	300						

Table 9.8: Characteristics of Vehicles per Category

Vehicle type	GVW (Tones)	ESAL Factor	No. of Axles	No. of Tires	No. of passengers	Service life (Years)	Hours driven/Year	Km driven/Year	Annual interest rate (%)
2 Wheeler	0.2	0	2	2	1	10	400	10000	12
3 Wheeler	1	0	2	3	3	10	550	23000	12
Mini Bus	2.5	0.04	2	4	30	15	850	34000	12

Vehicle type	GVW (Tones)	ESAL Factor	No. of Axles	No. of Tires	No. of passengers	Service life	Hours driven/Year	Km driven/Year	Annual interest
Car	1.5	0	2	4	4	10	550	23000	12
Bus	10	0.7	2	6	45	12	1750	70000	12
LCV	4	0.1	2	4	0	8	1300	30000	12
2 axle	24	2.28	2	10	0	15	2000	85000	12
3Axle	24	2.28	3	10	0	15	2000	85000	12
MAV	28	2.28	3	10	0	12	2050	66000	12
Agriculture Tractor	10	4.63	3	6	0	15	1200	50000	12

9.5 THE RESIDUAL VALUE

Considering the remaining life of the construction items the Residual value (salvage value) has been assessed at the end of the analysis period. For structures, the life is assumed to be 50 years. Values of the selected construction items such as LA, structures, sub-base, social displacement cost etc. are included in the economic analysis as residual values at the end of the analysis periods. These residual values are considered, as benefits to the project in the analysis. The value has been taken as 5%.

9.6 VOLUME OF TRAFFIC ON THE NEW ROADS

Table 9.9 gives the AADT in 2016 on the project road.

Table 9.9: Traffic on Road @ Year 2016

Vehicle Category	Moreh Bypass
Two Wheeler	1333
Car / Jeep / Van / Taxi	1116
Three Wheeler	1670
LCV	114
Govt. Bus	4
Private Bus	4
Mini Bus	3
Tractor	0
Tractor With Trolly	0
2 - Axle	27
3 - Axle	11
Multi-Axle Truck	0

Total Fast Moving	4282

9.7 TRAFFIC GROWTH RATE

Table 9.10 shows the traffic growth rates per annum on the new roads and existing roads.

Table 9.10: Traffic Growth Rates on existing Roads

Vehicle Category	>2016
2W	5
3W	5
Car	5
Mini Bus	5
Bus	5
LCV	5
2Axle Truck	5
3Axle Truck	5
MAV	5
Agriculture Tractor & Trailer	5

9.8 MODEL INPUTS

Road Geometry and Pavement Data are shown at the end of the Chapter.

9.9 PROJECT BENEFITS

9.9.1 Vehicle Operating Cost Savings

The model comprehensively predicts the performance and operating costs of motorized vehicles in the selected fleet. Motorized vehicle performance predictions include speeds (free flow and congested conditions) and consumptions. Predictions for vehicle operating costs include fuel, oil, tire and parts costs, crew and maintenance labour costs, capital depreciation, borrowing costs, and overhead costs.

HDM IV was used to estimate the Vehicle Operating Costs (VOC) for traffic in each vehicle category on each selected road *with* and *without improvement*. The model estimates VOC in both the with- and without-project situations taking into account the speed and travel time including surface quality and road congestion. The resulting VOC values for each road and section can be found in the HDM results.

9.9.2 Travel Time Saving

The model estimates the Value of Travel Time (VOTT) for passengers and goods in transit in both the *with*- and *without*-project scenarios taking into account speed and

travel time including surface quality, road congestion etc.

9.9.3 Accident Cost Savings

There can be some anticipated reduction of accidents due to improved signing and engineering intervention, the benefits deriving from this rehabilitation project are deemed to be moderate and consequently the accident-related benefits have not been discounted in the HDM analysis. As a result the actual economic return in respect of increased of Road Safety would be expected to be nominally higher than the rates of return presented in this report.

9.10 ECONOMIC VIABILITY

The economic internal rate of return is calculated by the model applying a project discount rate of 12 percent to the annual undiscounted net differences of the economic elements considered in the analysis. The sum of these discounted values gives the economic net present value (NPV) of the project which is generated and presented, together with the associated EIRR in the HDM output sheets for sectional and project basis attached in last respectively.

Economic evaluations were carried out for discrete sections of the project road as well as for the total aggregated length and for the scenarios described below:

In the analysis, the '*with project*' improvement alternative was compared with the base option of '*without project*' alternative of maintaining the existing road and minimum maintenance "Do Minimum" i.e

1. Base case

Without improvements and with annual *"Do Minimum"* maintenance from 2016

2. Improvement Alternative

With improvement/rehabilitation/Up gradation and annual "Routine Maintenance" supplemented by a Structural Overlay

The results of the HDM analysis based on Final Feasibility Study Report (Rev 0) are summarized below in Table 9.11**.** for original model generated sheets.

Table 9.11: Results of the Economic Analysis

Alternative	Present Value of Total Agency Costs (RAC)	Present Value of Agency Capital Costs (CAP)	Increase in Agency Costs	Decrease in User Costs	Net Exogenous Benefits	Net Present Value	NPV/Cost Ratio	NPV/Cost Ratio	Internal Rate of Return
			(C)	(B)	(E)	(NPV = B+E-C)	(NPV/RAC)	(NPV/CAP)	(IRR)
Do nothing case	57.024	55.518	0	0	0	0	0.000	0.000	0.000

Alternative	Present Value of Total Agency Costs (RAC)	Present Value of Agency Capital Costs (CAP)	Increase in Agency Costs	Decrease in User Costs	Net Exogenous Benefits	Net Present Value	NPV/Cost Ratio	NPV/Cost Ratio	Internal Rate of Return
			(C)	(B)	(E)	(NPV = B+E-C)	(NPV/RAC)	(NPV/CAP)	(IRR)
Upgradation	166.785	166.785	109.761	109.761	0	1,593.215	9.553	9.553	78.6 (1)

Source: HDM-4 Output sheets

The improved and upgraded section of length 2.52 km, the project is found to be economically viable. The entire project road is found viable *returning* a **NPV of Rs 9.553** million and an **EIRR of 78.6%**; EIRR is comfortably above the threshold of 12%

The project is recommended for implementation.

Table 9.12: HDM Inputs of Existing Roads

Definition	Section	Moreh Bypass
	Section ID	MBP1
	Link name	Moreh to Myanmar
	Link ID	MM1
	Speed flow type	Single lane
	Traffic flow pattern	rural
	Climatic zone	Manipur
	road class	Secondary
	Surface class	Unsealed
	pavement type	Gravel
	Length	2.520Km
	Carriage width	10m
	shoulder width	1m
	number of lanes	2
	MT	6529
	NMT	87
	Year	2016
	Flow direction	2-way
Geometry	Rise + Fall	25
	Avg curvature	150
	Speed limit	50
	Altitude	735
	Drainage	No drain
Pavement	Material type	Laterite gravel
	last regravel year	2011
Condition	Roughness	12

	Gravel thickness	30.00

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HIGHWAY DEVELOPMENT & MANAGEMENT

Economic Analysis Summary

Study Name: **Moreh Bypass**
Run Date: **09-12-2016**

This report shows total economic benefits using the following:
Currency: Rupee (millions).
Discount rate: 12.00%.
Analysis Mode: Analysis-by-Project

Alternative: Upgradation vs Alternative: Do nothing

	Increase in Road Agency Costs			Savings in MT VOC	Savings in MT Travel Time Costs	Savings in NMT Travel & Operating Costs	Reduction in Accident Costs	Net Exogenous Benefits	Net Economic Benefits (NPV)
	Capital	Recurrent	Special						
Undiscounted	-16.47	-5.01	0.00	-73.17	1,546.88	0.00	0.00	0.00	1,495.19
Discounted	111.27	-1.51	0.00	641.49	1,061.48	0.00	0.00	0.00	1,593.22

Economic Internal Rate of Return (EIRR) = 78.6% (No. of solutions = 2)

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HIGHWAY DEVELOPMENT & MANAGEMENT

Economic Indicators Summary

Study Name: **Moreh Bypass**
Run Date: **09-12-2016**
Currency: **Rupee (millions)**
Discount Rate: **12.00%.**

Alternative	Present Value of Total Agency Costs (RAC)	Present Value of Agency Capital Costs (CAP)	Increase in Agency Costs (C)	Decrease in User Costs (B)	Net Exogenous Benefits (E)	Net Present Value (NPV = B+E-C)	NPV/Cost Ratio (NPV/RAC)	NPV/Cost Ratio (NPV/CAP)	Internal Rate of Return (IRR)
Do nothing	57.024	55.518	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Upgradation	166.785	166.785	109.761	1,702.976	0.000	1,593.215	9.553	9.553	78.6 (2)

Figure in brackets is number of IRR solutions in range -90 to +900

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HIGHWAY DEVELOPMENT & MANAGEMENT

Comparison of Cost Streams (Undiscounted)

Study Name: **Moreh Bypass**
Run Date: **09-12-2016**

This report shows a comparison of the undiscounted economic cost streams using the following:
Base Alternative Cost versus Alternative Cost
The base alternative has been defined as: Do nothing
All costs are expressed in: Rupee (millions)

Comparison of alternative: Upgradation

Year	Increase in Road Agency Costs			Decrease in Road User Costs				Net Exogenous Benefits	Net Benefits
	Capital	Recurrent	Special	MT VOC	MT Time	NMT	Accidents		
2016	160.134	-0.167	0.000	0.000	0.000	0.000	0.000	0.000	-159.967
2017	-6.154	-0.167	0.000	34.571	43.682	0.000	0.000	0.000	84.574
2018	-5.968	-0.167	0.000	41.053	52.219	0.000	0.000	0.000	99.407
2019	-6.154	-0.167	0.000	53.082	69.944	0.000	0.000	0.000	129.347
2020	-6.154	-0.167	0.000	71.538	99.035	0.000	0.000	0.000	176.894
2021	-5.968	-0.167	0.000	106.866	154.810	0.000	0.000	0.000	267.811
2022	-6.154	-0.167	0.000	137.483	202.967	0.000	0.000	0.000	346.771
2023	-6.154	-0.167	0.000	149.620	220.332	0.000	0.000	0.000	376.273
2024	-5.968	-0.167	0.000	162.817	238.438	0.000	0.000	0.000	407.390
2025	-6.154	-0.167	0.000	177.071	257.880	0.000	0.000	0.000	441.271
2026	-6.154	-0.167	0.000	183.441	268.788	0.000	0.000	0.000	458.550
2027	-5.968	-0.167	0.000	173.892	262.654	0.000	0.000	0.000	442.681
2028	-6.154	-0.167	0.000	164.684	256.798	0.000	0.000	0.000	427.803
2029	-6.154	-0.167	0.000	154.616	250.198	0.000	0.000	0.000	411.135
2030	-5.968	-0.167	0.000	143.574	242.735	0.000	0.000	0.000	392.444
2031	-6.154	-0.167	0.000	131.439	234.266	0.000	0.000	0.000	372.025
2032	-6.154	-0.167	0.000	117.750	224.614	0.000	0.000	0.000	348.685
2033	-5.968	-0.167	0.000	101.942	213.558	0.000	0.000	0.000	321.635
2034	-6.154	-0.167	0.000	84.039	200.818	0.000	0.000	0.000	291.177
2035	-6.154	-0.167	0.000	61.175	185.918	0.000	0.000	0.000	253.414
2036	-5.968	-0.167	0.000	36.647	168.306	0.000	0.000	0.000	211.087

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H D M - 4 **Comparison of Cost Streams (Undiscounted)**

2037	-6.154	-0.167	0.000	-12.323	84.444	0.000	0.000	0.000	78.442
2038	-6.154	-0.167	0.000	-178.257	-180.490	0.000	0.000	0.000	-352.426
2039	-5.968	-0.167	0.000	-217.342	-222.267	0.000	0.000	0.000	-433.475
2040	-6.154	-0.167	0.000	-260.018	-266.127	0.000	0.000	0.000	-519.824
2041	-6.154	-0.167	0.000	-306.199	-313.208	0.000	0.000	0.000	-613.087
2042	-5.968	-0.167	0.000	-346.106	-352.818	0.000	0.000	0.000	-692.789
2043	-6.154	-0.167	0.000	-346.673	-350.199	0.000	0.000	0.000	-690.551
2044	-6.154	-0.167	0.000	-346.741	-350.203	0.000	0.000	0.000	-690.624
2045	-5.968	-0.167	0.000	-346.813	-350.208	0.000	0.000	0.000	-690.887
Total:	-16.465	-5.009	0.000	-73.170	1,546.882	0.000	0.000	0.000	1,495.187

10 CONCLUSIONS AND RECOMMENDATIONS

The Proposed alignment is best suited for the Moreh Bypass section. The proposed design shall enhance safety level of service for road users, superior operation & maintenance enabling enhanced operation efficiency, minimal adverse impact on the local population, minimal adverse impact on environment, minimal land acquisition by appropriate engineering solutions.

The improvement proposal consists of improvement to existing carriageway by reconstruction and widening to two lane with paved shoulder standard. The improvement proposal includes to improvement to geometrically deficient curves and grades to meet the geometrical standards.

The construction cost of the project would be approximately **Rs.40 crores.**