



National Highways Authority of India

(Ministry of Road Transport & Highways)

Government of India

G-5&6, Sector-10, Dwarka-New Delhi-110075

4 laning of Channarayana Bypass from km 140+449 to km 149+596 and Hassan Bypass from Km 175+935 to km 185+684 and providing Grade Separator Structures, Service Road and other safety measures in Devihalli (km 108+486) to Hassan (km 185+684) section of NH-75 (Old NH-48), on EPC Basis in the State of Karnataka.

EXECUTIVE SUMMARY DEVIHALLI TO HASSAN SECTION (Detail Project Report)



CHAPTER – 1	1
Executive Summary	1
1.1. Introduction	1
1.2. General	2
1.3. Project Location	2
1.4. Objectives.....	2
1.5. Project Road Description.....	3
1.6. Existing Project Road Feature	4
1.6.1. Terrain	4
1.6.2. Land Use Pattern	4
1.6.3. Built-Up Area on existing Road.....	5
1.7. Methodology Adopted for Feasibility Study	7
1.7.1. Primary Surveys	7
1.7.2. Project Development Plan.....	8
1.7.3. Preliminary Design.....	8
1.8. Engineering Investigations	9
1.9. Design standards	9
1.10. Improvement Proposal.....	9
1.10.1. Widening Proposal	9
1.11. Realignment	9
1.12. Service Road / Slip Road.....	9
1.12.1. Proposed Major Realignment.....	12
1.12.2. ROW.....	12
1.12.3. Widening Schedule & Geometry	12
1.13. Pavement Design.....	13
1.14. Structures Proposal	13
1.15. Junction Improvements	14
1.16. TCS Proposal.....	14

CHAPTER – 1

Executive Summary

1.1. Introduction

The **National Highways Authority of India (NHAI)** has been entrusted with the Assignment of preparation of Detail project report for Channarayanaapatna & Hassan By-Passes, Service Road, VUP/VOP and Other Road Safety Measures Essential in Devihalli (Km 108+486) To Hassan (Km-185+684) Section of NH-75, on EPC Basis in State of Karnataka.

NHAI will be the employer and executing agency for the consultancy services and the standards of output required from the appointed consultants are of international level both in terms of quality and adherence to the agreed time schedule.

For the purpose of project preparation, NHAI has selected Consultant through an open competitive bidding and assigned the consultancy services for **Widening of Channarayanaapatna & Hassan Bypasses from 2 Lane to 4 Lane, Grade Separator, Structures, Service Road and Other Road Safety Measures Essential in Devihalli (Km 108+456) To Hassan (Km-185+688) Section of NH-75, on EPC Basis for a Length of 77.212km in State of Karnataka**

The various stages leading to the submission of the report are as listed below:

- Signing of Contract
- Inception Report
- Feasibility Report
- **Detailed Project Report**

1.2. General

The National Highways Authority of India (NHAI) has been entrusted with the Assignment of preparation of Detail project report for Channarayanaapatna &Hassan By-Passes, Service Road, VUP/VOP and Other Road Safety Measures Essential in Devihalli (Km 108+486) To Hassan (Km-185+684) Section of NH-75, on EPC Basis in State of Karnataka. .

1.3. Project Location

The proposed project section in the state of Karnataka from Devihalli to Hassan on NH-75. The length of the project road is approximately 77.198Kms. NH-75 Bangalore-Mangalore Road is one of the Major connecting link between the capital of the Karnataka state and west coast of Karnataka through Western Ghats. The Highway runs parallel to the Bangalore-Mangalore Railway line and connects many number of cross roads, mostly state Highways and Major district roads. The Highway connects many important towns Varahasandra, Kunigal, Hirisave, Jogipura, Channarayanaapatna, Bydarahalli, Madenuru, Buvanahalli, etc., and caters to healthy Traffic from Mangalore port to Bangalore.

As per our reconnaissance survey the carriageway width has been 17.5-meter-wide at four lane sections between chainage 108+486 km to 185+684 km & rest of the portion of project corridor are of 10.0mt carriageway width. The project corridor is a part of NH-75 Bangalore-Mangalore Road, is one of the Major connecting link between the capitals of the Karnataka state.

1.4. Objectives

The main objective of the consultancy services is to establish the technical viability of the project and prepare detailed project report for widening of Devihalli to Hassan from 2 Lane to 4 Lanes,grade separated, VUPs & LVUPs structures, service road and other road safety measures essential in Devihalli (Km 108+486) To Hassan (Km-185+684) section of NH 75 on EPC basis for a length of 77.198km in the state of Karnataka.

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

The Detailed Project Report would inter-alia include detailed highway design, design of pavement and overlay with options for flexible or rigid pavements, design of bridges and cross drainage structures and grade separated structures, design of service roads, quantities of various items, detailed working drawings, detailed cost estimates, economic and financial viability analyses, environmental and social feasibility, social and environmental action plans as appropriate and documents required for tendering the project on commercial basis for international / local competitive bidding.

The consultant should ensure detailed project preparation incorporating aspects of value engineering, quality audit and safety audit requirement in design and implementation.

The consultant should, along with Feasibility Report, clearly bring out through financial analysis the preferred mode of implementation on which the Civil Works for the stretches are to be taken up. The consultant should also give cost estimates and tender documents along with feasibility report/ detailed Project Report.

If at feasibility stage, employer desire to terminate the contract, the contract will be terminated after payment up to that stage.

1.5. Project Road Description

Section (DEVIHALLI to HASSAN) provides direct connectivity between NH-75, improvement of this road will immensely help the populace of village enroute namely Varahasandra, A. Nagathihalli, Kadabahalli, Kirisave, H.Honnenahalli, Heggadihalli, Gowdageri, Channarayapatna, Bydarahalli, Madenuru, Buvanahalli, Hassan to fulfill their economic as well as social aspirations. The project road passes through the South-west part of HASSAN. The geography is mixed with the mountainous region to the west and south west called BisleGhat and the plains regions in the north, south and east. There are some areas of degraded forest ranges in central portion of the district. Existing alignment have 17.5 m carriageway from DEVIHALLI to HASSAN except in bypass location. The section includes one bypass with carriage way width 10 m passes through plain and rolling terrain till end.

Figure 1-1: Location Map

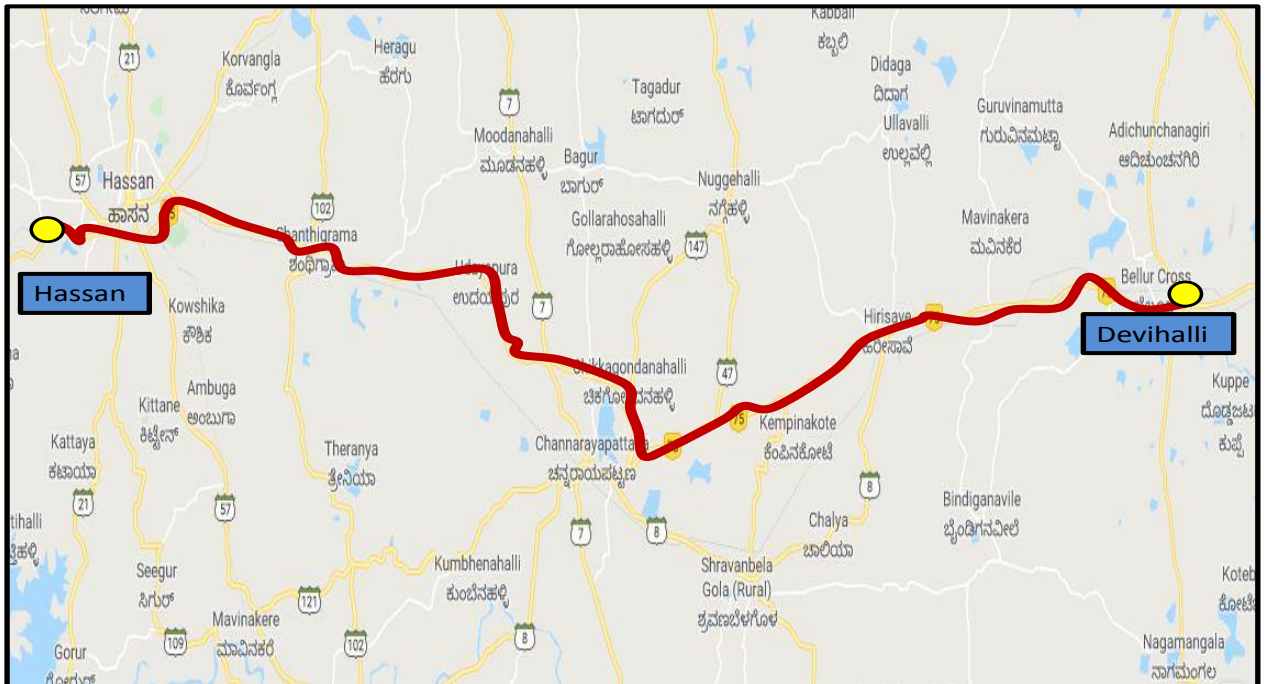


Figure 1-2: Start and End Points



**Fig. 4.1 Start Point of Project Road
(At Devihalli on NH-75)**



**Fig. 4.2 End Point of Project Road
(At Hassan on NH-75)**

1.6. Existing Project Road Feature

The Project road from Devihalli to Hassan is falls in the state of Karnataka. The approximate length of the project road is 77.198 Km.

A brief description of the salient features of this corridor is given in table below.

Table 1-1: Existing Project road feature

Length of the Project Road (Km)	77.198 km
Right of Way	2 lane with paved shoulder -60 m
	4 lane with paved shoulder - 60 m
Land Use	Agricultural land – 60.728 km
	Barren land – 2 km
	Built-up location – 12 km
	Forest Area – 2 km
	Ghat Section – 0 km
Major Junctions	19
Minor Junctions	39
Major Bridges	0
Minor Bridges	24
Culverts	Box/Slab Type- 18
	Pipe Type- 76
Level Crossings	0

1.6.1.Terrain

Entire project road (**Devihalli to Hassan**) passes through plain and rolling terrain.

1.6.2.Land Use Pattern

Table 1-2: Both side Land Use

Sl.No	Start Ch.	End Ch.	Land Use
1	108.486	109.456	Built up area
2	109.456	112.456	Agricultural Land
3	112.456	113.456	Agricultural Land/Built up area
4	113.456	115.456	Agricultural Land
5	115.456	116.456	Built up area/Agricultural Land
6	116.456	118.456	Agricultural Land
7	118.456	119.456	Agricultural Land/Built up area
8	119.456	124.456	Agricultural Land
9	124.456	125.456	Built up area/Agricultural Land

10	125.456	126.456	Agricultural Land
11	126.456	127.456	Built up area/Agricultural Land
12	127.456	128.456	Agricultural Land
13	128.456	132.456	Agricultural Land/Built up area
14	132.456	134.456	Agricultural Land
15	134.456	135.456	Agricultural Land/Built up area
16	135.456	137.456	Agricultural Land
17	137.456	139.456	Agricultural Land/Built up area
18	139.456	142.456	Agricultural Land
19	142.456	143.456	Agricultural Land/Built up area
20	143.456	144.456	Built up area/Agricultural Land
21	144.456	147.456	Built up area
22	147.456	150.000	Agricultural Land
23	150.000	152.456	Agricultural Land/Built up area
24	152.456	156.456	Agricultural Land
25	156.456	159.456	Agricultural Land/Built up area
26	159.456	164.456	Agricultural Land
27	164.456	165.456	Built up area/Agricultural Land
28	165.456	166.456	Agricultural Land/Built up area
29	166.456	168.456	Agricultural Land
30	168.456	169.456	Agricultural Land-Built up area
31	169.456	170.456	Built up area/Agricultural Land
32	170.456	172.456	Agricultural Land
33	172.456	173.456	Built up area/Agricultural Land
34	173.456	174.456	Agricultural Land/forest
35	174.456	175.456	Forest
36	175.456	176.456	Forest/Barren land/Agricultural Land
37	176.456	177.456	Built up area/Agricultural Land
38	177.456	183.456	Agricultural Land
39	183.456	185.684	Agricultural Land/Barren land

1.6.3.Built-Up Area on existing Road

Projected road (DEVIHALLI to HASSAN) provide direct connectivity between NH-75 improvement of this road traverses through the populace of village enroute namely Alesandra(km 111.4), Heggadihalli(km 126.400), HaralaBaraguru(km 149.900), Addhihalli(km 165.000), Anachihalli(km 185.684)

Table 1-3: Existing Built-Up Area

Sl.no.	Chainage (KM)	Village name
1	108.486	Devihalli
2	109.100	Varahasandra
3	110.600	Sanaba
4	111.400	Alesandra
5	112.900	Nagathihalli
6	113.600	Avverahalli
7	115.200	Chikkonahallipura
8	115.700	Kadhaballi
9	118.500	Honnadevihalli
10	118.600	Kirisave
11	120.100	Thubinakere
12	120.000	Byadarahalli
13	121.200	Metikeri
14	123.100	Hirisave
15	125.500	Honnenahalli
16	126.400	Heggadihalli
17	128.900	Rajapura
18	128.400	Dodderikavalu
19	129.700	Madhihalli
20	131.200	Mattanavile
21	132.250	Gulehonnenahalli
22	133.900	Kodibelagula
23	135.000	Gowdageri
24	137.700	Malavanaghatta
25	138.900	Jogipura
26	140.400	Shettyhalli
27	142.150	Aralapura
28	142.750	Bandihalli
29	143.900	Chikkagondanahalli
30	145.400	Belashindha
31	146.000	Gulashindha
32	146.500	Doddamatthigatta
33	149.250	Baraguru
34	149.900	HaralaBaraguru
35	151.200	Chavadenahalli
36	153.600	Baladhare
37	154.600	Vuppinahalli
38	156.200	Appenahalli
39	157.250	Hirehalli
40	158.750	Muddanahalli
41	160.200	Dhandiganahalli
42	161.200	Avarelinganakopalu
43	162.500	HitthalaAladahalli
44	164.097	Madenuru

45	165.000	Addihalli
46	167.200	Shanthigrama
47	170.700	VupparaHosahalli
48	171.100	Heggadihalli
49	174.250	Kenchatihalli
50	175.350	Kasthuravalli
51	176.200	Buvanahalli
52	176.500	Bustenahalli
53	177.800	Gavanahalli
54	178.200	Adavalli
55	179.472	Bammanayakanahalli
56	179.850	Channapatna
57	180.000	Hassan
58	181.545	Bittagondanahalli
59	183.100	Hullenahalli
60	184.150	Chikkamandiganahalli
61	184.850	Doddamandiganahalli
62	185.197	Devarayapatna
63	185.300	Kandhalli
64	185.684	Anachihalli

1.7. Methodology Adopted for Feasibility Study

The methodology adopted for the Technical Feasibility Study is presented below:

1.7.1.Primary Surveys

The following primary surveys were conducted as a part of this assignment is as given below. Detailed methodology for these surveys is already presented in Inception Report.

- **Road inventory Survey:** Detailed inventory of roads and structures were carried out in the form of visual inspection and secondary data collection. The information such as Existing carriageway width, Right of Way details, CD Structure details, Details of Grade separators, Land use details, Major & Minor Junctions and Major Settlements along the project road corridor were collected to understand the existing road characteristics.
- **Pavement condition survey:** Understanding the existing pavement condition is an important aspect of any highway improvement project, since the performance of highway directly depends on the performance of its pavement and the cost of improvement of pavement is of high importance in the total cost of project. Pavement condition survey is carried out on the project corridor to examine the functional efficiency of the existing pavement. Basic pavement distresses on the corridor were measured by visual observation and the Pavement Condition Index was determined. The sections which require maintenance were identified.
- **Topographic survey:** The main objective of the topographic survey is to capture the essential ground features at the study areas for developing widening schemes. From the existing topo data, 3D terrain model has been created, which will be used to design the geometry of the proposed upgradation / improvement.

1.7.2. Project Development Plan

The proposed improvement plan is laid in terms required lane configuration based on the findings and the potential of the project area to attract diversion from various corridors. All the improvement plans are prepared strictly adhering to the IRC guidelines prepared for public and private participation development of projects, any specific deviations such necessities will be discussed with NHA and MoRTH before they are put in the project design.

Structural proposal – The structure proposal was prepared on the structural soundness, the remaining life and future requirements. In general, all submersible bridges will be replaced by high level bridges and all the pipe culverts will be replaced by box culverts as predominantly NP-2 has been used based on the earlier specification and project requirements.

The project improvement proposals identified for the project road are:

- Lane configuration (Four lane with paved shoulder)
- Typical cross section for Urban and Rural section of Four lane with paved shoulder
- Proposals for CD Structures and other structures
- Widening of Channraypatana bypass (km 140+449 to km 149+596) is Eccentric widening
- Widening of Hassan bypass (km 175+935 to km 185+684) is Eccentric widening
- Grade separated Structure proposal on major intersection of existing project corridor as well as Bypass location

1.7.3. Preliminary Design

Based on the traffic data, the road improvement / upgradation proposal was finalized and the Preliminary Designs prepared. The design of various components of the project corridor is done adhering to relevant IRC/ MORT&H standards as following

- Manual of Specifications and Standards for FourLaning of State Highways: IRC SP 84 – 2014 and
- Ministry of Road Transport & Highways (MoRT&H) specifications and circulars – Fifth edition

The engineering design is divided into three sections as mentioned below:

- **Pavement design** – Based on the traffic projection data and design MSA the proposed pavement crust thickness for new construction / widening is designed for the effective design CBR. However, the reconstruction and new pavements will be designed with flexible pavement.
- **Road design** – This includes the preliminary geometric design of the project corridor. It also includes the preparation of preliminary designs for drainage, junction improvement, signage and marking according to the design standards
- **Structures design** – Structures design included the preparation of preliminary design of new structures, widening / reconstruction / repair of existing structures depending on their present condition.

1.8. Engineering Investigations

The following surveys and investigations have been carried out for preparing the most appropriate proposal to meet the functional and structural efficiency and safety requirements.

- Road Inventory
- Visual Pavement Condition Survey
- Pavement Composition surveys
- Material Investigations
- Topo graphical surveys

1.9. Design standards

Formulation of a series of design standards is required for applying them during design in order to avoid any inconsistency in design from one section to the other and provide desirable level of service and safety. Guidelines as suggested in Manual of Specifications and Standards for Four-Laning of National Highways (IRC: SP-84:2014), MoRT&H are followed mainly for the project.

1.10.Improvement Proposal

1.10.1. Widening Proposal

The consultants have divided the project road into Single homogeneous section with respective to the traffic volume and the details along with recommended widening are as given below.

Table 1-4: Widening proposal

Sub-Section	Length of the Section	Section	Section wise Recommendation for widening
Homogenous Section-I	140.449-149.596	Channayapatana bypass	Four lane with paved shoulder
Homogenous Section-II	175.935-185.684	Hassan bypass	Four lane with paved shoulder with SR

1.11. Realignment

Nil

1.12.Service Road / Slip Road

Service roads shall be constructed at given below locations including length and side of the built-up-area:

Table 1-5: Service Road proposal

Sl. No.	Location of Service Road (Design Chainage)		Side	Length of Service Road (Km)	TCS Type	Width (m)	Remark
	From (km)	To (km)					
1	109.260	109.600	BHS	0.340	TCS 6	7	Service Road With Existing 4-Lane Road
2	117.890	118.815	BHS	0.925	TCS 6	7	Service Road With Existing 4-Lane Road
3	121.700	122.100	BHS	0.400	TCS 6	7	Service Road With Existing 4-Lane Road
4	122.330	122.630	BHS	0.300	TCS 6	7	Service Road With Existing 4-Lane Road
5	123.580	124.600	BHS	1.020	TCS 6	7	Service Road With Existing 4-Lane Road
6	125.200	125.800	BHS	0.600	TCS 6	7	Service Road With Existing 4-Lane Road
7	126.200	127.050	BHS	0.850	TCS 6	7	Service Road With Existing 4-Lane Road
8	129.800	130.150	BHS	0.350	TCS 6	7	Service Road With Existing 4-Lane Road
9	132.160	132.500	BHS	0.340	TCS 6	7	Service Road With Existing 4-Lane Road
10	134.800	135.300	BHS	0.500	TCS 6	7	Service Road With Existing 4-Lane Road
11	137.200	138.000	BHS	0.800	TCS 6	7	Service Road With Existing 4-Lane Road
12	138.700	139.400	BHS	0.700	TCS 6	7	Service Road With Existing 4-Lane Road
13	153.600	154.600	BHS	1.000	TCS 6	7	EXISTING 4 LANE HIGHWAY WITH SERVICE ROAD
14	156.185	156.340	BHS	0.155	TCS 6	7	EXISTING 4 LANE HIGHWAY WITH SERVICE ROAD
15	161.100	161.300	LHS	0.200	TCS 6A	7	EXISTING 4 LANE HIGHWAY WITH SERVICE ROAD LHS SIDE
16	164.900	165.200	BHS	0.300	TCS 6	7	EXISTING 4 LANE HIGHWAY WITH SERVICE ROAD
17	167.500	167.850	BHS	0.350	TCS 6	7	EXISTING 4 LANE HIGHWAY WITH SERVICE ROAD

18	170.950	171.250	BHS	0.300	TCS 6	7	EXISTING 4 LANE HIGHWAY WITH SERVICE ROAD
19	176.480	178.500	BHS	2.020	TCS 1	7	4 LANE DIVIDED HIGHWAY WITH SERVICE ROAD (LHS ECCENTRIC WIDENING -AT HASSAN BYPASS)
20	180.410	181.320	BHS	0.910	TCS 1	7	4 LANE DIVIDED HIGHWAY WITH SERVICE ROAD (LHS ECCENTRIC WIDENING -AT HASSAN BYPASS)
21	182.010	182.590	BHS	0.580	TCS 1	7	4 LANE DIVIDED HIGHWAY WITH SERVICE ROAD (LHS ECCENTRIC WIDENING -AT HASSAN BYPASS)
22	183.360	184.950	BHS	1.590	TCS 1	7	4 LANE DIVIDED HIGHWAY WITH SERVICE ROAD (LHS ECCENTRIC WIDENING -AT HASSAN BYPASS)
23	184.950	185.100	BHS	0.150	TCS 7	7	AQUAVIADUCT PORTION
24	153.600	154.600	BHS	1.000	TCS 6	7	EXISTING 4 LANE HIGHWAY WITH SERVICE ROAD

Table 1-6: Slip Road proposal

Sl. No.	Location of Service Road (Design Chainage)		Side	Length of Service Road (Km)	TCS Type	Width (m)	Remark
	From (km)	To (km)					
1	115.300	116.290	BHS	0.990	TCS 8	7	VOP
2	122.630	123.580	BHS	0.950	TCS 3A	7	Grade Separator
3	130.890	131.900	BHS	1.010	TCS 3A	7	L VUP
4	135.480	136.180	BHS	0.700	TCS 3A	7	L VUP
5	139.600	141.000	BHS	1.400	TCS 3A	7	Grade Separator
6	141.670	142.600	BHS	0.930	TCS 3A	7	Grade Separator
7	147.890	149.600	BHS	1.710	TCS 3A	7	Grade Separator
8	154.750	155.300	BHS	0.550	TCS 3A	7	L VUP

9	156.850	157.640	BHS	0.790	TCS 3A	7	L VUP
10	162.300	164.430	BHS	2.130	TCS 3A	7	L VUP
11	173.070	173.690	BHS	0.620	TCS 3A	7	PUP
12	173.850	175.000	BHS	1.150	TCS 3A	7	PUP
13	175.390	176.480	BHS	1.090	TCS 3A	7	Grade Separator
14	179.200	180.410	BHS	1.210	TCS 3A	7	VUP/GS
15	181.320	182.010	BHS	0.690	TCS 3A	7	Grade Separator
16	182.590	183.360	BHS	0.770	TCS 3A	7	L VUP
17	185.100	186.270	BHS	1.170	TCS 3A	7	Grade Separator

1.12.1. Proposed Major Realignment

NIL

1.12.2. ROW

Table 1-6: Existing ROW Details

Sl. No.	Existing Chainage (km)		EROW (m) Length From Existing Centre Line		Total EROW (m)
	From	To	Left	Right	
1	108.486	185.684	30.00	30.00	60.00

1.12.3. Widening Schedule & Geometry

Eccentric Widening is followed at Bypass location.

Design speed of 100kmph and 80kmph has been maintained all through the project road. All the horizontal curves have been designed with a desirable minimum radius of 400m and 250m respectively.

Table 1-7: Pavement Proposal

Sl. No.	Design Chainage		Length (m)	Proposal	Remarks
	From	To			
1	108.486	140.449	31.963	Providing Grade Separator & Service Road	Existing Four Lane Road
2	140.449	150.000	9.551	Eccentric Widening (Four lanes with Paved Shoulder)	Channayapatana bypass

3	150.000	175.935	25.935	Providing Grade Separator & Service Road	Existing Four Lane Road
4	175.935	185.684	9.749	Eccentric Widening (Four lanes with Paved Shoulder + Service Road)	Hassan bypass

1.13. Pavement Design

The proposed pavement design for each section has been carried out considering above design parameters. The thickness for granular layers is derived using Tables of IRC:37-2001. The pavement Design for each homogeneous section is presented in Table below:

Table: Section wise Proposed Pavement Layer Thickness

Homogeneous Section	Bituminous Concrete	Dense Bituminous Macadam	Wet Mix Macadam	Granular Sub-base	Remarks
108.486to 140.449	40mm	50mm	250mm	200mm	LHS CW
108.486to 140.449	40mm	85mm	250mm	200mm	RHS CW
Channarayapatna Bypass (140.449 to 150.000)	40mm	110mm	250mm	200mm	LHS CW
150+000 to166+400	40mm	50mm	250mm	200mm	LHS CW
150+000 to166+400	40mm	75mm	250mm	200mm	RHS CW
166+400 to 175+935	40mm	55mm	250mm	200mm	LHS CW
166+400 to 175+935	40mm	80mm	250mm	200mm	RHS CW
Hassan Bypass (175+935 to 185+684)	40mm	110mm	250mm	200mm	LHS CW

Note: LHS CW-Left hand side carriageway, RHS CW-Right hand side carriageway

Summary of Proposals

- I. The flexible pavement is proposed for new main carriageway and widening portion of main carriageway as per above table.
- II. The flexible pavement of the same crust as main carriageway is proposed for paved shoulders.
- III. Service Road shall be designed for design traffic of 10 MSA and 10% CBR with flexible pavement. The flexible pavement is proposed for Service Road as 40 mm BC, 50mm DBM, 250mm WMM and 200 mm GSB.
- IV. The measures are proposed for strengthening / rehabilitating the existing flexible pavement as PCC/Camber correction with 40 mm BC overlay.

1.14. Structures Proposal

Table 1-8: Proposal for Structure

Sr. No.	Type	FOB	Subway	Minor Bridge	ROBs	FLYOVERs	VUPs	VOPs	LVUPs	PUPs	Total
---------	------	-----	--------	--------------	------	----------	------	------	-------	------	-------

1	New Construction	1	-	-	-	8	1	1	7	4	22
2	Reconstruction	-	-	7	-	-	-	-	-	-	7
3	Widening	-	-	4	2	-	1	-	-	-	7
	TOTAL	1	0	11	2	8	2	1	7	4	36

Table 1-9: Proposal for Culverts

Sr. No.	Type	Slab/box/arch	Pipe	Total
1	New Construction	-	-	-
2	Reconstruction	3	-	3
3	Widening	5	48	53

1.15. Junction Improvements

A total of 19 major junctions and 39 minor junctions have been proposed for improvement.

1.16. TCS Proposal

Table 1-10: TCS proposal List

Sl. No.	Chainage		Length (Km)	TCS Type
	From (km)	To (km)		
1	109.260	109.600	0.340	TCS 6
2	115.300	116.290	0.990	TCS 8
3	117.890	118.825	0.935	TCS 6
4	121.700	122.100	0.400	TCS 6
5	122.330	122.630	0.300	TCS 6
6	122.630	123.580	0.950	TCS 3A
7	123.580	124.600	1.020	TCS 6
8	125.200	125.800	0.600	TCS 6
9	126.200	127.050	0.850	TCS 6
10	129.800	130.150	0.350	TCS 6
11	130.650	131.580	0.930	TCS 3A

12	132.160	132.500	0.340	TCS 6
13	134.800	135.300	0.500	TCS 6
14	135.480	136.180	0.700	TCS 3A
15	137.200	138.000	0.800	TCS 6
16	138.700	139.400	0.700	TCS 6
17	139.600	141.000	1.400	TCS 3A
18	141.000	141.670	0.670	TCS 2
19	141.670	142.600	0.930	TCS 3A
20	142.600	147.890	5.290	TCS 2
21	147.890	149.600	1.710	TCS 3A
22	153.600	154.600	1.000	TCS 6
23	154.750	155.300	0.550	TCS 3A
24	156.185	156.340	0.155	TCS 6
25	156.850	157.640	0.790	TCS 3A
26	161.100	161.300	0.200	TCS 6A
27	162.300	164.430	2.130	TCS 3A
28	164.900	165.200	0.300	TCS 6
29	167.500	167.850	0.350	TCS 6
30	170.950	171.250	0.300	TCS 6
31	173.070	173.690	0.620	TCS 3A
32	173.850	175.000	1.150	TCS 3A
33	175.390	176.480	1.090	TCS 3A
34	176.480	177.280	0.800	TCS 5
35	177.280	178.500	1.220	TCS 1
36	178.500	179.200	0.700	TCS 5

37	179.200	180.410	1.210	TCS 3A
38	180.410	181.320	0.910	TCS 1
39	181.320	182.010	0.690	TCS 3A
40	182.010	182.590	0.580	TCS 1
41	182.590	183.360	0.770	TCS 3A
42	183.360	184.950	1.590	TCS 1