

CHAPTER -1

EXECUTIVE SUMMARY

1.1 Introduction

Good transportation systems are lifeline to the area they serve. Roads bring about all-round development in the region. A good road network helps in the success of all development activities. It is in the sphere of movement of people and goods, agriculture, commerce, education, health, and social welfare, or even maintenance of law and order and security.

Maharashtra State Road Development Corporation (MSRDC) Ltd., has been entrusted preparation of Detailed Project Report of selected stretches/corridor of Highway for Two/Four lanning with paved shoulder configuration.

In order to fulfill the traffic needs and road safety requirement, MSRDC has appointed the *M/S HIGHWAY ENGINEERING CONSULTANT, BHOPAL (M.P.)* as consultants to Providing Consultancy Services for Preparation of Detailed Project Report of *Pahur-Jamner-Bodhwad-Muktainagar Barhanpur Road* in the State of Maharashtra for up-gradation to Two lanes with paved shoulder /Four lane configurations., the assignment for *package no.-7. LOA No. MSRDC/CE(I)NHDPR/2016/2856, dated 01.06.2016.*

1.2 Scope of Study

The project study consists of preparation of the following:

Stage 1 – Inception Report & Quality Assurance Plan;

Stage 2 – Feasibility, Strip Plan and Clearance & Land Acquisition Report

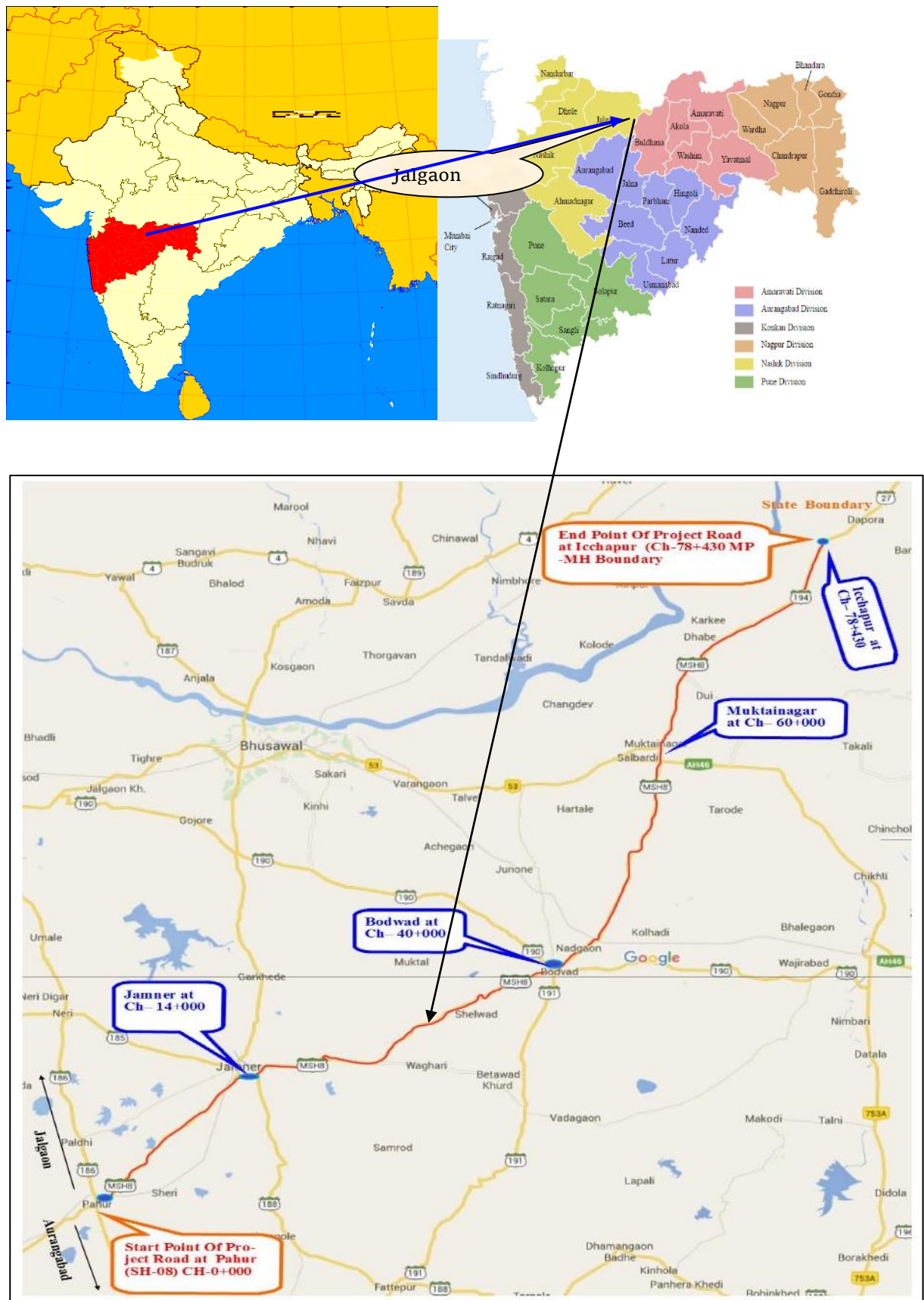
Stage 3 – (a) – Draft Detailed Project Report.

(b) – Final Detailed Project Report.

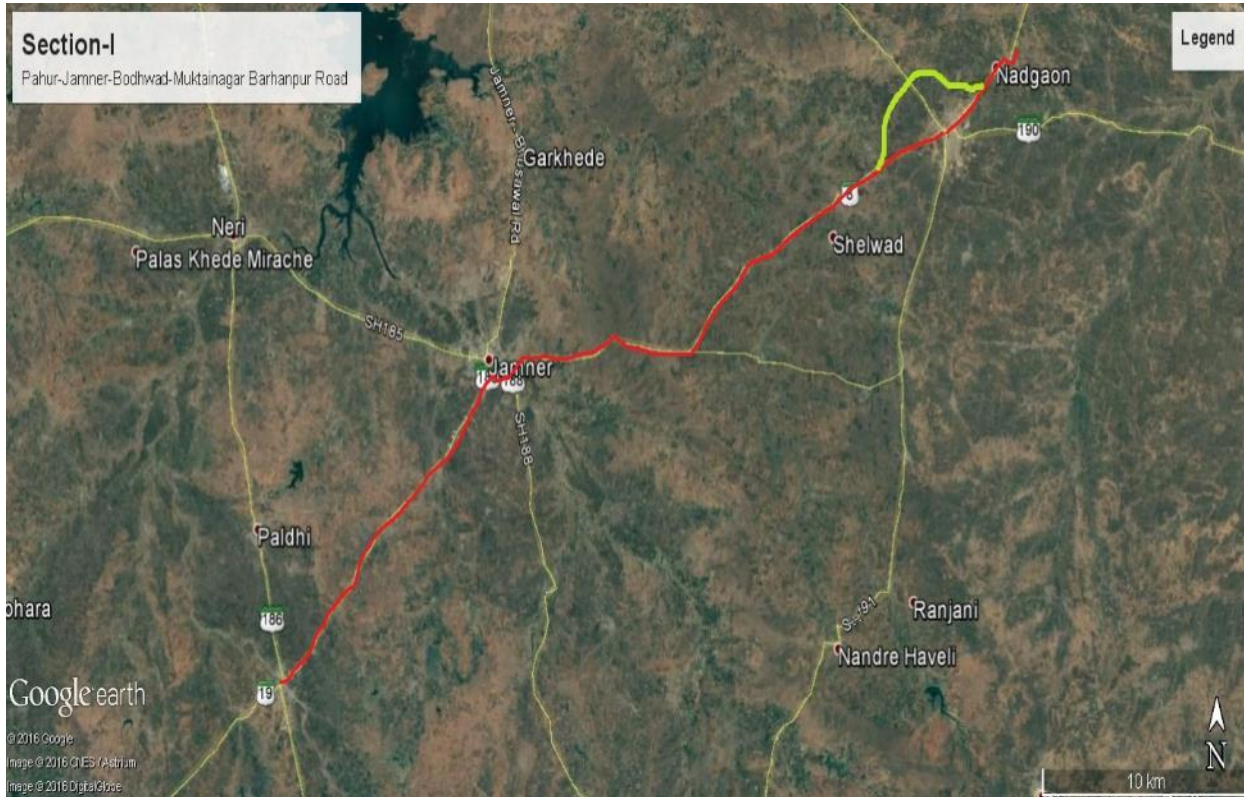
1.3 Socio - Economic Profile

The **Pahur-Jamner-Bodhwad-Muktainagar Barhanpur Road** is located in the district of Jalgaon, which in turn is located in the State of Maharashtra. Maharashtra occupies the western and central part of the country and has a long coastline stretching nearly 720 km along the Arabian Sea. The Sahyadri mountain ranges provide a physical backbone to the State on the west, while the Satpuda hills along the north and Bhamragad-ChiroliGaikhuri ranges on the east serve as its natural borders. The State is surrounded by Gujarat to the north west, Madhya Pradesh to the north, Chhattisgarh to the east, Andhra Pradesh to the south east, Karnataka to the south and Goa to the south west. Index Map as given in Figure 1.1 refers.

Figure 1.1 Index Map Enclosed Below



Index Map (Section-I, Pahur to Bodwad)



1.4 Project Description

The project road starts from Pahur at grade junction of (Km Stone 0/0 of SH-186) at Pahur Km 0.00 (20.710487° Latitude), (75.683667° Longitude) and ends at Icchapur (Km Stone 0/0 of SH-8 at Icchapur) (MP-MH Boarder) at 78.430 Km (21.154689° Latitude) (76.156787° Longitude). Project road divided into two section

The Project Road Pahur-Jamner-Bodhwad-Muktainagar Barhanpur is situated in eastern part of Chhattisgarh State having a total existing length 78.430 Kms and design length 78.145. The project road section between Pahur and Burhanpur (Icchapur) has been divided into following traffic homogeneous sections:

Table 1-1 Homogeneous Section

Section No.	Homogeneous Section	Chainage (km)		Length (km)
		From	To	
1	Pahur – Bodwad	0.00	45.00	45.00
2	Bodwad – Icchapur (MP-MH Bordar)	45.00	78.430	33.43

Start Point from Pahur at
3 arm junction of
Aurangabad-Jalgaon
Road at CH-0+000



Photo 1- : Starting Point Section -I of Project Road

End point of the project road:

End Point at Bodwad
(after Proposed ROB)
CH-45+000



Photo 2:- End Point Section-I of Project Road

Climate of Jalgaon District: -

Jalgaon District is located in the north-west region of the state of Maharashtra. It is bounded by Satpuda mountain ranges in the north, Ajanta mountain ranges in the south. Jalgaon is rich in volcanic soil which is well suited for cotton production. It is a major business centre for tea, gold, pulses, cotton and bananas. Languages spoken are Marathi, Ahirani, Hindi, and English. Jalgaon District receives an average rainfall of about 690 mm and the temperature varies from 10 to 48 degree Celsius.

Jalgaon has got pretty diverse climate. It is exceptionally hot and dry during summer with temperature reaching as high as 45 degrees Celsius. Jalgaon receives about 700 mm rainfall during monsoons, which is followed by pleasant temperature in winter.

Pavement Condition –

The existing road has an intermediate lane/ Two lane configuration from Km 0.00 to Km 45.000. Carriageway width varies from 5.50 m to 7.0 m bituminous surfaces and condition of the pavement is varies from poor to fair and having shoulder width of 0.5 m to 2.0 m on either side along the road and condition of shoulders is poor and covered with vegetation. The mostly project road traverses between plain terrains but project road traverses at some stretches between hilly terrains. Road inventory and pavement condition of project road may be seen in annexure -3.1



Photo 3:- Map Cracking



Photo 4:- Potholes

All major utilities follow the road alignment as the project road connects to Jamner, Bodwad Utilities like electric pole, Transformers, OFC, hand pumps, tube well, well etc. were observed on both sides of road



Photo 5 :- Location of Bodwad



Photo 6 :Location of Nadgaon

Table 1-1 List of Town/Villages

Sr. No.	Existing Chainage (m.)		Length (m)	Name of Village/Town
	From	To		
I	II	III	IV	V
1	0+000	0+520	520	Pahur
2	7+640	7+800	160	Pipalgon
3	10+600	11+240	640	Moyegaon
4	13+920	16+000	2080	Jammner
5	25+000	25+400	400	Wadikilla
6	40+000	41+650	1650	Bodwad
7	43+520	45+000	1480	Nadgaon

1.4.1 Geometrics

The horizontal alignment of the Project traverses through plain terrain. It is essential to improve substandard geometrics at various locations on project road. Geometric improvements shall be made as per standard and specifications.

In order to upgrade the road to the geometric requirements commensurate with the design speed, improvement has been proposed for the Project Road. The alignment passes through several villages and habitation areas of which some have built-up sections. The improvement works, consist of the existing intermediate / two lane carriageway to 2 lane with paved carriageway (7.0 m width) of rigid pavement with paved shoulder of 1.5 m on either side of rural section. The surface and sub-surface drainage system shall be planned as per IRC SP: 42-1994. A camber of 2.0% shall be provided in main carriageway and minimum longitudinal gradient of 0.05% in rural areas and 0.2% in urban shall be provided for smooth surface runoff. Longitudinal lined/unlined drain shall be provided near ROW in scattered built up section with outlets to cross drainage structures.



Photo-7-8: Horizontal alignment along the project road.

1.4.2 Road Junctions

The project road traverses through various habitations and village. Various important cross roads also join the project road at different locations. Project road encountered with 5 Major and 19 Minor intersections and 3 Railway level crossing. List of major and minor intersections is given in **Table 1.2** below. In general no safety arrangements viz. road signs, markings, etc are provided at these intersections. Junction details project road may be seen in annexure -I



**Photo 9- Grade junction of Pahur
(CH-0+000)**



**Photo 10-Grade junction Jamner, Bhusawal
(CH-14+560)**

Table 1-2: List of Junctions.

Sr. No.	Chainage as per Topo Survey	Destinations of Cross Road or railway	Road Side	Type of Junctions	Carriageway width (in M)	Remarks
	I	II	III	IV	V	VI
Section-I						
1	0+000	R/S--Aurangabad L/S- -Jalgaon	BHS	T	10	Major junction (SH-186)
2	0+840	Hiwarkhede	RHS	Y	3	Minor junction
3	1+125	L/S-Pachora R/S-Jamner	BHS	Railway crossing	Narrow gauge	Level Crossing 4 Time on -off a day
4	3+840	Sonale	LHS	T	3	Minor junction
5	7+660	Golaiet	RHS	T	3	Minor junction
6	10+730	Takali	RHS	T	3	Minor junction
7	11+120	Bhagdara	RHS	Y	3	Minor junction
8	13+160	L/S-Pachora R/S-Jamner	BHS	Railway crossing	Narrow gauge	Level Crossing 4 Time on -off a day
9	13+660	Kodoli	RHS	Y	3.5	Minor junction
10	14+560	Jamner, Bhusawal	LHS	Y	7	Major junction
11	15+920	Shahpur	RHS	T	5	Major junction (SH-188)
12	20+630	Lahasar	RHS	T	3	Minor junction
13	22+280	Shiddgad	RHS	Y	3	Minor junction
14	25+040	Nagan chouki	RHS	T	3	Minor junction
15	25+320	Waghari	RHS	T	3.75	Minor junction
16	26+480	Sonari	LHS	T	3	Minor junction
17	28+570	Maldabhadi	LHS	Y	3.75	Minor junction
18	31+320	Wadi	RHS	T	3	Minor junction
19	34+430	L/S-Bhausawal R/S-Jhamthi	BHS	X	5.5	Major junction
20	37+720	Jalchakra	LHS	Y	3.75	Minor junction
21	40+450	Bhusawal	LHS	Y	3.75	Minor junction
22	40+740	Market, jamthi	RHS	Y	3.75	Minor junction
23	40+800	Malkapur	RHS	T	14.00 - (4 Lane)	Major junction (SH-190)
24	44+280	Sonoti	LHS	T	3	Minor junction
25	44+648	L/S-Railway station (Mumbai) R/S-Nagpur	BHS	Railway crossing	Broad gauge	Level Crossing 350-400 Time on -off a day

Sr. No.	Chainage as per Topo Survey	Destinations of Cross Road or railway	Road Side	Type of Junctions	Carriageway width (in M)	Remarks
26	44+680	Ahmad gaon	LHS	Y	3	Minor junction
27	44+800	Kolhadi	RHS	Y	3	Minor junction

1.4.3 Bridge & Cross Drainage Structures

There are 2 Major and 7 Minor bridges along with 54 culverts on the project road.

Table containing details about existing Major/ Minor Bridges and Culverts for this road may be seen in annexure -3.2.

Table 1-3: Summary of Existing Bridges and CD

Type of Structure	Major Bridges	Minor Bridges	Slab /Arch Culvert	Vented Causeway	Hume Pipe Culvert
I	II	III	IV	V	VI
Existing Structure 63 Nos.	2	7	20	0	34

Table 1-4: Major Bridge

Sr. No.	Existing chainage	Details of Existing Structures			
		Type of Existing Structure	No of Span / Pipe x Length of Span / dia	Width of Structure	Condition of Structure
I	II	III	IV	V	VI
1	16+760	MJB	9 X 12.4	7.60	FAIR
2	31+880	MJB	7X10.4	8.20	FAIR

Table 1-5: Minor Bridge

Sr. No.	Existing chainage	Details of Existing Structures			
		Type of Existing Structure	No of Span / Pipe x Length of Span / dia	Width of Structure	Condition of Structure
I	II	III	IV	V	VI
1	3+390	MNB	1 X 8.40	12.20	GOOD
2	3+640	MNB	1 X 9.4	12.10	GOOD
3	7+240	MNB	3 X 9.4	12.30	POOR
4	10+780	MNB	5 X 9.40	8.10	FAIR
5	12+790	MNB	1 X 7.4	12.30	GOOD
6	42+210	MNB	2 X 4.4	12.00	FAIR
7	44+120	MNB	3 X 5.4	12.10	GOOD

Table 1-6: - List Of Existing Culverts

Sr. No.	Existing chainage	Details of Existing Structures			
		Type of Existing Structure	No of Span / Pipe x Length Span / dia	Width of Structure	Condition of Structure
I	II	III	IV	V	VI
1	0+340	HPC	2 ROW 900	12.10	Good
2	1+890	SLAB	1 X 5.3	12.10	Good
3	2+380	HPC	2 ROW 900	12.10	Fair
4	3+650	HPC	1 ROW 600	12.10	Poor
5	7+510	HPC	2 ROW 900	12.10	Good
6	8+100	SLAB	1 X 4.8	13.10	Poor
7	8+440	SLAB	1 X 4.2	12.30	Good

Sr. No.	Existing chainage	Details of Existing Structures			
		Type of Existing Structure	No of Span / Pipe x Length Span / dia	Width of Structure	Condition of Structure
I	II	III	IV	V	VI
8	8+590	HPC	1 ROW 900	12.00	Fair
9	8+750	SLAB	1 X 4.1	12.10	Good
10	9+700	SLAB	1 X 4.00	11.90	Good
11	9+870	HPC	1 ROW 900	12.00	Poor
12	10+120	HPC	2 ROW 900	12.00	Good
13	11+660	SLAB	1 X 3.00	11.90	Poor
14	12+480	SLAB	1 X 3.00	12.10	Poor
15	13+920	HPC	2 ROW 900	12.00	Fair
16	14+620	SLAB	1 X 4.00	12.10	Fair
17	14+980	HPC	1 ROW 900	10.10	Poor
18	15+430	HPC	1 ROW 900	10.00	Poor
19	15+760	SLAB	1 X 6.00	10.10	Poor
20	16+180	HPC	1 ROW 900	10.10	Poor
21	16+540	SLAB	1 X 3.00	10.10	Poor
22	17+190	SLAB	1 X 2.5	10.20	Poor
23	18+090	HPC	2 ROW 900 & 1 ROW 1000	10.20	Poor
24	18+340	HPC	2 ROW 900	10.10	Good
25	19+120	HPC	4 ROW 900	10.10	Poor
26	19+640	SLAB	1 X 6.00	10.10	Poor
27	20+240	HPC	2 ROW 900	13.10	Poor
28	20+540	HPC	2 ROW 900	10.10	Poor
29	21+430	SLAB	1 X 3.00	12.70	Poor
30	21+850	SLAB	1 X 0.5	7.40	Poor
31	21+520	SLAB	1 X 0.5	11.00	Poor
32	22+830	HPC	2 ROW 900	13.10	Fair
33	23+430	HPC	2 ROW 900	13.10	Fair
34	24+100	HPC	2 ROW 900	13.10	Poor
35	24+760	HPC	2 ROW 900	13.10	Poor
36	25+560	HPC	2 ROW 900	10.00	Good
37	25+910	HPC	2 ROW 900	10.00	Poor
38	28+230	HPC	2 ROW 900	10.00	Poor
39	31+580	HPC	1 ROW 900	11.00	Poor
40	32+480	HPC	1 ROW 1000	12.00	Poor
41	33+740	HPC	2 ROW 900	10.00	Poor
42	34+040	HPC	2 ROW 900	11.00	Poor
43	35+850	HPC	1 ROW 1000	10.10	Fair
44	36+100	HPC	1 ROW 900	11.00	Poor
45	36+770	HPC	1 ROW 900	10.10	Poor
46	38+370	HPC	1 ROW 900	10.20	Fair
47	40+170	SLAB	1 X 2.20	12.10	Good
48	40+420	HPC	1 ROW 900	12.50	Poor

Sr. No.	Existing chainage	Details of Existing Structures			
		Type of Existing Structure	No of Span / Pipe x Length Span / dia	Width of Structure	Condition of Structure
I	II	III	IV	V	VI
49	41+260	SLAB	1 X 0.6	-	Poor
50	41+520	SLAB	1 X 2.1	12.10	Good
51	41+860	SLAB	1 X 5.00	12.60	Good
52	42+910	HPC	1 ROW 900	10.30	Poor
53	43+980	SLAB	1 X 4.8	12.10	Good
54	44+410	HPC	2 ROW 900	10.50	Poor

1.5 Railway line crossing

There is three level crossing on the project road.

Table 1-7: List Of Existing Level Crossing

S.No.	Existing Chainage (Km)	Design Chainage (m)	No. of line	Type of line
I	II	III	IV	V
1	1+125	1+130	Single	Narrow gauge
2	13+160	13+087	Single	Narrow gauge
3	44+648	44+400	Six	Broad gauge

1.6 Traffic Survey Analysis and Forecast

To establish the traffic flow characteristics and travel pattern of the project corridor between **Pahur to Burhanpur** road the following traffic surveys were carried out:

- Classified Traffic Volume Count Survey
- Intersection Turning Movement Survey
- Axle Load Survey
- Origin Destination Survey

1.6.1 Classified Continuous Volume Count Survey

The objective of classified traffic volume count survey is to estimate traffic intensity on the project road.

The classified volume count surveys have been carried out for 7 days, 24 hours. The traffic is counted in number of vehicles by vehicle category-wise in each direction over 24Hrs a day for 7 Days. The counts were recorded in the formats as per IRC specifications. Classified volume count survey has been carried out on two locations the details given in table 1-8.



Photo 11 -At Ch-25+000 (TVC-1)



Photo 12 -At Ch-64+500 (TVC-2)

Table 1-8 : Average Daily Traffic (ADT)

S.No.	Chainage (km)	Location	Survey Dates
I	II	III	IV
1	25+000	Near Wadikilla	07.07.2016 to 13.07.2016
2	64+500	Near Muktainagar	07.07.2016 to 13.07.2016

Reference: Details have been given in Annexure-4.1

1.6.2 Traffic Characteristics on Project Road

The summary of all data collected from traffic volume survey for the 2 locations on the Project Road is presented in annexure. Average Daily Traffic (ADT) for the month of July 2016 is summarized in Table 1-9. Traffic volume count summary sheets along with ADT tables are presented in Annexure - 4.1 to this report.

Table 1-9 Traffic Volume at Two Locations of the Project Road (ADT)

Survey Location	Average Daily Traffic	Average daily PCUs
Near Wadikilla Village	2553	2841
Near Muktainagar	4943	4734

Source: Traffic Surveys, July, 2016

A. Near Wadikilla village at Km. 25+000

Survey was carried out at Km 25+000 Near Wadikilla village. Selected location lies between **Pahur and Nangaon (Section-I)** and is away from urban section to avoid influence of local traffic.

ADT recorded at this station is 2553 nos. / 2841 PCU. Fast moving vehicles were recorded as 96.00% of the total traffic (in PCU). Peak hour traffic flow of 262 nos. formed around 10.26% of the total traffic. Peak hour is identified during 5.00-6.00 PM.

B. Near Near Muktainagar at Km. 64+500

Survey was carried out at Km 64+500 near Near Muktainagar. Selected location lies between Nandghat to Icchapur village (Section-II) and is away from urban section to avoid influence of local traffic.

ADT recorded at this station is 4943 nos. / 4734 PCU. Fast moving vehicles were recorded as 95.90% of the total traffic (in PCU). Peak hour traffic flow of 590 nos. formed around 11.93% of the total traffic. Peak hour is identified during 11.00-12.00 AM.

1.6.3 Turning Movement Count

The objective of turning movement count survey is to estimate the direction-wise movement of the traffic at all major intersections on the project road and thus to arriving at the contribution and diversion of the traffic from adjacent road network.

The survey data have been analysed to obtain the peak hours with flow of vehicles in each direction at the location of end point of project road.



Photo 13 - -At Ch- 14+500(TMC)



Photo 14 - -At Ch- 60+540(TMC)

Table 1-10 Turning Movement

S. No.	Junction	Flow (PCU/hr)		Direction
		Min	Max	
1	Pahur Junction (km 0.000)	62	265	Min. from Burhanpur Max. from Aurangabad
2	Bhusawal Junction (km 14.560)	55	205	Min. from Pahur Max. from Bhusawal

1.6.4 Origin Destination Survey

To capture the productions and attractions of passenger and goods movement, from the respective zones, OD survey was carried. Roadside Interview method, as detailed in IRC: 102-1988, was used for O-D survey. The survey was carried out for both passenger and goods vehicles for 24 hours (in both directions) and trip data was collected at the volume count locations by trained enumerators under the supervision of Transportation Engineers. From the O-D survey, travel characteristics like origin and destination, occupancy, trip purpose and length of trip by mode type are captured. For goods modes, the survey elicited characteristics like origin and destination, commodity type, trip frequency and length of trip.

A reasonable sample size (about 10%) of vehicles was collected. Travel patterns for were established on the basis of these surveys.

Zoning

To study the travel pattern the project corridor influence area is divided in to 7 Zones. Zoning is done in such a way that the characteristics of inter zonal as well as intra zonal trips could be clearly analyzed and their influence is assessed on the project corridor. For the easy understanding of the traffic assignment, small zones are avoided and clubbed together. The Project passing area i.e., Muktainagar is considered in one zone, Pahur are considered in another. The districts such as Jalgaon, Aurangabad, Bhusawal, Buldana and Malkapur are considered as separate zones.

Origin Destination Matrix

The movements of the vehicles in the Project Influence Area (PIA) are summarized below:

Table 1-11 : Origin Destination Matrix

Zones	% Traffic			
	Car	Bus	LCV	Truck
Traffic with in PIA (with in Zones 1 & 2)	45%	55%	68%	21%
Traffic from Outside to PIA (from Zones 3, 4, 5, 6, & 7 to Zones 1 & 2)	34%	27%	16%	56%
Traffic from PIA to Outside (from Zones 1 & 2 to Zones 3, 4, 5, 6, & 7)	18%	18%	16%	23%
Through Traffic (Outside PIA)	3%	0%	0%	0%

Reference: Details have been given in Annexure-4.4

Origin and Destination analysis brings out that Zones 1 and 2 viz. Bhusawal and Jalgaon districts serve as major Origin/Destination for traffic (more than 50 %) on the project road. The through traffic from/to outside of PIA is very negligible.

Commodity Analysis

During the O-D surveys, information of goods pertaining to commodity and tonnage were recorded along with the origin destination details. The information so collected was analysed to assess the kind of goods movement on the project road. The commodity wise goods movement pattern at both locations across different vehicle categories in terms of share has been presented in Table 1-12

Table 1-12 : Commodity Wise Goods Movement Pattern (at Average of Km 25.00 & 64.50)

Commodity Type	LCV	2-Axle	3-Axle	MAV	Total Commodity In %
1.Food Grains	3.08	9.63	4.66	1.93	19.31
2.Fruits and Vegetables	1.46	4.39	2.07	0.85	8.77
3.Fertilizers	0.88	2.63	1.24	0.51	5.26
4.Petroleum	0.00	1.41	2.10	0.00	3.51
5.Building Materials	1.69	4.20	3.60	1.05	10.54
6.Textiles	0.00	5.75	3.61	1.07	10.43
7.Household Goods	0.59	1.41	1.22	0.34	3.56
8.Mineral Oils	0.00	0.77	0.77	0.21	1.75
9.Heavy Machinery	0.00	0.00	0.70	1.05	1.75
10.Empty	2.81	8.75	4.23	1.76	17.54
11.Other	6.39	9.80	6.90	1.46	24.56
Total Commodity					100

The result of Origin Destination Survey is presented at separate Annexure-4.4. at the end of the volume – II annexure report.

1.6.5 Axle Load Survey

The vehicle damage factor is a multiplier for converting the number of commercial vehicles of different axle loads to the number of standard axle load repetitions. Design of new pavement for additional lane or strengthening of existing pavement is based upon the cumulative number of 80 KN(IRC-37-2012 clause no. 4.4.2)equivalent standard axles (ESA) that will pass over during the 30 year design period. The classes of traffic which lead to significant axle loads (or damage) to the pavement and accordingly considered for design are: LCVs, two / three axle and multi axle trucks. Cumulative standard axles (CSA) are calculated in accordance with the guidelines provided in IRC: 37 – 2012 and IRC: 81 - 1997. The overloaded vehicles have serious adverse impact on performance of pavement. It has been ascertained that the damaging effect of axles on flexible pavement is approximately proportional to the fourth power of the axle load(IRC-37-2012 clause no. 4.4.3).

The equivalent single axle loads (ESALs) have been calculated assuming that the project road will be opened to traffic in the year 2019.



Photo-15 ; At Ch-25+000 (Axel Load Survey-1)



Photo-16 ; At Ch-64+700 (Axel Load Survey-2)

Table 1-13: Summary of VDF

LOCATION	DIRECTION	Commercial Vehicle			
		LCV	2AXLE	3 AXLE	MAV
I	II	III	IV	V	VI
KM :25+000 (Section-I)	Burhanpur To Pahur	0.0139	4.1804	4.2255	5.1747
	Pahur To Burhanpur	0.0231	2.9601	2.9694	5.5649
Adopted Maximum VDF		0.0231	4.1804	4.2255	5.5649
KM : 64+700 (Section-II)	Burhanpur To Pahur	0.0082	4.2486	2.7540	5.1341
	Pahur To Burhanpur	0.0225	3.6697	1.7773	2.4440
Adopted Maximum VDF		0.0225	4.2486	2.7540	5.1341

Reference: Details have been given in Annexure-4.2

Table 1.14 : Summary of MSA

Name of the road	MSA for 15 th	MSA for 30 th
<i>Pahur-Jamner-Bodhwad At 25+000 (Section-I)</i>	8.99	27.68

Reference: Details have been given in Annexure4.3

1.6.6 Homogeneous Section

The entire Project Road is considering as one homogeneous sections based on traffic volume and its characteristics.

Table 1-15: Homogeneous Section

Sr. No.	Homogenous Section	Length (km)	Design Length (km)
1	<i>Pahur-Jamner-Bodhwad (Section-I)</i>	45.00	44.760
2	<i>Bodwad-Muktainagar Barhanpur (Section-II)</i>	33.43	33.385

1.6.7 Growth Rate

Adopted design life 30 years **Ref. IRC-58, 2015 Page 4 clause 5.4** and growth rate is 5% **Ref. IRC-58, 2015 Page 5 clause 5.5.2.1** for commercial vehicles along the project road. The growth of remain traffic moving vehicles is taken as 5% "Reference: Ministry of Shipping, Road Transport & Highways, (18th January, 2008 reference no. RW/NH-37011/57/2006-PIC) 5% traffic growth rate."

Summary of projected traffic based on adopted growth rate is provided in Table given below:

Table 1-16: Projected Traffic Volume, Veh/day and PCU/day

Pahur-Jamner-Bodhwad (Section-I)

Project Road (Section-I)	Year 2016	Year 2019	Year 2033 (15 th year)	Year 2048 (30 th year)
I	II	III	IV	V
Projection of ADT				
Total Fast Moving Vehicle (Motorised Traffic)	2549	3232	6398	13302
Slow Moving Vehicle (Non-Motorised Traffic)	5	6	11	24
Traffic (Number)	2554	3238	6410	13326
Projection (PCUs/day)	(2841)	(3602)	(7131)	(14825)

Note: Values in bracket indicate PCUs/day

1.6.8 Annual Average Daily Traffic Seasonal Factor

Traffic survey were carried out in the month of July and AADT computed by multiplying the respective SCF the ADT. As seen from above Table the average consumption of petrol and diesel together for the month of July is 0.95. Therefore to arrive at Annual Average Daily Traffic (AADT), the average daily traffic figures of July are multiplied by 1.00. The summary of AADT for the project road is presented in below table

ANNUAL AVERAGE DAILY TRAFFIC SURVEY OF PAHUR-JAMNER-BODHWAD-MUKTAINAGAR-BARHANPUR ROAD																		
(Date: 07.07.2016 to 13.07.2016)																		
Section :	Pahur-Jamner-Bodhwad-Muktainagar Barhanpur Road																	
Direction :	Bothways									Location: Average of all locations								
Location	Motorised Traffic											Non-Motorised Traffic					Grand Total	
	Passenger Vehicles					Goods Vehicles			Agricultural		Passenger		Goods Vehicles					
	Two Wheeler	Three Wheeler	Car /Jeep	Mini Bus	Bus	Tempo / LCV	Ord. Trucks			Tractor	Tractor with Trailor	Cycle	Cycle Rickshaw	Animal Drawn		Hand Cart	ADT	PCU
							2 Axle	3 Axle	M Axle					Animal Drawn	Horse Drawn			
PCU Factor	0.5	1.0	1.0	1.5	3.0	1.5	3.0	3.0	4.5	4.5	1.5	0.5	2.0	8.0	4.0	3.0		
KM 25+000	1172	278	562	5	95	197	105	81	45	9	2	1	0	3	0	0	2553	2841
KM 65+000	2751	539	939	14	172	209	111	111	43	32	2	18	0	2	1	0	4943	4734
AVG OF ALL LOCATIONS	1961	409	751	10	133	203	108	96	44	20	2	9	0	3	0	0	3748	3788

1.7 Capacity Analysis

Capacity analysis for project road has been carried out in order to define the Level of Service (LOS) offered by road sections under the prevailing roadway and traffic conditions.

Capacity and level of service guidelines

Capacity and design service volumes for various lane configurations specified by IRC: 64 – 1990: 'Capacity of Roads in Rural Areas' has been adopted for determining the Level of Service offered by the road sections during design period.

Based on the average rise & fall observed from the field surveys, the project corridor runs through Plain terrain only. The capacity and design service volumes for various lane configurations in case of plain terrain at different LOS's are presented in Table 1.17 below.

Table 1.17 Capacity and Design Service Volume

Road Configuration	Shoulder Type	Plain Terrain	
		LOS B	LOS C
2 Lane	Paved Shoulder	18000	25000
4 Lane	Earthen shoulders	35000	49000
	Paved shoulders	40000	60000

Capacity augmentation proposals (lane requirement)

The observations on the traffic data and traffic projections as per ministry circular no. **NH-14019/6/2012-P&M dated 5 oct 2012**

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Table 1.18: Capacity augmentation

Homogeneous Section	Chainage from Km (Design length)	Year by which Two lane with paved Capacity Terminates	Lane Width Ref. <u>NH-14019/6/2012-P&M dated 5 oct 2012</u> <u>2 lane with paved shoulders</u> <u>Proposed year</u>
I	II	III	V
Pahur – Bodwad (Section-I)	0.0 to 44.760	2049	2019

1.8 Improvement Proposals

The improvement proposals for proposed widening include the provisions for the following major items:

- Proposed Pavement Design
- Rearrangement of Junctions
- Traffic Control and Safety Measures
- Bridge and Cross Drainage Structures

1.8.1 Reconstruction Proposal

In order to meet future traffic requirement the existing carriageway is proposed to upgrade to achieve high speed of travel with comfort and safety. Concentric widening scheme shall be followed to minimise land acquisition issues and to ensure maximum utilisation of existing carriageway. Tables given below shows relation between existing and proposed chainage and section wise improvement proposed for the project road.

Table 1-19 : Existing – Proposed Chainage

Sr. No.	Homogenous Section	Existing Length (km)	Design Length (km)
1	Pahur-Jamner-Bodhwad (Section-I)	45.000	44.760

Table 1-20 : Pavement Proposal for section-I of Project Road

ROAD :- Pahur-Jamner-Bodhwad-Muktainagar Barhanpur (Total Length=78.145 KM)												
Chainage From	Chainage To	Length (m)	Proposal	Design CBR (%)	Proposed Width (m)	Shoulder (BHS in m)		Proposed Pavement Composition (All Dimensions are in mm)				C/S Type
						Paved	Hard	PQC	DLC	GSB	Subgarde	
Pahur-Jamner-Bodhwad (Section-I) (44.760 KM)												
0+000	0+520	520	Reconstruction Rigid Pavement With Drain	8.0	7.0	2.50	-	300	150	150	500	III
0+520	7+640	7120	Reconstruction Rigid Pavement	8.0	7.0	1.50	2.00	300	150	150	500	I & II
7+640	7+800	160	Reconstruction Rigid Pavement With Drain	8.0	7.0	2.50	-	300	150	150	500	III
7+800	10+800	3000	Reconstruction Rigid Pavement	8.0	7.0	1.50	2.00	300	150	150	500	I & II
10+800	11+200	400	Reconstruction Rigid Pavement With Drain	8.0	7.0	2.50	-	300	150	150	500	III
11+200	14+000	2800	Reconstruction Rigid Pavement	8.0	7.0	1.50	2.00	300	150	150	500	I & II
14+000	15+900	1900	Reconstruction Rigid Pavement With Drain	8.0	7.0	2.50	-	300	150	150	500	III
15+900	20+950	5050	Reconstruction Rigid Pavement	8.0	7.0	1.50	2.00	300	150	150	500	I & II
20+950	22+050	1100	Reconstruction Rigid Pavement with toe & drain(RHS)	8.0	7.0	1.50	2.00	300	150	150	500	IV & V
22+050	37+900	15850	Reconstruction Rigid Pavement	8.0	7.0	1.50	2.00	300	150	150	500	I & II
37+900	43+100	5200	Strengthening	As Per Existing Width				BC = 40	DBM = 60			VI & VII
43+100	44+600	1500	Reconstruction Rigid Pavement With Drain	8.0	7.0	2.50	-	300	150	150	500	III
44+600	44+760	160	Reconstruction Rigid Pavement	8.0	7.0	1.50	2.00	300	150	150	500	I & II
TOTAL LENGTH OF SECTION-I									44760 m			

Reference: Details have been given in Annexure

Table 1-20(B) : Summary of Pavement Proposal

S.No.	TCS	Proposal	Length (m)
1.	TCS-I	Rigid Pavement	21280
2.	TCS-II	Rigid Pavement	12700
3.	TCS-III	Rigid Pavement with Drain	4480
4.	TCS-IV	Rigid Pavement with toe & Drain (RHS)	690
5.	TCS-V	Rigid Pavement with toe & Drain (RHS)	410
6.	TCS-VI	Strengthening	4950
7.	TCS-VII	Strengthening	250
Total Length (m)			44760

1.8.2 Pavement Design

The existing pavement is reconstructed on base layer of WBM, which is almost present in the entire project stretch Road. The appropriate grade and profile correction is assumed in the reconstruction of existing pavement.

The rigid pavement is adopted for proposed carriageway reconstruction. Design period of 30 year for CC layer are adopted for carriageway and Flexible Pavement design period of 15 year. That has been designed as per **IRC 58:2015**

The proposed pavement design standard is presented in Table given below:

Table 1-21: Rigid Pavement Design

Homogeneous Section	Pahur-Jamner-Bodhwad (Section-I)
Design Period	30 Year
Design CBR (%)	8
Design CBR (%) for Hard Shoulder	12
PQC (mm)	300
DLC (mm)	150
Granular Sub-base (mm)	150
Sub grade (mm)	500

Table 1-21(A): Flexible Pavement Design

Homogeneous Section	Pahur-Jamner-Bodhwad (Section-I)
Design Period	15 Year
Design CBR (%)	8
Design CBR (%) for Hard Shoulder	12
BC (mm)	40
Dense Bituminous Macadam (mm)	60

1.8.3 Junction Improvement

Simplicity and uniformity is the guiding principle for intersection design to ensure safe passage maneuvers. The primary factors considered while proposing improvement to the geometry of the existing junctions are smooth turning of vehicles, reduction of conflicts, provision of corner sight distance and safety. The geometric design of junctions is based on IRC: SP 41: Guidelines for the Design of at grade Intersections in Rural & Urban Areas. The design and detailing of all intersections are based on the type designs as outlined in the document titled, .Type Designs for Intersections on National highways. prepared by the MORTH New Delhi 1995.

Few of the notable major junctions along the project road are mentioned at Table 1-22. Apart from these, there are several minor roads that are intersecting the project road. Most of the roads are constructed under schemes namely Pradhan Mantri Gram Sadak Yojana (PMGSY) and National Rural Employment Guaranty Act (NREGA). Thus, adequate connectivity to surrounding habitations from the project road is found.

Table 1-22: Improvement Proposed for at-Grade Intersections

Table 1-22 (A): Major Junction Details(Section-I)

Sr. No.	Existing Chainage (Km)	Major/Minor Junction	Destination		Surface Type	Type of Junction	Width (m)
			Left	Right			
I	II	III	VI	V	VI	VII	VIII
1	0+000	Major	Jalgaon	Aurangabad	BT	T	10.00
2	14+560	Major	Bhusawal	-	BT	Y	7.00
3	15+920	Major	-	Shahpur	BT	T	7.00
4	34+430	Major	Bhusawal	Jhamthi	BT	X	7.00
5	40+800	Major	-	SH-190	BT	T	14.00

Table 1-22 (B): Minor Junction Details(Section-I)

Sr. No.	Existing Chainage (Km)	Destinations of Cross Road	Type of Junction	Road Side	Type of Intersections
I	II	III	IV	V	VI
1	0+840	Hiwarkhede	Y	RHS	Minor junction
2	3+840	Sonale	T	LHS	Minor junction
3	7+660	Golalet	T	RHS	Minor junction
4	10+730	Takali	T	RHS	Minor junction
5	11+120	Bhagdara	Y	RHS	Minor junction
6	13+660	Kodoli	Y	RHS	Minor junction
7	20+630	Lahasar	T	RHS	Minor junction
8	22+280	Shiddgad	Y	RHS	Minor junction
9	25+040	Nagan chouki	T	RHS	Minor junction
10	25+320	Waghari	T	RHS	Minor junction
11	26+480	Sonari	T	LHS	Minor junction
12	28+570	Maldabhadi	Y	LHS	Minor junction
13	31+320	Wadi	T	RHS	Minor junction
14	37+720	Jalchakra	Y	LHS	Minor junction

Sr. No.	Existing Chainage (Km)	Destinations of Cross Road	Type of Junction	Road Side	Type of Intersections
I	II	III	IV	V	VI
15	44+280	Sonoti	T	LHS	Minor junction
16	44+680	Ahmad gaon	Y	LHS	Minor junction
17	44+800	Kolhadi	Y	RHS	Minor junction

1.8.4 Geometric Improvement

In order to upgrade the road to the geometric requirements commensurate with the design speed, improvement has been proposed for the Project Road. The alignment passes through several villages and habitation areas of which some have built-up sections.

In order to utilize the existing carriageway to the maximum extent, the proposed center line has been aligned within the existing carriageway (with necessary correction to geometry).

Properly designed horizontal curves have been provided commensurate with design speed. All super-elevated curves have been provided with designed transition lengths. The existing geometry (both horizontal and vertical) is found to be inadequate. The alignments of the curves in these locations have been suitably corrected as per IRC standards. At the location of structures and back-to-back occurrence of summit and valley curves, correction of vertical profile is also carried out keeping in view the available and adequate sight distances.,

Table 1-23: List Of Curve

S.No	Location	Ex. Radius	Pro. Radius	Curve Length	Curve Number	Ex. ROW	Remark
1	4160	80	Straight	-	-		Improved
2	4280	42	250	113	13		
3	4640	39	250	193	14		
4	9800	79	250	18	36		
5	10100	97	250	56	39		
6	10560	112	210	109	41		
7	10880	150	150	56	43		Builtup Area
8	12120	220	220	79	52		Builtup Area
9	12380	180	250	90	54		Improved
10	13920	145	200	59	64		Improved
11	14480	105	250	124	68		Improved
12	15480	180	180	82	75		Builtup Area
13	16920	190	250	233	77		Improved
14	21060	58	250	37	103		Improved
15	21180	169	250	66	104		Improved
16	21280	51	80	79	105		Hilly Area
17	21360	40	250	111	106		Hilly Area
18	21760	21	Straight	-	-		Improved
19	23160	166	250	35	113		Improved
20	25120	163	210	83	118		Near Builtup Area (Wadikalla)
21	27000	166	250	26	123		Improved
22	28510	142	250	36	126		Improved
23	29000	104	155	15	127		Near Builtup Area
24	31280	220	250	28	128		Improved
25	31520	187	250	80	129		Improved
26	33940	100	250	72	138		Improved
27	34480	35	60	41	141		Hilly Area
28	34600	48	250	113	142		Improved
29	35000	115	250	58	144		Improved
30	36310	98	Straight	-	-		Improved
31	40240	100	100	10	158		Builtup Area (Bodwad)
32	40500	40	40	38	160		Builtup Area (Bodwad)
33	43840	180	180	99	167		Builtup Area (Nadgaon)
34	44020	25	25	45	168		Builtup Area (Nadgaon)
35	44360	40	40	44	171		Builtup Area (Nadgaon)

1.8.5 Bus Lay bays

There is 12 location at section-I are proposed for Bus lay-Bay at CH- 0+500, 0+720, 8+880, 9+150, 11+200, 11+360, 17+300, 17+560, 26+450, 25+680, 37+720, 37+950.

1.8.6 Truck Lay bays

There is 4 location at section-I are proposed for Truck lay-Bay at CH- 2+000, 2+200, 13+240, 13+480.

1.8.7 Road Marking & Traffic Signs

Appropriate road markings are provided with stop signs, give-way signs, traffic merging and diverging signs, lane closure signs, compulsory keep left/right signs or any other signs as per IRC-67. Advance cautionary signs are proposed for sharp curves along with chevron signs at the outer edge of the curves with appropriate delineators.

1.8.8 Major Bridge/ Minor Bridge & Cross Drainage Structures

There are 2 Major & 7 Minor bridges along with 54 culverts. During inventory and condition survey, the details of bridge and culverts wise Improvement Proposal containing Rehabilitation, Widening or Reconstruction is given in table: 1-24.

Table 1-24 Summary of Existing Bridges and CD works is as below

Type of Structure	Major Bridges	Minor Bridges	Slab /Arch Culvert	Vented Causeway	Hume Pipe Culvert
I	II	III	IV	V	VI
Existing Structure 63 Nos.	2	7	20	0	34

Table 1-25 :Summary of Improvement

Summary of Improvement (Section-I)								
S.No	Type of Structure	Existing Nos.	Proposals				Total	Remark
			Rehabilitation	Widening	Reconstruction	New Construction		
1	Hume Pipe Culverts	34	3	10	21	18	52	1 HPC upgrade to Slab
2	Vented Causeway	NIL	NIL	NIL	NIL	NIL	NIL	
3	Slab/Arch Culverts	20	5	1	13	1	20	-
4	Box Culverts	NIL	NIL	NIL	NIL	NIL	NIL	
5	Minor Bridge	7	NIL	5	2	NIL	7	
6	Major Bridge	2	NIL	NIL	2	NIL	2	
Total Structures							81	18 new proposed HPC

(a) **Table 1-26: Details of Major Bridge (Section- I)**

Details of Existing Minor Bridge						Details of Proposed Minor Bridge		
Sr. No	Existing Chainage	Design Chainage	Type of Existing Structure	No of Span / Pipe x Length Span / dia	Existing Width (m)	Type of Structure Proposed	Arrangement No of Span / Pipe x Length Span / dia	Proposal & Proposed width
					Over all			
I	II	III	IV	V	VI	VII	VIII	X
1	16+760	16+683	MJB	9 X 12.4	7.60	MJB	9 X 12.4	RECONSTRUCTION
2	31+880	31+682	MJB	7X10.4	8.20	MJB	7 X 10.4	RECONSTRUCTION

(a) **Table 1-27: Details of Minor Bridge (Section- I) :**

Details of Existing Minor Bridge	Details of Proposed Minor Bridge
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Sr. No	Existing Chainage	Design Chainage	Type of Existing Structure	No of Span / Pipe x Length Span / dia	Existing Width (m) Over all	Type of Structure Proposed	Arrangement No of Span / Pipe x Length Span / dia	Proposal & Proposed width
I	II	III	IV	V	VI	VII	VIII	X
Section-I								
1	3+390	3+375	Minor	1 X 9.0	12.20	Minor	1 X 9.00	WIDENING
2	3+640	3+620	Minor	1 X 9.4	12.10	Minor	1 X 9.4	WIDENING
3	7+240	7+160	Minor	3 X 9.4	12.30	Minor	3 X 10.4	RECONSTRUCTION
4	10+780	10+703	Minor	5 X 9.40	8.10	Minor	5 X 10.4	RECONSTRUCTION
5	12+790	12+718	Minor	1 X 8.0	12.30	Minor	1 X 8.0	WIDENING
6	42+210	41+972	Minor	2 X 5.0	12.00	Minor	2 X 5.0	WIDENING
7	44+120	43+882	Minor	3 X 5.4	12.10	Minor	3 X 5.4	WIDENING

(b) **Table 1-28: DETAILS OF HUME PIPE CULVERTS(Section- I):**

Details of Existing Culvert						Details of Proposed Culvert		
Sr. No	Existing Chainage	Design Chainage	Type of Existing Structure	No of Span / Pipe x Length Span / dia	Existing Width (m)	Type of Structure Proposed	Arrangement No of Span / Pipe x Length Span / dia	Proposal & Proposed width
I	II	III	IV	V	VI	VII	VIII	X
Section-I								
1	0+340	0+320	HPC	2 ROW 900	12.10	HPC	2 ROW 1200	RECONSTRUCTION
2	2+380	2+360	HPC	2 ROW 900	12.10	HPC	2 ROW 900	WIDENING
3	3+650	3+635	HPC	1 ROW 600	12.10	HPC	1 ROW 1200	RECONSTRUCTION
4	7+510	7+450	HPC	2 ROW 900	12.10	HPC	3 ROW 1200	RECONSTRUCTION
5	8+590	8+335	HPC	1 ROW 900	12.00	HPC	1 ROW 900	WIDENING
6	9+870	9+803	HPC	1 ROW 900	12.00	HPC	1 ROW 1200	RECONSTRUCTION
7	10+120	10+053	HPC	2 ROW 900	12.00	HPC	2 ROW 900	WIDENING
8	13+920	13+843	HPC	2 ROW 900	12.00	HPC	2 ROW 900	WIDENING
9	14+980	14+903	HPC	1 ROW 900	10.10	HPC	1 ROW 1200	RECONSTRUCTION
10	15+430	15+353	HPC	1 ROW 900	10.00	HPC	1 ROW 1200	RECONSTRUCTION
11	16+180	16+103	HPC	1 ROW 900	10.10	HPC	1 ROW 1200	RECONSTRUCTION
12	18+090	18+010	HPC	2 ROW 900 & 1 ROW 1000	10.20	HPC	3 ROW 1200	RECONSTRUCTION
13	18+340	18+260	HPC	2 ROW 900	10.10	HPC	2 ROW 900	WIDENING
14	19+120	19+040	HPC	4 ROW 900	10.10	SLAB	1X 4	RECONSTRUCTION
15	20+240	20+160	HPC	2 ROW 900	13.10	HPC	2 ROW 1200	RECONSTRUCTION
16	20+540	20+460	HPC	2 ROW 900	10.10	HPC	2 ROW 900	WIDENING
17	22+830	22+640	HPC	2 ROW 900	13.10	HPC	2 ROW 900	WIDENING
18	23+430	23+235	HPC	2 ROW 900	13.10	HPC	2 ROW 900	WIDENING
19	24+100	23+910	HPC	2 ROW 900	13.10	HPC	2 ROW 1200	RECONSTRUCTION
20	24+760	24+560	HPC	2 ROW 900	13.10	HPC	2 ROW 1200	RECONSTRUCTION
21	25+560	25+365	HPC	2 ROW 900	10.00	HPC	2 ROW 900	WIDENING
22	25+910	25+715	HPC	2 ROW 900	10.00	HPC	1 ROW 1200	RECONSTRUCTION
23	28+230	28+035	HPC	2 ROW 900	10.00	HPC	1 ROW 1200	RECONSTRUCTION

Details of Existing Culvert						Details of Proposed Culvert		
Sr. No	Existing Chainage	Design Chainage	Type of Existing Structure	No of Span / Pipe x Length Span / dia	Existing Width (m)	Type of Structure Proposed	Arrangement No of Span / Pipe x Length Span / dia	Proposal & Proposed width
I	II	III	IV	V	VI	VII	VIII	X
24	31+580	31+380	HPC	1 ROW 900	11.00	HPC	1 ROW 1200	RECONSTRUCTION
25	32+480	32+277	HPC	1 ROW 1000	12.00	HPC	1 ROW 1200	RECONSTRUCTION
26	33+740	35+537	HPC	2 ROW 900	10.00	HPC	2 ROW 1200	RECONSTRUCTION
27	34+040	33+842	HPC	2 ROW 900	11.00	HPC	2 ROW 1200	RECONSTRUCTION
28	35+850	35+617	HPC	1 ROW 1000	10.10	HPC	1 ROW 1000	WIDENING
29	36+100	35+867	HPC	1 ROW 900	11.00	HPC	1 ROW 1200	RECONSTRUCTION
30	36+770	36+537	HPC	1 ROW 900	10.10	HPC	1 ROW 1200	RECONSTRUCTION
31	38+370	38+132	HPC	1 ROW 900	10.20	HPC	1 ROW 900	RETAIN
32	40+420	40+187	HPC	1 ROW 900	12.50	HPC	1 ROW 900	RETAIN
33	42+910	42+672	HPC	1 ROW 900	10.30	HPC	1 ROW 900	RETAIN
34	44+410	44+172	HPC	2 ROW 900	10.50	HPC	2 ROW 1200	RECONSTRUCTION

(c) **Table 1-29 DETAILS OF VCW (Section- I):**

Details of Existing Culvert						Details of Proposed Culvert		
Sr. No	Existing Chainage	Design Chainage	Type of Existing Structure	No of Span / Pipe x Length Span / dia	Existing Width (m)	Type of Structure Proposed	Arrangement No of Span / Pipe x Length Span / dia	Proposal & Proposed width
I	II	III	IV	V	VI	VII	VIII	X
Nil								

(d) **Table 1-30 DETAILS OF SLAB/ ARCH CULVERTS (Section- I):**

Details of Existing Culvert						Details of Proposed Culvert		
Sr. No	Existing Chainage	Design Chainage	Type of Existing Structure	No of Span / Pipe x Length Span / dia	Existing Width (m)	Type of Structure Proposed	Arrangement No of Span / Pipe x Length Span / dia	Proposal & Proposed width
I	II	III	IV	V	VI	VII	VIII	X
1	1+890	1+870	SLAB	1 X 5.3	12.10	SLAB	1 X 5.3	WIDENING
2	8+100	8+040	SLAB	1 X 4.8	13.10	SLAB	1 X 6.00	RECONSTRUCTION
3	8+440	8+380	SLAB	1 X 4.2	12.30	SLAB	1X 6.00	RECONSTRUCTION
4	8+750	8+690	SLAB	1 X 4.1	12.10	SLAB	1X 6.00	RECONSTRUCTION
5	9+700	9+633	SLAB	1 X 4.0	11.90	SLAB	1 X 4.00	NEW CONSTRUCTION
6	11+660	11+588	SLAB	1 X 3.00	11.90	SLAB	1 X 4.00	RECONSTRUCTION
7	12+480	12+408	SLAB	1 X 3.00	12.10	SLAB	1 X 4.00	RECONSTRUCTION
8	14+620	14+543	SLAB	1 X 4.00	12.10	SLAB	1 X 5.00	RECONSTRUCTION

Details of Existing Culvert						Details of Proposed Culvert		
Sr. No	Existing Chainage	Design Chainage	Type of Existing Structure	No of Span / Pipe x Length Span / dia	Existing Width (m)	Type of Structure Proposed	Arrangement No of Span / Pipe x Length Span / dia	Proposal & Proposed width
I	II	III	IV	V	VI	VII	VIII	X
9	15+760	15+683	SLAB	1 X 6.00	10.10	SLAB	1 X 6.00	RECONSTRUCTION
10	16+540	16+468	SLAB	1 X 3.00	10.10	SLAB	1 X 4.00	RECONSTRUCTION
11	17+190	17+115	SLAB	1 X 2.5	10.20	SLAB	1 X 3.00	RECONSTRUCTION
12	19+640	19+560	SLAB	1 X 6.00	10.10	SLAB	1 X 6.00	RECONSTRUCTION
13	21+430	21+340	SLAB	1 X 3.00	12.70	SLAB	1 X 4.00	RECONSTRUCTION
14	21+520	21+420	SLAB	1 X 0.5	7.40	SLAB	1 X 3.00	RECONSTRUCTION
15	21+850	21+730	SLAB	1 X 0.5	11.00	SLAB	1 X 3.00	RECONSTRUCTION
16	40+170	39+942	SLAB	1 X 2.20	12.10	SLAB	1 X 2.20	RETAIN
17	41+260	41+027	SLAB	1 X 0.6	-	SLAB	1 X 0.6	RETAIN
18	41+520	41+282	SLAB	1 X 2.1	12.10	SLAB	1 X 2.1	RETAIN
19	41+860	41+627	SLAB	1 X 5.00	12.60	SLAB	1 X 5.00	RETAIN
20	43+980	43+747	SLAB	1 X 4.8	12.10	SLAB	1 X 4.8	RETAIN

1.9 Cost Estimate

Cost estimate for the project Road is finalised based on the improvement proposals.

Table 1-31: Cost of Project Road (Section-I)

Section	Proposed Length (km)	Base Cost (Crore)	Base Cost Per KM (Crore)
Pahur-Jamner-Bodhwad (Section-I)	44.760	193.46	4.32

Reference: - Details have been given in **chapter -9**

1.10 Conclusions and Recommendations

As per contract agreement the current stage of corridor comprises preparation of Final Feasibility Report for rehabilitation and upgrading of existing road to 2-lane with paved shoulder. We have conducted Classified Traffic Volume counts at 2 No locations for analyzing the capacity. As per analysis of the traffic surveys total number of PCUs at all two locations has crossed the threshold limit (15000 PCU) of design service volume for 2 lane roads with paved shoulder configuration as per the IRC in year 2038. The project road is not only an important transport link for en-route habitations within Maharashtra but it is also an important inter-state link.

The existing road has stretches whose geometrics do not conform to IRC standards will need to be improved by means of realignments and by reconstruction. The road passes through ribbon development at 16 Nos locations, where travel speed does not meet NH standards, hence bypasses have been proposed for them. The soil conditions along the project road are generally good and the construction materials like soil and aggregates are available nearby.

The existing ROW along the project road varies from 20m to 40 m. Therefore land acquisition is required for widening of the project road , Improving and black spots. Hence the project will have social impact in terms of loss of livelihood or shelter, which will have to be studied and a suitable mitigation plan prepared.

Construction of project is proposed in two Phase. Phase-I includes intermediate lane / two lanning of existing road from km 0.0 to km 44.760 (total length - 44.760 km). Phase-II construction would commence in future for two lane with paved of Bodwad bypass (Length - 5.432km) and construction of two railway over bridges at km 1+120 and 13+100.

It is recommended that the project be undertaken for two laning with paved in the immediate future.

The project can be constructed within 24 months period with strategic planning and through two construction package. The estimated basic cost of Project road is Rs. 249.75Crores for section-I.