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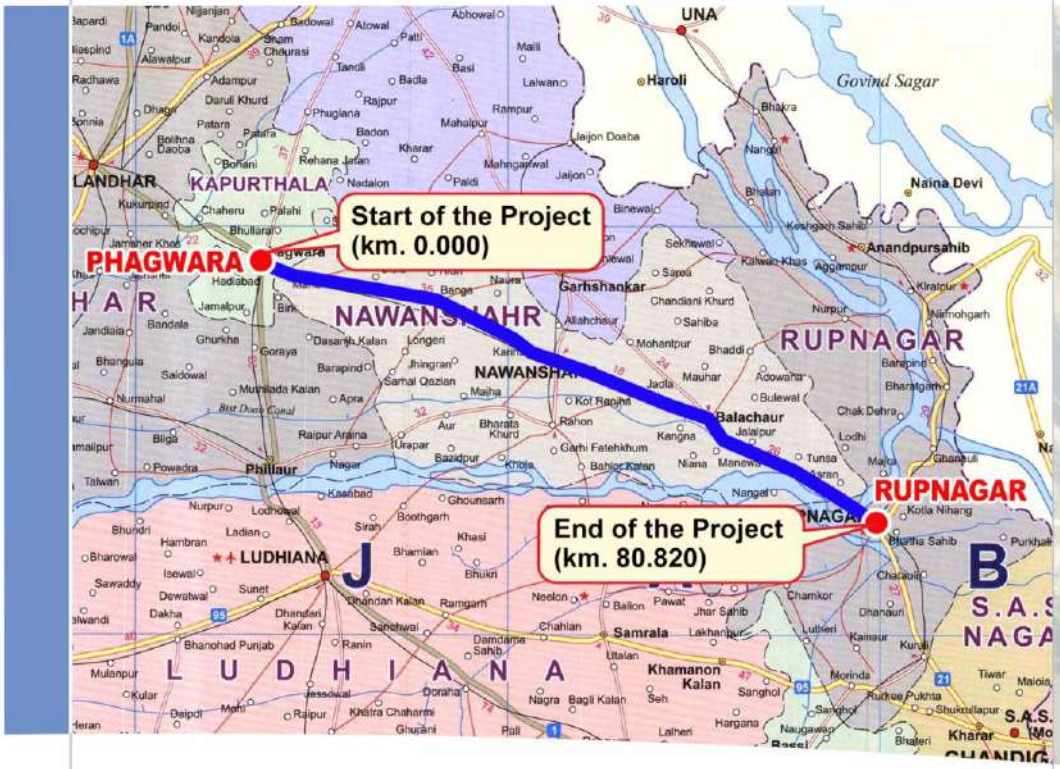

Four Laning of Phagwara - Rupnagar Section of NH-344A from km. 0.000 to km. 80.820 in the State of Punjab on Hybrid Annuity Mode

Technical Due Diligence Study

Final Report

November 2022

Delivering Commitment

Submitted by:

FP Project Management

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FOUR LANING OF PHAGWARA - RUPNAGAR SECTION OF NH-344A FROM KM. 0.000 (DESIGN CHAINAGE) TO KM. 80.820 (DESIGN CHAINAGE) IN THE STATE OF PUNJAB ON HYBRID ANNUITY MODE

TECHNICAL DUE DILIGENCE STUDY

FINAL REPORT

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1 INTRODUCTION

1.1 Background

The Government of India had entrusted National Highways Authority of India (NHAI) for the development, maintenance and management of National Highway No. 344A including the Section from km. 0.000 (Design Chainage) to km. 80.820 (Design Chainage) on the Phagwara - Rupnagar Section in the State of Punjab on design, build, operate and transfer (the "DBOT Annuity" or "Hybrid Annuity") basis. Total length of the project highway is 80.820 kms.

Based on competitive bid process completed, NHAI has signed Concession Agreement with **M/s. GR Phagwara Expressway Limited (GPEL)**, a Special Purpose Vehicle (SPV) formed for implementing this project.

The Appointed Date of the project was 06th October 2017. The concession period of the project highway is 17.5 years from the Appointed Date including construction period of 2.5 years. The project highway has received provisional completion certificate on 25th February 2020 and final completion certificate on 26th May 2021. The Scheduled Completion Date of the project highway was on 03rd April 2020.

During maintenance period of the project highway, **GR Highways Investment Manager Pvt. Ltd.** (in its capacity as the Investment Manager of Bharat Highways InvIT) has appointed **FP Project Management Consultancy Services Private Limited** [Formerly Frischmann Prabhu (I) Pvt. Ltd.] as Technical Consultant for carrying out techincal study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, FP Project Management undertook the site visits to carry out site inspection. The report is based on findings during this period.

1.2 Our Approach Philosophy

Composition of Team

Our team consists of well-qualified Engineers and other professionals, whose experience covers all the skills and specializations required for undertaking such assignments. All the team personnel are our regular employees and have a long and stable working relationship with our firm.

The Team Leader coordinates the activities between all the key staff who work closely together. The key staff is assisted by various support staff, who report to the respective key staff in their field of expertise. The Team Leader is the point of contact for Client on Technical Study.

The technical study includes review of all the available documents namely:

a) Concession Agreement including Technical Schedules
b) EPC Agreement
c) Pavement design reports
d) O&M Manual prepared by the Concessionaire
e) O&M Contract, work order and their provisions
f) Recent O&M Report submitted to Authority
g) Quality of construction based on available data, design and drawings
h) Documents on historical expenditure on operation and maintenance

i) Reports on past accidents
j) O&M cost schedule for the concession period
k) Completion / Provisional Completion and status of items in punch list items
l) Correspondence regarding scope of works and during O&M
m) Toll operation manual / ATMS related documents

The review of the above documents is the first step towards accomplishment of the assignment. This gives a complete idea of the project and is used as input data for preparation of report after necessary analysis.

Site Visit and Data Collection

A team of experts from various streams has carried out the preliminary site visit to understand the assessment of project assets mainly condition of the pavement and structures.

- The site visit is undertaken for detailed reconnaissance and visual pavement condition assessment
- The condition assessment of major structures by visual inspection
- The information like material sources and the probable cost is collected for the purpose of cost estimate.

The detailed design / drawings viz. Plan & L-sections, drainage design, structure design, layout drawings for project facilities like toll plaza, bus bay, truck lay-byes, highway lighting facilities etc., would be studied. Also, design / drawing and provision pertaining to road furniture are studied.

The adequacy of design is verified in accordance with the concession agreement, manual of specifications and standards as well as relevant IRC standards.

The information on availability of material in the vicinity is gathered. It has direct impact on cost of maintenance work and balance work if any.

The basic approach for preparation for cost estimates for operation and maintenance is as per the practice of State PWD / MoRT&H in respect of highways and structures.

Data Analysis

Based on the study of the available information and preliminary site visits, the consultants share their preliminary observations with the Client.

1.3 About this Report

This report has been prepared based on the information, reports and documents made available to us by the Company. We have also referred to publicly available reports, literature etc., and have made our best efforts to check the authenticity of the information available, analyse the same as per the best engineering / industry practices.

The site visit and inspection were carried out between the periods of **9th August 2022 to 12th August 2022**.

The report is organized with the following chapters for easy understanding of various issues.

- **Introduction -** This chapter gives an overview of the project background, approach and methodology of Due Diligence studies.

- **Project Description -** This chapter describes existing project features before proposed development.

- **Development of Project Highway -** This chapter gives an overview of project development.

- **Pavement Investigation and Proposal -** This chapter describes present condition of pavement, surveys and investigations carried out on site and proposals for maintenance as per contract requirements.

- **Balance works -** This chapter summarizes the details of balance works at Site if any.

- **Operation and Maintenance -** This chapter describes O&M set up as well as O&M cost over the concession period.

- **Review of Concession Agreement -** This chapter summarizes the observations on the executed concession agreement document.

- **Review of O&M Agreement -** This chapter summarizes the observations on the O&M Agreement executed.

- **Toll Plaza Equipment Status and ATMS -** This chapter summarizes assessment of Toll Plaza in terms of no of lanes, Toll Collection System installed and working status is presented under this section.

- **Accident Data Analysis -** This chapter deals with the analysis of nature of accidents occurring on the stretch and to identify blackspots.

- **Annexures**

2 PROJECT DESCRIPTION

2.1 Location

The project highway Phagwara to Rupnagar (NH-344A), starts from km. 0.000 at Phagwara Town and terminates at km. 80.820 at Rupnagar Town. The design length of the project highway is 80.820 kms. The project stretch is the important link connecting important cities in Punjab State such as Amritsar, Jalandhar and Chandigarh. The project involved development of existing 2 lane carriageway to 4 lane divided carriageway with 1.5 m wide paved shoulder and 2.0 m earthen shoulder on either side.

The project highway passes through the Districts of Nawanshahr and Kapurthala. The project highway passes through the built-up areas of towns and villages enroute. Important towns along the alignment are Mehli, Bahar Majara, Jasso Majara, Behram, Malha Sodhian, Dhahan, Banga, Kahma, Nawanshahr, Langroya, Garhi Kanugoan, and Bachhwan.

The Location Map of the project highway is presented below:

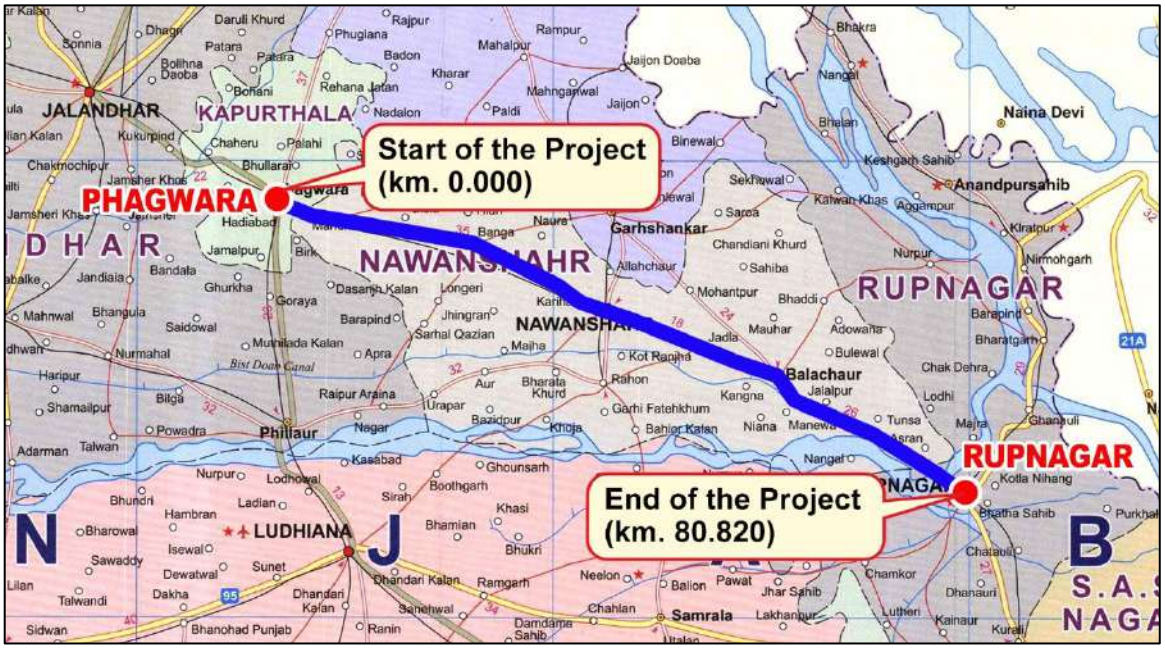


Figure 2-1 Location Map

2.2 Climate

The climate of project area is characterized by general dryness (except in the south west monsoon season), a hot summer and a cold winter. The year may be divided into four seasons. The period from about middle of November to February is the cold season. This is followed by the summer season from March to about the end of June. The south-west monsoon season commences late in June and continues up to about middle of September. The period from mid September to the middle of November constitutes the post-monsoon or transition season. The temperature ranges from a minimum of 1°C (34°F) in winter to 47°C (117°F) in summer. May and June are generally the hottest months and December and January are the coldest months. Relative humidity is high, averaging about 70% during monsoon. The average annual rainfall in the district is 775.6 millimeters (30.54 in). About 78% of the annual rainfall is received during June through September.

2.3 Terrain

This section of National Highway traverses through plain / rolling terrain.

2.4 Abutting Land Use

The land use along the project highway is predominantly agriculture with intermittent built-up area.

2.5 Right of Way

The width of existing Right of Way (RoW) for the project highway varies from 35.0 m to 62.0 m.

2.6 Existing Utilities

During widening of the project highway, various affected utility services located along the project road were shifted to the PROW. The different types of utilities found along the road include, electrical poles, telephone poles, OFC Cables, etc.

3 DEVELOPMENT OF PROJECT ROAD

As per Article 2 of Concession Agreement, the scope of the project defined in Schedule A and Schedule B, shall mean and include, during the concession period,

a. Construction of the project on the Site set forth in Schedule-A and as specified in Schedule-B together with provision of project facilities as specified in Schedule-C and in conformity with the Specification and Standards set forth in Schedule-D
b. Operation and maintenance of the project in accordance with the provisions of this Agreement and
c. Performance and fulfillment of all other obligations of the Concessionaire in accordance with the provisions of this Agreement and matters incidental thereto or necessary for the performance of any or all of the obligations of the Concessionaire under Concession Agreement.

3.1 Width of Carriageway

The paved carriageway is 18 m [(2 x 7.5 m) + (2 x 1.5 m)] wide excluding the median.

The cross section type along the project is tabulated below:

Design Chainage (km)		Length (km)	Proposed TCS Type	Remarks
From	To			
0.000	3.601	3.601	TCS-8	
3.601	4.748	1.147	TCS-9	Proposed Flyover
4.748	6.420	1.672	TCS-8	
6.420	7.380	0.960	TCS-9	VUP
7.380	8.694	1.314	TCS-8	
8.694	9.315	0.621	TCS-9	Proposed Flyover
9.315	9.920	0.605	TCS-9	Mehli
9.920	12.015	2.095	TCS-1	
12.015	12.565	0.550	TCS-5	Bahar Majara
12.565	13.415	0.850	TCS-1	
13.415	14.015	0.600	TCS-5	Jasso Majra
14.015	16.515	2.500	TCS-1	
16.515	17.715	1.200	TCS-5	Behram
17.715	19.265	1.550	TCS-1	
19.265	19.615	0.350	TCS-5	Malla Sodian
19.615	21.190	1.575	TCS-1	
21.190	21.390	0.200	TCS-7	Dhahan
21.390	21.715	0.325	TCS-1	
21.715	22.465	0.750	TCS-5	Dhahan
22.465	23.965	1.500	TCS-1	
23.965	24.465	0.500	TCS-7	Mazari
24.465	24.640	0.175	TCS-1	
24.640	25.319	0.679	TCS-12A	
25.319	28.319	3.000	TCS-12	Elevated Structure (km. 21.000 to km. 24.000) at Banga
28.319	28.890	0.571	TCS-12A	
28.890	30.215	1.325	TCS-1	
30.215	30.715	0.500	TCS-5	Khtkar Kalan
30.715	31.565	0.850	TCS-1	
31.565	32.065	0.500	TCS-5	Kahma
32.065	32.780	0.715	TCS-9	PUP

Design Chainage (km)		Length (km)	Proposed TCS Type	Remarks
From	To			
32.780	34.415	1.635	TCS-1	
34.415	35.115	0.700	TCS-5	Kariha
35.115	37.100	1.985	TCS-1	
37.100	38.550	1.450	TCS-3	
38.550	39.350	0.800	TCS-11A	ROB, Nawashahr Bypass
39.350	40.500	1.150	TCS-11	Flyover at Hoshiarpur Road Crossing of Bypass
40.500	47.100	6.600	TCS-3	Nawashahr Bypass
47.100	48.719	1.619	TCS-1	
48.719	48.969	0.250	TCS-7	Nai Mazara
48.969	55.369	6.400	TCS-1	
55.369	56.119	0.750	TCS-5	Garhi
56.119	56.219	0.100	TCS-4	
56.219	56.700	0.481	TCS-3A	Realignment
56.700	57.100	0.400	TCS-1	
57.100	57.866	0.766	TCS-3A	Realignment
57.866	59.525	1.659	TCS-2	
59.525	60.223	0.698	TCS-10	Proposed Flyover LHS at Balachaur
60.223	60.770	0.547	TCS-6	
60.770	64.220	3.450	TCS-2	
64.220	64.570	0.350	TCS-6	Sudha Majra
64.570	68.120	3.550	TCS-2	
68.120	68.370	0.250	TCS-6	Kathgarh
68.370	69.420	1.050	TCS-2	
69.420	69.670	0.250	TCS-6	Bharthala
69.670	72.720	3.050	TCS-2	
72.720	72.920	0.200	TCS-6	
72.920	75.420	2.500	TCS-2	
75.420	80.820	5.400	TCS-6	Rail Majra

The photographs taken at the time of site visit is presented as below:

Figure 3-1 Start of Project Road

Start of Project Road - Left Carriageway

Start of Project Road - Right Carriageway

Figure 3-2 End of Project Road

Approach to End of Project Road

End of Project Road

3.2 Bypass / Realignment

There is one bypass and two re-alignments in the project highway. The details of bypass and re-alignments provided are as tabulated below:

Bypass:

Location of Bypass	Existing Chainage (km)		Existing length (km)	Design Chainage (km)		Design length (km)
	From	To		From	To	
Nawanshahr	32+760	42+231	9.471	37+100	47+100	10.000

Figure 3-3 Photographs of Bypass

Nawanshahr Bypass

Nawanshahr Bypass

Realignments:

Existing Chainage (km)		Existing length (km)	Design Chainage (km)		Design length (km)	Remarks
From	To		From	To		
51+350	51+908	0.558	56+219	56+700	0.481	Garhi
52+303	53+196	0.893	57+100	57+866	0.766	Garhi

3.3 Service Road

Service road are provided in lengths as tabulated below:

Sr. No.	Location (km)		Side	Length of Service Road (km)
	From	To		
1	3.601	4.748	Both Side	2.294
2	6.420	7.380	Both Side	1.920
3	8.694	9.315	Both Side	1.242
4	9.315	9.920	Both Side	1.210
5	12.015	12.565	Both Side	1.100
6	13.415	14.015	Both Side	1.200
7	16.515	17.715	Both Side	2.400
8	19.265	19.615	Both Side	0.700
9	21.190	21.390	RHS	0.200
10	21.715	22.465	Both Side	1.500
11	23.965	24.465	RHS	0.500
12	24.640	25.319	Both Side	1.358
13	25.319	28.319	Both Side	6.000
14	28.319	28.890	Both Side	1.142
15	30.215	30.715	Both Side	1.000
16	31.565	32.065	Both Side	1.000
17	32.065	32.780	Both Side	1.430
18	34.415	35.115	Both Side	1.400
19	39.350	40.500	Both Side	2.300
20	48.719	48.969	RHS	0.250
21	55.369	56.119	Both Side	1.500
22	59.525	60.223	LHS	0.698
23	60.223	60.770	LHS	0.547
24	64.220	64.570	LHS	0.350
25	68.120	68.370	LHS	0.250
26	69.420	69.670	LHS	0.250
27	72.720	72.920	LHS	0.200
28	75.420	80.820	LHS	5.400
Total Length				**39.341**

The photographs taken at the time of site visit is presented as below:

Figure 3-4 Photographs of Service Road

Service Road at km. 0+630 (LHS)

Service Road at km. 77+600 (LHS)

3.4 Right Of Way

The details of the proposed ROW for the development of project highway is as tabulated below:

Proposed Chainage (km)		Existing Chainage (km)		Old Name of Project Road	Existing ROW (m)	Proposed ROW (m)	Remarks
From	To	From	To				
0.000	9.312	17.673	27.003	Phagwara Bypass (SH- 18)	50	50	
9.312	13.427	5.003	9.117	MDR-56	33.54	48.5	
13.427	14.800	9.117	10.430		32.62	42.5	
14.800	14.877	10.430	10.597		32.62	40.9	
14.877	15.105	10.597	10.825		32.62	41.21	
15.105	15.160	10.825	10.880		32.62	64.705 / 104.405	
15.160	15.210	10.800	10.930		32.62	111	Proposed Toll Plaza
15.210	15.275	10.930	10.995		32.62	112	
15.275	15.389	10.995	11.079		32.62	108 / 85	
15.389	15.518	11.079	11.147		30	61	
15.518	15.650	11.147	11.289		30	61	
15.650	15.945	11.289	11.551		30	62	
15.945	16.185	11.551	11.147		30	38	
16.185	16.493	11.147	12.183		32.92	42.5	
16.493	18.985	12.183	14.675		32.62	42.5	
18.985	19.559	14.675	15.249		35.06	45	
19.559	21.773	15.249	17.463		34.44	43	
21.773	25.983	17.463	21.668		32.92	42.5	
25.983	28.833	21.668	24.518		33.53	42.5	
28.833	29.148	24.518	24.833		43.58	50	
29.148	37.100	24.833	32.760		33.53	48	
37.100	39.190	32.700				45	
39.190	40.625					60	Nawanshahr Bypass
40.625	47.100		42.010			45	
47.100	47.199	42.010	42.330		30.18	43	
47.199	54.764	42.330	49.980		27.75	44	
54.764	55.000	49.980			48	48	
55.000	56.219		51.350		15	48	
		Garhi Realignment					Garhi Re-Alignment
56.219	56.700					45	
56.700	57.000	51.908	52.203		33	50	
57.000	57.100	52.203	52.303		48	50	
57.100	57.866	Garhi Realignment				45	Garhi Re-Alionment
57.866	58.157	53.193	53.465		27.29	39.75	
58.157	60.300	53.465	27.000		32	49.5	
60.300	60.770	27.000	26.655		32	41.75	
60.770	61.340	26.655	26.085		30.5	38.25	
61.340	62.024	26.085	25.400		30.5	37.25	
62.024	62.360	25.400	25.064		17.71	37.25	

Proposed Chainage (km)		Existing Chainage (km)		Old Name of Project Road	Existing ROW (m)	Proposed ROW (m)	Remarks
From	To	From	To				
62.360	62.586	25.064	24.878		17.71	39.25	
62.586	62.605	24.878	24.819		21.06	39.25	
62.605	62.695	24.819	24.729	SH-24	21.06	41	
62.695	62.975	24.729	24.449		21.06	36.5	
62.975	63.29	24.449	24.134		21.06	41	
63.290	63.334	24.134	24.085		22.06	45	
63.334	63.377	24.085	24.047		19.7	45	
63.377	63.644	24.047	23.780		19.7	47	
63.644	63.887	23.780	23.537		28.77	47	
63.887	63.945	23.537	23.475		42.18	47	
63.945	64.191	23.475	23.232		37.15	40.5	
64.191	64.252	23.232	23.170		42.68	42.68	
64.252	64.555	23.170	22.865		39.33	40.5	
64.555	64.862	22.865	22.560		42.68	42.68	
64.862	65.442	22.560	21.982		20.2	40.5	
65.442	65.779	21.982	21.646		39.33	40.5	
65.779	66.065	21.646	21.360		34.3	40.5	
66.065	66.085	21.360	21.341		34.3	42	
66.085	66.236	21.341	21.189		27.89	42	
66.236	66.388	21.189	21.037		19.36	42	
66.388	66.555	21.037	20.870		19.21	42	
66.555	66.842	20.870	20.579		19.21	41	
66.842	67.147	20.579	20.274		25.92	41	
67.147	67.424	20.274	19.970		32.62	41	
67.424	67.604	19.970	19.817		22.56	41	
67.604	67.910	19.817	19.512		23.32	41	
67.910	68.061	19.512	19.360		24.24	41	
68.061	68.210	19.360	19.207		20.89	41	
68.210	69.000	19.207	18.422		19.21	41	
69.000	69.353	18.422	18.067		17.21	36	
69.353	69.637	18.067	17.782		17.21	52	
69.637	70.193	17.782	17.226		17.21	52	
70.193	70.250	17.226	17.173		18.89	37.5	
70.250	70.440	17.173	16.983		18.89	72.15 / 139.15	Proposed Toll Plaza
70.440	70.600	16.983	16.826		18.89, 17.51	92.93 / 141.2	
70.600	70.650	16.826	16.775		17.51	93.6	
70.650	70.960	16.775	16.463		17.510, 22.240	35	
70.960	71.425	16.463	15.995		22.24	35	
71.425	71.788	15.995	15.631		22.24	37.5	
71.788	72.295	15.631	15.125		22.24	44.5	
72.295	72.410	15.125	15.011		22.24	41.75	
72.410	72.630	15.011	14.792		22.24	36	
72.630	73.700	14.792	13.720		23.24	40	
73.700	74.000	13.720	13.415		28.27	40	
74.000	74.609	13.415	12.805		36.33	40	
74.609	75.223	12.805	12.195		36.65	40	
75.223	75.335	12.195	12.043		18.21	40	
75.335	79.221	12.043	8.157		50	50	

Proposed Chainage (km)		Existing Chainage (km)		Old Name of Project Road	Existing ROW (m)	Proposed ROW (m)	Remarks
From	To	From	To				
79.221	79.719	8.157	7.657		54.42	54.42	
79.719	79.969	7.657	7.407		41.01	41.01	
79.969	80.820	7.407	6.651		44.36	44.36	

3.5 At Grade Intersection

At grade intersections are provided at the intersection of service roads and all intersecting roads at locations as specified below:

Major Intersections (Junctions / Intersections):

Sr. No.	Location (km)	Type of Intersection	Cross Road		
			Side	Leading to	Width (m)
1	0+000	Y	Right	Phagwara	7.0
2	4+200	X	-	Hoshiarpur	7.5
3	9+300	Y	Right	Phagwara	7.0
4	37+400	Y	Right	Nawanshahr	10.0
5	46+800	Y	Right	Langroy	13.0
6	56+500	X	-	Balachaur	8.0
7	59+800	X	-	SH-24	7.0

The photographs taken at the time of site visit is presented as below:

Figure 3-5 Photographs of Major Junctions

Major Junction at km. 1+250 (LHS)

Major Junction at km. 57+260 (RHS)

Minor Junctions:

Sr. No.	Location (Existing)	Location (Design)	Name of Road	Type		Width (m)	Type of Surface	Side	Leading to
				Junction Type	Cross Road				
1	18+229	0+535	SH-18	X	Village	L (3.25) R (3.67)	BT	Both	Nangal Majra
2	18+807	1+100		X	Village	L (3.49) R (3.49)	BT	Both	Village Road
3	20+226	2+560		X	Village	L (6.4) R (7.0)	BT	Both	Palahi, Phagwara

Sr. No.	Location (Existing)	Location (Design)	Name of Road	Type		Width (m)	Type of Surface	Side	Leading to
				Junction Type	Cross Road				
4	22+205	4+521		Y	Village	R (3.1)	BT	RHS	Village Road
5	22+658	5+065		X	Village	L (4.7) R (5.2)	BT	Both	BhullaRai, Dana Mandi
6	23+948	6+258		X	Village	L (4.5) R (5.3)	BT	Both	Purewal Nagar
7	24+306	6+617		Y	Village	R (3.59)	BT	RHS	Shastri Nagar Gurunanak
8	24+579	6+895		X	Village	L (3.2) R (2.3)	BT	Both	Nagar, Sukhchain Nagar
9	25+507	7+800		X	Village	L (3.69) R (3.12)	BT	Both	Gonspur
10	5+948	10+259	MDR-56	T	Village	L (3.15)	BT	LHS	Bahua
11	6+171	10+483		Y	Village	L (2.9)	BT	LHS	Village Road
12	6+697	11+024		Y	Village	L (3.0)	BT	LHS	Village Road
13	7+944	11+269		Y	Village	L (3.5)	BT	LHS	Village Road
14	7+875	12+245		Y	Village	R (3.23)	BT	RHS	Village Road
15	8+143	12+513		T	Village	R (3.28)	BT	RHS	Kultham
16	8+572	12+941		Y	Village	L (3.0)	BT	LHS	Chak Mander
17	8+830	13+200		X	Village	L (3.5) R (3.7)	BT	Both	Chak Mander Kultham
18	9+189	13+560		Y	Village	L (3.0)	BT	LHS	JassoMajra JassoMajra,
19	9+410	13+782		X	Village	L (3.2) R (3.4)	BT	Both	Sarhala Ranuan
20	9+448	13+824		Y	Village	L (3.0)	BT	LHS	Jasso Majra
21	10+379	14+716		T	Village	R (3.3)	BT	RHS	Chak Mai das
22	12+123	16+443		Y	Village	R (2.5)	BT	RHS	Behram
23	12+456	16+775		Y	Village	L (3.18)	BT	LHS	Behram
24	12+520	16+838		Y	Village	R (3.18)	BT	RHS	Behram
25	12+625	16+943		Y	Village	L (3.12) R (4.01)	BT	HHS	Behram
26	12+885	17+200		Y	Village	R (3.25)	BT	RHS	Behram
27	12+995	17+300		Y	Village	L (7.58)	BT	LHS	Behram
28	13+046	17+363		Y	Village	L (3.07)	BT	RHS	Behram
29	13+133	17+450		Y	Village	L (2.48)	BT	LHS	Behram
30	13+835	18+144		T	Village	R (3.12)	BT	RHS	Chak Bilgan
31	14+988	19+300		Y	Village	L (3.09)	BT	LHS	Malla Sodhian
32	15+166	19+478		Y	Village	R (2.82)	BT	RHS	Malla Sodhian
33	15+283	19+597		Y	Village	L (3.09)	BT	LHS	Malla Sodhian
34	15+936	20+249		Y	Village	R (3.20)	BT	RHS	Lalpur
35	16+275	20+600		Y	Village	L (2.97)	BT	LHS	Bisla
36	17+061	21+386		Y	Village	R (2.83)	BT	RHS	Dhahan
37	17+815	22+143		Y	Village	L (4.95)	BT	LHS	Kaleran
38	18+591	22+920		Y	Village	R (2.78)	BT	RHS	MalluPotta
39	19+887	24+205		X	Village	L (2.9) R (2.65)	BT	Both	Mazari
40	20+022	24+348		Y	Village	R (3.48)	BT	RHS	Mazari
41	20+348	24+673			Village	L (2.08)	BT	Both	Village Road

Sr. No.	Location (Existing)	Location (Design)	Name of Road	Type		Width (m)	Type of Surface	Side	Leading to
				Junction Type	Cross Road				
				X		R (3.39)			
42	20+394	24+719		Y	Village	L (2.75)	BT	LHS	Village Road
43	21+161	25+490		Y	Town	R (3.75)	BT	RHS	Banga
44	21+237	25+563		Y	Town	L (4.3)	BT	LHS	Banga
45	21+413	25+739		Y	Town	R (2.4)	BT	RHS	Banga
46	21+535			Y	Town	R (3.51)	BT	RHS	Banga
47	21+722	26+060		X	Town	L (S.6) R (3.23)	BT	Both	Banga
48	22+160	26+300		X	Town	L (4.3) R)	BT	Both	Banga
49	22+329	26+480		X	Town	L (S.6) R (4.0)	BT	Both	Banga
so	22+620	26+500		Y	Town	R (6.17)	BT	RHS	Banga
51	22+826	26+538		Y	Town	L (6.9)	BT	LHS	Banga
52	23+556	26+621		X	Town	L (2.7) R (3.2)	BT	Both	Banga
53	23+995	26+713		Y	Town	L (3.4)	BT	LHS	Banga
54	24+167	26+952		Y	Town	R (3.2)	BT	RHS	Village Road
55	25+325	29+639		X	Village	L (2.9) R (4.6)	BT	Both	Village Road
56	26+053	30+358		X	Village	L (4.6) R (7.2)	BT	Both	Khatkar Kalan
57	26+230	30+535		Y	Village	R (4.6)	BT	RHS	Khatkar Kalan
58	26+766	31+072		X	Village	L (3.59) R (2.76)	BT	Both	Khatkar Kalan, Bhoot
59	27+434	31+734		X	Village	L (2.8) R (3.2)	BT	Both	Kahma, Bhoot
60	27+891	32+182		Y	Village	R (2.95)	BT	RHS	Kahma
61	28+167	32+459		X	Village	L (2.94) R (3.2)	BT	Both	Kahma
62	29+122	33+416		Y	Village	R (2.38)	BT	RHS	Kahma
63	29+314	33+608		X	Village	L (3.5) R (3.04)	BT	Both	Bainsa, Kariha
64	30+261	34+600		X	Village	L (3.0) R (4.5)	BT	Both	MalpurArkan, Kariha
65	30+660	34+990		Y	Village	L (2.9)	BT	LHS	MalpurArkan
66	30+885	35+217		Y	Village	R (2.9)	BT	RHS	Kariha
67	32+075	36+400		Y	Village	L (2.9)	BT	LHS	Village Road
68		42+060		X	Village	L (2.8) R (3.07)	BT	Both	L () R ()
69		46+920		Y	Village	L (2.9)	BT	LHS	L (Kishanpur)
70	42+777	47+683		X	Village	L (2.8) R (3.07)	BT	Both	Sajwalpur
71	43+329	48+234		Y	Village	R (3.14)	BT	RHS	Sanawa
72	43+433	48+337		Y	Village	R (2.5)	BT	RHS	Village Road
73	43+692	48+600		Y	Village	L (3.0)	BT	LHS	Kishanpura
74	43+863	48+920		Y	Village	R (3.3)	BT	RHS	Nai Majara
75	44+120	49+180		Y	Village	L (2.9)	BT	LHS	Daulatpur
76	44+313	49+373		Y	Village	R (2.72)	BT	RHS	Village Road
77	45+208	50+050		X	Village	L (3.43)	BT	Both	Daulatpur, Jadla

Sr. No.	Location (Existing)	Location (Design)	Name of Road	Type		Width (m)	Type of Surface	Side	Leading to
				Junction Type	Cross Road				
						R (2.92)			
78	45+574	50+414		X	Village	L (5.03) R (4.71)	BT	Both	Daulatpur, Jadla
79	46+302	51+134		X	Village	L (3.1) R (3.1)	BT	Both	Jadli, Jadla
80	47+799	52+600		Y	Village	R (2.4)	BT	RHS	Village Road
81	48+354	53+166		X	Village	L (2.5) R (3.2)	BT	Both	Thathiala Dhaha, Birowal
82	49+247	54+036		Y	Village	L (3.74)	BT	LHS	Garle
83	26+257	61+171		X	Village	L (2.6) R (3.5)	BT	Both	Balachaur, Sojowal
84	23+849	63+570		X	Village	L (2.8) R (4.1)	BT	Both	Lohat, Lohgarh
85	23+133	64+287		Y	Village	L (3.12)	BT	LHS	Village Road
86	19+741	67+646		X	Village	L (2.8) R (2.3)	BT	Both	Jalalpur
87	19+096	68+289		Y	Village	L (5.65)	BT	LHS	Katgarh
88	18+089	69+296		Y	Village	L (2.9)	BT	LHS	Village Road
89	17+953	69+429		Y	Village	L (2.77)	BT	LHS	Bharthala
90	17+911	69+474		T	Village	R (2.75)	BT	RHS	Village Road
91	17+529	69+855		Y	Village	L (2.76)	BT	LHS	Village Road
92	16+668	70+723		Y	Village	L (3.63)	BT	LHS	Panayali Kalan
93	16+208	71+177		X	Village	L (3.2) R (2.9)	BT	Both	Panayali Khurd
94	16+060	71+324		Y	Village	L (2.5)	BT	LHS	Panayali Khurd
95	15+365	72+019		T	Village	L (2.8)	BT	LHS	Jamitgarh
96	14+840	72+544	SH-24	X	Village	L (3.45) R (3.04)	BT	Both	Majra Jathan
97	14+070	73+315		T	Village	L (2.85)	BT	LHS	Village Road
98	13+190	74+181		Y	Village	L (4.13)	BT	LHS	Fatepur
99	12+507	74+867		Y	Village	L (3.09)	BT	LHS	Village Road
100	11+967	75+413		X	Village	L (3.0) R (3.3)	BT	Both	Tanusa
101	11+091	76+285		Y	Village	L (2.99)	BT	LHS	Dana Mandi
102	9+624	77+747		X	Village	L (3.29) R (3.37)	BT	Both	Majra

3.6 Grade Separated Intersection

The grade separated intersections provided are as tabulated below:

Grade separated structure:

Sr. No.	Location of structure (km)	Existing / Proposed	Proposed Span Arrangement (m)	Minimum Vertical Clearance (m)	Type
1	4+200	Proposed	1 x 25 + 1 x 40 + 1 x 25	5.5	6 lane as per Type-1
2	9+320	Proposed	1 x 25 + 1 x 30 + 1 x 25	5.5	6 lane as per Type-1
3	39+900	Proposed	1 x 25 + 1 x 30 + 1 x 25	5.5	6 lane as per Type-1
4	59+800	Proposed	1 x 25 + 1 x 30 + 1 x 25	5.5	3 lane as per Type-3

Elevated structure:

Sr. No.	Location of structure	Existing / Proposed	Proposed Span Arrangement (m)	Minimum Vertical Clearance above Service Road (m)	Type
1	25+319 to 28+319	Proposed	100 x 30	5.5	4 lane as per TYPE-4

3.7 Underpasses

Vehicular Underpass (VUP):

Vehicular Underpass are provided at location as tabulated below:

Sr. No.	Location (Chainage)	Span Arrangement (m)	Minimum Horizontal Clearance (m)	Minimum Vertical Clearance (m)	Type
1	6+894	1 x 19	12	5.5	6 lane as per TYPE-1

Cattle and Pedestrian Underpass / Overpass:

Cattle and Pedestrian Underpass / Overpass are constructed as tabulated below:

Sr. No.	Location (Chainage)	Minimum Horizontal Clearance (m)	Minimum Vertical Clearance (m)	Type
1	32+450	1 x 7	4.5	6 lane as per TYPE-2

3.8 Major Bridges

Reconstruction / New Construction of existing Major Bridge is as tabulated below:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type Of Crossing	Proposed Structural Configuration	Proposed Structure Type	Proposed Span Arrangement (No. x Length)	Total Structure Width
1	54+721	59+370	Right	New 2-Lane bridge on LHS of existing bridge	RCC Girder + Slab	11 + 3 x 15.9 + 11	Additional 2 lane as per TYPE-8

Rehabilitation / Repair / Widening of existing Major Bridge is as tabulated below:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Width (m)	Span Arrangement (No. x Length)	Type of Structure			Detail of Rehabilitation	Detail of Repair	Detail of Widening
					Foundation	Sub-Structure	Super-Structure			
1	54+721	59+370	2-lane	13 x 5.3	Open	Wall	Solid Slab	General Rehabilitation	Routine Maintenance	Nil

3.9 Minor Bridges

Reconstruction / New Construction of existing Minor Bridges are as tabulated below:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Crossing	Proposed Structural Configuration	Proposed Structure Type	Proposed Span Arrangement (No. x Length)	Total Structure Width
1	31+470	35+790	26° Skew	New 2-Lane bridge on LHS of existing bridge	Box	1 x 10 (skew) (clear)	Additional 2 lane as per TYPE-8
2	39+844	38+305	38° Skew	New 4-Lane bridge	Box	3 x 7 (skew) (clear)	4 lane as per TYPE-5
3	43+441	48+292	51° Skew	New 2-Lane bridge on LHS of existing bridge	Box	3 x 8 (skew) (clear)	Additional 2 lane as per TYPE-8
4	53+300	57+967	Right	New 2-Lane bridge on LHS of existing bridge	PSC Girder	1 x 28	Additional 2 lane as per TYPE-8

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Crossing	Proposed Structural Configuration	Proposed Structure Type	Proposed Span Arrangement (No. x Length)	Total Structure Width
5	54+573	59+225	Right	New 2-Lane bridge on LHS of existing bridge	RCC Girder	3 x 16	Additional 2 lane as per TYPE-8
6	24+731	62+692	Right	New 3-Lane bridge on LHS of existing bridge	RCC Girder	1 x 18	Additional 3 lane as per TYPE-9
7	23+814	63+602	Right	New 3-Lane bridge on LHS of existing bridge	PSC Girder	1 x 26	Additional 3 lane as per TYPE-9
8	22+645	64+777	Right	New 3-Lane bridge on LHS+ Reconstruction from 9m width RHS of existing bridge	RCC Solid Slab	5 x 7.5	6 Lane as per TYPE-7
9	21+409	66+007	Right	New 3-Lane bridge on LHS of existing bridge	PSC Girder	1 x 35	Additional 3 lane as per TYPE-9
10	18+881	68+506	Right	New 3-Lane bridge on LHS of existing bridge	RCC Solid Slab	4 x 11	Additional 3 lane as per TYPE-7
11	17+583	69+802	Right	New 3-Lane bridge on LHS of existing bridge	Box	1 x 10 (clear)	Additional 3 lane as per TYPE-9
12	16+231	71+154	Right	New 3-Lane bridge on LHS+ Reconstruction by 9m width on RHS of existing bridge	RCC Solid Slab	11 + 12.8 + 11	6 Lane as per TYPE-7
13	15+676	71+708	Right	New 3-Lane bridge on LHS of existing bridge+ New 2-Lane bridge on RHS of new 3-Lane bridge & LHS to existing bridge	RCC Girder	1 x 18	Additional 3 lane as per TYPE-12
14	15+269	72+117	Right	New 3-Lane bridge on LHS + Reconstruction of 3- Lane bridge on RHS	RCC Girder	3 x 15	6 Lane as per TYPE-6
15	14+505	72+880	Right	New 3-Lane bridge on LHS + Reconstruction of 3- Lane bridge on RHS	Box	3 x 7 (clear)	6 Lane as per TYPE-6
16	13+227	74+148	Right	New 3-Lane bridge on LHS + Reconstruction of 3- Lane bridge on RHS	Box	3 x 8 (Clear)	6 Lane as per TYPE-6
17	13+039	74+336	Right	New 3-Lane bridge on LHS + Reconstruction of 3- Lane bridge on RHS	Box	2 x 8 (Clear)	6 Lane as per TYPE-6
18	12+393	74+987	Right	New 3-Lane bridge on LHS + Reconstruction of 3- Lane bridge on RHS	Box	2 x 9 (Clear)	6 Lane as per TYPE-6
19	10+558	76+793	Right	New 2-Lane bridge on LHS of existing bridge + New 2 Lane Service Road bridge on LHS of main carriageway	Box	1 x 6.5 (Clear)	Additional 2 lane as per TYPE-10

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Crossing	Proposed Structural Configuration	Proposed Structure Type	Proposed Span Arrangement (No. x Length)	Total Structure Width
20	9+786	77+591	Right	New 2-Lane bridge on Service Road + New 2 Lane Service Road bridge on LHS of main carriageway	Box	3 x 8 (Clear)	4 Lane as per TYPE-11
21	8+764	78+613	Right	New 2-Lane bridge on LHS of existing bridge + New 2 Lane Service Road bridge on LHS of main carriageway	RCC Girder	1 x 13	Additional 2 lane as per TYPE-10
22	7+353	80+018	Right	New 2-Lane bridge on LHS of existing bridge + New 2 Lane Service Road bridge on LHS of main carriageway	Box	1 x 8 (Clear)	Additional 2 lane as per TYPE-10

Rehabilitation / Repair / Widening of existing Minor Bridge are as tabulated below:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Span Arrangement (No. x Length)	Side of Existing 2- lane Bridge	Type of Structure			Detail of Rehabilitation	Detail of Repair	Detail of Widening
					Foundation	Sub-Structure	Super-Structure			
1	31+470	35+790	2 x 4.9	-	Open	Wall	Solid Slab	General Rehabilitation	Routine Maintenance	Nil
2	43+441	48+292	3 x 9.4	-	Open	Wall	Solid Slab	General Rehabilitation	Routine Maintenance	Nil
3	53+300	57+967	7 x 3.9	-	Open	Box	Box	General Rehabilitation	Routine Maintenance	Nil
4	54+573	59+225	3 x 15.5	-	Open	Wall	Arch	General Rehabilitation	Routine Maintenance	Nil
5	24+731	62+692	1 x 18	-	Open	Wall	T girder	General Rehabilitation	Routine Maintenance	Nil
6	23+814	63+602	1 x 25.6	-	Open	Arch	T girder	General Rehabilitation	Routine Maintenance	Nil
7	22+645	64+777	5 X 7.3	LHS	Pile	Wall	Continuous Slab	General Rehabilitation	Routine Maintenance	Nil
8	21+409	66+007	1 x 35	-	Open	Box	T girder	General Rehabilitation	Routine Maintenance	Nil

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Span Arrangement (No. x Length)	Side of Existing 2- lane Bridge	Type of Structure			Detail of Rehabilitation	Detail of Repair	Detail of Widening
					Foundation	Sub-Structure	Super-Structure			
9	18+881	68+506	2 x 11 + 10.8 + 11 4 x 11	RHS LHS	Open	Wall	Solid Slab	General Rehabilitation	Routine Maintenance	Widening by 2 m on RHS of existing bridge on LHS to match the total proposed width of 16 m (Ref. Type-7)
10	17+583	69+802	1 x 11	-	Open	Wall	Solid Slab	General Rehabilitation	Routine Maintenance	Nil
11	16+231	71+154	11 + 12.8 + 11	LHS	Pile	Wall	Continuous Slab	General Rehabilitation	Routine Maintenance	Nil
12	15+676	71+708	1 x 18	-	Open	Wall	T girder	General Rehabilitation	Routine Maintenance	Widening by 9 m on LHS of existing bridge to match the total proposed width of 16 m (Ref. Type-12)
13	10+588	76+793	1 x 7.3	-	Open	Wall	Solid Slab	General Rehabilitation	Routine Maintenance	Nil
14	8+764	78+613	1 x 13	-	Open	Wall	RCC Girder	General Rehabilitation	Routine Maintenance	Nil
15	7+353	80+018	1 x 8.9	-	Open	Wall	Solid Slab	General Rehabilitation	Routine Maintenance	Nil

3.10 Culverts

Culverts provided, widened, reconstructed, or extended are as tabulated below:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Proposal	Existing Type	Proposed Type	Proposed Size (m)	Remarks
1	18+200	0+516	Reconstruct	Pipe	Pipe	2.0 x 2.0	Cross Drainage
2	18+487	0+802	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
3	18+627	0+858	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
4	18+800	1+113	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Proposal	Existing Type	Proposed Type	Proposed Size (m)	Remarks
5	19+025	1+339	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
6	19+120	1+429	Reconstruct	Slab	Box	6.0 x 3.5	Cross Drainage
7	19+357	1+672	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
8	19+500	1+815	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
9	19+549	1+862	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
10	19+600	1+919	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
11	19+648	1+967	Reconstruct	Slab	Box	6.0 x 3.5	Cross Drainage
12	19+670	1+989	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
13	19+900	2+212	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
14	20+029	2+341	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
15	20+170	2+483	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
16	20+194	2+507	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
17	20+200	2+513	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
18	20+137	2+690	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
19	20+731	3+209	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
20	21+100	3+408	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
21	21+400	3+708	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
22	21+755	4+064	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
23	22+200	4+514	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
24	22+500	4+817	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
25	22+600	4+917	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
26	23+152	5+464	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
27	23+735	6+045	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
28	23+970	6+254	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
29	24+298	6+608	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
30	24+560	6+891	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
31	24+820	7+135	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
32	25+882	8+196	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
33	26+318	8+630	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
34	26+384	8+695	Reconstruct	Slab	Box	3.0 x 3.0	Cross Drainage
35	26+760	9+081	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
36	6+150	10+457	Widening	Slab	Box	3.0 x 3.0	Cross Drainage

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Proposal	Existing Type	Proposed Type	Proposed Size (m)	Remarks
37	9+403	13+774	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
38	10+318	14+655	Widening	Slab	Box	4.0 x 4.0	Cross Drainage
39	12+615	16+932	Widening	Slab	Box	6.0 x 3.5	Cross Drainage
40	12+705	17+022	Widening	Slab	Box	4.0 x 4.0	Cross Drainage
41	13+615	17+924	Widening	Slab	Box	3.0 x 3.0	Cross Drainage
42	13+935	18+246	Widening	Slab	Box	4.0 x 4.0	Cross Drainage
43	14+010	18+321	Widening	Slab	Box	6.0 x 3.5	Cross Drainage
44	15+135	19+445	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
45	17+122	21+442	Widening	Slab	Box	6.0 x 3.5	Cross Drainage
46	20+607	24+929	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
47	26+088	30+392	Widening	Slab	Box	3.0 x 3.0	Cross Drainage
48	27+465	31+764	Widening	Slab	Box	3.0 x 3.0	Cross Drainage
49	32+580	36+928	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
50	-	37+480	New Construction	-	Box	3.0 x 3.0	Cross Drainage
51	-	37+905	New Construction	-	Box	3.0 x 3.0	Cross Drainage
52	-	38+050	New Construction	-	Pipe	1.2 m dia	Cross Drainage
53	-	38+510	New Construction	-	Pipe	1.2 m dia	Cross Drainage
54	-	39+520	New Construction	-	Box	3.0 x 3.0	Cross Drainage
55	-	42+310	New Construction	-	Pipe	1.2 m dia	Cross Drainage
56	-	42+437	New Construction	-	Box	6.0 x 3.5	Cross Drainage
57	-	42+665	New Construction	-	Pipe	1.2 m dia	Cross Drainage
58	-	43+225	New Construction	-	Box	3.0 x 3.0	Cross Drainage
59	-	43+760	New Construction	-	Box	3.0 x 3.0	Cross Drainage
60	-	44+210	New Construction	-	Pipe	1.2 m dia	Cross Drainage
61	-	45+010	New Construction	-	Box	3.0 x 3.0	Cross Drainage
62	-	45+725	New Construction	-	Pipe	1.2 m dia	Cross Drainage
63	-	46+163	New Construction	-	Pipe	1.2 m dia	Cross Drainage
64	-	46+606	New Construction	-	Box	3.0 x 3.0	Cross Drainage
65	43+713	48+770	Widening	Slab	Box	3.0 x 3.0	Cross Drainage
66	43+828	48+885	Widening	Slab	Box	6.0 x 3.5	Cross Drainage
67	46+548	51+367	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
68	47+350	52+160	Widening	Slab	Box	2.0 x 2.0	Cross Drainage

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Proposal	Existing Type	Proposed Type	Proposed Size (m)	Remarks
69	47+624	52+434	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
70	47+822	52+632	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
71	48+156	52+967	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
72	48+437	53+226	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
73	48+690	53+478	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
74	48+811	53+599	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
75	48+955	53+743	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
76	50+800	55+590	Widening	Slab	Box	2.0 x 2.0	Cross Drainage
77	50+840	55+667	Widening	Pipe	Pipe	1 m dia	Cross Drainage
78	50+910	55+739	Widening	Pipe	Pipe	1 m dia	Cross Drainage
79	52+963	57+654	Reconstruct	Arch	Box	2.0 x 2.0	Cross Drainage
80	53+050	57+728	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
81	53+687	58+349	Widening	Pipe	Pipe	1 m dia	Cross Drainage
82	53+913	58+575	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
83	54+357	59+022	Widening	Pipe	Pipe	1 m dia	Cross Drainage
84	54+457	59+124	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
85	22+173	65+250	Widening	Pipe	Pipe	1 m dia	Cross Drainage
86	21+964	65+460	Widening	Pipe	Pipe	1 m dia	Cross Drainage
87	21+857	65+568	Widening	Pipe	Pipe	1 m dia	Cross Drainage
88	21+763	65+662	Widening	Pipe	Pipe	1 m dia	Cross Drainage
89	17+945	69+439	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
90	17+410	69+978	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage
91	6+900	80+477	Reconstruct	Pipe	Pipe	1.2 m dia	Cross Drainage

3.11 ROB / RUB

Road Over Bridges (ROB) provided is as tabulated below:

Sr. No.	Location	Design Chainage (km)	Existing / Proposed	Proposed Span	Type
1	Bypass	39+100	Proposed	1 x 19 + 1 x 37.28 + 1 x 19	4-lane as per TCS-13

3.12 Entry / Exit Ramps

Entry / exit ramps for entering into or exiting from the project highway are provided wherever necessary.

3.13 Slope Protection

The side slope is protected by using suitable slope protection measures wherever required along the present highway.

3.14 Utilities

Provision of accommodating utilities is made both over as well as underground wherever required.

3.15 Rainwater Harvesting

As per Ministry of Environment and Forests Notification, New Delhi dated 14.01.1997 (as amended on 13.01.1998, 05.01.1999 & 6.11.2000), the construction of rainwater, harvesting structure is mandatory in and around Water Crisis area, notified by the Central Ground Water Board.

Rainwater harvesting structures are provided all along the project road.

3.16 Project Facilities

a. Toll Plaza

The Concession Agreement requires construction of Toll Plaza at 2 Nos. of locations. Accordingly, Concessionaire has constructed 2 Nos. of Toll Plazas at following locations.

1. Toll Plaza-1 at km. 15+300

The construction of toll plaza is completed and is in operation. 8 Nos. of lanes [2 x (3+1)] has been constructed and all are under operation. Concessionaire has constructed administration, operation and maintenance facility at base camp. All required facilities are available at the toll plaza. Some of the photographs of toll plaza-1 are presented below.

Figure 3-6 Photographs of Toll Plaza-1

Behram Toll Plaza at km. 15+300

Behram Toll Plaza at km. 15+300

2. Toll Plaza-2 at km. 70+240

The construction of toll plaza is completed and is in operation. 8 Nos. of lanes [2 x (3+1)] has been constructed and all are under operation. Concessionaire has constructed administration, operation and maintenance facility at base camp. All required facilities are available at the toll plaza. Some of the photographs of toll plaza-2 are presented below.

Figure 3-7 Photographs of Toll Plaza-2

Bachhwan Toll Plaza at km. 70+240

Bachhwan Toll Plaza at km. 70+240

b. Roadside Furniture

Pavement Marking

Pavement marking for the project highway is done as per the design standards indicated in section 12 of Schedule-D. The painting is being done wherever is required on regular basis as a part of routine maintenance. Some of the photographs of road marking are presented below.

Figure 3-8 Photographs of Road Markings

Road Marking at km. 70+000 (RHS)

Road Marking at km. 15+800 (RHS)

Traffic Signage

Traffic signs includes roadside signs, overhead signs, kerb mounted signs and median signs along the project highway. The design for the traffic signs along the project highway is done as per the design standards indicated in section 11 of Schedule-D.

The height, lateral clearance, location and installation are as per relevant clauses of Schedule 'D'. Overhead sign has been installed ahead of major intersections, toll plazas, start / end of project highway and urban areas as per detailed design requirements.

The sign boards, kilometer stones and hectometer stones are being replaced wherever damaged.

Some of the photographs of sign boards are presented below.

Figure 3-9 Photographs of Road Sign Boards

Overhead Gantry Sign Board at km. 8+400

Traffic Sign Board at km. 72+000

Foot Over Bridge (FOB) at km. 6+600

Kilometer Stone at km. 41+000

Highway Lighting

Highway lighting is provided at underpasses, flyovers, truck lay-byes, toll plaza, ROBs and built-up locations. High mast lighting is provided at both toll plaza locations.

At underpass and flyover locations, highway lighting is provided at the structure locations and at its approaches.

Solar amber blinker signals are provided at each at-grade intersections and at median opening locations. These lights are properly maintained and are in good working condition. Regular maintenance work is carried out to ensure their efficient operation. Some of the photographs of highway lightings are presented below.

Figure 3-10 Photographs of Highway Lighting

Street Lighting at Structure Approach

Street Lighting at Service Road

Crash Barriers

Metal beam crash barriers are provided at bridge approaches, locations of high embankment and sharp curves. All the crash barriers provided by the Concessionaire are well maintained at site. Some of the photographs of metal beam crash barriers are presented below. Some of the photographs of crash barriers are presented below.

Figure 3-11 Photographs of Crash Barriers

Crash Barrier at high embankment

Crash Barrier at curve location

Pedestrian Guard Rail

The pedestrian guard rails are provided between main road and service road at the built-up locations. Some of the photographs of pedestrian guard rails are presented below.

Figure 3-12 Photographs of Pedestrian Guard Rail

Pedestrian Guard Rail at km. 69+400

Pedestrian Guard Rail at km. 69+400

Road Land Boundary

Road land (ROW) boundary demarcation is required to be maintained by the Concessionaire on the project highway during the concession period. The road land boundary pillars are being fixed at required locations whenever required.

Avenue Plantation and Median Plantation

Avenue plantation and median plantation is available intermittently along the project highway. Variety of trees and plants are planted throughout the corridor at road side and at median side respectively. Median plantation is maintained along the project highway. The plantation is being done wherever required on regular basis. Some of the photographs of avenue plantation and median plantation are presented below.

Figure 3-13 Photographs of Avenue and Median Plantation

Median Plantation on project highway

Avenue Plantation at km. 72+900

c. Truck Lay Bye

Concession Agreement has proposed construction of truck lay-byes at 2 Nos. of locations. The work is completed as per requirement of Concession Agreement. Truck lay byes are provided at the following locations.

Table 3-1 Details of Truck Lay-Byes

Sr. No.	Design Chainage (km)	Carriageway (m)
1	1+600	7.5
2	45+500	7.5

The photographs taken at the time of site visit is presented as below:

Figure 3-14 Photographs of Truck Lay-Bye

Truck Lay-Bye at km. 1+600

Truck Lay-Bye at km. 1+600

d. Bus bay and passenger shelter

Bus bays and passenger shelters are constructed at the various locations along the project highway. 25 Nos. of bus bays with passenger shelters on LHS and 18 Nos. on RHS are provided along the project highway. Bus bays are equipped with all necessary signage as per relevant IRC guidelines mentioned in Schedule-D of Concession Agreement. The details of the bus bays and passenger shelters provided as below.

Table 3-2 Details of Bus Bays

Sr. No.	LHS	LHS Design Chainage (km)	RHS	RHS Design Chainage (km)
1	Bus Bay & Shelter	0+742	Bus Bay & Shelter	0+858
2	Bus Bay & Shelter	3+150	Bus Bay & Shelter	3+255
3	Bus Bay & Shelter	5+125	Bus Bay & Shelter	5+100
4	Bus Bay & Shelter	8+200	Bus Bay & Shelter	8+200
5	Bus Bay & Shelter	10+255	Bus Bay & Shelter	10+255
6	Bus Bay & Shelter	13+050	Bus Bay & Shelter	13+150
7	Bus Bay & Shelter	15+300	Bus Bay & Shelter	15+300
8	Bus Bay & Shelter	20+050	Bus Bay & Shelter	20+050
9	Bus Bay & Shelter	22+720	Bus Bay & Shelter	22+720
10	Bus Bay & Shelter	25+100	Bus Bay & Shelter	25+100
11	Bus Bay & Shelter	29+450	Bus Bay & Shelter	29+550
12	Bus Bay & Shelter	31+200	Bus Bay & Shelter	31+200
13	Bus Bay & Shelter	34+100	Bus Bay & Shelter	34+100
14	Bus Bay & Shelter	36+550	Bus Bay & Shelter	36+660
15	Bus Bay & Shelter	47+500	Bus Bay & Shelter	47+600
16	Bus Bay & Shelter	49+590	Bus Bay & Shelter	49+700
17	Bus Bay & Shelter	52+940	Bus Bay & Shelter	53+060

Sr. No.	LHS	LHS Design Chainage (km)	RHS	RHS Design Chainage (km)
18	Bus Bay & Shelter	55+000	Bus Bay & Shelter	55+100
19	Bus Bay & Shelter	60+200		
20	Bus Bay & Shelter	63+200		
21	Bus Bay & Shelter	69+525		
22	Bus Bay & Shelter	73+050		
23	Bus Bay & Shelter	75+600		
24	Bus Bay & Shelter	78+200		
25	Bus Bay & Shelter	80+550		

The photographs taken at the time of site visit is presented as below:

Figure 3-15 Photographs of Bus Bays

Bus Bay at km. 0+740

Bus Bay at km. 10+255

Bus Bay at km. 62+900

Bus Bay at km.69+200

3.17 Condition Survey of Bridges

The inventory of structures including major bridges, minor bridges, ROB, flyovers, elevated structure, underpasses and culverts is presented in table as below:

Table 3-3 Summary of Structures

Type of Structure	Total Number of Structures
Major Structures:	
Road Over Bridge (ROB)	01
Road Under Bridge (RUB)	-
Elevated Structure	01
Flyover	04
Vehicular Underpass (VUP)	03
Pedestrian Underpass (PUP)	01
Overpass	-
Major Bridges (MJB)	01
Minor Bridges (MNB)	22
Culverts:	
Pipe Culverts	42
Box Culverts	51
Total	**125**

The detailed condition survey of structures was carried out by visual inspection. The observations and findings are presented in table below:

Table 3-4 Condition Survey of Major Bridge

Sr. No.	Chainage (km)	Side	Span Arrangement (m)	Carriageway Width (m)	Type of Sub-structure	Type of Super-structure	Type of foundation	Remarks
1	59+381	LHS	1 x 11 + 3 x 15.9 + 1 x 11	1 x 9.5	RCC	RCC Girder	Open	**New Bridge -** Structure is in sound condition. Expansion Joint, crash barrier and slope protection are in good condition.
		RHS	13 x 5.3	1 x 12.4	Wall	Solid slab	Open	**Existing Bridge -** Open foundation, brick wall sub-structure and RCC solid slab-structure in fair condition. As informed, vegetation is being cleaned on regular basis.

Table 3-5 Condition Survey of Minor Bridge

Sr. No.	Design Chainage (km)	Structural Configuration	Structure Type	Span Arrangement (m) (No. x Length)	Total Structure Width (m)	Remarks
1	35+812	New 2-Lane bridge on LHS of existing bridge	Box	1 x 10 (skew)	Additional 2-lane	**Existing Bridge -** 2 x 4.9 m span, Open foundation, brick wall sub-structure and RCC slab - Structure is in sound condition. **New Bridge -** RCC box type - Structure is in sound condition.
2	38+326	New 4-Lane bridge	Box	3 x 7 (skew)	4-lane	**New Bridge -** RCC box type - Structure is in sound condition.
3	48+323	New 2-Lane bridge on LHS of existing bridge	Box	3 x 8 (skew)	Additional 2-lane	**Existing Bridge -** 3 x 9.4 m span**,** open foundation, brick wall sub-structure and RCC slab - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis. **New Bridge -** RCC box type - Structure is in sound condition.
4	57+981	New 2-Lane bridge on LHS of existing bridge	PSC Girder	1 x 28	Additional 2-lane	**Existing Bridge -** 7 x 3.9 m span**,** Open foundation, RCC box type - Structure is in sound condition.

Sr. No.	Design Chainage (km)	Structural Configuration	Structure Type	Span Arrangement (m) (No. x Length)	Total Structure Width (m)	Remarks
						New Bridge - PSC Girder type - Structure is in sound condition.
5	59+237	New 2-Lane bridge on LHS of existing bridge	RCC Girder	3 x 16	Additional 2-lane	**Existing Bridge -** 3 x 9.4 m span**,** open foundation, brick wall sub-structure and RCC slab - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis. **New Bridge -** RCC Girder type - Structure is in sound condition.
6	62+704	New 3-Lane bridge on LHS of existing bridge	RCC Girder	1 x 18	Additional 3-lane	**Existing Bridge -** 1 x 18 m span**,** open foundation, brick wall sub-structure T-Girder - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis. **New Bridge -** RCC Girder type - Structure is in sound condition.
7	63+615	New 3-Lane bridge on LHS of existing bridge	PSC Girder	1 x 26	Additional 3-lane	**Existing Bridge -** 1 x 25.6 m span**,** open foundation, brick wall sub-structure T-Girder - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis. **New Bridge -** PSC Girder type - Structure is in sound condition.
8	64+791	New 3-Lane bridge on LHS + Reconstruction from 9 m width RHS of existing bridge	RCC Solid Slab	7.250 + 7.580 + 9.930 + 7.580 + 7.250	6-Lane	**New Bridge -** RCC solid slab - Structure is in sound condition.
9	66+020	New 3-Lane bridge on LHS of existing bridge	PSC Girder	1 x 35	Additional 3-lane	**Existing Bridge -** 1 x 35 m span**,** open foundation, box sub-structure and solid slab - Structure is in sound condition. **New Bridge -** PSC Girder type - Structure is in sound condition.

Sr. No.	Design Chainage (km)	Structural Configuration	Structure Type	Span Arrangement (m) (No. x Length)	Total Structure Width (m)	Remarks
10	68+519	New 3-Lane bridge on LHS of existing bridge	RCC Solid Slab	4 x 11	Additional 3-lane	**Existing Bridge -** 4 x 11 m span**,** open foundation, wall type sub-structure and RCC solid - Structure is in fair condition. As informed, vegetation is being cleaned on regular basis. **New Bridge -** RCC solid slab type - Structure is in sound condition.
11	69+815	New 3-Lane bridge on LHS of existing bridge	Box	1 x 10	Additional 3-lane	**Existing Bridge -** 1 x 11 m span**,** open foundation, brick wall sub-structure solid Slab - Structure is in fair condition. As informed, vegetation is being cleaned on regular basis. **New Bridge -** RCC Solid Slab - Structure is in sound condition.
12	71+174	New 3-Lane bridge on LHS + Reconstruction by 9 m width on RHS of existing bridge	RCC Solid Slab	11 + 12.8 + 11	6-Lane	**New Bridge -** RCC Solid Slab type - Structure is in sound condition.
13	71+727	New 3-Lane bridge on LHS of existing bridge + New 2-Lane bridge on RHS of new 3-Lane bridge & LHS to existing bridge	RCC Girder	1 x 18	Additional 3-lane	**Existing Bridge -** 1 x 11 m span**,** open foundation, brick wall sub-structure T-Girder -Structure is in sound condition. **New Bridge -** RCC Girder Type - Structure is in sound condition.
14	72+134	New 3-Lane bridge on LHS + Reconstruction of 3- Lane bridge on RHS	RCC Girder	3 x 15	6-Lane	**New Bridge -** RCC Girder type - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis.
15	72+900	New 3-Lane bridge on LHS + Reconstruction of 3-Lane bridge on RHS	Box	3 x 7	6-Lane	**New Bridge -** RCC Box type - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis.
16	74+173	New 3-Lane bridge on LHS + Reconstruction of 3-Lane bridge on RHS	Box	3 x 8	6-Lane	**New Bridge -** RCC Box type - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis.

Sr. No.	Design Chainage (km)	Structural Configuration	Structure Type	Span Arrangement (m) (No. x Length)	Total Structure Width (m)	Remarks
17	74+361	New 3-Lane bridge on LHS + Reconstruction of 3-Lane bridge on RHS	Box	2 x 8	6-Lane	**New Bridge -** RCC Box type - Structure is in sound condition.
18	75+009	New 3-Lane bridge on LHS + Reconstruction of 3-Lane bridge on RHS	Box	2 x 9	6-Lane	**New Bridge -** RCC Box type - Structure is in sound condition.
19	76+815	New 2-Lane bridge on LHS of existing bridge + New 2-Lane Service Road bridge on LHS of main carriageway	Box	1 x 6.5	Additional 2-lane	**Existing Bridge -** 1 x 7.3 m span**,** open foundation, brick wall sub-structure solid Slab - Structure is in fair condition. As informed, vegetation is being cleaned on regular basis. **New Bridge -** RCC Box type - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis.
20	77+613	New 2-Lane bridge on Service Road + New 2-Lane bridge on LHS of main carriageway bridge + Reconstruction of new 3- Lane bridge on RHS	Box	3 x 8	4-Lane as per	**New Bridge -** RCC Box type - Structure is in sound condition. Vegetation needs to be cleaned**.**
21	78+636	New 2-Lane bridge on LHS of existing bridge + New 2-Lane Service Road bridge on LHS of main carriageway	RCC Girder	1 x 13	Additional 2-lane	**Existing Bridge -** 1 x 13 m span**,** open foundation, brick wall sub-structure RCC Girder - Structure is in sound condition. **New Bridge -** RCC Girder Type - Structure is in sound condition. Vegetation needs to be cleaned.
22	80+045	New 2-Lane bridge on LHS of existing bridge + New 2-Lane Service Road bridge on LHS of main carriageway	Box	1 x 8	Additional 2-lane	**Existing Bridge -** 1 x 8.9 m span**,** open foundation, brick wall sub-structure and RCC slab - Structure is in sound condition. As informed, vegetation is being cleaned on regular basis. **New Bridge -** RCC box type - Structure is in sound condition.

Table 3-6 Condition Survey of VUP and PUP

Sr. No.	Chainage (km)	Side	Type	Span Arrangement (m)	Width (m)	Vertical Clearance (m)	Type of structure	Remarks
1	2+450	LHS	VUP (COS)	1 x 12	13.5	5.5	Box	Box Type - Structure is in sound condition.
		RHS		1 x 12	13.5	5.5	Box	Box Type - Structure is in sound condition.
2	06+930	LHS	VUP	1 x 19	13.5	5.5	RCC Girder	RCC Girder - Structure is in sound condition
		RHS		1 x 19	13.5	5.5	RCC Girder	RCC Girder - Structure is in sound condition
3	32+487	LHS	PUP	1 x 7.5	13.5	5.5	Box	Box Type - Structure is in sound condition
		RHS		1 x 7.5	13.5	5.5	Box	Box Type - Structure is in sound condition
4	38+674	LHS	VUP (COS)	1 x 12	13.5	5.5	Box	Box Type - Structure is in sound condition
		RHS		1 x 12	13.5	5.5	Box	Box Type - Structure is in sound condition

Table 3-7 Condition Survey of Flyover

Sr. No.	Chainage (km)	Side	Span Arrangement (m)	Width (m)	Vertical Clearance (m)	Type of structure	Remarks
1	4+225	LHS	1 x 25 + 1 x 40 + 1 x 25	13.5	5.5	PSC Girder and RCC Deck Slab	Open Foundation - Structure is in sound condition.
		RHS	1 x 25 + 1 x 40 + 1 x 25	13.5	5.5		Open Foundation - Structure is in sound condition.
2	9+335	LHS	1 x 25 + 1 x 30 + 1 x 25	13.5	5.5	PSC Girder and RCC Deck Slab	Open Foundation - Structure is in sound condition.
		RHS	11 x 25 + 1 x 30 + 1 x 25	13.5	5.5		Open Foundation - Structure is in sound condition.
3	39+915	LHS	1 x 25 + 1 x 30 + 1 x 25	13.5	5.5	PSC Girder and RCC Deck Slab	Open Foundation - Structure is in sound condition.
		RHS	1 x 25 + 1 x 30 + 1 x 25	13.5	5.5		Open Foundation - Structure is in sound condition.
4	59+818	LHS	11 x 25 + 1 x 30 + 1 x 25	13.5	5.5	PSC Girder and RCC Deck Slab	Pile Foundation - Structure is in sound condition.

Table 3-8 Condition Survey of Road Over Bridge (ROB)

Sr. No.	Chainage (km)	Side	Span Arrangement (m)	Carriageway Width (m)	Type of Sub-structure	Type of Super-structure	Type of foundation	Remarks
1	39+134	LHS	1 x 19 + 1 x 37.28 + 1 x 19	1 x 9.5	RCC	PSC Girder for Non-Railway span and steel composite girder for Railway Span.	Open	Structure is in sound condition. Expansion Joint, crash barrier and RE wall approach is in good condition.
		RHS	1 x 19 + 1 x 37.28 + 1 x 19	1 x 9.5	RCC		Open	

Table 3-9 Condition Survey of Elevated Structure

Sr. No.	Chainage (km)	Span Arrangement (m)	Carriageway Width (m)	Type of Sub-structure	Type of Super-structure	Type of foundation	Remarks
1	39+134	99 x 30.44	2 x 9.5	RCC	PSC Girder and RCC Deck slab	Pile	Structure is in sound condition. Expansion joint, crash barrier, RE wall approach is in good condition.

Figure 3-16 Photographs of Major Bridge

Major Bridge at km. 59+381 (Top View)

Major Bridge at km. 59+381 (Existing Structure View)

Major Bridge at km. 59+381 (New Structure View)

Major Bridge at km. 59+381 (Substructure and Super structure)

Figure 3-17 Photographs of Minor Bridge

Minor Bridge at km. 35+812 (Existing Structure View)

Minor Bridge at km. 35+812 (New Structure View)

Minor Bridge at km. 38+326 (New Structure 4-lane View)

Minor Bridge at km. 38+326 (New Structure 4-lane View)

Minor Bridge at km. 48+323 (Existing Structure View)

Minor Bridge at km. 48+323 (New Structure View)

Minor Bridge at km. 57+981 (Existing Structure View)

Minor Bridge at km. 57+981 (New Structure View)

Minor Bridge at km. 57+981 (Existing Structure Inner View)

Minor Bridge at km 59+237 (Expansion Joint)

Minor Bridge at km 59+237 (New Structure View)

Minor Bridge at km 59+237 (top view)

Minor Bridge at km. 62+704 (Existing Structure View)

Minor Bridge at km. 62+704 (New Structure View)

Minor Bridge at km. 63+615 (Existing Structure View)

Minor Bridge at km. 63+615 (New Structure View)

Minor Bridge at km. 64+791 (New Structure View)

Minor Bridge at km. 64+791 (Existing Structure inner View)

Minor Bridge at km. 64+791 (Existing Structure View)

Minor Bridge at km. 66+020 (New Structure View)

Minor Bridge at km. 66+020 (New Structure View)

Minor Bridge at km. 66+020 (Top View)

Minor Bridge at km. 68+519 (New Structure View)

Minor Bridge at km. 68+519 (Substructure and Super structure)

Minor Bridge at km. 68+519 (Existing Structure View)

Minor Bridge at km. 68+519 (Substructure and Superstructure)

Minor Bridge at km. 69+815 (New Structure View)

Minor Bridge at km. 69+815 (Existing Structure View)

Minor Bridge at km. 71+174 (Structure View)

Minor Bridge at km. 71+174 (Substructure and Super structure)

Minor Bridge at km. 71+727 (Top View)

Minor Bridge at km. 71+727 (Structure View)

Minor Bridge at km. 72+134 opening blocked (Structure View)

Minor Bridge at km. 72+134 (Top View)

Minor Bridge at km. 72+900 (Structure View)

Minor Bridge at km. 72+900 (Top View)

Minor Bridge at km. 74+173 (Structure View)

Minor Bridge at km. 74+361 (Structure View)

Minor Bridge at km. 75+009 (Structure View)

Minor Bridge at km. 76+815 (Structure View)

Minor Bridge at km. 77+613 opening blocked (Structure View)

Minor Bridge at km. 77+613 (Top View)

Minor Bridge at km. 78+636 (Structure View)

Minor Bridge at km. 80+045 (Structure View)

Figure 3-18 Photographs of VUP and PUP

VUP at km. 2+450

VUP at km. 2+450

VUP at km. 6+930

VUP at km. 6+930

PUP at km. 32+487

PUP at km. 32+487

VUP at km. 38+694

VUP at km. 38+694

Figure 3-19 Photographs of Flyover

Flyover at km. 4+225

Flyover at km. 4+225

Flyover at km. 9+335

Flyover at km. 9+335

Flyover at km. 39+915

Flyover at km. 39+915

Flyover at km. 59+818

Flyover at km. 59+818

Figure 3-20 Photographs of ROB

ROB at km. 39+134

ROB at km. 39+134

ROB at km. 39+134

ROB at km. 39+134

Figure 3-21 Photographs of Elevated Structure

Elevated Structure at km. 25+319

Elevated Structure at km. 25+319

Elevated Structure at km. 25+319

Elevated Structure at km. 25+319

3.18 Condition Survey of Culverts

The cross-drainage structures include hume pipe culverts and box culverts at various locations. There are total 92 Nos. of culverts in which 41 Nos. are pipe culverts, 50 Nos. are box culverts and 01 No. is box culvert (constructed under Change of Scope) along the project road. The height of culvert varies from 1.0 m to 3.0 m from bed level. During the condition survey of structure, these culverts were inspected on sample basis.

The project involves strengthening and widening of existing road to four lane divided carriageway with service road on both side and construction of new four lane carriageway at proposed bypass location. The culverts beneath existing alignment are either widened or reconstructed. The structural condition of culverts is generally found in sound condition. The quality of surface concrete of box culverts and slab culverts is found to be satisfactory. The RCC parapet, metal beam crash barrier or RCC railing has been provided at culvert locations, which is maintained properly.

Vegetation growth and accumulation of debris at waterway is being removed and cleaned by the Concessionaire on regular basis.

Figure 3-22 Photographs of Culverts

Box Culvert at km. 0+960

Box Culvert at km. 1+457

HP Culvert at km. 1+135

Box Culvert at km. 6+068

Box Culvert at km. 6+650

Box Culvert at km. 37+480

Box Culvert at km. 48+800

Box Culvert at km. 53+510

Box Culvert at km. 36+929

Box Culvert at km. 17+946

HP Culvert at km. 1+850

Box Culvert at km. 10+481

HP Culvert at km. 69+420

HP Culvert at km. 80+569

Box Culvert at km. 2+531

HP Culvert at km. 6+874

4 PAVEMENT AND SITE INVESTIGATION

4.1 General

The project has been developed on Design, Build, Operate and Transfer (the "DBOT Annuity" or "Hybrid Annuity") basis.

The concession period of the project is 15 years from the date of commercial operation day (COD) of the project highway. The project highway has received provisional completion certificate on 25th February 2020 and final completion certificate on 26th May 2021.

4.2 Details of As-built Pavement

The following table shows crust details based on pavement design report submitted by the Concessionaire. The details of pavement crust are as provided during the development of existing two lane to four lane divided carriageway. The pavement design report states that pavement was designed as per IRC:37-2012.

Table 4-1 Existing Pavement Crust Details

Particulars	Chainage (km)		Design MSA	Pavement Thickness (mm)				
	From	To		BC	DBM	RAP	WMM	GSB / CTSB
Main Carriageway	0+000	56+500	30	50	-	100	-	250 (CTSB)
	56+500	80+820	100	50	90	-	150	250 (CTSB)
Service Road	-	-	10	40	50	-	250	200 (GSB)

4.3 Surveys and Investigation

4.3.1 Pavement Condition Survey

Pavement condition survey was carried out from **9th August 2022 to 12th August 2022** through visual inspection for the entire project length. The details of the visual condition survey are provided in **Annexure-IV.**

The summary of pavement condition based on the visual inspection is tabulated below.

Table 4-2 Summary of Pavement Condition

Design Chainage (km)		Length	Visual Condition (As per IRC:115-2014)	
From	To		LHS Carriageway	RHS Carriageway
0.000	5.000	5.000	Good	Good
5.000	10.000	5.000	Good	Good
10.000	15.000	5.000	Good	Good
15.000	20.000	5.000	Good	Good
20.000	25.000	5.000	Good	Good
25.000	50.000	5.000	Good	Good
50.000	55.000	5.000	Good	Good
55.000	60.000	5.000	Good	Good
60.000	65.000	5.000	Good	Good
65.000	70.000	5.000	Good	Good
70.000	75.000	5.000	Good	Good
75.000	80.000	5.000	Good	Good

Design Chainage (km)		Length	Visual Condition (As per IRC:115-2014)	
From	To		LHS Carriageway	RHS Carriageway
80.000	80.820	0.820	Good	Good

Observation and Conclusion:

From the above table, it is observed that the overall pavement condition for the entire project stretch is found to be good.

Following Photographs were taken at the time of visual pavement condition survey.

Figure 4-1 Photographs of Pavement Condition Survey

Pavement Condition at km. 6+950

Pavement Condition at km. 59+000

Pavement Condition at km.33+000

Pavement Condition at km.75+000

Rigid Pavement at km. 38+000

Rigid Pavement at km. 41+000

4.3.2 Roughness Index test

Prior period report for the Roughness Index Test conducted by **Aadharshila Infratech Pvt. Ltd.** Dated **19th May 2021** has been provided by the Concessionaire. This test was done using Car Mounted Bump Integrator to assess the riding quality on each direction (each lane) of the carriageway of project highway.

As per IRC:SP:16-2019, condition of pavement is categorised under:

Table 4-3 Roughness Values (BI Value - mm / km)

Sr. No.	Roughness Range (m/km)	Severity	Inner Lane (Lane-1) LHS Length (km)	Outer Lane (Lane-2) LHS Length (km)	Inner Lane (Lane-1) RHS Length (km)	Outer Lane (Lane-2) RHS Length (km)
1	Less than 2.81	Good	80.820	80.820	80.820	80.820
2	2.81 - 3.30	Fair	-	-	-	-
3	More Than	Poor	-	-	-	-

5 BALANCE WORKS

The project has received Final Completion Certificate on 26th May 2021 by completing all the works as mentioned in the Technical Schedules of Concession Agreement. There are no balance works to be executed as per CA.

6 OPERATION AND MAINTENANCE

6.1 Introduction

Article 17 and Schedule-K of the Concession Agreement defines the Operation and Maintenance requirement during concession period.

The Provisional Completion Certificate (PCOD) for the length of 65.910 kms has been received on 25th February 2020 and the Final Completion Certificate (COD) for the total length of project highway i.e., 80.820 kms is achieved as on 26th May 2021. The project is currently under O&M stage. The concession period of the project highway is 17.5 years from the Appointed Date including construction period of 2.5 years.

6.2 O & M Set Up

O & M Contract

As per Clause 17.1 of the Concession Agreement, the Concessionaire shall operate and maintain the project by itself, or through O&M Contractors and if required, modify, repair, improve the project highway to comply with Specifications and Standards, and other requirements set forth in the Agreement through Good Industry Practice, Applicable Laws and Applicable Permits and manufacturer's guidelines and instructions with respect to toll systems. The Operation and Maintenance activities will confirm to all the requirements laid down in MORT&H, IRC Specifications and the Concession Agreement.

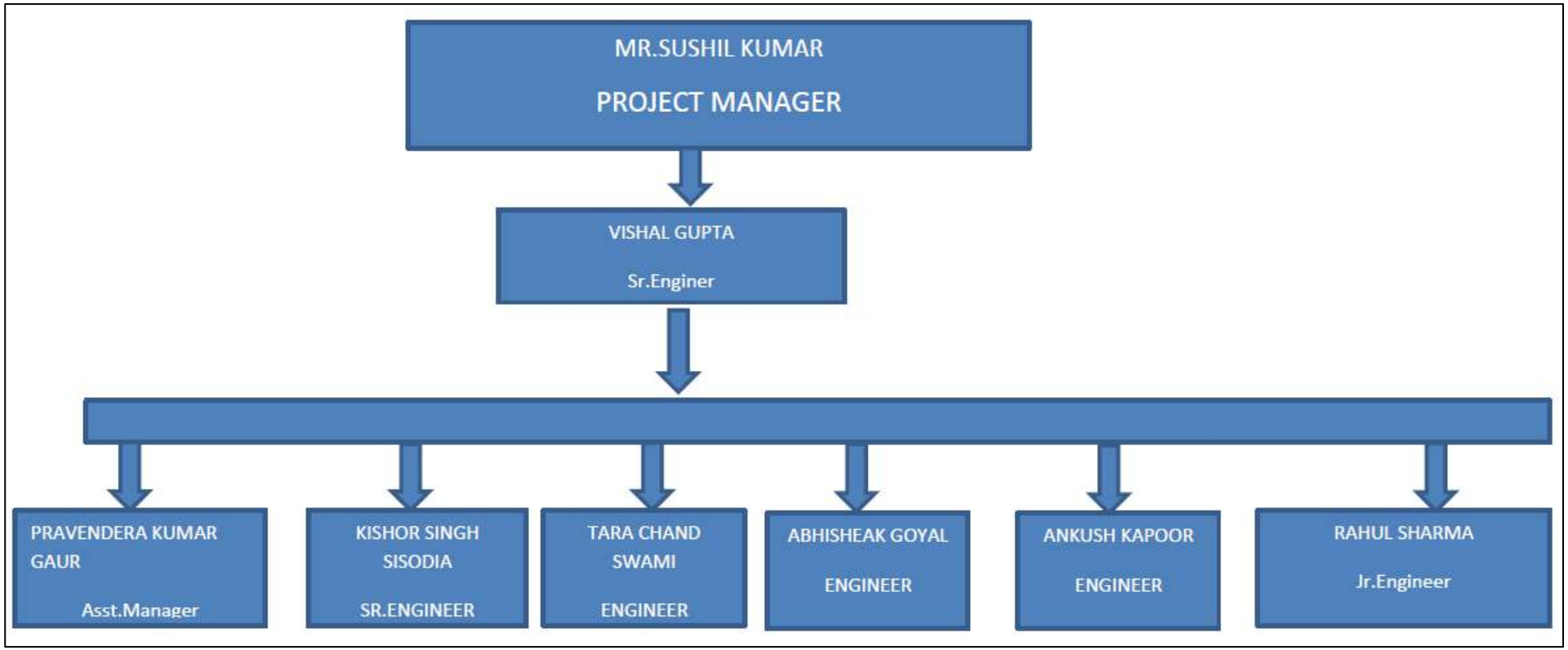
Under routine maintenance, the road is to be maintained in good, safe and motorable condition. The specifications in contracts are kept as same as per design and construction specification.

The periodical maintenance will have to be done during O&M period as per requirement of Concession Agreement and as per site requirement to maintain the design standards and level.

O&M Organization Chart

The Concessionaire has given the organization chart at site for Operation and maintenance. Accordingly, there is 01 Project Manager, 02 Sr. Engineer, 01 Assistant Manager, 03 Engineers and 01 Junior Engineer to carry out O&M activities. The team controls the maintenance activities along with other supporting staff.

Organization Structure for GPEL



List of Manpower (SPV):

Sr. No.	Employee name	Designation	Department
1	Vishal Gupta	Senior Engineer	Structure
2	Pravendra Kumar Gaur	Assistant Manager	Operations & Maintenance
3	Kishor Singh Sisodia	Senior Engineer	Highway
4	Tara Chand Swami	Engineer	Highway
5	Abhishek Goyal	Engineer	Operations & Maintenance
6	Ankush	Engineer	Operations & Maintenance
7	Pradyumn Pathak	Executive	Horticulture
8	Rahul Sharma	Junior Engineer	Highway
9	Anish Pal	Senior Supervisor	Structure
10	Pranshu Kumar	Senior Supervisor	Safety
11	Manoj	Supervisor	Structure
12	Ajay Kumar	Nurse	Safety
13	Harjit Singh	Nurse	Safety
14	Rohit Mann	Nurse	Safety
15	Nirmal Singh	Nurse	Safety
16	Sukhjeet Singh	Electrician	Plants & Equipments
17	Ramandeep Kumar	Electrician	Plants & Equipments
18	Siyaram Ram	Welder	Plants & Equipments
19	Puran Meena	LMV Driver	Plants & Equipments
20	Ramswroop	LMV Driver	Plants & Equipments
21	Suresh	LMV Driver	Plants & Equipments
22	Makhan Lal	LMV Driver	Plants & Equipments
23	Motilal Jaiswal	LMV Driver	Plants & Equipments
24	Govind Chauhan	HMV Driver	Plants & Equipments
25	Hardev Singh	HMV Driver	Plants & Equipments
26	Devi Kishan Gurjar	HMV Driver	Plants & Equipments
27	Vinod Singh	HMV Driver	Plants & Equipments
28	Shiv Lal Yadav	Miller Operator	Plants & Equipments
29	Dalip Singh	HMV Driver	Plants & Equipments
30	Ajab Singh	HMV Driver	Plants & Equipments
31	Vijay Vishwakarma	HMV Driver	Plants & Equipments
32	Balwinder Singh	HMV Driver	Plants & Equipments
33	Naresh Kumar	HMV Driver	Plants & Equipments
34	Kamal Singh	HMV Driver	Plants & Equipments
35	Manjit Singh	HMV Driver	Plants & Equipments
36	Kailash Chander	HMV Driver	Plants & Equipments
37	Sushil Kumar	LMV Driver	Plants & Equipments

6.3 Operation Cost

Operations cost is comprised of manpower cost, power and electricity cost, office operating expenses, vehicle running expenses, administrative expenses and other miscellaneous expenses The Concessionaire has provided the expenses occurred towards operation expenses for current / past years. Necessary assumptions have made from the expenses of similar type of projects to arrive at the operation cost. The estimates are projected based on best industry practice and are compared with the operating cost in the vicinity of the project area.

The estimated operating cost for the base month of August 2022 is **Rs. 8.19 Crores**. The detailed working of the same is attached in **Annexure-I**.

6.4 Routine Maintenance Cost

The Routine Maintenance cost is derived based on the Ministry of Road Transport and Highways - Report of the Committee on Norms for Maintenance of Roads in India (published by Indian Road Congress New Delhi 2001) along with actual pavement condition assessed during condition survey.

Maintenance cost constitutes the routine, day-to-day maintenance activities for project assets, including road pavement, shoulders, embankment, drainage, structures, plantations, roadside furniture, traffic signs, traffic safety devices etc., Past data has been used to assess maintenance costs due to normal usage or "wear-and-tear". Likely costs of maintenance of structures are assessed based on their present condition and vintage, in combination with well-established guidelines and thumb rules given in Indian codes and standards.

The estimated cost of Routine Maintenance works out to be **Rs. 2.59 Crores (3.20 Lakhs per km)** for the base month of August 2022. The detailed working of the same is attached in **Annexure-II**.

6.5 Major Maintenance Cost

Unlike the old Concession Agreements where periodicity and threshold limits were clearly described for the major maintenance, the Concession Agreement of this project does not specify the periodicity or the threshold limits for carrying out the full-length major maintenance. Schedule-K of the Concession Agreement specifies the threshold limits and the timelines for carrying out repairs to the distresses during the operation period.

The maintenance thus can be carried out as and when required basis and to the compliance of Schedule-K requirement to maintain the road in serviceable condition. Only improvement to Riding Quality is expected if the roughness value exceeds 2750 mm/km. However, the average roughness value of the project highway lies within the limit as mentioned above.

Any new pavement is not expected to show any distresses at least for 6 to 7 years with the proper routine maintenance. Mere Routine Maintenance would suffice to meet the performance standard mentioned in Schedule-K. In this project, there is no specific requirement to carry out the major maintenance at the end of concession period.

Hence, major maintenance is planned every 7th year from the date of COD till end of concession period.

The summary of the major maintenance planned up to end of concession period is presented in the below table.

The total base cost of major maintenance works out to be **Rs. 176.00 Crores** for the base month of August 2022 i.e., till 31st August 2022. The detailed working for the same is shown in **Annexure-III**.

6.6 Paved Shoulders

As per design specifications, the paved shoulder is designed as an integral part of the pavement for main carriageway. Therefore, the total pavement thickness in paved shoulder would be the same as in the carriageway.

6.7 Summary of Major Maintenance Cycle

The table below shows the major maintenance cycle throughout the concession period for the project stretch.

Table 6-1 Maintenance Cycle

Sr. No.	Year	Main Carriageway	Service Road
1	FY 2023	-	-
2	FY 2024	-	
3	FY 2025	-	-
4	FY 2026	-	-
5	FY 2027	1st Major Maintenance (100% BC + 25% DBM)	-
6	FY 2028	1st Major Maintenance (100% BC + 25% DBM)	1st Major Maintenance (20% BC + 80% Micro-surfacing)
7	FY 2029	-	-
8	FY 2030	-	-
9	FY 2031	-	-
10	FY 2032	-	-
11	FY 2033	-	-
12	FY 2034	2nd Major Maintenance (100% BC + 25% DBM)	-
13	FY 2035	2nd Major Maintenance (100% BC + 25% DBM)	2nd Major Maintenance (20% BC + 80% Micro-surfacing)

6.8 Projected Maintenance Cost without escalation

The below table shows the total cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period without escalation.

Table 6-2 Summary of Operation & Maintenance Cost without escalation

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
1	**Total Operation and Routine Maintenance Cost**	80.82	Every year	13.34	**10.78**
2	**Major Maintenance Cost**				
i)	1st major maintenance	80.82	FY 2027	108.89	**88.00**
ii)	2nd major maintenance	80.82	FY 2034	108.89	**88.00**
	Total Major Maintenance Cost				**176.00**

Notes:

1. It is to be noted that, the rates considered for calculating all the above cost are exclusive of Goods and Service Tax (GST).

2. The estimated cost in table above is for base month of August 2022 i.e., till 31st August 2022.
3. The material rates are based on CSR of Govt. of Punjab PWD (B&R) for the year 2019-2020. The plant & machinery rates are adopted from the revised standard data book 2019 and escalated @ 5% every year. The current market rates are considered for bitumen, cement and steel.
4. The labour rate adopted from Ministry of Labour and Employment Department, Office of Chief Labour Commissioner (C), Government of India, New Delhi w.e.f. August 2022.

6.9 Projected Maintenance Cost with escalation

The below table shows the total cost of operation and routine maintenance and major maintenance cost up to end of the concession period with assumed escalation of 5% every year.

Table 6-3 Summary of Operation & Maintenance Cost with escalation

Sr. No.	Year	WPI Inflation	Total O&M Cost (Crores)	Major Maintenance Cost (Crores)
1	FY 2023		10.78	-
2	FY 2024	2.87*%	11.09	-
3	FY 2025	5.00%	11.65	-
4	FY 2026	5.00%	12.23	-
5	FY 2027	5.00%	12.84	52.40
6	FY 2028	5.00%	13.48	55.02
7	FY 2029	5.00%	14.16	-
8	FY 2030	5.00%	14.87	-
9	FY 2031	5.00%	15.61	-
10	FY 2032	5.00%	16.39	-
11	FY 2033	5.00%	17.21	-
12	FY 2034	5.00%	18.07	73.73
13	FY 2035	5.00%	18.97	77.42
	Total Cost (Crores)		**187.36**	**258.56**

* Considering the base month for calculation as August 2022.

The company may carry out necessary investigation prior to O&M and Major Maintenance. This will help in proper assessment of maintenance work based on the actual pavement condition. The spending on major maintenance can then be reduced if the road is adequately and timely maintained.

7 REVIEW OF CONCESSION AGREEMENT

The provisions under various clauses of the Agreement concerned has been reviewed with post construction period. Our specific comments are indicated below clause-wise.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 3 Clause 3.1	The Concession	Subject to and in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits, the Authority hereby grants to the Concessionaire the concession set forth herein including the exclusive right, license and authority to construct, operate and maintain the Project (the "**Concession**") during the Construction Period of 910 (Nine Hundred and Ten Days) days and Operation Period of 15 (Fifteen) years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.	The construction period is 910 days and the O&M period is 15 years from COD.
Article 4 Clause 4.2	Conditions Precedent - Damages for delay by the Authority	In the event that (i) the Authority does not procure fulfillment of any or all the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.2% (zero point two percent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent, subject to the maximum limit equal to the amount of the Bid Security and upon reaching such limit, the Concessionaire may, in its sole discretion terminate the Agreement.	The project has received Completion Certificate.
Article 4 Clause 4.3	Damages for delay by the Concessionaire	In the event that (i) the Concessionaire does not procure fulfillment of any or all the Conditions Precedent set forth in Clause 4.1.3 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of failure to fulfill the obligations under Clause 4.1.2 or other breach of this agreement by the Authority, or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.3% (zero point three percent) of the Performance Security for each day's delay until the fulfillment of such Condition Precedent.	The project has received Completion Certificate.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 5 Clause 5.1.4 (d, e & f)	Obligation of the Concessionaire	The Concessionaire shall d) make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement. e) make reasonable efforts to facilitate the acquisition of land and procuring of environmental and forest clearances required for the purposes of the Agreement f) ensure and procure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Concessionaire's obligations under this agreement.	The project has received Completion Certificate.
Article 8 Clause 8.1.5	Disclaimer	Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the Authority shall not be liable in any manner for such risks or the consequences thereof.	The project has received Completion Certificate.
Article 9 Clause 9.1.1	Performance Security	The Concessionaire shall, for the performance of its obligations hereunder, provide to the Authority no later than 30 (thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank in the form set forth in Schedule-F (the "Performance Security"). Until such time the Performance Security is provided by the Concessionaire pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security pursuant hereto, the Authority shall release the Bid Security to the Concessionaire.	The project has received Completion Certificate.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 9 Clause 9.4	Deemed Performance Security	The Parties expressly agree that upon release of the Performance Security in accordance with the provisions of Clause 9.3, a substitute Performance Security for a like amount shall be deemed to be created under this Clause 9.4, as if it is a Performance Security under Clause 9.1 for and in respect of the remaining Concession Period (the **"Deemed Performance Security"**). The Deemed Performance Security shall be unconditional and irrevocable, and shall, notwithstanding anything to the contrary contained in Clause 25.3, constitute the first and exclusive charge on an equivalent balance in the Escrow Account, subject only to the statutory dues and Taxes and on all amounts due and payable by the Authority to the Concessionaire, and the Authority shall be entitled to enforce the Deemed Performance Security through a withdrawal from the Escrow Account or by making a deduction from the amounts due and payable by it to the Concessionaire in accordance with the provisions of Clause 9.5. For the avoidance of doubt, the Parties agree that no amounts shall be earmarked, frozen or withheld in the Escrow Account for Securing payment of any potential Damages that may fall due at a subsequent date, and only the amounts which shall have become due and payable by the Concessionaire upon occurrence of Concessionaire Default shall be liable to appropriation hereunder.	Upon released of Performance Security, the Substitute Performance Security (Deemed Performance Security) of like amount to be created for balance Concession Period. The same will be unconditional and irrevocable and it is from first and exclusive charge on equivalent balance of Escrow Account as per Clause 25.4 of CA.
Article 10 Clause 10.3.2	Right of Way - Procurement of the site	Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree that on or prior to the Appointment Date, the Authority shall have granted vacant access and Right of Way such that the Appendix shall not include land which shall in any manner prevent the Concessionaire from undertaking construction of the project to the extent of at least 80% (eighty percent) of the length thereof, and in the event Financial Close is delayed on account of delay in grant of such vacant access and Right of Way, the Authority shall be liable to payable to damages solely under the provisions of Clause 4.2.	The project has received Completion Certificate.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 10 Clause 10.3.4	Procurement of the site	The Authority shall make best efforts to procure and grant no later than 90 (ninety) days from the Appointed Date, Right of Way to the Concessionaire in respect of all land included in the Appendix, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Concessionaire, it shall pay to the Concessionaire Damages in a sum calculated at the rate of Re. 1 per day for every 10 square meter or part thereof, commencing from the 91st day of the Appointed Date and until such Right of Way is procured or 180 days from Appointed Date whichever is earlier.	The project has received Completion Certificate.
Article 11 Clause 11.4	Utilities, Associated Roads and Trees - Felling of trees	The Authority shall assist the Concessionaire in obtaining the Applicable Permits for felling of trees to be identified by the Authority for this purpose if and only if such trees causes a material adverse effect on the construction, operation or maintenance of Project Highway. The Cost of such felling shall borne by the Authority and in the event of any delay in felling thereof for reasons beyond the control of the Concessionaire, it shall be excused to perform any of its obligations hereunder if such failure is a direct consequence of delay in the felling of trees.	The project has received Completion Certificate.
Article 12 Clause 12.3.1	Construction of the Project	On or after the Appointed Date, the Concessionaire shall undertake construction of the Project as specified in Schedule-B and Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D. The 910th (nine hundred and tenth) day from the Appointed Date shall be the scheduled date for completion of the Project (the **"Scheduled Completion Date"**) and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	The project has received Completion Certificate.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 12 Clause 12.3.2	Construction of the Project	The Concessionaire shall construct the Project Highway in accordance with the Project Completion Schedule set forth in Schedule-G. In the event that the Concessionaire fails to achieve any Project Milestone within a period of 90 (ninety) days from the date set forth for such Milestone in Schedule-G, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, it shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one percent) of the amount of performance security for delay of each day until such Milestone is achieved.	The project has received Completion Certificate.
Article 12 Clause 12.3.3	Construction of the Project	In the event that the project is not completed and COD does not occur within 270 (two hundred and seventy) days from the Scheduled Completion Date, unless the delay is on account of reasons solely attributable to the Authority or due to Force Majeure, the Authority shall be entitled to terminate this Agreement.	The project has received Completion Certificate.
Article 14 Clause 14.3.2	Completion Certificate - Provisional Certificate	The Parties hereto expressly agree that a Provisional Certificate under this Clause 14.3 may, upon request of the Concessionaire to this effect, be issued for operating part of the Project, if the Concessionaire has completed construction of 100% of the site made available to the Concessionaire upto 182 days from the Appointed Date. Upon issue of such Provisional Certificate, the provisions of Article 15 shall apply to such completed part, and the rights and obligations of the Concessionaire for and in respect of such completed part of the Project shall be constructed accordingly.	The project has received Completion Certificate.
Article 15 Clause 15.2	Entry into commercial service - Damages for delay	Subject to the provisions of Clause 12.3, if COD does not occur prior to the 91st (ninety first) day after the Scheduled Completion Date, unless the delay is on account of reasons attributable to the Authority or due to force Majeure, the Concessionaire shall pay Damages to the Authority in a sum calculated at the rate of 0.2% of the amount of performance Security for delay of each day until COD is achieved.	The project has received Completion Certificate.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 23 Clause 23.1	Payment of Bid Project cost	The Parties expressly agree that the cost of construction of the project, as on the Bid Date, which is due and payable by the Authority to the Concessionaire shall be deemed to be Rs. 1367.00 Crores (Rs. One thousand three hundred and sixty seven crores).	The project has received Completion Certificate.
Article 23 Clause 23.3.1	Payment of Bid Project Cost	40% of the Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable to the Concessionaire is 5 equal installments of 8% during the construction Period in accordance with the provisions of Clause 23.4.	The project has received Completion Certificate.
Article 23 Clause 23.4	Payment during Construction Period	For the purpose of this clause 23.4, the payment Milestone for release of payment during construction period shall be as under: (a) I (first) payment Milestone - On achievement of 20% Physical Progress. (b) II (second) payment Milestone - On achievement of 40% Physical Progress. (c) III (third) payment Milestone - On achievement of 60% Physical Progress. (d) IV (fourth) payment Milestone - On achievement of 75% Physical Progress. (e) V (fifth) payment Milestone - On achievement of 90% Physical Progress.	The project has received Completion Certificate.
Article 23 Clause 23.5	Bonus on early completion	In the event that the Concessionaire shall achieve COD on or more than 30 days prior to the Scheduled Completion Date, the Authority shall pay to the Concessionaire a bonus equal to 0.5% of 60% of the Bid Project Cost for the first 30 days by which COD shall precede the Schedule Completion Date and thereafter the said bonus shall be calculated on the pro-rata basis for each day preceding the said 30 days period. The Bonus shall be due and payable to the Concessionaire along with the 1st Annuity Payment.	The project has received Completion Certificate.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 23 Clause 23.7.1	O & M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the Authority, which shall be computed on the amount quoted by the selected bidder under its O&M Bid, in accordance with the provisions of this Clause 23.7 (the "**O&M Payments**"). The Parties further acknowledge and agree that any O&M Expenses in excess of the O&M Payments shall be borne solely by the Concessionaire, save and except as expressly provided in this Agreement. For avoidance of doubt, it is clarified that the O&M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.	Expenses towards O&M shall be the responsibility of Concessionaire and biannual O&M payments shall be of Authority.
Article 23 Clause 23.8	Mobilization advance	The Authority shall, on request of the Concessionaire, made at any time after expiry of 60 days from the Appointed Date, and upon the Concessionaire furnishing a Bank Guarantee in a form satisfactory to the Authority, make an advance payment in a sum not exceeding 10% of the Bid Project Cost (the "Mobilization Advance").	The project has received Completion Certificate.
Article 31 Clause 31.1.3	Termination - Termination for Concessionaire Default	The Authority shall, if there be Senior Lenders, send a copy of its notice of intention to issue a Termination Notice referred to in Clause 31.1.2 to inform the Lenders' Representative and grant 15 (fifteen) days to the Lenders' Representative, for making a representation on behalf of the Senior Lenders stating the intention to substitute the Concessionaire in accordance with the Substitution Agreement. In the event the Authority receives such representation on behalf of Senior Lenders, it shall, in its discretion, either withhold Termination for a period not exceeding 180 (one hundred and eighty) days from the date of such representation or exercise its right of Suspension, as the case may be, for enabling the Lenders' Representative to exercise the Senior Lenders' right of substitution in accordance with the Substitution Agreement:	In case of Termination, the Lenders are given opportunity for Substitution of Concessionaire. The Interest and Safety of Lenders is covered.

<table>
<tr><th>Article & Clause No.</th><th>Subject</th><th>Description in Brief</th><th>Remarks</th></tr>
<tr><td></td><td></td><td>Provided that the Lenders' Representative may, instead of exercising the Senior Lenders' right of substitution, procure that the default specified in the notice is cured within the aforesaid period of 180 (one hundred and eighty) days, and upon such curing thereof, the Authority shall withdraw its notice referred to above and restore all the rights of the Concessionaire.
Provided further that upon written request from the Lenders' Representative and the Concessionaire, the Authority shall extend the aforesaid period of 180 (one hundred and eighty) days by such further period not exceeding 90 (ninety) days, as the Authority may deem appropriate.</td><td></td></tr>
<tr><td>Article 31
Clause 31.3</td><td>Termination Payment</td><td>31.3.1 Upon Termination on account of a Concessionaire Default during the Operation Period, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to 65% (sixty five per cent) of the sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.
31.3.2 Notwithstanding to the provisions of Clause 31.3.1 upon Termination on account of Concessionaire Default during the Construction Period, the Termination Payment shall be based on the Payment Milestone achieved which is in terms of the Physical Progress made by the Concessionaire in the Project and the Termination Payment corresponding to the achieved Payment Milestone shall be as follows:
<table>
<tr><th>Payment Milestone</th><th>Termination Payment</th></tr>
<tr><td>1st Payment Milestone</td><td>NIL</td></tr>
<tr><td>2nd Payment Milestone</td><td>50% of Debt Due or 9% of Bid Project Cost, whichever is lower</td></tr>
<tr><td>3rd Payment Milestone</td><td>60% of Debt Due or 16% of Bid Project Cost, whichever is lower</td></tr>
<tr><td>4th Payment Milestone</td><td>70% of Debt Due or 24% of Bid Project Cost, whichever is lower</td></tr>
<tr><td>5th Payment Milestone</td><td>80% of Debt Due or 32% of Bid Project Cost, whichever is lower</td></tr>
</table></td><td>31.3.1 In case of Termination during Operation period due to Concessionaire Default, the amount of 65% of sum of Annuity Payment remaining unpaid and interest thereon upto Transfer Date will be paid to the Concessionaire. This is inadequate considering the expenses incurred by Concessionaire. Hence, the Concessionaire should avoid the situation by performing as per Agreement.</td></tr>
</table>

<table>
<tr><th>Article & Clause No.</th><th>Subject</th><th>Description in Brief</th><th>Remarks</th></tr>
<tr><td></td><td></td><td>For the avoidance of doubt, it is clarified that in case of termination happening in between two Payment Milestones, for the purpose of calculation of Termination Payment, the milestone achieved would only be considered.

31.3.3 Upon Termination on account of an Authority Default, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to:
(i) In case the termination occurs prior to COD
(a) Debt Due payment calculated as per the table below less Insurance Cover; provided that if any insurance claims forming part of the Insurance Cover are not admitted and paid, then 80% (eighty per cent) of such unpaid claims shall be included in the computation of Debt Due. Further the Debt

Due would be calculated as per the table provided below:

<table>
<tr><th>Payment Milestone</th><th>Basis of calculation for Debt Due payment</th></tr>
<tr><td>1st Payment Milestone</td><td>Debt Due or 9% of Bid Project Cost, whichever is lower</td></tr>
<tr><td>2nd Payment Milestone</td><td>Debt Due or 18% of Bid Project Cost, whichever is lower</td></tr>
<tr><td>3rd Payment Milestone</td><td>Debt Due or 27% of Bid Project Cost, whichever is lower</td></tr>
<tr><td>4th Payment Milestone</td><td>Debt Due or 33.75% of Bid Project Cost, whichever is lower</td></tr>
<tr><td>5th Payment Milestone</td><td>Debt Due or 40.50% of Bid Project Cost, whichever is lower</td></tr>
</table>

For the avoidance of doubt, it is clarified that in case of termination happening in between two Payment Milestones, for the purpose of calculation of Debt Due, the milestone achieved would only be considered; and</td><td>31.3.2 In case of termination during Construction Period due to Concessionaire Default, the Termination Payment is related to the Physical Progress achieved and Milestone completed. The Payment of Debt Due is not sufficient to compensate the expenses incurred by the Concessionaire. Hence, the Concessionaire shall avoid the situation by performing as per Agreement.</td></tr>
</table>

Article & Clause No.	Subject	Description in Brief	Remarks
		(b) 150% (one hundred and fifty per cent) of the Adjusted Equity; (ii) In case the termination occurs on or after COD, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date. 31.3.4 Termination Payment shall become due and payable to the Concessionaire within 15 (fifteen) days of a demand being made by the Concessionaire to the Authority with the necessary particulars, and in the event of any delay, the Authority shall pay interest at a rate equal to 3% (three per cent) above the daily average Bank Rate on the amount of Termination Payment remaining unpaid; provided that such delay shall not exceed 90 (ninety) days. For the avoidance of doubt, it is expressly agreed that Termination Payment shall constitute full discharge by the Authority of its payment obligations in respect thereof hereunder. 31.3.5 The Concessionaire expressly agrees that Termination Payment under this Article 31 shall constitute a full and final settlement of all claims of the Concessionaire on account of Termination of this Agreement for any reason whatsoever and that the Concessionaire or any shareholder thereof shall not have any further right or claim under any law, treaty, convention, contract or otherwise.	
Article 34 Clause 34.3.1	Assignment and Charges - Substitution Agreement	The Lender's Representative, on behalf of Senior Lenders, may exercise the right to substitute the Concessionaire pursuant to the agreement for substitution of the Concessionaire (the '**Substitution Agreement**') to be entered into amongst the Concessionaire, the Authority and the Lenders' Representative, on behalf of Senior Lenders, Substantially in the form set forth in Schedule-R.	The Lender's interest is protected with provision of Substitution Agreement.

8 REVIEW OF O&M CONTRACT

The Operation and Maintenance Agreement was signed between **M/s GR Phagwara Expressway Limited (GPEL)** and **G R Infraprojects Limited (O&M Contractor)** on 08th September 2021 and addendum O&M Agreement has been signed on 26th July 2022 for a period of 1 year.

We have reviewed the provisions under various clauses of this O&M Contract and our specific comments are indicated below clause-wise.

Sr. No.	Clause No.	Description in Brief	Remark
1	Agreement Para (ii)	The Concessionaire now wishes to appoint M/s G R Infraproiects Limited for Operation and Maintenance of Project Highway as 0&M Contractor in accordance with Scope of Work as mentioned in Annexure-I hereto, under the Concession Agreement.	The Contractor M/s. G R Infraprojects Ltd. is appointed for O&M work as per scope in CA.
2	Clause 1 Definition	"O&M Contractor" means the person, if any, with whom the Concessionaire has entered into an O&M agreement for discharging O&M obligations for and on behalf of the Concessionaire.	The Contractor is appointed to discharge duties of O&M work on behalf of Concessionaire as per scope in O&M Agreement.
3	Clause 1 Definition	"O&M Period" O&M Agreement means operation and maintenance period of 1 year commencing from Commercial Operation Date.	The Agreement of O&M is for one year and addendum is signed for another 1 year.
4	Clause 2 Availability of Documents	The O&M Contractor also acknowledges the fact that the Concession Agreement is always binding and applicable back to back on the O&M Agreement, limited to the obligations during the O&M period under the Concession Agreement and the scope of the O&M Contractor as per this Agreement. In case of any discrepancy in whatsoever matter, the clauses of Concession Agreement shall prevail over and above this O&M Agreement.	The copy of Concession Agreement & Maintenance Manual is provided to Contractor. It is always binding to Contractor for implementation during O&M work.
5	Clause 6.1 O&M Contractor's obligation	During Operation Period, provisions of Article 17 of the Concession Agreement shall apply. The O&M Contractor shall operate and maintain the Project Highway in accordance with Article 17 of the Concession Agreement and if required, modify, repair or otherwise make improvements to the Project Highway comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and confirm to Specifications and Standards and Good Industry Practice.	The obligations of O&M are as per Article 17 of CA.

Sr. No.	Clause No.	Description in Brief	Remark
6	Clause 6.3 Maintenance Requirements	The O&M Contractor shall procure that at all times during the Operation Period; the Project Highway conforms to the maintenance requirements set forth in Schedule-K of the Concession Agreement (the "Maintenance Requirements").	The maintenance required to be done as per Schedule-K of CA.
7	Clause 6.4 Maintenance Program	Not later than 55 days prior to the beginning of each Accounting Year during the Operation Period, the O&M Contractor shall provide to the Concessionaire, its proposed annual program of preventive, urgent and other scheduled maintenance (the "Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Contractor has to submit the programme and work for O&M with maintenance requirement and safety.
8	Clause 6.5 Safety, Breakdown and accident	The O&M Contractor shall ensure safe conditions for the users, and in the event of unsafe conditions, closures, diversions, breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good industry Practice.	Safety of users including breakdown, accident rescue operations is covered.
9	Clause 6.10 Damages for Breach of Maintenance obligations	In the event that the O&M Contractor fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the O&M Contractor shall pay to the Concessionaire Damages at such rate as the Concessionaire is required to pay to the Authority under the Concession Agreement. Recovery of such Damages shall be without prejudice to the rights of the Concessionaire under this Agreement, including the right of Termination thereof.	The provision of Levy of Damage for breach of Agreement, defective work will keep pressure on Contractor to work as per requirement.
10	Clause 6.17 Tests	For determining that the Project Highway conforms to the Maintenance Requirements, the Project Manager/IE shall require the O&M Contractor to carry out, or cause to be carried out, tests specified by it in accordance with Good Industry Practice.	This will maintain quality of work.

Sr. No.	Clause No.	Description in Brief	Remark
11	Clause 6.19.1 Safety Requirements	The O&M Contractor shall comply with the provisions of this Agreement and /or Concession Agreement, Applicable Laws and Applicable Permits and confirm to Good Industry Practice for securing the safety of the Users. In particular, the O&M Contractor shall develop, implement and administer a surveillance and safety program for providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in Schedule-L of the Concession Agreement (the “Safety Requirements").	The O&M Contractor has to provide requirements provision for safety of Highway Users. The safety of users is given priority.
12	Clause 13 Sub-contracts	The O&M Contractor shall notify to the Project Manager in writing of its intent to subcontract the O&M works in part or full and without the written approval of the Project Manager no subcontractor shall be appointed by the O&M Contractor.	The subcontractor cannot be appointed without approval of Project Manager. This will keep control over contractor to appoint competent contractor.
13	Clause 16.1 Insurance	The Concessionaire shall procure and maintain the insurance for the Project Highway including all facilities in accordance with the Article 26 of the Concession Agreement.	The risks and security of Authority, Concessionaire and Lender is covered.
14	Clause 17.1 Defect Liability Period	The Concessionaire and/or the EPC Contractor ls responsible for all the defects and deficiencies in construction of the Project Highway or any section thereof and rectify the same, without any cost to the O&M Contractor, during the O&M period. Under this agreement the O&M Contractor is only under obligation of Operation 8r Maintenance of the Project Highway. For avoidance of doubt, any repair or restoration on account of usual wear and tear in the Project Highway shall form a part of the maintenance.	The Contractor is responsible for any defects during Defect Liability period i.e., O&M Period. This will maintain the quality to avoid any action for defective work as proposed.
15	Clause 21 Acknowledgement	The O&M Contractor acknowledges and accepts that this agreement entitles the Authority and/or Lenders Representative to step into this agreement, in its sole discretion, in Substitution of the Concessionaire In the event of Termination or Suspension of the Concessionaire. Further, provision of clause 5.2 of the Concession Agreement relating to Project Agreement shall apply *mutatis mutandis.*	The Contractor has agreed for step in right of Authority or Lender in case of Termination of Concessionaire.

Sr. No.	Clause No.	Description in Brief	Remark
16	Clause 22 O&M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the O&M Contractor to carryout routine maintenance Works as detailed in Annexure-I to this 0&M Agreement and in lieu thereof; a fixed lump sum fee amounting to Rs. 4,00,00,000 exclusive of taxes for the entire year in the form of biannual payment shall be due and payable by the Concessionaire.	The O&M Contractor will be paid fixed & Lumpsum payment of Rs. 4.0 Crores. Biannual payment during year for his work as per scope. The Contractor has to manage O&M work responsibility within this payment. Over & above these expenses, Concessionaire is incurring expenses for insurance, electricity, IE & professional fees etc.,
17	Clause 27.1 Termination For O&M Contractor Default	In the event of any defaults specified below shall have occurred, and the O&M Contractor fails to cure the default within the Cure Period of 60 (sixty) days, the O&M Contractor shall be deemed to be in default of this Agreement (the "O&M Contractor Default"), unless the default has occurred as a result of any breach of this Agreement by the Concessionaire or due to Force Majeure.	The Contractor shall note this. This provision of termination keep pressure on Contractor to work as per scope of O&M responsibility.
18	Clause 32 Liability and Indemnification	The O&M Contractor shall fully indemnify and hold harmless and defend the Concession to the extent that the Concessionaire has provided any indemnities to Authority in terms of Article 36 of Concession Agreement, insofar as such indemnities relate to the Services.	The Concessionaire is secured from Contractor for any loss, claim.

8.1 Conclusion

i. Operation and Maintenance Contract is comprehensive and correct for major concerns of the Lender.

ii. The provision of O&M Contract Agreement is consistent with the provision of the Concession Agreement.

9 TOLL PLAZA EQUIPMENT STATUS & ATMS

An assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and working status is carried out based on Section 10 of IRC:SP:84-2014 and the Authority's requirements of Hybrid ETC System. Highway Traffic Management System (HTMS) is assessed based on Section 816 of MoRTH Specifications for Road and Bridge Works as required by Section 12.12 of the Manual.

9.1 Toll Plaza and Toll Collection System

Two toll plazas are provided at km. 15+300 at Behram and km. 70+240 at Bachhwan. The Toll Collection System installed at the toll plazas is provided by Qualix Information Systems LLP.

The toll plazas have (5+5) lanes. All lanes are functional with Hybrid ETC equipment. View of the toll plazas are shown in Figure 9-2.

Figure 9-1 View of Behram Toll Plaza (km. 15+300)

Figure 9-2 View of Bachhwan Toll Plaza (km. 70+240)

9.1.1 Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

1. RFID ETC Transceiver
2. Lane Controller with Industrial PC
3. AVC Sensors
4. Automatic Lane Barrier (ALB)
5. Incident Capture Camera
6. Overhead Lane Signals
7. Traffic Lights
8. Toll Booth Equipment

9.1.1.1 RFID ETC Transceiver

RFID ETC Transceiver reads tags installed on the windshield of vehicles and mounted on a pole at about 6 m height. Handheld RFID readers are provided (1 no. in each direction) in case a tag is not detected by the fixed reader.

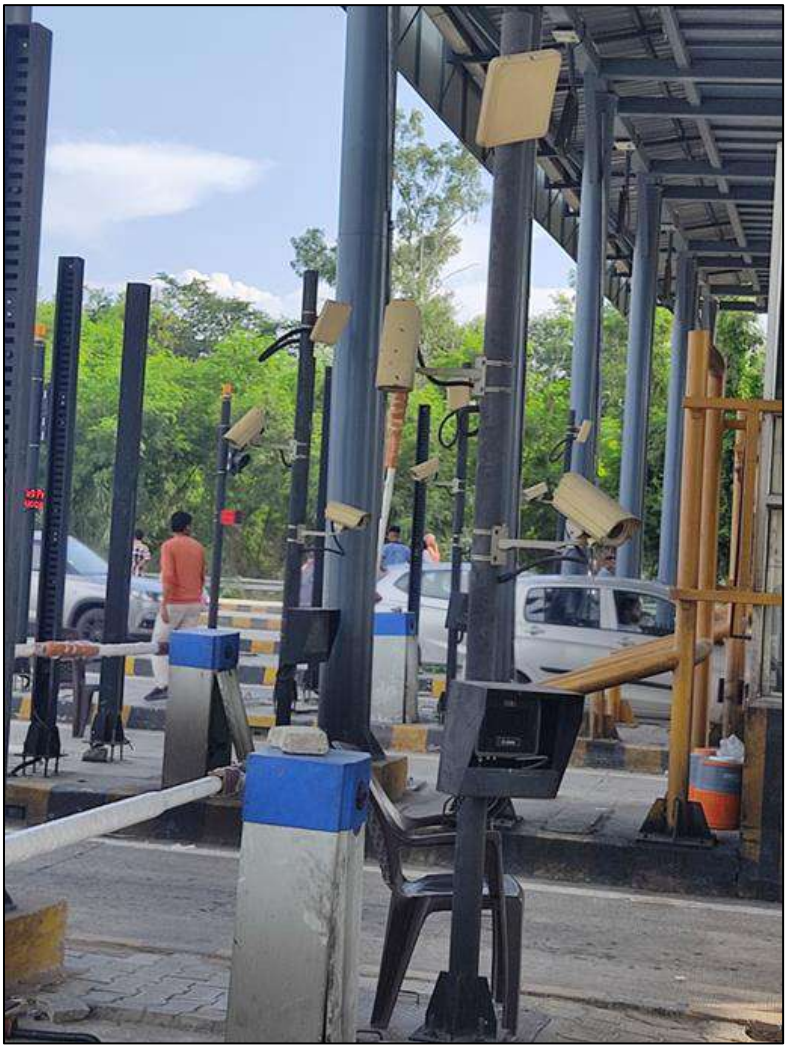


Figure 9-3 RFID ETC Transceiver installed on pole

9.1.1.2 Lane Controller with Industrial PC

Toll Lane Controller is located within the Electronic Enclosure placed inside each toll booth which are connected to the common server and are capable of independent storage of data.

9.1.1.3 Automatic Vehicle Classification (AVC) Sensors

The AVC equipment comprises of a pair of height sensor poles, axle sensors and inductive loops. The height detector has a high sensing resolution and detects height when object blocks the path. The presence of vehicle is detected by inductive loop. The loop sensors embedded on the pavement trigger the AVC height sensors located on parallel pillars.

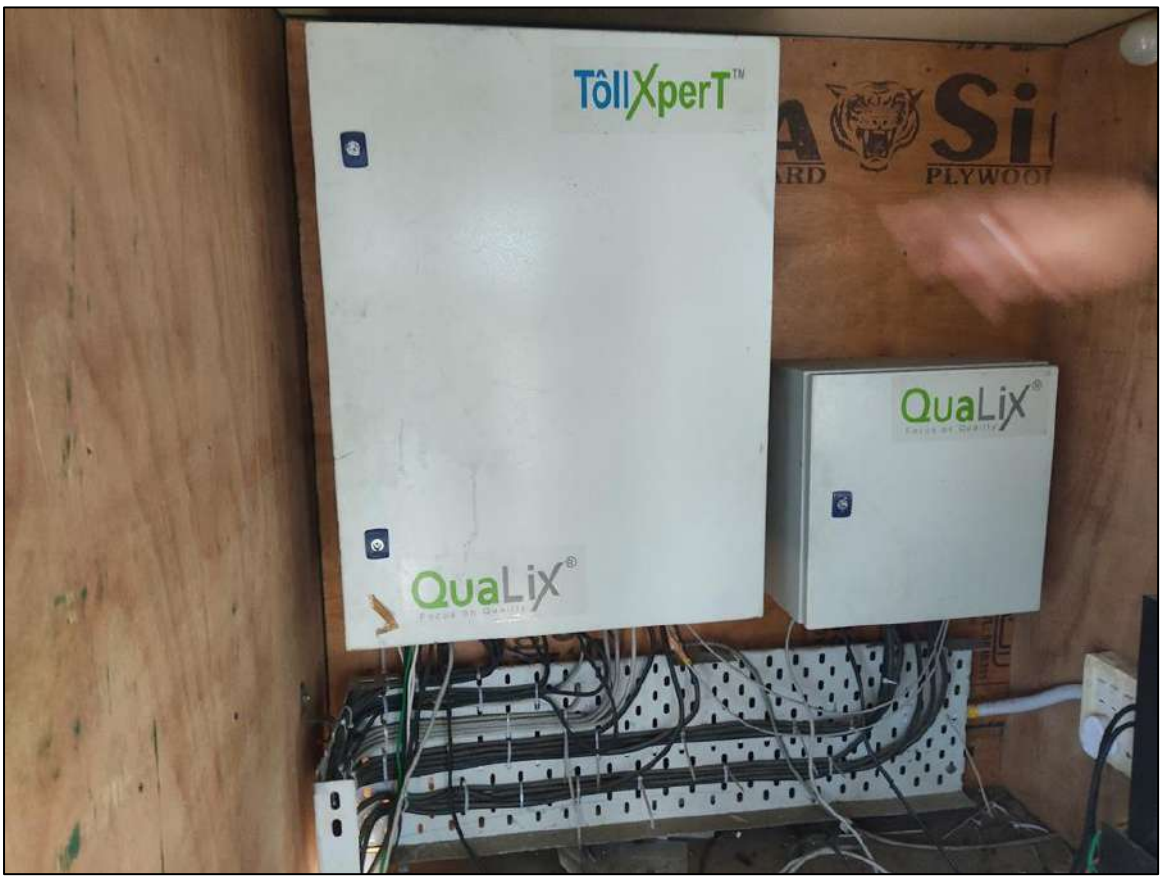


Figure 9-4 Lane Controller and AVC installed in enclosures at Toll Booth

Figure 9-5 Height sensors

Figure 9-6 Inductive loop

9.1.1.4 Automatic Lane Barrier

Boom barriers installed on all lanes are in working condition and have a working time of 0.6 - 0.9 s. Automatic Lane Barrier is used to allow only authorized vehicles to pass through the lane. The barrier is activated only on generation of user fee receipt or other relevant vehicle processing activity. A torque motor powers the barrier for raising and lowering the boom. The motor can be blocked at any position without causing any damage. In the event of power failure, the boom is automatically raised. The boom weight is exactly balanced by built-in springs.

Figure 9-7 Automatic Lane Barrier

9.1.1.5 Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. The LTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done; the LTL turns Green to instruct the vehicle to pass through the lane. The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The user fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

Figure 9-8 Lane Traffic Light (LTL) and User Fare Display (UFD)

9.1.1.6 Incident Capture Camera (AVC Camera)

The incident capture camera is installed on island of the booth to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.

9.1.1.7 License Plate Image Capture Camera (LPIC)

License Plate Image capture camera is installed on a 3m pole facing incoming vehicle to capture the image of the vehicle number plate.

Figure 9-9 LPIC and AVC Cameras

9.1.1.8 Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane “Open” and “Close” sign consists of a pair of “GREEN” (arrow) and “RED” (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed

Figure 9-10 Over Head Lane Signal (OHLS)

9.1.1.9 Toll Booth Equipment

Toll Booth Hardware / Equipment provided are:

- Toll Collector Display (Operator Monitor)
- Customized Industrial Keyboard
- Receipt Printer
- Intercom Slave unit
- Bar code reader
- Violation Light and alarm
- Manual Booth Control (MBC)
- Booth Camera

The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a programmable keyboard for Registration of toll operations and is customized for different vehicle types and type of ticket.

Figure 9-11 Booth Equipment

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Violation system has an alarm switch which is triggered whenever there is a violation such as run-through happening on the lane. When there is an emergency, a foot switch pressed by the booth operator alerts the control room.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room. Manual Booth Controller is used to release exempt vehicles.

9.1.1.10 Medium Speed Weigh in Motion (MSWIM)

Medium Speed Weigh in Motion (MSWIM) is installed on entry lanes with a platform size of 1500 mm x 620 mm for normal lanes and 1750 mm x 620 mm for extra wide lanes and capacity of 30 ton/axle. Bending plate strain gauge technology is used with hardware and software support to calculate weight of vehicles running through it up to a speed of 50 km/hr.

Figure 9-12 Medium Speed Weigh in Motion (MSWIM)

9.1.2 Plaza Equipment

9.1.2.1 TMS Server

Plaza Server is provided in a hot standby configuration and provided with 42 U switch rack, 28 port non-POE network switch and 10 Port PoE switch. Firewall and 2 broadband internet lease line with 4 Mbps link for CCH connectivity is available.

Figure 9-13 Control Room Equipment - Server & Switch rack

9.1.2.2 55” LED screen for CCTV monitoring

55” LED screen for CCTV monitoring installed at the toll plaza admin block provides view of all the toll booths, important zones within the plaza where cash transactions take place (server room, control room, cash up).

Figure 9-14 CCTV screen at the Toll Plaza Control Room

The toll plaza manager is able to observe the activities at the toll lanes and toll booth. When the toll collector calls up on the intercom, the manager is able to comprehend the situation at the lane by a zoomed view of the particular lane.

9.1.2.3 Workstations in Control Room, PoS and Cash up room

Workstations are available in control room (lane monitoring, administration, and audit), cash room and PoS with 4 GB RAM and 1 TB HDD.

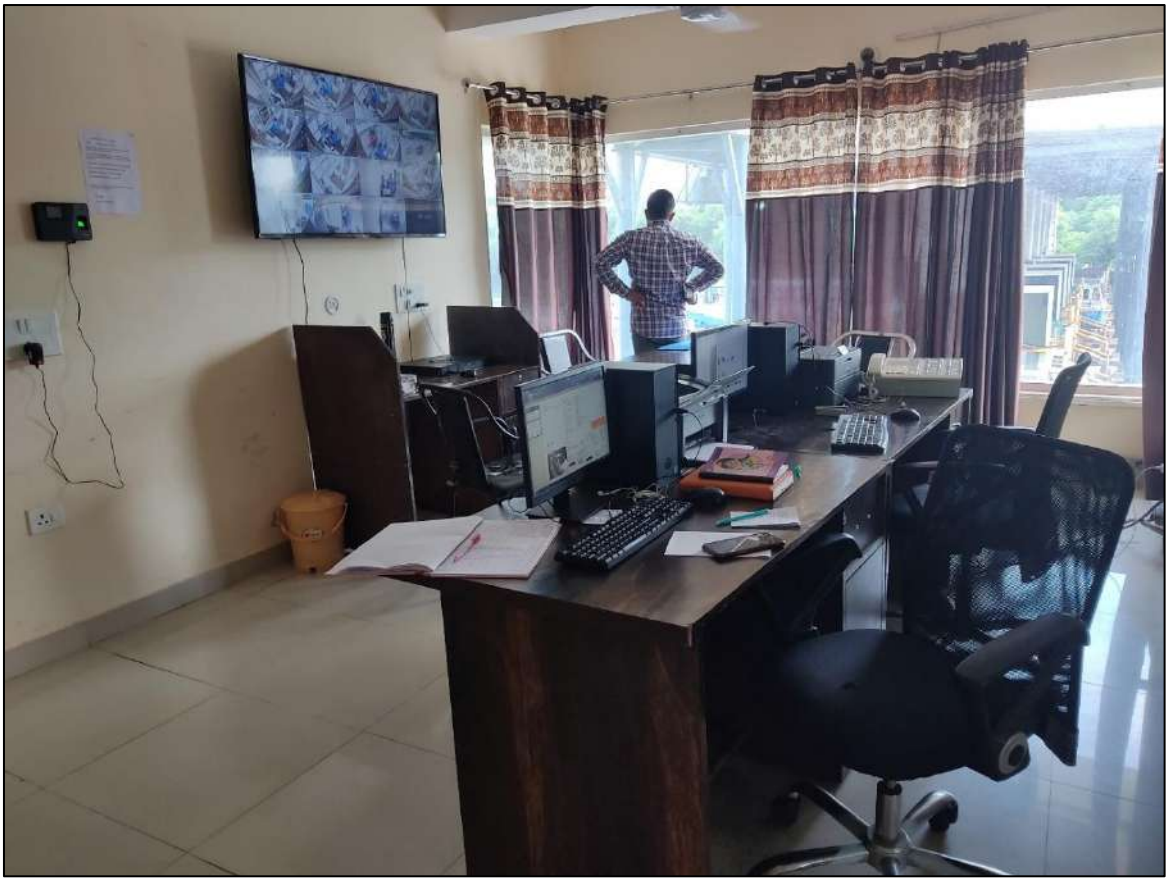


Figure 9-15 Work Stations at Control room

Figure 9-16 Network Printer and Intercom Master Unit at control room

9.2 Advanced Traffic Management System (ATMS)

Advanced Traffic Management System (ATMS) installed for the project road is controlled by the ATMS centre at the toll plaza location (km 15+300). It comprises of the following:

- Emergency Call Back System (ECB)
- Mobile Radio communication system
- Meteorological Data system
- Variable Message Signboards (VMS)
- Automatic Traffic Counter cum Classifier (ATCC)
- CCTV system

9.2.1 Emergency Call Back System (ECB)

21 pairs of Emergency Call Booths are installed along the project road stretch. The users can access these ECBs and communicate to the HTMS control centre in case of emergency such as vehicle breakdown.

9.2.2 Mobile Radio communication System (MRCS)

Communication between patrol vehicles, ambulances, crane operators and the control centre is managed using MRCS installed at the two locations, Km 15.300 and Km 70.240.

9.2.3 MET system

Meteorological sensors comprise of sensors to measure the atmospheric temperature, humidity, pavement surface temperature, visibility and equipment for measuring wind speed and direction and installed at km 15+300.

Figure 9-17 MET Equipment

9.2.4 Variable Message Signboards (VMS)

Variable message sign boards are installed at 8 locations. These display specific messages to the users based on the prevailing conditions on the highway. The message can be changed at any point of time from the HTMS centre. About 250 customised messages can be stored on the system.

9.2.5 Automatic Traffic Counter cum Classifier (ATCC)

Automatic Traffic Counter cum Classifiers (ATCC) is installed at km 15+465. The ATCC are infrared Traffic Logger (TIRTL) type and count at an accuracy of 95%.

9.2.6 CCTV and Surveillance Cameras

Surveillance Cameras are installed at 4 locations along the project corridor. The HTMS control room has video wall to monitor these locations through the cameras installed.

Figure 9-18 Video wall at HTMS Control room

9.2.7 Video Incident Detection System

Video Incident Detection System is located at 4 locations km.13+400, km.17+260, km.68+400 and km.72+600.

9.3 Adequacy of Toll Collection System and ATMS

- Adequacy - The software and hardware as a part of Toll Collection and Management System (TMS) was commissioned on 22nd March 2022. All lanes are Hybrid ETC system as stipulated by NHAI in Technical Specifications of Hybrid ETC system. NHAI has approved maintenance costs for TMS. TMS shall be upgraded every 5 years, at the cost of the Authority.

- Advanced Traffic Management System (ATMS) installed is as per specifications required by the Authority and in working condition.

10 ACCIDENT DATA ANALYSIS

Accident Data Records for the project have been studied in order to analyse the nature of accidents occurring on the stretch and identify blackspots.

10.1 Accident Trend

Accident Data for the period 1st April 2021 to 31st March 2022 has been made available for analysis. 155 Accidents have occurred out of which 1 no. was fatal, and 26 were grievous 86 minor and 42 non-injury type.

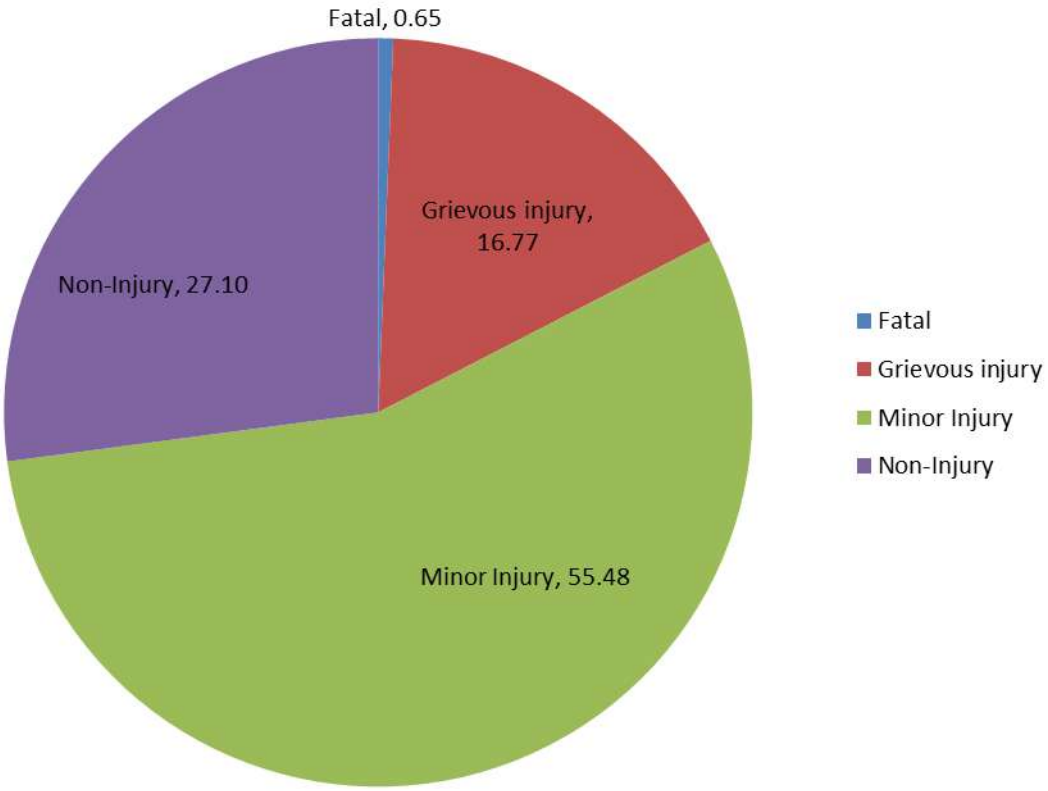


Figure 10-1 Accident Types

More number of accidents have occurred during the day time than at night time. Monthly data analysis does not show any consistent seasonal trend. Over speeding has been recorded as a major cause of accident followed by faulty driver behaviour.

Table 10-1 Monthly Accidents during the financial year 2021-22

Sr. No.	Month / Year	Minor Injury	Grievous Injury	Fatalities (Deaths)	TOTAL
1	Apr-21	11	3	0	14
2	May-21	4	0	0	4
3	Jun-21	6	3	0	9
4	Jul-21	6	0	0	6
5	Aug-21	9	3	0	12
6	Sep-21	2	2	0	4
7	Oct-21	12	3	0	15
8	Nov-21	10	1	0	11

Sr. No.	Month / Year	Minor Injury	Grievous Injury	Fatalities (Deaths)	TOTAL
9	Dec-21	16	3	0	19
10	Jan-22	4	4	0	8
11	Fab-22	5	2	0	7
12	Mar-22	1	2	1	4
Grand Total		**86**	**26**	**1**	**113**

Accident Cause:

Wrong side driving is noted as the top cause for accidents which needs to be looked into and remedied. Speed comes second in causing highest number of accidents which again needs to be studied in detail based on the accident spots. Figure below shows the share of various causes of accident on the project road.

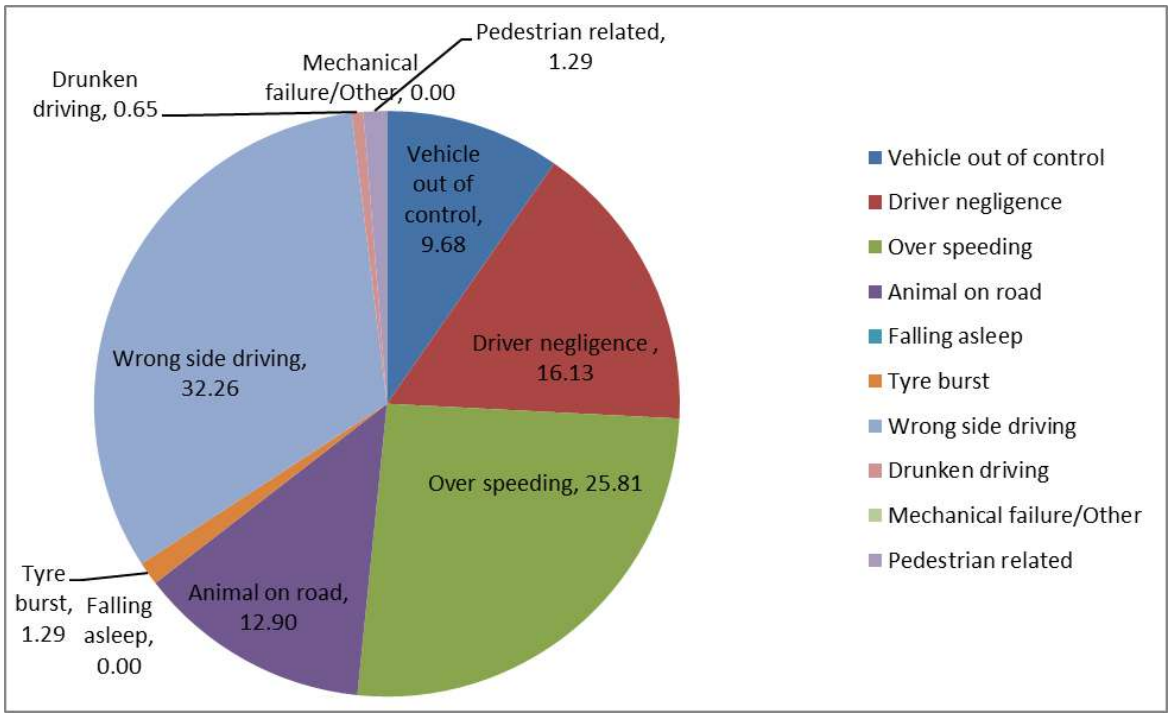


Figure 10-2 Accident Causes

10.2 Conclusions & Recommendations

It is recommended that the Concessionaire maintain road signs, markings and other road safety devices as per the manual.

Annexures

Annexure I : Operation and Routine Maintenance Cost

Sr. No.	Particulars	Cost per Annum (Rs.)	Cost per Annum (Crores)
1	Incidental Management Expenses		
a	*Ambulance - 2 Nos.*	3,488,171	0.35
b	*Patrolling Vehicle - 2 Nos.*	4,078,377	0.41
c	*Crane - 2 Nos.*	2,424,268	0.24
d	*Other Vehicle - 2 Nos.*	1,195,727	0.12
e	*JCB - 1 Nos.*	852,563	0.09
f	*Corridor Manager & Officer*	953,280	0.10
2	Maintenance Staff Expenses	7,200,000	0.72
3	Routine Maintenance Cost (Civil Works)	25,890,073	2.59
4	Professional & IE Fee	10,231,812	1.02
5	Insurance Expenses	9,630,611	0.96
6	Staff Welfare Expenses	660,000	0.07
7	Electricity Expenses + Maintenance of parts	29,329,437	2.93
8	ATMS/HTMS Expenses	8,001,180	0.80
9	Contingency @ 5%	3,902,271	0.39
	Total Cost (Rs.)	**107,837,771**	**10.78**
	Per km Cost (Lakhs)		**13.34**

Annexure II : Routine Maintenance Cost

Routine Maintenance Cost	
GPEL	
Ordinary Repair Cost for Flexible without GST	24,179,175
(Exclusive of GST)	= 3.36 lakhs per km
Ordinary Repair Cost for Rigid without GST	1,710,897
(Exclusive of GST)	= 1.53 lakhs per km
Total Cost (Exclusive of GST)	**25,890,073**
	= 3.20 lakhs per km

CONVERSION FACTORS									
National Highways / State Highways - Flexible Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Flexible Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				199,604	**216,814**				
						Normal	**Urban**	**Normal**	**Urban**
1	Two-lane without shoulder		0.90	179644.00	195132.00	1.15	-	195,825.45	-
2	Four-lane with divided carriageway	Without paved shoulder	1.53	305394.00	331725.00	-	-	-	-
		Paved shoulder	1.70	339327.00	368583.00	51.95	-	16,709,670.52	-
3	Four-lane with divided carriageway and service lane on either side	Without paved shoulder	2.00	399208.00	433627.00	-	-	-	-
		Paved shoulder	2.20	439129.00	476990.00	-	10.22	-	4,642,129.25
4	Six lane with divided carriageway and service lane on either side	without Paved shoulder	2.90	578852.00	628760.00	-	-	-	-
		with Paved shoulder	3.10	618773.00	672122.00	-	8.65	-	5,533,051.01
TOTAL						**71.970**		**27,080,676.23**	

CONVERSION FACTORS									
National Highways / State Highways - Rigid Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Rigid Pavement**		**Factor**	**Rigid Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				96,149	**109,116**				
						Normal	**Urban**	**Normal**	**Urban**
3	Two-lane without shoulder		0.90	86534.00	98205.00	-	1.15	-	112,935.75
8	Four-lane with divided carriageway	Without paved shoulder	1.53	147107.00	166948.00	-	-	-	-
		Paved shoulder	1.70	163453.00	185498.00	8.05		1,315,796.65	-
10	Six lane with divided carriageway	without Paved shoulder	2.43	233641.00	265153.00	-	-	-	-
		with Paved shoulder	2.60	249986.00	283703.00	1.95		487,472.70	-
					TOTAL		**11.150**		**1,916,205.10**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km.**
				More than 4500 CVD
				BT Surface
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.50%
	Volume (cum)			2.50
	Rs/m^3			11368
	Cost in Rupees			28,420
	ii) Patch repair	100 % Patch less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			455
	Cost in Rupees			22,736
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	3.50%
	Area (sqm)			350
	Rs/m^2			86
	Cost in Rupees			30,184
	b) Width less than 3 mm	75 % Crack Less	As & when required	2.50%
	Area (sqm)			187.5
	Rs/m^2			58
	Cost in Rupees			10,920
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			455
	Cost in Rupees			34,104
	v) Road marking	10%	Once in 10 year & @ Repaired location	12983
	SUB TOTAL			**139,347**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	50%	As & when required	17,334
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			
	SUB TOTAL			**17,334**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debris removal		Once in a Year	3467
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	3467

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km.**
				More than 4500 CVD
				BT Surface
1	**2**	**3**	**4**	**5**
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 3 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**189,204**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	10%	Once in 10 years with thermoplastic paint	4614
	ii)Repairs to footpath	20%	As & when required	924
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**17,210**
	GRAND TOTAL (Urban)			**206,413**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity**
				More than 4500 CVD
				CC Surface
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.00%
	Volume (cum)			0.00
	Rs/m^3			0
	Cost in Rupees			0
	ii) Patch repair	100 % Patch less	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			455
	Cost in Rupees			0
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			86
	Cost in Rupees			4,312
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			58
	Cost in Rupees			4,368
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			455

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	Cost in Rupees			0
	v) Road marking	10%	Once in 15 year & @ Repaired location	15782
	vi) Joint Sealant Repair/Replacement	5%		32230
	SUB TOTAL			**56,692**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	20%	As & when required	6,934
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	SUB TOTAL			**6,934**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debris removal		Once in a Year	3467
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	3467
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**96,149**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	7%	Once in 15 years with thermoplastic paint	1296
	ii)Repairs to footpath	0%	As & when required	0
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**12,968**
	GRAND TOTAL (Urban)			**109,116**

Annexure III : Major Maintenance Cost

Sr. No.	Description	Unit	No.	Length (m)	Width (m)	Depth (m)	Quantity	Total Quantity	Rate (Rs.)	Amount (Rs.)
I. Main Carriageway										
A	**Main Carriageway: Flexible Pavement**									
1	Milling	Sqm	100%	1,266,123.43			1,266,123.43	1,266,123.43	55.00	69,636,789
2	Tack Coat for DBM	Sqm	25%	1,266,123.43			316,530.86	316,530.86	16.00	5,064,494
3	DBM Overlay	Cum	25%	1,266,123.43		0.05	15,826.54	15,826.54	9,172.00	145,161,051
4	Tack Coat for BC	Sqm	1	1,266,123.43			1,266,123.43	1,266,123.43	16.00	20,257,975
5	BC Overlay	Cum	1	1,266,123.43		0.03	37,983.70	37,983.70	10,593.00	402,361,365
6	Filling of Earthen shoulder	Cum	1	209,198.00		0.03	6,275.94	6,275.94	430.00	2,698,654
B	**Main Carriageway: Rigid Pavement**									
7	Replacement of Joint Sealant	Rmt	5%	100,342.86			5,017.14	5,017.14	110.00	551,886
8	Dismantling of CC Panels @ 2% area	Cum	2%	197,550.00		0.30	1,185.30	1,185.30	893.00	1,058,473
9	Replacement of Panels - PQC @ 2% area	Cum	2%	197,550.00		0.30	1,185.30	1,185.30	7,662.00	9,081,769
10	Diamond Grinding	Sqm	3%	197,550.00			5,926.50	5,926.50	50.00	296,325
C	**Rigid Pavement at Toll Plaza**									
11	Replacement of Joint Sealant	Rmt	5%	5,869.84	-	-	293.49	293.49	110.00	32,284
12	Dismantling of CC Panels @ 2% area	Cum	2%	11,556.25		0.30	69.34	69.34	893.00	61,918
13	Replacement of Panels - PQC @ 2% area	Cum	2%	11,556.25		0.30	69.34	69.34	7,662.00	531,264
D	**Service Roads (Flexible Pavement)**									
14	Tack Coat for BC	Sqm	20%	535,783.05			107,156.61	107,156.61	16.00	1,714,506
15	BC Overlay with 30mm	Cum	20%	535,783.05		0.03	3,214.70	3,214.70	10,593.00	34,053,299
16	Microsurfacing	Sqm	80%	535,783.05			428,626.44	428,626.44	133.00	57,007,317
E	**Structural Deck area**									
17	Milling	Sqm	50%	80,524.32			40,262.16	40,262.16	55.00	2,214,419
18	Tack Coat	Sqm	50%	80,524.32			40,262.16	40,262.16	16.00	644,195
19	Mastic Asphalt Overlay	Sqm	50%	80,524.32			40,262.16	40,262.16	498.85	20,084,738
F	**Miscellaneous**									
20	Replacement of Kerb	Rmt	20%	239,476.00			47,895.20	47,895.20	242.00	11,590,638
21	Painting of Kerbs	Sqm	1	239,476.00		0.32	75,434.94	75,434.94	94.00	7,090,884
22	Painting of Crash Barrier	Sqm	1	39,892.00		1.12	44,479.58	44,479.58	94.00	4,181,081
23	Thermoplastic paint									
	a) Median & Edge line	Sqm	100%				75,196.72	75,196.72	469.00	35,267,262
	Main Carriageway 6L		4	9,919.35	0.15		5,951.61			
	Main Carriageway 4L		4	65,281.65	0.15		39,168.99			
	Service Road		2	73,538.85	0.10		14,707.77			
	b) Lane line									
	Main Carriageway 6L		4	3,471.77	0.10		1,388.71			
	Main Carriageway 4L		2	22,848.58	0.10		4,569.72			
	Service Road		1	25,738.60	0.10		2,573.86			
	c) Junction crossing						6,836.07			
24	Replacement of Road Stud	No	100%				24,892.00	24,892.00	300.00	7,467,600
	Main Carriageway 6L		4	552.00			2,208.00			
	Main Carriageway 4L		4	3,628.00			14,512.00			
	Service Road		2	4,086.00			8,172.00			
25	Miscellaneous	5%								41,905,509
Total Amount (MCW)										**880,015,693.16**
Total Cost in Lakhs (MCW)										**8,800.16**
Per km Cost in lakhs (MCW)										**108.89**

Annexure IV: Pavement Condition Survey

LHS - Phagwara to Rupnagar

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition	Visual Condition of Road Side	Road side Drain (NE/PF/F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	0.000	1.000	G	-	BT		-	G	0	-	-	-	-	-	G	BT	G	G				
2	1.000	2.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
3	2.000	3.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
4	3.000	4.000	G	-	BT		-	G	0.2	-	-	-	1	-	G	BT	G		G			
5	4.000	5.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
6	5.000	6.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
7	6.000	7.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
8	7.000	8.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	F				
9	8.000	9.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
10	9.000	10.000	G	-	BT		-	G	0.2	-	-	Moderate	-	-	G	BT	G		G			
11	10.000	11.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
12	11.000	12.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
13	12.000	13.000	G	-	BT		-	G	0.0.2	-	-	-	-	-	G	BT	G	G				
14	13.000	14.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
15	14.000	15.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G	F				
16	15.000	16.000	G	-	BT/PQC		-	G	-	-	-	-	-	-	G	BT/PQC	G	F				TP-1 @ Km.15.300
17	16.000	17.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
18	17.000	18.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		F			
19	18.000	19.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G	F				
20	19.000	20.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
21	20.000	21.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G	F				
22	21.000	22.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
23	22.000	23.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		F			
24	23.000	24.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G	G				
25	24.000	25.319	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
26	25.319	26.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G	-				Flyover (Elevated structure)
27	26.000	27.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G	-				
28	27.000	28.333	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G					
29	28.333	29.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
30	29.000	30.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
31	30.000	31.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
32	31.000	32.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
33	32.000	33.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
34	33.000	34.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	F				
35	34.000	35.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		F			
36	35.000	36.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
37	36.000	37.100	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
38	37.100	38.000	G	-	PQC		-	G	0.2	-	-	-	-	-	G	PQC	G	G				Nawanshahr Bypass Start @ Km.37.100
39	38.000	39.000	G	-	PQC		-	G	0.2	-	-	-	-	-	G	PQC	G	G				
40	39.000	40.000	G	-	PQC		-	G	0.2						G	PQC	G		G			

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition	Visual Condition of Road Side	Road side Drain (NE/PF/F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
41	40.000	41.000	G	-	PQC		-	G	0.2	-	-	-	-	-	G	PQC	G	G				
42	41.000	42.000	G	-	PQC		-	G	0.2	-	-	-	-	-	G	PQC	G	G				
43	42.000	43.000	G	-	PQC		-	G	0.2	-	-	-	-	-	G	PQC	G	G				
44	43.000	44.000	G	-	PQC		-	G	0.2							PQC		G				
45	44.000	45.000	G	-	PQC		-	G	0.2							PQC		G				
46	45.000	46.000	G	-	PQC		-	G	0.2	-	-	-	-	-	G	PQC	G	G				
47	46.000	47.100	G	-	PQC		-	G	0.2	-	-	-	-	-	G	PQC	G	G				Nawanshahr Bypass End @ Km. 47.100
48	47.100	48.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
49	48.000	49.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
50	49.000	50.000	G	-	BT		-	G	0.2					-		BT		G				
51	50.000	51.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
52	51.000	52.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		F			
53	52.000	53.000	G	-	BT		-	G	0.2	-	-	-	2	-	G	BT	G	G				
54	53.000	54.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
55	54.000	55.000	G	-	BT		-		0.2					-		BT		G				
56	55.000	56.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
57	56.000	57.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
58	57.000	58.000	G	-	BT		-		0.2					-		BT		G				
59	58.000	59.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
60	59.000	60.000	G	-	BT		-		0.2					-		BT			G			
61	60.000	61.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
62	61.000	62.000	G	-	BT		-		0.2					-		BT		G				
63	62.000	63.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
64	63.000	64.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
65	64.000	65.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
66	65.000	66.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
67	66.000	67.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
68	67.000	68.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
69	68.000	69.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
70	69.000	70.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
71	70.000	71.000	G	-	BT/PQC		-	G		-	-	-	-	-	G	BT/PQC	G	G				TP-2 @ Km.70.240
72	71.000	72.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G	G				
73	72.000	73.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
74	73.000	74.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G	G				
75	74.000	75.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
76	75.000	76.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
77	76.000	77.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
78	77.000	78.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
79	78.000	79.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
80	79.000	80.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
81	80.000	80.820	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			

RHS - Rupnagar to Phagwara

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition	Visual Condition of Road Side	Road side Drain (NE/PF/F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	80.820	80.000	G	-	BT	-	-	G	0.2	-	-	-	-	-	G	BT	G					
2	80.000	79.000	G	-	BT	-	-	G	0.2	-	-	-	-	-	G	BT	G					
3	79.000	78.000	G	-	BT	-	-	G	0.2	-	-	-	-	-	G	BT	G					
4	78.000	77.000	G	-	BT	-	-	G	0.2	-	-	-	-	-	G	BT	G					
5	77.000	76.000	G	-	BT	-	-	G	0.2	-	-	-	-	-	G	BT	G					
6	76.000	75.000	G	-	BT	-	-	G	0.2	-	-	-	-	-	G	BT	G					
7	75.000	74.000	G	-	BT	-	-	G	0.2	-	-	-	-	-	G	BT	G					
8	74.000	73.000	G		BT	-	-	G	1	-	-	Moderate	-	-	G	BT	G					
9	73.000	72.000	G	-	BT	-	-	G	-	-	-	-	-	-	G	BT	G					
10	72.000	71.000	G	-	BT	-	-	G	1	-	-		-	-	G	BT	G					
11	71.000	70.000	G	-	BT/PQC		-	G	-	-	-	-	-	-	G	BT	G					TP-2 @ Km.70.240
12	70.000	69.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
13	69.000	68.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
14	68.000	67.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
15	67.000	66.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
16	66.000	65.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
17	65.000	64.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
18	64.000	63.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
19	63.000	62.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
20	62.000	61.000	G		BT			G	0.2					-	G	BT						
21	61.000	60.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
22	60.000	59.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
23	59.000	58.000	G		BT			G	0.2					-	G	BT	G					
24	58.000	57.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
25	57.000	56.000	G	-	BT		-	G	3	-	-	-	-	-	G	BT	G					
26	56.000	55.000	G	-	BT		-	G	1	-	-	-	-	-	G	BT	G					
27	55.000	54.000	G	-	BT		-	G	-	-	-	-	-	-	G	BT	G		G			
28	54.000	53.000	G		BT			G	0.2					-								
29	53.000	52.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
30	52.000	51.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
31	51.000	50.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
32	50.000	49.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G					
33	49.000	48.000	G		BT		-	G	0.2	-				-								
34	48.000	47.100	G		BT		-	G	0.2	-				-								
35	47.100	46.000	G	-	PQC		-	G		-	-	-	-	-	G	BT	G	G				Nawanshahr Bypass End @ Km. 47.100
36	46.000	45.000	G	-	PQC		-	G		-	-	-	-	-	G	BT	G	G				
37	45.000	44.000	G	-	PQC		-	G		-	-	-	-	-	G	BT	G	G				
38	44.000	43.000	G	-	PQC		-	G	1	-	-	-	-	-	G	BT	G	G				
39	43.000	42.000	G	-	PQC		-	G		-	-	-	-	-	G	BT	G	G				
40	42.000	41.000	G	-	PQC		-	G		-	-	-	-	-	G	BT	G	G				
41	41.000	40.000	G	-	PQC		-	G		-	-	-	-	-	G	BT	G	G				

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition	Visual Condition of Road Side	Road side Drain (NE/PF/F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
42	40.000	39.000	G	-	PQC		-	G		-	-	-	-	-	G	BT	G					ROB @ km.39.134
43	39.000	38.000	G	-	PQC		-	G		-	-	-	-	-	G	BT	G	G				
44	38.000	37.100	G	-	PQC		-	G		-	-	-	-	-	G	BT	G	G				Nawanshahr Bypass Start @ Km.37.100
45	37.100	36.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
46	36.000	35.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
47	35.000	34.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
48	34.000	33.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
49	33.000	32.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
50	32.000	31.000	G		BT				0.2					-					G			
51	31.000	30.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
52	30.000	29.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
53	29.000	28.333	G	-	BT		-	G			-	-	-	-	G	BT	G		G			
54	28.333	27.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			Flyover (elevated structure)
55	27.000	26.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
56	26.000	25.319	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
57	25.319	24.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
58	24.000	23.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
59	23.000	22.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
60	22.000	21.000	G	-	BT		-	G	1	-	-	-	-	-	G	BT	G		G			
61	21.000	20.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
62	20.000	19.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
63	19.000	18.000	G	-	BT		-	G	1	-	-	-	-	-	G	BT	G	G				
64	18.000	17.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G	G				
65	17.000	16.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
66	16.000	15.000	G	-	BT/PQC		-	G		-	-	-	-	-	G	BT	G	G				TP-1 @ Km.15.300
67	15.000	14.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G	G				
68	14.000	13.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
69	13.000	12.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
70	12.000	11.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G	G				
71	11.000	10.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
72	10.000	9.000	G	-	BT		-	G	1	-	-	-	-	-	G	BT	G		G			
73	9.000	8.000	G	-	BT		-	G	0.2	-	-	-	2	-	G	BT	G		G			
74	8.000	7.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
75	7.000	6.000	G	-	BT		-	G	1	-	-	-	-	-	G	BT	G		G			
76	6.000	5.000	G	-	BT		-	G		-	-	-	-	-	G	BT	G		G			
77	5.000	4.000	G	-	BT		-	G	0.2	-	-	-	2	-	G	BT	G		G			
78	4.000	3.000	G	-	BT		-	G	0.2	-	-	-	3	-	G	BT	G		G			
79	3.000	2.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G		G			
80	2.000	1.000	G	-	BT		-	G	0.2	-	-	-	-	-	G	BT	G	G				
81	1.000	0.000	G	-	BT		-	G	1	-	-	-	-	-	G	BT	G	G				

FP Project Management

Four Laning of Porbandar - Dwarka of NH-8E from km. 379+100 to km. 496+848 in the State of Gujarat through PPP on Hybrid Annuity Mode

Technical Due Diligence Study

Final Report

November 2022

Submitted by:

FP Project Management
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Delivering Commitment

FP/QD/05

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FOUR LANING WITH PAVED SHOULDER OF PORBANDAR - DWARKA SECTION OF NH-8E FROM KM. 356+766 TO KM. 473+000 (DESIGN CHAINAGE KM. 379+100 TO KM. 496+848) IN THE STATE OF GUJARAT THROUGH PUBLIC PRIVATE PARTNERSHIP (PPP) ON HYBRID ANNUITY MODE

TECHNICAL DUE DILIGENCE STUDY

FINAL REPORT

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1 INTRODUCTION

1.1 Background

The Government of India had authorized National Highways Authority of India (NHAI) for the development of National Highways and as a part of this endeavor, the authority had decided to undertake development and operation / maintenance of the four laning with paved shoulder on Porbandar - Dwarka Section of NH-8E from existing carriageway km. 356+766 to km. 473+000 (approx. 116.234 kms) (Design chainage from km. 379+100 to km. 496+848) (approx. 117.748 kms) in the State of Gujarat through Design, Build, Operate and Transfer (the DBOT Hybrid Annuity basis) which shall be partly financed by the Concessionaire who shall recover its investment and costs through payments to be received from the Authority, in accordance with the terms and conditions to be set forth in a Concession Agreement executed on 8th August 2017. Total design length of the project highway is 117.748 kms.

Based on competitive bid process completed, NHAI had signed Concession Agreement with **M/s. GR Porbandar Dwarka Expressway Private Limited (PDEPL),** a Special Purpose Vehicle (SPV) formed for implementing this project on 8th August 2017.

The Appointed Date of the project was 12th February 2018. The concession period of the project highway is 18 years from the Appointed Date including construction period of 3 years. The Scheduled Completion Date of the project highway was on 10th February 2021. The NHAI had granted Extension of Time (EOT) for 90 days. The project highway has received provisional completion certificate on 18th April 2020 and final completion certificate on 13th October 2021.

During maintenance period of the project highway, **GR Highways Investment Manager Pvt. Ltd.** (in its capacity as the Investment Manager of Bharat Highways InvIT) has appointed **FP Project Management Consultancy Services Private Limited** [Formerly Frischmann Prabhu (I) Pvt. Ltd.] as Technical Consultant for carrying out techincal study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, FP Project Management undertook the site visits to carry out site inspection. The report is based on findings during this period.

1.2 Our Approach Philosophy

Composition of Team

Our team consists of well-qualified Engineers and other professionals, whose experience covers all the skills and specializations required for undertaking such assignments. All the team personnel are our regular employees and have a long and stable working relationship with our firm.

The Team Leader co-ordinates the activities between all the key staff who work closely together. The key staff is assisted by various support staff, who report to the respective key staff in their field of expertise. The Team Leader is the point of contact for Client on Technical Study.

The technical study includes review of all the available documents namely:

a) Concession Agreement including Technical Schedules
b) EPC Agreement

c) Pavement design reports
d) O&M Manual prepared by the Concessionaire
e) O&M Contract, work order and their provisions
f) Recent O&M Report submitted to Authority
g) Quality of construction based on available data, design and drawings
h) Documents on historical expenditure on operation and maintenance
i) Reports on past accidents
j) O&M cost schedule for the concession period
k) Completion / Provisional Completion and status of items in punch list items
l) Correspondence regarding scope of works and during O&M
m) Toll operation manual / ATMS related documents

The review of the above documents is the first step towards accomplishment of the assignment. This gives a complete idea of the project and is used as input data for preparation of report after necessary analysis.

Site Visit and Data Collection

A team of experts from various streams has carried out the preliminary site visit to understand the assessment of project assets mainly condition of the pavement and structures.

- The site visit is undertaken for detailed reconnaissance and visual pavement condition assessment
- The condition assessment of major structures by visual inspection
- The information like material sources and the probable cost to be collected for the purpose of cost estimate

The detailed design / drawings viz. Plan & L-sections, drainage design, structure design, layout drawings for project facilities like toll plaza, bus bay, truck lay-byes, highway lighting facilities etc., would be studied. Also, design / drawing and provision pertaining to road furniture are studied.

The adequacy of design is verified in accordance with the concession agreement, manual of specifications and standards as well as relevant IRC standards.

The information on availability of material in the vicinity is gathered. It has direct impact on cost of maintenance work and balance work if any.

The basic approach for preparation for cost estimates for operation and maintenance is as per the practice of State PWD / MoRT&H in respect of highways and structures.

Data Analysis

Based on the study of the available information and preliminary site visits, the consultants share their preliminary observations with the Client.

1.3 About this Report

This report has been prepared based on the information, reports and documents made available to us by the Company. We have also referred to publicly available reports, literature etc. and have made our best efforts to check the authenticity of the information available, analyse the same as per the best engineering / industry practices.

The site visit and inspection were carried out between the periods of **3rd August 2022 to 7th August 2022**.

The report is organized with the following chapters for easy understanding of various issues.

- **Introduction -** This chapter gives an overview of the project background, approach and methodology of Due Diligence studies.
- **Project Description -** This chapter describes existing project features.
- **Development of Project Highway -** This chapter gives an overview of project development.
- **Pavement and Site Investigation -** This chapter describes present condition of pavement, surveys and investigations carried out on site and proposals for maintenance as per contract requirements.
- **Balance works -** This chapter summarizes the balance works to be executed at Site.
- **Review of Concession Agreement -** This chapter summarizes the observations on the Concession Agreement.
- **Review of O&M Agreement -** This chapter summarizes the observations on the O&M Agreement executed.
- **Operation and Maintenance -** This chapter describes O&M set up as well as O&M cost over the concession period.
- **Toll Plaza Equipment and HTMS -** This chapter summarizes assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and working status is presented under this section.
- **Accident Data Analysis -** This chapter deals with the analysis of nature of accidents occurring on the stretch and to identify blackspots.
- **Annexures**

2 PROJECT DESCRIPTION

2.1 Location

The project highway is a section of National Highway Number 08E, NH-08E in the State of Gujarat which starts from km. 379+100 near Porbandar Bypass and ends at km. 496+848 in Dev Bhumi Dwarka. Existing length of the project highway was 116.234 kms whereas design length measures to be 117.748 kms. There is increase in design length due to addition of 2 bypasses (Porbandar and Visawada Bypass) on the project highway.

The project highway passes through the built-up areas of towns and villages enroute. Important towns along the alignment are Visawada, Miyami, Bhavpuru, Jodhpur etc.,

The Location Map of the project highway is presented below:

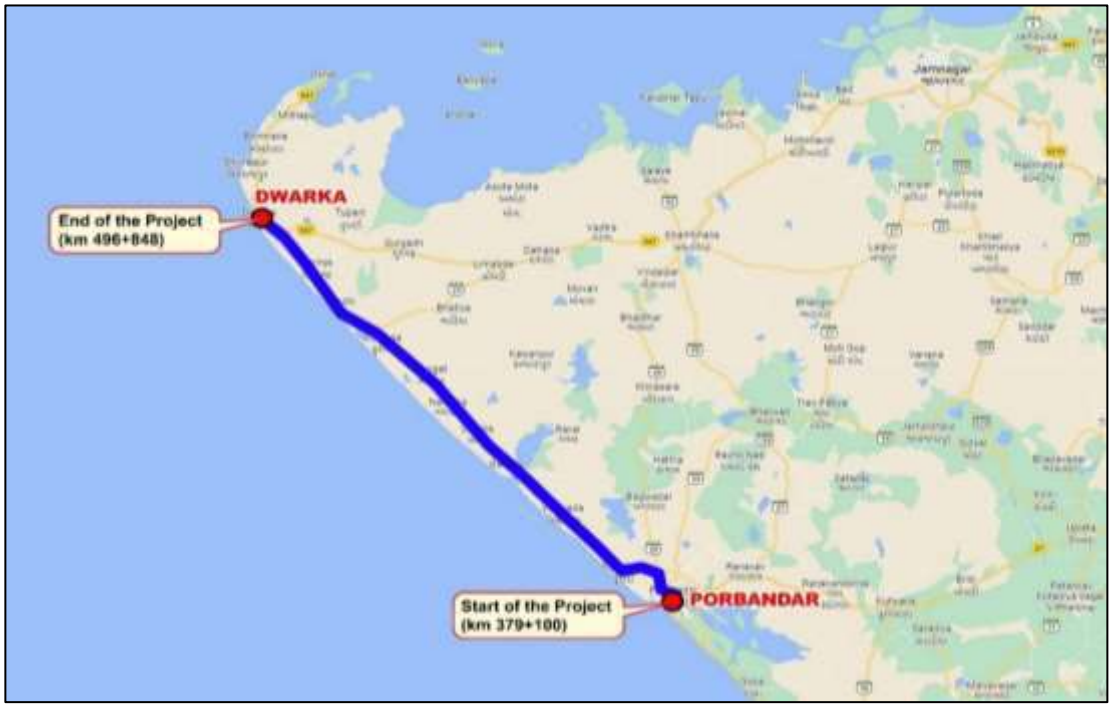


Figure 2-1 Location Map

Figure 2-2 Start of project highway at km. 379+100

Figure 2-3 End of project highway at km. 496+848

2.2 Climate

The climate of the project area is generally dry except during the South-West monsoon season between July to September. The average annual rainfall in the area is around 488 mm. The driest month is January. The average annual temperature of the project area is 29.5^{0}C & June is being the warmest month. The highest relative humidity is in August @ 83.52% and the lowest relative humidity is in January @ 55.40%.

2.3 Terrain

This section of National Highway traverses through plain / rolling terrain.

2.4 Abutting Land Use

The land use along the highway is predominantly agriculture or barren and rocky.

2.5 Right of Way

The width of existing Right of Way (RoW) for the project highway varies between 30 m to 120 m. Details of ROW for the project highway are as given below:

Section	Existing Chainage (km)		Design Chainage (km)		Proposed ROW (m)
	From	To	From	To	
NH-8E (Porbandar to Dwarka)	356+766	387+596	379+100	409+930	45
	387+596	388+096	409+930	410+430	120
	388+096	445+432	410+430	469+339	45
	445+432	445+932	469+339	469+839	120
	445+932	469+963	469+839	495+600	45
	471+752	473+000	495+600	496+848	30

2.6 Existing Utilities

During widening of the project highway, various affected utility services located along the project road were shifted to the PROW. The different types of utilities found along the road include, electrical poles, water pipeline, OFC Cables, etc.,

3 DEVELOPMENT OF PROJECT ROAD

3.1 Project Road

The project road from Porbandar (km. 379+100) to Dwarka (km. 496+848) has been developed as four lane divided carriageway with median width varies from 0.6 m to 4.0 m, service road and other arrangements. The project road passes through rural as well as built-up sections. The stretches falling in built-up area have been provided with service road as per scope of works. The development of entire project road has been carried out in accordance with schedule-B and schedule-C as per standards set forth in schedule-D under the Concession Agreement.

M/s GR Porbandar Dwarka Expressway Private Limited has completed construction of the project road for the length of 117.748 kms.

The stretch of the project highway under the scope of study runs predominantly through plain / rolling terrain. The design standards have been adhered to with a realistic compatibility with the existing ROW, utilities and optimum land acquisition. Generally, the cross-sectional dimensions of project road are as below:

Table 3-1 Cross sectional dimension

Main Carriageway	Width (m)
Carriageway width	17.5
Paved Shoulder width - one side	1.5
Earthen Shoulder width - one side	2.0
Median width	0.600 - 4.00
Service Road	5.5 to 7.0

3.2 Bypass and Realignment

There are two nos. bypasses on the project highway. The total length of both bypasses is 23.300 kms. The bypasses constructed along the project highway are as indicated below:

Table 3-2 Bypass and Realignment

Sr. No.	Name of Bypass	Existing Chainage (km)		Design Chainage (km)		Design Length (km)
		From	To	From	To	
1	Porbandar	356+847	375+921	379+100	400+800	21.700
2	Visawada	396+644	398+166	421+200	422+800	1.600

Figure 3-1 Photographs of Bypass

Porbandar Bypass at km. 379.100

Visawada Bypass at km. 422.800

3.3 Pavement Construction

The entire stretch of the project highway including Toll Plaza is rigid pavement except from km. 493+850 to km. 496+848 including service road and slip road which is flexible pavement.

3.4 Service Roads

Service roads have been constructed at 7 locations along the project highway. The total length of service road (including LHS and RHS) is 11.710 kms and the width of service road varies from 7.0 m to 5.5 m. Service roads are provided in both built-up sections and in open country. Built-up sections are provided with RCC built-up drains on outer side of service roads. The details of service roads provided are as tabulated below.

Table 3-3 Details of Service Roads as per CA

Design Chainage (km)		Length (m)	Side	Remarks
From	To			
390+018	391+085	1067	LHS	
396+483	397+428	945	LHS	
400+285	400+710	425	LHS	
400+710	401+130	420	LHS	
428+570	428+960	390	LHS	
467+522	468+361	839	LHS	
488+660	489+505	845	LHS	
495+600	496+848	845	LHS	
390+018	391+085	1067	RHS	
396+483	397+428	945	RHS	
400+285	401+130	845	RHS	
428+570	428+960	390	RHS	
467+522	468+361	839	RHS	
488+660	489+505	845	RHS	
495+600	496+848	1248	RHS	
Total Length (m)		**11955**		
Net Length (m)		**= 11955/2 = 5977.5**		

Table 3-4 Details of Service Roads as per COS

Design Chainage (km)		Length (m)	Side	Remarks
From	To			
381+052.5	382+016	963.5	LHS	
387+920	388+560	640	LHS	
431+746	432+590	844	LHS	
381+052.5	382+016	963.5	RHS	
387+920	388+560	640	RHS	
431+746	432+590	844	RHS	
Total Length (m)		**4895**		

Figure 3-2 Photographs of Service Road

km. 488+654 to km. 489+346 (RHS)

km. 488+654 to km. 489+346 (LHS)

km. 467+601 to km. 468+347 (RHS)

km. 467+601 to km. 468+347 (LHS)

km. 400+319 to km. 400+700 (LHS)

km. 400+319 to km. 401+051 (RHS)

km. 396+499 to km. 397+466 (RHS)

km. 396+499 to km. 397+466 (LHS)

km. 390+177 to km. 390+953 (RHS)

km. 390+177 to km. 390+953 (LHS)

3.5 Major Intersections

There are 5 Nos. of major intersections along project highway. The details of the Major Intersections are as tabulated below.

Table 3-5 Details of Major Intersections

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Crossing Side (LHS / RHS)	Carriageway Width (m)	Category of Road
1	Start of Porbandar Bypass	379+100	RHS	5.5	City Road
2	Start of Visawada Realignment	421+250	LHS	5.5	VR
3	407+600	432+050	Both	3.75 / 3.50	MDR
4	431+100	455+450	RHS	6.0	MDR
5	471+821	495+700	LHS	14.0	Dwarka Temple

Figure 3-3 Photographs of Major Intersection

km. 432+050

km. 421+250

km. 379+100

3.6 Minor Junctions

There are 42 Nos. of minor junctions along project highway. The details of the minor junctions are as tabulated below.

Table 3-6 Details of Minor Intersections

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Side (LHS / RHS)	Going to Village	
				Left	Right
1	379+575	404+180	RHS	-	Renavadi
2	386+400	410+940	RHS	-	Kantela
3	387+550	412+115	RHS	-	Srinagar
4	389+500	414+520	LHS	Farms	-
5	390+020	414+900	RHS	-	Ratadi
6	393+210	417+700	RHS	-	Palakhda
7	398+050	422+700	RHS	-	Farms
8	401+250	425+600	RHS	-	Tukada
9	405+400	430+030	RHS	-	Bhavpuru
10	407+500	432+420	Both	Miyani	Medhakrik
11	409+950	434+400	LHS	Harshad	
12	410+300	434+820	Both	Harshad	Medhakrik
13	413+800	438+240	RHS	-	Kalyanpur
14	417+000	441+520	RHS	-	Bhogat
15	419+400	443+850	RHS	-	Lamba
16	421+190	445+550	Both	Wachardada	Farms
17	424+600	449+100	RHS	-	Satepar
18	426+050	450+430	RHS	-	Jodhpur
19	426+500	450+930	LHS	Navadra	-
20	436+700	461+010	LHS	Gogima	-
21	441+450	465+730	LHS	Unbara	-
22	446+540	470+221	RHS	-	Tupani
23	459+440	483+500	RHS	-	Goinjha
24	465+000	488+980	RHS	-	Baradia
25	467+050	491+000	LHS	Baradia	-
26	467+560	491+495	RHS	-	Bawda
27	472+122	496+000	Both	Kamdash Asaram Road	Pavuda
28	472+163	496+041	Left	Street Road	-
29	472+192	496+070	Left	Redhuvapada	-
30	472+258	496+136	Right	-	Street Road
31	472+284	496+162	Left	Street Road	-

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Side (LHS / RHS)	Going to Village	
				Left	Right
32	472+322	496+200	Left	Street Road	-
33	472+352	496+230	Right	-	Street Road
34	472+382	496+260	Left	Street Road	-
35	472+457	496+335	Right	-	Street Road
36	472+510	496+388	Right	-	Street Road
37	472+627	496+485	Right	-	Railway Station Road
38	472+667	496+525	Left	Street Road	-
39	472+684	496+542	Right	-	Street Road
40	472+720	496+578	Right	-	Water Pump House
41	472+805	496+663	Left	Dingesh Station	-
42	472+848	496+706	Left	Street Road	-

Figure 3-4 Photographs of Minor Intersection

km. 491+000

km. 483+500

km. 461+010

km. 450+430

km. 441+520

km. 434+820

km. 429+000

km. 427+600

km. 417+700

3.7 Condition Survey of Bridges

The inventory of structures including major bridges, minor bridges, ROB, underpasses and culverts is as tabulated below:

Table 3-7 Summary of Structures

Sr. No.	Type of Structure	Total No. of Structures	Remark
1	ROB	01	
2	Fly over	02	
3	Major Bridges - New	07	
4	Major Bridge (COS)	-	
5	Major Bridges (Widening & Repairing)	01	
6	Major Bridges (Reconstruction)	01	
7	Minor Bridges - New	13	
8	MNB (COS)	04	
9	Minor Bridges (Widening & Repairing)	17	
10	Vehicular Underpass	05	
11	VUP (COS)	04	
12	PUP	02	01 No. descoped
13	PUP (COS)	02	
14	CUP (COS)	01	
15	LVUP (COS)	01	
16	Slab Culverts - New	03	
17	Widening of Slab Culvert	25	02 Nos shifted in box culvert under COS.
18	Widening of Box Culverts	01	Shifted in reconstruction under COS
19	Box Culvert (COS)	02	
20	Pipe Culverts - New	108	
21	Widening of Pipe culvert	43	6 Nos Reconstruction in COS
22	Reconstruction of Pipe culvert	19	
23	Pipe Culverts (COS)	29	

The detailed condition survey of structures was carried out by visual inspection. The observations and findings are as tabulated below:

Table 3-8 Structure Condition Survey

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
1	**381+533 (Under COS)**	**VUP 12.0 m x 5.5 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat/ Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
2	**386+750**	**Major Bridge (River) 30 x 30 m**	**Age**	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	30 Span PSC Girders and Slab Footpath - Both side Condition - No problem	30 Span PSC Girders and Slab Footpath - Both side Condition - No problem	
			Bearing	Bearing - POT/PTFE	Bearing - POT/PTFE	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Standing water	Standing water	
			Parapet / Railing	RCC railing with Crash Barrier -	RCC railing with Crash Barrier - No Problem	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				No Problem		
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
3	**388+236 (Under COS)**	**VUP 12.0 m x 4.5 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat/ Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
4	**388+760**	**Major Bridge (River) 1 x 20 + 10 x 30 + 1 x 20 m**	**Age**	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	22 Span PSC Girders and RCC Slab Footpath - Both side Condition - No problem	22 Span PSC Girders and RCC Slab Footpath - Both side Condition - No problem	
			Bearing	Bearing - POT/PTFE	Bearing - POT/PTFE	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Standing water	Standing water	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	RCC railing with Crash Barrier -No Problem	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat/ Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
5	**389+295**	**Minor Bridge 13 x 30.0 m**	**Age**	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	Pile Foundation	Pile Foundation	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	13 Span PSC Girders and RCC Slab Footpath - Both side Condition - No problem	13 Span PSC Girders and RCC Slab Footpath - Both side Condition - No problem	
			Bearing	Bearing - POT/PTFE	Bearing - POT/PTFE	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Standing water	Standing water	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
6	**390+563**	**Flyover**	**Age**	New - 2 Lane	New - 2 Lane	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
		2 x 15.0 m	**Foundation**	Pile Foundation	Pile Foundation	The structure is in sound condition.
			Sub Structure Abutment / Pier	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	2 Span PSC Girders and RCC Slab Footpath - Both side Condition - No problem	2 Span PSC Girders and RCC Slab Footpath - Both side Condition - No problem	
			Bearing	Bearing - Elastomeric	Bearing - Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
7	**393+635**	**VUP 9.0 m x 5.5 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat/ Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
8	**393+642**	**ROB 1 x 25.2 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition. Crack developed at RHS (A2 side) on RE Block and bushes growing on RE Block wall shall be removed.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	1 Span Composite Girders and RCC Slab Footpath - Both side Condition - No problem	1 Span Composite Girders and RCC slab Footpath - Both side Condition - No problem	
			Bearing	Bearing - POT/PTFE	Bearing - POT/PTFE	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
9	**393+695**	**VUP 9.0 m x 5.5 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
10	**395+255**	**Major Bridge (River) 1 x 23 + 1 x 24 + 1 x 23 m**	**Age**	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	3 Span RCC Girders & RCC Deck Slab Footpath - Both side Condition - No problem	3 Span RCC Girders & RCC Deck Slab Footpath - Both side Condition - No problem	
			Bearing	Bearing - Elastomeric	Bearing - Elastomeric	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Standing water	Standing water	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
11	**396+876**	**VUP 12.0 m x 5.5 m**	**Age**	New - 2 lane	New - 2 lane	The Structure is in sound condition,
			Foundation	RCC Open Foundation	RCC Open Foundation	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
		Skew	**Sub Structure Abutment / Pier**	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
12	**397+100**	**VUP 12.0 m x 5.5 m Skew**	**Age**	New - 2 lane	New - 2 lane	The Structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
13	**400+702**	**VUP 12.0 m x 5.5 m**	**Age**	New - 2 lane	New - 2 lane	The Structure is in sound condition,
			Foundation	RCC Open Foundation	RCC Open Foundation	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
14	**406+170**	**Minor Bridge LHS - New 1 x 3.93 + 1 x 3.75 + 1 x 3.69 + 1 x 3.9 m**	**Age**	New - 2 lane	-	The structure is in sound condition.
			Foundation	RCC Open Foundation	-	
			Sub Structure Abutment / Pier	RCC wall RCC wall Box type	-	
			Super Structure	RCC solid slab	-	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	-	
			Nalla Bed	Clear Height upper level	-	
			Parapet / Railing	RCC Railing with Crash Barrier	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	-	
			Approach Slope	Stable	-	
			Drainage	Grating provided	-	
15	**406+170**	**Minor Bridge RHS - Skew -**	**Age**	-	New - 2 lane	The structure is in sound condition.
			Foundation	-	RCC Open Foundation	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
		Widening 1 x 3.93 + 1 x 3.75 + 1 x 3.69 + 1 x 3.9 m	**Sub Structure Abutment / Pier**	-	RCC wall RCC wall Box type	
			Super Structure	-	RCC solid slab	
			Bearing	-	-	
			Slope Protection	-	RCC Return & CC Pitching	
			Nalla Bed	-	Clear Height lower level	
			Parapet / Railing	-	RCC Railing with Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat/ Surface	-	BC - No problem	
			Approach Slope	-	Stable	
			Drainage	-	Grating provided	
16	**406+880**	**Minor Bridge- New 1 x 18.0 m**	**Age**	New - 2 lane	New - 2 lane	The Structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	RCC wall RCC wall - 3 cell Box type	RCC wall RCC wall- 3 cell Box type	
			Super Structure	RCC solid slab	RCC solid slab	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC Railing with Crash Barrier	RCC Railing with Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable	Stable	
			Drainage	Grating provided	Grating provided	
17	**415+929**	**Major Bridge**	**Age**	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
		11 x 20.9 m	**Sub structure Abutment / Pier**	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	11 Span RCC Girders & RCC Deck Slab Footpath - Both side Condition - No problem	11 Span RCC Girders & RCC Deck Slab Footpath - Both side Condition - No problem	
			Bearing	Bearing - Elastomeric	Bearing - Elastomeric	
			Slope Protection	RCC Return and CC Pitching damaged	RCC Return and CC Pitching damaged	
			Nalla Bed	Standing water	Standing water	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Damaged with rain cuts	Damaged with rain cuts	
			Drainage	Water grating clear	Water grating clear	
18	**417+996 (Under COS)**	**PUP 12.0 m x 3.0 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
19	**420+180**	**Major Bridge - LHS - New 17.755 + 17.91 + 17.865 + 17.81 + 17.805 + 11.95 + 17.845 m**	**Age**	New - 2 Lane	-	The structure is in sound condition.
			Foundation	RCC Open Foundation	-	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	7 Span RCC Girders & RCC Deck Slab Footpath - Both side Condition - No problem	-	
			Bearing	Bearing – Elastomeric	-	
			Slope Protection	RCC Return	-	
			Nalla Bed	Clear Height lower level	-	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	-	
			Expansion Joint	Available (Require cleaning)	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	Stable in condition	-	
			Drainage	Water grating clear	-	
20	**420+180**	**Major Bridge - RHS - Widening**	**Age**	-	Widened(old) - 2 Lane	The structure is in sound condition.
			Foundation	-	RCC Open Foundation	
			Sub Structure Abutment / Pier	-	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
		5.970 + 5.925 + 5.860 + 5.945 + 5.920 + 6.045 + 5.900 + 5.930 + 6.035 + 5.970 + 5.910 + 5.930 + 5.945 + 5.940 + 5.920 + 5.920 + 6.030 + 5.930 + 5.935 + 5.980 m	**Super Structure**	-	20 Span RCC Girders & RCC Deck Slab Footpath - Both side Condition - No problem	
			Bearing	-	Bearing - Elastomeric	
			Slope Protection	-	RCC Return	
			Nalla Bed	-	Clear Height upper level	
			Parapet / Railing	-	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	-	-	
			Wearing Coat / Surface	-	BC is in good condition	
			Approach Slope	-	Stable in condition	
			Drainage	-	Water grating clear	
21	**422+314**	**Minor Bridge 3 x 20 + 22 x 30 m (LHS) & 24 x 30 m (RHS)**	**Age**	New - 2 Lane	New - 2 Lane	The structure is in sound condition. Side Slope settled at A1 side (LHS). The Concessionaire is repairing / rectifying the same as a part of routine maintenance.
			Foundation	Pile Foundation	Pile Foundation	
			Sub Structure Abutment / Pier	Abutment - RCC wall Piers - RCC Circular & pier type Condition - Satisfactory	Abutment - RCC wall Piers - RCC Circular & pier type Condition - Satisfactory	
			Super Structure	25 Span PSC Girders & RCC Slab Footpath - Both side Condition - No problem	24 Span PSC Girders & RCC Slab Footpath - Both side Condition - No problem	
			Bearing	Elastomeric / POT-PTFE	Elastomeric / POT-PTFE	
			Slope Protection	RCC Return	RCC Return	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC railing with Crash Barrier -	RCC railing with Crash Barrier - No Problem	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				No Problem		
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
22	**422+716- (Under COS)**	**PUP 12.0 m x 4.5 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
23	**425+638**	**Minor Bridge - LHS - Widening 1 x 31.5 m**	**Age**	Widened - 2 lane	-	The structure is in sound condition.
			Foundation	Pile Foundation	-	
			Sub Structure Abutment / Pier	Abutment - RCC pedestal type	-	
			Super Structure	PSC Girders and RCC Slab	-	
			Bearing	POT-PTFE (Not visible)	-	
			Slope Protection	RCC Return	-	
			Nalla Bed	Clear	-	
			Parapet / Railing	RCC railing with Crash Barrier -	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				No Problem		
			Expansion Joint	Available (Require cleaning)	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	-	-	
			Drainage	Grating provided	-	
24	**425+638**	**Minor Bridge - RHS - New 1 x 31.5 m**	**Age**	-	New - 2 lane	The structure is in sound condition.
			Foundation	-	Pile Foundation	
			Sub Structure Abutment / Pier	-	Abutment - RCC pedestal type	
			Super Structure	-	PSC Girders and RCC Slab	
			Bearing	-	POT-PTFE (Not visible)	
			Slope Protection	-	RCC Return	
			Nalla Bed	-	Clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	-	Available (Require cleaning)	
			Wearing Coat / Surface	-	BC is in good condition	
			Approach Slope	-	-	
			Drainage	-	Grating provided	
25	**427+321**	**Minor Bridge - LHS - Widening 1 x 28.5 m & RHS - Widening 1 x 24.5 m**	**Age**	Widened - 2 lane	Widened - 2 lane	The structure is in sound condition.
			Foundation	Pile Foundation	Pile Foundation	
			Sub Structure Abutment / Pier	RCC Pedestal Type	RCC Pedestal Type	
			Super Structure	PSC Girders & RCC slab	PSC Girders & RCC slab	
			Bearing	POT-PTFE (Not visible)	POT-PTFE (Not visible)	
			Slope Protection	RCC Return	RCC Return	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC railing with Crash Barrier -	RCC railing with Crash Barrier - No Problem	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				No Problem		
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC is in good condition (Covered with BT material)	BC is in good condition (Covered with BT material)	
			Approach Slope	Stable	Stable	
			Drainage	Drain Spout provided	Drain Spout provided	
26	**428+071**	**Minor Bridge - LHS - Widening 1 x 13.1 m**	**Age**			Minor Bridge (Widened) is not constructed due to Land Acquisition issue. (Bhavpara Village)
			Foundation			
			Sub Structure Abutment / Pier			
			Super Structure			
			Bearing			
			Slope Protection			
			Nalla Bed			
			Parapet / Railing			
			Expansion Joint			
			Wearing Coat / Surface			
			Approach Slope			
			Drainage			
27	**428+762**	**PUP 12.0 m x 4.5 m**	**Age**			PUP is not constructed due to Land Acquisition issue. (Bhavpara Village)
			Foundation			
			Sub Structure Abutment / Pier			
			Super Structure			
			Bearing			
			Slope Protection			
			Nalla Bed			
			Parapet / Railing			
			Expansion Joint			

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat / Surface			
			Approach Slope			
			Drainage			
28	**432+134 (Under COS)**	**VUP 12.0 m x 5.5 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat/ Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
29	**433+276**	**Major Bridge - New - LHS & RHS**	**Age**	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	Pile Foundation	Pile Foundation	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	21 span PSC Gliders & RCC slab Footpath - Both side Condition - No problem	21 span PSC Gliders & RCC slab Footpath - Both side Condition - No problem	
			Bearing	POT-PTFE	POT-PTFE	
			Slope Protection	RCC return and CC Pitching with chute drain	RCC return and CC Pitching with chute drain	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
		9248 + 39600 + 39867 + 39415 + 39624 + 39620 + 39503 + 39678 + 39577 + 39605 + 39586 + 39591 + 39582 + 40306 + 39206 + 39623 + 39771 + 39717 + 39437 + 39831 + 39622 m	**Nalla Bed**	Clear	Clear	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Grating provided - clean	Grating provided - clean	
30	**434+974**	**Minor Bridge - LHS - New - Skew 10.75 + 10.77 + 10.73 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	
			Super Structure	RCC Solid Slab	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	RCC return - Toe wall CC Pitching is provided	RCC return - Toe wall CC Pitching is provided	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Grating provided - clean	Grating provided - clean	
31	**440+350**	**Minor Bridge -**	**Age**	New - 2 lane	-	The structure is in sound condition.
			Foundation	Open Foundation	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
		LHS - New - Skew 1 X 7.1 + 2 X 7.2 + 1 X 7.3 m	**Sub Structure Abutment / Pier**	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	RCC Solid Slab	-	
			Bearing	-	-	
			Slope Protection	RCC return - Toe wall CC Pitching is provided	-	
			Nalla Bed	Clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	Earthen side slope washed out, to be rectified	-	
			Drainage	Grating provided - clean	-	
32	**440+350**	**Minor Bridge-RHS-Widening-Skew 1 x 7.1 + 2 x 7.2 + 1 x 7.3 m**	**Age**	-	Widening - 2 lane	The structure is in sound condition.
			Foundation	-	Open Foundation	
			Sub Structure Abutment / Pier	-	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	-	RCC return - Toe wall CC Pitching is provided	
			Nalla Bed	-	Clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat / Surface	-	BC is in good condition	
			Approach Slope	-	Earthen side slope washed out, to be rectified	
			Drainage	-	Grating provided - clean	
33	**442+979 (Under COS)**	**VUP 12.0 m x 4.0 m**	**Age**	New - 2 lane	New - 2 lane	The structure is in sound condition
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat/ Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
34	**449+894**	**Minor Bridge - LHS - New 9.55 + 9.4 + 9.36 m**	**Age**	New - 2 lane	-	The structure is in sound condition.
			Foundation	Open Foundation	-	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	RCC Solid Slab	-	
			Bearing	-	-	
			Slope Protection	RCC return	-	
			Nalla Bed	Clear	-	
			Parapet / Railing	RCC railing with Crash Barrier -	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				No Problem		
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	Earthen side slope washed out, to be rectified	-	
			Drainage	Grating provided -Not clean	-	
35	**449+894**	**Minor Bridge - RHS - Widening 9.55 + 9.4 + 9.36 m**	**Age**	-	Widening - 2 lane	The structure is in sound condition.
			Foundation	-	Open Foundation	
			Sub Structure Abutment / Pier	-	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	-	RCC return	
			Nalla Bed	-	Clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	-	-	
			Wearing Coat / Surface	-	BC is in good condition	
			Approach Slope	-	Earthen side slope washed out, to be rectified	
			Drainage	-	Grating provided -Not clean	
36	**450+241**	**Minor Bridge - LHS - New 9.527 + 9.617 + 9.662 + 9.527 + 9.662 m**	**Age**	New - 2 lane	-	The structure is in sound condition.
			Foundation	Open Foundation	-	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	RCC Solid Slab	-	
			Bearing	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Slope Protection	RCC return wall - CC Pitching at A1 side & Earthen side slope at A2 side	-	
			Nalla Bed	Clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - No Problem	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	Stable in condition	-	
			Drainage	Grating provided - Not clean	-	
37	**450+241**	**Minor Bridge - RHS - Widening 9.527 + 9.617 + 9.662 + 9.527 + 9.662 m**	**Age**	-	Widening - 2 lane	The structure is in sound condition.
			Foundation	-	Open Foundation	
			Sub Structure Abutment / Pier	-	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	-	RCC return wall- Earthen side slope at A1 & A2 side	
			Nalla Bed	-	Clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - No Problem	
			Expansion Joint	-	-	
			Wearing Coat / Surface	-	BC is in good condition	
			Approach Slope	-	Stable in condition	
			Drainage	-	Grating provided - Not clean	
38	**455+195**	**Minor Bridge - LHS - Widening**	**Age**	Widening - 2 lane	-	
			Foundation	Open Foundation	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
		7.4 + 7.05+ 7.05 + 7.05 + 7.07 + 7.04 + 7.45 m	**Sub Structure Abutment / Pier**	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	-	The structure is in sound condition. Approach slab settled at A1 Kerb side. CC pitching damaged. The Concessionaire is repairing / rectifying the same as a part of routine maintenance.
			Super Structure	RCC Solid Slab	-	
			Bearing	-	-	
			Slope Protection	RCC return wall & CC Pitching- damaged	-	
			Nalla Bed	Clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	Stable in condition	-	
			Drainage	Grating provided -Not clean	-	
39	**455+195**	**Minor Bridge - RHS - New 7.4 + 7.05 + 7.05 + 7.05 + 7.07 + 7.04 + 7.45 m**	**Age**	-	New - 2 lane	The structure is in sound condition. CC pitching damaged. Gap in RCC railing. The Concessionaire is repairing / rectifying the same as a part of routine maintenance.
			Foundation	-	Open Foundation	
			Sub Structure Abutment / Pier	-	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	-	RCC return wall & CC Pitching	
			Nalla Bed	-	Clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - Footpath to be clean & Missing gap in RCC Railing	
			Expansion Joint	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat / Surface	-	BC is in good condition	
			Approach Slope	-	Settled approach slab @A1 Kerb side	
			Drainage	-	Grating provided -Not clean	
40	**456+533**	**Minor Bridge - LHS - Skew - New 10.6 + 10.6 + 10.8 + 10.6 + 10.65 m**	**Age**	New - 2 lane	-	The structure is in sound condition.
			Foundation	Open Foundation	-	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	RCC Solid Slab	-	
			Bearing	-	-	
			Slope Protection	RCC return wall & CC Pitching-damaged	-	
			Nalla Bed	Clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	Stable in condition	-	
			Drainage	Grating provided - Not clean	-	
41	**456+533**	**Minor Bridge - RHS - Skew Widening 10.6 + 10.6 + 10.8 + 10.6 + 10.65 m**	**Age**	-	Widening - 2 lane	
			Foundation	-	Open Foundation	
			Sub Structure Abutment / Pier	-	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	RCC Solid Slab	
			Bearing	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Slope Protection	-	RCC return wall top beam concreting balance at A2 side & CC pitching - damaged	The structure is in sound condition. Concreting of return wall at A2 side is pending. CC pitching damaged. Rain cuts developed. The Concessionaire is repairing / rectifying the same as a part of routine maintenance.
			Nalla Bed	-	Clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - Footpath to be clean	
			Expansion Joint	-	-	
			Wearing Coat / Surface	-	BC is in good condition	
			Approach Slope	-	Stable in condition	
			Drainage	-	Grating provided - Not clean	
42	**459+038**	**Minor Bridge - LHS - New 10.406 + 10.455 + 10.504 + 10.377 + 10.357 m**	**Age**	New - 2 lane	-	The structure is in sound condition.
			Foundation	Open Foundation	-	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	RCC Solid Slab	-	
			Bearing	-	-	
			Slope Protection	RCC return wall & CC Pitching-damaged	-	
			Nalla Bed	Clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	Rain cut developed, to be rectified	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Drainage	Grating provided -Not clean	-	
43	**459+038**	**Minor Bridge - RHS - Widening 10.406 + 10.455 + 10.504 + 10.377 + 10.357 m**	**Age**	-	Widening - 2 lane	The structure is in sound condition. CC pitching damaged. The Concessionaire is repairing / rectifying the same as a part of routine maintenance.
			Foundation	-	Open Foundation	
			Sub structure Abutment / Pier	-	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	-	CC Pitching@A1 side - damaged	
			Nalla Bed	-	Clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - Footpath to be clean	
			Expansion Joint	-	-	
			Wearing Coat / Surface	-	BC is in good condition	
			Approach Slope	-	Stable in condition	
			Drainage	-	Grating provided -Not clean	
44	**460+812**	**Minor Bridge - LHS - New 1 x 6.4 m**	**Age**	New - 2 lane	New - 2 lane	The condition is sound.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Condition - Satisfactory	Abutment RCC wall Type Condition - Satisfactory	
			Super Structure	RCC Solid Slab	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	RCC return wall & CC Pitching	RCC return wall & CC Pitching	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	RCC railing with Crash Barrier - Footpath to be clean	
			Expansion Joint	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided - Not cleared	Drain spout provided - Not cleared	
45	**462+447**	**Minor Bridge - LHS - Skew - Widening 4 X 7.0 m**	**Age**	Widening - 2 lane	-	The structure is in sound condition. CC Pitching at A1 side damaged. The Concessionaire is repairing / rectifying the same as a part of routine maintenance.
			Foundation	Open Foundation	-	
			Sub structure Abutment / Pier	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	RCC Solid Slab	-	
			Bearing	-	-	
			Slope Protection	RCC return wall & CC Pitching - damaged at A1 side	-	
			Nalla Bed	Clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	-	
			Approach Slope	Stable in condition	-	
			Drainage	Drain spout provided - Not cleared	-	
46	**462+447**	**Minor Bridge - RHS - Skew - New 4 x 7.0 m**	**Age**	-	New - 2 lane	
			Foundation	-	Open Foundation	
			Sub structure / Abutment / Pier	-	Abutment RCC wall Type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	RCC Solid Slab	
			Bearing	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Slope Protection	-	RCC return wall & CC Pitching - damaged at A1 & A2 side	The structure is in sound condition. CC Pitching at A1 & A2 side damaged. The Concessionaire is repairing / rectifying the same as a part of routine maintenance.
			Nalla Bed	-	Clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - Footpath to be clean	
			Expansion Joints	-	-	
			Wearing Coat Surface	-	BC is in good condition	
			Approach Slope	-	Stable in condition	
			Drainage	-	Drain spout provided -Not cleared	
47	**467+975**	**Flyover 2 x 15.0 m**	**Age**	New - 2 Lane	New - 2 Lane	The Structure is in sound condition. Crash barrier at A2 side of LHS is missing.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment - RE Block & RCC wall type Piers - RCC piers Condition - Satisfactory	Abutment - RE Block & RCC wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	2 Span RCC Girders and Slab Condition - No problem	2 Span RCC Girders and Slab Condition - No problem	
			Bearing	Bearing - Elastomeric	Bearing - Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Missing at A2 side	Crash Barrier - No Problem	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	-	-	
			Drainage	Drain spout not provided	Drain spout not provided	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
48	472+120 (Under COS)	CUP 7.0 m x 3.0 m	**Age**	New - 2 lane	New - 2 lane	The Structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall	Abutment RCC wall	
			Super Structure	RCC slab Box type	RCC slab Box type	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC parapet	RCC parapet	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided	Drain spout provided	
49	480+171	Minor Bridge - LHS - Widening 3 x 7.1 m	**Age**	Widening - 2 lane	-	The Structure is in sound condition.
			Foundation	Open Foundation	-	
			Sub structure/ Abutment / Pier	Abutment –RCC wall type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	3 Span RCC solid Slab Condition - No problem	-	
			Bearing	-	-	
			Slope Protection	RCC Return & CC pitching	-	
			Nalla Bed	clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	-	
			Expansion Joints	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat Surface	BC is in good condition	-	
			Approach Slope	Stable in condition	-	
			Drainage	Drain spout provided- cleared	-	
50	**480+171**	**Minor Bridge - RHS - New 3 x 7.1 m**	**Age**	-	New - 2 Lane	The Structure is in sound condition. Drain spout to be cleared. Footpath to be clean.
			Foundation	-	Open Foundation	
			Sub structure/ Abutment / Pier	-	Abutment - RCC wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	3 Span RCC solid Slab Condition - No problem	
			Bearing	-	-	
			Slope Protection	-	RCC Return & CC pitching	
			Nalla Bed	-	clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - Footpath to be clean	
			Expansion Joints	-	-	
			Wearing Coat Surface	-	BC is in good condition	
			Approach Slope	-	Stable in condition	
			Drainage	-	Drain spout provided- cleared	
51	**483+502**	**Minor Bridge LHS - New 4 x 5.3 m**	**Age**	New - 2 Lane	-	The structure is in sound condition.
			Foundation	Open Foundation	-	
			Sub structure/ Abutment / Pier	Abutment –RCC wall type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	4 Span RCC solid Slab Condition - No problem	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Bearing	-	-	
			Slope Protection	RCC Return & CC pitching	-	
			Nalla Bed	clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	-	
			Expansion Joints	-	-	
			Wearing Coat Surface	BC is in good condition	-	
			Approach Slope	Stable in condition	-	
			Drainage	Drain spout provided- cleared	-	
52	**483+502**	**Minor Bridge RHS - Widening 4 X 5.3 m**	**Age**	-	Widening - 2 lane	The structure is in sound condition.
			Foundation	-	Open Foundation	
			Sub structure / Abutment / Pier	-	Abutment –RCC wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	4 Span RCC solid Slab Condition - No problem	
			Bearing	-	-	
			Slope Protection	-	RCC Return & CC pitching	
			Nalla Bed	-	clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - Footpath to be clean	
			Expansion Joints	-	-	
			Wearing Coat Surface	-	BC is in good condition	
			Approach Slope	-	Stable in condition	
			Drainage	-	Drain spout provided- cleared	
53	**489+047**	**PUP**	**Age**	New - 2 lane	New - 2 lane	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
		12 m x 4.5 m		Service Road - Both side	Service Road - Both side	The structure is in sound condition.
			Foundation	Open Foundation	Open Foundation	
			Sub structure / Abutment / Pier	Abutment - RCC box type	Abutment - RCC box type	
			Super Structure	RCC slab	RCC slab	
			Bearing	-	-	
			Slope Protection	RE Block wall	RE Block wall	
			Nalla Bed	Road	Road	
			Parapet / Railing	RCC Parapet	RCC Parapet	
			Expansion Joints	Nil	Nil	
			Wearing Coat Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided- Not cleared	Drain spout provided- Not cleared	
54	**492+030**	**Minor Bridge - RHS - New 4 x 9.4 m**	**Age**	-	New - 2 lane	The structure is in sound condition.
			Foundation	-	Open Foundation	
			Sub structure / Abutment / Pier	-	Abutment - RCC wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	-	4 Span RCC solid Slab Condition - No problem	
			Bearing	-	-	
			Slope Protection	-	RCC Return & CC pitching	
			Nalla Bed	-	clear	
			Parapet / Railing	-	RCC railing with Crash Barrier - Damaged footpath at A2 side, to be repaired	
			Expansion Joints	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat Surface	-	BC is in good condition	
			Approach Slope	-	Stable in condition	
			Drainage	-	Drain spout provided- cleared	
55	**492+030**	**Minor Bridge LHS - Widening 4 x 9.4 m**	**Age**	Widening - 2 lane		The structure is in sound condition.
			Foundation	Open Foundation	-	
			Sub structure / Abutment / Pier	Abutment - RCC wall type Piers - RCC piers Condition - Satisfactory	-	
			Super Structure	4 Span RCC solid Slab Condition - No problem	-	
			Bearing	-	-	
			Slope Protection	RCC Return & CC pitching	-	
			Nalla Bed	clear	-	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	-	
			Expansion Joints	-	-	
			Wearing Coat Surface	BC is in good condition	-	
			Approach Slope	Stable in condition	-	
			Drainage	Drain spout provided- cleared	-	
56	**494+166**	**Minor Bridge - BHS - Widening 3 x 10.0 m**	**Age**	Widening - 2 lane	Widening - 2 lane	The structure is in sound condition.
			Foundation	Open Foundation	Open Foundation	
			Sub structure / Abutment / Pier	Abutment - RCC wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	3 Span RCC solid Slab	3 Span RCC solid Slab	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				Condition - No problem	Condition - No problem	
			Bearing	-	-	
			Slope Protection	RCC Return & CC pitching	RCC Return & CC pitching	
			Nalla Bed	clear	clear	
			Parapet / Railing	RCC railing with Crash Barrier - Footpath to be clean	RCC railing with Crash Barrier - Footpath to be clean	
			Expansion Joints	-	-	
			Wearing Coat Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Drain spout provided - Not cleared	Drain spout provided - Not cleared	

Figure 3-5 Photographs of Major Structures

Side View of ROB at km. 393+642 (RHS)

Vertical crack developed at A2 side at km. 393+642 - ROB (RHS)

Bottom View of ROB Girder at km. 393+642 (LHS)

Side View of ROB at km. 393.642 (LHS)

Side View of Major Bridge at km. 386+750 (RHS)

Bottom View of MJB Girder at km. 386+750 (RHS)

Mid Portion of MJB at km. 386+750

Wearing Coat of MJB at km. 386+750 (LHS)

Side View of Major Bridge at km. 388+760 (RHS)

Side View of Major Bridge at km. 388+760 (LHS)

Side View of Major Bridge at km. 389+295 (RHS)

Side View of Major Bridge at km. 389+295 (LHS)

Side View of Major Bridge at km. 395+255 (RHS)

Mid Portion of Major Bridge at km. 395+255

Wearing Coat of MJB at km. 395+255 (LHS)

Side View of Major Bridge at km. 420+180 (RHS)

Side View of Major Bridge at km. 420+180 (LHS)

Side View of Major Bridge at km. 422+314 (RHS)

Settled CC Pitching at A1 side of MJB at km. 422+314 (LHS)

Uneven Drain with footpath at A1 side of MJB at km. 422.314 (LHS)

Side View of Major Bridge at km. 422+314 (LHS)

Side View of Major Bridge at km. 415+929 (RHS)

Settled CC Pitching at A2 side of MJB at km. 415+929 (RHS)

Rain cuts developed at A2 side at MJB at km. 415+929 (RHS)

Side View of Major Bridge at km. 415+929 (LHS)

Side View of MJB - Widening at km. 420+180 (LHS)

Top View of MJB - Widening at km. 420+180 (LHS)

Side View of MJB - New at km. 433+276 (LHS)

Bottom of MJB - New at km. 433+276 (LHS)

Major Bridge - km. 433+295 (LHS) Wearing Coat

Major Bridge - km. 433+295 (RHS) side view

Major Bridge - km. 433+295 (RHS) Footpath settled

Minor Bridge at km. 406+170 (RHS) - Widening - Wearing Coat

Side view of Minor Bridge at km. 406+170 (RHS) - Widening

Minor Bridge at km. 406+880 (RHS) - Widening - Wearing Coat

Side view of Minor Bridge at km. 406+880 (RHS) - Widening

Minor Bridge at km. 427+321(RHS) - Widening - Wearing Coat

Side view of Minor Bridge at km. 427+321 (LHS) - Widening

Side view of Minor Bridge at km. 434+974 (RHS) - Widening

Side view of Minor Bridge at km. 434+974 (LHS) - Widening

Side View of Minor Bridge at km. 440+350 (RHS) - Widening

Side View of Minor Bridge at km. 440+350 (RHS) - Widening

Side View of Minor Bridge at km. 440+350 (LHS) - New

Side View of Minor Bridge at km. 440+350 (LHS) - Rain cut developed

Bottom of Minor Bridge at km. 449+894 (LHS) - New

Side View of Minor Bridge at km. 449+894 (RHS) - Widening

Side View of Minor Bridge at km. 449+894 (LHS) - New

Side View of Minor Bridge at km. 450+241(RHS) - Widening

Side View of Minor Bridge at km. 450+241(LHS) - New - Approach settled

Side View of Minor Bridge at km. 450+241(LHS) - New

Bottom of Minor Bridge at km. 455+195 (BHS)

Bottom of Minor Bridge at km. 455+195 (RHS)

Side View of Minor Bridge at km. 455+195 (LHS) - Missing railing

Return wall beam pending of MNB at km. 456+533 (RHS)

Damaged CC Pitching of MNB at km. 456+533 (BHS) on Both end

Side View of Minor Bridge at km. 456+533 (LHS) - New

Side View of Minor Bridge at km. 459+038 (LHS) - New

Side View of Minor Bridge at km. 459+038 (RHS) - Widening

Side View of Minor Bridge at km. 459+038 (LHS) - New - Approach settled

Side View of Minor Bridge at km. 460+812 (LHS) - New

Side View of Minor Bridge at km. 460+812 (RHS) - New

Side View of Minor Bridge at km. 462+447 (RHS) - Widening

Minor Bridge at km. 385+350 (LHS) - Under COS

Minor Bridge at km. 385+350 (RHS) - Under COS

Side View of Minor Bridge at km. 462+447 (LHS) - Widening

Mid Portion of Minor Bridge at km. 462+447 (LHS) - Widening

Side View of Minor Bridge at km. 480+171 (LHS) - Widening

Side View of Minor Bridge at km. 480+171 (RHS) - New

Side View of Minor Bridge at km. 483+502 (RHS) - Widening

Side View of Minor Bridge at km. 483+502 (LHS) - Widening

Side View of Minor Bridge at km. 492+030 (RHS) - New - Footpath damaged

Side View of Minor Bridge at km. 492+030 (RHS) - New

Side View of Minor Bridge at km. 492+030 (LHS) - Widening

Side View of Minor Bridge at km. 494+166 (RHS) - Widening

Side View of Minor Bridge at km. 494+166 (LHS) - Widening

VUP at km. 432+050 (RHS) - Skew (Miyani) under COS

VUP at km. 432+050 (LHS) - Skew (Miyani) under COS

VUP at km. 432+050 (LHS) - (Miyani) under COS - RE Block Wall at A1 side

VUP at km. 432+050 (LHS) - (Miyani) under COS - RE Block Wall at A2 side

VUP at km. 400+681 (LHS)

VUP at km. 400+681 (RHS)

VUP at km. 400+681 (RHS) at A1 side

VUP at km. 400+681 (LHS) at A1 side

VUP at km. 400+681 (LHS) at A1 side

VUP at km. 397+096 (RHS) - Skew - A1 side

VUP at km. 397+096 (RHS)

VUP at km. 397+096 (LHS) - Skew - A1 side

VUP at km. 397+096 (LHS)

VUP at km. 396+865 (Bottom)

VUP at km. 396+865 (LHS)

VUP at km. 396+865 (RHS)

VUP at km. 396+865 (RHS) - A1 side

VUP at km. 393+695 (LHS)

VUP at km. 393+695 (RHS)

VUP at km. 393+616 (LHS)

LVUP at km. 488+981 (RHS) - Under COS

VUP at km. 393+695 (LHS)

VUP at km. 393+695 (RHS)

VUP at km. 393+616 (LHS)

LVUP at km. 488+981 (RHS) - Under COS

LVUP at km. 381+600 (RHS) - Under COS

LVUP at km. 381+600 (LHS) - Under COS

LVUP at km. 422+750 (LHS) - Under COS

LVUP at km. 488+981 (LHS) - Under COS

LVUP at km. 422+750 (RHS) - Under COS

3.8 Condition Survey of Culverts

The cross-drainage structures include hume pipe culverts, box culverts and slab culverts at various locations. There are 196 Nos. of pipe culverts, 30 Nos. of box culverts along the project road. The height of culvert varies from 1.0 m to 3.0 m from bed level. During the condition survey, these culverts were inspected on sample basis.

The project involves strengthening and widening of existing road to four lane divided carriageway. The culverts beneath existing alignment are either widened or reconstructed. The structural condition of culverts is generally found in sound condition. The quality of surface concrete of box culverts and slab culverts is found to be satisfactory. The RCC parapet, metal beam crash barrier or RCC railing has been provided at culvert locations, which is maintained properly.

Vegetation growth and accumulation of debris at waterway is being removed and cleaned by the Concessionaire on regular basis.

Figure 3-6 Photographs of Culverts

Slab culvert at km. 439+458 (LHS)

Slab culvert at km. 439+458 (RHS)

Slab culvert at km. 441+648 (LHS)

Slab culvert at km. 441+648 (RHS)

Slab culvert at km. 444+062 (LHS)

Slab culvert at km. 444+062 (RHS)

Slab culvert at km. 475+860 (LHS)

Slab culvert at km. 475+860 (RHS)

HPC at km. 380+328 (LHS)

HPC at km. 380+328 (RHS)

HPC at km. 391+096 (LHS)

HPC at km. 391+096 (RHS)

HPC at km. 437+025 (LHS)

HPC at km. 437+025 (RHS)

HPC at km. 456+200 (LHS)

HPC at km. 456+200 (RHS)

HPC at km. 487+054 (LHS)

HPC at km. 487+054 (RHS)

HPC at km. 490+350 (LHS)

HPC at km. 490+350 (RHS)

HPC at km. 437+025 (LHS)

HPC at km. 437+025 (RHS)

HPC at km. 409+195 (LHS)

HPC at km. 409+195 (RHS)

HPC at km. 487+054 (LHS)

HPC at km. 487+054 (RHS)

HPC at km. 490+350 (LHS)

HPC at km. 490+350 (RHS)

3.9 Drainage System

There are RCC box drains at built-up areas and earthen drains at rural areas provided for the project stretch. Lined median longitudinal drain is provided at super-elevated sections. The roadside drainage along the project highway as well as lined drains at median portion needs to be maintained by cleaning debris on regular basis. Some of the photographs of the drains provided are presented as below.

Figure 3-7 Photographs of Drains provided

Built up drain from km. 489+000 to km. 490+000 (LHS)

Built up drain from km. 489+000 to km. 490+000 (RHS)

Median longitudinal drain from km. 483+000 to km. 484+000

Median longitudinal drain from km. 472+000 to km. 473+000

Built-up drain from km. 467+601 to km. 468+347 (RHS)

Built-up drain from km. 467+601 to km. 468+347 (LHS)

Built-up drain from km. 400+319 to km. 400+700 (LHS)

Built-up drain from km. 400+319 to 400+700 (LHS)

Built-up drain from km. 396+499 to km. 397+466 (RHS)

Built-up drain from km. 396+499 to km. 397+466 (LHS)

Built-up drain from km. 390+177 to km. 390+953 (RHS)

Built-up drain from km. 390+170 to km. 390+953 (LHS)

3.10 Slope Protection Measures

Slope protection for high embankment of height greater than 3 m has not been provided with stone pitching although at few locations turfing has been provided for height up to 3 m. At many places, rain cut found at slope section which needs to be rectified on priority basis. Some of the photographs of slope are presented as below.

Figure 3-8 Photographs of Slope Protection Works

MJB at km. 415+929 (RHS)

MJB at km. 415+929 (RHS)

MJB at km. 415+929 (RHS)

MJB at km. 474+405 (RHS)

MJB at km. 487+054 (RHS)

MJB at km. 456+533 (RHS)

From km. 492+000 to km. 493+000 (RHS)

From km. 487+000 to km. 488+000 (LHS)

From km. 476+000 to km. 477+000 (RHS)

From km. 469+000 to km. 470+000 (LHS)

From km. 466+000 to km. 467+000 (RHS)

From km. 466+000 to km. 467+000 (LHS)

From km. 454+000 to km. 455+000

From km. 443+000 to km. 444+000 (RHS)

From km. 443+000 to km. 444+000 (LHS)

From km. 408+000 to km. 409+000 (RHS)

From km. 408+000 to km. 409+000 (LHS)

From km. 384+000 to km. 385+000 (RHS)

3.11 Road Furniture

Pavement Marking

Pavement marking for the project highway is done as per the design standards indicated in section 12 of Schedule-D. Pavement marking work found in progress wherever marking has become faded. Some of the photographs of road marking are presented below.

Figure 3-9 Photographs of Road Markings

RHS

km. 495+000

km. 462+300

km. 459+500

km. 441+520

km. 487+900

km. 468+347

LHS

km. 418+700

km. 385+350

km. 388+550

km. 465+000

km. 474+400

km. 433+500

Road Studs

Road studs for the project highway is done as per the design standards indicated in section 12 of the manual as specified in Schedule-D. Road studs have been fixed at junction & at pedestrian crossings. However, at few locations some studs have damaged which are being rectified / replaced. Some of the photographs of road studs are presented below.

km. 483+800

km. 421+000

Traffic signage / Median kerb painting / Kilometer Stone

Traffic signs includes roadside signs, overhead signs, kerb mounted signs and median signs along the project highway. The design for the traffic signs along the project highway is done as per the design standards indicated in section 11 of the manual as specified in Schedule-D.

The height, lateral clearance, location and installation are as per relevant clauses of manual as specified in Schedule-D. Overhead sign has been installed ahead of major intersections, toll plazas, start / end of project highway and urban areas as per detailed design requirements.

Kilometre stones, vertical post of sign boards, chevron boards & median kerb paint are faded at few locations. Concessionaire needs to rectify the same. Some of the photographs of sign boards are presented below.

Figure 3-10 Photographs of Road Sign Boards

km. 495+600

km. 495+000

km. 454+200

km. 450+500

km. 451+800

km. 445+780

km. 433+295

km. 422+850

km. 379+100

km. 495+000

km. 465+000

km. 420+000

km. 419+500

km. 421+200

km. 472+000 to km. 473+000

km. 465+000 to km. 466+000

km. 452+000 to km. 453+000

km. 489+000 to km. 490+000

km. 397+800

km. 480+000

km. 461+000

km. 435+000

km. 493+000 to km. 494+000

km. 403+600

km. 430+400

km. 483+000 to km. 484+000

km. 426+000

km. 480+171

km. 480+171

km. 461+000

km. 434+400

km. 389+700

km. 396+200

km. 445+500

km. 494+700

km. 462+500

Highway Lighting

Highway lighting is provided at underpasses, flyovers, toll plaza, ROBs and built-up locations. High mast lighting is provided at both toll plaza locations.

At underpass and flyover locations, highway lighting is provided at the structure locations and at its approaches.

Solar amber blinker signals are provided at each median opening locations. These lights are properly maintained and are in good working condition. Regular maintenance work is carried out to ensure their efficient operation. Some of the photographs of highway lightings are presented below.

Figure 3-11 Photographs of Highway Lighting

km. 489+000 to km. 490+000

PUP Lighting

km. 467+000 to km. 468+000

km. 422+850

km. 421+000

km. 390+000 to km. 391+000

km. 491+575

km. 486+600

km. 443+780

Crash Barriers

Metal beam crash barriers are provided at bridge approaches, locations of high embankment and sharp curves. At few locations, crash barriers provided are damaged which are being rectified. Some of the photographs of metal beam crash barriers are presented below.

Figure 3-12 Photographs of Crash Barriers

km. 494+000 to km. 495+000 (RHS)

km. 456+533 (RHS)

km. 434+200 (RHS)

km. 416+000 to km. 417+000 (RHS)

km. 389+295 (RHS)

km. 422+500 (LHS)

km. 459+038 (LHS)

km. 434+400 (LHS)

km. 475+200 (LHS)

km. 427+321 (LHS)

Delineators

The traffic delineators are provided by Concessionaire for road users in abnormal condition of weather in the project highway. The same is maintained by the Concessionaire. Some of the photographs of delineators are presented below.

Figure 3-13 Photographs of Delineator

km. 389+900 (LHS)

km. 411+500 (LHS)

km. 416+800

km. 426+800 (LHS)

km. 391+100 (LHS)

Pedestrian Guard Rail

The pedestrian guard rails are provided at the locations of bus shelters. The same is maintained by the Concessionaire. Some of the photographs of pedestrian guard rails are presented below.

Figure 3-14 Photographs of Pedestrian Guard Rail

km. 432+050 (LHS)

km. 432+050 (RHS)

km. 421+000 (LHS)

km. 421+000 (RHS)

Road Land Boundary

Road land (ROW) boundary demarcation is maintained by the Concessionaire on the project highway during the concession period. During the site visit, road land boundary pillars found maintained. However, the ROW pillars are being fixed at missing locations. Some of the photographs of road boundary pillars are presented below.

Figure 3-15 Photographs of Road Land Boundary

km. 486+200 (RHS)

km. 494+000 to km. 495+000 (RHS)

km. 435+000 (RHS)

km. 483+500 (LHS)

km. 435+000 (LHS)

km. 427+321 (LHS)

3.12 Avenue Plantation and Median Plantation

Median Plantation is available all along the project highway whereas avenue plantation is missing at most of the project stretch. Variety of shrubs and flowering plants are planted throughout the corridor at median. Median plantation is maintained in good condition. The plantation is being done wherever required on regular basis. Some of the photographs of median plantation are presented below.

Figure 3-16 Photographs of Avenue and Median Plantation

km. 379+000 to km. 380+000

km. 486+000 to km. 487+000

km. 483+000 to km. 484+000

km. 467+000 to km. 468+000

km. 465+000 to km. 466+000

km. 451+000 to km. 452+000

3.13 Project Facilities

Toll Plaza

As per Concession Agreement, the Concessionaire shall require to construct 2 Nos. of Toll Plaza along the project highway. Accordingly, Concessionaire has constructed 2 Nos. of Toll Plazas at following locations.

1. Toll Plaza-1 at km. 409+500

The construction of toll plaza is completed and is in operation. 10 (5+5) Nos. of lanes has been constructed and all are under operation. Concessionaire has constructed administration, operation and maintenance facility at base camp. All required facilities are available at the toll plaza. Some of the photographs of toll plaza-1 are presented below.

Figure 3-17 Photographs at Toll Plaza-1

Toll Plaza

Administrative Building

Crane

Ambulance

DG Set

Panel / Pump Room

PTZ camera

Resident Quarter

Static Weigh Bridge

High mast

Highway Aid / Medical Room

Toilet

2. Toll Plaza-2 at km. 470+875

The construction of toll plaza is completed and is in operation. 10 (5+5) Nos. of lanes has been constructed and all are under operation. Concessionaire has constructed administration, operation and maintenance facility at base camp. All required facilities are available at the toll plaza. Some of the photographs of toll plaza-2 are presented below.

Figure 3-18 Photographs at Toll Plaza-2

Toll Plaza

Administrative Building

Crane

Ambulance

DG Set

Panel / Pump Room

Static Weigh Bridge

PTZ camera

High Mast

Highway Aid / Medical Room

Toilet

Resident Quarter

Truck Lay Byes

As per Concession Agreement, there is no scope for construction of truck lay bye along the project highway.

Bus Bay and Passenger Shelter:

Bus bays and passenger shelters are constructed at the various locations along the project highway. There are total 04 Nos. of bus bays with passenger shelters are provided along project highway. Bus bays are equipped with all necessary signage as per relevant IRC guidelines and as per specifications as mentioned in Schedule-D of Concession Agreement. The details of the bus bays and passenger shelters are provided as below.

Table 3-9 Details of Bus Bays along Project Highway

Sr. No.	Design Chainage (km)		Junction Name	Remarks
	Left	Right		
1	420.987	420.987	Visawada	Chainages given in photographs are as per site condition
2	431.786	431.786	Miyami Bandar	Chainages given in photographs are as per site condition

Figure 3-19 Photographs of Bus Bay

km. 432+050 (LHS)

km. 432+050 (RHS)

km. 421+000 (RHS)

km. 421+000 (LHS)

4 PAVEMENT AND SITE INVESTIGATION

4.1 General

The project has been developed through Public Private Partnership (PPP) on Hybrid (Annuity) mode basis. The concession period of the project is 18 years including 3 years (1095 days) of construction period.

The Provisional Completion Certificate (PCOD) for the length of 100.977 kms has been received on 18th April 2020 and the Final Completion Certificate (COD) for the total length of project highway i.e., 117.748 kms is achieved as on 13th October 2021. The project is currently under O&M stage. The operation period of the project highway is 15 years from COD.

4.2 Details of As-built Pavement

The project highway comprises of rigid pavement (from km. 379+100 to km. 493+850 of 114.750 kms) and flexible pavement (from km. 493+850 to km. 496+848 of 2.998 kms) on main carriageway. The details of the as built pavement crust from pavement design report as submitted by the Company has been tabulated as below:

The rigid pavement is designed for the design life of 30 years and 8% CBR with specifications as per IRC:58-2015.

Table 4-1 Rigid Pavement Details

Location	Panel Size	Crust (mm)	Dowel bar	Tie bar
Main Carriageway (from km. 379+100 to km. 493+850)	Type-1 Panel Size: 4.5 m x 4.5 m (For TCS 1, 2, 3, 4 and 5)	PQC - 300 DLC - 150 GSB - 150	32 mm dia. Spacing - 300 mm, Length - 450 mm	12 mm dia. Spacing - 600 mm, Length - 640 mm
	Type-2 Panel Size: 4.5 m x 4.0 m (For TCS 6)			12 mm dia. Spacing - 680 mm, Length - 640 mm

The flexible pavement is designed for the design life of 15 years for design traffic of 10 msa and 8% CBR as per specifications of IRC:37-2012. The details of as built flexible pavement have been given below:

Table 4-2 Flexible Pavement Details

Location	Crust Composition	Thickness at widening section (mm)	Thickness at overlay section (mm)
Main Carriageway (from km. 493+850 to km. 496+848)	BC (VG-30)	50	50
	DBM (VG-30)	50	Existing BT & Granular layer
	WMM	200	
	GSB	200	

The service / slip road pavement is designed for the design life of 15 years for design traffic of 10 msa and 8% CBR as per specifications of IRC:37-2012.

Table 4-3 Service / Slip Road Pavement Details

Crust Composition	Thickness (mm)
BC (VG-30)	40
DBM (VG-30)	60
WMM	200
GSB	200

4.3 Surveys and Investigation

4.3.1 Pavement Condition Survey

Pavement condition survey was carried out from **3rd August 2022 to 7th August 2022** through visual inspection for the entire project length. The details of the visual condition survey are provided in **Annexure-IV.**

The summary of pavement condition based on the visual inspection is as tabulated below.

Table 4-4 Summary of Pavement Condition (MCW)

Sr. No.	Chainage (km)		Length (km)	Visual Condition (As per IRC: 115-2014)	
	From	To		LHS Carriageway	RHS Carriageway
1	379+100	380+000	0.900	Good	Good
2	380+000	381+000	1.000	Good	Good
3	381+000	382+000	1.000	Good	Good
4	382+000	383+000	1.000	Fair	Good
5	383+000	384+000	1.000	Good	Good
6	384+000	385+000	1.000	Good	Good
7	385+000	386+000	1.000	Good	Good
8	386+000	387+000	1.000	Good	Good
9	387+000	388+000	1.000	Good	Good
10	388+000	389+000	1.000	Good	Good
11	389+000	390+000	1.000	Good	Good
12	390+000	391+000	1.000	Good	Good
13	391+000	392+000	1.000	Good	Good
14	392+000	393+000	1.000	Good	Good
15	393+000	394+000	1.000	Good	Good
16	394+000	395+000	1.000	Good	Good
17	395+000	396+000	1.000	Good	Fair
18	396+000	397+000	1.000	Good	Good
19	397+000	398+000	1.000	Good	Good
20	398+000	399+000	1.000	Good	Good
21	399+000	400+000	1.000	Good	Good
22	400+000	401+000	1.000	Fair	Good
23	401+000	402+000	1.000	Good	Good
24	402+000	403+000	1.000	Good	Good
25	403+000	404+000	1.000	Good	Good
26	404+000	405+000	1.000	Good	Good
27	405+000	406+000	1.000	Good	Good
28	406+000	407+000	1.000	Good	Good
29	407+000	408+000	1.000	Good	Good
30	408+000	409+000	1.000	Good	Good
31	409+000	410+000	1.000	Good	Good

Sr. No.	Chainage (km)		Length (km)	Visual Condition (As per IRC: 115-2014)	
	From	To		LHS Carriageway	RHS Carriageway
32	410+000	411+000	1.000	Good	Fair
33	411+000	412+000	1.000	Good	Good
34	412+000	413+000	1.000	Good	Good
35	413+000	414+000	1.000	Good	Good
36	414+000	415+000	1.000	Good	Good
37	415+000	416+000	1.000	Good	Good
38	416+000	417+000	1.000	Good	Good
39	417+000	418+000	1.000	Good	Good
40	418+000	419+000	1.000	Good	Good
41	419+000	420+000	1.000	Good	Poor
42	420+000	421+000	1.000	Good	Good
43	421+000	422+000	1.000	Fair	Good
44	422+000	423+000	1.000	Good	Good
45	423+000	424+000	1.000	Good	Good
46	424+000	425+000	1.000	Good	Fair
47	425+000	426+000	1.000	Good	Good
48	426+000	427+000	1.000	Good / Fair	Fair
49	427+000	428+000	1.000	Good	Good
50	428+000	429+000	1.000	Poor	Good
51	429+000	430+000	1.000	Good	Good
52	430+000	431+000	1.000	Good	Good
53	431+000	432+000	1.000	Good	Good
54	432+000	433+000	1.000	Good	Fair
55	433+000	434+000	1.000	Good	Good
56	434+000	435+000	1.000	Good	Good
57	435+000	436+000	1.000	Good	Good
58	436+000	437+000	1.000	Good	Good
59	437+000	438+000	1.000	Good	Good
60	438+000	439+000	1.000	Good	Good
61	439+000	440+000	1.000	Fair	Good
62	440+000	441+000	1.000	Good	Good
63	441+000	442+000	1.000	Good	Good
64	442+000	443+000	1.000	Good	Good
65	443+000	444+000	1.000	Good	Good
66	444+000	445+000	1.000	Good	Good
67	445+000	446+000	1.000	Good	Good
68	446+000	447+000	1.000	Fair	Good
69	447+000	448+000	1.000	Good	Good
70	448+000	449+000	1.000	Good	Good
71	449+000	450+000	1.000	Good	Good
72	450+000	451+000	1.000	Good	Good
73	451+000	452+000	1.000	Good	Good
74	452+000	453+000	1.000	Poor	Good
75	453+000	454+000	1.000	Good	Fair
76	454+000	455+000	1.000	Good	Good
77	455+000	456+000	1.000	Good	Good
78	456+000	457+000	1.000	Fair	Good
79	457+000	458+000	1.000	Good	Good
80	458+000	459+000	1.000	Good	Good
81	459+000	460+000	1.000	Good	Good
82	460+000	461+000	1.000	Good	Good

Sr. No.	Chainage (km)		Length (km)	Visual Condition (As per IRC: 115-2014)	
	From	To		LHS Carriageway	RHS Carriageway
83	461+000	462+000	1.000	Good	Good
84	462+000	463+000	1.000	Good	Good
85	463+000	464+000	1.000	Good	Good
86	464+000	465+000	1.000	Good	Good
87	465+000	466+000	1.000	Fair	Good
88	466+000	467+000	1.000	Good	Good
89	467+000	468+000	1.000	Good	Good
90	468+000	469+000	1.000	Good	Good
91	469+000	470+000	1.000	Good	Good
92	470+000	471+000	1.000	Good	Good
93	471+000	472+000	1.000	Good	Good
94	472+000	473+000	1.000	Good	Good
95	473+000	474+000	1.000	Good	Good
96	474+000	475+000	1.000	Good	Good
97	475+000	476+000	1.000	Good	Good
98	476+000	477+000	1.000	Good	Good
99	477+000	478+000	1.000	Good	Good
100	478+000	479+000	1.000	Good	Good
101	479+000	480+000	1.000	Good	Good
102	480+000	481+000	1.000	Fair	Good
103	481+000	482+000	1.000	Good	Good
104	482+000	483+000	1.000	Good	Fair
105	483+000	484+000	1.000	Good	Fair
106	484+000	485+000	1.000	Good	Good
107	485+000	486+000	1.000	Good	Good
1108	486+000	487+000	1.000	Good	Good
109	487+000	488+000	1.000	Good	Fair
110	488+000	489+000	1.000	Good	Good
111	489+000	490+000	1.000	Good	Good
112	490+000	491+000	1.000	Good	Good
113	491+000	492+000	1.000	Good	Good
114	492+000	493+000	1.000	Good	Good
115	493+000	494+000	1.000	Fair	Good
116	494+000	495+000	1.000	Fair	Fair
117	495+000	496+000	1.000	Fair	Fair
118	496+000	497+000	1.000	Fair	Fair

Table 4-5 Summary of Pavement Condition (SR)

Sr. No.	Chainage (km)		Length (km)	Visual Condition (As per IRC:115-2014)		Remark
	From	To		LHS Carriageway	RHS Carriageway	
1	390+177	390+953	0.776	Fair	Fair	
2	396+499	397+466	0.967	Fair	Good / Fair	
3	400+319	401+051	0.732	Fair	Fair	LHS Partially executed
4	428+442	429+134	0.692	-	-	Not Executed due to LA
5	467+601	468+347	0.746	Good / Fair	Good / Fair	

Sr. No.	Chainage (km)		Length (km)	Visual Condition (As per IRC:115-2014)		Remark
	From	To		LHS Carriageway	RHS Carriageway	
6	488+654	489+346	0.692	Fair	Fair	
7	495+600	496+848	1.248	-	-	Not Executed due to LA
8	381+050	382+020	0.970	Fair	Fair	Under COS
9	387+920	388+560	0.640	Fair	Fair	Under COS
10	431+750	432+600	0.850	Fair	Fair	Under COS

Observation and Conclusion:

From the above table, it is observed that the overall pavement condition for the entire project stretch is found to be fair to good.

Following Photographs were taken at the time of visual pavement condition survey.

Figure 4-1 Photographs of Pavement Condition Survey

RHS

km. 496+848 to km. 493+850

km. 494+200

km. 487+600

km. 483+600

km. 482+350

km. 458+800

km. 493+850

km. 432+900

km. 419+950

km. 395+200

km. 467+601 to km. 468+347

km. 432+600 to km. 431+750

km. 400+319 to km. 401+050

km. 396+499 to km. 397+466

km. 390+177 to km. 390+953

km. 382+020 to km. 381+050

km. 490+800

km. 483+700

km. 458+800

km. 428+000

LHS

km. 382+400

km. 400+950

km. 421+100

km. 428+800

km. 428+100

km. 439+100

km. 446+400

km. 452+650

km. 456+200

km. 465+000

km. 481+000

km. 382+020 to km. 381+050

km. 388+560 to km. 387+920

km. 390+177 to km. 390+953

km. 396+499 to km. 397+466

km. 400+319 to km. 401+051

km. 432+600 to km. 431+750

km. 467+601 to km. 468+347

km. 488+654 to km. 489+346

km. 385+350

km. 404+000

km. 474+400

4.3.2 Roughness Index Test

Prior period report for the Roughness Index Test conducted by **Aadharshila Infratech Pvt. Ltd.** Dated **2nd April 2022** has been provided by the Concessionaire. This test was done using NSV on each direction (each lane) of the carriageway on project highway.

As per IRC:SP:16-2019, condition of pavement is categorised under:

Table 4-6 Roughness Values (BI Value - mm / km)

Sr. No.	Roughness Range (m/km)	Severity	Inner Lane (Lane-1) LHS Length (km)	Outer Lane (Lane-2) LHS Length (km)	Inner Lane (Lane-1) RHS Length (km)	Outer Lane (Lane-2) RHS Length (km)
1	Less than 2.81	Good	117.748	117.748	117.748	117.748
2	2.81 - 3.30	Fair	-	-	-	-
3	More Than	Poor	-	-	-	-

TDD Consultant's Observations:

TDD Consultants have visited the project site along with Mr. Manish, O&M In-charge and team to understand the status of project under O&M stage. Observations during site visit are as presented below:

1. During site visit, it has been observed that the Concessionaire, Porbandar Dwarka Expressway Pvt. Ltd. (PDEPL) is carrying out O&M activities at site except collection of toll which is being done by M/s Coral Associates Pvt. Ltd. appointed by Authority.
2. As informed by Concessionaire, O&M office is established at Porbandar and site mobile team offices is at TP-1 & TP-2.
3. At few locations, concrete panel of MCW has been settled i.e., at km. 419+700 (RHS), LHS km. 452+650 (LHS) and km. 456+200 (LHS) and between km. 465+000 to 466+000.
4. Water logging found on MCW between km. 428+000 to km. 429+000 and at km. 428+100.
5. Service roads exist only at structure locations.
6. Water logging found on service road between km. 381+000 to km. 382+200.
7. Service road & MCW are not maintain as per O&M agreement.
8. Thermoplastic paint on MCW and SR, has become faded at many locations.
9. Delineators has got rusted at many locations.
10. At few locations, solar blinker are not working.
11. Lots of debris found on service road near Miyami Bandar junction.
12. At many locations, MBCB has broken or missing or settled.
13. On flexible pavement, crocodile cracks and rutting found on both side.
14. Sealant are missing at many locations on MCW.
15. Except few locations, all sign boards post have got rusted.
16. At few locations, drain has been settled on service road i.e., between km. 467+601 to 468+347.
17. It has been observed that overall condition of all structures is sound. However, vegetation, bushes and waterway need to be cleaned in minor bridges, pipe & box culverts as well as chute drain need to be clean from debris / vegetation. Few chainages are as MJB - km. 422+314 at A1 side, VUP - km. 400+681 at A1 side, MJB - km. 397+096 at A2 side & ROB - km. 393+642 - BHS etc.,
18. All drainage vent provided in structures found in block condition.
19. At many locations expansion joints found fill of soil or debris as well as found covered with BT material at MNB km. 425+638 (LHS) & MNB km. 427+321 (RHS) also vegetation found inside slopes, parapet wall & structures.
20. Vertical cracks found at A2 side RE wall / Block - RHS near abutment wall at ROB km. 393+642.
21. Honeycombing found at edge of crash barrier of PUP km. 488+981.
22. Some portion of crash barrier is pending A2 side in LHS at Flyover km. 467+975.
23. It is observed that damaged CC pitching need to be repaired at MNB at km. 455+195 - BHS, MNB at km. 456+533 - RHS, MNB at km. 462+447 - BHS, MJB at km. 415+929 -BHS.
24. A settlement in approach slab / approach road at MNB - km. 455+195 at A1 side of LHS, MNB - km. 492+030 at A2 side RHS found.
25. Gap between RCC Railing at MNB - km. 455+195 and concreting of return wall final beam at A2 side of RHS is balance.
26. Stone pitching and MBCB may be done on high embankment area in the interest of carriageway protection and road users safety.

However, the Concessionaire is repairing / rectifying the damaged portion on regular basis as a part of routine maintenance.

5 BALANCE WORKS

5.1 Introduction

The project has received Completion certificate (COD) on 13th October 2021 with undertaking for completion of minor balance works. As instructed by the Authority to the Concessionaire with Letter No. NHAI/2018/PIU-Rajkot/Por.Dwarka/Tech./Vol.24/F-23/D-1379 dated 16.10.2021, "Issues related with the prevailing hindrances at few scattered locations in Project Highway have been taken up with the District Administration and likely to be resolved as an early date. In this regard, the Concessionaire hereby undertakes to complete such works for the augmentation of Project Highway during the O&M period after removal of hindrance at the Project Site without claiming any additional cost on account of this work. In view of the above, the earlier proposal submitted by the Concessionaire for the negative Change of Scope may not be considered at this stage."

Following balance work is to be completed by the Concessionaire as and when the hindrances are removed.

1. Main Carriageway from km. 455+598 to km. 455+636 (LHS) has been constructed with a reduced width of 4.5 m (instead of 9 m) and from km. 428+570 to km. 428+960 (BHS) the main carriageway has been constructed with reduced width of 2 x 7 m (instead of 2 x 9 m). The Concessionaire has provided MBCB barricading and other safety measures at these locations.

2. Service road length of 0.440 kms, lined drain in length 2.665 kms, earthen drain in length of 0.428 kms, minor junctions at 16 locations, hectometre stones at 7 locations, boundary stones at 87 locations, avenue plantation at 10 locations, traffic signs at 24 locations and highway lighting at 3 locations could not be completed.

3. At km. 455+320 (RHS), due to land constraint and to match the profile with the profile of existing bridge, the vertical profile of the project highway has been designed for 100 kmph design speed with SSD.

4. From km. 455+300 to km. 456+000, due to land constraint, the width of the median has been reduced to 2.0 m against the specified width of 4.5 m.

6 REVIEW OF CONCESSION AGREEMENT

6.1 General

The National Highways Authority of India (NHAI) in accordance with the statutory powers vested on it by the Government of India has entered into a Concession Agreement with the M/s. Porbandar Dwarka Expressway Private Limited, a Special Purpose Vehicle (SPV) formed for implementing this project, a company incorporated under Indian Companies Act, 2013 for Design, Engineering, Construction, Development, Operation and Maintenance of the 4-Laning of Porbandar Dwarka Section of NH-8E from km. 379+100 to km. 496+848 in the State of Gujarat. The project is to be developed on Design, Build, Operate and Transfer on DBOT Annuity basis.

6.2 Specific Comments on Articles

We have reviewed the provisions under various clauses of the Agreement and our specific comments are indicated below clause-wise.

Sr. No.	Article and Clause No.	Description in brief	Remark
1	Definitions O&M	O&M means the operation and maintenance With provision of this Agreement.	The Operation and Maintenance is defined.
2	Definitions O&M	"O&M Expenses" means expenses incurred by the concessionaire, O&M Contractor or on behalf of the Concessionaire or by the Authority, as the case may be, for all O&M including (a) cost of salaries and other compensation to employees, [b] cost of materials, supplies, utilities and other services, (c) premier for insurance, (d) all taxes, duties, cess and fees due and payable for O&M, (e) all repair, replacement, reconstruction, reinstatement, improvement and maintenance costs, if payments required to be made under the O&M Agreement or any other contract in connection with or incidental to O&M, and is) all other expenditure required to be incurred under Applicable Laws, Applicable Permits or this Agreement.	The items which includes the expenses is explained.
3	Article 2 Scope of Project	2.1 Scope of Project The scope oi the Project [the "Scope of the Project") shall mean and include during Concession Period: (b) operation and maintenance of-the Project in accordance with the provisions of this Agreement	The O&M of road after COD is in scope of Concessionaire as per specifications & standards of Agreement.
4	Article 3 Gran of Concession	3.1 The Concession	The Operation and Maintenance period of Highway is 15 years from COD as per provision in CA.

Sr. No.	Article and Clause No.	Description in brief	Remark
		3.1.1 Subject to and in accordance with the provisions of this Agreement, Applicable laws and Applicable Permits, the Authority hereby grants to the Concessionaire the forth herein including the exclusive right, license and authority to construct, operate and maintain the Project (the "Concession" during the Construction Period of 1095 (one thousand and ninety five) days and Operation Period of 15 [Fifteen] years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.	
5	Article 5 Clause 5.3 Obligations relating to Change in owner	5.3.1 The Concessionaire shall not undertake or permit any Change in Ownership, except with the prior written approval of the Authority.	The project has received Completion Certificate.
6	Article 8 Disclaimer	Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the Authority shall not be liable in any manner for such risks or the consequences thereof.	The project has received Completion Certificate.
7	Article 9 Performance Security	9.1.1 The Concessionaire shall. for the performance of its obligations hereunder, provide to the Authority no later than 30 (thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank for Sum equivalent to Rs 80 crore (Rupees Eighty crore only) in the form set forth in Schedule-F (the "Performance Security")	The project has received Completion Certificate.
8	Article 17 17.1 O&M obligations of the Concessionaire	17.1.1 During the Operation Period, the Concessionaire shall operate and maintain the Project in accordance with this Agreement either by Itself, or through the O&M Contractor and if required, modify, repair or otherwise make improvements to the Project to comply with the previsions of this Agreement, Applicable Laws and Applicable Permits, and conform to Specifications and Standards and Good Industry Practice. The obligations of the Concessionaire hereunder shall include: (a) Procuring and ensuring safe. smooth and uninterrupted use of the Project, including prevention of loss or damage thereto, during normal operating conditions;	The responsibility of O&M is of Concessionaire as per provision of Agreement, standards and specifications. The Concessionaire has to take of safety. Routine periodically major maintenance is in scope.

Sr. No.	Article and Clause No.	Description in brief	Remark
		(b) Minimizing disruption in the event of accidents or other incidents affecting the safety and use of the Project by providing a rapid and effective response and maintaining liaison with emergency services of the State; (c) Carrying out periodic preventive maintenance of the Project; (d) undertaking routine maintenance including prompt repairs of potholes, cracks, joints, drains, embankments, structures, markings, lighting, signage and other control devices (e) Undertaking major maintenance such as resurfacing, repairs to structures, and repairs and refurbishment of system and equipment;	
9	Article 17 17.4 Maintenance Program	17.4.1 On or before COD and no later than 45 (forty live) days prior to the beginning of each Accounting Year during the Operation Period, as the case may be, the Concessionaire shall provide to the Authority and the independent Engineer, its. proposed annual program of preventive, urgent and other scheduled maintenance [the “Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Concessionaire has to work as per approved maintenance program for O&M works in operation period.
10	Article 17 17.5 Safety, breakdowns and accidents	The Concessionaire shall ensure sale conditions for the Users, and in the event of unsafe conditions, closures. diversions, breakdowns and accidents. it shall follow the relevant operating procedures including the setting up of temporary Lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good Industry Practice.	The safety of users of Highway is given priority.

Sr. No.	Article and Clause No.	Description in brief	Remark
11	Article 17 17.8	17.8.1 In the Event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% [two per cent] of the Performance Security, and (b) 0.1% [zero point one per cent of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of the Termination thereof.	The Concessionaire has to do the work as per requirement and scope of O&M to avoid action of damages and Termination.
12	Article 19 Monitoring of Operation and Maintenance	19.2 Inspection The Independent Engineer shall inspect the Project at least once a month. it shall make a report of such inspection {the "O&M Inspection Report") stating in reasonable detail the defects or deficiencies, if any. With particular reference to the Maintenance Requirements, Maintenance Manual, the Maintenance Program and Safety Requirements, and send a copy thereof to the Authority and the Concessionaire within 7 (seven) days of such inspection.	The regular inspection of maintenance work by IE will control the quality, progress & safety or work.
13	Article 20 20.1 Traffic regulation by the Concessionaire	The Concession shall regulate traffic on the Project in accordance with Applicable Laws, and subject to the supervision and control of the State authorities or a substitute thereof empowered in this behalf under Applicable laws.	The Concessionaire has to do the management of Traffic, medical aid to users of Highway with help of Police Medical Dept of Govt.

Sr. No.	Article and Clause No.	Description in brief	Remark
14	Article 23 Payment of Bid Project Cost	23.7.1 The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the Authority, which shall be computed on Rs. 5.97 crore (Rupees Flue (rare and ninety seven lakh only) (the "First Year O&M Cost in accordance with the provisions of this Clause 23.7 [the ”O&M Payments"). The Parties further acknowledge and agree that any O&M Expenses In excess of the O&M Payments shall be borne solely by the Concessionaire. save and except as expressly provided in this Agreement. For avoidance of doubt it is clarified that the 08M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.	The Concessionaire will he paid lumpsum Rs. 5.97 crores in form of Biannual payment during O&M period of O&M of activation.
15	Article 26 Insurance during Concession Period	26.1 The Concessionaire shall effect and maintain at its own cost. during the Construction Period and the Operation Period. such insurances for such maximum sums as may be required under the Financing Agreements and Applicable Laws, and Such insurances as may be necessary or prudent in accordance with Good industry Practice.	The safety, risk of Authority, Concessionaire, Lender is covered.
16	Article 31 Termination 31.1 Termination for Concessionaire Default	31.1.2 Without prejudice to any other rights or remedies which the Authority may have under this Agreement, upon occurrence of a Concessionaire Default, the Authority shall be entitled to terminate this Agreement by issuing Termination Notice to the Concessionaire; provided that before issuing the Termination Notice, the Authority shall by a notice inform the Concessionaire of its intention to issue such Termination Notice and grant 15 (fifteen) days to the Concessionaire to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation. issue the Termination Notice, subject to the provisions of Clause 31.1.3.	The Authority can terminate the default by Concessionaire. The default may be in maintenance Requirements as per clause 31.1.1 (d). Hence concessionaire needs to take care not doing any default during O&M period.

Sr. No.	Article and Clause No.	Description in brief	Remark
17	Article 38 Dispute Resolution 38.1 Arbitration	38.3.1 Any Dispute which is not resolved amicably by conciliation, as provided in Clause 38.2, shall be finally decided by reference to arbitration by an arbitral tribunal constituted in accordance with Clause 38.3.2. Such arbitration shall be held in accordance with the Rules of Society tor Affordable Redressal of Disputes (“SAROD"]. New Delhi (the “Rules"), or such other rules as may be mutually agreed by the Parties, and shall be subject to the previsions of the Arbitration and Conciliation Act, 1996.	There is provision of Arbitration for in case of unresolved issues or dispute between Authority and Concessionaire
18	Article 41 Miscellaneous	41.17 State Support Agreement The Concessionaire acknowledges that it has received from the Authority :1 certified true copy of the agreement executed between MORIH and the State Government for providing the support and services specified therein [the "State Support Agreement"). and the Parties hereto agree to make their best endeavors to procure the support of the State Government.	The Concessionaire will get support from state governments, Departments for O&M activities.

7 REVIEW OF O&M CONTRACT

The Operation and Maintenance Agreement was signed between **Porbandar Dwarka Expressway Private Limited (GPDEPL)** and **G R Infraprojects Limited (O&M Contractor)** on 13th October 2021 and addendum O&M Agreement has been signed on 26th July 2022 for a period of 1 year (from 1st April 2022 to 31st March 2023).

We have reviewed the provisions under various clauses of this O&M Contract and our specific comments are indicated below clause-wise.

Sr. No.	Clause No.	Description in Brief	Remark
1	Agreement Para (ii)	The Concessionaire now wishes to appoint M/s G R Infraproiects Limited for Operation and Maintenance of Project Highway as O&M Contractor in accordance with Scope of Work as mentioned in Annexure 1 hereto, under the Concession Agreement.	The Contractor M/s. G. R. Infraprojects Ltd. is appointed for O&M work as per scope in CA.
2	Clause 1 Definition	"O&M Contractor" means the person, if any, with whom the Concessionaire has entered into an O&M agreement for discharging O&M obligations for and on behalf of the Concessionaire.	The Contractor is appointed to discharge duties of O&M work on behalf of Concessionaire as per scope in O&M Agreement.
3	Clause 1 Definition	"O&M Period" O&M Agreement means operation and maintenance period of 1 year commencing from Commencement Date.	The Agreement of O&M is for one year and addendum is signed for another 1 year.
4	Clause 2 Availability of Documents	The O&M Contractor also acknowledges the fact that the Concession Agreement is always binding and applicable back to back on the O&M Agreement, limited to the obligations during the O&M period under the Concession Agreement and the scope of the O&M Contractor as per this Agreement. In case of any discrepancy in whatsoever matter, the clauses or' Concession Agreement shall prevail over and above this O&M Agreement.	The copy of Concession Agreement & Maintenance Manual is provided to Contractor. It is always binding to Contractor for implementation during O&M work.
5	Para 6 O&M Contractor's obligation	6.1 During Operation Period, provisions of Article 17 of the Concession Agreement shall apply. The O&M Contractor shall operate and maintain the Project Highway in accordance with Article 17 of the Concession Agreement and if required, modify, repair or otherwise make improvements to the Project Highway comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and confirm to Specifications and Standards and Good Industry Practice.	The obligation of O&M are as per Article 17 of CA.

Sr. No.	Clause No.	Description in Brief	Remark
6	Clause 6.3 Maintenance Requirements	The O&M Contractor shall procure that at all times during the Operation Period; the Project Highway conforms to the maintenance requirements set forth in Schedule-K of the Concession Agreement (the "Maintenance Requirements").	The maintenance required to be done as per Schedule K of CA only.
7	Clause 6.3 Maintenance Program	Not later than 55 days prior to the beginning of each Accounting Year during the Operation Period, the O&M Contractor shall provide to the Concessionaire, its proposed annual program of preventive. urgent and other scheduled maintenance (the "Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Contractor has to submit the programme and work for O&M with maintenance requirement and safety.
8	Clause 6 Maintenance Requirements 6.5 Safety, Breakdown and accident	6.5.1 The O&M Contractor shall ensure safe conditions for the users, and in the event of unsafe conditions, closures, diversions, breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary Lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good industry Practice.	Safety of users including breakdown, accident rescue operations is covered.
9	Clause 6 Maintenance Requirements 6.10 Damages for Breach of Maintenance obligations	In the event that the O&M Contractor fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be this Agreement and the cm Contractor shall pay to the Concessionaire Damages at such rate as the Concessionaire Is required to pay to the Authority under the Concession Agreement. Recovery of such Damages shall be without prejudice to the rights of the Concessionaire under this Agreement, including the right of Termination thereof.	The provision of Levy of Damage for breach of Agreement, defective work will keep pressure on contractor to work as per requirement.
10	Clause 6 Maintenance Requirements 6.17 Tests	For determining that the Project Highway conforms to the Maintenance Requirements, the Project Manager/IE shall require the O&M Contractor to carry out, or cause to be carried out, tests specified by it in accordance with Good Industry Practice.	This will maintain quality of work.

Sr. No.	Clause No.	Description in Brief	Remark
11	Clause 6 Maintenance Requirements 6.19 Safety Requirements	6.19.1 The O&M Contractor shall comply with the provisions of this Agreement and [or Concession Agreement, Applicable Laws and Applicable Permits and confirm to Good Industry Practice for securing the safety of the Users. in particular, the O&M Contractor shall develop, implement and administer a surveillance and safety program for providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in Schedule L of the Concession Agreement (the “Safety Requirements").	The O&M Contractor has to provide requirements provision for safety of Highway users. The safety of users is given priority.
12	Clause 13 Sub-contracts	13.1 The O&M Contractor shall notify to the Project Manager in writing of its intent to subcontract the O&M works in part or full and without the written approval of the Project Manager no subcontractor shall be appointed by the O&M Contractor.	The sub contractor cannot be appointed without approval of Project Manager. This will keep control over contractor to appoint competent contractor.
13	Clause 16 Insurance	16.1 The Concessionaire shall. procure and maintain the insurance for the Project Highway including all facilities in accordance with the Article 26 of the Concession Agreement.	The risks and security of Authority, concessionaire and lender is covered.
14	Clause 17 Defect Liability Period	17.1 The Concessionaire and/or the EPC Contractor ls responsible for all the defects and deficiencies in construction of the Project Highway or any section thereof and rectify the Same, without any cost to the O&M Contractor. during the cam period. Under this agreement the O&M Contractor is only under obligation of Operation 8r Maintenance of the Project Highway. For avoidance of doubt, any repair or restoration on account of usual wear and tear in the Project Highway shall form a part of the maintenance.	The Contractor is responsible for any defects during Defect Liability period i.e. O&M Period. This will maintain the quality to avoid any action for defective work as proposed.
15	Clause 21 Acknowledgement	The O&M Contractor acknowledges and accepts that this agreement entitles the Authority and/or Lenders Representative to step into this agreement, in its sole discretion, in Substitution-of the Concessionaire In the event of Termination or Suspension of the Concessionaire. Further, provision of clause 5.2 of the Concession Agreement relating to Project Agreement shall apply *mutatis mutandis.*	The Contractor has agreed for step in right of Authority or Lender in case of Termination of Concessionaire.

Sr. No.	Clause No.	Description in Brief	Remark
16	Clause 22 O&M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the O&M Contractor to carryout routine maintenance Works as detailed in Annexure-I to this O&M Agreement and in lieu thereof; a fixed lump sum fee amounting to Rs. 6,50,00,000 exclusive of taxes for the entire year in the form of biannual payment shall be due and payable by the Concessionaire.	The O&M Contractor will be paid fixed & Lumpsum payment of Rs.6.50 Crores. Biannual payment during year for his work as per scope. The contractor has to manage O&M work responsibility within this payment. Over & above these expenses, Concessionaire is incurring expenses for insurance, electricity, IE & professional fees etc.,
17	Clause 27 Termination 27.1 Termination For O&M Contractor Default	In the event of any defaults specified below shall have occurred, and the O&M Contractor falls to cure the default within the Cure Period of 60 (sixty) days, the O&M Contractor shall be deemed to be in default of this Agreement (the "O&M Contractor Default"), unless the default has occurred as a result of any breach of this Agreement by the Concessionaire or due to Force Majeure.	The Contractor shall note this. This provision of termination keep pressure on contractor to work as per scope of O&M responsibility.
18	Clause 32 Liability and Indemnification	The O&M Contractor shall fully indemnify and hold harmless and defend the Concession extent that the Concessionaire has provided any indemnities to Authority in terms of Article Concession Agreement, Insofar as such indemnities relate to the Services.	The Concessionaire is secured from contractor for any loss, claim.

7.1 Conclusion

i. Operation and Maintenance Contract is comprehensive and correct for major concerns of the Lender.

ii. The provision of O&M Contract Agreement is consistent with the provision of the Concession Agreement.

8 OPERATION AND MAINTENANCE

8.1 Introduction

Article 17 and Schedule-K of the Concession Agreement defines the Operation and Maintenance requirement during concession period.

The Provisional Completion Certificate (PCOD) for the length of 100.977 kms has been received on 18th April 2020 and the Final Completion Certificate (COD) for the total length of project highway i.e., 117.748 kms is achieved as on 13th October 2021. The project is currently under O&M stage. The concession period of the project highway is 18 years from the Appointed Date including construction period of 3 years. The operation period of the project highway is 15 years from COD.

The project highway comprises of the rigid pavement for 114.75 kms and flexible pavement for 2.998 kms.

8.2 O & M Set Up

O & M Contract

As per Clause 17.1 of the Concession Agreement, the Concessionaire shall operate and maintain the project by itself, or through O&M Contractors and if required, modify, repair, improve the project highway to comply with Specifications and Standards, and other requirements set forth in the Agreement through Good Industry Practice, Applicable Laws and Applicable Permits and manufacturer's guidelines and instructions with respect to toll systems. The Operation and Maintenance activities will confirm to all the requirements laid down in MORT&H, IRC Specifications and the Concession Agreement.

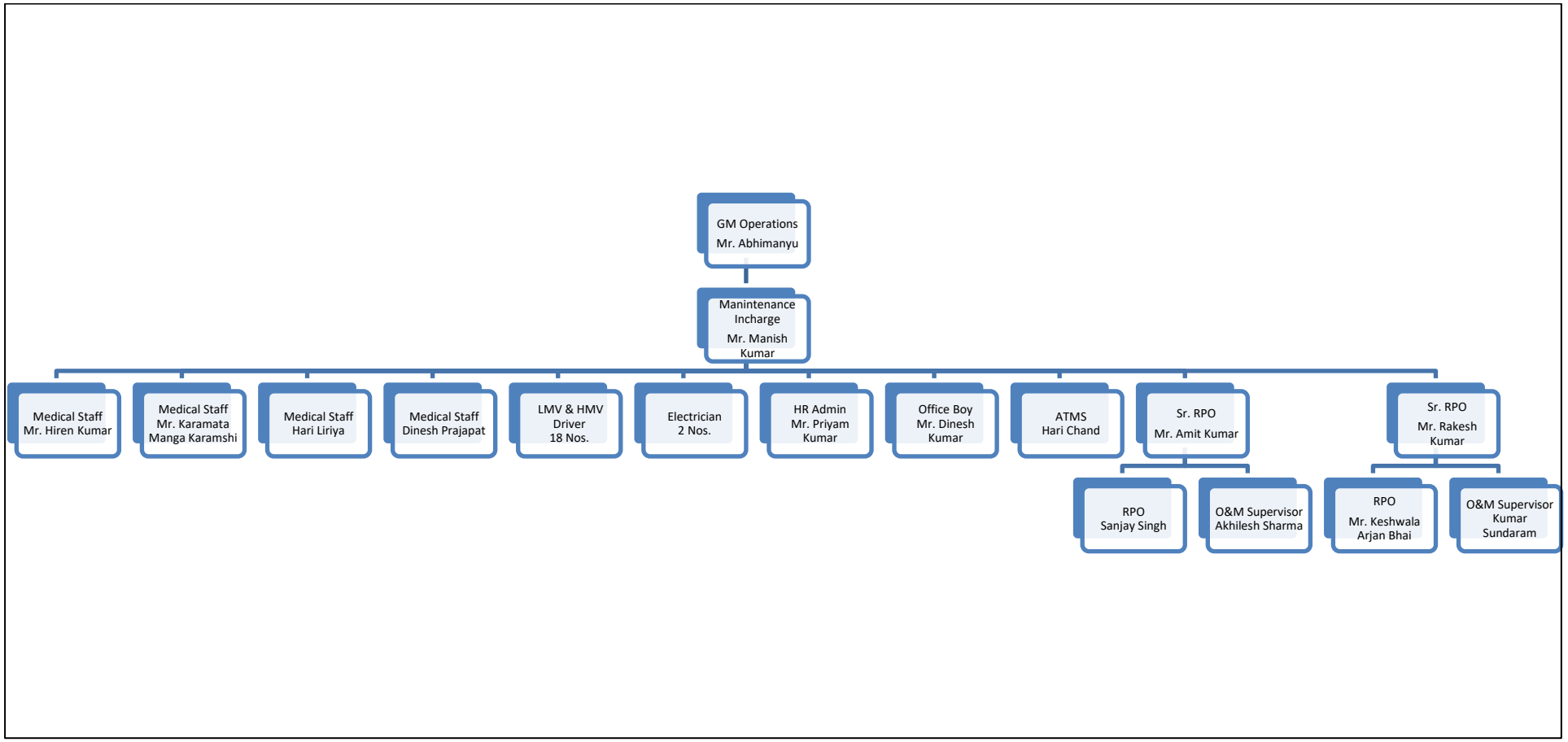
Under routine maintenance, the road is to be maintained in good, safe and motorable condition. The specifications in contracts are kept as same as per design and construction specification.

The periodical maintenance will have to be done during O&M period as per requirement of Concession Agreement and as per site requirement to maintain the design standards and level.

O&M Organization Chart

The Concessionaire has given the organization chart at site for Operation and maintenance. Accordingly, there is 01 GM, 01 O&M In charge, 04 Medical staff, 18 LMV / HMV drivers, 02 Electrician, 01 HR / Admin, 01 Office boy, 01 ATMS, 02 Sr. RPO, 02 RPO & 02 O&M Supervisors to carry out O&M activities. The team controls the maintenance activities along with other supporting staff. However, the maintenance work is undertaken and executed through competent sub-contractors.

Organization Structure for PDEPL



List of Manpower (SPV):

Sr. No.	Responsibilities	Name
1.	O&M In-Charge	Mr. Manish Kumar
2.	Route Patrol Officer	i) Mr. Keshwala Arjan Bhai ii) Mr. Amit Kumar iii) Mr. Rakesh Kumar iv) Mr. Sanjay Singh
3.	O&M Supervisors	i) Mr. Akhilesh Sharma ii) Mr. Kumar Sundaram
4.	Medical Attendants	iii) Mr. Hiren Kumar iv) Mr. Hari Liriya v) Mr. Karamata Manga Karamshi vi) Mr. Dinesh prajapat
5.	Drivers	i) Mr. Pawan Gujar ii) Mr. Raiya Bhai iii) Mr. Tej Kumar iv) Mr. Kunti Karam v) Mr. Bhawani Singh vi) Mr. Nemi Chand vii) Mr. Magu Singh viii) Mr. Mahesh Yogi ix) Mr. Jayesh Chaitariya x) Mr. Pramod Kumar xi) Mr. Devsi Bhai Sutreja xii) Mr. Babulal Meena xiii) Mr. Dalveer Singh xiv) Mr. Laxman Singh xv) Mr. Budhani Yaseen xvi) Mr. Prabhu lal Gujar xvii) Mr. Jag veer Singh xviii) Mr. Sanjay bhai
6.	Electrician	i) Mr. Subhash Kumawat ii) Mr. Shankar Dan
7.	Administration & Accounts, In-Charge	i) Mr. Priyam Kumar ii) Mr. Dinesh Kumar
8.	In-charge HSMU	i) Mr. Raniya Rizvan ii) Mr. Mahesh iii) Mr. Hari Chand

8.3 Operation Cost

Operations cost is comprised of manpower cost, power and electricity cost, office operating expenses, vehicle running expenses, administrative expenses and other miscellaneous expenses. The Concessionaire has provided the expenses occurred towards operation expenses for current / past years. Necessary assumptions have made from the expenses of similar type of projects to arrive at the operation cost. The estimates are projected based on best industry practice and are compared with the operating cost in the vicinity of the project area.

The estimated Operating cost base month of August 2022 is **Rs. 6.16 Crores**. The detailed working of the same is attached in **Annexure-I**.

8.4 Routine Maintenance Cost

The Routine Maintenance cost is derived based on the Ministry of Road Transport and Highways - Report of the Committee on Norms for Maintenance of Roads in India (published by Indian Road Congress New Delhi 2001) along with actual pavement condition assessed during condition survey.

Maintenance cost constitutes the routine, day-to-day maintenance activities for project assets, including road pavement, shoulders, embankment, drainage, structures, plantations, roadside furniture, traffic signs, traffic safety devices etc., Past data has been used to assess maintenance costs due to normal usage or "wear-and-tear". Likely costs of maintenance of structures are assessed based on their present condition and vintage, in combination with well-established guidelines and thumb rules given in Indian codes and standards.

The estimated cost of Routine Maintenance works out to be **Rs. 1.64 Crores (1.39 Lakhs per km)** for the base month August 2022. The detailed working of the same is attached in **Annexure-II**.

8.5 Major Maintenance Cost

Unlike the old Concession Agreements where periodicity and threshold limits were clearly described for the major maintenance, the Concession Agreement of this project does not specify the periodicity or the threshold limits for carrying out the full-length major maintenance. Schedule-K of the Concession Agreement specifies the threshold limits and the timelines for carrying out repairs to the distresses during the operation period.

The maintenance thus can be carried out as and when required basis and to the compliance of Schedule-K requirement to maintain the road in serviceable condition. Only improvement to Riding Quality is expected if the roughness value exceeds 2750 mm/km. However, the average roughness value of the project highway lies within the limit as mentioned above.

Any New pavement is not expected to show any distresses at least for 6 to 7 years with the proper routine maintenance. Mere Routine Maintenance would suffice to meet the performance standard mentioned in Schedule-K. In this project, there is no specific requirement to carry out the major maintenance at the end of concession period.

Hence, major maintenance is planned every 7th year from the date of COD till end of concession period.

The summary of the major maintenance planned up to end of concession period is presented in the below table.

The total base cost of major maintenance works out to be **Rs. 36.20 Crores** for the base month of August 2022 i.e., till 31st August 2022. The detailed working for the same is shown in **Annexure-III**.

Generally, it is observed that the routine and MMR cost of rigid pavement is less as compared with flexible pavement. The project highway being of more length as rigid pavement, the routine and MMR cost is less.

8.6 Paved Shoulders

As per design specifications, the paved shoulder is designed as an integral part of the pavement for main carriageway. Therefore, the total pavement thickness in paved shoulder would be the same as in the carriageway.

8.7 Summary of Major Maintenance Cycle

The table below shows the major maintenance cycle throughout the concession period for the project stretch.

Table 8-1 Maintenance Cycle

Sr. No.	Year	Main Carriageway	Service Road
1	FY 2023	-	-
2	FY 2024	-	
3	FY 2025	-	-
4	FY 2026	-	-
5	FY 2027	1st Major Maintenance	-
6	FY 2028	1st Major Maintenance	1st Major Maintenance (20% BC + 80% Micro-surfacing)
7	FY 2029	-	-
8	FY 2030	-	-
9	FY 2031	-	-
10	FY 2032	-	-
11	FY 2033	-	-
12	FY 2034	2nd Major Maintenance	-
13	FY 2035	2nd Major Maintenance	2nd Major Maintenance (20% BC + 80% Micro-surfacing)
14	FY 2036	-	-

8.8 Projected Maintenance Cost without escalation

The below table shows the total cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period without escalation.

Table 8-2 Summary of Operation & Maintenance Cost without escalation

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
1	**Total Operation and Routine Maintenance Cost**	117.748	Every year	6.62	**7.79**
2	**Major Maintenance Cost**				
i)	1st major maintenance	117.748	FY 2027	15.37	**18.10**
ii)	2nd major maintenance	117.748	FY 2034	15.37	**18.10**
	Total Major Maintenance Cost				**36.20**

Notes:

1. It is to be noted that, the rates considered for calculating all the above cost are exclusive of Goods and Service Tax (GST).
2. The estimated cost in table above is for base month of August 2022 i.e., till 31st August 2022.

3. The material rates are based on SOR of Govt. of Gujrat NH Division Rajkot for the year 2015-2016. The plant & machinery rates are adopted from the revised standard data book 2019 and escalated @ 5% every year. The current market rates are considered for bitumen, cement and steel.
4. The labour rate adopted from Govt. of India, Ministry of Labour and Employment Office of the Chief Labour Commissioner (C) w.e.f. 29/07/2022.

8.9 Projected Maintenance Cost with escalation

The below table shows the total cost of operation and routine maintenance and major maintenance cost up to end of the concession period with assumed escalation of 5% every year.

Table 8-3 Summary of Operation & Maintenance Cost with escalation

Sr. No.	Year	WPI Inflation	Total O&M Cost (Crores)	Major Maintenance Cost (Crores)
1	FY 2023		7.79	-
2	FY 2024	2.87*%	8.02	-
3	FY 2025	5.00%	8.42	-
4	FY 2026	5.00%	8.84	-
5	FY 2027	5.00%	9.28	10.78
6	FY 2028	5.00%	9.75	11.32
7	FY 2029	5.00%	10.23	-
8	FY 2030	5.00%	10.75	-
9	FY 2031	5.00%	11.28	-
10	FY 2032	5.00%	11.85	-
11	FY 2033	5.00%	12.44	-
12	FY 2034	5.00%	13.06	15.16
13	FY 2035	5.00%	13.71	15.92
14	FY 2036	5.00%	0.67	-
	Total Cost (Crores)		**136.10**	**53.18**

* Considering the base month for calculation as August 2022.

The company may carry out necessary investigation prior to O&M and Major Maintenance. This will help in proper assessment of maintenance work based on the actual pavement condition. The spending on major maintenance can then be reduced if the road is adequately and timely maintained.

9 TOLL PLAZA EQUIPMENT & ATMS

An assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and working status is carried out based on Section 10 of IRC:SP:84-2014 and the Authority's requirements of Hybrid ETC System. Advanced Traffic Management System (ATMS) is assessed based on Section 816 of MoRTH Specifications for Road and Bridge Works as required by Section 12.12 of the Manual.

9.1 Toll Plaza Equipment

Two toll plazas are provided at km. 409+500 at Kuchadi and km. 470+875 at Okhamadi. The Toll Collection System installed at the toll plazas is provided by Qualix Information Systems LLP.

The toll plazas have 5+5 lanes. All lanes are functional with Hybrid ETC equipment and additional equipment is provided on reversible lanes (one in each direction). View of the toll plazas are shown in Figure 9-1 and Figure 9-2.

Figure 9-1 View of Kuchadi Toll Plaza (km. 409+500)

Figure 9-2 View of Okhamadi Toll Plaza

9.1.1 Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

1. RFID ETC Transceiver
2. Lane Controller with Industrial PC
3. AVC Sensors
4. Automatic Lane Barrier (ALB)
5. Incident Capture Camera
6. Overhead Lane Signals
7. Traffic Lights
8. Toll Booth Equipment

9.1.1.1 RFID ETC Transceiver

RFID ETC Transceiver reads tags installed on the windshield of vehicles and mounted on a pole at about 6 m height. Handheld RFID readers are provided (1 no. in each direction) in case a tag is not detected by the fixed reader.

Figure 9-3 RFID ETC Reader mounted on Pole

9.1.1.2 Lane Controller with Industrial PC

Toll Lane Controller is located within the Electronic Enclosure placed inside each toll booth which are connected to the common server and are capable of independent storage of data.

TP-1 at km. 409+500

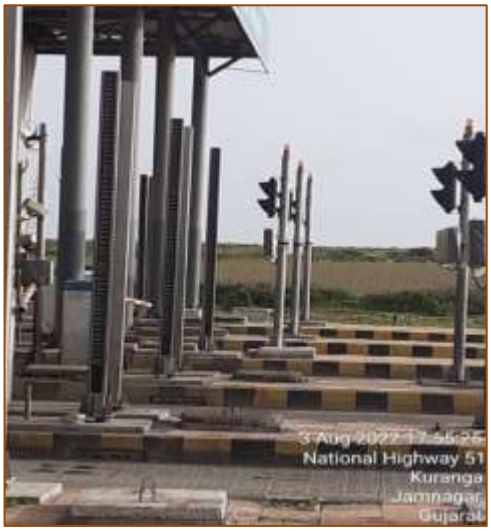
TP-2 at km. 470+875

Figure 9-4 Toll Lane Controller (TLC)

9.1.1.3 Automatic Vehicle Classification (AVC) Sensors

The AVC equipment comprises of a pair of height sensor poles, axle sensors and inductive loops. The height detector has a high sensing resolution and detects height when object blocks the path. The presence of vehicle is detected by inductive loop. The loop sensors embedded on the pavement trigger the AVC height sensors located on parallel pillars.

TP-1 at km. 409+500



TP-2 at km. 470+875

Figure 9-5 View of Toll Lane with Equipment

9.1.1.4 Automatic Lane Barrier

Boom barriers installed on all lanes are in working condition and have a working time of 0.6 sec - 0.9 sec. Automatic Lane Barrier is used to allow only authorized vehicles to pass through the lane. The barrier is activated only on generation of user fee receipt or other relevant vehicle processing activity. A torque motor powers the barrier for raising and lowering the boom. The motor can be blocked at any position without causing any damage. In the event of power failure, the boom is automatically raised. The boom weight is exactly balanced by built-in springs.

Figure 9-6 Automatic Lane Barrier

9.1.1.5 Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. The LTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done; the LTL turns Green to instruct the vehicle to pass through the lane. The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The user fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

TP-1 at km. 409+500

TP-2 at km. 470+875

Figure 9-7 Traffic Light and User Fare Display

9.1.1.6 Incident Capture Camera (AVC Camera)

The incident capture camera is installed on island of the booth to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.

9.1.1.7 License Plate Image Capture Camera (LPIC)

License Plate Image capture camera is installed on a 3 m pole facing incoming vehicle to capture the image of the vehicle number plate.

Figure 9-8 LPIC and AVC cameras

9.1.1.8 Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane “Open” and “Close” sign consists of a pair of “GREEN” (arrow) and “RED” (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed.

TP-1 at km. 409+500

TP-2 at km. 470+875

Figure 9-9 OHLS indicating green arrows for operational lanes

9.1.1.9 Toll Booth Equipment

Toll Booth Hardware / Equipment provided are:

- Toll Collector Display (Operator Monitor)
- Customized Industrial Keyboard
- Receipt Printer
- Intercom Slave unit
- Bar code reader
- Violation Light and alarm
- Manual Booth Control (MBC)
- Booth Camera

The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a programmable keyboard for Registration of toll operations and is customized for different vehicle types and type of ticket.

TP-1 at km. 409+500

TP-2 at km. 470+875

Figure 9-10 Booth Equipment

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Violation system has an alarm switch which is triggered whenever there is a violation such as run-through happening on the lane. When there is an emergency, a foot switch pressed by the booth operator alerts the control room.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room. Manual Booth Controller is used to release exempt vehicles.

9.1.1.10 Medium Speed Weigh in Motion (MSWIM)

Medium Speed Weigh in Motion (MSWIM) is installed on entry lanes with a platform size of 1500mm x 620mm for normal lanes and 1750mm x 620mm for extra wide lanes and capacity of 30 ton/axle. Bending plate strain gauge technology is used with hardware and software support to calculate weight of vehicles running through it up to a speed of 50 km/hr.

9.1.2 Plaza Equipment

9.1.2.1 Plaza Server

Plaza Server is provided in a hot standby configuration and provided with 42 U switch rack, 28 port non-POE network switch and 10 Port PoE switch. Firewall and 2 broadband internet lease line with 4 Mbps link for CCH connectivity is available.

TP-1 at km. 409+500

TP-2 at km. 470+875

Figure 9-11 Control Room Equipment - Server & Switch rack

9.1.2.2 55” LED screen for CCTV monitoring

55” LED screen for CCTV monitoring installed at the toll plaza admin block provides view of all the toll booths , important zones within the plaza where cash transactions take place (server room, control room, cash up).

TP-1 at km. 409+500

TP-2 at km. 470+875

Figure 9-12 CCTV screen at the Toll Plaza Control Room

The toll plaza manager is able to observe the activities at the toll lanes and toll booth. When the toll collector calls up on the intercom, the manager is able to comprehend the situation at the lane by a zoomed view of the particular lane.

9.1.2.3 Workstations in Control Room, PoS and Cash up room

Workstations are available in control room (lane monitoring, administration, and audit), cash room and PoS with 4 GB RAM and 1 TB HDD.

TP-1 at km. 409+500

TP-2 at km. 470+875

Figure 9-13 Incident Management Workstation at Control room

9.2 Advanced Traffic Management System (ATMS)

Advanced Traffic Management System (ATMS) installed for the project road is controlled by the ATMS centre at the toll plaza location. It comprises of the following:

- Mobile Radio communication system
- Meteorological Data system
- Variable Message Signboards (VMS)
- Automatic Traffic Counter cum Classifier (ATCC)
- CCTV system

9.2.1 Mobile Radio communication System (MRCS)

Communication between patrol vehicles, ambulances, crane operators and the control centre is managed using MRCS installed at the two locations, km. 409+400 and km. 470+700.

9.2.2 MET system

Meteorological sensors comprise of sensors to measure the atmospheric temperature, humidity, pavement surface temperature, visibility and equipment for measuring wind speed and direction and installed at Km 470.700.

9.2.3 Variable Message Signboards (VMS)

Variable message sign boards are installed at 6 locations. These display specific messages to the users based on the prevailing conditions on the highway. The message can be changed at any point of time from the ATMS centre. About 250 customised messages can be stored on the system.

9.2.4 Automatic Traffic Counter cum Classifier (ATCC)

Automatic Traffic Counter cum Classifiers (ATCC) is installed at entry and exit of each toll plaza location (total 8 Nos.). The ATCC are infrared Traffic Logger (TIRTL) type and count at an accuracy of 95%.

9.2.5 CCTV and Surveillance Cameras

Surveillance Cameras are installed at 4 locations along the project corridor in addition to the toll plaza location. The ATMS control room has video wall to monitor these locations through the cameras installed.

9.3 Adequacy of Toll Collection System and ATMS

- Adequacy - The software and hardware as a part of Toll Collection and Management System (TMS) was commissioned on 15th February 2022. The plaza went live on 29th September 2020. All lanes are Hybrid ETC system as stipulated by NHAI in Technical specifications of Hybrid ETC system. NHAI has approved maintenance costs for TMS. As per supplementary agreement, TMS shall be upgraded every 5 years, at the cost of the Authority.

- Advanced Traffic Management System (ATMS) installed is as per specifications required by the Authority and in working condition. Equipment such as cameras may require replacement every 5-8 years.

10 ACCIDENT DATA ANALYSIS

Accident Data Records for the project have been studied in order to analyse the nature of accidents occurring on the stretch and identify blackspots.

10.1 Accident Trend

Accident Data for the period October 2021 to June 2022 has been made available for analysis. 23 Accidents have occurred out of which 1 no. were fatal, and 21 were minor. More number of accidents have occurred during the daytime than at night-time. Monthly data analysis does not show any consistent seasonal trend. Over speeding has been recorded as a major cause of accident which alone or in combination with faulty driver behaviour.

10.2 Blackspots Identification

There are no black spot found in the project stretch however the details of accidents in the project length are given in Table below:

Table 10-1 Accidents details on Project Road

DATE	MONTH	LOCATION	SIDE	TIME	TYPE	REASON
14/10/2021	October	388+100	LHS	10:00 PM		Vehicle Out of Control
NIL	November	NIL	NIL	NIL		Nil
01/12/2021	December	396+2000	RHS	11:30 PM	MINOR	Vehicle Out of Control
15/12/2022		431+500	RHS	9:30 PM	MINOR	Over speeding
22/12/2022		428+450	LHS	6:30 PM	MINOR	Vehicle Out of Control
18/01/2022	January	462+000	LHS	8:30 PM	MINOR	Vehicle Out of Control
25/01/2022		459+100	LHS	5:00 PM	MINOR	Over speeding
03/02/2022	February	472+150	MEDIAN	-	MINOR	No Record
06/02/2022		440+200	RHS	-	MINOR	No Record
06/02/2022		416+150	LHS	-	MINOR	No Record
20/02/2022		464+400	LHS	8:00 PM	MINOR	Over speeding
22/02/2022		427+650	LHS	9:30 PM	MINOR	Over speeding
27/02/2022		390+000	LHS	-	-	Vehicle Out of Control
10/03/2022	March	465+000	LHS	3:00 PM	MINOR	Vehicle Out of Control
10/03/2022		409+600	LHS	5:00 PM	MINOR	Vehicle Out of Control
19/03/2022		401+600	RHS	11:00 AM	NIL	Vehicle Out of Control
30/03/2022		476+180	RHS	2:30 PM	MINOR	Over speeding
06/04/2022	April	418+600	LHS	3:50 PM	MINOR	Vehicle Out of Control
17/04/2022		409+400	RHS	5:20 PM	MINOR	Door Open by Passenger
07/05/2022	May	477+200	LHS	11:00 AM	NIL	Fault Of Driver

DATE	MONTH	LOCATION	SIDE	TIME	TYPE	REASON
01/06/2022	June	469+550	LHS	4:30 PM	MINOR	Vehicle Out of Control
04/06/2022		469+450	LHS	2:10 PM	FATAL	Vehicle Out of Control
04/06/2022		409+000	LHS	4:10 PM	MINOR	Vehicle Out of Control
11/06/2022		485+860	LHS	12:10 PM	MINOR	Vehicle Out of Control

10.3 Conclusions & Recommendations

As there are no major accidents found in the project length and as informed by the Company, all accidents occur due to overloading and uncontrolled driving on project highway. Hence, there are no black spot identified from Authority's Engineer and from Concessionaire. However, Concessionaire needs to maintain all road furniture as per schedule given in CA.

Annexures

Annexure I : Operation Cost

Sr. No.	Particulars	Cost per Annum (Rs.)	Cost per Annum (Cr.)
1	Incidental Management Expenses		
a	*Ambulance - 2 Nos.*	3,641,702	0.36
b	*Patrolling Vehicle - 2 Nos.*	4,846,030	0.48
c	*Crane - 2 Nos.*	2,808,095	0.28
d	*Other Vehicle - 3 Nos.*	1,828,499	0.18
e	*JCB - 1 Nos.*	1,108,447	0.11
f	*Corridor Manager & Officer*	953,280	0.10
2	Maintenance Staff Expenses	6,600,000	0.66
3	Routine Maintenance Cost (Civil Works)	16,355,213	1.64
4	Professional & IE Fee	5,235,076	0.52
5	Insurance Expenses	16,547,269	1.65
6	Staff Welfare Expenses	701,000	0.07
7	Electricity Expenses + Maintenance of parts	9,798,436	0.98
8	ATMS/HTMS Expenses	4,592,172	0.46
9	Contingency @ 5% (Excl. Civil works)	2,933,000	0.29
	Total Cost (Rs)	**77,948,219**	**7.79**
	Per km Cost (Lakh)		**6.62**

Annexure II : Routine Maintenance Cost

Routine Maintenance Cost	
Ordinary Repair Cost for Flexible Pavement	15,68,928
(Exclusive of GST) (including Service Road)	= 1.56 lakhs per km
Ordinary Repair Cost for Rigid Pavement	1,47,86,285
(Exclusive of GST)	= 1.29 lakhs per km
Total Cost (Exclusive of GST)	**1,63,55,213**
	= 1.39 lakhs per km

CONVERSION FACTORS									
National Highways / State Highways - Rigid Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Rigid Pavement**		**Factor**	**Rigid Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				94,533	**1,06,899**				
						Normal	**Urban**	**Normal**	**Urban**
1	Four-lane with divided carriageway	Without paved shoulder	1.53	144635.00	163555.00	-	-	-	-
		Paved shoulder	1.70	160705.00	181728.00	107.69	7.07	15,401,647	1,158,992
2	Four-lane with divided carriageway and service lane on either side	Without paved shoulder	2.00	189065.00	213797.00	-	-	-	-
		Paved shoulder	2.20	207972.00	235177.00	-	-	-	-
TOTAL						**114.75**		**16,560,639**	

CONVERSION FACTORS									
National Highways / State Highways - Flexible Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Flexible Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				1,42,344	**1,56,114**				
						Normal	**Urban**	**Normal**	**Urban**
1	Two-lane without shoulder		0.90	128110.00	140503.00	7.07	-	9,05,097	-
2	Four-lane with divided carriageway	Without paved shoulder	1.53	217787.00	238855.00	-	-	-	-
		Paved shoulder	1.70	241985.00	265394.00	1.75	-	4,23,474	-
3	Four-lane with divided carriageway and service lane on either side	Without paved shoulder	2.00	284688.00	312229.00	-	-	-	-
		Paved shoulder	2.20	313157.00	343452.00	-	1.25	-	4,28,628
TOTAL						**10.063**		**17,57,199**	

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity**
				More than 4500 CVD
				CC Surface
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.00%
	Volume (cum)			0.00
	Rs/m^3			0
	Cost in Rupees			0
	ii) Patch repair	100 % Patch less	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			419
	Cost in Rupees			0
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			86
	Cost in Rupees			4,312
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			58
	Cost in Rupees			4,368
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			419
	Cost in Rupees			0

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	v) Road marking	7%	Once in 15 year & @ Repaired location	9480
	vi) Joint Sealant Repair/Replacement	5%		16115
	vii) Slab Replacement	0.00%		0
	SUB TOTAL			**34,276**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	50%	As & when required	17,334
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	SUB TOTAL			**17,334**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debries removal		Once in a Year	3467
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	3467
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**84,132**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	7%	Once in 15 years with thermoplastic paint	695
	ii)Repairs to footpath	0%	As & when required	0
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**12,366**
	GRAND TOTAL (Urban)			**96,498**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Potholes repair (50 mm deep)	100 % Pothole free	As & when required	0.50%
	Volume (cum)			2.50
	Rs/m^3			10472
	Cost in Rupees			26,180
	ii) Patch repair	100 % Patch less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			419
	Cost in Rupees			20,944
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	1.00%
	Area (sqm)			100
	Rs/m^2			86
	Cost in Rupees			8,624
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			58
	Cost in Rupees			4,368
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			419
	Cost in Rupees			31,416
	v) Road marking	10%	Once in 10 year & @ Repaired location	14823

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
	SUB TOTAL			**1,06,355**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	10%	As & when required	3,467
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			
	SUB TOTAL			**3,467**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debris removal		Once in a Year	3467
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometre stone etc.		Once in a Year	3467

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**1,42,344**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Centre Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	10%	Once in 10 years with thermoplastic paint	2099
	ii) Repairs to footpath	0%	As & when required	0
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**13,770**
	GRAND TOTAL (Urban)			**1,56,114**

Annexure III : Major Maintenance Cost

Major Maintenance Cost (Every 6th / 7th year) FY 2027 & FY 2034										
Sr. No.	**Description**	**Unit**	**No.**	**Length (m)**	**Width (m)**	**Depth (m)**	**Quantity**	**Total Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
I. Main Carriageway, Service Road / Slip Road & Miscellaneous location										
A	**Main Carriageway: Flexible Pavement**									
1	Milling	Sqm	100%	2,998.00	18.00		53,964.00	53,964.00	55.00	2,968,020
2	Tack Coat for DBM	Sqm	10%	2,998.00	15.00		4,497.00	4,497.00	19.00	85,443
3	DBM Overlay	Cum	10%	2,998.00	15.00	0.05	224.85	224.85	9,029.00	2,030,171
4	Tack Coat for BC	Sqm	1	2,998.00	18.00		53,964.00	53,964.00	19.00	1,025,316
5	BC Overlay	Cum	1	2,998.00	18.00	0.03	1,618.92	1,618.92	10,668.00	17,270,639
6	Filling of Earthen shoulder	Cum	0	1,750.00	4.00	0.03	-	-	284.00	-
B	**Main Carriageway: Rigid Pavement**									
7	Replacement of Joint Sealant	Rmt	5%	838,581.33			41,929.07	41,929.07	55.00	2,306,099
8	Dismantling of CC Panels @ 1.5% area	Cum	1.5%	110,063.80	15.00	0.30	7,429.31	7,429.31	874.00	6,493,214
9	Replacement of Panels - PQC @ 1.5% area	Cum	1.5%	110,063.80	15.00	0.30	7,429.31	7,429.31	6,814.00	50,623,294
10	Replacement of Panels - DLC @ 0% area	Cum	0.0%	110,063.80	15.00	0.15	-	-	3,014.00	-
11	Diamond Grinding	Sqm	3%	110,063.80	15.00		49,528.71	49,528.71	50.00	2,476,436
C	**Rigid Pavement at Toll Plaza**									
12	Replacement of Joint Sealant	Rmt	5%	6,884.55			344.23	344.23	55.00	18,933
13	Dismantling of CC Panels @ 1.5% area	Cum	1.5%		13,553.95	0.30	60.99	60.99	874.00	53,308
14	Replacement of Panels - PQC @ 1.5% area	Cum	1.5%		13,553.95	0.30	60.99	60.99	6,814.00	415,605
15	Replacement of Panels - DLC @ 0% area	Cum	0.0%		13,553.95	0.15	-	-	3,014.00	-
16	Diamond Grinding	Sqm	0%		13,553.95		-	-	50.00	-
D	**Service Roads (Flexible Pavement)**									
17	Tack Coat for BC	Sqm	20%	8,313.00	13.55		22,527.60	22,527.60	19.00	428,024
18	BC Overlay with 30mm	Cum	20%	8,313.00	13.55	0.03	675.83	675.83	10,211.00	6,900,880
19	Micro surfacing	Sqm	80%	8,313.00	13.55		90,110.40	90,110.40	133.00	11,984,683
20	Filling of Earthen shoulder	Cum	1	8,313.00	-	0.03	-	-	284.00	-
E	**Structural Deck area**									
21	Milling	Sqm	50%	4,314.20	23.00		49,613.30	49,613.30	55.00	2,728,732
22	Tack Coat	Sqm	50%	4,314.20	23.00		49,613.30	49,613.30	19.00	942,653
23	Mastic Asphalt Overlay	Sqm	50%	4,314.20	23.00		49,613.30	49,613.30	516.00	25,600,463
F	**Miscellaneous**									
24	Replacement of Kerb	Rmt	10%	233,440.00			23,344.00	23,344.00	237.00	5,532,528
25	Painting of Kerbs	Sqm	1	233,440.00		0.32	73,533.60	73,533.60	89.00	6,544,490
26	Painting of Crash Barrier	Sqm	1	21,368.80		1.12	23,826.21	23,826.21	89.00	2,120,533
27	Thermoplastic paint									
	a) Median & Edge line	Sqm	50%				46,449.83	46,449.83	451.00	20,948,873
	Main Carriageway 4L		4	120,102.96	0.15		72,061.78			
	Service Road		2	16,958.52	0.10		3,391.70			
	b) Lane line									
	Main Carriageway 4L		2	42,036.04	0.10		8,407.21			
	Service Road		1	5,935.48	0.10		593.55			
	c) Junction crossing						8,445.42			
28	Replacement of Road Stud	No	50%				14,289.00	14,289.00	201.00	2,872,089
	Main Carriageway 4L		4	6,673.00			26,692.00			
	Service Road		2	943.00			1,886.00			
29	Miscellaneous	5%								8,618,521
Total Amount (MCW + Service Road + Toll Plaza + Miscellaneous)										**180,988,944.54**
Total Cost in Lakhs (MCW + Service Road + Toll Plaza + Miscellaneous)										**1,809.89**
Per km Cost in lakhs (MCW + Service Road + Toll Plaza + Miscellaneous)										**15.37**

Annexure IV : Pavement Condition Survey

LHS

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	379.1	380	Good		PQC	300		G							F	PQC	G	F				
2	380	381	Good		PQC	300		G							F	PQC	G	F				
3	381	382	Good		PQC	300		G							F	PQC	G	F				
4	382	383	G/F		PQC	300		G	0.1						F	PQC	G	F				
5	383	384	Good		PQC	300		G							F	PQC	G	F				
6	384	385	Good		PQC	300		G							F	PQC	G	F				
7	385	386	Good		PQC	300		G							F	PQC	G	F				
8	386	387	Good		PQC	300		G							F	PQC	G	F				
9	387	388	Good		PQC	300		G							F	PQC	G	F				
10	388	389	Good		PQC	300		G							F	PQC	G	F				
11	389	390	Good		PQC	300		G							F	PQC	G	F				
12	390	391	Good		PQC	300		G							F	PQC	G	F				
13	391	392	Good		PQC	300		G							F	PQC	G	F				
14	392	393	Good		PQC	300		G							F	PQC	G	F				
15	393	394	Good		PQC	300		G							F	PQC	G	F				
16	394	395	Good		PQC	300		G							F	PQC	G	F				
17	395	396	Good		PQC	300		G							F	PQC	G	F				
18	396	397	Good		PQC	300		G							F	PQC	G	F				
19	397	398	Good		PQC	300		G							F	PQC	G	F				
20	398	399	Good		PQC	300		G							F	PQC	G	F				
21	399	400	Good		PQC	300		G							F	PQC	G	F				
22	400	401	G/F		PQC	300		G/F							F	PQC	G	F				
23	401	402	Good		PQC	300		G							F	PQC	G	F				
24	402	403	G/F		PQC	300		G							F	PQC	G	F				
25	403	404	G/F		PQC	300		G							F	PQC	G	F				
26	404	405	Good		PQC	300		G							F	PQC	G	F				
27	405	406	Good		PQC	300		G							F	PQC	G	F				
28	406	407	Good		PQC	300		G							F	PQC	G	F				
29	407	408	G/F		PQC	300		G							F	PQC	G	F				
30	408	409	Good		PQC	300		G							F	PQC	G	F				
31	409	410	Good		PQC	300		G							F	PQC	G	F				
32	410	411	G/F		PQC	300		G							F	PQC	G	F				
33	411	412	Good		PQC	300		G							F	PQC	G	F				
34	412	413	Good		PQC	300		G							F	PQC	G	F				
35	413	414	Good		PQC	300		G							F	PQC	G	F				
36	414	415	Good		PQC	300		G							F	PQC	G	F				
37	415	416	Good		PQC	300		G							F	PQC	G	P				

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
38	416	417	Good		PQC	300		G							F	PQC	G	P				
39	417	418	Good		PQC	300		G							F	PQC	G	F				
40	418	419	Good		PQC	300		G							F	PQC	G	F				
41	419	420	G/F		PQC	300		G							F	PQC	G	F				
42	420	421	G/F		PQC	300		G							F	PQC	G	F				
43	421	422	Fair		PQC	300		F	0.2						F	PQC	G	P				
44	422	423	Good		PQC	300		G							F	PQC	G	P				
45	423	424	G/F		PQC	300		G							F	PQC	G	F				
46	424	425	G/F		PQC	300		G							F	PQC	G	F				
47	425	426	G/F		PQC	300		G							F	PQC	G	F				
48	426	427	G/F		PQC	300		G	0.1						F	PQC	G	F				
49	427	428	Good		PQC	300		G							F	PQC	G	F				
50	428	429	Good		PQC	300		G							F	PQC	G	F				Water Logging on MCW
51	429	430	Good		PQC	300		G							F	PQC	G	F				
52	430	431	Good		PQC	300		G							F	PQC	G	F				
53	431	432	Good		PQC	300		G							F	PQC	G	F				
54	432	433	G/F		PQC	300		G							F	PQC	G	F				
55	433	434	Good		PQC	300		G							F	PQC	G	F				
56	434	435	Good		PQC	300		G							F	PQC	G	F				
57	435	436	G/F		PQC	300		G							F	PQC	G	F				
58	436	437	G/F		PQC	300		G							F	PQC	G	F				
59	437	438	G/F		PQC	300		G							F	PQC	G	F				
60	438	439	G/F		PQC	300		G							F	PQC	G	F				
61	439	440	G/F		PQC	300		G/F	0.1						F	PQC	G	F				
62	440	441	Good		PQC	300		G							F	PQC	G	P				
63	441	442	Good		PQC	300		G							F	PQC	G	F				
64	442	443	G/F		PQC	300		G							F	PQC	G	F				
65	443	444	G/F		PQC	300		G							P	PQC	G	P				
66	444	445	G/F		PQC	300		G							F	PQC	G	F				
67	445	446	G/F		PQC	300		G							F	PQC	G	F				
68	446	447	G/F		PQC	300		G/F	0.1						P	PQC	G	P				
69	447	448	G/F		PQC	300		G							F	PQC	G	F				
70	448	449	G/F		PQC	300		G							F	PQC	G	F				
71	449	450	G/F		PQC	300		G							F	PQC	G	F				
72	450	451	G/F		PQC	300		G							F	PQC	G	F				
73	451	452	Good		PQC	300		G							F	PQC	G	F				
74	452	453	Poor		PQC	300		P	0.2						F	PQC	G	F				MCWConcrete pannel settle
75	453	454	G/F		PQC	300		G							F	PQC	G	F				
76	454	455	Good		PQC	300		G							P	PQC	G	F				
77	455	456	G/F		PQC	300		G							F	PQC	G	F				

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
78	456	457	Poor		PQC	300		P	0.2						P	PQC	G	P				MCW Concrete panel settle
79	457	458	Good		PQC	300		G							F	PQC	G	F				
80	458	459	Good		PQC	300		G							F	PQC	G	F				
81	459	460	Good		PQC	300		G							P	PQC	G	P				
82	460	461	Good		PQC	300		G							F	PQC	G	F				
83	461	462	Good		PQC	300		G							F	PQC	G	F				
84	462	463	Good		PQC	300		G							F	PQC	G	F				
85	463	464	G/F		PQC	300		G							F	PQC	G	F				
86	464	465	Good		PQC	300		G							F	PQC	G	F				
87	465	466	Good		PQC	300		G/F	0.1						P	PQC	G	P				MCW Concrete panel settle
88	466	467	Good		PQC	300		G							P	PQC	G	P				
89	467	468	Good		PQC	300		G							P	PQC	G	P				
90	468	469	G/F		PQC	300		G							F	PQC	G	F				
91	469	470	G/F		PQC	300		G							F	PQC	G	F				
92	470	471	G/F		PQC	300		G							F	PQC	G	F				
93	471	472	G/F		PQC	300		G							F	PQC	G	F				
94	472	473	G/F		PQC	300		G							F	PQC	G	F				
95	473	474	G/F		PQC	300		G							P	PQC	G	P				
96	474	475	Good		PQC	300		G							F	PQC	G	P				
97	475	476	Good		PQC	300		G							F	PQC	G	P				
98	476	477	Good		PQC	300		G							F	PQC	G	F				
99	477	478	G/F		PQC	300		G							F	PQC	G	F				
100	478	479	G/F		PQC	300		G							F	PQC	G	F				
101	479	480	G/F		PQC	300		G							F	PQC	G	F				
102	480	481	Good		PQC	300		G							F	PQC	G	F				
103	481	482	G/F		PQC	300		G							F	PQC	G	F				
104	482	483	Good		PQC	300		G							F	PQC	G	F				
105	483	484	G		PQC	300		G							F	PQC	G	F				
106	484	485	G/F		PQC	300		G							F	PQC	G	F				
107	485	486	G/F		PQC	300		G							F	PQC	G	F				
108	486	487	G/F		PQC	300		G							F	PQC	G	F				
109	487	488	G/F		PQC	300		G							F	PQC	G	F				
110	488	489	G/F		PQC	300		G	0.1						F	PQC	G	F				
111	489	490	G/F		PQC	300		G							F	PQC	G	F				
112	490	491	G/F		PQC	300		G							F	PQC	G	F				
113	491	492	G/F		PQC	300		G		0.15					F	PQC	G	F				
114	492	493	G/F		PQC	300		G							F	PQC	G	F				
115	493	494	Good		BT/PQC	300/50		G/F							F	PQC	G	F				
116	494	495	Fair		BT	50		F	1			10			F	BT	G	F				

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
117	495	496	Fair		BT	50		F	1			10			F	BT	G	F				
118	496	497	Fair		BT	50		F	1			15			F	BT	G	F				

RHS

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	379.1	380	Good		PQC	300		G							F	PQC	G	F				
2	380	381	Good		PQC	300		G							F	PQC	G	F				
3	381	382	Good		PQC	300		G							F	PQC	G	F				
4	382	383	Good		PQC	300		G							F	PQC	G	F				
5	383	384	Good		PQC	300		G							F	PQC	G	F				
6	384	385	G/F		PQC	300		G							F	PQC	G	F				
7	385	386	G/F		PQC	300		G							F	PQC	G	F				
8	386	387	Good		PQC	300		G							F	PQC	G	F				
9	387	388	Good		PQC	300		G							F	PQC	G	F				
10	388	389	G/F		PQC	300		G							F	PQC	G	F				
11	389	390	G/F		PQC	300		G							F	PQC	G	F				
12	390	391	G/F		PQC	300		G							F	PQC	G	F				
13	391	392	G/F		PQC	300		G							F	PQC	G	F				
14	392	393	Good		PQC	300		G							F	PQC	G	F				
15	393	394	G/F		PQC	300		G							F	PQC	G	F				
16	394	395	G/F		PQC	300		G							F	PQC	G	F				
17	395	396	Fair		PQC	300		F							F	PQC	G	F				
18	396	397	Good		PQC	300		G							F	PQC	G	F				
19	397	398	G/F		PQC	300		G							F	PQC	G	F				
20	398	399	G/F		PQC	300		G							F	PQC	G	F				
21	399	400	G/F		PQC	300		G							F	PQC	G	F				
22	400	401	G/F		PQC	300		G							F	PQC	G	F				
23	401	402	G/F		PQC	300		G							F	PQC	G	F				
24	402	403	Good		PQC	300		G							F	PQC	G	F				

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
25	403	404	G/F		PQC	300		G							F	PQC	G	F				
26	404	405	G/F		PQC	300		G							F	PQC	G	F				
27	405	406	Good		PQC	300		G							F	PQC	G	F				
28	406	407	G/F		PQC	300		G							F	PQC	G	F				
29	407	408	G/F		PQC	300		G							F	PQC	G	F				
30	408	409	G/F		PQC	300		G							F	PQC	G	F				
31	409	410	Good		PQC	300		G							F	PQC	G	F				
32	410	411	G/F		PQC	300		G							F	PQC	G	F				
33	411	412	Good		PQC	300		G							F	PQC	G	F				
34	412	413	Good		PQC	300		G							F	PQC	G	F				
35	413	414	G/F		PQC	300		G							F	PQC	G	F				
36	414	415	G/F		PQC	300		G							F	PQC	G	F				
37	415	416	Good		PQC	300		G							F	PQC	G	P				
38	416	417	Good		PQC	300		G							P	PQC	G	P				
39	417	418	G/F		PQC	300		G		0.25					F	PQC	G	F				
40	418	419	Good		PQC	300		G							F	PQC	G	F				
41	419	420	Fair		PQC	300		F	0.15						F	PQC	P	F				MCW Concrete panel settle
42	420	421	Good		PQC	300		G							F	PQC	G	F				
43	421	422	G/F		PQC	300		G							F	PQC	G	P				
44	422	423	Good		PQC	300		G							F	PQC	G	P				
45	423	424	Good		PQC	300		G							F	PQC	G	F				
46	424	425	G/F		PQC	300		G	0.1						F	PQC	G	F				
47	425	426	G/F		PQC	300		G	0.1						F	PQC	G	F				
48	426	427	G/F		PQC	300		G							F	PQC	G	F				
49	427	428	G/F		PQC	300		G		0.1					F	PQC	G	F				
50	428	429	Good		PQC	300		G							F	PQC	G	F				
51	429	430	Good		PQC	300		G							F	PQC	G	F				
52	430	431	Good		PQC	300		G							F	PQC	G	F				
53	431	432	Good		PQC	300		G							F	PQC	G	F				
54	432	433	Fair		PQC	300		F	0.15						F	PQC	G	F				
55	433	434	Good		PQC	300		G							F	PQC	G	F				
56	434	435	Good		PQC	300		G							F	PQC	G	F				
57	435	436	G/F		PQC	300		G							F	PQC	G	F				
58	436	437	Good		PQC	300		G							F	PQC	G	F				
59	437	438	G/F		PQC	300		G							F	PQC	G	F				
60	438	439	G/F		PQC	300		G							F	PQC	G	F				
61	439	440	G/F		PQC	300		G							F	PQC	G	F				
62	440	441	Good		PQC	300		G							P	PQC	G	P				
63	441	442	Good		PQC	300		G							F	PQC	G	F				
64	442	443	G/F		PQC	300		G							F	PQC	G	F				

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
65	443	444	Good		PQC	300		G							P	PQC	G	P				
66	444	445	Good		PQC	300		G							F	PQC	G	F				
67	445	446	Good		PQC	300		G							F	PQC	G	F				
68	446	447	G/F		PQC	300		G							P	PQC	G	P				
69	447	448	Good		PQC	300		G							F	PQC	G	F				
70	448	449	Good		PQC	300		G							F	PQC	G	F				
71	449	450	G/F		PQC	300		G							F	PQC	G	F				
72	450	451	Good		PQC	300		G							F	PQC	G	F				
73	451	452	Good		PQC	300		G							F	PQC	G	F				
74	452	453	Good		PQC	300		G							F	PQC	G	F				
75	453	454	Fair		PQC	300		F	0.15						F	PQC	G	F				
76	454	455	Good		PQC	300		G							P	PQC	G	P				
77	455	456	Good		PQC	300		G							F	PQC	G	F				
78	456	457	Good		PQC	300		G							P	PQC	G	P				
79	457	458	Good		PQC	300		G							F	PQC	G	F				
80	458	459	Good		PQC	300		G							P	PQC	G	P				
81	459	460	G/F		PQC	300		G/F							P	PQC	G	P				
82	460	461	Good		PQC	300		G							F	PQC	G	F				
83	461	462	Good		PQC	300		G							F	PQC	G	F				
84	462	463	Good		PQC	300		G							F	PQC	G	F				
85	463	464	Good		PQC	300		G							F	PQC	G	F				
86	464	465	Good		PQC	300		G							F	PQC	G	F				
87	465	466	Good		PQC	300		G							F	PQC	G	F				
88	466	467	G/F		PQC	300		G							F	PQC	G	F				
89	467	468	G/F		PQC	300		G							F	PQC	G	F				
90	468	469	G/F		PQC	300		G							F	PQC	G	F				
91	469	470	Good		PQC	300		G							F	PQC	G	F				
92	470	471	Good		PQC	300		G							F	PQC	G	F				
93	471	472	Good		PQC	300		G							F	PQC	G	F				
94	472	473	G/F		PQC	300		G							F	PQC	G	F				
95	473	474	Good		PQC	300		G							F	PQC	G	F				
96	474	475	Good		PQC	300		G							F	PQC	G	P				
97	475	476	Good		PQC	300		G							F	PQC	G	P				
98	476	477	Good		PQC	300		G							F	PQC	G	F				
99	477	478	Good		PQC	300		G							F	PQC	G	F				
100	478	479	Good		PQC	300		G							F	PQC	G	F				
101	479	480	G/F		PQC	300		G							F	PQC	G	F				
102	480	481	Good		PQC	300		G							F	PQC	G	F				
103	481	482	Good		PQC	300		G							F	PQC	G	F				
104	482	483	Fair		PQC	300		F	0.25						F	PQC	G	F				
105	483	484	G/F		PQC	300		G	0.2						F	PQC	G	F				

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
106	484	485	Good		PQC	300		G							F	PQC	G	F				
107	485	486	Good		PQC	300		G							F	PQC	G	F				
108	486	487	Good		PQC	300		G							P	PQC	G	P				
109	487	488	G/F		PQC	300		F	0.1						P	PQC	G	P				
110	488	489	Good		PQC	300		G							F	PQC	G	F				
111	489	490	G/F		PQC	300		G							F	PQC	G	F				
112	490	491	Good		PQC	300		G							F	PQC	G	F				
113	491	492	Good		PQC	300		G							F	PQC	G	F				
114	492	493	Good		PQC	300		G							F	PQC	G	F				
115	493	494	Good		BT/PQC	300/50		G							F	PQC	G	F				
116	494	495	Fair		BT	50		F	3			10			F	BT	G	F				
117	495	496	Fair		BT	50		F	3			10			F	BT	G	F				
118	496	497	Fair		BT	50		F	3			8			F	BT	G	F				

FP Project Management

Four laning of Gundugolanu - Devarapalli - Kovvuru from km. 15.320 to km. 85.204 in the state of Andhra Pradesh under Bharatmala Pariyojana on Hybrid Annuity Mode under NHDP PHASE-V

Technical Due Diligence Study

Final Report

November 2022

Submitted by:

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FOUR LANING OF GUNDUGOLANU - DEVARAPALLI - KOVVURU SECTION OF NH-16 (OLD SH-107) FROM KM. 15.320 (EXISTING KM. 15.700) TO KM. 85.204 (EXISTING KM. 81.400) (DESIGN LENGTH - 69.884 KM) IN THE STATE OF ANDHRA PRADESH UNDER BHARATMALA PARIYOJANA ON HYBRID ANNUITY MODE UNDER NHDP PHASE-V

TECHNICAL DUE DILIGENCE STUDY

FINAL REPORT

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1 INTRODUCTION

1.1 Background

The Government of India had entrusted to the Authority the project of development, maintenance and management of National Highway No. 16 (Old SH-107) including the section from Chainage from km. 15.320 to km. 85.204 (Approx. kms 69.884). The Authority had resolved to augment the existing road from km. 15.700 to km. 81.400 (Design Chainage from km. 15.320 to km. 85.204). Approx. km. 69.884 on the section of National Highway No.16 (Old SH-107) in the state of Andhra Pradesh for four laning (the "Project") on Design, Build, Operate and Transfer (the "DBOT Annuity" or "Hybrid Annuity" basis) under Bharatmala Pariyojana which shall be partly financed by the Concessionaire who shall recover its investment and costs through payments to be made by the Authority, in accordance with the terms and conditions to be set forth in a Concession Agreement.

The National Highways Authority of India invited proposals of 4-laning of Gundugolanu - Devarapalli - Kovvuru section of NH-16 (Old SH-107) Design chainage from km. 15.320 to km. 85.204 for a length of 69.884 kms on "DBOT Annuity" or "Hybrid Annuity" basis. The project was awarded to **M/s. GR Gundugolanu Devarapalli Highway Pvt. Ltd.** based on lowest Net Present Value of both Bid Project Cost during construction period and O&M cost during the operations period.

The Appointed Date of the project was 22nd October 2018. The concession period of the project highway is 17.5 years from the Appointed Date including construction period of 2.5 years. The Scheduled Completion Date of the project highway was on 19th April 2021. The NHAI had granted Extension of Time (EOT) for 83 days. The project has received Provisional Completion Certificate on 10th July 2021.

During maintenance period of the project highway, **GR Highways Investment Manager Pvt. Ltd.** (in its capacity as the Investment Manager of Bharat Highways InvIT) has appointed **FP Project Management Consultancy Services Private Limited** [Formerly Frischmann Prabhu (I) Pvt. Ltd.] as Technical Consultant for carrying out techincal study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, FP Project Management undertook the site visits to carry out site inspection. The report is based on findings during this period.

1.2 Our Approach Philosophy

Composition of Team

Our team consists of well-qualified Engineers and other professionals, whose experience covers all the skills and specializations required for undertaking such assignments. All the team personnel are our regular employees and have a long and stable working relationship with our firm.

The Team Leader coordinates the activities between all the key staff who work closely together. The key staff is assisted by various support staff, who report to the respective key staff in their field of expertise. The Team Leader is the point of contact for Client on Technical Study.

The technical study includes review of all the available documents namely:
a) Concession Agreement including Technical Schedules

b) EPC Agreement
c) Pavement design reports
d) O&M Manual prepared by the Concessionaire
e) O&M Contract, work order and their provisions
f) Recent O&M Report submitted to Authority
g) Quality of construction based on available data, design and drawings
h) Documents on historical expenditure on operation and maintenance
i) Reports on past accidents
j) O&M cost schedule for the concession period
k) Completion / Provisional Completion and status of items in punch list items
l) Correspondence regarding scope of works and during O&M
m) Toll operation manual / ATMS related documents

The review of the above documents is the first step towards accomplishment of the assignment. This gives a complete idea of the project and is used as input data for preparation of report after necessary analysis.

Site Visit and Data Collection

A team of experts from various streams has carried out the preliminary site visit to understand the assessment of project assets mainly condition of the pavement and structures.

- The site visit is undertaken for detailed reconnaissance and visual pavement condition assessment
- The condition assessment of major structures by visual inspection
- The information like material sources and the probable cost is collected for the purpose of cost estimate

The detailed design / drawings viz. Plan & L-sections, drainage design, structure design, layout drawings for project facilities like toll plaza, bus bay, truck lay-byes, highway lighting facilities etc., would be studied. Also, design / drawing and provision pertaining to road furniture are studied.

The adequacy of design is verified in accordance with the concession agreement, manual of specifications and standards as well as relevant IRC standards.

The information on availability of material in the vicinity is gathered. It has direct impact on cost of maintenance work and balance work if any.

The basic approach for preparation for cost estimates for operation and maintenance is as per the practice of State PWD / MoRT&H in respect of highways and structures.

Data Analysis

Based on the study of the available information and preliminary site visits, the consultants share their preliminary observations with the Client.

1.3 About this Report

This report has been prepared based on the information, reports and documents made available to us by the Company. We have also referred to publicly available reports, literature etc., and have made our best efforts to check the authenticity of the information available, analyse the same as per the best engineering / industry practices.

The site visit and inspection were carried out between the periods of **11th August 2022 to 14th August 2022**.

The report is organized with the following chapters for easy understanding of various issues.

- **Introduction -** This chapter gives an overview of the project background, approach and methodology of Due Diligence studies.
- **Project Description -** This chapter describes existing project features.
- **Development of Project Highway -** This chapter gives an overview of project development.
- **Balance works -** This chapter summarizes the balance works to be executed at Site.
- **Pavement and Site Investigation -** This chapter describes present condition of pavement, surveys and investigations carried out on site and proposals for maintenance as per contract requirements.
- **Operation and Maintenance -** This chapter describes O&M set up as well as O&M cost over the concession period.
- **Review of Concession Agreement -** This chapter summarizes the observations on the Concession Agreement.
- **Review of O&M Agreement -** This chapter summarizes the observations on the O&M Agreement executed.
- **Accident Data Analysis -** This chapter deals with the analysis of nature of accidents occurring on the stretch and to identify blackspots.
- **Annexures**

2 PROJECT DESCRIPTION

2.1 Location

The site of the Four Laning of Project Highways comprises the section of National Highway NH-16 (Old SH-107) commencing from km. 15.700 to km. 81.400 (Design Chainage from km. 15.320 to km. 85.204).

The proposed alignment of Four-Lane Project Highway starts from chainage km. 15.700 of existing NH-16 and run on existing NH-16 upto existing chainage km. 81.400. The entire alignment is passing through West Godavari District and mainly passes through settlements like Surappagudem, Bhimdole, Dubacherla, Pullalapadu, Nallajerla, Yerragudem, Devarapalli, Pangidi, Duddukuru, Dommeru, and ends at Kovvuru. After that the proposed alignment of Four-Lane Project Highway leaves the existing NH and takes the bypasses at following areas Bhimadole, Dubacherla, Nallajarla, Ananthapalli, Yernagudem, Devarapalli and project road ends at kovvuru.

The project highway is of four lane divided carriageway with paved shoulder & earthen shoulder and Six-Lane configuration structures (Interchange / Flyover / VUP / LVUP) with their 6-lane carriageway approaches.

Flexible Pavement is provided for the entire project highway including bypasses, Realignments, Slip roads and Service roads except toll plaza location. Rigid Pavement is provided for Toll Plaza location. The proposed length of the project highway is 69.884 kms.

The Location Map of the project highway is presented below:

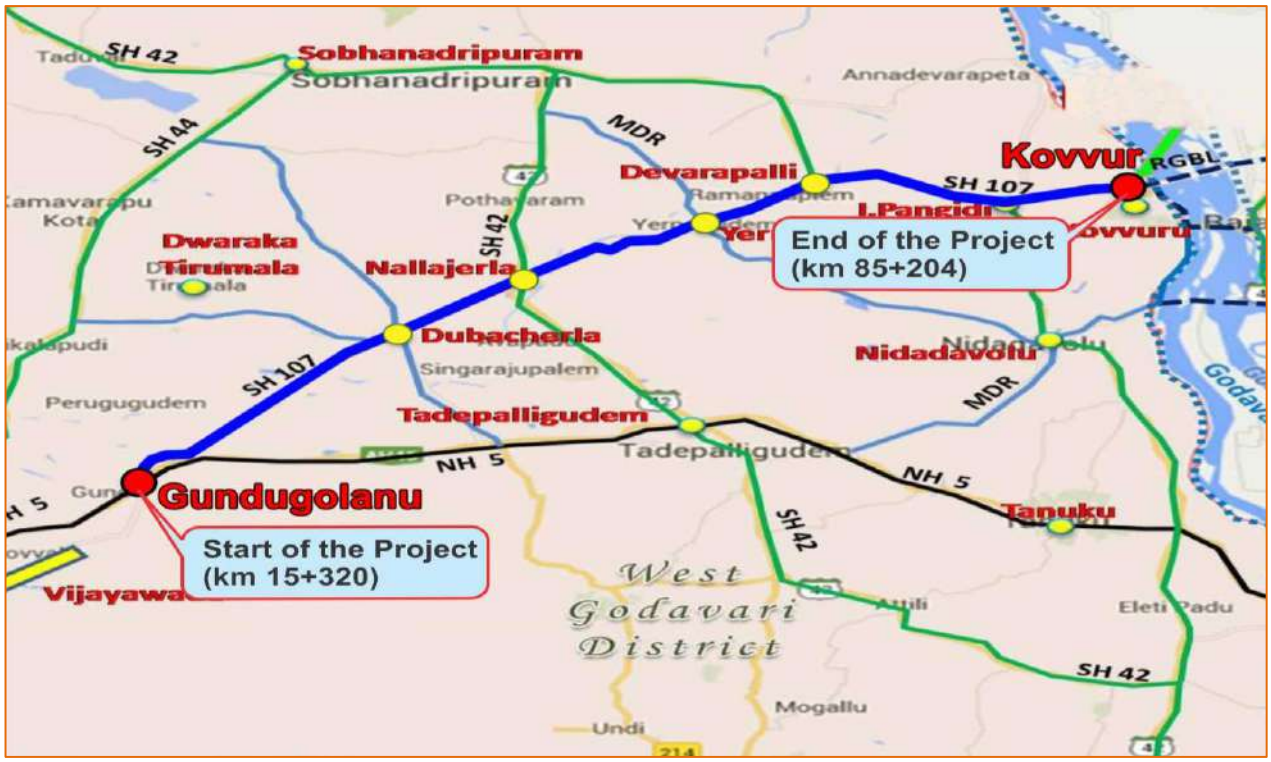


Figure 2-1 Location Map

2.2 Climate

The climate of the project area is generally dry except during the monsoon season between July and August are being the peak rainy months. The average annual rainfall in the area is around 1179 mm. The hottest season is from April to June, with temperature ranging from 34 °C (93 °F) to 48 °C (118 °F) with maximum of 52 °C (126 °F). The month with the highest relative humidity is September (82.60 %). The month with the lowest relative humidity is May (61.01 %).

2.3 Terrain

This section of National Highway traverses through plain / rolling terrain.

2.4 Abutting Land Use

The land use along the highway is predominantly agriculture, built up and barren.

2.5 Right of Way

The width of existing Right of Way (RoW) throughout the project stretch is 60.0 m.

2.6 Existing Utilities

During widening of the project highway, various affected utility services located along the project road were shifted to the PROW. The different types of utilities found along the road include, electrical poles, telephone poles, OFC Cables, etc.

3 DEVELOPMENT OF PROJECT ROAD

3.1 Project Road

The existing two-lane road with earthen shoulder from km. 15+700 to km. 81+400 has been developed as four lane divided carriageway during the construction stage for the length of 69.884 kms. The project road passes through rural as well as built-up sections. The stretches falling in built-up areas have been provided with service road as per scope of works. The development of entire project road has been carried out in accordance with schedule-B and schedule-C as per standards set forth in schedule-D under the Concession Agreement.

M/s. GR Gundugolanu Devarapalli Highway Pvt. LTD. has completed construction of the project road for the length of 69.884 kms.

The stretch of the project highway under the scope of study runs predominantly through plain / rolling terrain. The design standards have been adhered to with a realistic compatibility with the existing ROW, utilities and optimum land acquisition. Generally, the cross-sectional dimensions of project road are as below:

Table 3-1 Cross sectional dimension

Main Carriageway	Width (m)
Carriageway	15.0 to 26.0
Paved Shoulder width - one side	2.0
Earthen Shoulder width - one side	2.0
Median width	1.5 - 4.0
Service Road	5.5 to 7.5

3.2 Width of Carriageway

The paved carriageway is 4 lane varies from 18 m to 27 m wide including paved shoulders, shyness and excluding the median for 4-lane divided carriageway.

3.3 Bypass and Realignment

A) Realignment

There are 03 locations where realignments are made. The same is as listed below.

Table 3-2 Details of Realignment

Sr. No.	Existing Chainage (km)		Design Chainage (km)		Design Length (km)	Remarks
	From	To	From	To		
1	Realignment	16.680	15.320	16.660	1.340	Start of project
2	18.720	18.940	18.690	18.910	0.220	Curve Improvement
3	52.950	53.390	54.380	54.820	0.440	Curve Improvement
				Total	**2.000**	

B) Bypasses

There are 06 Nos. of bypass on the project highway. The same is as listed below,

Table 3-3 Details of Bypasses

Sr. No.	Name of Bypass	Existing Chainage (km)		Design Chainage (km)		Design Length (km)
		From	To	From	To	
1	Bhimadole Bypass	20.380	24.880	20.330	25.610	5.280
2	Dubacherla Bypass	33.970	38.300	34.680	39.190	4.510
3	Nallajerla Bypass	41.770	44.590	42.660	46.010	3.350
4	Ananthapalli Bypass	47.160	50.260	48.610	51.700	3.090
5	Yernagudem Bypass	54.570	57.550	56.010	59.130	3.120
6	Devarapalli Bypass	58.320	81.410	59.890	85.204	25.314
	Total Length					**44.664**

3.4 Typical Cross Sections

A) Cross Section Type along the Project Corridor

The Typical Cross Sections as listed below:

Table 3-4 Details of Typical Cross Sections

Sr. No.	Design Chainage (km)		Length (m)	Type of C/S	Remarks
	From	To			
1	15.320	15.755	435	Fig 2.4A	
2	15.755	15.845	90	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
3	15.845	16.220	375	Fig 2.4A	
4	16.220	18.060	1840	Fig 2.4 of 4 laning manual	
5	18.060	18.550	490	Fig 2.4D	
6	18.550	18.757	207	Fig 7.3 of 4 laning manual	ROB
7	18.757	19.210	453	Fig 2.4D	
8	19.210	19.915	705	Fig 2.6A	
9	19.915	20.450	535	Fig 2.4A	
10	20.450	20.490	40	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
11	20.490	20.960	470	Fig 2.4A	
12	20.960	22.404	1444	Fig 2.5 of 4 laning manual	
13	22.404	22.614	210	Fig 7.3 of 4 laning manual	Major Bridge
14	22.614	22.850	236	Fig 2.5 of 4 laning manual	
15	22.850	23.120	270	Fig 2.4C	
16	23.120	23.180	60	Fig 7.8 of 4 laning manual	Flyover
17	23.180	23.580	400	Fig 2.4C	
18	23.580	24.910	1330	Fig 2.5 of 4 laning manual	
19	24.910	25.370	460	Fig 2.4A	
20	25.370	25.410	40	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
21	25.410	25.730	320	Fig 2.4A	
22	25.730	27.500	1770	Fig 2.4 of 4 laning manual	

Sr. No.	Design Chainage (km)		Length (m)	Type of C/S	Remarks
	From	To			
23	27.500	27.784	284	Fig 2.6B	
24	27.784	27.796	12	Fig 7.8 of 4 laning manual	LVUP
25	27.796	28.315	519	Fig 2.6B	
26	28.315	31.597	3282	Fig 2.4 of 4 laning manual	
27	31.597	31.723	126	Fig 7.3 of 4 laning manual	Major Bridge
28	31.723	34.620	2897	Fig 2.4 of 4 laning manual	
29	34.620	34.920	300	Fig 2.4A	
30	34.920	34.960	40	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
31	34.960	35.500	540	Fig 2.4A	
32	35.500	35.995	495	Fig 2.5 of 4 laning manual	
33	35.995	36.404	409	Fig 2.4C	
34	36.404	36.416	12	Fig 7.8 of 4 laning manual	LVUP
35	36.416	36.770	354	Fig 2.4C	
36	36.770	37.060	290	Fig 2.5 of 4 laning manual	
37	37.060	37.394	334	Fig 2.4C	
38	37.394	37.406	12	Fig 7.8 of 4 laning manual	LVUP
39	37.406	37.835	429	Fig 2.4C	
40	37.835	38.535	700	Fig 2.5 of 4 laning manual	
41	38.535	38.915	380	Fig 2.4A	
42	38.915	38.955	40	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
43	38.955	39.450	495	Fig 2.4A	
44	39.450	42.460	3010	Fig 2.4 of 4 laning manual	
45	42.460	42.855	395	Fig 2.4A	
46	42.855	42.895	40	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
47	42.895	43.255	360	Fig 2.4A	
48	43.255	44.060	805	Fig 2.5 of 4 laning manual	
49	44.060	44.368	307.5	Fig 2.4C	
50	44.368	44.383	15	Fig 7.8 of 4 laning manual	VUP
51	44.383	44.720	337.5	Fig 2.4C	
52	44.720	45.350	630	Fig 2.5 of 4 laning manual	
53	45.350	45.610	260	Fig 2.4C	
54	45.610	45.650	40	Fig 7.8 of 4 laning manual	Flyover
55	45.650	46.250	600	Fig 2.4C	
56	46.250	46.544	294	Fig 2.6B	
57	46.544	46.556	12	Fig 7.8 of 4 laning manual	LVUP
58	46.556	46.890	334	Fig 2.6B	
59	46.890	48.117	1227	Fig 2.4 of 4 laning manual	
60	48.117	48.272	155	Fig 7.3 of 4 laning manual	Major Bridge
61	48.272	48.415	143	Fig 2.4 of 4 laning manual	
62	48.415	48.810	395	Fig 2.4B	
63	48.810	48.850	40	Fig 2.4B**	Uni directional Flyover LHS- Elevated Structure RHS- At Grade Road
64	48.850	49.230	380	Fig 2.4B	

Sr. No.	Design Chainage (km)		Length (m)	Type of C/S	Remarks
	From	To			
65	49.230	49.760	530	Fig 2.5 of 4 laning manual	
66	49.760	50.039	279	Fig 2.4C	
67	50.039	50.051	12	Fig 7.8 of 4 laning manual	LVUP
68	50.051	50.480	429	Fig 2.4C	
69	50.480	51.095	615	Fig 2.5 of 4 laning manual	
70	51.095	51.415	320	Fig 2.4B	
71	51.415	51.455	40	Fig 2.4B**	Uni directional Flyover LHS- Elevated Structure RHS- At Grade Road
72	51.455	51.735	280	Fig 2.4B	
73	51.735	51.820	85	Fig 2.4 of 4 laning manual	
74	51.820	52.020	200	Fig 7.3 of 4 laning manual	Major Bridge
75	52.020	54.380	2360	Fig 2.4 of 4 laning manual	
76	54.380	55.310	930	Fig 2.6A	
77	55.310	55.840	530	Fig 2.5 of 4 laning manual of 4 laning manual	
78	55.840	56.245	405	Fig 2.4A	
79	56.245	56.285	40	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
80	56.285	56.645	360	Fig 2.4A	
81	56.645	57.260	615	Fig 2.5 of 4 laning manual	
82	57.260	57.784	524	Fig 2.4C	
83	57.784	57.796	12	Fig 7.8 of 4 laning manual	LVUP
84	57.796	58.100	304	Fig 2.4C	
85	58.100	58.570	470	Fig 2.5 of 4 laning manual	
86	58.570	58.920	350	Fig 2.4A	
87	58.920	58.960	40	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
88	58.960	59.380	420	Fig 2.4A	
89	59.380	59.708	328	Fig 2.4 of 4 laning manual	
90	59.708	59.832	124	Fig 7.3 of 4 laning manual	Major Bridge
91	59.832	59.890	58	Fig 2.4 of 4 laning manual	
92	59.890	60.180	290	Fig 2.4A	
93	60.180	60.220	40	Fig 2.4A*	Uni directional Flyover LHS- At Grade Road RHS- Elevated Structure
94	60.220	60.545	325	Fig 2.4A	
95	60.545	61.560	1015	Fig 2.5 of 4 laning manual	
96	61.560	61.919	359	Fig 2.4C	
97	61.919	61.931	12	Fig 7.8 of 4 laning manual	LVUP
98	61.931	62.240	309	Fig 2.4C	
99	62.240	63.075	835	Fig 2.5 of 4 laning manual	
100	63.075	63.448	373	Fig 2.4C	
101	63.448	63.473	25	Fig 7.8 of 4 laning manual	VUP
102	63.473	64.390	917	Fig 2.4C	
103	64.390	66.200	1810	Fig 2.5 of 4 laning manual	
104	66.200	66.655	455	Fig 2.4C	
105	66.655	66.745	90	Fig 7.8 of 4 laning manual	Flyover

Sr. No.	Design Chainage (km)		Length (m)	Type of C/S	Remarks
	From	To			
106	66.745	67.390	645	Fig 2.4C	
107	67.390	67.700	310	Fig 2.5 of 4 laning manual	
108	67.700	67.969	269	Fig 2.4C	
109	67.969	67.981	12	Fig 7.8 of 4 laning manual	LVUP
110	67.981	68.480	499	Fig 2.4C	
111	68.480	68.645	165	Fig 2.5 of 4 laning manual	
112	68.645	68.765	120	Fig 7.3 of 4 laning manual	Major Bridge
113	68.765	70.780	2015	Fig 2.5 of 4 laning manual	
114	70.780	71.134	354	Fig 2.4C	
115	71.134	71.146	12	Fig 7.8 of 4 laning manual	LVUP
116	71.146	71.530	384	Fig 2.4C	
117	71.530	73.650	2120	Fig 2.5 of 4 laning manual	
118	73.650	73.994	344	Fig 2.4C	
119	73.994	74.006	12	Fig 7.8 of 4 laning manual	LVUP
120	74.006	74.430	424	Fig 2.4C	
121	74.430	76.673	2243	Fig 2.5 of 4 laning manual	
122	76.673	76.753	80	Fig 7.3 of 4 laning manual	Major Bridge
123	76.753	77.455	702	Fig 2.5 of 4 laning manual	
124	77.455	77.535	80	Fig 7.3 of 4 laning manual	Major Bridge
125	77.535	77.800	265	Fig 2.5 of 4 laning manual	
126	77.800	78.314	514	Fig 2.4C	
127	78.314	78.326	12	Fig 7.8 of 4 laning manual	LVUP
128	78.326	78.860	534	Fig 2.4C	
129	78.860	79.021	161	Fig 2.4C	
130	79.021	79.111	90	Fig 7.3 of 4 laning manual	Major Bridge
131	79.111	79.265	154	Fig 2.4C	
132	79.265	79.305	40	Fig 7.8 of 4 laning manual	Flyover
133	79.305	79.790	485	Fig 2.4C	
134	79.790	82.980	3190	Fig 2.5 of 4 laning manual	
135	82.980	83.398	418	Fig 2.4C	
136	83.398	83.423	25	Fig 7.8 of 4 laning manual	VUP
137	83.423	83.800	377	Fig 2.4C	
138	83.800	85.204	1404	Fig 2.5 of 4 laning manual	Overpass to be con- structed for existing road @ 84+795 as per GAD

The cross-section has developed as per the Manual Specifications and Standards for four-laning of highways through Public Private Partnership published by the IRC:SP:84-2014.

Figure 3-1 Start and end of Project Road

Start of Project Road at km. 15+700

End of Project Road km. 85+204

3.5 Built-up Area

The Project Highway passes through the following built up areas.

Table 3-5 Details of Built-up area

Sr. No.	Design Chainage (km)		Length (m)	Location Name
	From	To		
1	19.210	19.915	705	Surappagudem
2	27.500	28.315	815	Gopalapuram
3	46.110	46.890	780	Achchannapeta
4	54.380	55.310	930	Surya Narayanapuram
		Total	**3230**	

3.6 Pavement Design

The entire stretch of the project highway including service road and slip road are flexible pavement except toll plaza which is rigid pavement.

3.6.1 Pavement design

Design of Flexible pavement has been carried out in accordance with Section 5 of the Manual for minimum design traffic of 80 MSA for section from design km. 15.320 to km. 34.680 of main carriageway. Minimum crust has composition of 40 mm BC, 105 mm DBM, 250mm WMM and 200 mm GSB.

Design of Flexible pavement has been carried out in accordance with Section 5 of the Manual for minimum design traffic of 84 MSA for section from design km. 34.680 to km. 42.660 of main carriageway. Minimum crust has composition of 50 mm BC, 110 mm DBM, 250mm WMM and 200 mm GSB.

Design of Flexible pavement has been carried out in accordance with Section 5 of the Manual for minimum design traffic of 100 MSA and for section from design km. 42.660 to km. 59.890 of main carriageway. Minimum crust has composition of 50 mm BC, 110mm DBM, 250mm WMM and 200 mm GSB.

Design of Flexible pavement has been carried out in accordance with Section 5 of the Manual for minimum design traffic of 150 MSA and for section from design km. 59.890 to km. 85.204 of main carriageway. Minimum crust has composition of 50 mm BC, 125 mm DBM, 250mm WMM and 200 mm GSB.

Design of Flexible pavement has been carried out in accordance with Section 5 of the Manual for minimum design traffic of 10 MSA for Service roads and Slip roads. Minimum crust has composition of 40 mm BC, 50 mm DBM, 250mm WMM and 200 mm GSB.

Design of Rigid pavement has been carried out in accordance with Section 5 of the Manual. Minimum crust has composition of 270 mm PQC, 150mm DLC and 150 mm GSB.

3.6.2 Type of Pavement

Flexible Pavement has been provided for the entire project highway including bypasses, Rea-alignments, Slip roads and Service roads except toll plaza location. However, overlay on existing carriage has been provided as per detailed design. Rigid Pavement has been provided for Toll Plaza location.

3.7 Intersections

i) At grade intersections

At grade intersections has been provided with the intersecting roads at the following locations.

a) Major Intersections

Table 3-6 Details of Major Intersections

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Junction	Cross Road Category	Leads to	Remarks
1	15.700	15.800	T	NH	Tanuku	Start of project
2	20.540	20.470	Y	SH	Bhimadole	Bypass start
3	24.660	25.390	Y	SH	Bhimadole	Bypass end
4	34.260	34.940	Y	SH	Dubacherla	Bypass start
5	38.020	38.935	Y	SH	Dubacherla	Bypass end
6	42.030	42.875	Y	SH	Nallagerla	Bypass start
7	47.420	48.830	Y	SH	Anatapalli	Bypass start
8	49.980	51.435	Y	SH	Anatapalli	Bypass end
9	54.940	56.265	T	SH	Yernagudem	Bypass start
10	57.350	58.940	Y	SH	Yernagudem	Bypass end
11	58.680	60.200	Y	SH	Devarapalli	Bypass start

b) Minor Intersections

Table 3-7 Details of Minor Intersections

Sr. No.	Existing Chainage	Design Chainage	Type	Cross road leads to		Category of cross road	Carriageway width cross road
				LHS	RHS		
1	17.380	17.350	Y	sitampeta		VR	Single Lane
2	19.090	19.070	Y	Gandivarigudem		VR	Single Lane
3	19.660	19.630	T		Patthuru	VR	Single Lane

Sr. No.	Existing Chainage	Design Chainage	Type	Cross road leads to		Category of cross road	Carriageway width cross road
				LHS	RHS		
4	25.060	25.800	+		K.Amberpeta	VR	Single Lane
5	29.210	29.900	T		Buttayagudem	VR	Single Lane
6	30.790	31.480	T		Gunnampalli	VR	Single Lane
7	39.530	40.420	T	Pullalapadu		VR	Single Lane
8	45.580	47.030	T		Village road	VR	Single Lane
9	50.320	51.765	T	Village road		VR	Single Lane
10	Bypass	65.025	+	Vadalakunta	Devarapalli	VR	Single Lane

Figure 3-2 Photographs of Major Junction

Major intersection at km. 60+000

End of Project Road km. 48+830

3.8 Underpasses

The details of the underpasses provided are tabulated as below.

Table 3-8 Details of lateral and Vertical Clearances at Underpasses

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Clear Span / Opening (m)	Width (m)	Type of Structure	Remarks
1	15.700	15.800	3 x 30.0	1 x 14.5	Uni directional Flyover	Realignment Start
2	20.540	20.470	2 x 20.0	1 x 14.5	Uni directional Flyover	Bhimadole Bypass Start
3	Bypass	23.150	2 x 30.0	2 x 14.5	Flyover	Bhimadole Bypass
4	24.660	25.390	2 x 20.0	1 x 14.5	Uni directional Flyover	Bhimadole Bypass end
5	27.100	27.790	1 x 12.0	2 x 14.5	LVUP	Konda Reddy Nagar
6	34.260	34.940	2 x 20.0	1 x 14.5	Uni directional Flyover	Dubhacherla Bypass start
7	Bypass	36.413	1 x 12.0	2 x 14.5	LVUP	Dubacherla Bypass Road Crossing
8	Bypass	37.400	1 x 12.0	2 x 14.5	LVUP	Dubacherla Bypass Towards Lakkavaram
9	38.020	38.935	2 x 20.0	1 x 14.5	Uni directional Flyover	Dubhacherla Bypass End

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Clear Span / Opening (m)	Width (m)	Type of Structure	Remarks
10	42.030	42.875	2 x 20.0	1 x 14.5	Uni directional Flyover	Nallajerla Bypass Start
11	Bypass	44.375	1 x 15.0	2 x 14.5	VUP	Nallajerla Bypass
12	Bypass	45.630	2 x 20.0	2 x 14.5	Flyover	Nallajerla Bypass
13	45.100	46.550	1 x 12.0	2 x 14.5	LVUP	
14	47.420	48.830	2 x 20.0	1 x 14.5	Uni directional Flyover	Ananthapalli Bypass Start
15	Bypass	50.045	1 x 12.0	2 x 14.5	LVUP	Ananthapalli Bypass Towards Chowdavaram
16	49.980	51.435	2 x 20.0	1 x 14.5	Uni directional Flyover	Ananthapalli Bypass End
17	54.940	56.265	2 x 20.0	1 x 14.5	Uni directional Flyover	Yernagudem Bypass Start
18	Bypass	57.790	1 x 12.0	2 x 14.5	LVUP	Yernagudem Bypass Towards Chinnayyagudem
19	57.350	58.940	2 x 20.0	1 x 14.5	Uni directional Flyover	Yernagudem Bypass End
20	58.680	60.200	2 x 20.0	1 x 14.5	Uni directional Flyover	Devarapalli Bypass Start
21	Bypass	61.925	1 x 12.0	2 x 14.5	LVUP	Devarapalli Bypass Towards Kothagudem
22	Bypass	63.460	1 x 25.0	2 x 14.5	VUP	Devarapalli Bypass Yadhavolu Rd
23	Bypass	66.700	3 x 30.0	2 x 14.5	Flyover	Devarapalli Bypass
24	Bypass	67.975	1 x 12.0	2 x 14.5	LVUP	Devarapalli Bypass
25	Bypass	71.140	1 x 12.0	2 x 14.5	LVUP	Devarapalli Bypass
26	Bypass	74.000	1 x 12.0	2 x 14.5	LVUP	Devarapalli Bypass Towards Gowripatnam
27	Bypass	78.320	1 x 12.0	2 x 14.5	LVUP	Devarapalli Bypass
28	Bypass	79.285	1x20 +1x35	2 x 14.5	Flyover	Devarapalli Bypass
29	Bypass	83.410	1 x 25.0	2 x 14.5	VUP	Devarapalli Bypass

3.8.1 Overpasses

The details of the Overpasses provided are tabulated as below.

Table 3-9 Details of lateral and vertical clearances at Over passes

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Span / Opening (m)	Deck Width (m)	Remarks
1	81.000	84.795	2 x 45.0m	1 x 12.0	At Kovvur Road

3.9 Service Road and slip roads

a) Service Road

Service roads has been constructed at the following sections excluding lengths of taper:

Table 3-10 Details of Service Roads

Sr. No.	From (km)	To (km)	Length in km	Side	Service road width, m	Total Length, km
1	19.210	19.915	0.705	Both	7.5	1.410
2	20.960	22.390	1.430	Both	7	2.860
3	23.580	24.910	1.330	Both	7	2.660
4	27.500	28.315	0.815	Both	7.5	1.630
5	35.500	35.995	0.495	Both	7	0.990
6	36.770	37.060	0.290	Both	7	0.580
7	37.835	38.535	0.700	Both	7	1.400
8	43.255	44.060	0.805	Both	7	1.610
9	44.720	45.350	0.630	Both	7	1.260
10	46.250	46.890	0.640	Both	7.5	1.280
11	49.230	49.760	0.530	Both	7	1.060
12	50.480	51.095	0.615	Both	7	1.230
13	54.380	55.310	0.930	Both	7.5	1.860
14	55.310	55.840	0.530	Both	7	1.060
15	56.645	57.260	0.615	Both	7	1.230
16	58.100	58.570	0.470	Both	7	0.940
17	60.545	61.560	1.015	Both	7	2.030
18	62.240	63.075	0.835	Both	7	1.670
19	64.390	66.200	1.810	Both	7	3.620
20	67.390	67.700	0.310	Both	7	0.620
21	68.900	70.780	1.880	Both	7	3.760
22	71.530	73.650	2.120	Both	7	4.240
23	74.430	76.650	2.220	Both	7	4.440
24	76.800	77.420	0.620	Both	7	1.240
25	77.580	77.800	0.220	Both	7	0.440
26	79.790	82.980	3.190	Both	7	6.380
27	83.800	85.204	1.404	Both	7	2.808
Total Length (km)			**27.154**			**54.308**

b) Slip Road

Slip roads has been constructed at the following sections excluding taper.

Table 3-11 Details of Slip Road

Sr. No.	Design Chainage (km)		Length (km)	Side	Slip Road Width (m)	Total Length (km)
	From	To				
1	15.320	16.220	0.900	Both	7.0	1.800
2	18.060	19.210	1.150	Both	5.5	2.300
3	19.915	20.960	1.045	Both	7.0	2.090
4	22.850	23.580	0.730	Both	7.0	1.460
5	24.910	25.730	0.820	Both	7.0	1.640
6	34.620	35.500	0.880	Both	7.0	1.760
8	35.995	36.770	0.775	Both	7.0	1.550
9	37.060	37.835	0.775	Both	7.0	1.550
10	38.535	39.450	0.915	Both	7.0	1.830
11	42.460	43.255	0.795	Both	7.0	1.590
12	44.060	44.720	0.660	Both	7.0	1.320
13	45.350	46.250	0.900	Both	7.0	1.800

Sr. No.	Design Chainage (km)		Length (km)	Side	Slip Road Width (m)	Total Length (km)
	From	To				
14	48.415	49.230	0.815	Both	7.0	1.280
16	49.760	50.480	0.720	Both	7.0	1.610
17	51.095	51.735	0.640	Both	7.0	1.680
18	55.840	56.645	0.805	Both	7.0	1.620
21	57.260	58.100	0.840	Both	7.0	1.310
22	58.570	59.380	0.810	Both	7.0	1.360
23	59.890	60.545	0.655	Both	7.0	2.630
24	61.560	62.240	0.680	Both	7.0	2.380
25	63.075	64.390	1.315	Both	7.0	1.560
26	66.200	67.390	1.190	Both	7.0	1.500
27	67.700	68.480	0.780	Both	7.0	1.560
28	70.780	71.530	0.750	Both	7.0	2.120
29	73.650	74.430	0.780	Both	7.0	1.860
30	77.800	78.860	1.060	Both	7.0	1.640
31	78.860	79.790	0.930	Both	7.0	1.280
32	82.980	83.800	0.820	Both	7.0	1.610
Total Length, km			**23.935**			**47.870**

Figure 3-3 Photographs of Service Road

km. 23+800 (LHS)

km. 27+790 (LHS)

km. 36+420 (RHS)

km. 78+800 (RHS)

km. 50+700 (LHS)

km. 44+800 (LHS)

3.10 Culverts reconstructed / widened / newly constructed

The culverts reconstructed / widened / newly constructed are given below:

a) Widening of Box / Slab Culverts

Table 3-12 Details of Widening of Box / Slab Culverts

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Flow	Type of Existing Culvert	Span Arrangement (m)	
					Existing	Proposed
1	25.870	26.611	Nala	Slab Culvert	3 x 1.5	3 x 1.5
2	28.610	29.314	Nala	Slab Culvert	3 x 1.5	3 x 1.5
3	30.170	30.874	Nala	Slab Culvert	1 x 1.5	1 x 1.5
4	39.920	40.829	Nala	Slab Culvert	1 x 4.3	1 x 4.3
5	41.145	42.054	Nala	Slab Culvert	1 x 1.6	1 x 1.6
6	45.450	46.914	Canal	Slab Culvert	2 x 1.5	2 x 1.5
7	51.695	53.144	Nala	Slab Culvert	1 x 2.2	1 x 2.2
8	52.760	54.234	Nala	Slab Culvert	1 x 2	1 x 2

b) Widening of Hume Pipe Culverts (HPC)

Table 3-13 Details of Widening of Hume Pipe Culverts (HPC)

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Flow	Type of Culvert		Span Arrangement (m)	
				Existing	Proposed	Existing	Proposed
1	16.880	16.846	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
2	17.070	17.042	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
3	17.300	17.280	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
4	17.440	17.420	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
5	19.430	19.401	Nala	Pipe Culvert	Pipe Culvert	2 x 0.9	2 x 0.9
6	19.660	19.631	Nala	Pipe Culvert	Pipe Culvert	3 x 0.9	3 x 0.9
7	19.995	19.961	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
8	28.320	29.016	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
9	29.070	29.774	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
10	46.016	47.804	Nala	Pipe Culvert	Pipe Culvert	4 x 1.1	4 x 1.2
11	50.710	52.164	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
12	52.020	53.464	Nala	Pipe Culvert	Pipe Culvert	1 x 0.9	1 x 0.9
13	52.260	53.704	Nala	Pipe Culvert	Pipe Culvert	3 x 0.9	3 x 0.9

c) Reconstruction of Box / Slab Culverts

Table 3-14 Details of Reconstruction of Box / Slab Culverts

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Flow	Total Length (m)
1	31.580	32.294	Nala	2.0

d) Reconstruction of Pipe to Box Culverts

Table 3-15 Details of Reconstruction of Pipe to Box Culverts

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Flow	Total Length (m)
1	20.190	20.156	Nala	2.0
2	25.030	25.740	Nala	2.0
3	29.560	30.274	Nala	2.0
4	31.060	31.764	Nala	2.0

5	46.372	48.580	Canal	2.0
6	53.760	55.200	Nala	3.0

e) New Construction of Box / Slab Culverts

Table 3-16 Details of New Construction of Box / Slab Culverts

Sr. No.	Design Chainage (km)	Type of flow	Total Length (m)
1	15.600	Nala	2.0
2	15.720	Nala	5.0
3	15.900	Nala	2.0
4	16.390	Nala	2.0
5	20.740	Nala	5.0
6	20.811	Nala	6.0
7	21.800	Nala	2.0
8	21.901	Nala	2.0
9	22.340	Canal	4.0
10	23.011	Nala	4.0
11	23.650	Canal	4.0
12	23.850	Canal	4.0
13	23.900	Canal	4.0
14	24.111	Canal	4.0
15	24.217	Canal	4.0
16	25.113	Nala	5.0
17	25.456	Nala	2.0
18	34.984	Nala	2.0
19	35.774	Nala	4.0
20	37.434	Nala	4.0
21	38.320	Nala	4.0
22	38.420	Canal	4.0
23	38.725	Canal	3.5
24	39.963	Canal	6.0
25	42.784	Nala	2.0
26	43.184	Nala	2.0
27	43.504	Nala	2.0
28	43.734	Nala	2.0
29	44.154	Nala	2.0
30	44.334	Nala	2.0
31	44.584	Nala	2.0
32	44.734	Nala	2.0
33	44.784	Nala	2.0
34	45.254	Nala	2.0
35	45.664	Nala	2.0
36	47.014	Canal	2.0
37	47.120	Nala	2.0
38	47.260	Canal	2.0
39	47.480	Canal	2.0
40	47.836	Canal	2.5
41	49.084	Canal	2.0
42	49.450	Canal	2.0
43	49.796	Canal	4.0
44	50.060	Canal	2.0
45	50.084	Canal	2.0

Sr. No.	Design Chainage (km)	Type of flow	Total Length (m)
46	50.434	Nala	2.0
47	50.700	Nala	2.0
48	50.820	Nala	2.0
49	51.210	Canal	2.0
50	51.494	Nala	2.0
51	51.694	Nala	2.0
52	56.310	Nala	2.0
53	56.500	Canal	2.0
54	56.650	Nala	2.0
55	56.700	Nala	2.0
56	57.000	Nala	2.0
57	57.510	Nala	2.0
58	57.810	Nala	2.0
59	58.160	Nala	2.0
60	58.725	Nala	2.0
61	58.840	Canal	5.0
62	60.430	Nala	2.0
63	60.810	Nala	4.0
64	61.010	Nala	5.0
65	61.980	Nala	4.0
66	62.410	Nala	2.0
67	62.782	Nala	4.0
68	63.020	Canal	2.0
69	63.200	Canal	2.0
70	63.490	Canal	2.0
71	63.700	Canal	2.0
72	63.900	Canal	2.0
73	64.400	Canal	2.0
74	64.600	Canal	2.0
75	64.674	Nala	3.0
76	64.900	Canal	2.0
77	65.130	Nala	2.0
78	65.200	Canal	2.0
79	65.470	Nala	6.0
80	65.725	Canal	2.0
81	66.860	Nala	2.0
82	67.310	Nala	2.0
83	68.000	Nala	2.0
84	68.040	Nala	3.0
85	69.055	Nala	3.0
86	70.130	Nala	2.0
87	70.230	Nala	2.0
88	70.600	Nala	6.0
89	71.160	Nala	2.0
90	72.080	Nala	3.0
91	72.195	Nala	2.0
92	73.206	Nala	2.0
93	73.480	Nala	4.0
94	74.030	Nala	2.0
95	75.960	Nala	6.0
96	76.180	Nala	2.0
97	77.210	Nala	2.0

Sr. No.	Design Chainage (km)	Type of flow	Total Length (m)
98	78.100	Nala	5.0
99	78.310	Nala	2.0
100	78.720	Nala	2.0
101	80.203	Nala	4.0
102	81.012	Nala	2.0
103	81.103	Nala	5.0
104	83.360	Nala	2.0
105	83.872	Nala	2.0
106	84.772	Nala	2.0

f) New Hume Pipe Culverts

Table 3-17 Details of New Hume Pipe Culverts

Sr. No.	Design Chainage (km)	Type of Flow	Total Length (m)
1	35.350	Nala	1.2

g) New Pipe culverts proposed at minor junctions

Table 3-18 Details of New Pipe culverts proposed at minor junctions

Sr. No.	Design Chainage (km)	Total Length (m)	Type of Jn.	Nos.
1	17.350	1 x 1.2	Y	1
2	19.070	1 x 1.2	Y	1
3	19.630	1 x 1.2	T	1
4	25.800	1 x 1.2	+	2
5	29.900	1 x 1.2	T	1
6	31.480	1 x 1.2	T	1
7	40.420	1 x 1.2	T	1
8	47.030	1 x 1.2	T	1
9	51.765	1 x 1.2	T	1
10	65.025	1 x 1.2	+	2

h) New Hume Pipe culverts at Ramps of Diamond Interchange

Table 3-19 Details of New Hume Pipe culverts at Ramps of Diamond Interchange

Sr. No.	Total Length (m)	Width (m)
1	1 x 1.2	9.0
2	1 x 1.2	9.0
3	1 x 1.2	9.0
4	1 x 1.2	9.0

i) New Box culverts at Junction Improvement

Table 3-20 Details of New Box culverts at Junction Improvement

Sr. No.	Chainage (Km)	Total Length (m)	Width (m)
1	25.390	1 x 5.0	18.0

3.11 Details of Bridges reconstructed / widened / newly constructed

Details of Major Bridges and Minor Bridges reconstructed / widened / newly constructed are given below:

A) Rehabilitation & Repair of Existing Major Bridges and Construction of New Major Bridges

The following existing major bridges are retained and utilized as a bridge for main carriageway on one side and these are repaired / strengthened as per the details given below. New three Lane major bridges for main carriageway on other side has been constructed as per the details given below:

Table 3-21 Details of Rehabilitation & Repair of Existing Major Bridges and Construction of new Major Bridges

Sr. No.	Chainage (km)		Type of Crossing	Existing Structure Details		Proposal	Proposed New Bridge		Nature of Extent of Repairs/ Strengthening
	Existing	Design		Existing Span Arrangement (m)	Carriageway Width (m)		Total Length (m)	Width (m)	
1	30.960	31.659.9	Indira Sagar Canal	6 x 21.0	10.5	LHS-New Construction RHS-Retain	LHS - 126.0	LHS - 1 x 16.0	Cleaning, painting, replacement of railing with crash barrier, replacement of expansion joint & wearing coat, epoxy application. Rain spouts, Kerb, foot- path shall be retro- fitted. Bearings shall be checked and re-placed if required.
2	46.740	48.194.5	Indira Sagar Canal	10 x 15.5	10.5	LHS -New Construction RHS-Retain	LHS - 155.0	LHS - 1 x 16.0	
3	58.210	59.770	Indira Sagar Canal	8 x 15.5	10.5	LHS - New Construction RHS - Retain	LHS –124.0	LHS - 1 x 16.0	

B) Rehabilitation & Repair of Existing Minor Bridges and Construction of New Minor Bridges:

The following existing minor bridge, retained and utilized as a bridge for main carriageway on one side, was repaired /strengthened as per the details given below. New three Lane minor bridges for main carriageway on other side constructed as per the details given below:

Table 3-22 Details of Rehabilitation & Repair of Existing Minor Bridges and Construction of New Minor Bridges

Sr. No.	Chainage (km)		Type of Crossing	Existing Structure Details		Proposal	Proposed New Bridge			Nature of Extent of Repairs / Strengthening to be carried out for Existing Bridge
	Existing	Design		Span Arrangement (m)	Carriage-way Width (m)		Total Length (m)	Proposed Width (m)		
								Main Carriageway (m)	Service/ Slip Road (m)	
1	51.415	52.845	Canal	3 x 10.0	10.5	LHS-New Construction RHS-Retain	LHS- 30.0	LHS-1X16.0	-	Cleaning, painting, replacement of railing with crash barrier, replacement of expansion joint & wearing coat, epoxy application etc.

C) Widening, Rehabilitation & Repair of Existing Minor Bridges and Construction of new Minor Bridges

The following existing narrow minor bridges, widened and utilized as a bridge for main carriageway on one side, repaired / strengthened as per the details given below. New three Lane minor bridges for main carriageway on other side constructed as per the details given below. Also, service road bridge on both sides constructed as per the details given below:

Table 3-23 Details of Widening, Rehabilitation & Repair of Existing Minor Bridges and Construction of New Minor Bridges

Sr. No.	Chainage (km)		Type of Crossing	Existing Structure Details		Proposal	Proposed New Bridge			Nature of Extent of Repairs/ Strengthening to be carried out for Existing Bridge
	Existing	Design		Span Arrangement (m)	Carriage-way Width (m)		Total Length (m)	Proposed Width (m)		
								Main Carriageway (m)	Service/ Slip Road	
1	28.880	29.568.6	Nala	4 x 6.5m	10.5m	LHS-New Construction RHS-Retain & Widening	LHS – 26.0	LHS- 1 x 16.0m RHS-Widening to 16.0m	-	Cleaning, painting, replacement of railing with crash barrier, replacement of expansion joint & wearing coat, epoxy application etc.
2	30.080	30.769.7	Canal	2 x 9.5m	10.5m	LHS-New Construction RHS-Retain & Widening	LHS - 20.0	LHS- 1 x 16.0m RHS-Widening to 16.0m	-	
3	44.780	46.225.7	Nala	3 x 2.8m	10.5m	LHS - Retain & Widening RHS - New Construction	RHS - 9.0	LHS-Widening to 14.5m RHS-1x14.5m	2 x10.8m	
4	57.980	59.550.7	Canal	3 x 10.0m	10.0m	LHS - New Construction RHS - Retain & Widening	LHS - 30.0	LHS-1x 16.0m RHS-Widening to 16.0m	-	

3.12 Reconstruction & New Construction of Major Bridges

The existing bridge at the following location is re-constructed as new structures:

Table 3-24 Details of Reconstruction & New Construction of Major Bridges

Sr. No.	Chainage (km)		Type of Crossing	Proposal	Proposed New Bridge	
	Existing	Design			Total Length (m)	Width (m)
1	50.470	51.920.3	Yerram Caluva	LHS-New construction RHS- Re-construction	200.0m	2 x 16.0m

E) Reconstruction & New Construction of Minor Bridges

The existing bridge at the following locations are re-constructed as new structures:

Table 3-25 Details of Reconstruction & New Construction of Minor Bridges

Sr. No	Chainage (km)		Type of Crossing	Proposal	Total Length (m)	Proposed Width (m)	
	Existing	Design				Main Carriageway	Service/ Slip Road
1	18.450	18.419.2	Nala	LHS-Re-construction RHS-New Construction	13.5m	2 x 16.0m	2x10.8
2	20.330	20.298.2	Nala	LHS - New Construction RHS – Re-construction	16.0m	2 x 14.5m	2x10.8
3	27.840	28.534.8	Canal	LHS-Reconstruction RHS-New Construction	17.0m	2 x 16.0m	-
4	28.080	28.772.7	Nala	LHS – Re-construction RHS-New Construction	50.0m	2 x 16.0m	-

F) New Major Bridges

New major bridges at the following locations on the Project Highway are constructed.

Table 3-26 Details of New Major Bridges

Sr. No.	Design Chainage (km)	Type of Crossing	Total Length (m)	Proposed Width (m)	
				Main Carriageway	Service/ Slip Road
1	22.509	Pond	210m	2 x 16.0m	-
2	68.705	Indira Sagar Canal	120m	2 x 16.0m	-
3	76.713	Rallamadugu River	80m	2 x 16.0m	-
4	77.495	Rallamadugu River	80m	2 x 16.0m	-
5	79.066	Rallamadugu River	90m	2 x 14.5m	2 x 10.8m

G) New Minor Bridges

New minor bridges at the following locations on the Project Highway are constructed.

Table 3-27 Details of New Minor Bridge

Sr. No.	Design Chainage (km)	Type of Crossing	Total Length (m)	Proposed Width (m)	
				Main Carriageway	Service/ Slip Road
1	24.415	Nala	12.5	2 x 14.0	2 x 10.8
2	24.581	GAIL Pipe	25.0	2 x 14.0	2 x 10.8
3	26.850	Canal	8.0	2 x 16.0	-
4	36.660	Nala	10.0	2 x 14.5	2 x 10.8
5	38.612	Nala	7.0	2 x 14.5	2 x 10.8
6	44.692	Nala	12.5	2 x 14.5	2 x 10.8
7	56.445.3	Nala	15.0	2 x 14.5	2 x 10.8
8	56.860.3	Nala	22.5	2 x 14.0	2 x 10.8
9	66.240	Canal	12.0	2 x 14.5	2 x 10.8
10	70.210	Nala	15.0	2 x 14.0	2 x 10.8
11	72.060	Nala	7.0	2 x 14.0	2 x 10.8
12	75.676	Nala	10.0	2 x 14.0	2 x 10.8
13	83.310	Nala	12.5	2 x 14.5	2 x 10.8

3.12.1 Interchanges

The Interchanges are constructed at the following locations:

Table 3-28 Details of Interchanges

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Location	Type of Interchange	Remarks
1	Bypass	66.700	On Devarapalli Bypass, Khammam cross road	Diamond	For layout & details Refer Appendix B-1

Chain link fencing provided at the end of ROW of Diamond Interchange.

3.12.2 Road Over Bridges (ROB)

A) The details of Reconstruction and new construction of ROBs are given below

Table 3-29 Details of the details of Reconstruction and New Construction of ROBs

Sr. No.	Chainage (km)		Type of Crossing	Existing Span Arrangement (m)	Proposal	Proposed Structure Details	
	Existing	Design				Span Arrangement (m)	Width
1	18.680	18.653.8	Railway	1 x 15.0	LHS-Re-construction RHS-New Construction	35.0+76.0+45.4+35.0	L-16.0m R-16.0m

3.12.3 Right of Way

The ROW for the entire project highway is 60 m.

3.13 Condition Survey of Bridges

The inventory of structures including major bridges, minor bridges, ROB, underpasses and culverts is presented in table as below:

Table 3-30 Summary of Structures

Type of Structure	Total Number of Structures
Major Structures:	
Road Over Bridge (ROB)	1
Overpasses	1
Flyover	16
Vehicular Underpass (VUP)	2
Light Vehicular Underpass (LVUP)	11
Cattle Underpass (CUP)	5
Major Bridges (MJB)	9
Minor Bridges (MNB)	22
Culverts:	
Box	122
Pipe Culverts	28
Total	**217**

The detailed condition survey of structures was carried out by visual inspection. The observations and findings are presented in table below:

Table 3-31 Structure Condition Survey

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
1	27.790	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
2	36.420	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
3	37.425	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
4	44+135	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
5	47+044	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed, Electrification work is completed in the Underpass.
6	50050	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
7	57.796	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
8	61.932	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
9	68.029	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
10	71.140	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed, Electrification work is completed in the Underpass.
11	74.000	1 x 12.00	Light Vehicular Underpass	2 x 14.5	LHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation	RCC Box type underpass, Structure is Newly constructed. It is sound in condition and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
12	63.466	1 x 25.0	Vehicular Underpass	2 x 14.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
13	83.405	1 x 25	Vehicular Underpass	2 x 14.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
14	23.150	2 x 30.0	Flyover	2 x 14.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
15	45.630	2 x 20.0	Flyover	2 x 14.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
16	56.275		Flyover	2 x 14.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
17	66.702	3 x 30.0	Flyover	2 x 14.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
18	79.277	1x20 +1x35	Flyover	2 x 14.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
19	84.795		Flyover	2 x 14.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
20	15.800	3 x 30.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
21	20.440	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
22	25.409	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
23	34.915	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
24	38.955	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
25	42.875	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
26	48.830	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
27	51.477	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
28	58.940	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
29	60.160	2 x 20.0	Uni directional Flyover	1 x 14.5	RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
30	84.795	2 x 45.0	Over pass	1 x 12.0		RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 3 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
31	31.647	LHS 126 m RHS 6 x 21.0	Major Bridge	1X16.0+ 10.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders. RCC Crash Barrier constructed for Main Carriageway.
32	48.222	LHS 155 m RHS 10 x 15.5	Major Bridge	1X16.0+ 10.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos. each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									Girders. RCC Crash Barrier constructed for Main Carriageway.
33	59.770	LHS 124 m RHS 8 x 15.5	Major Bridge	1X16.0+ 10.5	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders 5 nos each span is used for Main Carriageway. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. Elastomeric Type bearings are used, Precast Girders. RCC Crash Barrier constructed for Main Carriageway
34	51.929	200m	Major Bridge	2x16	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway
35	22.509	210m	Major Bridge	2 x 16.0m	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway
36	68.742	120m	Major Bridge	2 x 16.0m	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway
37	76.722	80m	Major Bridge	2 x 16.0m	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									bearings are used, RCC Crash Barrier constructed for Main Carriageway
38	77.505	80m	Major Bridge	2 x 16.0m	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway
39	79.071	90m	Major Bridge	2 x 14.0m	LHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Girder Type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. Elastomeric Type bearings are used, RCC Crash Barrier constructed for Main Carriageway
40	18+433	13.5m	Minor Bridge	2 x 16.0m	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed for Main Carriageway.
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
41	20+322	16.0m	Minor Bridge	2 x 14.5m	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway.
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
42	24+400	12.5m	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
43	24+603	25.0m	Minor Bridge	2 x 14.0	LHS	RCC Girder type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed for Main Carriageway
					RHS	RCC Girder type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
44	26+850	8m	Minor Bridge	2 x 16.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
45	28+542	17m	Minor Bridge	2 x 16.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
46	28+782	50.0m	Minor Bridge	2 x 16.0m	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
47	29+577	26m	Minor Bridge	LHS- 1 x 16.0m RHS- Widening to 16.0m	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
48	30+774	20m	Minor Bridge	LHS- 1 x 16.0m RHS- Widening to 16.0m	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
49	36+665	10	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
50	38+612	7	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
51	44+703	12.5	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
52	46+237	3 x 2.8m	Minor Bridge	LHS-Widening to 14.5m	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
				RHS-1x14.5m	RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
53	52+853	3 x 10.0	Minor Bridge	10.5+16	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
54	56+467	15	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
55	56+860	22.5	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
56	59+522	3 x 10.0m	Minor Bridge	LHS - New Construction RHS - Retain & Widening	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
57	66+242	12m	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
58	70.238	15	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
59	72.052	7	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
60	75.676	10	Minor Bridge	2 x 14.0	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
61	83.307	12	Minor Bridge	2 x 14.5	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
62	19+636		Cattle Underpass		LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
63	22+400		Cattle Underpass		LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
64	35+488		Cattle Underpass		LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
65	48+600		Cattle Underpass		LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
66	82+200		Cattle Underpass		LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
67	18+868	35.0+76.0+45 . 4+35.0	Rail Over Bridge	L-16.0m R-16.0m	LHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway
					RHS	RCC Box type	RCC Slab	Open Foundation	Structure is Newly constructed. It is sound in condition and satisfactory. RCC Crash Barrier constructed for Main Carriageway

Figure 3-4 Photographs of Major Structures

View of LVUP at km 27+790

View of LVUP at km 36+420

View of LVUP at km 44+135

View of LVUP at km 71+140

View of VUP at km 63+466

View of VUP at km 83+405

View of CUP at km 48+60

View of LVUP at km 61+932

View of Major Bridge at km. 31+647

View of Major Bridge at km. 48+222

View of Major Bridge at km. 51+929

View of Major Bridge at km. 68+742

View of Minor Bridge at km. 24+603

View of Minor Bridge at km. 26+850

View of Minor Bridge at km. 28+782

View of Minor Bridge at km. 30+774

View of UDFO at km. 15+800

View of UDFO at km. 20+440

View of UDFO at km. 34+915

View of UDFO at km. 48+830

View of Flyover at km. 23+164

View of Flyover at km. 45+645

View of ROB at km. 18+677

View of ROB at km. 18+677

3.14 Condition Survey of Culverts

The cross-drainage structure includes hume pipe culverts at various locations. There are 28 nos. of pipe culverts along the project highway. There are 122 nos. box / slab culverts along the project highway. During the condition survey of structure, these culverts were inspected on Site.

The project involves construction of four lane divided carriageway. The culverts beneath existing alignment are either widened or reconstructed. The condition of culverts is generally found in sound condition. The quality of surface concrete of box culverts is satisfactory. The RCC parapet, has been provided at culvert locations, which is maintained properly.

Vegetation growth and accumulation of debris at waterway is being removed and cleaned by the Concessionaire on regular basis.

Figure 3-5 Photographs of Culverts

Box Culvert at km. 30+874

Box Culvert at km. 26+605

Box Culvert at km. 35+736

Box Culvert at km. 56+650

3.15 Drainage System

There are RCC box drains at the built-up areas and earthen drain at rural areas provided for the project stretch. Lined median longitudinal drain is provided at super-elevated sections. V shaped lined drain is provided at some locations. The roadside drainage along the project highway as well as lined drains at median portion needs to be maintained by cleaning debris on regular basis. Some of the photographs of the drains provided are presented as below.

Figure 3-6 Photographs of Drains provided

V Drain at km. 78+900

Built-up Drain cum footpath at km. 36+450

3.16 Road Furniture

Pavement Marking

Pavement marking for the project highway is done as per the design standards indicated in section 12 of Schedule-D. The painting is being done wherever is required on regular basis as a part of routine maintenance. Some of the photographs of road marking are presented below.

Figure 3-7 Photographs of Road Markings

Road Markings at km. 29+400

Road Markings at km. 56+760

Traffic Signage

Traffic signs includes roadside signs, overhead signs, kerb mounted signs and median signs along the project highway. The design for the traffic signs along the project highway is done as per the design standards indicated in section 11 of Schedule-D.

The height, lateral clearance, location and installation are as per relevant clauses of Schedule 'D'. Overhead sign has been installed ahead of major intersections, start / end of project highway and urban areas as per detailed design requirements.

The sign boards, kilometer stones and hectometer stones are being replaced wherever damaged. Some of the photographs of sign boards are presented below.

Figure 3-8 Photographs of Road Sign Boards

Cantilever Sign at km. 67+000

Sign Board at km. 59+000

Highway Lighting

Highway lighting is provided at underpasses, flyovers, ROBs and built-up locations. Lighting in some Underpasses are theft by Local peoples.

At underpass and flyover locations, highway lighting is provided at the structure locations and at its approaches.

Solar amber blinker signals are provided at each at-grade intersections and at median opening locations. These lights are properly maintained and are in good working condition. Regular maintenance work is carried out to ensure their efficient operation. Some of the photographs of highway lightings are presented below.

Figure 3-9 Photographs of Highway Lighting

Highway Lighting at km. 45+645

Highway Lighting at km. 44+135

Crash Barriers

Metal beam crash barriers are provided at bridge approaches, locations of high embankment and sharp curves. All the crash barriers provided by the Concessionaire are maintained at site. Some of the photographs of metal beam crash barriers are presented below.

Figure 3-10 Photographs of Crash Barriers

W beam Crash Barrier at km. 52+300

W beam Crash Barrier at km. 85+204

Chain fencing

The chain fencing is provided between main road and service road.

Figure 3-11 Photographs of Chain fencing

Chain fencing at km. 85+150

Chain fencing at km. 78+800

Road Land Boundary

Road land (ROW) boundary demarcation is required to be maintained by the Concessionaire on the project highway during the concession period. During the site visit, road land boundary pillars are found to be fixed at site. The road land boundary pillars are being fixed at required locations whenever missing.

3.17 Avenue Plantation and Median Plantation

Avenue plantation and median plantation is available intermittently along the project highway. Variety of trees and plants are planted throughout the corridor at road side and at median side respectively. Median plantation is maintained in good condition. The plantation is being done wherever required on regular basis. Some of the photographs of avenue plantation and median plantation are presented below.

Figure 3-12 Photographs of Avenue and Median Plantation

Median Plantation at km. 22+900

Median Plantation at km. 25+260

3.18 Project Facilities

The Concessionaire has constructed the Project Facilities as described in Technical Schedules. The Project Facilities includes:

(a) Toll Plazas;
(b) Roadside Furniture;
(c) Street Lighting;
(d) Pedestrian Facilities;
(e) Rest areas (way side amenities);
(f) Truck lay-byes;
(g) Bus-bays and bus shelters;
(h) Landscaping and tree plantation
(i) Traffic aid posts;
(j) Medical aid posts;
(k) Vehicle rescue posts;
(l) Others

3.18.1 Plaza

i) Toll Plazas are provided at the following locations:

Table 3-32 Details of Toll Plaza

Location	Location of Toll Plaza (km)		Minimum Number of Toll Lanes	
	Existing Chainage	Design Chainage	Entry	Exit
Near Ananthapalli	52.250	53.700	7+1	7+1

Figure 3-13 View of Toll Plaza

3.18.2 Road Side Furniture

Road side furniture are provided in accordance with the Manual of Specifications and Standards as referred in Schedule D.

Traffic Signs: Traffic signs include roadside signs, overhead signs and kerb mounted signs etc. along the entire project highway.

Overhead signs: The details of Overhead Signs are provided as listed below.

Table 3-33 Details of Overhead signs

Sr. No.	Design Chainage	Side	Type of Sign
1	15.400	LHS	Gantry
2	16.400	RHS	Gantry
3	19.800	LHS	Cantilever
4	25.900	RHS	Cantilever
5	34.450	LHS	Cantilever
6	39.600	RHS	Cantilever
7	42.300	LHS	Cantilever
8	45.200	LHS	Gantry
9	46.300	RHS	Gantry
10	48.200	LHS	Cantilever
11	51.900	RHS	Cantilever
12	55.700	LHS	Cantilever
13	59.600	RHS	Cantilever
14	59.600	LHS	Cantilever
15	66.000	LHS	Gantry
16	67.650	RHS	Gantry
17	77.600	LHS	Gantry
18	80.000	RHS	Gantry
19	84.600	LHS	Gantry
20	85.000	RHS	Gantry

i) **Hectometer / Kilometer stones**: Hectometer and kilometer stones are provided for the entire Project Highway as per the manual.

Figure 3-14 Photographs of kilometer stones

Kilimeter stone at km 22+000

kilometer stone at km 80+000

ii) **Boundary Stones**: Boundary Stones are provided at the boundary on both sides of Right of Way.

3.18.3 Highway Lighting

a) Highway lighting (LED) provided at the following locations:

i) At Toll Plazas, Rest area, Truck lay bye, Bus bays, bus shelter as given in

Schedule-C, Interchanges, Grade separators, built up sections, ROB & junctions as location given in schedule-B.

ii) Solar lighting provided near junctions, interchanges and at toll plaza locations.

3.18.4 Pedestrian Facilities

Pedestrian Facilities have been provided in accordance with the Manual of Specifications and Standards as referred in Schedule-D.

a) Rest Areas (Wayside Amenities):

Wayside Amenities are provided at following locations.

Table 3-34 Details of Wayside Amenities

Sr. No.	Existing Chainage	Design Chainage	Side	Location Name	L: B Ratio	Area(Ha)
1	32.000	33.500	LHS	Near Lakshmi Nagaram	3:2	4 Ha
2	32.400	33.900	RHS	Near Lakshmi Nagaram	3:2	4 Ha
3	Devarapalli Bypass	66.600	LHS	At Diamond Interchange	Area between the ramps of Diamond interchange To be utilized*.	
4	Devarapalli Bypass	66.800	RHS			

Figure 3-15 Photographs of Rest Area

Rest Area at km. 66+600

Rest Area at km. 66+800

3.18.5 Truck lay-byes

The truck lay-byes has provided at below location.

Table 3-35 Details of Truck lay-bye

Sr. No.	Existing km	Design Chainage	Side	Name / Location
1	39.800	41.500	Both	Near Pullalapadu
2		16+520	Both	

Figure 3-16 Photographs of Truck Lay bye

Truck Lay bye at km. 41+500

Truck Lay bye at km. 16+520

3.18.6 Bus bays and Passenger Shelters

Bus bays are constructed at following locations. Toilet block is provided at each of the bus bay and bus shelter locations.

Table 3-36 Details of Bus Bays and Passengers Shelters

Sr. No.	Existing km	Design Chainage	Side	location	Remarks
1	Realignment	15.700	LHS	Gundugolanu	Bus shelter on slip road
2	Realignment	15.900	RHS		Bus shelter
3	17.240	17.210	LHS		Bus Bay with Shelter
4	17.530	17.500	RHS		Bus Bay with Shelter
5	20.340	19.800	LHS		Bus shelter
6	20.440	19.900	RHS		Bus shelter
7	Bypass	23.050	LHS		Bus shelter on slip road
8		23.300	RHS		Bus shelter on slip road
9	25.750	25.250	LHS	Bhimadole by-pass Ends	Bus shelter
10	25.850	26.440	RHS		Bus shelter on slip road
11	27.370	28.060	LHS	Gopalapuram	Bus shelter on service road
12	27.470	28.160	RHS		Bus shelter on service road
13	29.100	29.750	LHS		Bus Bay with Shelter
14	29.400	30.050	RHS		Bus Bay with Shelter
15	30.570	31.260	LHS	Gunnampalli	Bus Bay with Shelter
16	30.580	31.360	RHS		Bus Bay with Shelter
17	31.470	32.400	LHS	Kappalgunta	Bus Bay with Shelter
18	31.540	32.600	RHS		Bus Bay with Shelter
19	33.610	34.200	RHS	Dubbacherla	Bus Bay with Shelter

Sr. No.	Existing km	Design Chainage	Side	location	Remarks
				Bypass Starts	
20	33.710	34.350	LHS		Bus Bay with Shelter
21	Bypass	37.285	LHS		Bus shelter on slip road
22		37.500	RHS		Bus shelter on slip road
23	38.700	39.700	RHS	Dubbacherla Bypass ends	Bus Bay with Shelter
24	38.800	40.000	LHS		Bus Bay with Shelter
25	41.320	42.200	LHS	Nelligerla By-pass starts	Bus Bay with Shelter
26	41.270	42.140	RHS		Bus Bay with Shelter
27	Bypass	45.500	LHS		Bus shelter on slip road
28		45.750	RHS		Bus shelter on slip road
29	45.100	46.560	LHS		Bus shelter
30	45.200	46.660	RHS		Bus shelter
31		48.700	LHS	Ananthapalli Bypass starts	Bus shelter on slip road
32		48.950	RHS		Bus shelter
33	Bypass	49.960	LHS		Bus shelter on slip road
34		50.165	RHS		Bus shelter on slip road
35	Bypass	51.300	LHS		Bus shelter on slip road
36		51.550	RHS		Bus shelter
37	53.550	54.800	LHS		Bus shelter
38	53.700	54.950	RHS		Bus shelter
39	Bypass	56.140	LHS	Yarnagudem Bypass starts	Bus shelter
40		56.410	RHS		Bus shelter on slip road
41		57.680	LHS		Bus shelter on slip road
42		57.900	RHS		Bus shelter on slip road
43	57.500	59.050	LHS	Yarnagudem Bypass ends	Bus shelter
44	Bypass	58.870	RHS		Bus shelter on slip road
45	Bypass	65.800	LHS		Bus Bay with Shelter
46		65.800	RHS		Bus Bay with Shelter
47		71.150	LHS	Duddukuru	Bus shelter
48		71.250	RHS		Bus shelter
49		73.000	RHS	Gowripatnam	Bus Bay with Shelter
50		73.350	LHS		Bus Bay with Shelter
51		79.200	LHS		Bus shelter on slip road
52		79.410	RHS		Bus shelter on slip road
53		82.050	LHS		Bus Bay with Shelter
54		81.950	RHS		Bus Bay with Shelter
55		84.475	LHS		Bus shelter
56		84.540	RHS		Bus shelter

Figure 3-17 Photographs of Bus bays

Bus Bay with Shelter at km. 79+200

Bus Bay with Shelter at km. 56+140

3.18.7 Others

i. Traffic Aid Posts

Traffic aid post is constructed at the toll plaza in consultation with the Independent Engineer / Project Director, NHAI.

ii. Medical Aid Posts

Medical aid is constructed at the toll plaza in consultation with the Independent Engineer / Project Director, NHAI. 2 Nos of ambulance(s) services are provided.

iii. Vehicle Rescue Posts

Vehicle Rescue is constructed at the toll plaza in consultation with the Independent Engineer/Project Director, NHAI. 2 Nos of crane services to tow away the disabled vehicles are provided.

Figure 3-18 Photographs of Emergency Medical Service

Ambulance at toll plaza

Medical bed at toll plaza medical aid post

iv. Communication system:

Communication system is provided as specified in the manual.

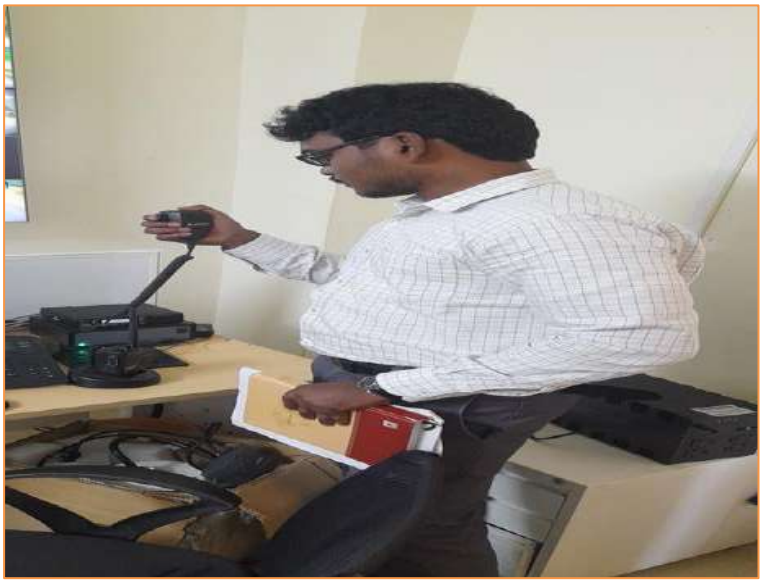


Figure 3-19 Emergency communication system is checking at Toll plaza

v. Operation and Maintenance Centre

Operation and Maintenance Centre is provided at Toll Plaza location.

Figure 3-20 Operation and maintenance building at Toll Plaza

4 BALANCE WORKS

As informed by the Concessionaire, all works as mentioned in the Technical Schedules of Concession Agreement are completed. There are no balance works to be executed as per CA.

5 PAVEMENT AND SITE INVESTIGATION

5.1 General

The project has been developed on Hybrid Annuity Mode basis.

The concession period of the project is 17 years from Appointment Date i.e., 22nd October 2018 including construction period of 910 days. The Provisional Completion (PCOD) for the entire project has been achieved on 10th July 2021. The project is currently under operation and maintenance (O&M) stage.

5.2 Details of As-built Pavement

The following table shows crust details based on pavement design report submitted by the Concessionaire. The details of pavement crust are as provided during the development of existing two lane to four lane divided carriageway. The pavement design report states that pavement was designed as per IRC:58-2015.

Table 5-1 Existing Pavement Crust Details

From	To	Effective CBR	Minimum Design Traffic as Per CA	carriage Way	Crust Details			
					GSB (mm)	WMM (mm)	DBM (mm)	BC (mm)
15320	34680	10%	80 MSA	MCW	200	250	105	40
34680	42660	10%	84 MSA	MCW	200	250	110	50
42660	59890	10%	100 MSA	MCW	200	250	110	50
59890	85204	10%	150 MSA	MCW	200	250	125	50
				SR	200	250	50	40

5.3 Surveys and Investigation

5.3.1 Pavement Condition Survey

Pavement condition survey was carried out from 11th **August to 13th August 2022** through visual inspection for the entire project length. The details of the visual condition survey are provided in **Annexure-V.**

The summary of pavement condition based on the visual inspection is tabulated below.

Table 5-2 Summary of Pavement Condition

Design Chainage (km)		Length	Visual Condition (As per IRC:115-2014)	
From	To		LHS Carriageway	RHS Carriageway
15+320	20+000	4.680	Good	Good
20+000	30+000	10.000	Good	Good
30+000	40+000	10.000	Good	Good
40+000	50+000	10.000	Good	Good
50+000	60+000	10.000	Good	Good
60+000	70+000	10.000	Good	Good
70+000	80+000	10.000	Good	Good
80+000	85+204	5.204	Good	Good

Observation and Conclusion:

From the above table, it is observed that the overall pavement condition for the entire project stretch is found to be good.

Following Photographs were taken at the time of visual pavement condition survey.

Figure 5-1 Photographs of Pavement Condition Survey

Pavement Condition at km. 41+200

Pavement Condition at km. 46+700

Pavement Condition at km. 55+100

Pavement Condition at km. 57+200

Pavement Condition at km. 71+300

Pavement Condition at km. 76+900

5.3.2 Roughness Index test

Prior period report for the Roughness Index Test conducted by **Aadharshila Infratech Pvt. Ltd.** Dated **17th** and **18th August 2022** has been provided by the Concessionaire. This test was done using Network Survey Vehicle (NSV) to assess the riding quality on each direction (each lane) of the carriageway of project highway.

As per IRC:SP:16-2019, condition of pavement is categorised under:

Table 5-3 Roughness Values (BI Value - mm / km)

Sr. No.	Roughness Range (m/km)	Severity	Inner Lane (Lane-1) LHS Length (km)	Outer Lane (Lane-2) LHS Length (km)	Inner Lane (Lane-1) RHS Length (km)	Outer Lane (Lane-2) RHS Length (km)
1	Less than 2.55	Good	69.884	69.884	69.884	69.884
2	2.55 - 3.30	Fair	-	-	-	-
3	More Than 3.30	Poor	-	-	-	-

6 OPERATION AND MAINTENANCE

6.1 Introduction

Article 17 and Schedule-K of the Concession Agreement defines the Operation and Maintenance requirement during the concession period.

The Company has received Provisional Completion Certificate on 10th July 2021.

The project is currently under Operation and Maintenance stage. The O&M period of the project highway is 15 years from the date of COD.

6.2 O & M Set Up

O & M Contract

As per Clause 17.1 of the Concession Agreement, the Concessionaire shall operate and maintain the Project Highway by itself, or through O&M Contractors and if required, modify, repair, improve the Project Highway to comply with Specifications and Standards, and other requirements set forth in the Agreement through Good Industry Practice, Applicable Laws and Applicable Permits and manufacturer's guidelines. The Operation and Maintenance activities will confirm to all the requirements laid down in MoRT&H, IRC Specifications and the Concession Agreement.

The Concessionaire (M/s. GR Gundugolanu Devarapalli Highway Private Limited) has been carrying out the activities related to operation and maintenance of the project highway.

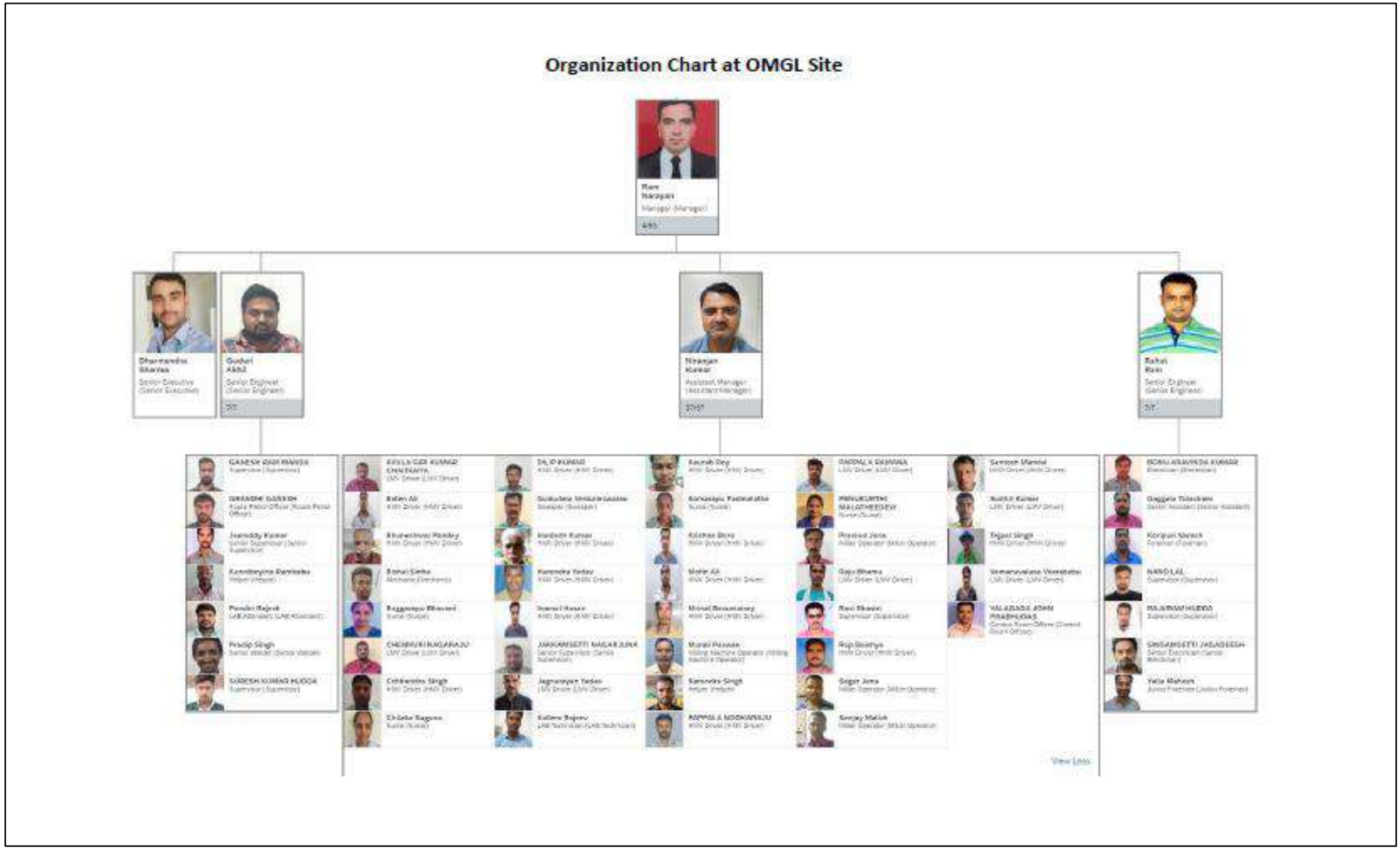
Under Routine maintenance, the road is to be maintained in good, safe and motorable condition. The specification in contracts are kept as same as per design and construction specification.

The periodical maintenance will have to be done during O&M period as per requirement of Concession Agreement and as per site requirement to maintain the design standards and level.

O&M Organization Chart

The Concessionaire has given the organization chart at site for Operation and maintenance. Accordingly, there is 01 Manager, 01 Asst Manager, 02 Senior Executive, 01 Senior Engineers, 01 Controll room officer, 01 route petrolling officer, 02 Sr supervisor, 06 supervisors 26 Miller operator / LMV / HMV / Tractor Drivers, to carry out O&M activities. The team controls the maintenance activities along with other supporting staff.

Organization Structure for GDHPL



List of Manpower

Sr. No.	Name of Employee's	Designation	Department
1	MURALI DHAR PASWAN	MILLING MACHINE OPERATOR	PLANT & EQUIPMENT
2	TEJPAL SINGH	HMV DRIVER	PLANT & EQUIPMENT
3	VEMANAVALASA VEERABABU	LMV DRIVER	PLANT & EQUIPMENT
4	MOTIN ALI	HMV DRIVER	PLANT & EQUIPMENT
5	KORIPURI NARESH	JR. FOREMAN	HIGHWAY
6	KRISHNA BORO	HMV DRIVER	PLANT & EQUIPMENT
7	GUDURI GNANANANDA AKHIL	SR. ENGINEER	HIGHWAY
8	INAMUL HASAN	HMV DRIVER	PLANT & EQUIPMENT
9	RUP KUMAR BAISHYA	HMV DRIVER	PLANT & EQUIPMENT
10	BATEN ALI	HMV DRIVER	PLANT & EQUIPMENT
11	YALLA MAHESH	SR. SUPERVISOR	HIGHWAY
12	PRAMOD KUMAR JENA	MILLER OPERATOR	PLANT & EQUIPMENT
13	JAGNARAYAN SINGH YADAV	LMV DRIVER	PLANT & EQUIPMENT
14	GAGGALA TULASIRAM	ASSISTANT	LEGAL & LIASONING
15	RAJU RAM BHAMU	LMV DRIVER	PLANT & EQUIPMENT
16	KANNIBOYINA RAMBABU	HELPER	QUALITY CONTROL
17	KALLEM RAJEEV	LAB. TECHNICIAN	QUALITY CONTROL
18	MRINAL BASUMATARY	HMV DRIVER	PLANT & EQUIPMENT
19	JEEREDDY VENKATA PAVAN KUMAR	SUPERVISOR	HIGHWAY
20	BHUNESHWAR PANDEY	HMV DRIVER	PLANT & EQUIPMENT
21	SINGAMSETTI VEERA VENKATA JAGADEESH	SR. ELECTRICIAN	PLANT & EQUIPMENT
22	PRADIP KUMAR SINGH	SR. WELDER	PLANT & EQUIPMENT
23	SANJAY MALICK	MILLER OPERATOR	PLANT & EQUIPMENT
24	SAGAR JENA	MILLER OPERATOR	PLANT & EQUIPMENT
25	KAURAB ROY	HMV DRIVER	PLANT & EQUIPMENT
26	HARENDRA YADAV	HMV DRIVER	PLANT & EQUIPMENT
27	PANDIRI CHINNA RAJESH	LAB. TECHNICIAN	QUALITY CONTROL
28	SANTOSH MANDAL	HMV DRIVER	PLANT & EQUIPMENT
29	HARDESH KUMAR	HMV DRIVER	PLANT & EQUIPMENT
30	NARENDRA SINGH	HELPER	PLANT & EQUIPMENT
31	RAVI SHASTRI	SUPERVISOR	HIGHWAY
32	SUDHIR KUMAR	LMV DRIVER	PLANT & EQUIPMENT

Sr. No.	Name of Employee's	Designation	Department
33	CCHIRENDRA SINGH	HMV DRIVER	PLANT & EQUIPMENT
34	CHILAKA SUGUNA	NURSE	SAFETY
35	KOMARAPU PADMALATHA	NURSE	SAFETY
36	GUDUDALA VENKATESWARAO	SWEEPER	HR & ADMINISTARTION
37	PENUKURTHI MALATHEEDEVI	NURSE	SAFETY
38	GRANDHI GANESH	Route Patrol Officer	OPERATIONS & MAINTENANCE
39	BONU ARAVINDA KUMAR	ELECTRICIAN	PLANT & EQUIPMENT
40	PAPPALA VENKATA RAMANA	LMV DRIVER	PLANT & EQUIPMENT
41	CHENNURI NAGARAJU	LMV DRIVER	PLANT & EQUIPMENT
42	JAKKAMSETTI NAGARJUNA	SR. SUPERVISOR	HIGHWAY
43	YALAGADA JOHN PRABHUDAS	Control Room Officer	OPERATIONS & MAINTENANCE
44	AVULA GIRI KUMAR CHAITANYA	LMV DRIVER	PLANT & EQUIPMENT
45	PAPPALA NOOKARAJU	HMV DRIVER	PLANT & EQUIPMENT
46	DILIP KUMAR	HMV DRIVER	PLANT & EQUIPMENT
47	RAJURAM HUDA	SUPERVISOR	HIGHWAY
48	NAND LAL	SUPERVISOR	HIGHWAY
49	SURESH KUMAR HUDA	SUPERVISOR	HIGHWAY
50	GANESH RAM MANDA	SUPERVISOR	HIGHWAY
51	RAHUL RAM	SR.ENGINEER	HIGHWAY
52	RAM NARAYAN	MANAGER	OPERATIONS & MAINTENANCE
53	NIRANJAN KUMAR	ASST. MANAGER	OPERATIONS & MAINTENANCE
54	BISHAL SINHA	MECHANIC	PLANT & EQUIPMENT
55	DHARMENDRA KUMAR SHARMA	SR. EXECUTIVE	HORTICULTURE
56	BOGGARAPU BHAVANI	NURSE	SAFETY

6.3 Operation Cost

Operations cost is comprised of manpower cost, power and electricity cost, office operating expenses, vehicle running expenses, administrative expenses and other miscellaneous expenses. The Concessionaire has provided the expenses occurred towards operation expenses for current / past years. Necessary assumptions have made from the expenses of similar type of projects to arrive at the operation cost. The estimates are projected based on best industry practices and are compared with the operating cost in the vicinity of the project area.

The estimated Operating Cost for the base month of August 2022 is **Rs. 8.53 Crores**. The detailed working of the same is attached in **Annexure-I**.

6.4 Routine Maintenance Cost

The Routine Maintenance cost is derived based on the Ministry of Road Transport and Highways - Report of the Committee on Norms for Maintenance of Roads in India (published by Indian Road Congress New Delhi 2001) along with actual pavement condition assessed during condition survey.

Maintenance cost constitutes the routine, day-to-day maintenance activities for project assets, including road pavement, shoulders, embankment, drainage, structures, plantations, roadside furniture, traffic signs, traffic safety devices etc. Past data has been used to assess maintenance costs due to normal usage or “wear-and-tear”. Likely costs of maintenance of structures are assessed based on their present condition and vintage, in combination with well-established guidelines and thumb rules given in Indian codes and standards.

The estimated cost of Routine Maintenance works out to be **Rs. 2.27 Crores (3.24 Lakhs per km)** for the base month of August 2022. The detailed working of the same is attached in **Annexure-II**.

6.5 Major Maintenance Cost

Unlike the old Concession Agreements where periodicity and threshold limits were clearly described for the major maintenance, the Concession Agreement of this project does not specify the periodicity or the threshold limits for carrying out the full-length major maintenance. Schedule-K of the Concession Agreement specifies the threshold limits and the timelines for carrying out repairs to the distresses during the operation period.

The maintenance thus can be carried out as and when required basis and to the compliance of Schedule-K requirement to maintain the road in serviceable condition. Only improvement to Riding Quality is expected if the roughness value exceeds 2750 mm/km. However, the average roughness value of the project highway lies within the limit as mentioned above.

Any New pavement is not expected to show any distresses at least for 6 to 7 years with the proper routine maintenance. Mere Routine Maintenance would suffice to meet the performance standard mentioned in Schedule-K. In this project, there is no specific requirement to carry out the major maintenance at the end of concession period.

Hence, major maintenance is planned every 7th year from the date of COD till end of concession period.

The summary of the major maintenance planned up to end of concession period is presented in the below table.

The total Base cost of major maintenance works out to be **Rs. 190.90 Crores** for the base month of August 2022 i.e., till 31st August 2022.The detailed working for the same is shown in **Annexure-III**.

6.6 Paved Shoulders

As per design specifications, the paved Shoulder is designed as an integral part of the pavement for main carriageway. Therefore, the total pavement thickness in paved shoulders would be the same as in the carriageway.

6.7 Summary of Major Maintenance Cycle

The table below shows the major maintenance cycle throughout the concession period for the project stretch.

Table 6-1 Maintenance Cycle

Sr. No.	Year	Main Carriageway	Service Road
1	FY 2023	-	-
2	FY 2024	-	-
3	FY 2025	-	-
4	FY 2026	-	-
5	FY 2027	-	-
6	FY 2028	-	-
7	FY 2029	1st Major Maintenance (100% BC + 10% DBM)	1st Major Maintenance (20% BC + 80% Micro-surfacing)
8	FY 2030	1st Major Maintenance (100% BC + 10% DBM)	1st Major Maintenance (20% BC + 80% Micro-surfacing)
9	FY 2031	-	-
10	FY 2032	-	-
11	FY 2033	-	-
12	FY 2034	-	-
13	FY 2035	2nd Major Maintenance (100% BC + 10% DBM)	2nd Major Maintenance (20% BC + 80% Micro-surfacing)
14	FY 2036	2nd Major Maintenance (100% BC + 10% DBM)	2nd Major Maintenance (20% BC + 80% Micro-surfacing)
15	FY 2037	-	-

6.8 Projected Maintenance Cost without escalation

The below table shows the base cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period without escalation.

Table 6-2 Summary of Operation & Maintenance Cost without escalation

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
1	**Total Operation and Routine Maintenance Cost**	69.885	Every year	15.45	**10.79**

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
2	**Periodic Maintenance Cost**				
i)	1st Major Maintenance - MCW & SR	69.885	FY 2029	136.58	**95.45**
ii)	2nd Major Maintenance - MCW & SR	69.885	FY 2035	136.58	**95.45**
	Total Major Maintenance Cost				**190.90**

Notes:

1. It is to be noted that, the rates considered for calculating all the above cost are exclusive of Goods and Service Tax (GST).
2. The estimated cost in table above is for base month of August 2022.
3. The rates are based on SOR of Govt. of Andhra Pradesh for the year 2022-2023. The current market rates are considered for Bitumen, cement and steel.
4. The labour rate adopted from Govt. of India, Ministry of Labour and Employment Office of the Chief Labour Commissioner © w.e.f. 25.07.2022.

6.9 Projected Maintenance Cost with escalation

The below table shows the total cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period with escalation as per WPI provided by the company.

Table 6-3 Summary of Operation & Maintenance Cost with escalation

Sr. No.	Year	WPI Inflation	Total O & M Cost	Major Maintenance Cost
1	FY 2023		10.79	-
2	FY 2024	2.87*%	11.10	-
3	FY 2025	5.00%	11.66	-
4	FY 2026	5.00%	12.24	-
5	FY 2027	5.00%	12.85	-
6	FY 2028	5.00%	13.50	-
7	FY 2029	5.00%	14.17	62.66
8	FY 2030	5.00%	14.88	65.79
9	FY 2031	5.00%	15.62	-
10	FY 2032	5.00%	16.41	-
11	FY 2033	5.00%	17.23	-
12	FY 2034	5.00%	18.09	-
13	FY 2035	5.00%	18.99	83.97
14	FY 2036	5.00%	19.94	88.17
15	FY 2037	5.00%	5.23	-
	Total Cost (Cr)		**212.71**	**300.59**

* Considering the base month for calculation as August 2022.

The company may carry out necessary investigation prior to O&M and major maintenance. This will help in proper assessment of maintenance work based on the actual pavement condition. The spending on periodic maintenance / strengthening can then be reduced if the road is adequately and timely maintained.

7 REVIEW OF CONCESSION AGREEMENT

The Ministry of Road Transport & Highways in accordance with the statutory powers vested on it by the Government of India has entered into in to a Concession Agreement with **GR Gundugolanu Devarapalli Highway Private Limited (GDHPL)** a Special Purpose Vehicle (SPV) formed for implementing this project, a company incorporated under Indian Companies Act, 2013 to Design, Built, finance, operate and Transfer (the "DBFOT Annuity" or Hybrid Annuity") basis for the For Four Laning of Gundugolanu - Devarapalli - Kovvuru section from km. 15.320 to km. 85.204 (Length 69.884 km.) of NH-16 on Hybrid Annuity Mode under Bharatmala Pariyojana in the state of Andhra Pradesh.

The Documents we studied from the point of interest of Lenders and our comments on Concession Agreement are given below.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 3 Clause 3.1	The Concession	Subject to and in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits, the Authority hereby grants to the Concessionaire the concession set forth herein including the exclusive right, license and authority to construct, operate and maintain the Project (the "**Concession**") during the Construction Period of 910 (Nine Hundred and Ten Days) days and Operation Period of 15 (Fifteen) years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.	This construction work is completed, and PCOD is achieved on 10th July 2021.
Article 4 Clause 4.1.2	Condition Precedent	a) Procured for the concessionaire the Right of way to the Site in accordance with the provisions of Clauses 10.3.1 and 10.3.2. b) Procured all Applicable Permits relating to environmental protection, and conservation in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2 c) Procured forest clearance for and in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2, save and except permission for cutting trees; and d) Procured approval of the General Arrangement Drawings for the road over bridges/under bridges at level crossings on the project.	All issues complied and PCOD is achieved.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 4 Clause 4.2	Conditions Precedent- Damages for delay by the Authority	a) Procured for the concessionaire the right of way to the site in accordance with the provisions of the clause 10.3.1 and 10.3.2 b) Procure all applicable permits relating to environmental protection and conservation in respect land forming part of the right of way under clause 10.3.1 and 10.3.2 c) Procured project clearance for and in respect land forming part of the right of way under clause 10.3.1 and 10.3.2 save and except permission for cutting trees d) Procured approval of the general arrangement drawings for the road over bridges / under bridges at level crossing on the project	All issues complied and PCOD is achieved.
Article 4 Clause 4.3	Damages for delay by the concessionaire	In the event that (i) the Concessionaire does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.3 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of failure to fulfill the obligations under Clause 4.1.2 or other breach of this Agreement by the Authority, or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.3% (zero point three per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent.	The PCOD is achieved.
Article 5 Clause 5.1.4 (d, e & f)	Obligation of the Concessionaire	d) The Concessionaire shall make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement. e) Make reasonable efforts to facilitate the acquisition of land required for the purposes of the Agreement f) Ensure and procure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Concessionaire's obligations under this agreement.	The risk of lender is covered.
Article 8 Clause 8.1.5	Disclaimer	Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the	The Concessionaire shall note this provision and perform.

Article & Clause No.	Subject	Description in Brief	Remarks
		Authority shall not be liable in any manner for such risks or the consequences thereof.	
Article 9 Clause 9.1.1	Performance Security	The Concessionaire shall, for the performance of its obligations hereunder during the Construction Period, provide to the Authority no later than 30 (thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank for a sum equivalent to Rs.91.35 Crores (Rs. Ninety-one Crore and thirty-five Lakhs only) in the form set forth in Schedule-F (the "Performance Security"). Until such time the Performance Security is provided by the Concessionaire pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security pursuant hereto, the Authority shall release the Bid Security to the Concessionaire.	The Performance Security is Rs. 91.35 Crores. The Concessionaire should perform as per agreement to safeguard the Performance Security.
Article 10 Clause 10.3.2	Procurement of the site -	Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree that on or prior to the Appointment Date, the Authority shall have granted vacant access and Right of Way such that the Appendix shall not include land which shall in any manner prevent the Concessionaire from undertaking construction of the project to the extent of at least 80% (eighty percent) of the length thereof, and in the event Financial Close is delayed on account of delay in grant of such vacant access and Right of Way, the Authority shall be liable to payable to damages solely under the provisions of Clause 4.2.	The Concessionaire received the land as per Schedule to work and work is completed.
Article 10 Clause 10.3.4	Procurement of the site-Right of Way	The Authority shall make best efforts to procure and grant no later than 90 (ninety) days from the Appointed date, Right of Way to the Concessionaire in respect of all land included in the Appendix, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Concessionaire, it shall pay to the Concessionaire Damages in a sum calculated at the rate of Rs.1 per day for every 10 square meter or part thereof, commencing	The land is received to work timely.

Article & Clause No.	Subject	Description in Brief	Remarks
		from the 91st day of the Appointed Date and until such Right of Way is procured or 180 days from Appointed date whichever is earlier.	
Article 11 Clause 11.4	Utilities, Associated Roads and Trees-Felling of trees	The Authority shall assist the Concessionaire in Obtaining the Applicable Permits for felling of trees to be identified by the Authority for this purpose if and only if such trees causes a material adverse effect on the construction, operation or maintenance of Project Highway. The Cost of such felling shall borne by the Authority and in the event of any delay in felling thereof for reasons beyond the control of the Concessionaire, it shall be excused to perform any of its obligations hereunder if such failure is a direct consequence of delay in the felling of trees.	The work is completed. No obstructions of trees.
Article 12 Clause 12.3.1	Construction of the Project	On or after the Appointed Date, the Concessionaire shall undertake construction of the Project as specified in Schedule-B and Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D. The 910th (nine hundred and tenth) day from the Appointed Date shall be the scheduled date for completion of the Project (the **"Scheduled Completion Date"**) and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	The work is now completed, and PCOD is achieved.
Article 12 Clause 12.3.2	Construction of the Project Highway and Mile Stone	The Concessionaire shall construct the Project Highway in accordance with the Project Completion schedule set forth in Schedule-G. In the event that the Concessionaire fails to achieve any Project Milestone within a period of 90 (ninety) days from the date set forth for such Milestone in Schedule G, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, it shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one percent) of the amount of performance Security for delay of each day until such Milestone is achieved.	The Concessionaire shall avoid such situations of payment of damages by achieving Milestone timely.
Article 12 Clause 12.3.3	Construction of the Project	In the event that the project is not completed, and COD does not occur within 270 (two hundred and seventy) days from the	The work is competed as per Milestone.

Article & Clause No.	Subject	Description in Brief	Remarks
	Highway and Mile Stone	Scheduled Completion Date, unless the delay is on account of reasons solely attributable to the Authority or due to Force Majeure, the Authority shall be entitled to terminate this Agreement.	
Article 13 Clause 13.2	Inspection	During the construction period, the independent Engineer shall inspect the Project at least once a month and make a report of such inspection (the "Inspection Report") stating all reasonable detail the defects or deficiencies, if any, with particular reference to the Project Completion Schedule, Scope of the Project and specification and standards	The work is completed with quality. The defect will be attended during Defect Liability Period.
Article 14 Clause 14.3.2	Provisional Certificate	The parties hereto expressly agree that a Provisional Certificate under this Clause 14.3 may, upon requested of the Concessionaire to this effect, be issued for operating part of the Project, if the Concessionaire has completed construction of 100% of the site made available to the Concessionaire up to 182 days from the Appointed Date. Upon issue of such Provisional Certificate, the provisions of Article 15 shall apply to such completed part, and the rights and obligations of the Concessionaire for and in respect of such completed part of the Project shall be constructed accordingly.	This Clause covers the risk and give relief to Concessionaire and Lender in case full Project Completion is delayed due to land or utility problems and gives the relief.
Article 15 Clause 15.2	Entry into commercial service-Damages for delay	Subject to the provisions of Clause 12.3, if COD does not occur prior to the 91st (ninety first) day after the Scheduled Completion Date, unless the delay is on account of reasons attributable to the Authority or due to force Majeure, the Concessionaire shall pay Damages to the Authority in a sum calculated at the rate of 0.2% of the amount of performance Security for delay of each day until COD is achieved.	The PCOD is achieved as per Schedule Competed Date.
Article 23 Clause 23.1	Bid Project cost	The parties expressly agree that the cost of construction of the project, as on the Bid Date, which is due and payable by the Authority to the Concessionaire shall be deemed to be Rs.1827 Crores. (Rupees One thousand eight hundred and twenty seven crores)	The PCOD is achieved as per Schedule Competed Date.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 23 Clause 23.3.1	Payment of Bid Project Cost	40% of the Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable to the Concessionaire is 5 equal installments of 8% during the construction Period in accordance with the provisions of Clause 23.4.	The PCOD is achieved as per Schedule Competed Date.
Article 23 Clause 23.4	Payment during construction period	For the purpose of this clause 23.4, the payment Milestone for release of payment during construction period shall be as under: (a) I (first) payment Milestone-On achievement of 10% Physical Progress. (b) II (Second) payment Milestone-On achievement of 30% Physical Progress. (c) III (Third payment Milestone-On achievement of 50% Physical Progress. (d) IV (Fourth) payment Milestone-On achievement of 75% Physical Progress. (e) V (Fifth) payment Milestone-On achievement of 90% Physical Progress.	The PCOD is achieved as per Schedule Competed Date.
Article 23 Clause 23.5	Bonus on early completion	In the event that the concessionaire shall achieve COD on or more than 30 days prior to the Scheduled Completion Date, the Authority shall pay to the Concessionaire a bonus equal to 0.5% of 60% of the Bid project cost for the first 30 days by which COD shall precede the Schedule Completion date and there after the said bonus shall be calculated on the pro-rata basis for each day preceding the said 30 days period. The Bonus shall be due and payable to the Concessionaire along with the 1st Annuity Payment.	This provision of Bonus will encourage the Concessionaire for early completion.
Article 23 Clause 23.6.2	Annuity Payments during operation period	The completion cost remaining to be paid in pursuance of the provisions Clause 23.6.1 shall be due and payable in biannual installments over a period of 15 (fifteen) years commencing from COD, (the Authority Payments) the 1st (first) installment of Annuity Payments shall be due and payable within 15 (fifteen) days of the 180th (one hundred and eighteen) day of COD and the remaining installments shall be due and payable within 15 (fifteen) days of	The Concessionaire is getting this as per Concession Agreement as non COD is achieved.

Article & Clause No.	Subject	Description in Brief	Remarks
		completion of each of the successive six months (the "Annuity Payment Date").	
Article 23 Clause 23.7	O & M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the Authority, which shall be computed on Rs. 17 Crores (Rupees Seventeen Crores) the amount quoted by the selected bidder under its O&M Bid, in accordance with the provisions of this Clause 23.7 (the "**O&M Payments**"). The Parties further acknowledge and agree that any O&M Expenses in excess of the O&M Payments shall be borne solely by the Concessionaire, save and except as expressly provided in this Agreement. For avoidance of doubt it is clarified that the O&M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16of this Agreement.	O & M during Concession period is responsibility of Concessionaire and Authority will extend financial support as quoted in CA.
Article 23 Clause 23.8	Mobilization advance	The Authority shall, on request of the Concessionaire, make an advance payment in a sum not exceeding 10%(ten percent) of the bid project cost (the Mobilization Advance). This advance payment shall be made in two equal installments. The concessionaire may request the Authority for the first installment of the advance payment at any time after the appointed date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority. The concessionaire may request the Authority for the second installment of the advance payment at any time after 60(Sixty) days from the appointed date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority	The Concessionaire has received this Mobilization Advance and work is completed.
Article 26 Clause 26.1	Insurance-Insurance during Concessionaire period	The Concessionaire shall affect and maintain at its own cost, during the Construction Period and the Operation Period, such insurances for such maximum sums as may be required under the Financing Agreements and Applicable laws, and such insurances	The Concessionaire, has taken all Insurances.

Article & Clause No.	Subject	Description in Brief	Remarks
		as may be necessary or prudent in accordance with Good Industry Practice.	
Article 34 Clause 34.3.1	Substitution Agreement	The Lender's Representative, on behalf of Senior Lenders, may exercise the right to substitute the Concessionaire pursuant to the agreement for substitution of the Concessionaire (the '**Substitution Agreement**') to be entered into amongst the Concessionaire, the Authority and the Lenders' Representative, on behalf of Senior Lenders, Substantially in the form set forth in Schedule-R.	The Lender's risk is covered with provision of Substitution Agreement. This will be operated if situation needs.
Article 38 Clause 38.3.1	Arbitration	Any dispute which is not resolved amicably by conciliation as provided in clause 38.2 shall be finally decided by reference to arbitration by an arbitral tribunal constituted in accordance with clause 38.3.2such arbitration shall be held in accordance with the rules of the society for affordable Redressal of disputes **(SAROD)** new Delhi (the rules) or such other rules as may be mutually agreed by the parties and shall be subject to the provision of the arbitration and conciliation act 1996	There is provision of Arbitration in case of unresolved dispute between Authority and concessionaire.
Article 41 Clause 41.17	Miscellaneous - State Support Agreement	The Concessionaire acknowledges that it has received from the Authority a certified true copy of the agreement executed between MORTH and the State Government for providing the support and services specified therein (the **"State Support Agreement")** and the Parties hereto agree to make their best endeavors to procure the support of the State Government.	This provision will help the Concessionaire for obtaining permission, approval and land acquisition faster.

Most of the points above are brought out to see that the Agreement is generally enforceable in law without ambiguities.

Conclusions

- The Concession Agreement is comprehensive and covers most of the concerns of Lenders and all risk factors.

8 REVIEW OF O&M AGREEMENT

The Operation and Maintenance Agreement was signed between **M/s GR Gundugolanu Devarapalli Highway Private Limited (GDHPL)** and **G R Infraprojects Limited (O&M Contractor)** on 02nd November 2021 and addendum O&M Agreement has been signed on 26th July 2022 for a period of 1 year.

We have reviewed the provisions under various clauses of this O&M Contract and our specific comments are indicated below clause-wise.

Sr. No.	Clause No.	Description in Brief	Remark
1	Agreement Para (ii)	The Concessionaire now wishes to appoint M/s G R lnfraproiects Limited for Operation and Maintenance of Project Highway as 0&M Contractor in accordance with Scope of Work as mentioned in Annexure 1 hereto, under the Concession Agreement.	The Contractor M/s. G. R. Infraprojects Ltd. is appointed for O&M work as per scope in CA.
2	Clause (n) Definition	"O&M Contractor" means the person, if any, with whom the Concessionaire has entered into an O&M agreement for discharging O&M obligations for and on behalf of the Concessionaire.	The Contractor is appointed to discharge duties of O&M work on behalf of Concessionaire as per scope in O&M Agreement.
3	Clause r Definition	"O&M Period" O&M Agreement means operation and maintenance period of 1 year commencing from Commencement Date.	The Agreement of O&M is for one year and addendum is signed for another 1 year.
4	Clause 2 Availability of Documents	The O&M Contractor also acknowledges the fact that the Concession Agreement is always binding and applicable back to back on the O&M Agreement, limited to the obligations during the O&M period under the Concession Agreement and the scope of the O&M Contractor as per this Agreement. In case of any discrepancy in whatsoever matter, the clauses or' Concession Agreement shall prevail over and above this O&M Agreement.	The copy of Concession Agreement & Maintenance Manual is provided to Contractor. It is always binding to Contractor for implementation during O&M work.
5	Para 6 O&M Contractor's obligation	6.1 During Operation Period, provisions of Article 17 of the Concession Agreement shall apply. The O&M Contractor shall operate and maintain the Project Highway in accordance with Article 17 of the Concession Agreement and if required, modify, repair or otherwise make improvements to the Project Highway comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and confirm to Specifications and Standards and Good Industry Practice.	The obligation of O&M is as per Article 17 of CA. These cover periodical routine & major repair work and safety of users.

Sr. No.	Clause No.	Description in Brief	Remark
6	Clause 6 Maintenance Requirements	6.3 The O&M Contractor shall procure that at all times during the Operation Period; the Project Highway conforms to the maintenance requirements set forth in Schedule-K of the Concession Agreement (the "Maintenance Requirements").	The maintenance required to be done as per Schedule K of CA only.
7	Clause 6 Maintenance Program	6.4 Not later than 55 days prior to the beginning of each Accounting Year during the Operation Period, the O&M Contractor shall provide to the Concessionaire, its proposed annual program of preventive. urgent and other scheduled maintenance (the "Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Contractor has to submit the programme and work for O&M with maintenance requirement and safety.
8	Clause 6 Maintenance Requirements 6.5 Safety, Breakdown and accident	6.5.1 The 0&M Contractor shall ensure safe conditions for the users, and in the event of unsafe conditions, closures, diversions, breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary Lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good industry Practice.	Safety of users including breakdown, accident rescue operations is covered.
9	Clause 6 Maintenance Requirements 6.10 Damages for Breach of Maintenance obligations	In the event that the O&M Contractor fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be this Agreement and the cm Contractor shall pay to the Concessionaire Damages at such rate as the Concessionaire Is required to pay to the Authority under the Concession Agreement. Recovery of such Damages shall be without prejudice to the rights of the Concessionaire under this Agreement, including the right of Termination thereof.	The provision of Levy of Damage or Termination for breach of Agreement, defective work will keep pressure on contractor to work as per requirement.
10	Clause 6 Maintenance Requirements 6.16 Monthly Status report during Operation Period	During the Operation Period, the O&M Contractor shall, no later than 7 (seven) days after the close of each English calendar month, furnish to the Concessionaire, a monthly report stating in reasonable detail the condition of the Project including its compliance or otherwise with the Maintenance Requirements, Maintenance Manual. Maintenance Program and Safety Requirements and shall promptly give such other relevant information as may be required by the Concessionaire/ IE/ Authority.	It is binding on Contractor to submit status report on monthly basis for information of Authority, Concessionaire, IE & Lender.
11	Clause 6	For determining that the Project Highway conforms to the Maintenance Requirements, the Project Manager/IE shall require the O&M Contractor to carry	This will maintain quality of work.

Sr. No.	Clause No.	Description in Brief	Remark
	Maintenance Requirements 6.17 Tests	out, or cause to be carried out, tests specified by it in accordance with Good Industry Practice.	
12	Clause 6 Maintenance Requirements 6.19 Safety Requirements	6.19.1 The O&M Contractor shall comply with the provisions of this Agreement and [or Concession Agreement, Applicable Laws and Applicable Permits and confirm to Good Industry Practice for securing the safety of the Users. in particular, the O&M Contractor shall develop, implement and administer a surveillance and safety program for providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in Schedule L of the Concession Agreement (the “Safety Requirements").	The O&M Contractor has to provide requirements provision for safety of Highway users. The safety of users is given priority.
13	Clause 13 Sub-contracts	13.1 The O&M Contractor shall notify to the Project Manager in writing of its intent to subcontract the O&M works in part or full and without the written approval of the Project Manager no subcontractor shall be appointed by the O&M Contractor.	The sub-contractor cannot be appointed without approval of Project Manager. This will keep control over contractor to appoint competent contractor.
14	Clause 16 Insurance	16.1 The Concessionaire shall. procure and maintain the insurance for the Project Highway including all facilities in accordance with the Article 26 of the Concession Agreement.	The risks and security of Authority, concessionaire and lender is covered.
15	Clause 17 Defect Liability Period	17.1 The Concessionaire and/or the EPC Contractor ls responsible for all the defects and deficiencies in construction of the Project Highway or any section thereof and rectify the Same, without any cost to the O&M Contractor. during the cam period. Under this agreement the O&M Contractor is only under obligation of Operation 8r Maintenance of the Project Highway. For avoidance of doubt, any repair or restoration on account of usual wear and tear in the Project Highway shall form a part of the maintenance.	The Contractor is responsible for any defects during Defect Liability period i.e. O&M Period. This will maintain the quality to avoid any action for defective work as proposed.
16	Clause 21 Acknowledgement	The O&M Contractor acknowledges and accepts that this agreement entitles the Authority and/or Lenders Representative to step into this agreement, in its sole discretion, in Substitution-of the Concessionaire In the event of Termination or Suspension of the Concessionaire. Further, provision of clause 5.2 of the Concession Agreement relating to Project Agreement shall apply *mutatis mutandis.*	The Contractor has agreed for step in right of Authority or Lender in case of Termination of Concessionaire.

Sr. No.	Clause No.	Description in Brief	Remark
17	Clause 22 O&M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the O&M Contractor to carryout routine maintenance Works as detailed in Annexure-I to this 0&M Agreement and in lieu thereof; a fixed lump sum fee amounting to Rs. 6,00,00,000 exclusive of taxes for the entire year in the form of biannual payment shall be due and payable by the Concessionaire.	The O&M Contractor will be paid fixed & Lumpsum payment of Rs. 6.0 Crores. Biannual payment during year for his work as per scope. The Contractor has to manage O&M work responsibility within this payment. Over & above these expenses, Concessionaire is incurring expenses for insurance, electricity, IE & professional fees etc.,
18	Clause 27 Termination 27.1 Termination For O&M Contractor Default	In the event of any defaults specified below shall have occurred, and the 0&M Contractor falls to cure the default within the Cure Period of 60 (sixty) days, the O&M Contractor shall be deemed to be in default of this Agreement (the "08M Contractor Default"), unless the default has occurred as a result of any breach of this Agreement by the Concessionaire or due to Force Majeure.	The Contractor shall note this. This provision of termination keep pressure on contractor to work as per scope of O&M responsibility.
19	Clause 32 Liability and Indemnification	The O&M Contractor shall fully indemnify and hold harmless and defend the Concession extent that the Concessionaire has provided any indemnities to Authority in terms of Article Concession Agreement, in so far as such indemnities relate to the Services.	The Concessionaire is secured from contractor for any loss, claim.

Conclusion

i. Operation and Maintenance Contract is comprehensive and correct for major concerns of the Lender.

ii. The provision of O&M Contract Agreement is consistent with the provision of the Concession Agreement.

9 TOLL PLAZA EQUIPMENT STATUS & ATMS

An assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and working status is carried out based on Section 10 of IRC:SP:84-2014 and the Authority's requirements of Hybrid ETC System. Advanced Traffic Management System (ATMS) is assessed based on Section 816 of MoRTH Specifications for Road and Bridge Works as required by Section 12.12 of the Manual.

9.1 Toll Plaza and Toll Collection System

One toll plaza is provided at km. 53+700 at Veeravalli. The Toll Collection System installed at the toll plazas is provided by Qualix Information Systems LLP.

The toll plazas have Entry 7+1 lanes and Exit 7+1. All lanes are functional with Hybrid ETC equipment. View of the toll plazas are shown in Figure 9-1.

Figure 9-1 View of Toll Plaza (km. 53+700)

9.1.1 Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

1. RFID ETC Transceiver
2. Lane Controller with Industrial PC
3. AVC Sensors
4. Automatic Lane Barrier (ALB)
5. Incident Capture Camera
6. Overhead Lane Signals
7. Traffic Lights
8. Toll Booth Equipment

9.1.1.1 RFID ETC Transceiver

RFID ETC Transceiver reads tags installed on the windshield of vehicles and mounted on a pole at about 6 m height. Handheld RFID readers are provided (1 no. in each direction) in case a tag is not detected by the fixed reader.

Figure 9-2 RFID ETC Transceiver installed on pole

9.1.1.2 Lane Controller with Industrial PC

Toll Lane Controller is located within the Electronic Enclosure placed inside each toll booth which are connected to the common server and are capable of independent storage of data.

9.1.1.3 Automatic Vehicle Classification (AVC) Sensors

The AVC equipment comprises of a pair of height sensor poles, axle sensors and inductive loops. The height detector has a high sensing resolution and detects height when object blocks the path. The presence of vehicle is detected by inductive loop. The loop sensors embedded on the pavement trigger the AVC height sensors located on parallel pillars.

Figure 9-3 Lane Controller and AVC installed in enclosures at Toll Booth

Figure 9-4 Height sensors

Figure 9-5 Inductive loop

9.1.1.4 Automatic Lane Barrier

Boom barriers installed on all lanes are in working condition and have a working time of 0.6 - 0.9 s. Automatic Lane Barrier is used to allow only authorized vehicles to pass through the lane. The barrier is activated only on generation of user fee receipt or other relevant vehicle processing activity. A torque motor powers the barrier for raising and lowering the boom. The motor can be blocked at any position without causing any damage. In the event of power failure, the boom is automatically raised. The boom weight is exactly balanced by built-in springs.

Figure 9-6 Automatic Lane Barrier

9.1.1.5 Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. The LTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done; the LTL turns Green to instruct the vehicle to pass through the lane. The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The user fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

Figure 9-7 Lane Traffic Light (LTL) and User Fare Display (UFD)

9.1.1.6 Incident Capture Camera (AVC Camera)

The incident capture camera is installed on island of the booth to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.

9.1.1.7 License Plate Image Capture Camera (LPIC)

License Plate Image capture camera is installed on a 3m pole facing incoming vehicle to capture the image of the vehicle number plate.

Figure 9-8 LPIC and AVC Cameras

9.1.1.8 Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane "Open" and "Close" sign consists of a pair of "GREEN" (arrow) and "RED" (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed

Figure 9-9 Over Head Lane Signal (OHLS)

9.1.1.9 Toll Booth Equipment

Toll Booth Hardware / Equipment provided are:

- Toll Collector Display (Operator Monitor)
- Customized Industrial Keyboard
- Receipt Printer
- Intercom Slave unit
- Bar code reader
- Violation Light and alarm
- Manual Booth Control (MBC)
- Booth Camera

The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a programmable keyboard for Registration of toll operations and is customized for different vehicle types and type of ticket.

Figure 9-10 Booth Equipment

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Violation system has an alarm switch which is triggered whenever there is a violation such as run-through happening on the lane. When there is an emergency, a foot switch pressed by the booth operator alerts the control room.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room. Manual Booth Controller is used to release exempt vehicles.

9.1.1.10 Medium Speed Weigh in Motion (MSWIM)

Medium Speed Weigh in Motion (MSWIM) is installed on entry lanes with a platform size of 1500 mm x 620 mm for normal lanes and 1750 mm x 620 mm for extra wide lanes and capacity of 30 ton/axle. Bending plate strain gauge technology is used with hardware and software support to calculate weight of vehicles running through it up to a speed of 50 km/hr.

Figure 9-11 Medium Speed Weigh in Motion (MSWIM)

9.1.2 Plaza Equipment

9.1.2.1 TMS Server

Plaza Server is provided in a hot standby configuration and provided with 42 U switch rack, 28 port non-POE network switch and 10 Port PoE switch. Firewall and 2 broadband internet lease line with 4 Mbps link for CCH connectivity is available.

Figure 9-12 Control Room Equipment - Server & Switch rack

9.1.2.2 55” LED screen for CCTV monitoring

55” LED screen for CCTV monitoring installed at the toll plaza admin block provides view of all the toll booths, important zones within the plaza where cash transactions take place (server room, control room, cash up).

Figure 9-13 CCTV screen at the Toll Plaza Control Room

The toll plaza manager is able to observe the activities at the toll lanes and toll booth. When the toll collector calls up on the intercom, the manager is able to comprehend the situation at the lane by a zoomed view of the particular lane.

9.1.2.3 Workstations in Control Room, PoS and Cash up room

Workstations are available in control room (lane monitoring, administration, and audit), cash room.

Figure 9-14 Work Stations at Control room

9.2 Advanced Traffic Management System (ATMS)

Advanced Traffic Management System (ATMS) installed for the project road is controlled by the ATMS centre at the toll plaza location (km 53+700). It comprises of the following:

- Emergency Call Back System (ECB)
- Mobile Radio communication system
- Meteorological Data system
- Variable Message Signboards (VMS)
- Automatic Traffic Counter cum Classifier (ATCC)
- CCTV system

9.2.1 Emergency Call Back System (ECB)

25 pairs of Emergency Call Booths are installed along the project road stretch. The users can access these ECBs and communicate to the ATMS control centre in case of emergency such as vehicle breakdown.

9.2.2 Mobile Radio communication System (MRCS)

Communication between patrol vehicles, ambulances, crane operators and the control centre is managed using MRCS installed at the two locations, Km 33+800 and Km 65+300.

9.2.3 MET system

Meteorological sensors comprise of sensors to measure the atmospheric temperature, humidity, pavement surface temperature, visibility and equipment for measuring wind speed and direction and installed at km 53+700

Figure 9-15 MET Equipment

9.2.4 Variable Message Signboards (VMS)

Variable message sign boards are installed at 8 locations. These display specific messages to the users based on the prevailing conditions on the highway. The message can be changed at any point of time from the ATMS centre. About 250 customised messages can be stored on the system.

Figure 9-16 VMS on project highway

9.2.5 Automatic Traffic Counter cum Classifier (ATCC)

Automatic Traffic Counter cum Classifiers (ATCC) is installed at km 53+700. The ATCC are infrared Traffic Logger (TIRTL) type and count at an accuracy of 95%.

9.2.6 CCTV and Surveillance Cameras

Surveillance Cameras are installed at 4 locations along the project corridor. The ATMS control room has video wall to monitor these locations through the cameras installed.

Figure 9-17 Video wall at ATMS Control room

9.2.7 Video Incident Detection System

Video Incident Detection System is located at 11 locations. 15+350, 18+40, 18+923, 20+285, 22+460, 32+200, 40+500, 64+300, 65+400, 65+050, 66+640.

9.3 Adequacy of Toll Collection System and ATMS

- Adequacy - The software and hardware as a part of Toll Collection and Management System (TMS) was commissioned on 08th September 2021. All lanes are Hybrid ETC system as stipulated by NHAI in Technical Specifications of Hybrid ETC system. NHAI has approved maintenance costs for TMS. TMS shall be upgraded every 5 years, at the cost of the Authority.

- Advanced Traffic Management System (ATMS) installed is as per specifications required by the Authority and in working condition.

10 ACCIDENT DATA ANALYSIS

Accident Data Records for the project have been studied in order to analyse the nature of accidents occurring on the stretch and identify blackspots.

10.1 Accident Trend

Accident Data for the period July 2019 to June 2022 has been made available for analysis. 293 Accidents have occurred out of which 40 no. were fatal, 101 were grievous injury and 185 were minor. More number of accidents have occurred during the day time than at night time. Monthly data analysis does not show any consistent seasonal trend. Fault of the driver has been recorded as a major cause of accident (65%) followed by over speeding (35%).

10.2 Blackspots Identification

There are no black spot found in the project stretch. Details of accidents in the project length are given in Table below:

Table 10-1 Accidents details on Project Road

Sr. No.	Month	No. of Accidents	No. of Affected Persons			Remarks
			Minor Injury	Serious Injury	Fatal	
1	July 2021	8	5	0	6	
2	August 2021	11	14	4	2	
3	September 2021	8	6	4	1	
4	October 2021	23	21	12	8	
5	November 2021	25	20	8	5	
6	December 2021	25	24	10	4	
7	January 2022	10	8	6	0	
8	February 2022	15	2	10	3	
9	March 2022	11	1	9	1	
10	April 2022	58	32	14	2	
11	May 2022	63	17	12	3	
12	June 2022	61	35	12	5	

10.3 Conclusions & Recommendations

There are no accident blackspots based on analysis of recorded data. Concessionaire need to maintain all signs, markings and road safety devices as per schedule given in CA.

Annexures

Annexure I: Operation Cost

Sr. No.	Particulars	Cost per Annum (Rs)	Cost per Annum (Cr)
1	Incidental Management Expenses		
a	*Ambulance - 2 Nos.*	3,475,762	0.35
b	*Patrolling Vehicle - 2 Nos.*	4,016,329	0.40
c	*Crane - 2 Nos.*	2,393,245	0.24
d	*Other Vehicle - 3 Nos.*	1,607,245	0.16
e	*JCB - 1 Nos.*	831,880	0.08
f	*Corridor Manager & Officer*	953,280	0.10
2	Maintenance Staff Expenses	6,600,000	0.66
3	Routine Maintenance Cost (Civil Works)	22,666,594	2.27
4	Professional & IE Fee	22,215,044	2.22
5	Insurance Expenses	14,966,100	1.50
6	Staff Welfare Expenses	224,000	0.02
7	Electricity Expenses + Maintenance of parts	18,292,723	1.83
8	ATMS Expenses	5,639,642	0.56
9	Contingency @ 5% (Excl. Civil works)	4,060,763	0.41
	Total Cost (Rs)	**107,942,608**	**10.79**
	Per km Cost (Lakh)		**15.45**

Annexure II: Routine Maintenance Cost

Routine Maintenance Cost - GGDHPL	
Ordinary Repair Cost for Rigid without GST	**22,666,594.40**
(Exclusive of GST @ 12%)	**= 3.24 lakhs per km**

CONVERSION FACTORS									
National Highways / State Highways - Flexible Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Flexible Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	**More than 4500 CVD**				
				152,109	**166,951**				
						Normal	**Urban**	**Normal**	**Urban**
2	Four-lane with divided carriageway	Without paved shoulder	1.53	232726.00	255436.00	-	-	-	-
		Paved shoulder	1.70	258585.00	283817.00	-	3.23	-	916,728.91
3	Four-lane with divided carriageway and service lane on either side	Without paved shoulder	2.00	304217.00	333903.00	-	-	-	-
		Paved shoulder	2.20	334639.00	367293.00	50.84	-	17,014,385.32	-
4	Six lane with divided carriageway	without Paved shoulder	2.43	369624.00	405692.00	-	-	-	-
		with Paved shoulder	2.60	395483.00	434073.00	-	-	-	-
5	Six lane with divided carriageway and service lane on either side	without Paved shoulder	2.90	441115.00	484159.00	-	-	-	-
		with Paved shoulder	3.10	471537.00	517549.00	15.81	-	7,455,471.51	-
					TOTAL		**69.885**		**25,386,585.73**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.50%
	Volume (cum)			2.50
	Rs/m^3			4480
	Cost in Rupees			11,200
	ii) Patch repair	100 % Patch less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			179
	Cost in Rupees			8,960
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	3.50%
	Area (sqm)			350
	Rs/m^2			85
	Cost in Rupees			29,792
	b) Width less than 3 mm	75 % Crack Less	As & when required	2.50%
	Area (sqm)			187.5
	Rs/m^2			57
	Cost in Rupees			10,710
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			179
	Cost in Rupees			13,440
	v) Road marking	10%	Once in 10 year & @ Repaired location	17750
	SUB TOTAL			**91,852**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	80%	As & when required	27,734
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			
	SUB TOTAL			**27,734**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debries removal		Once in a Year	3467
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	3467

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**152,109**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	10%	Once in 10 years with thermoplastic paint	860
	ii)Repairs to footpath	50%	As & when required	2311
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**14,843**
	GRAND TOTAL (Urban)			**166,951**

Annexure III : Major Maintenance Cost

Major Maintenance Cost (Every 6th / 7th year) (FY2029 & FY2035)											
Sr. No.	**Description**	**Unit**	**No.**	**Length**	**Width**	**Depth**	**Quantity**	**Total Quantity**	**Rate**	**Amount**
I. Main Carriageway, Service Road / Slip Road & Miscellaneous location										
A	**Main Carriageway: Flexible Pavement**									
1	Milling	Sqm	100%	67,535.00	19.69		1,329,920.00	1,329,920.00	55.00	73,145,600
2	Tack Coat for DBM	Sqm	10%	67,535.00	19.69		132,992.00	132,992.00	10.00	1,329,920
3	DBM Overlay	Cum	10%	67,535.00	19.69	0.05	6,649.60	6,649.60	8,731.00	58,057,658
4	Tack Coat for BC	Sqm	100%	67,535.00	19.69		1,329,920.00	1,329,920.00	10.00	13,299,200
5	BC Overlay	Cum	100%	67,535.00	19.69	0.04	53,196.80	53,196.80	10,672.00	567,716,250
6	Filling of Earthen shoulder	Cum	2	52,479.00	1.50	0.04	6,297.48	6,297.48	408.00	2,569,372
C	**Rigid Pavement at Toll Plaza**									
7	Replacement of Joint Sealant	Rmt	5%	6,884.55			344.23	344.23	51.00	17,556
8	Dismantling of CC Panels @ 2% area	Cum	2.0%	13,553.95		0.27	73.19	73.19	879.00	64,335
9	Replacement of Panels - PQC @ 2% area	Cum	2.0%	13,553.95		0.27	73.19	73.19	7,486.00	547,910
10	Replacement of Panels - DLC @ 0% area	Cum	0.0%	13,553.95		0.15	-	-	3,404.00	-
11	Diamond Grinding	Sqm	3%	13,553.95			406.62	406.62	50.00	20,331
D	**Service Roads (Flexible Pavement)**									
12	Tack Coat for BC	Sqm	20%	51,089.00	13.90		142,027.42	142,027.42	10.00	1,420,274
13	BC Overlay with 30mm	Cum	20%	51,089.00	13.90	0.03	4,260.82	4,260.82	10,211.00	43,507,260
14	Micro surfacing	Sqm	80%	51,089.00	13.90		568,109.68	568,109.68	133.00	75,558,587
15	Filling of Earthen shoulder	Cum	1	51,089.00	-	0.03	-	-	408.00	-
E	**Structural Deck area**									
16	Milling	Sqm	50%	837.00	26.00		10,881.00	10,881.00	55.00	598,455
17	Tack Coat	Sqm	50%	837.00	26.00		10,881.00	10,881.00	10.00	108,810
18	Mastic Asphalt Overlay	Sqm	50%	837.00	26.00		10,881.00	10,881.00	534.00	5,810,454
F	**Miscellaneous**									
19	Replacement of Kerb	Rmt	10%	191,594.00			19,159.40	19,159.40	250.00	4,789,850
20	Painting of Kerbs	Sqm	1	191,594.00		0.32	60,352.11	60,352.11	94.00	5,673,098
21	Painting of Crash Barrier	Sqm	1	56,612.00	1.12		63,122.38	63,122.38	94.00	5,933,504
22	Thermoplastic paint									
	a) Median & Edge line	Sqm	100%				79,746.88	79,746.88	496.00	39,554,455
	Main Carriageway 6L		4	15,897.72	0.15		9,538.63			
	Main Carriageway 4L		4	55,384.98	0.15		33,230.99			
	Service Road		2	104,221.56	0.10		20,844.31			
	b) Lane line									
	Main Carriageway 6L		4	5,564.20	0.10		2,225.68			
	Main Carriageway 4L		2	19,384.74	0.10		3,876.95			
	Service Road		1	36,477.55	0.10		3,647.75			
	c) Junction crossing						6,382.57			
23	Replacement of Road Stud	No	100%				27,430.00	27,430.00	340.00	9,326,200
	Main Carriageway 6L		4	884.00			3,536.00			
	Main Carriageway 4L		4	3,078.00			12,312.00			
	Service Road		2	5,791.00			11,582.00			
24	Miscellaneous	5%								45,452,454
									Total Amount (MCW)	**954,501,531.86**
									Total Cost in Lakhs (MCW)	**9,545.02**
									Per km Cost in lakhs (MCW)	**136.58**

Annexure IV: Pavement Condition Survey

LHS - Gundugolanu to Kovvuru

Pavement Condition Survey-LHS																					
Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	15.320	15.500	F	BT	BC	-	100	F	-	-	-	Y	-	-	F	Soil	F	F	F	F	F	
2	15.500	16.000	F	BT	BC	-	100	F	-	-	-	Y	-	-	F	Soil	F	F	F	F	F	
2	16.000	16.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
3	16.500	17.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
4	17.000	17.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
5	17.500	18.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
6	18.000	18.500	F	BT	BC	-	100	F	-	-	-	Y	-	-	F	Soil	F	F	F	F	F	ROB
7	18.500	19.000	F	BT	BC	-	100	F	-	-	-	Y	-	-	F	Soil	F	F	F	F	F	
8	19.000	19.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
9	19.500	20.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
10	20.000	20.500	G	BT	BC		100	F	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
11	20.500	21.000	F	BT	BC		100	F	-	-	-	-	30	-	F	Soil	F	F	F	F	F	
12	21.000	21.500	F	BT	BC		100	G	-	-	-	-	35	-	F	Soil	F	F	F	F	F	
13	21.500	22.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
14	22.000	22.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
15	22.500	23.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
16	23.000	23.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
17	23.500	24.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
18	24.000	24.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
19	24.500	25.000	F	BT	BC		100	F	-	-	-	-	40	-	F	Soil	F	F	F	F	F	
20	25.000	25.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
21	25.500	26.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
22	26.000	26.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
23	26.500	27.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
24	27.000	27.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
25	27.500	28.000	G	BT	BC		100	F	15	-	-	-	-	-	F	Soil	F	F	F	F	F	
26	28.000	28.500	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
27	28.500	29.000	F	BT	BC		100	F	25	-	-	-	-	-	F	Soil	F	F	F	F	F	
28	29.000	29.500	F	BT	BC		100	P	-	-	-	M	12	-	F	Soil	F	F	F	F	F	
29	29.500	30.000	F	BT	BC		100	F	-	-	-	M	15	-	F	Soil	F	F	F	F	F	
30	30.000	30.500	F	BT	BC		100	F	-	-	-	M	10	-	F	Soil	F	F	F	F	F	
31	30.500	31.000	F	BT	BC		100	G	-	-	-	M	5	-	F	Soil	F	F	F	F	F	
32	31.000	31.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
33	31.500	32.000	F	BT	BC		100	G	-	-	-	-	-	-	P	Soil	F	F	F	F	F	
34	32.000	32.500	F	BT	BC		100	G	-	-	-	-	-	-	P	Soil	F	F	F	F	F	

Pavement Condition Survey-LHS																					
Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
35	32.500	33.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
36	33.000	33.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
37	33.500	34.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
38	34.000	34.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
39	34.500	35.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
40	35.000	35.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
41	35.500	36.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
42	36.000	36.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
43	36.500	37.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
44	37.000	37.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
45	37.500	38.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
46	38.000	38.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
47	38.500	39.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
48	39.000	39.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
49	39.500	40.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
50	40.000	40.500	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
51	40.500	41.000	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
52	41.000	41.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
53	41.500	42.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
54	42.000	42.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
55	42.500	43.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
56	43.000	43.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
57	43.500	44.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
58	44.000	44.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
59	44.500	45.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
60	45.000	45.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
61	45.500	46.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
62	46.000	46.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
63	46.500	47.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
64	47.000	47.500	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
65	47.500	48.000	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
66	48.000	48.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
67	48.500	49.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
68	49.000	49.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
69	49.500	50.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
70	50.000	50.500	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
71	50.500	51.000	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
72	51.000	51.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
73	51.500	52.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	

Pavement Condition Survey-LHS																					
Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
74	52.000	52.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
75	52.500	53.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
76	53.000	53.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
77	53.500	54.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	Toll PLaza
78	54.000	54.500	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
79	54.500	55.000	F	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
80	55.000	55.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
81	55.500	56.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
82	56.000	56.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
83	56.500	57.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
84	57.000	57.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
85	57.500	58.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
86	58.000	58.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
87	58.500	59.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
88	59.000	59.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
89	59.500	60.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
90	60.000	60.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
91	60.500	61.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
92	61.000	61.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
93	61.500	62.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
94	62.000	62.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
95	62.500	63.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
96	63.000	63.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
97	63.500	64.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
98	64.000	64.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
99	64.500	65.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
100	65.000	65.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
101	65.500	66.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
102	66.000	66.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
103	66.500	67.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
104	67.000	67.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
105	67.500	68.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
106	68.000	68.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
107	68.500	69.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
108	69.000	69.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
109	69.500	70.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
110	70.000	70.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
111	70.500	71.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
112	71.000	71.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	P	F	F	

Pavement Condition Survey-LHS																					
Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
113	71.500	72.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	P	F	F	
114	72.000	72.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
115	72.500	73.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
116	73.000	73.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
117	73.500	74.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
118	74.000	74.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
119	74.500	75.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
120	75.000	75.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
121	75.500	76.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
122	76.000	76.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
123	76.500	77.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
124	77.000	77.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
125	77.500	78.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
126	78.000	78.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
127	78.500	79.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
128	79.000	79.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
129	79.500	80.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
130	80.000	80.500	G	BT	BC		100	G	-	-	-	-	-	-	P	Soil	P	F	F	F	F	
131	80.500	81.000	G	BT	BC		100	G	-	-	-	-	-	-	P	Soil	P	F	F	F	F	
132	81.000	81.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
133	81.500	82.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
134	82.000	82.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
135	82.500	83.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
136	83.000	83.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
137	83.500	84.000	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
138	84.000	84.500	G	BT	BC		100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
138	84.500	85.000	G	BT	BC		100	F	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
139	85.000	85.204	F	BT	BC		100	F	-	-	-	S	-	-	F	Soil	F	F	F	F	F	

RHS - Kovvuru to Gundugolanu

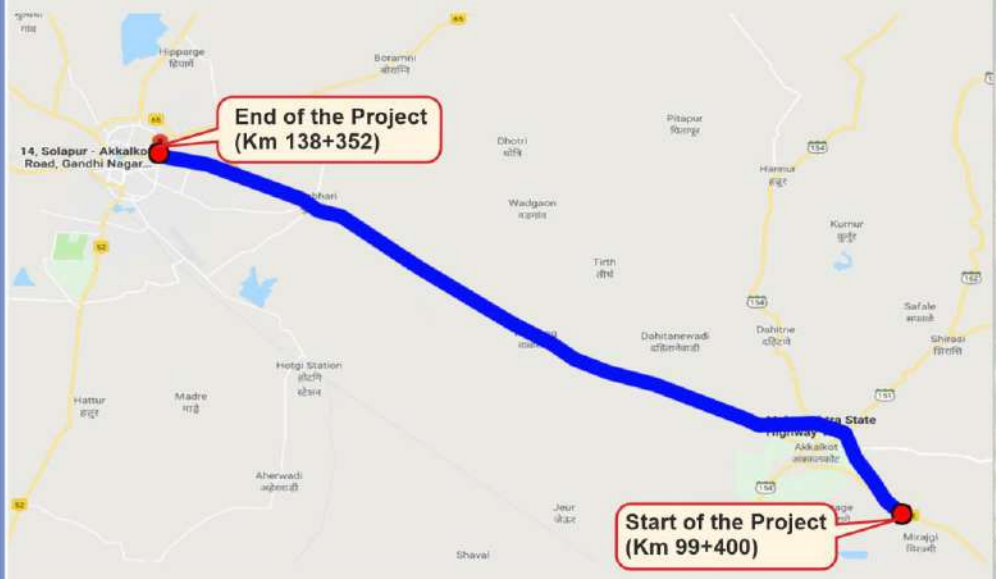
Pavement Condition Survey-RHS																				
Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	15.320	15.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
2	15.500	16.000	F	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
2	16.000	16.500	F	BT	BC	-	100	G	-	-	-	-	**5**	-	F	Soil	F	F	F	F	F	
3	16.500	17.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
4	17.000	17.500	F	BT	BC	-	100	G	-	-	-	-	**7**	-	F	Soil	F	F	F	F	F	
5	17.500	18.000	F	BT	BC	-	100	G	-	-	-	-	**6**	-	F	Soil	F	F	F	F	F	
6	18.000	18.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	ROB
7	18.500	19.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
8	19.000	19.500	F	BT	BC	-	100	G	-	-	-	-	**7**	-	F	Soil	F	F	F	F	F	
9	19.500	20.000	F	BT	BC	-	100	G	-	-	-	-	**6**	-	F	Soil	F	F	F	F	F	
10	20.000	20.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
11	20.500	21.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
12	21.000	21.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
13	21.500	22.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
14	22.000	22.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
15	22.500	23.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
16	23.000	23.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
17	23.500	24.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
18	24.000	24.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
19	24.500	25.500	F	BT	BC	-	100	G	-	-	-	-	**2**	-	F	Soil	F	F	F	F	F	
20	25.500	26.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
21	26.000	26.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
22	26.500	27.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
23	27.000	27.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
24	27.500	28.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
25	28.000	28.500	F	BT	BC	-	100	G	-	-	-	-	**5**	-	F	Soil	F	F	F	F	F	
26	28.500	29.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
27	29.000	29.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
28	29.500	30.000	F	BT	BC	-	100	G	-	-	-	-	**4**	-	F	Soil	F	F	F	F	F	
29	30.000	30.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
30	30.500	31.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
31	31.000	31.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
32	31.500	32.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
33	32.000	32.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
34	32.500	33.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
35	33.000	33.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
36	33.500	34.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
37	34.000	34.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	

Pavement Condition Survey-RHS																					
Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
38	34.500	35.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
39	35.000	35.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
40	35.500	36.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
41	36.000	36.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
42	36.500	37.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
43	37.000	37.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
44	37.500	38.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
45	38.000	38.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
46	38.500	39.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
47	39.000	39.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
48	39.500	40.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
49	40.000	40.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
50	40.500	41.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
51	41.000	41.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
52	41.500	42.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
53	42.000	42.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
54	42.500	43.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
55	43.000	43.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
56	43.500	44.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
57	44.000	44.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
58	44.500	45.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
59	45.000	45.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
60	45.500	46.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
61	46.000	46.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
62	46.500	47.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
63	47.000	47.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
64	47.500	48.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
65	48.000	48.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
66	48.500	49.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
67	49.000	49.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
68	49.500	50.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
69	50.000	50.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
70	50.500	51.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
71	51.000	51.500	F	BT	BC	-	100	G	-	-	-	-	**5**	-	F	Soil	F	F	F	F	F	
72	51.500	52.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
73	52.000	52.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
74	52.500	53.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
75	53.000	53.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
76	53.500	54.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	Toll PLaza
77	54.000	54.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	

Pavement Condition Survey-RHS																				
Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
78	54.500	55.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
79	55.000	55.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
80	55.500	56.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
81	56.000	56.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
82	56.500	57.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
83	57.000	57.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
84	57.500	58.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
85	58.000	58.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
86	58.500	59.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
87	59.000	59.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
88	59.500	60.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
89	60.000	60.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
90	60.500	61.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
91	61.000	61.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
92	61.500	62.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
93	62.000	62.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
94	62.500	63.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
95	63.000	63.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
96	63.500	64.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
97	64.000	64.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
98	64.500	65.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
99	65.000	65.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	P	F	P	
100	65.500	66.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	P	F	P	
101	66.000	66.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
102	66.500	67.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
103	67.000	67.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
104	67.500	68.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
105	68.000	68.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
106	68.500	69.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
107	69.000	69.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
108	69.500	70.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
109	70.000	70.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
110	70.500	71.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
111	71.000	71.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
112	71.500	72.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
113	72.000	72.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
114	72.500	73.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
115	73.000	73.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
116	73.500	74.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
117	74.000	74.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	

Pavement Condition Survey-RHS																				
Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
118	74.500	75.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
119	75.000	75.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
120	75.500	76.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
121	76.000	76.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
122	76.500	77.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
123	77.000	77.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
124	77.500	78.000	F	BT	BC	-	100	G	-	-	-	-	7	-	F	Soil	F	F	F	F	F	
125	78.000	78.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
126	78.500	79.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
127	79.000	79.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
128	79.500	80.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
129	80.000	80.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
130	80.500	81.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
131	81.000	81.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
132	81.500	82.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
133	82.000	82.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
134	82.500	83.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
135	83.000	83.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
136	83.500	84.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
137	84.000	84.500	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
138	84.500	85.000	G	BT	BC	-	100	G	-	-	-	-	-	-	F	Soil	F	F	F	F	F	
139	85.000	85.00	F	BT	BC		100	F	-	-	-	M	-	-	F	Soil	F	F	F	F	F	

FP Project Management



Four Laning of Akkalkot - Solapur section of NH-150E from design chainage km. 99.400 to km. 138.352 (Design Length 38.952 kms) including Akkalkot bypass in the State of Maharashtra Under HAM

Technical Due Diligence

Final Report

November 2022

Submitted by:

FP Project Management

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FOUR LANING OF AKKALKOT - SOLAPUR SECTION OF NH-150E WITH PAVED SHOULDERS FROM DESIGN CHAINAGE KM. 99.400 TO KM. 138.352 / EXISTING CHAINAGE FROM KM. 102.819 TO KM. 141.800 (DESIGN LENGTH 38.952 KMS) INCLUDING AKKALKOT BYPASS (DESIGN LENGTH 7.350 KMS) IN THE STATE OF MAHARASHTRA UNDER HYBRID ANNUITY MODE

TECHNICAL DUE DILIGENCE STUDY

FINAL REPORT

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1 INTRODUCTION

1.1 Background

The Government of India has entrusted to the National Highways Authority of India (NHAI), under Ministry of Road Transport and Highway (MORT&H), the development of highways under National Highways Development Projects (NHDP) and as part of this endeavor, the authority has approved Four Lanning of Akkalkot - Solapur section of NH-150E from km. 102.819 to km. 141.800 (Design Chainage from km. 99.400 to km. 138.352) in the state of Maharashtra on Hybrid Annuity Mode. The total length of project road is 38.952 kms including Akkalkot Bypass (design length 7.350 kms)

Based on competitive bid process completed, NHAI has signed Concession Agreement with **M/s. GR Akkalkot Solapur Highway Private Limited**, a Special Purpose Vehicle (SPV) formed for implementing this project.

The Appointed Date of the project was 14th December 2018 vide Authority letter no. NHAI/ PIU/SLP/Akkalkot-Solapur/20002/2018-19/4115 dated 15-Dec-2018. The concession period of the project highway is 17 years from the Appointed Date including construction period of 2 years. The Scheduled Completion Date of the project highway was on 13th December 2020. The NHAI has granted Extension of Time EOT-I and EOT-II for total 180 days. The project has received Provisional Completion Certificate on 31st March 2021.

During maintenance period of the project highway, **GR Highways Investment Manager Pvt. Ltd.** (in its capacity as the Investment Manager of Bharat Highways InvIT) has appointed **FP Project Management Consultancy Services Private Limited** [Formerly Frischmann Prabhu (I) Pvt. Ltd.] as Technical Consultant for carrying out techincal study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, FP Project Management undertook the site visits to carry out site inspection. The report is based on findings during this period.

1.2 Our Approach Philosophy

Composition of Team

Our team consists of well-qualified Engineers and other professionals, whose experience covers all the skills and specializations required for undertaking such assignments. All the team personnel proposed are our regular employees and have a long and stable working relationship with our firm.

The Team Leader coordinates the activities between all the key staff who work closely together. The key staff is assisted by various support staff, who report to the respective key staff in their field of expertise. The Team Leader is the point of contact for Client on Technical Study.

The technical study includes review of all the available documents namely:

a) Concession Agreement including Technical Schedules
b) EPC Agreement
c) Pavement design reports
d) O&M Manual prepared by the Concessionaire
e) O&M Contract, work order and their provisions
f) Recent O&M Report submitted to Authority
g) Quality of construction based on available data, design and drawings

h) Documents on historical expenditure on operation and maintenance
i) Reports on past accidents
j) O&M cost schedule for the concession period
k) Completion / Provisional Completion and status of items in punch list items
l) Correspondence regarding scope of works and during O&M
m) Toll operation manual / ATMS related documents

The review of the above documents is the first step towards accomplishment of the assignment. This gives a complete idea of the project and is used as input data for preparation of report after necessary analysis.

Site Visit and Data Collection

A team of experts from various streams has carried out the preliminary site visit to understand the assessment of project assets mainly condition of the pavement and structures.

- The site visit is undertaken for detailed reconnaissance and visual pavement condition assessment
- The condition assessment of major structures by visual inspection
- The information like material sources and the probable cost is collected for the purpose of cost estimate

The detailed design / drawings viz. Plan & L-sections, drainage design, structure design, layout drawings for project facilities like toll plaza, bus bay, truck lay-byes, highway lighting facilities etc., would be studied. Also, design / drawing and provision pertaining to road furniture are studied.

The adequacy of design is verified in accordance with the concession agreement, manual of specifications and standards as well as relevant IRC standards.

The information on availability of material in the vicinity is gathered. It has direct impact on cost of maintenance work and balance work if any.

The basic approach for preparation for cost estimates for operation and maintenance is as per the practice of State PWD / MoRT&H in respect of highways and structures.

Data Analysis

Based on the study of the available information and preliminary site visits, the consultants share their preliminary observations with the Client.

1.3 About this Report

This report has been prepared based on the information, reports and documents made available to us by the Company. We have also referred to publicly available reports, literature etc. and have made our best efforts to check the authenticity of the information available, analyse the same as per the best engineering / industry practices.

The site visit and inspection were carried out between the periods of **24th August 2022 to 27th August 2022**.

The report is organized with the following chapters for easy understanding of various issues.

- **Introduction -** This chapter gives an overview of the project background, approach and methodology of Due Diligence studies.

- **Project Description -** This chapter describes existing project features.

- **Development of Project Highway -** This chapter gives an overview of project development.

- **Balance works -** This chapter summarizes the balance works to be executed at Site.

- **Pavement and Site Investigation -** This chapter describes present condition of pavement, surveys and investigations carried out on site and proposals for maintenance as per contract requirements.

- **Review of Concession Agreement -** This chapter summarizes the observations on the executed concession agreement document.

- **Review of O&M Agreement -** This chapter summarizes the observations on the O&M Agreement executed.

- **Operation and Maintenance -** This chapter describes O&M set up as well as O&M cost over the concession period.

- **Toll Plaza Equipment and ATMS -** This chapter summarizes assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and working status is presented under this section.

- **Accident Data Analysis -** This chapter deals with the analysis of nature of accidents occurring on the stretch and to identify blackspots.

- **Annexures**

2 PROJECT DESCRIPTION

2.1 Location

The project highway is part of National Highway No. 150E of Barshi - Gulbarga section in the state of Maharashtra and Karnataka. The total project length is 38.952 kms which starts from km. 99.400 near Akkalkot Bypass and ends at km. 138.352 in Solapur City.

The project highway passes through the built-up areas of towns and villages Karjal, Walsung, Chincholi, Rajanpur, Togarhalli, Akkalkot and Kumbhari.

The Location Map of the project highway is presented below:

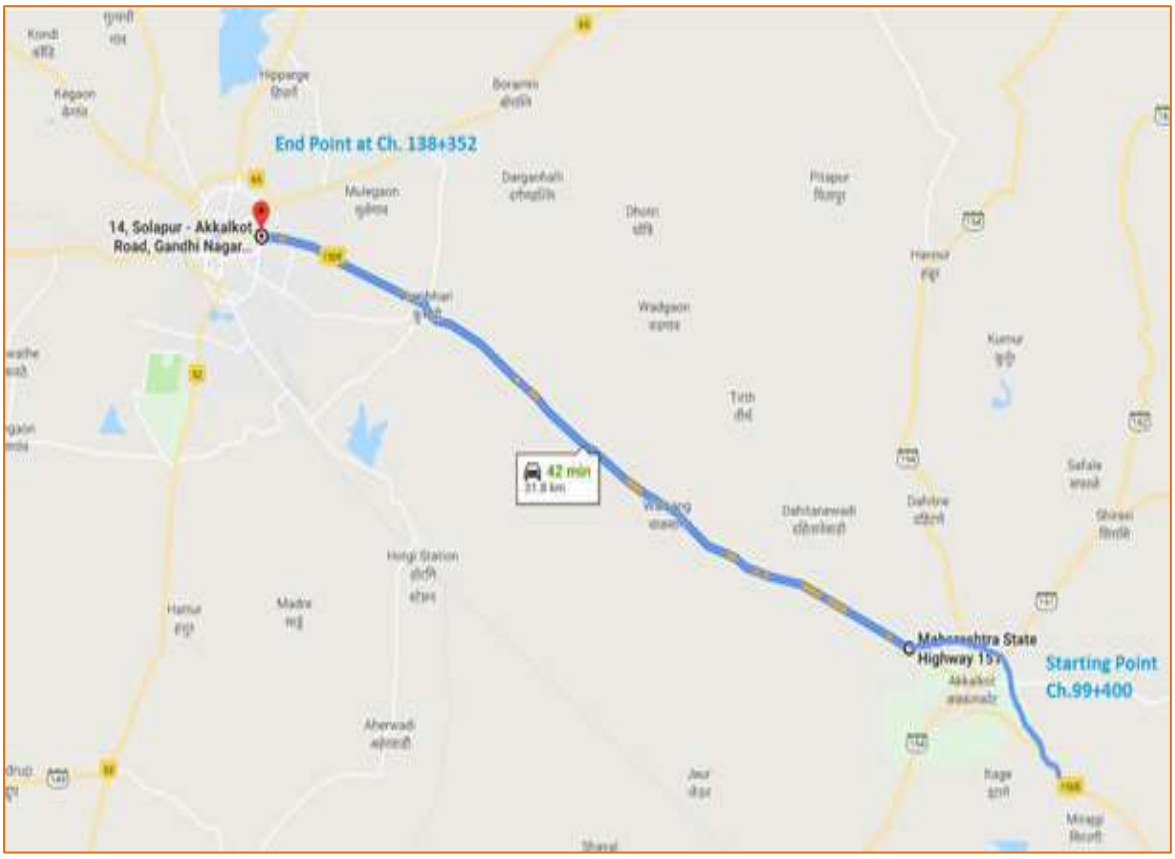

Figure 2-1 Location Map

2.2 Climate

The climate of the project area is generally dry except during the South-West monsoon season between July to September. The average annual rainfall in the area is around 540.96 mm. The driest month is February. The average annual temperature of the project area is 34.1 ^{0}C & May-June is being the warmest month. The highest relative humidity is in August @ 76.97% and the lowest relative humidity is in March @ 25.29%.

2.3 Terrain

The project Highway passes through plain terrain.

2.4 Abutting Land Use

Abutting land use on both sides is predominantly agricultural in rural section and residential and commercial in built-up section.

2.5 Right of Way

The available ROW along the project road section is 45 m except bypass where ROW is 60 meter.

2.6 Existing Utilities

During widening of the project highway, various affected utility services located along the project road were shifted to the PROW. The different types of utilities found along the road include, electrical poles, water pipeline, OFC Cables & HT lines, etc.,

3 DEVELOPMENT OF PROJECT ROAD

3.1 Project Road

The project highway is part of National Highway No. 150E of Barshi - Gulbarga section in the state of Maharashtra and Karnataka. Akkalkot is a taluka place while Solapur is a district place. Akkalkot is a religious place and known for Swami Samarth home as well as Akkalkot taluka is famous for Khwaja Daud dargah staying for peace. Solapur is famous for chadars, cotton mills and power looms. The National Research Centre on Pomegranate (NRCP) of India is located in Solapur. The present carriageway of the project highway is four lane with paved shoulder. The total project length is 38.952 kms.

The road from Akkalkot (km. 99.400) to Solapur City (km. 138.352) was proposed to be developed as four lane divided carriageway with median width 4.0 meter, service road and other arrangements. The project road passes through rural as well as built-up sections. The stretches falling in built-up areas have been provided with service road as per scope of works. The development of entire project road has been carried out in accordance with schedule-B and schedule-C as per standards set forth in schedule-D under the Concession Agreement.

M/s GR Akkalkot Solapur Highway Private Limited has completed construction of the project road for the length of 38.752 kms including Akkalkot Bypass length of 7.126 kms.

The Concessionaire i.e., M/s Akkalkot Solapur Highway Private Limited has received Provisional Completion Certificate on 31st March 2021 vide IE letter no. SAIL/IE/Akk-Sol/NH-150E/TL/2021/13924, dated: 12-04-2021.

The stretch of the project highway under the scope of study runs predominantly through plain / rolling terrain. The design standards have been adhered to with a realistic compatibility with the existing ROW, utilities and optimum land acquisition. Generally, the cross-sectional dimensions of project road are as below:

Cross sectional dimension

Table 3-1 Cross sectional dimension

Main Carriageway	Width (m)
Carriageway width	17.5 to 24.5
Paved Shoulder width - one side	1.5
Earthen Shoulder width - one side	1.5 to 2.0
Median width	1.5 - 4.00
Service Road	7.0

Figure 3-1 Start and End of the Project Highway

Start of the Project Highway at km. 99+400

End of the Project Highway at km. 138+352

3.2 Bypass and Realignment

There is one no. of bypass in the project length. Total length of bypass is 7.126 kms. The details of bypass are as under.

Sr. No.	Name of Bypass	Design Length (km)
1	Akkalkot	7.126

End of the Bypass at km. 106.526

3.3 Pavement Construction

The pavement type for the project highway on both carriageway including Toll Plaza and service road is rigid pavement.

Service Road

Service road is constructed in built-up area and adjoining underpass and overpass locations of 7.0 meter width. The scope of service road as per Concession Agreement is 25.86 kms (BHS). Out of Scope, 25.304 kms work has completed and about 0.500 km of service road is balance due to non-availability of land.

Details of Service Roads is tabulated below:

Table 3-2 Details of Service Road

Sr. No.	Proposed Chainage (km)		Length (km)	Side
	From	To		
1	99+400	100+340	0.940	BHS
2	102+155	104+195	2.040	BHS
3	105+320	106+750	1.430	BHS
4	110+800	111+500	0.700	BHS
5	113+650	114+310	0.660	BHS
6	117+540	118+260	0.720	BHS
7	121+470	122+320	0.850	BHS
8	124+500	125+400	0.900	BHS
9	129+990	131+330	1.340	BHS
10	131+550	132+400	0.850	BHS
11	134+500	135+650	1.150	BHS
12	136+100	137+450	1.350	BHS

Figure 3-2 Photographs of Service Road

LHS

km. 99.400 to km. 100.340 (Partially Balance)

km. 102.155 to km. 104.195

km. 105.320 to km. 106.750

km. 110.80 to km. 111.500

km. 113.650 to km. 114.310

km. 117.540 to km. 118.260

km. 121.470 to km. 122.320

km. 124.500 to km. 125.400

km. 129.990 to km. 130.890

km. 131.550 to km. 132.400

km. 134.500 to km. 135.650

km. 136.100 to km. 137.450

RHS

km. 136.100 to km. 137.450

km. 134.500 to km. 135.650

km. 131.550 to km. 132.400

km. 129.990 to km. 130.890

km. 124.500 to km. 125.400

km. 121.470 to km. 122.320

km. 117.540 to km. 118.260

km. 113.650 to km. 114.350

km. 110.800 to km. 111.500

km. 105.320 to km. 106.750

km. 102.155 to km. 104.195

km. 99.400 to km. 100.340

3.4 Major Intersections

There are 2 Nos. of major intersections along project highway. The details of the major intersections are presented as below.

Table 3-3 Details of Major Intersections

Sr. No.	Design Chainage (km)	Side	Type of Junction	Leading to (LHS)	Leading to (RHS)	Location	Feature
1	106+327	LHS	Y-junction	Akkalkot City	-	-	Akkalkot Bypass end
2	138+352	BHS	X-junction	Solapur Bus Stand	Sakhare Wada	Solapur City	Built up area

Figure 3-3 Photographs of Major Intersection

km. 138.352

km. 106.327

3.5 Minor Junctions

There are 22 minor junctions along project highway. The details of the minor junctions are presented as below.

Table 3-4 Details of Minor Intersections

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Side	Type of Junction	Leading to (LHS)	Leading to (RHS)	Location	Feature
1	-	100+817	BHS	X-junction	Akkalkot City	Godugow	Akkalkot City	-
2	-	101+983	BHS	X-junction	Akkalkot City	Neemgow Village	Akkalkot City	-
3	-	102+212	BHS	X-junction	Akkalkot City	Namdabad	Akkalkot City	-
4	-	102+700	BHS	X-junction	Akkalkot City	Vathri Village	Akkalkot City	-
5	-	103+474	BHS	X-junction	Akkalkot City	Kunoor Village	Akkalkot City	-
6	-	103+800	BHS	X-junction	Akkalkot City	Duljapur Village	Akkalkot City	-
7	-	104+755	BHS	X-junction	Akkalkoti City	Ashapura	Akkalkot City	-
8	112+375	109+040	BHS	Staggered Junction	Banagahati Village	Temple	-	-
9	114+525	111+230	BHS	Staggered Junction	-	Dahitanewadi	-	-
10	114+590				Konhali Village	-	-	-
11	117+405	114+080	BHS	Staggered Junction	Singjodi Village	Halhali village	Karjal Village	Built up Area
12	120+900	117+575	RHS	T-Junction	-	Tirth	-	-
13	124+795	121+470	BHS	X-Junction	Revansi Temple	Dindur Village	-	-
14	125+260	121+937	RHS	T-Junction	-	Rampur Village	-	-

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Side	Type of Junction	Leading to (LHS)	Leading to (RHS)	Location	Feature
15	128+385	125+055	BHS	X-Junction	Hungaon Village	Rampur Village	Thougapadi Village	-
16	132+740	129+416	RHS	T-Junction	-	Khaduthakhadi Village	-	-
17	133+070	129+740	LHS	X-Junction	Hanmgaon	Togarali Village		-
18	133+160	129+830	LHS	T-Junction	Hatgi Village	-	-	
19	134+180	130+830	BHS	Staggered Junction	Sidheshwar Sakhara Mill	Dhodi Village	Kumbhari Village	Built up Area
20	135+355	132+025	LHS	T-Junction	Kumbhari Village	-	-	-
21	137+775	134+437	BHS	X-Junction	Krishna Temple	Ali Mahara Ashram	-	-
22	139+450	136+120	RHS	T-Junction	-	Rebba Nagar	Wamik Square	-

Figure 3-4 Photographs of Major Intersection

km. 101.983

km. 102.212

km. 103.800

km. 109.040

km. 129.416

3.6 Condition Survey of Bridges

The inventory of structures including major bridges, minor bridges, underpasses and culverts is presented in table as below:

Table 3-5 Summary of Structures

Sr. No.	Type of Structure	Unit	Scope	Remark
1	Flyover	Nos.	07	
2	Major Bridges (New)	Nos.	01	RHS
3	Major Bridges (Re construction)	Nos.	01	LHS
4	Minor Bridges	Nos.	09	
5	Minor Bridges on Service Road	Nos.	06	BHS
6	Dismantle and Reconstruction of Minor Bridge	Nos.	05	LHS
7	Pedestrian Underpasses	Nos.	03	02 Nos under COS
8	ROB	Nos.	0	
9	Light Vehicular Underpass	Nos.	06	
10	Box Culverts (New)	Nos.	11	
11	Box Culvert (Re-construction)	Nos.	11	
12	Box Culvert (New on Slip Road)	Nos.	04	
13	Pipe Culvert Widening	Nos.	18	
14	Pipe Culvert (Re Construction)	Nos.	03	

The detailed condition survey of structures was carried out by visual inspection. The observations and findings are presented in table below:

Table 3-6 Structure Condition Survey

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
1	99.586 LHS	Minor Bridge (Reconstruction) 4 x 10 m	Age	New - 2 Lane		The structure is in sound condition. Partial BC is balance on the existing & reconstructed bridge (Some work is still pending due to land acquisition)
			Foundation	RCC Raft		
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC Wall type piers Condition - Satisfactory		
			Super Structure	Four Cell Box Type RCC Slab Condition - Satisfactory		
			Bearing	–		
			Slope Protection	RCC Return		
			Nalla Bed	Flowing water		
			Parapet / Railing	Crash Barrier - Satisfactory		
			Expansion Joint	–		
			Wearing Coat / Surface	BC – Satisfactory		
			Approach Slope	Stable in condition		
			Drainage	Water grating not provided		
2	99.586 (Akkalkot Bypass)	Minor Bridge (New) 4 x 10 m	Age		New - 2 Lane	The structure is in sound condition. Filling work, GSB, DLC & PQC @ A1 side are pending due to local hindrances.
			Foundation		RCC Raft	
			Sub structure Abutment / Pier		Abutment - RCC Wall type Piers - RCC Wall type piers Condition - Satisfactory	
			Super Structure		Four Cell Box Type RCC Slab Condition - Satisfactory	
			Bearing		–	
			Slope Protection		RCC Return	
			Nalla Bed		Flowing water	
			Parapet / Railing		Crash Barrier - Satisfactory	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Expansion Joint		–	
			Wearing Coat / Surface		BC – Satisfactory	
			Approach Slope		Stable in condition	
			Drainage		Water grating not provided	
3	99.586 BHS	Minor Bridge (New-SR) 4 x 10 m	Age		New - 2 Lane	The structure @ LHS is pending due to land acquisition. Wearing coat is pending at MCW. Filling work, GSB, DLC & PQC @ A1 side of SR & MCW-RHS are pending due to local hindrances.
			Foundation		RCC Raft	
			Sub Structure Abutment / Pier		Abutment - RCC Wall type Piers - RCC Wall type piers Condition - Satisfactory	
			Super Structure		Four Cell Box Type RCC Slab Condition - Satisfactory	
			Bearing		–	
			Slope Protection		RCC Return	
			Nalla Bed		Flowing water	
			Parapet / Railing		Crash Barrier - Satisfactory	
			Expansion Joint		–	
			Wearing Coat / Surface		BC – Pending	
			Approach Slope		Stable in condition	
			Drainage		Water gratings not provided	
4	99.900	Flyover 1 x 15.0 + 1 x 25 + 1 x 15 m	Age	New - 3 Lane	New – 3 Lane	The structure is in sound condition.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	3 Span 10-PSC Girders, 20-RCC Girders and RCC Slab	3 Span 10-PSC Girders, 20-RCC Girders and RCC Slab	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				Condition - Satisfactory	Condition – Satisfactory	
			Bearing	Bearing – Elastomeric	Bearing – Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier – Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC – Satisfactory	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Not proper arrangement	Not proper arrangement	
5	101.260 (Akkalkoti Bypass)	Minor Bridge (New) 1 x 10 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Condition - Satisfactory	Abutment - RCC Wall type Condition - Satisfactory	
			Super Structure	Single Cell Box Type RCC Slab Condition - Satisfactory	Single Cell Box Type RCC Slab Condition - Satisfactory	
			Bearing	–	–	
			Slope Protection	RCC Return	RCC Return	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	–	–	
			Wearing Coat / Surface	PQC – Satisfactory	PQC – Satisfactory	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspout not provided	Waterspout not provided	
6	102.700	Flyover 1 x 21 + 1 x 30 + 1 x 21 m	Age	New - 3 Lane	New – 3 Lane	The structure is in sound condition.
			Foundation	Pile Foundation	Pile Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type	Abutment - RE Block & RCC Circular type	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				Piers - RCC Circular type Condition - Satisfactory	Piers - RCC Circular type Condition – Satisfactory	
			Super Structure	3 Span 10-PSC Girders, 20-RCC Girders and RCC Slab Condition - Satisfactory	3 Span 10-PSC Girders, 20-RCC Girders and RCC Slab Condition – Satisfactory	
			Bearing	Bearing – POT-PTFE & Elastomeric	Bearing – POT-PTFE & Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier – Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC –damaged	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water gratings not provided	Water gratings not provided	
7	103.801	Flyover 1 x 21 + 1 x 30 + 1 x 21 m	Age	New - 3 Lane	New – 3 Lane	The structure is in sound condition.
			Foundation	Pile Foundation	Pile Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	3 Span 10-PSC Girders, 20-RCC Girders and RCC Slab Condition - Satisfactory	3 Span 10-PSC Girders, 20-RCC Girders and RCC Slab Condition - Satisfactory	
			Bearing	Bearing – POT-PTFE & Elastomeric	Bearing – POT-PTFE & Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier – Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC - damaged	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water gratings not provided in mid span	Water gratings not provided in mid span	
8	104.348 (Akkalkoti Bypass)	Minor Bridge (New) 1 x 11 m	Age	New - 3 Lane	New – 3 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC Wall type pier Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC Wall type pier Condition - Satisfactory	
			Super Structure	Single Cell Box Type RCC Slab Condition - Satisfactory	Single Cell Box Type RCC Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return	RCC Return	
			Nalla Bed	Standing water	Standing water	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Roughened	BC - Satisfactory	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts not provided	Waterspouts not provided	
9	104.820	PUP under COS- 7 m x 4 m	Age	New - 3 lane	New - 3 lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	RCC wall RCC wall Box type	RCC wall RCC wall Box type	
			Super Structure	RCC solid slab	RCC solid slab	
			Bearing	-	-	
			Slope Protection	RE Block Wall	RE Block Wall	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Stable	Stable	
			Drainage	Waterspouts provided	Waterspouts provided	
10	106.240	Flyover 1 x 15 + 1 x 25 + 1 x 15 m	Age	New - 3 Lane	New – 3 Lane	The structure is in sound condition.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	3 Span 10-PSC Girders, 20-RCC Girders and RCC Slab Condition - Satisfactory	3 Span 10-PSC Girders, 20-RCC Girders and RCC Slab Condition - Satisfactory	
			Bearing	Bearing – Elastomeric	Bearing – Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC –damaged	BC - damaged	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts provided	Waterspouts provided	
11	110.930 (LHS)	Minor Bridge-Chappla Wadi River (Reconstruction)	Age	New - 2 lane		The Structure is in sound condition.
			Foundation	RCC Raft		
			Sub Structure Abutment / Pier	Single Cell Box Type RCC wall Box type		

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
		1 x 10 m	Super Structure	RCC solid slab		
			Bearing	-		
			Slope Protection	RCC Return		
			Nalla Bed	Clear		
			Parapet / Railing	Crash Barrier		
			Expansion Joint	-		
			Wearing Coat / Surface	PQC - Satisfactory		
			Approach Slope	Stable		
			Drainage	Waterspouts provided		
12	110.930 (RHS)	Minor Bridge (New) 1 x 10 m	Age		New - 2 lane	The Structure is in sound condition.
			Foundation		RCC Raft	
			Sub Structure Abutment / Pier		Single Cell Box Type RCC wall Box type	
			Super Structure		RCC solid slab	
			Bearing		-	
			Slope Protection		RCC Return	
			Nalla Bed		Clear	
			Parapet / Railing		Crash Barrier	
			Expansion Joint		-	
			Wearing Coat / Surface		PQC - Satisfactory	
			Approach Slope		Stable	
			Drainage		Waterspouts provided	
13	110.930 (BHS)	Minor Bridge (New-SR) 1 x 10 m	Age	New - 2 lane	New - 2 lane	The Structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Single Cell Box Type RCC wall Box type	Single Cell Box Type RCC wall Box type	
			Super Structure	RCC solid slab	RCC solid slab	
			Bearing	-	-	
			Slope Protection	RCC Return	RCC Return	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	PQC - Satisfactory	PQC - Satisfactory	
			Approach Slope	Stable	Stable	
			Drainage	-	-	
14	111.260	LVUP- 12 m x 4 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	RCC wall RCC wall Box type	RCC wall RCC wall Box type	
			Super Structure	RCC solid slab	RCC solid slab	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Stable	Stable	
			Drainage	Waterspouts provided	Waterspouts provided	
15	114.080	LVUP 12 m x 4 m	Age	New - 2 lane	New - 2 lane	The Structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	RCC wall RCC wall Box type	RCC wall RCC wall Box type	
			Super Structure	RCC solid slab	RCC solid slab	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Stable	Stable	
			Drainage	Waterspouts provided	Waterspouts provided	
16	114.405 LHS	Major Bridge- Hlullai River 4 x 20 m	Age	New - 3 lane- Reconstruction	New - 3 lane- New construction	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	4 Span RCC Girders & RCC Deck Slab Condition - Satisfactory	4 Span RCC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	Bearing – Elastomeric	Bearing – Elastomeric	
			Slope Protection	RCC Return and Rubble Stone Pitching & RE Block Wall	RCC Return and Rubble Stone Pitching & RE Block Wall	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water gratings blocked	Water gratings blocked	
17	117.796- BHS	Minor Bridge- (New) 2 x 20 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	2 Span	2 Span	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				RCC Girders & RCC Deck Slab Footpath - Both side Condition - Satisfactory	RCC Girders & RCC Deck Slab Footpath - Both side Condition – Satisfactory	
			Bearing	Bearing – Elastomeric	Bearing – Elastomeric	
			Slope Protection	RE Block Wall	RE Block Wall	
			Nalla Bed	Flowing water Height Upper level	Flowing water Height Upper level	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier – Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC surface is roughened	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Sufficient water gratings not provided	Sufficient water gratings not provided	
18	117.796-BHS	Minor Bridge-(New-SR) 2 x 20 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	2 Span RCC Girders & RCC Deck Slab Footpath - Both side Condition - Satisfactory	2 Span RCC Girders & RCC Deck Slab Footpath - Both side Condition - Satisfactory	
			Bearing	Bearing – Elastomeric	Bearing – Elastomeric	
			Slope Protection	RCC Return	RCC Return	
			Nalla Bed	Flowing water Height lower level	Flowing water Height lower level	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts provided	Waterspouts provided	
19	117.935	Flyover 1 x 15 + 1 x 25 + 1 x 15 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC rectangle type Piers - RCC rectangle type Condition - Satisfactory	Abutment - RE Block & RCC rectangle type Piers - RCC rectangle type Condition - Satisfactory	
			Super Structure	3 Span 8-PSC Girders, 16-RCC Girders and RCC Slab Condition - Satisfactory	3 Span 8-PSC Girders, 16-RCC Girders and RCC Slab Condition - Satisfactory	
			Bearing	Bearing – Elastomeric	Bearing – Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Roughened	BC - Satisfactory	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Sufficient water gratings not provided	Sufficient water gratings not provided	
20	121.678 BHS	Minor Bridge-(New) 2 X 5.6 m	Age	New - 2 Lane (Not accessible)	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers - RCC wall type Condition - Satisfactory	Abutment – RCC wall Piers - RCC wall type Condition - Satisfactory	
			Super Structure	Double Span RCC Slab	Double Span RCC Slab	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				Condition - Satisfactory	Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return	RCC Return	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	PQC is in good condition	PQC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts not provided	Waterspouts not provided	
21	121.678 BHS	Minor Bridge-New-SR 2 X 5.6 m	Age	New - 2 Lane (Not accessible)	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers - RCC wall type Condition - Satisfactory	Abutment – RCC wall Piers - RCC wall type Condition - Satisfactory	
			Super Structure	Double Span RCC Slab Condition - Satisfactory	Double Span RCC Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	PQC is in good condition	PQC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	No need of waterspouts	No need of waterspouts	
22	121.950	LVUP 12 m x 4 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	RCC wall RCC wall Box type	RCC wall RCC wall Box type	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Super Structure	RCC solid slab	RCC solid slab	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Roughened	
			Approach Slope	Stable	Stable	
			Drainage	Waterspouts not provided	Waterspouts not provided	
23	124.337 LHS	Minor Bridge- (Dhubdhubi Odha River) (Reconstruction) 5 X 11 m	Age	New - 3 Lane		The structure is in sound condition.
			Foundation	Open Foundation		
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers - RCC Pier type Condition - Satisfactory		
			Super Structure	Five Span RCC Slab Condition - Satisfactory		
			Bearing	-		
			Slope Protection	Rubble with concrete pitching		
			Nalla Bed	Standing water		
			Parapet / Railing	Crash Barrier - Satisfactory		
			Expansion Joint	-		
			Wearing Coat / Surface	BC is roughened & settled approach slab @ A1 kerb side		
			Approach Slope	Stable in condition		
			Drainage	Fixing of water grating is in progress		
24	124.337 RHS	Minor Bridge-	Age		New - 3 Lane	The structure is in sound condition.
			Foundation		Open Foundation	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
		(Dhubdhubi Odha River) (New) 5 X 11 m	Sub Structure Abutment / Pier		Abutment – RCC wall Piers - RCC Pier type Condition - Satisfactory	
			Super Structure		Five Span RCC Slab Condition - Satisfactory	
			Bearing		-	
			Slope Protection		Rubble with concrete pitching	
			Nalla Bed		Standing water	
			Parapet / Railing		Crash Barrier - Satisfactory	
			Expansion Joint		-	
			Wearing Coat / Surface		BC is roughened	
			Approach Slope		Rubble pitching of approach slope @ both end of A1 & A2 is pending	
			Drainage		Fixing of water grating is in progress	
25	125.055	LVUP 12 m x 4 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	RCC wall RCC wall Box type	RCC wall RCC wall Box type	
			Super Structure	RCC solid slab	RCC solid slab	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is roughened	BC - Satisfactory	
			Approach Slope	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Drainage	Waterspouts not provided	Waterspouts not provided	
26	130.149 LHS	Minor Bridge- (Reconstruction) 1 X 20 m	Age	New - 2 lane- Reconstruction		The structure is in sound condition.
			Foundation	Open Foundation		
			Sub Structure Abutment / Pier	Abutment RCC wall Type Condition - Satisfactory		
			Super Structure	RCC Solid Slab		
			Bearing	-		
			Slope Protection	RCC return		
			Nalla Bed	Not clear		
			Parapet / Railing	Crash Barrier - Satisfactory		
			Expansion Joint	Available (Require cleaning)		
			Wearing Coat / Surface	BC is pending		
			Approach Slope	Stable in condition		
			Drainage	Water gratings not provided		
27	130.149 RHS	Minor Bridge- (New) 1 X 20 m	Age		New - 2 lane- New construction	The structure is in sound condition.
			Foundation		Open Foundation	
			Sub Structure Abutment / Pier		Abutment RCC wall Type Condition - Satisfactory	
			Super Structure		RCC Solid Slab	
			Bearing		-	
			Slope Protection		RCC return	
			Nalla Bed		Not clear	
			Parapet / Railing		Crash Barrier - Satisfactory	
			Expansion Joint		Available (Require cleaning)	
			Wearing Coat / Surface		BC is pending	
			Approach Slope		Stable in condition	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Drainage		Water gratings not provided	
28	130.149 BHS	Minor Bridge-(New-SR) 1 X 20 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Condition - Satisfactory	Abutment RCC wall Type Condition - Satisfactory	
			Super Structure	RCC Solid Slab	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	RCC return	RCC return	
			Nalla Bed	Not clear	Not clear	
			Parapet / Railing	Crash Barrier with Footpath - Satisfactory	Crash Barrier with Footpath - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC is repairable	BC is damaged	
			Approach Slope	Repairable	Damaged	
			Drainage	Waterspouts not provided	Waterspouts not provided	
29	130.485	PUP under COS-5 m x 4 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	RCC wall RCC wall Box type	RCC wall RCC wall Box type	
			Super Structure	RCC solid slab	RCC solid slab	
			Bearing	-	-	
			Slope Protection	RE Block Wall	RE Block Wall	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Stable	Stable	
			Drainage	Waterspouts provided	Waterspouts provided	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
30	130.650	Flyover- 1 x 15 + 1 x 25 + 1 x 15 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC rectangular type Piers - RCC rectangular type Condition - Satisfactory	Abutment - RE Block & RCC rectangular type Piers - RCC rectangular type Condition - Satisfactory	
			Super Structure	3 Span 8-PSC Girders, 16-RCC Girders and RCC Slab Condition - Satisfactory	3 Span 8-PSC Girders, 16-RCC Girders and RCC Slab Condition - Satisfactory	
			Bearing	Bearing – Elastomeric	Bearing – Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts provided	Waterspouts provided	
31	132.025	LVUP 12 m x 4 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Condition - Satisfactory	Abutment RCC wall Type Condition - Satisfactory	
			Super Structure	RCC Solid Slab	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Wearing Coat / Surface	BC is in good condition	BC is roughened	
			Approach Slope	-	-	
			Drainage	Waterspouts not provided	Waterspouts provided	
32	132.363	Minor Bridge 1 x 10 m	Age	New - 2 lane-Reconstruction	New - 2 lane-New construction	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Condition - Satisfactory	Abutment RCC wall Type Condition - Satisfactory	
			Super Structure	RCC Solid Slab	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	RCC return wall	RCC return wall	
			Nalla Bed	Standing water	Standing water	
			Parapet / Railing	Crash Barrier – Satisfactory	RCC Railing - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	PQC is in good condition	PQC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	No need of waterspouts	No need of waterspouts	
33	132.363	Minor Bridge (Service Road) 1 x 10 m	Age	New - 2 lane- New-SR	New - 2 lane- New-SR)	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Condition - Satisfactory	Abutment RCC wall Type Condition - Satisfactory	
			Super Structure	RCC Solid Slab	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	RCC return wall	RCC return wall	
			Nalla Bed	Standing water	Standing water	
			Parapet / Railing	Crash Barrier – Satisfactory	RCC Railing - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	PQC is in good condition	PQC is in good condition	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	No need of waterspouts	No need of waterspouts	
34	135.100	LVUP 12 m x 4 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment RCC wall Type Condition - Satisfactory	Abutment RCC wall Type Condition - Satisfactory	
			Super Structure	RCC Solid Slab	RCC Solid Slab	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	-	-	
			Drainage	Waterspouts not provided	Waterspouts not provided	
35	136.657	PUP	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition. miscellaneous work is in progress.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC rectangle type Condition - Satisfactory	Abutment - RE Block & RCC rectangle type Condition - Satisfactory	
			Super Structure	Single Span RCC Girders and RCC Slab Condition - Satisfactory	Single Span RCC Girders and RCC Slab Condition - Satisfactory	
			Bearing	Elastomeric	Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier – Work in progress	Crash Barrier – Work in progress	
			Expansion Joint	Available	Available	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat / Surface	BC - Pending	BC - Pending	
			Approach Slope	-	-	
			Drainage	Work is in progress	Work is in progress	
36	136.857	Flyover 1 x 15 + 1 x 25 + 1 x 15 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition. miscellaneous work is in progress.
			Foundation	Open Foundation	Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC rectangle type Piers - RCC rectangle type Condition - Satisfactory	Abutment - RE Block & RCC rectangle type Piers - RCC rectangle type Condition - Satisfactory	
			Super Structure	3 Span 8-PSC Girders, 16-RCC Girders and RCC Slab Condition - Satisfactory	3 Span 8-PSC Girders, 16-RCC Girders and RCC Slab Condition - Satisfactory	
			Bearing	Elastomeric	Elastomeric	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier – Work is in progress	Crash Barrier - Work is in progress	
			Expansion Joint	Pending	Pending	
			Wearing Coat / Surface	Pending	Pending	
			Approach Slope	-	-	
			Drainage	Pending	Pending	

Figure 3-5 Photographs of Major Structures

Side View of MNB at km. 99.586 (RHS)

Balance work at A2 side at km. 99.586 - MNB (RHS)

Balance work @ A1 side at km.99.586 - MNB (RHS)

View of MNB at km. 99.586 (LHS)

Side View of Flyover at km. 99.900 (LHS)

Hessian Cloth @ P2 Pier (RHS) of Flyover at km. 99.900

Side View of Flyover at km. 99.900 (RHS)

Side View of Minor Bridge at km. 101.260 (LHS)

PQC of Minor Bridge at km. 101.260 (LHS)

PQC of Minor Bridge at km. 101.260 (RHS)

Side View of Minor Bridge at km. 101.260 (RHS)

Side View of Flyover at km. 102.700 (LHS)

BC surface of Flyover at km. 102.700 (RHS)

BC surface of Flyover at km. 102.700 (LHS)

Side View of Flyover at km. 102.700 (RHS)

Side View of Flyover at km. 103.801 (LHS)

Roughened BC surface of Flyover at km. 103.801 (RHS)

Good BC surface of Flyover at km. 103.801 (LHS)

Side View of Flyover at km. 103.801 (RHS)

Side View of Minor Bridge at km. 104.348 (LHS)

Roughened BC surface of Minor Bridge at km. 104.348 (LHS)

Good BC surface of Minor Bridge at km. 104.348 (RHS)

Side View of Minor Bridge at km. 104.348 (RHS)

Side View of PUP at km. 104.820 (RHS) - Under COS

RE Block Wall @ A2 side of PUP at km. 104.820 (LHS)

RE Block Wall @ A2 side of PUP at km. 104.820 (RHS)

Side View of PUP at km. 104.820 (LHS) - Under COS

Side View of Flyover at km. 106.240 (LHS)

Flyover at km. 106.240 (RHS)

Flyover at km. 106.240 (LHS)

Side View of Flyover at km. 106.240 (RHS)

Good PQC surface of MCW at MNB at km. 110.930 (BHS)

Good PQC surface of SR at MNB at km. 110.930 (RHS)

Side View of Minor Bridge at km. 110.930 (RHS)

Side view of LVUP at km. 111.260 (RHS)

Good BC surface of LVUP at km. 111.260 (RHS)

LVUP at km. 111.260 (LHS)

Side view of LVUP at km. 111.260 (LHS)

Side view of LVUP at km. 114.080 (RHS)

LVUP at km. 114.080 (RHS)

LVUP at km. 114.080 (LHS)

Side view of LVUP at km. 114.080 (LHS)

Side View of Major Bridge at km. 114.405 (RHS)

Side View of Major Bridge at km. 114.405 (LHS)

Side View of Minor Bridge at km. 117.796 - LHS (MCW & SR)

Bottom & side view of Minor Bridge at km. 117.796 (RHS)

Side View of Minor Bridge at km. 117.796 - RHS (MCW & SR)

Bottom of Minor Bridge at km. 117.796 - BHS (MCW)

Side View of Flyover at km. 117.935 (LHS)

Hanging hessian cloth @ A2 cap of Flyover at km. 117.935 (RHS)

De-shuttering at bottom @ A1 & A2 Side of Flyover at km. 117.935 (RHS)

Side View of Flyover at km. 117.935 (RHS)

Side View of Minor Bridge at km. 121.678 (LHS)

Good condition of PQC surface of MNB at km. 121.678 - LHS (SR)

Good condition of PQC surface of MNB at km. 121.678 - BHS (MCW)

Side View of Minor Bridge at km. 121.678 (RHS)

Side View of LVUP at km. 121.950 (RHS)

LVUP at km. 121.950 (RHS)

Good condition of BC surface of LVUP at km. 121.950 (LHS)

Side View of LVUP at km. 121.950 (LHS)

Side View of Minor Bridge at km. 124.337 (LHS)

Side View of Minor Bridge at km. 124.337 (RHS)

Rubble pitching pending @ A1 side of MNB at km. 124.337 (RHS)

Rubble pitching pending @ A2 side of MNB at km. 124.337 (RHS)

Side View of LVUP at km. 125.055 (RHS)

Side View of LVUP at km. 125.055 (LHS)

Side View of Minor Bridge at km. 130.149 - RHS (Not accessible)

Side View of Minor Bridge at km. 130.149 - LHS (Not accessible)

Side View of PUP at km. 130.485 - RHS (Under COS)

Side View of PUP at km. 130.485 - LHS (Under COS)

Side View of Flyover at km. 130.650 (LHS)

Side View of Flyover at km. 130.650 (RHS)

Good condition of BC surface of Flyover at km. 130.650 (RHS)

Filled expansion joint of Flyover at km. 130.650 (RHS)

Good condition of BC surface of Flyover at km. 130.650 (LHS)

Side View of LVUP at km. 132.025 (RHS)

LVUP at km. 132.025 (RHS)

Good BC surface of LVUP at km. 132.025 (LHS)

Side View of LVUP at km. 132.025 (LHS)

Side View of LVUP at km. 135.100 (RHS)

Good BC surface of LVUP at km. 135.100 (RHS)

Good BC surface of LVUP at km. 135.100 (LHS)

Side View of LVUP at km. 135.100 (LHS)

Side View of PUP at km. 136.657 (RHS)

Wearing coat & Crash barrier of PUP pending at km. 136.657 (BHS)

Bottom View of PUP at km. 136.657 (LHS)

Side View of PUP at km. 136.657 (LHS)

Side View of Flyover at km. 136.857 (RHS)

Friction slab & crash barrier of Flyover pending at km. 136.857 @ A2 side (RHS)

RE Block wall & FSCB of Flyover pending at km. 136.857 @ A1 side (RHS)

Side View of Flyover at km. 136.857 (LHS)

Filling work of Flyover is in progress at km.136.857 @ Akkalkot side (BHS)

Expansion joint & crash barrier of Flyover is in progress at km. 136.857 (BHS)

DLC & PQC of Flyover pending at km. 136.857 @ Solapur (BHS)

DLC & PQC of Flyover is in progress at km. 136.857 @ Solapur side (BHS)

Expansion joint @ A2 side of Flyover is in progress at km. 136.857 (RHS)

Approach slab work @ A2 side of Flyover is in progress at km. 136.857 (LHS)

Filling work & RE Block erection work of Flyover is in progress at km. 136.857 @ Akkalkot side (LHS)

Filling work & RE Block erection work of Flyover is in progress at km. 136.857 @ Akkalkot side (RHS)

3.7 Condition Survey of Culverts

The cross-drainage structure includes Hume pipe culverts and box culverts at various locations. There are 21 Nos. of pipe culverts, 26 Nos. of box culverts along the project road. The height of culvert varies from 1.0 m to 3.0 m from bed level. During the condition survey of structure, these culverts were inspected on sample basis.

The project involves strengthening and widening of existing road to four lane divided carriageway. The culverts beneath existing alignment are either widened or reconstructed. The structural condition of culverts is generally found in sound condition. The quality of surface concrete of box culverts and slab culverts is satisfactory. The RCC parapet, crash barrier has been provided at culvert locations, which is maintained properly.

Vegetation growth and accumulation of debris at waterway is being removed and cleaned by the Concessionaire on regular basis.

Figure 3-6 Photographs of Culverts

Box culvert at km. 101.823 - LHS (New Construction)

Box culvert at km. 101.823 - RHS (New Construction)

Box culvert at km. 102.650 - LHS (MCW & SR- New Construction)

Box culvert at km. 102.650 - RHS (MCW & SR - New Construction)

Box culvert at km. 103.850 - LHS (MCW & SR - New Construction)

Box culvert at km. 103.850 - RHS (MCW & SR - New Construction)

Box culvert at km. 105.290 - RHS (New Construction)

Box culvert at km. 105.290 - LHS (New Construction)

Box culvert at km. 125.495 - RHS (Reconstruction)

Box culvert at km. 125.495 - LHS (Reconstruction)

Box culvert at km. 126.643 - RHS (Reconstruction)

Box culvert at km. 126.643 - LHS (Reconstruction)

Box culvert at km. 128.229 - RHS (Reconstruction)

Box culvert at km. 128.229 - LHS (Reconstruction)

Box culvert at km. 133.524 - RHS (Reconstruction)

Box culvert at km. 133.524 - LHS (Reconstruction)

Pipe Culvert at km. 109.578 - RHS (Widening)

Pipe Culvert at km. 109.578 - LHS (Widening)

Pipe Culvert at km. 113.155 - RHS (Widening)

Pipe Culvert at km. 113.155-LHS (Widening)

Pipe Culvert at km. 117.423 - RHS (Widening)

Pipe Culvert at km. 117.423 - LHS (Widening)

Pipe Culvert at km. 124.106 - RHS (Widening)

Pipe Culvert at km. 124.106-LHS (Widening)

3.8 Drainage System

There are RCC box / open / toe / chute type drains at the built-up areas and earthen drain at rural areas provided for the project stretch. Lined median longitudinal drain is provided at superelevated sections. Balance drain work is in progress. The roadside drainage along the project highway as well as lined drains at median portion needs to be maintained by cleaning debris on regular basis. Some of the photographs of the drains provided are presented as below.

Figure 3-7 Photographs of Drains provided

km. 100.340 (LHS)

km. 102.155 (LHS)

km. 113.650 (RHS)

km. 121.470 (RHS) partially completed

km. 133.300 WIP (RHS)

km. 135.900 (RHS)

km. 137.00 (LHS)

km. 137.400 (RHS)

3.9 Slope Protection Measures

Slope protection for high embankment greater than 3.0 m stone pitching has been provided. Some of the photographs of slope are presented below.

Figure 3-8 Photographs of Slope Protection Works

LHS

km. 101.00

km. 114.800

km. 102.155 SR

km. 116.150

km. 123.300

km. 128.700

km. 124.300

km. 124.400

km. 117.850

km. 111.050

km. 114.600

RHS

km. 127.650 (RHS)

km. 126.700

km. 123.900

km. 105.250

km. 101.950

km. 132.350

km. 124.300

km. 124.300

km. 114.600

km. 111.050

km. 114.500

3.10 Road Furniture

Pavement Marking

Pavement marking for the project highway is done as per the design standards indicated in section 12 of Schedule-D. As informed by Concessionaire, the painting is being done

wherever is required on regular basis as a part of routine maintenance. Some of the photographs of road marking are presented below.

Figure 3-9 Photographs of Road Markings

LHS

km. 99.400

km. 101.983

km. 105.200

km. 116.500

RHS

km. 138.00

km. 121.800

km. 105.250

km. 109.040

Road Studs

Road studs for the project highway is done as per the design standards indicated in section 12 of Schedule-D. Road studs have been fixed at junction & at zebra crossings. However, at few locations some road studs have damaged which are being rectified. Some of the photographs of road marking are presented below.

km. 102.212

km. 103.800

km. 109.040

km. 101.950

Traffic Signage / Median Kerb painting / KM Stone

Traffic signs includes roadside signs, overhead signs, kerb mounted signs and median signs along the project highway. The design for the traffic signs along the project highway is done as per the design standards indicated in section 11 of Schedule-D.

The height, lateral clearance, location and installation are as per relevant clauses of Schedule 'D'. Overhead sign has been installed ahead of major intersections, toll plazas, start / end of project highway and urban areas as per detailed design requirements.

Kilometre stones, vertical post of sign boards, chevron boards and Median kerb paint are faded at few locations. The sign boards, kilometer stones and hectometer stones are being replaced wherever damaged. Some of the photographs of sign boards are presented below.

Figure 3-10 Photographs of Road Sign Boards

km. 101.000

km. 108.000

km. 110.000

km. 123.000

km. 101.300

km. 102.155

km. 102.155

km. 101.983

km. 102.155

km. 102.155

km. 106.950

km. 107.300

km. 117.300

km. 118.400

km. 134.250

km. 105.200

km. 111.600

km. 111.600

km. 112.00

km. 113.950

km. 121.900

km. 117.300

km. 121.900

km. 133.200

km. 101.300

km. 102.212

km. 107.300

km. 111.600

Highway / Solar Lighting

Highway lighting is provided at underpasses, flyovers, toll plaza, and built-up locations. High mast lighting is provided at toll plaza and rest area locations.

At underpass and flyover locations, highway lighting is provided at the structure locations and at its approaches.

Solar blinker signals are provided at each median opening locations. These lights are properly maintained and are in good working condition. Regular maintenance work is carried out to ensure their efficient operation. Some of the photographs of highway lightings are presented below.

Figure 3-11 Photographs of Highway/Solar Lighting

km. 101.983

km. 102.155

km. 109.040

km. 110.800

km. 136.050

km. 114.300

km. 131.550

km. 129.990

km. 124.500

km. 121.470

km. 113.650

km. 110.800

Crash Barriers

Metal beam crash barriers are provided at bridge approaches, locations of high embankment, median and sharp curves. All the crash barriers provided by the Concessionaire are maintained. Some of the photographs of metal beam crash barriers are presented below.

Figure 3-12 Photographs of Crash Barriers

km. 138.352

km. 133.500

km. 131.800 (RHS)

km. 124.200 (RHS)

km. 114.300 (RHS)

km. 106.300 (RHS)

km. 111.600 (LHS)

km. 116.850 (LHS)

km. 124.350 (LHS)

km. 130.140

km. 113.950 (LHS)

Delineators

The Traffic Delineators are provided by Concessionaire for road users. The same is maintained by the Concessionaire. Some of the photographs of pedestrian guard rails are presented below.

Figure 3-13 Photographs of Delineator

km. 127.650 (RHS)

km. 123.900 (RHS)

km. 116.450 (RHS)

km. 101.00 (LHS)

km. 107.300 (LHS)

Pedestrian Guard Rail

The pedestrian guard rails are provided at the bus shelters only. It is maintained by the Concessionaire. Some of the photographs of pedestrian guard rails are presented in photographs of bus shelter.

Road Land Boundary

Road land (ROW) boundary demarcation is maintained by the Concessionaire on the project highway during the concession period. During the site visit, it is found that road land boundary pillars are maintained. However, ROW pillars are being fixed in missing locations. Some of the photographs of pedestrian guard rails are presented below.

Figure 3-14 Photographs of Road Land Boundary

km. 101.000 (LHS)

km. 105.000 (LHS)

km. 108.400 (LHS)

km. 128.800 (RHS)

km. 120.000 (RHS)

km. 117.000

3.11 Avenue Plantation and Median Plantation

Median and Avenue Plantation is available along the project highway. Variety of trees and plants are planted throughout the corridor at median / avenue. Median and avenue plantation is maintained in good condition. Some of the photographs of median plantation are presented below.

Figure 3-15 Photographs of Avenue and Median Plantation

km. 101.000 to km. 102.000

km. 106.000 to km. 107.000

km. 107.000 to km. 108.000

km. 111.000 to km. 112.000

km. 116.000 to km. 117.000

km. 129.000 to km. 130.000

km. 127.000 to km. 128.000

km. 117.000 to km. 116.000

3.12 Project Facilities

Toll Plaza

The Concession Agreement required construction of one no. of Toll Plaza at km. 119.350. Subsequently, Concessionaire has taken up construction of the Toll Plaza at the same location. Presently, Toll Plaza has started for road users.

1. Toll Plaza at km. 119.350

The construction of toll plaza is completed and is in operation. 10 (5+5) Nos. of lanes has been constructed and all are under operation. Concessionaire has constructed administration, operation and maintenance facility at base camp. All required facilities are available at the toll plaza. Some of the photographs of toll plaza are presented below.

Figure 3-16 Photographs at Toll Plaza

Toll Plaza

Admin Building

DG Set

Ambulance & Crane

Highway / Medical aid post at GF

High mast

CC TV Camera

Patrolling Vehicle

Toilet

Weigh Bridge

km. 133.00 (RHS)

km. 126.100 (RHS)

km. 101.100 (LHS)

km. 129.700

km. 125.450

km. 121.400

km. 117.450

km. 113.550

Truck Lay Byes

As per Concession Agreement, there is no scope for construction of truck lay bye along the project highway.

Rest Area

There is a provision for Rest Area in the Concession Agreement which is completed at Site.

Trucker's dormitory

Public Toilet

Trauma Centre

Repair Workshop

High Mast

Dhaba

Bus Bay and Passenger Shelter

Bus bays and passenger shelters are constructed at the various locations along the project highway. 06 Nos. of bus bays with passenger shelters are provided along project highway and 06 Nos. of passenger shelters are provided on service roads along project highway. Concessionaire needs to maintain bus bays with all necessary signage as per relevant IRC guidelines mentioned in Schedule-D of Concession Agreement. The details of the bus bays and passenger shelters provided are as below.

Table 3-7 Details of Bus Bays

Sr. No.	Project Facility	Design Chainage (km)	Side
1	Bus Bay and Passenger Shelters	102.440	LHS
2	Bus Bay and Passenger Shelters	102.940	RHS
3	Bus Bay and Passenger Shelters	103.540	LHS
4	Bus Bay and Passenger Shelters	104.050	RHS
5	Bus Bay and Passenger Shelters	106.060	LHS
6	Bus Bay and Passenger Shelters	106.460	RHS

Figure 3-17 Photographs of Bus Bay

km. 102.440 (LHS)

km. 103.540 (LHS)

km. 106.060 (LHS)

km. 104.050 (RHS)

km. 102.940 (RHS)

4 BALANCE WORKS

The project has received Provisional Completion Certificate (PCOD) on 31st March 2021 with balance works to be executed at site as mentioned in punch list items. During site visit, it is found that construction of main carriageway, service road, drain and minor bridge work is hindered due to non-availability of land from km. 99.400 to km. 99.600.

As informed by the Concessionaire, an amount of Rs. 5.97 Crores of work is balance at Site.

5 PAVEMENT INVESTIGATION AND PROPOSAL

5.1 General

The project has been developed on Design, Build, Operate and Transfer (DBOT) basis.

The concession period of the project is 17 years including 2 years (710 days) of construction period. The Provisional Completion Certificate (PCOD) for the length of 27.650 kms out of 38.952 kms. has been received on 31st March 2021. The project is currently under operation and maintenance (O&M) stage. The Operation and Maintenance period of the project highway is 15 years from Provisional Completion Certificate (PCOD).

5.2 Details of As-built Pavement

The following table shows crust details based on pavement design report submitted by the Concessionaire. The details of pavement crust are as provided during the development of existing two lane to four lane divided carriageway. The pavement design report states that pavement was designed as per IRC:58-2015.

Table 5-1 Existing Pavement Crust Details

Particulars	Chainage (km)		Design Life	Pavement Thickness (mm)		
	From	To		PQC	DLC	GSB
Main Carriageway	99.400	138.352	30 years	300	150	150
Service Road	-	-	30 years	250	150	150

5.3 Surveys and Investigation

Pavement Condition Survey

Pavement condition survey was carried out from **24th August to 27th August 2022** through visual inspection for the entire project length. The details of the visual condition survey are provided in **Annexure-IV**.

The summary of pavement condition based on the visual inspection is tabulated below.

Table 5-2 Summary of Pavement Condition

Design Chainage (km)		Length	Visual Condition (As per IRC:115-2014)	
From	To		LHS Carriageway	RHS Carriageway
99.400	100.000	0.600	Good	Good
100.000	105.000	5.000	Good	Good
105.000	110.000	5.000	Good	Good
110.000	115.000	5.000	Good	Good
115.000	120.000	5.000	Good	Good
120.000	125.000	5.000	Good	Good
125.000	130.000	5.000	Good	Good
130.000	135.000	5.000	Good	Good
135.000	138.352	3.352	Good	Good

Following Photographs were taken at the time of visual pavement condition survey

Figure 5-1 Photographs of Pavement Condition Survey

LHS-MCW

km. 101.000

km. 101.000 to km. 102.000

km. 106.000 to km. 107.000

km. 107.000 to km. 108.000

km. 108.000 to km. 109.000

km. 109.000 to km. 110.000

km. 110.000 to km. 111.000

km. 111.000 to km. 112.000

km. 116.000 to km. 117.000

km. 120.000 to km. 121.000

km. 121.000 to km. 122.000

km. 123.000 to km. 124.000

km. 136.000 to km. 137.000

km. 138.000 to km. 138.352

km. 138.000 to km. 138.352

LHS-SR

km. 110.800 to km. 111.500

km. 113.650 to km. 114.310

km. 117.540 to km. 118.260

km. 121.470 to km. 122.320

km. 124.500 to km. 125.400

km. 129.990 to km. 130.890

km. 131.550 to km. 132.400

km. 134.500 to km. 135.650

km. 136.100 to km. 137.450

RHS-MCW

km. 133.000 to km. 134.000

km. 125.000 to km. 126.000

km. 120.000 to km. 121.000

km. 112.000 to km. 113.000

km. 108.000 to km. 107.000

km. 102.000 to km. 103.000

km. 99.400 to km. 99.600

RHS-SR

km. 136.100 to km. 137.450

km. 134.500 to km. 135.650

km. 131.550 to km. 132.400

km. 129.990 to km. 130.890

km. 124.500 to km. 125.400

km. 121.470 to km. 122.320

km. 117.540 to km. 118.260

km. 113.650 to km. 114.310

km. 110.800 to km. 111.500

km. 102.155 to km. 104.195

km. 105.320 to km. 106.750

Observation and Conclusion:

From the above table and photographs as well as physical review at site, it is observed that the overall pavement condition for the entire project stretch is found to be fair to good.

Roughness Index Test

Prior period report for the Roughness Index Test conducted by **Aadharshila Infratech Pvt. Ltd.** Dated **09th March 2022** has been provided by the Concessionaire. This test was done using NSV on each direction (each lane) of the carriageway on project highway.

As per IRC:SP:16-2019, condition of pavement is categorised under:

Maximum Permissible Values of Roughness (BI Value - mm / km)

Sr. No.	Roughness Range (m/km)	Severity	Inner Lane (Lane - 1) LHS Length in Km	Outer Lane (Lane - 2) LHS Length in Km	Inner Lane (Lane - 1) RHS Length in Km	Outer Lane (Lane - 2) RHS Length in Km	Remark
1	Less than 2.81	Good	38.340	34.490	38.400	36.000	Conducted on 16-10-21
2	2.81 – 3.30	Fair	-	-	-	-	
3	More than 3.30	Poor	-	-	-	-	

Sr. No.	Roughness Range (m/km)	Severity	Inner Lane (Lane - 1) LHS Length in Km	Outer Lane (Lane - 2) LHS Length in Km	Inner Lane (Lane - 1) RHS Length in Km	Outer Lane (Lane - 2) RHS Length in Km	Remark
1	Less than 2.81	Good	37.240	37.240	35.920	35.920	Conducted on 09-03-22
2	2.81 – 3.30	Fair	-	-	-	-	
3	More than 3.30	Poor	-	-	-	-	

TDD Consultant's Observations

TDD Consultants have visited the project site with Mr. Mankesh, Planning Manager from Concessionaire on 24-08-2022 to understand the status of project under O&M. During site visit, TDD Consultant has the following observations.

1. IE/NHAI had granted EOT till 11-06-2021. However, work is still in progress and the reason for delay is land acquisition. Concessionaire informed that wherever land is available after EOT expiration, work is in progress and balance work will be completed as and when land will be available.

2. Concessionaire has requested to Authority to execute the settlement agreement to release the completion certificate and the same has been asked to IE by NHAI. Matter is under review at IE end.

3. Overall condition of all structures is in sound condition. However, vegetation and waterway need to be cleaned in minor bridges, pipe culverts and box culverts.

4. At MCW & SR - RHS @ km. 99.586, BC and wearing coat is balance partially on existing & reconstructed bridge. GSB, DLC and PQC are pending A-1 approach side of MNB 99.586 RHS. LHS structure work is pending due to LA.

5. All expansion joints need to be clean as provided at structures.

6. Rubble pitching work is pending at approach slab both end of A-1 A2 side at km. 124.337 MNB.

7. At km. 130.650-FO, & km. 136.657-PUP work is in progress.

8. At Km. 136+857 flyover, main structure is completed, and misc. work is in progress.

9. MCW/SR/Drain/MNB-LHS work is pending due to LA i.e., km. 99.400 to 99.600. concessionaire informed to LIE that they will complete the work as and when land will be available during the concession period.

10. Major Junction is yet to be developed at km. 138.352.

11. MCW work is under progress partially between km. 136.00 to 137.000 and partially completed.

12. Drains, MCW, SR and structures etc can be maintain as per O&M contract.

13. Concessionaire requested RO, NHAI for delinking of balance work for Issuance of Completion Certificate.

However, the Concessionaire is repairing / rectifying the damaged portion on regular basis as a part of routine maintenance.

6 REVIEW OF CONCESSION AGREEMENT

6.1 General

The NHAI accordance with the statutory powers vested on it by the Government of India has entered into a Concession Agreement with the M/s. GR Akkalkot Solapur Highway Pvt. Ltd., a Special Purpose Vehicle (SPV) formed for implementing this project, a company incorporated under Indian Companies Act, 2013 to Design, Built, Finance, Operate and Transfer (The "DBFOT Annuity" or Hybrid Annuity") basis for the Four Ianing of Akkalkot - Solapur Section of NH-150E with paved shoulders from design chainage Km. 99.400 to Km. 141.800 (Design Length - 38.952 Km) including Akkalkot Bypass (Design Length - 7.350 Km) in the state of Maharashtra on Hybrid Annuity Mode.

6.2 Specific Comments on Articles

We have reviewed the provisions under various clauses of the Agreement concerned with post construction period. Our specific comments are indicated below clause-wise.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 3 Clause 3.1	The Concession	Subject to and in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits, the Authority hereby grants to the Concessionaire the concession set forth herein including the exclusive right, license and authority to construct, operate and maintain the Project (the "**Concession**") during the Construction Period of 730 (Seven hundred and thirty) days and Operation Period of 15 (Fifteen) years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.	This construction work is completed, and PCOD is achieved on 31th March 2021. The O&M started for 15 years.
Article 4 Clause 4.1.2	Conditions Precedent	The Condition precedent required to be satisfied by the Authority shall be deemed to have been fulfilled when the Authority shall have (a) Procured for the Concessionaire the Right of Way to the site in accordance with the provisions of Clauses 10.3.1 and 10.3.2 (b) Procured all Applicable Permits relating to environmental protection, and conservation in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2 (c) Procured forest clearance for and in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2, save and except permission for cutting trees.	All issues complied and PCOD is achieved.
Article 4 Clause 4.2	Conditions Precedent-	In the event that (i) the Authority does not procure fulfillment of any or all the Conditions Precedent set forth in Clause 4.1.2 within the	All issues complied and

Article & Clause No.	Subject	Description in Brief	Remarks
	Damages for delay by the Authority	period specified in respect thereof, and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.2% (zero point two percent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent, subject to the maximum limit equal to the amount of 1% of the Estimated Project Cost as mentioned in RFP and upon reaching such limit, the Concessionaire may, in its sole discretion terminate the Agreement.	PCOD is achieved.
Article 4 Clause 4.3	Damages for delay by the concessionaire	In the event that (i) the Concessionaire does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.3 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of failure to fulfill the obligations under Clause 4.1.2 or other breach of this Agreement by the Authority, or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.3% (zero point three per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent. Provided, however, that the Damages payable hereunder shall be subject to the maximum limit equal to the amount of 1% of the Estimated Project Cost as mentioned in the RFP and upon reaching such limit, the Concessionaire may, in its sole discretion and subject to the provisions of Clause 9.2, terminate the Agreement	The PCOD is achieved.
Article 5 Clause 5.1.4 (d, e & f)	Obligation of the Concessionaire	The Concessionaire shall, at its own cost and expense, in addition to and not in derogation of its obligations elsewhere set out in this Agreement d) The Concessionaire shall make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement. e) Make reasonable efforts to facilitate the acquisition of land required for the purposes of the Agreement f) Ensure and procure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Concessionaire's obligations under this agreement.	The Concessionaire followed actions and PCOD is achieved.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 5 Clause 5.3.1	Obligation relating to Change in ownership	The Concessionaire shall not undertake or permit any Change in Ownership, except with the prior written approval of the Authority.	The risk of Lender is covered.
Article 8 Clause 8.1.5	Disclaimer	Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the Authority shall not be liable in any manner for such risks or the consequences thereof.	The Concessionaire shall note this and perform according to Concession Agreement Provision. All risks are with Concessionaire.
Article 9 Clause 9.1.1	Performance Security	The Concessionaire shall, for the performance of its obligations hereunder during the Construction Period, provide to the Authority no later than 30 (thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank For a sum equivalent to Rs.40.35 (Rupees Forty Crores and Thirty Five Lakhs only) in the form set forth in schedule-F (the "Performance Security").	The PCOD is achieved.
Article 10 Clause 10.3.2	Procurement of the site -	Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree that on or prior to the Appointment Date, the Authority shall have granted vacant access and Right of Way such that the Appendix shall not include land which shall in any manner prevent the Concessionaire from undertaking construction of the project to the extent of at least 80% (eighty percent) of the length thereof, and in the event Financial Close is delayed on account of delay in grant of such vacant access and Right of Way, the Authority shall be liable to payable to damages solely under the provisions of Clause 4.2.	The PCOD is achieved.
Article 10 Clause 10.3.4	Procurement of the site-Right of Way	The Authority shall make best efforts to procure and grant no later than 90 (ninety) days from the Appointed date, Right of Way to the Concessionaire in respect of all land included in the Appendix, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Concessionaire, it shall pay to the Concessionaire Damages in a sum calculated at the rate of Rs.1 per day for every 10 square meter or part thereof, commencing from the 91st day of the Appointed Date and until such Right of Way is procured or 180 days from Appointed date whichever is earlier.	The PCOD is achieved.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 11 Clause 11.4	Utilities, Associated Roads and Trees - Felling of trees	The Authority shall assist the Concessionaire in Obtaining the Applicable Permits for felling of trees to be identified by the Authority for this purpose if and only if such trees cause a material adverse effect on the construction, operation or maintenance of Project Highway. The Cost of such felling shall be borne by the Authority and in the event of any delay in felling thereof for reasons beyond the control of the Concessionaire, it shall be excused to perform any of its obligations hereunder if such failure is a direct consequence of delay in the felling of trees.	The work is completed. No obstructions of trees.
Article 12 Clause 12.3.1	Construction of the Project	On or after the Appointed Date, the Concessionaire shall undertake construction of the Project as specified in Schedule-B and Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D. The 730th (Seven hundred and thirty)) day from the Appointed Date shall be the scheduled date for completion of the Project (the **"Scheduled Completion Date"**) and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	The work is now completed, and PCOD is achieved.
Article 12 Clause 12.3.2	Construction of the Project Highway and Milestone	The Concessionaire shall construct the Project Highway in accordance with the Project Completion schedule set forth in Schedule-G. In the event that the Concessionaire fails to achieve any Project Milestone within a period of 90 (ninety) days from the date set forth for such Milestone in Schedule G, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, it shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one percent) of the amount of performance Security for delay of each day until such Milestone is achieved.	The work is competed as per Milestone.
Article 12 Clause 12.3.3	Construction of the Project Highway and Milestone	In the event that the project is not completed, and COD does not occur within 270 (two hundred and seventy) days from the Scheduled Completion Date, unless the delay is on account of reasons solely attributable to the Authority or due to Force Majeure, the Authority shall be entitled to terminate this Agreement.	The work is completed, and PCOD is achieved.
Article 13 Clause 13.2	Inspection	During the construction period, the independent Engineer shall inspect the Project at least once a month and make a report of such inspection (the "Inspection Report") stating all reasonable	The work is completed with quality. The defect will be

Article & Clause No.	Subject	Description in Brief	Remarks
		detail the defects or deficiencies, if any, with particular reference to the Project Completion Schedule, Scope of the Project and specification and standards.	attended during Defect Liability Period.
Article 14 Clause 14.3.2	Provisional Certificate	The parties here to expressly agree that a Provisional Certificate under this Clause 14.3 may, upon requested of the Concessionaire to this effect, be issued for operating part of the Project, if the Concessionaire has completed construction of 100% of the site made available to the Concessionaire up to 146 days from the Appointed Date. Upon issue of such Provisional Certificate, the provisions of Article 15 shall apply to such completed part, and the rights and obligations of the Concessionaire for and in respect of such completed part of the Project shall be constructed accordingly.	The project is completed as per Schedule Completion Date.
Article 15 Clause 15.2	Entry into commercial service- Damages for delay	Subject to the provisions of Clause 12.3, if COD does not occur prior to the 91st (ninety first) day after the Scheduled completion Date, unless the delay is on account of reasons attributable to the Authority or due to force Majeure, the Concessionaire shall pay Damages to the Authority in a sum calculated at the rate of 0.2% of the amount of performance Security for delay of each day until COD is achieved.	The PCOD is achieved as per Schedule Competed Date.
Article 17 Clause 17.8.1	Damages for breach of maintenance obligations	In the event that the concessionaire fails to repair any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% (two per cent) of the Performance Security and (b) 0.1 (zero point one per cent) of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.	The Maintenance of completed Highway is in progress after COD as per O&M Contractor executed between Concessionaire & Contractor. The scope specifications, standards as per CA is being followed.
Article 23 Clause 23.1	Bid Project cost	The parties expressly agree that the cost of construction of the project, as on the Bid Date, which is due and payable by the Authority to the Concessionaire shall deemed to be Rs. 807.00 Crores (Rupees Eight Hundred Seven Crore)	The work is completed within Project Cost.
Article 23 Clause 23.2.1	Payment of Bid Project Cost	The bid project cost specified in Clause 23.1 shall be revised from time to time in accordance with the provisions of this Clause 23.2 to reflect	This is paid during

Article & Clause No.	Subject	Description in Brief	Remarks
		the variation in Price Index occurring after the Reference Index Date immediately preceding the Bid Date.	construction work.
Article 23 Clause 23.3.1	Payment of Bid Project Cost	40% of the Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable to the Concessionaire is 5 equal installments of 8% during the construction Period in accordance with the provisions of Clause 23.4.	This is paid during construction work.
Article 23 Clause 23.4	Payment during construction period	For the purpose of this clause 23.4, the payment Milestone for release of payment during construction period shall be as under: (a) I (first) payment Milestone - On achievement of 10% Physical Progress. (b) II (Second) payment Milestone-On achievement of 30% Physical Progress. (c) III (Third) payment Milestone-On achievement of 50% Physical Progress. (d) IV (Fourth) payment Milestone - On achievement of 75% Physical Progress. (e) V (Fifth) payment Milestone-On achievement of 90% Physical Progress.	This amount is released and paid during construction activities.
Article 23 Clause 23.5	Bonus on early completion	In the event that the concessionaire shall achieve COD on or more than 30 days prior to the Scheduled Completion Date, the Authority shall pay to the Concessionaire a bonus equal to 0.5% of 60% of the Bid project cost for the first 30 days by which COD shall precede the Schedule Completion date and there after the said bonus shall be calculated on the pro-rata basis for each day preceding the said 30 days period. The Bonus shall be due and payable to the Concessionaire along with the 1st Annuity Payment.	The Concessionaire should claim this if it is eligible.
Article 23 Clause 23.6.2	Annuity Payments during operation period	The completion cost remaining to be paid in pursuance of the provisions Clause 23.6.1 shall be due and payable in biannual installments over a period of 15 (fifteen) years commencing from COD, (the Authority Payments) the 1st (first) installment of Annuity Payments shall be due and payable within 15 (fifteen) days of the 180th (one hundred and eighteen) day of COD and the remaining installments shall be due and payable within 15 (fifteen) days of completion of each of the successive six months (the "Annuity Payment Date").	The Concessionaire is getting this as per Concession Agreement as non COD is achieved.
Article 23 Clause 23.7.1	O & M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the	O & M during Concession Period is responsibility of Concessionaire

Article & Clause No.	Subject	Description in Brief	Remarks
		Authority, which shall be computed on Rs.2.70 crores (Rupees Two Crores Seventy Lakhs only) (the first year O&M), in accordance with the provisions of this Clause 23.7 (the "**O&M Payments**"). The Parties further acknowledge and agree that any O&M Expenses in excess of the O&M Payments shall be borne solely by the Concessionaire, save and except as expressly provided in this Agreement. For avoidance of doubt it is clarified that the O&M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.	and Authority will extend financial support of Rs. 2.70 crores as bi-annual payment during O&M period. This amount is being received by O&M Contractor during O&M Period.
Article 23 Clause 23.8	Mobilization advance	The Authority shall, on request of the Concessionaire, make an advance payment in a sum not exceeding 10% (ten percent) of the bid project cost (the Mobilization Advance). This advance payment shall be made in two equal installments. The concessionaire may request the Authority for the first installment of the advance payment at any time after the appointed date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority. The concessionaire may request the Authority for the second installment of the advance payment at any time after 60 (Sixty) days from the appointed date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority	The Concessionaire has received this Mobilization Advance and work is completed.
Article 26 Clause 26.1	Insurance-Insurance during Concessionaire period	The Concessionaire shall affect and maintain at its own cost, during the Construction Period and the Operation Period, such insurances for such maximum sums as may be required under the Financing Agreements and Applicable laws, and such insurances as may be necessary or prudent in accordance with Good Industry Practice.	The Concessionaire has taken all Insurances.
Article 34 Clause 34.3.1	Substitution Agreement	The Lender's Representative, on behalf of Senior Lenders, may exercise the right to substitute the Concessionaire pursuant to the agreement for substitution of the Concessionaire (the '**Substitution Agreement**') to be entered into amongst the Concessionaire, the Authority and the Lenders' Representative, on behalf of Senior Lenders, Substantially, in the form set forth in Schedule-R.	The Lender's risk is covered with provision of Substitution Agreement. This will be operated if situation needs.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 38 Clause 38.3.1	Dispute Resolution	Any dispute which is not resolved amicably by conciliation as provide in Clause 38.2 shall be finally settled by arbitration as set forth below:	There is provision of Arbitration in case of unresolved dispute between Authority and concessionaire.
Article 41 Clause 41.17	State support agreement	The Concessionaire acknowledges that it has received from the authority a certified true copy of the agreement executed between MORTH and the state government for providing the support and services specified therein (the "State support agreement"), and the parties here to agree to make their best endeavors to procure the support of the state government.	This provision will help the Concessionaire for obtaining permission, approval and land acquisition faster.

Most of the points above are brought out to see that the Agreement is generally enforceable in law without ambiguities.

6.3 Conclusions

The Concession Agreement is comprehensive and covers most of the concerns of the Lenders and all risk factors.

7 REVIEW OF O&M CONTRACT

The Operation and Maintenance Agreement was signed between **M/s GR Akkalkot Solapur Highway Private Limited (GASHPL)** and **G R Infraprojects Limited (O&M Contractor)** on 13th October 2021 and addendum O&M Agreement has been signed on 26th July 2022 for a period of 1 year.

We have reviewed the provisions under various clauses of this O&M Contract and our specific comments are indicated below clause-wise.

Sr. No.	Clause No.	Description in Brief	Remark
1	Agreement Para (ii)	The Concessionaire now wishes to appoint M/s G R Infraproiects Limited for Operation and Maintenance of Project Highway as 0&M Contractor in accordance with Scope of Work as mentioned in Annexure-I hereto, under the Concession Agreement.	The Contractor M/s. G R Infraprojects Ltd. is appointed for O&M work as per scope in CA.
2	Clause 1 Definition	"O&M Contractor" means the person, if any, with whom the Concessionaire has entered into an O&M agreement for discharging O&M obligations for and on behalf of the Concessionaire.	The Contractor is appointed to discharge duties of O&M work on behalf of Concessionaire as per scope in O&M Agreement.
3	Clause 1 Definition	"O&M Period" O&M Agreement means operation and maintenance period of 1 year commencing from Commercial Operation Date.	The Agreement of O&M is for one year and addendum is signed for 1 year from the date of 01st April 2022 to 31st March 2023.
4	Clause 2 Availability of Documents	The O&M Contractor also acknowledges the fact that the Concession Agreement is always binding and applicable back to back on the O&M Agreement, limited to the obligations during the O&M period under the Concession Agreement and the scope of the O&M Contractor as per this Agreement. In case of any discrepancy in whatsoever matter, the clauses of Concession Agreement shall prevail over and above this O&M Agreement.	The copy of Concession Agreement & Maintenance Manual is provided to Contractor. It is always binding to Contractor for implementation during O&M work.
5	Clause 6.1 O&M Contractor's obligation	During Operation Period, provisions of Article 17 of the Concession Agreement shall apply. The O&M Contractor shall operate and maintain the Project Highway in accordance with Article 17 of the Concession Agreement and if required, modify, repair or otherwise make improvements to the Project Highway comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and confirm to Specifications and Standards and Good Industry Practice.	The obligations of O&M are as per Article 17 of CA.

Sr. No.	Clause No.	Description in Brief	Remark
6	Clause 6.3 Maintenance Requirements	The O&M Contractor shall procure that at all times during the Operation Period; the Project Highway conforms to the maintenance requirements set forth in Schedule-K of the Concession Agreement (the "Maintenance Requirements").	The maintenance required to be done as per Schedule-K of CA.
7	Clause 6.4 Maintenance Program	Not later than 55 days prior to the beginning of each Accounting Year during the Operation Period, the O&M Contractor shall provide to the Concessionaire, its proposed annual program of preventive, urgent and other scheduled maintenance (the "Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Contractor has to submit the programme and work for O&M with maintenance requirement and safety.
8	Clause 6.5 Safety, Breakdown and accident	The O&M Contractor shall ensure safe conditions for the users, and in the event of unsafe conditions, closures, diversions, breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good industry Practice.	Safety of users including breakdown, accident rescue operations is covered.
9	Clause 6.10 Damages for Breach of Maintenance obligations	In the event that the O&M Contractor fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the O&M Contractor shall pay to the Concessionaire Damages at such rate as the Concessionaire is required to pay to the Authority under the Concession Agreement. Recovery of such Damages shall be without prejudice to the rights of the Concessionaire under this Agreement, including the right of Termination thereof.	The provision of Levy of Damage for breach of Agreement, defective work will keep pressure on Contractor to work as per requirement.
10	Clause 6.17 Tests	For determining that the Project Highway conforms to the Maintenance Requirements, the Project Manager/IE shall require the O&M Contractor to carry out, or cause to be carried out, tests specified by it in accordance with Good Industry Practice.	This will maintain quality of work.

Sr. No.	Clause No.	Description in Brief	Remark
11	Clause 6.19.1 Safety Requirements	The O&M Contractor shall comply with the provisions of this Agreement and /or Concession Agreement, Applicable Laws and Applicable Permits and confirm to Good Industry Practice for securing the safety of the Users. In particular, the O&M Contractor shall develop, implement and administer a surveillance and safety program for providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in Schedule-L of the Concession Agreement (the "Safety Requirements").	The O&M Contractor has to provide requirements provision for safety of Highway Users. The safety of users is given priority.
12	Clause 13 Sub-contracts	The O&M Contractor shall notify to the Project Manager in writing of its intent to subcontract the O&M works in part or full and without the written approval of the Project Manager no subcontractor shall be appointed by the O&M Contractor.	The subcontractor cannot be appointed without approval of Project Manager. This will keep control over contractor to appoint competent contractor.
13	Clause 16.1 Insurance	The Concessionaire shall procure and maintain the insurance for the Project Highway including all facilities in accordance with the Article 26 of the Concession Agreement.	The risks and security of Authority, Concessionaire and Lender is covered.
14	Clause 17.1 Defect Liability Period	The Concessionaire and/or the EPC Contractor ls responsible for all the defects and deficiencies in construction of the Project Highway or any section thereof and rectify the same, without any cost to the O&M Contractor, during the O&M period. Under this agreement the O&M Contractor is only under obligation of Operation 8r Maintenance of the Project Highway. For avoidance of doubt, any repair or restoration on account of usual wear and tear in the Project Highway shall form a part of the maintenance.	The Contractor is responsible for any defects during Defect Liability period i.e., 2 years from COD. This will maintain the quality to avoid any action for defective work as proposed.
15	Clause 21 Acknowledgement	The O&M Contractor acknowledges and accepts that this agreement entitles the Authority and/or Lenders Representative to step into this agreement, in its sole discretion, in Substitution of the Concessionaire In the event of Termination or Suspension of the Concessionaire. Further, provision of clause 5.2 of the Concession Agreement relating to Project Agreement shall apply *mutatis mutandis.*	The Contractor has agreed for step in right of Authority or Lender in case of Termination of Concessionaire.

Sr. No.	Clause No.	Description in Brief	Remark
16	Clause 22 O&M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the O&M Contractor to carryout routine maintenance Works as detailed in Annexure-I to this 0&M Agreement and in lieu thereof; a fixed lump sum fee amounting to Rs. 2,50,00,000 exclusive of taxes for the entire year in the form of biannual payment shall be due and payable by the Concessionaire.	The O&M Contractor will be paid fixed & Lumpsum payment of Rs. 2.5 Crores. Biannual payment during year for his work as per scope. The Contractor has to manage O&M work responsibility within this payment. Over & above these expenses, Concessionaire is incurring expenses for insurance, electricity, IE & professional fees etc.,
17	Clause 27.1 Termination For O&M Contractor Default	In the event of any defaults specified below shall have occurred, and the O&M Contractor fails to cure the default within the Cure Period of 60 (sixty) days, the O&M Contractor shall be deemed to be in default of this Agreement (the "O&M Contractor Default"), unless the default has occurred as a result of any breach of this Agreement by the Concessionaire or due to Force Majeure.	The Contractor shall note this. This provision of termination keep pressure on Contractor to work as per scope of O&M responsibility.
18	Clause 32 Liability and Indemnification	The O&M Contractor shall fully indemnify and hold harmless and defend the Concession to the extent that the Concessionaire has provided any indemnities to Authority in terms of Article 36 of Concession Agreement, insofar as such indemnities relate to the Services.	The Concessionaire is secured from Contractor for any loss, claim.

7.1 Conclusion

i. Operation and Maintenance Contract is comprehensive and correct for major concerns of the Lender.

ii. The provision of O&M Contract Agreement is consistent with the provision of the Concession Agreement.

8 OPERATION AND MAINTENANCE

8.1 Introduction

Article 17 and Schedule-K of the Concession Agreement defines the Operation and Maintenance requirement during the concession period.

The Company has received Provisional Completion Certificate on 31st March 2021. The project is currently under Operation and Maintenance stage. The concession period of the project highway is 17 years form the Appointed Date including construction period of 2 years.

8.2 O & M Set Up

O & M Contract

As per Clause 17.1 of the Concession Agreement, the Concessionaire shall operate and maintain the project highway by itself, or through O&M Contractors and if required, modify, repair, improve the project highway to comply with Specifications and Standards, and other requirements set forth in the Agreement through Good Industry Practice, Applicable Laws and Applicable Permits and manufacturer's guidelines and instructions with respect to toll systems. The Operation and Maintenance activities will confirm to all the requirements laid down in MoRT&H, IRC Specifications and the Concession Agreement.

Under Routine maintenance, the road is to be maintained in good, safe and motorable condition. The specification in contracts are kept as same as per design and construction specification.

The periodical maintenance will have to be done during O&M period as per requirement of Concession Agreement and as per site requirement to maintain the design standards and level.

O&M Organization Chart

The Concessionaire has given the Organization Chart at site for Operation and maintenance. Accordingly, there is 01 Manager (O&M), 02 Maintenance Engineers (Civil), 01 Planning Engineer, 02 RPO, 01 CRO, 03 Supervisor, 01 Medical Attendant, 01 medical assistants, 01 Electrician, 06 LMV Drivers, 07 HMV Drivers, and 25 labours to carry out O&M activities. The team controls the maintenance activities. However, the maintenance work is undertaken and executed by M/s. GR Akkalkot Solapur Highway Private Limited (GASHPL).

List of Manpower (O&M):

Sr. No	Name of Employee's	Designation
1	Mani Bhushan	Project Manager
2	Rohit Tanaji Jagtap	Executive
3	Shrishail Genappa Mali	Route Patrol Officer
4	Mahesh Mahadev Khairate	Control Room Officer
5	Basavraj Mallikarjun Pare	Supervisor
6	Sagar Birajdar	Assistant
7	Shrikant Fulsing Chavhan	Office Boy
8	Vinayak Arun Hanchate	Engineer
9	Rajratan Nanaji Zade	Junior LAB Technician

Sr. No	Name of Employee's	Designation
10	Shrikant Tuljaram Rajput	Nurse
11	Rahul Sanjay Varvadkar	Nurse
12	Shivaji .	Security Guard
13	Sanjay Chavan	Senior Supervisor
14	Rahul Koli	Electrician
15	Ramesh Kumar	Tractor Driver
16	Prabhu Rajak	Tractor Driver
17	Birendra Baitha	HMV Driver
18	Pramod Singh Chouhan	HMV Driver
19	Jalam Chand Meena	HMV Driver
20	Kuldeep Mahto	HMV Driver
21	Gurlal Singh	HMV Driver
22	Khadap Govind Bharat	HMV Driver
23	Babu Vasant Shinde	HMV Driver
24	Amarish Birajadar	LMV Driver
25	Ravi Rajindra Shahiapure	LMV Driver
26	Shivalingappa Basaveshwar Trigule	LMV Driver
27	Anantpratap Singh	LMV Driver
28	Kalu Ram	LMV Driver
29	Robinpreet Singh	Helper
30	Mohan Chavan	JCB Operator

8.3 Operation Cost

Operations cost is comprised of manpower cost, power and electricity cost, office operating expenses, vehicle running expenses, administrative expenses and other miscellaneous expenses. The Concessionaire has provided the expenses occurred towards operation expenses for current / past years. Necessary assumptions have made from the expenses of similar type of projects to arrive at the operation cost. The estimates are projected based on best industry practices and are compared with the operating cost in the vicinity of the project area.

The estimated Operating Cost for the base month of August 2022 is **Rs. 4.64 Crores**. The detailed working of the same is attached in **Annexure-I**.

8.4 Routine Maintenance Cost

The Routine Maintenance cost is derived based on the Ministry of Road Transport and Highways - Report of the Committee on Norms for Maintenance of Roads in India (published by Indian Road Congress New Delhi 2001) along with actual pavement condition assessed during condition survey.

Maintenance cost constitutes the routine, day-to-day maintenance activities for project assets, including road pavement, shoulders, embankment, drainage, structures, plantations, roadside furniture, traffic signs, traffic safety devices etc. Past data has been used to assess maintenance costs due to normal usage or “wear-and-tear”. Likely costs of maintenance of structures are assessed based on their present condition and vintage, in combination with well-established guidelines and thumb rules given in Indian codes and standards.

The estimated cost of Routine Maintenance works out to be **Rs. 0.65 Crores (1.67 Lakhs per km)** for the base month of August 2022. The detailed working of the same is attached in **Annexure-II**.

8.5 Major Maintenance Cost

Unlike the old Concession Agreements where periodicity and threshold limits were clearly described for the major maintenance, the Concession Agreement of this project does not specify the periodicity or the threshold limits for carrying out the full-length major maintenance. Schedule-K of the Concession Agreement specifies the threshold limits and the timelines for carrying out repairs to the distresses during the operation period.

The maintenance thus can be carried out as and when required basis and to the compliance of Schedule-K requirement to maintain the road in serviceable condition. Only improvement to Riding Quality is expected if the roughness value exceeds 2750 mm/km. However, the average roughness value of the project highway lies within the limit as mentioned above.

Any New pavement is not expected to show any distresses at least for 6 to 7 years with the proper routine maintenance. Mere Routine Maintenance would suffice to meet the performance standard mentioned in Schedule-K. In this project, there is no specific requirement to carry out the major maintenance at the end of concession period.

Hence, major maintenance is planned every 7th year from the date of COD till end of concession period.

The summary of the major maintenance planned up to end of concession period is presented in the below table.

The total base cost of major maintenance works out to be **Rs. 12.10 Crores** for the base month of August 2022 i.e., till 31st August 2022. The detailed working for the same is shown in **Annexure-III**.

8.6 Paved Shoulders

As per design specifications, the paved Shoulder is designed as an integral part of the pavement for main carriageway. Therefore, the total pavement thickness in paved shoulders would be the same as in the carriageway.

8.7 Summary of Major Maintenance Cycle

The table below shows the major maintenance cycle throughout the concession period for the project stretch.

Table 8-1 Maintenance Cycle

Sr. No.	Year	Main Carriageway	Service Road
1	FY 2023	-	-
2	FY 2024	-	-
3	FY 2025	-	-
4	FY 2026	-	-
5	FY 2027	-	-
6	FY 2028	1st Major Maintenance	1st Major Maintenance

Sr. No.	Year	Main Carriageway	Service Road
7	FY 2029	1st Major Maintenance	1st Major Maintenance
8	FY 2030	-	-
9	FY 2031	-	-
10	FY 2032	-	-
11	FY 2033	-	-
12	FY 2034	-	-
13	FY 2035	2nd Major Maintenance	2nd Major Maintenance
14	FY 2036	2nd Major Maintenance	2nd Major Maintenance

8.8 Projected Maintenance Cost without escalation

The below table shows the total cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period without escalation.

Table 8-2 Summary of Operation & Maintenance Cost without escalation

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
1	**Total Operation and Routine Maintenance Cost**	38.952	Every year	13.58	**5.29**
2	**Major Maintenance Cost**				
i)	1st Periodic maintenance - MCW & SR	38.952	FY 2028	15.53	**6.05**
ii)	2nd Periodic Maintenance - MCW & SR	38.952	FY 2035	15.53	**6.05**
	Total Major Maintenance Cost				**12.10**

Notes:

1. It is to be noted that, the rates considered for calculating all the above cost are inclusive of Goods and Service Tax (GST).
1. The estimated cost in table above is for base month of August 2022 i.e., till 31st August 2022.
2. The rates are based on SOR of Govt. of Maharashtra for the year 2022-2023. The current market rates are considered for Bitumen, cement and steel.
3. The labour rate adopted from Govt. of India, Ministry of Labour, and Employment Office of the Chief Labour Commissioner w.e.f. 25.07.2022.

8.9 Projected Maintenance Cost with escalation

The below table shows the total cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period with escalation as per WPI provided by the company.

Table 8-3 Summary of Operation & Maintenance Cost with escalation

Sr. No.	Year	WPI Inflation	Total O & M Cost (Crores)	Major Maintenance Cost (Crores)
1	FY 2023		5.29	-
2	FY 2024	2.87*%	5.45	-
3	FY 2025	5.00%	5.72	-
4	FY 2026	5.00%	6.00	-
5	FY 2027	5.00%	6.30	-
6	FY 2028	5.00%	6.62	3.78

Sr. No.	Year	WPI Inflation	Total O & M Cost (Crores)	Major Maintenance Cost (Crores)
7	FY 2029	5.00%	6.95	3.97
8	FY 2030	5.00%	7.30	-
9	FY 2031	5.00%	7.66	-
10	FY 2032	5.00%	8.04	-
11	FY 2033	5.00%	8.45	-
12	FY 2034	5.00%	8.87	-
13	FY 2035	5.00%	9.31	5.32
14	FY 2036	5.00%	9.78	5.59
	Total Cost (Cr)		**101.74**	**18.66**

* Considering the base month for calculation as August 2022.

The company may carry out necessary investigation prior to O&M and Major maintenance. This will help in proper assessment of maintenance work based on the actual pavement condition. The spending on periodic maintenance / strengthening can then be reduced if the road is adequately and timely maintained.

9 TOLL PLAZA EQUIPMENT STATUS & ATMS

An assessment of Toll Plaza in terms of no of lanes, Toll Collection System installed and working status is carried out based on Section 10 of IRC:SP:84-2014 (The Manual) and the Authority's requirements of Hybrid ETC System. Advance Traffic Management System (ATMS) is assessed based on Section 816 of MoRTH Specifications for Road and Bridge Works as required by Section 12.12 of the Manual.

9.1 Toll Plaza and Toll Collection System

Toll plazas is provided at km. 119+350 at Valsang. The Toll Collection System installed at the toll plazas is provided by Qualix Ltd.

The toll plazas have 5+5 lanes as stipulated in Concession Agreement and 1+1 additional lanes serving VIP vehicles, ambulances and Extra wide Vehicles. All Lanes are on either side is dedicated ETC lane. View of the toll plazas are shown in figure.

Figure 9-1 View of Valsang Toll Plaza

9.2 Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

1. RFID ETC Transceiver
2. Lane Controller with Industrial PC
3. AVC Sensors
4. Automatic Lane Barrier (ALB)
5. Incident Capture Camera
6. Overhead Lane Signals
7. Traffic Lights
8. Toll Booth Equipment

9.2.1.1 RFID ETC Transceiver

RFID ETC Transceiver reads tags installed on the windshield of vehicles and mounted on a pole at about 6m height. Hand held RFID readers are provided (1 no. in each direction) in case a tag is not detected by the fixed reader.

Figure 9-2 RFID ETC Reader mounted on Pole

9.2.1.2 Lane Controller with Industrial PC

Toll Lane Controller is located within the Electronic Enclosure placed inside each toll booth which are connected to the common server and are capable of independent storage of data.

Figure 9-3Toll Lane Controller TLC

9.2.1.3 Automatic Vehicle Classification (AVC) Sensors

The AVC equipment comprises of a pair of height sensor poles, axle sensors and inductive loops. The height detector has a high sensing resolution and detects height when object blocks the path. The presence of vehicle is detected by inductive loop. The loop sensors embedded on the pavement trigger the AVC height sensors located on parallel pillars.

9.2.1.4 Automatic Lane Barrier

Boom barriers installed on all lanes are in working condition and have a working time of 0.6 - 0.9s. Automatic Lane Barrier is used to allow only authorized vehicles to pass through the lane. The barrier is activated only on generation of user fee receipt or other relevant vehicle processing activity. A torque motor powers the barrier for raising and lowering the boom. The motor can be blocked at any position without causing any damage. In the event of power failure, the boom is automatically raised. The boom weight is exactly balanced by built-in springs.

Figure 9-4 Automatic Lane Barrier

9.2.1.5 Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. The LTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done; the LTL turns Green to instruct the vehicle to pass through the lane. The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The user fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

9.2.1.6 Incident Capture Camera (AVC Camera)

The incident capture camera is installed on island of the booth to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.

9.2.1.7 License Plate Image Capture Camera (LPIC)

License Plate Image capture camera is installed on a 3m pole facing incoming vehicle to capture the image of the vehicle number plate.

9.2.1.8 Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane "Open" and "Close" sign consists of a pair of "GREEN" (arrow) and "RED" (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed.

Figure 9-5 OHLS indicating green arrows for operational lanes

9.2.1.9 Toll Booth Equipment

Toll Booth Hardware / Equipment provided are:

- Toll Collector Display (Operator Monitor)
- Customized Industrial Keyboard
- Receipt Printer
- Intercom Slave unit
- Bar code reader
- Violation Light and alarm
- Manual Booth Control (MBC)
- Booth Camera

Figure 9-6 Booth Equipment

The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a programmable keyboard for Registration of toll operations and is customized for different vehicle types and type of ticket.

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Violation system has an alarm switch which is triggered whenever there is a violation such as run-through happening on the lane. When there is an emergency, a foot switch pressed by the booth operator alerts the control room.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room. Manual Booth Controller is used to release exempt vehicles.

9.2.1.10 Medium Speed Weigh in Motion (MSWIM)

Medium Speed Weigh in Motion (MSWIM) is installed on entry lanes with a platform size of 1500mm x 620mm for normal lanes and 1750mm x 620mm for extra wide lanes and capacity of 30 ton/axle. Bending plate strain gauge technology is used with hardware and software support to calculate weight of vehicles running through it up to a speed of 50 km/hr.

Figure 9-7 Medium Speed Weigh in Motion

9.3 Plaza Equipment

9.3.1.1 TMS Server

Plaza Server is provided in a hot standby configuration and provided with 42 U switch rack, 24 port and 16 port non POE network switches, 16 port and 8Port PoE switches. Firewall and 2 broadband internet lease line with 4 Mbps link for CCH connectivity is available.

Figure 9-8 Medium Control Room Equipment – Server & Switch rack

9.3.1.2 55” LED screen for CCTV monitoring

55” LED screen for CCTV monitoring installed at the toll plaza admin block provides view of all the toll booths, important zones within the plaza where cash transactions take place (server room, control room, cash up).

Figure 9-9 CCTV screen at the Toll Plaza Control Room

The toll plaza manager is able to observe the activities at the toll lanes and toll booth. When the toll collector calls up on the intercom, the manager is able to comprehend the situation at the lane by a zoomed view of the particular lane.

9.3.1.3 Workstations in Control Room, PoS and Cash up room

Workstations are available in control room (lane monitoring, administration and audit), cash room and PoS with 4 GB RAM and 1 TB HDD.

Figure 9-10 Incident Management Workstation at Control room

9.3.1.4 Cash up Room Equipment

As all the lane are ETC on Hybrid mode hence there are a very less transition in cash however as per CA provision, cash up room is provided which has a computer, Laser Printer and Cash counting machine. Cash collected in each shift is secured inside the strong room. Day cash locker stores small amount of cash required for float money. Cash is deposited by the Cashier at the Bank accompanied by gunmen on a daily basis.

Figure 9-11 Cash up Room

Figure 9-12 Strong Room

9.4 Adequacy of Toll Collection System and ATMS

- Adequacy-The software and hardware as a part of Toll Collection and Management System is installed in September 2021. All lanes are Hybrid ETC system as stipulated by NHAI in Technical specifications of Hybrid ETC system. TMS shall be upgraded every 5 years, at the cost of the Authority.

10 ACCIDENT DATA ANALYSIS

Accident Data, based on last one year April 2021 to March 2022 Records for the project have been studied in order to analyze the nature of accidents occurring on the stretch and identify blackspots.

10.1 Accident Trend

Accident Data for the period April 1st, 2021, to March 31st, 2022, has been made available for analysis. 40 Accidents have occurred out of which 6 no. were fatal, and 07 were Major, 27 Minor. More number of accidents have occurred during the early morning than at night-time. Monthly data analysis does not show any consistent seasonal trend. Over speeding has been recorded as a major cause of accident which alone or in combination with faulty driver behaviour.

10.2 Blackspots Identification

There is no black spot found in the project stretch however the details of accidents in the project length are given in Table below:

ACCIDENT SUMMARY BY TIME OF THE DAY

(From 1st Apr 2021 to 31st March 2022)			
Sr. No.	**Time of Day**	**No. of Accidents**	**Percentage%**
1	00-01 Hrs	3	8%
2	01-02 Hrs	3	8%
3	02-03 Hrs	5	13%
4	03-04 Hrs	2	5%
5	04-05 Hrs	0	0%
6	05-06 Hrs	10	25%
7	06-07 Hrs	1	3%
8	07-08 Hrs	1	3%
9	08-09 Hrs	2	5%
10	09-10 Hrs	1	3%
11	10-11 Hrs	0	0%
12	11-12 Hrs	1	3%
13	12-13 Hrs	1	3%
14	13-14 Hrs	1	3%
15	14-15 Hrs	2	5%
16	15-16 Hrs	0	0%
17	16-17 Hrs	2	5%
18	17-18 Hrs	0	0%
19	18-19 Hrs	0	0%
20	19-20 Hrs	0	0%
21	20-21 Hrs	1	3%
22	21-22 Hrs	0	0%
23	22-23 Hrs	4	10%
24	23-24 Hrs	0	0%
	Total Accidents	40	

Accident Summary by Causes
(From 1st Apr 2021 to 31st March 2022)

Sr. No.	Causes of Accident	No. of Accident	Percentage %
1	Vehicle out of control	6	15
2	Driver negligence	6	15
3	Over speeding	15	38
4	Animal on road	0	0
5	Falling asleep	0	0
6	Tyre burst	0	0
7	Wrong side driving	0	0
8	Drunken driving	8	20
9	Mechanical failure/Other	5	13
	Total Accidents = 40		

10.3 Conclusions & Recommendations

As there are no consistent major accidents found in the project length and company informed to LIE that all accidents occur due to over speeding and uncontrolled driving on the highway. Hence there are no Black spot detected from IE end as well as from concessionaire end however concessionaire need to maintain all road furniture as per schedule given in CA.

Annexures

Annexure I : Operation Cost

Sr. No.	Particulars	Cost per Annum (Rs.)	Cost per Annum (Cr.)
1	Incidental Management Expenses		
a	*Ambulance - 1 Nos.*	1,781,782	0.18
b	*Patrolling Vehicle - 1 Nos.*	2,092,669	0.21
c	*Crane - 1 Nos.*	1,246,375	0.12
d	*Other Vehicle - 3 Nos.*	2,094,467	0.21
e	*JCB - 1 Nos.*	653,140	0.07
f	*Corridor Manager & Officer*	953,280	0.10
2	Maintenance Staff Expenses	8,400,000	0.84
3	Routine Maintenance Cost (Civil Works)	6,509,041	0.65
4	Professional & IE Fee	10,800,000	1.08
5	Insurance Expenses	6,297,540	0.63
6	Staff Welfare Expenses	467,424	0.05
7	Electricity Expenses + Maintenance of parts	5,568,760	0.56
8	ATMS/HTMS Expenses	3,856,248	0.39
9	Contingency @ 5% (Excl. Civil works)	2,210,584	0.22
	Total Cost (Rs.)	**52,931,309**	**5.29**
	Per km Cost (Lakhs)		**13.59**

Annexure II : Routine Maintenance Cost

Routine Maintenance Cost-GASHPL	
Total Cost (Exclusive of GST @ 12%)	**6,509,041**
	= 1.67 lakhs per km

CONVERSION FACTORS									
National Highways / State Highways - Rigid Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Rigid Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				95,409	**111,227**				
						Normal	**Urban**	**Normal**	**Urban**
1	Four-lane with divided carriageway	Without paved shoulder	1.53	145976.00	170177.00	-	-	-	-
		Paved shoulder	1.70	162196.00	189086.00	23.76	-	3,433,676.40	-
2	Four-lane with divided carriageway and service lane on either side	Without paved shoulder	2.00	190818.00	222454.00	-	-	-	-
		Paved shoulder	2.20	209900.00	244699.00	-	10.78	-	2,446,457.36
4	Six lane with divided carriageway and service lane on either side	without Paved shoulder	2.90	276687.00	322558.00	-	-	-	-
		with Paved shoulder	3.10	295769.00	344803.00	-	4.41	-	1,409,991.66
TOTAL						**38.95**		**7,290,125.42**	

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Potholes repair (50 mm deep)	100 % Pot hole free	As & when required	0.00%
	Volume (cum)			0.00
	Rs/m^3			0
	Cost in Rupees			0
	ii) Patch repair	100 % Patch less	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			461
	Cost in Rupees			0
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			88
	Cost in Rupees			4,424
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			63
	Cost in Rupees			4,704
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			461
	Cost in Rupees			0

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	v) Road marking	7%	Once in 15 year & @ Repaired location	5807
	vi) Joint Sealant Repair/Replacement	5%		20217
	vii) Slab Replacement	0.00%		0
	SUB TOTAL			**35,152**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	50%	As & when required	17,334
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	SUB TOTAL			**17,334**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debris removal		Once in a Year	3467
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	3467
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**85,009**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	7%	Once in 15 years with thermoplastic paint	4146
	ii)Repairs to footpath	50%	As & when required	2311
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**18,129**
	GRAND TOTAL (Urban)			**103,137**

Annexure III: Major Maintenance Cost

Periodic Maintenance Cost (Every 6th / 7th year)										
Sr. No.	**Description**	**Unit**	**No.**	**Length (m)**	**Width (m)**	**Depth (m)**	**Quantity**	**Total Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
I. Main Carriageway, Service Road / Slip Road & Miscellaneous location										
A	**Main Carriageway: Rigid Pavement**									
1	Replacement of Joint Sealant	Rmt	5%	317,375.72			15,868.79	15,868.79	69.00	1,094,946
2	Dismantling of CC Panels @ 2% area	Cum	2%	38,099.60	16.40	0.30	3,749.00	3,749.00	655.00	2,455,595
3	Replacement of Panels - PQC @ 2% area	Cum	2%	38,099.60	16.40	0.30	3,749.00	3,749.00	6,172.00	23,138,832
4	Replacement of Panels - DLC @ 0% area	Cum	0%	38,099.60	16.40	0.15	-	-	3,287.00	-
5	Diamond Grinding	Sqm	3%	38,099.60	16.40		18,745.00	18,745.00	50.00	937,250
B	**Toll Plaza: Rigid Pavement**									
6	Replacement of Joint Sealant	Rmt	5%	6,884.55			344.23	344.23	69.00	23,752
7	Dismantling of CC Panels @ 2% area	Cum	2%		13,553.95	0.30	81.32	81.32	655.00	53,267
8	Replacement of Panels - PQC @ 2% area	Cum	2%		13,553.95	0.30	81.32	81.32	6,172.00	501,930
9	Replacement of Panels - DLC @ 0% area	Cum	0%		13,553.95	0.15	-	-	3,287.00	-
10	Diamond Grinding	Sqm	0%		13,553.95		-	-	50.00	-
C	**Service Road : Rigid Pavement**									
11	Replacement of Joint Sealant	Rmt	3%	90,240.00			2,707.20	2,707.20	69.00	186,797
12	Dismantling of CC Panels @ 1% area	Cum	1%		177,660.00	0.25	444.15	444.15	655.00	290,918
13	Replacement of Panels - PQC @ 1% area	Cum	1%		177,660.00	0.25	444.15	444.15	6,172.00	2,741,294
14	Replacement of Panels - DLC @ 0% area	Cum	0%		177,660.00	0.15	-	-	3,287.00	-
15	Diamond Grinding	Sqm	0%		177,660.00		-	-	50.00	-
E	**Structural Deck area**									
16	Milling	Sqm	50%	852.40	26.00		11,081.20	11,081.20	55.00	609,466
17	Tack Coat	Sqm	50%	852.40	26.00		11,081.20	11,081.20	15.00	166,218
18	Mastic Asphalt Overlay	Sqm	50%	852.40	26.00		11,081.20	11,081.20	593.00	6,571,152
F	**Miscellaneous**									
19	Replacement of Kerb	Rmt	10%	103,284.00			10,328.40	10,328.40	202.00	2,086,337
20	Painting of Kerbs	Sqm	1	103,284.00		0.32	32,534.46	32,534.46	110.00	3,578,791
21	Painting of Crash Barrier	Sqm	1	25,380.00		1.12	28,298.70	28,298.70	110.00	3,112,857
22	Thermoplastic paint									
	a) Median & Edge line	Sqm	50%				18,612.15	18,612.15	425.00	7,910,164
	Main Carriageway 4L		4	36,269.10	0.15		21,761.46			
	Main Carriageway 6L		4	4,630.50	0.15		2,778.30			
	Service Road		2	26,014.50	0.10		5,202.90			
	b) Lane line									
	Main Carriageway 4L		2	12,694.19	0.10		2,538.84			
	Main Carriageway 6L		4	1,620.68	0.10		648.27			
	Service Road		1	9,105.08	0.10		910.51			
	c) Junction crossing						3,384.03			
23	Replacement of Road Stud	No	50%				6,252.00	6,252.00	343.00	2,144,436
	Main Carriageway 4L		4	2,016.00			8,064.00			
	Main Carriageway 6L		6	258.00			1,548.00			
	Service Road		2	1,446.00			2,892.00			
24	Miscellaneous	5%								2,880,200
									Total Amount (MCW)	**60,484,201.41**
									Total Cost in Lakhs (MCW)	**604.84**
									Per km Cost in lakhs (MCW)	**15.53**

Annexure IV: Pavement Condition Survey

Summary of Pavement Condition Survey-LHS- MCW

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/	Patching (%)**			Type	Condition			Left	Right	
1	99.400	99.600	LA		LA																	Work not done due to LA
2	99.600	100.000	G		PQC	280		G							F							
3	100.000	101.000	G		PQC	280		G							G/F			G/F	NE			
4	101.000	102.000	F		PQC	280		G							G/F			G/F	NE			
5	102.000	103.000	G		PQC	280		G										G				Structure/SR
6	103.000	104.000	G		PQC	280		G										G				Structure/SR
7	104.000	105.000	G		PQC	280		G							G			F	NE			Structure/SR
8	105.000	106.000	G		PQC	280		G							F			F	NE			Structure/SR
9	106.000	107.000	F		PQC	280		G							G/F			G/F	NE			Structure/SR
10	107.000	108.000	F		PQC	280		G							F			F				
11	108.000	109.000	F		PQC	280		G							F			F				
12	109.000	110.000	F		PQC	280		G							F			F				
13	110.000	111.000	F		PQC	280		G							F			F				Partially Structure/SR
14	111.000	112.000	G		PQC	280		G							F			F				Partially Structure/SR
15	112.000	113.000	G		PQC	280		G							F			F				Partially Structure/SR
16	113.000	114.000	G		PQC	280		G							F			F				Partially Structure/SR
17	114.000	115.000	G		PQC	280		G							F			G/F				Partially Structure/SR
18	115.000	116.000	G		PQC	280		G							F			F				
19	116.000	117.000	F		PQC	280		G	0.1						F			F				
20	117.000	118.000	G		PQC	280		G							G/F			G/F				Partially Structure/SR
21	118.000	119.000	G		PQC	280		G							F			F				Partially Structure/SR
22	119.000	120.000	G		PQC	280		G							F			F				
23	120.000	121.000	G		PQC	280		G							G/F			G/F				
24	121.000	122.000	G		PQC	280		G	0.1						F			G/F				Partially Structure/SR
25	122.000	123.000	G		PQC	280		G							F			F				Partially Structure/SR
26	123.000	124.000	F		PQC	280		F	0.5						F			F				
27	124.000	125.000	G		PQC	280		G							F			F				Partially Structure/SR
28	125.000	126.000	F		PQC	280		G							F			F				Partially Structure/SR
29	126.000	127.000	F		PQC	280		G							F			F				
30	127.000	128.000	F		PQC	280		G							F			F				
31	128.000	129.000	F		PQC	280		G							F			F				
32	129.000	130.000	F		PQC	280		G							F			F				Partially Structure/SR
33	130.000	131.000	F		PQC	280		G							F			G/F				Partially Structure/SR
34	131.000	132.000	F		PQC	280		G							F			G/F				Partially Structure/SR
35	132.000	133.000	G		PQC	280		G							F			G/F				
36	133.000	134.000	G		PQC	280		G							NE			F	F	Y		
37	134.000	135.000	F		PQC	280		G							NE			F	F	Y		Partially Structure/SR
38	135.000	136.000	G		PQC	280		G							NE			G/F	F	Y		Structure/SR
39	136.000	137.000	WIP		PQC	280		WIP							NE			G/F	F	Y		Structure/SR
40	137.000	138.000	WIP		PQC	280		WIP							NE			F	F	Y		
41	138.000	138.352	G		PQC	280		G							NE			F	F	Y		

Summary of Pavement Condition Survey-RHS-MCW

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	99.400	99.600	LA																			Work not done due to LA
2	99.600	100.000	G		PQC	280		G							F	PQC	G	F				
3	100.000	101.000	G		PQC	280		G							F	PQC	G	G/F				
4	101.000	102.000	G		PQC	280		G							F	PQC	G	G/F				
5	102.000	103.000	G		PQC	280		G								PQC	G	G				Structure/SR
6	103.000	104.000	G		PQC	280		G								PQC	G	G				Structure/SR
7	104.000	105.000	G		PQC	280		G							G	PQC	G	F				Structure/SR
8	105.000	106.000	G		PQC	280		G							F	PQC	G	F				Structure/SR
9	106.000	107.000	F		PQC	280		G	0.1						F	PQC	G	G/F				Structure/SR
10	107.000	108.000	F		PQC	280		G	0.1						F	PQC	G	F				
11	108.000	109.000	F		PQC	280		G							F	PQC	G	F				
12	109.000	110.000	F		PQC	280		G							F	PQC	G	F				
13	110.000	111.000	F		PQC	280		G							F	PQC	G	F				Partially Structure/SR
14	111.000	112.000	F		PQC	280		G	0.15						F	PQC	G	F				Partially Structure/SR
15	112.000	113.000	F		PQC	280		G	0.15						F	PQC	G	F				Partially Structure/SR
16	113.000	114.000	G		PQC	280		G							F	PQC	G	F				Partially Structure/SR
17	114.000	115.000	G		PQC	280		G							F	PQC	G	G/F				Partially Structure/SR
18	115.000	116.000	G		PQC	280		G							F	PQC	G	F				
19	116.000	117.000	G		PQC	280		G							F/P	PQC	G	F/P				
20	117.000	118.000	G		PQC	280		G							F	PQC	G	G/F				Partially Structure/SR
21	118.000	119.000	G		PQC	280		G							F	PQC	G	F				Partially Structure/SR
22	119.000	120.000	F		PQC	280		G							F	PQC	G	F				
23	120.000	121.000	G/F		PQC	280		G							G/F	PQC	G	G/F				
24	121.000	122.000	F		PQC	280		G							F	PQC	G	G/F				Partially Structure/SR
25	122.000	123.000	G		PQC	280		G							F	PQC	G	F				Partially Structure/SR
26	123.000	124.000	F		PQC	280		G	0.1						F	PQC	G	F				
27	124.000	125.000	F		PQC	280		G							F	PQC	G	F				Partially Structure/SR
28	125.000	126.000	F		PQC	280		G							F	PQC	G	F				Partially Structure/SR
29	126.000	127.000	F/P		PQC	280		G	0.1						F	PQC	G	F				
30	127.000	128.000	F		PQC	280		G							F	PQC	G	F				
31	128.000	129.000	F		PQC	280		G							F	PQC	G	F				
32	129.000	130.000	G		PQC	280		G							F	PQC	G	F				Partially Structure/SR
33	130.000	131.000	G		PQC	280		G							F	PQC	G	G/F				Partially Structure/SR
34	131.000	132.000	G		PQC	280		G							F	PQC	G	G/F				Partially Structure/SR
35	132.000	133.000	G		PQC	280		G							F	PQC	G	G/F				
36	133.000	134.000	G		PQC	280		G							NE	PQC	G	F	F		Y	Drain WIP
37	134.000	135.000	G		PQC	280		G							NE	PQC	G	F	F		Y	Partially Structure/SR
38	135.000	136.000	G		PQC	280		G							NE	PQC	G	G/F	F		Y	Structure/SR
39	136.000	137.000	WIP		PQC	280		WIP							NE	PQC	G	G/F	F		Y	Structure/SR
40	137.000	138.000	WIP		PQC	280		WIP							NE	PQC	G	F	F		Y	
41	138.000	138.352	G		PQC	280		G							NE	PQC	G	F	F		Y	

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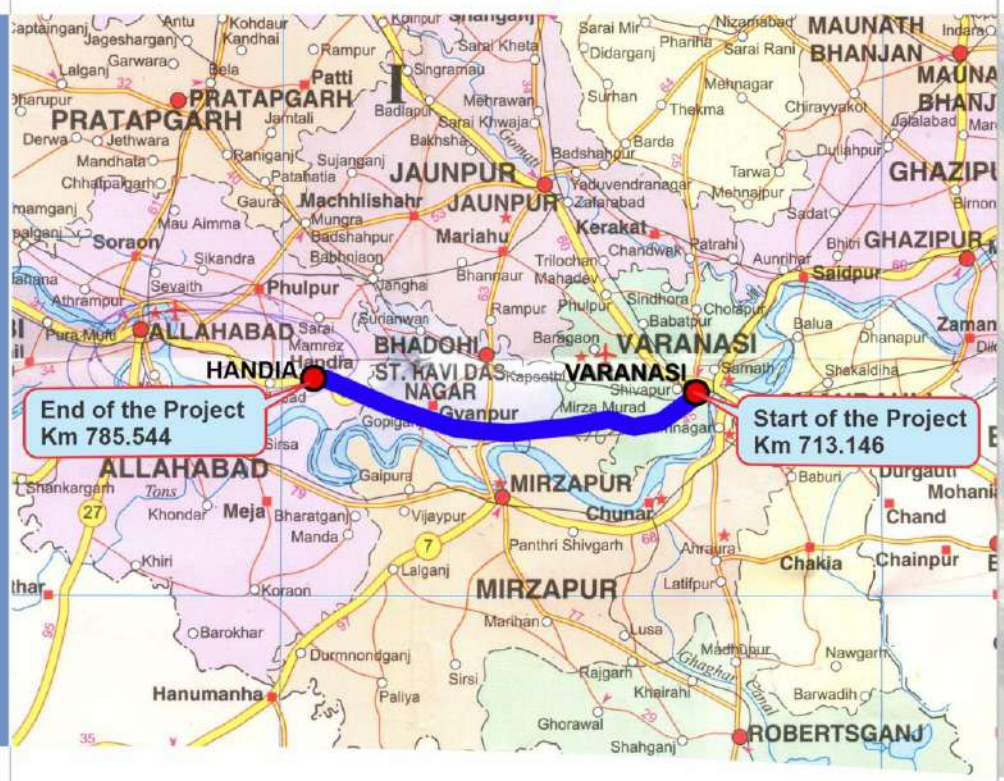

Six Laning of Handia Varanasi Section of NH-2 from km. 713.146 to km. 785.544 in the state of Uttar Pradesh on Hybrid Annuity Mode (HAM)

Technical Due Diligence Study

Final Report

November 2022

Submitted by:

FP Project Management
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FP Project Management

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SIX LANING OF HANDIA VARANASI SECTION OF NH-2 FROM KM. 713+146 TO KM. 785+544 IN THE STATE OF UTTAR PRADESH UNDER NHDP PHASE-V ON HYBRID ANNUITY MODE

TECHNICAL DUE DILIGENCE STUDY

FINAL REPORT

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1 INTRODUCTION

1.1 Background

The Government of India had authorized National Highways Authority of India (NHAI) for the development of National Highways and as a part of this endeavor, the authority had decided to undertake development, maintenance and management of National Highway No. 2 including the Section from km. 713+416 to km. 785+544 (apprx. 72.398 kms). The Authority had resolved to Augment the 6-laning of Handia - Varanasi Section of NH-2 from km. 713+416 to km. 785+544 (apprx. 72.398 kms) in the State of Uttar Pradesh under NHDP-V on Design, Build, Operate and Transfer (the "DBOT Annuity" or "Hybrid Annuity") basis which shall be partly financed by the Concessionaire who shall recover its investment and costs through payments to be received from the Authority, in accordance with the terms and conditions to be set forth in a Concession Agreement executed on 15th May 2017. Total design length of the project highway is 72.398 kms.

Based on competitive bid process completed, NHAI has signed Concession Agreement with **M/s Varanasi Sangam Expressway Private Limited (VSEPL),** a Special Purpose Vehicle (SPV) formed for implementing this project.

The Appointed Date of the project was 05th December 2017. The concession period of the project is 17.5 years including construction period of 2.5 years and operation period of 15 years from the date of Commercial Operation Day (COD) of the project highway. Schedule Completion Date for the project highway was on 02nd June 2020. The NHAI had granted Extension of Time (EOT) for 162 days. The project highway has received Provisional Completion Certificate on 02nd November 2020. The Final Completion Certificate is still awaited. PD, NHAI recommended to RO, NHAI for Issuance of Completion certificate to Concessionaire.

During maintenance period of the project highway, **GR Highways Investment Manager Pvt. Ltd.** (in its capacity as the Investment Manager of Bharat Highways InvIT) has appointed **FP Project Management Consultancy Services Private Limited** [Formerly Frischmann Prabhu (I) Pvt. Ltd.] as Technical Consultant for carrying out technical study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, FP Project Management undertook the site visits to carry out site inspection. The report is based on findings during this period.

1.2 Our Approach Philosophy

Composition of Team

Our team consists of well-qualified Engineers and other professionals, whose experience covers all the skills and specializations required for undertaking such assignments. All the team personnel are our regular employees and have a long and stable working relationship with our firm.

The Team Leader coordinates the activities between all the key staff who work closely together. The key staff is assisted by various support staff, who report to the respective key staff in their field of expertise. The Team Leader is the point of contact for Client on Technical Study.

The technical study include review of all the available documents namely:

a) Concession Agreement including Technical Schedules
b) EPC Agreement
c) Pavement design reports
d) O&M Manual prepared by the Concessionaire
e) O&M Contract, work order and their provisions
f) Recent O&M Report submitted to Authority
g) Quality of construction based on available data, design and drawings
h) Documents on historical expenditure on operation and maintenance
i) Reports on past accidents
j) O&M cost schedule for the concession period
k) Completion / Provisional Completion and status of items in punch list items
l) Correspondence regarding scope of works and during O&M
m) Toll operation manual / ATMS related documents

The review of the above documents is the first step towards accomplishment of the assignment. This gives a complete idea of the project and is used as input data for preparation of report after necessary analysis.

Site Visit and Data Collection

A team of experts from various streams has carried out the preliminary site visit to understand the assessment of project assets mainly condition of the pavement and structures.

- The site visit is undertaken for detailed reconnaissance and visual pavement condition assessment
- The condition assessment of major structures by visual inspection
- The information like material sources and the probable cost is collected for the purpose of cost estimate

The detailed design / drawings viz. Plan & L-sections, drainage design, structure design, layout drawings for project facilities like toll plaza, bus bay, truck lay-byes, highway lighting facilities etc., would be studied. Also, design / drawing and provision pertaining to road furniture are studied.

The adequacy of design is verified in accordance with the concession agreement, manual of specifications and standards as well as relevant IRC standards.

The information on availability of material in the vicinity is gathered. It has direct impact on cost of maintenance work and balance work if any.

The basic approach for preparation for cost estimates for operation and maintenance is as per the practice of State PWD / MORT&H in respect of highways and structures.

Data Analysis

Based on the study of the available information and preliminary site visits, the consultants share their preliminary observations with the Client.

1.3 About this Report

This report has been prepared based on the information, reports and documents made available to us by the Company. We have also referred to publicly available reports, literature etc. and have made our best efforts to check the authenticity of the information available, analyse the same as per the best engineering / industry practices.

The site visit and inspection were carried out between the periods of **07th August 2022 to 09th August 2022**. Tests and other related surveys were carried out on the same days of site visit.

The report is organized with the following chapters for easy understanding of various issues.

- **Introduction -** This chapter gives an overview of the project background, approach and methodology of Due Diligence studies.
- **Project Description -** This chapter describes existing project features.
- **Development of Project Highway -** This chapter gives an overview of project development.
- **Pavement and Site Investigation -** This chapter describes present condition of pavement, surveys and investigations carried out on site and proposals for maintenance as per contract requirements.
- **Balance works -** This chapter summarizes the balance works to be executed at Site.
- **Review of Concession Agreement -** This chapter summarizes the observations on the Concession Agreement.
- **Review of O&M Agreement -** This chapter summarizes the observations on the O&M Agreement executed.
- **Operation and Maintenance -** This chapter describes O&M set up as well as O&M cost over the concession period.
- **Toll Plaza Equipment and ATMS -** This chapter summarizes assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and working status is presented under this section.
- **Accident Data Analysis -** This chapter deals with the analysis of nature of accidents occurring on the stretch and to identify blackspots.
- **Annexures**

2 PROJECT DESCRIPTION

2.1 Location

The project stretch is linking Delhi and Kolkata, traverses through 6 States namely Delhi, Haryana, Uttar Pradesh, Bihar, Jharkhand and West Bengal and connects a number of major urban cities on its way like Delhi, Agra, Kanpur, Allahabad, Varanasi, Dhanbad, Durgapur & Howrah. The project road from Khokhraj approximately 42 kms from Allahabad towards Kanpur to Varanasi i.e., Allahabad bypass to Varanasi.

The project highway passes through the built-up areas of towns and villages enroute. Important towns along the alignment are Rajatalab, Aurai, Gopigunj and Handia.

The Location Map of the project highway is presented below:

Figure 2-1 Location Map

Figure 2-2 Start of Project Highway at km. 713+146

Figure 2-3 End of Project Highway at km. 785+544

2.2 Climate

The project highway has a humid subtropical climate with large variations between summer and winter temperatures. The dry summer starts in April and lasts until June, followed by the monsoon season from July to October. The temperature ranges between 22 °C and 46 °C in the summers. Winters in Varanasi see very large diurnal variations, with warm days and downright cold nights. Cold waves from the Himalayan region cause temperatures to dip across the city in the winter from December to February and temperatures below 5 °C (41 °F) are not uncommon. The average annual rainfall is 1,110 mm.

2.3 Terrain

This section of National Highway traverses through plain / rolling terrain.

2.4 Abutting Land Use

The land use along the highway is predominantly rural / built-up area.

2.5 Right of Way

The width of existing Right of Way (RoW) of the project stretch varies from 28.0 m to 67.0 m.

2.6 Existing Utilities

During widening of the project highway, various affected utility services located along the project road were shifted to the PROW. The different types of utilities found along the road include, electrical poles, telephone poles, OFC Cables, water pipeline etc.,

3 DEVELOPMENT OF PROJECT ROAD

3.1 Project Road

The Site of Six-lane divided project highway is situated between km. 713+146 to km. 785+544 of Handia to Varanasi section of NH-2 in the state of Uttar Pradesh. The project road passes through rural as well as built-up sections. The stretches falling in built-up areas have been provided with service road as per scope of works. The development of entire project road has been carried out in accordance with schedule-B and schedule-C as per standards set forth in schedule-D under the Concession Agreement.

M/s Varanasi Handia Expressway Private Limited has completed construction of the project road for the length of 72.644 kms.

The stretch of the project highway under the scope of study runs predominantly through plain / rolling terrain. The design standards have been adhered to with a realistic compatibility with the existing ROW, utilities and optimum land acquisition. Generally, the cross-sectional dimensions of project road are as below:

Table 3-1 Cross sectional dimension

Main Carriageway	Width (m)
Carriageway width excluding edge strip	17.0
Paved Shoulder width - one side	1.5
Earthen Shoulder width - one side	2.0
Median width	1.2 – 5.6
Service Road	3.75 to 5.5

3.2 Built up Areas / Urban Section

The locations of built up area along the project highways are indicated in table below.

Table 3-2 Details of Built Up Areas

Sr. No.	Design Chainage (km)		Length (m)	Name of Township	Carriageway Width (m)
	From	To			
1	713146	713397	250.6	Handia	22
2	713397	713485	88.4	Handia	26
3	713485	715235	1750	Handia	22
4	715235	716225	990	Handia	22
5	716225	716845	620	Handia	26
6	717445	718085	640	Handia	23
7	722135	722535	400	Baraut	22
8	722535	723655	1120	Baraut	22
9	723655	725245	1590	Baraut	22
10	725885	726085	200	Baraut	22
11	726085	726955	870	Baraut	22
12	726955	727135	180	Baraut	22
13	728435	728525	90	Bhiti	26
14	732365	733785	1420	Wahida	26
15	734645	735015	370	Jangiganj	26
16	739685	740130	445	Gopiganj	25

Sr. No.	Design Chainage (km)		Length (m)	Name of Township	Carriageway Width (m)
	From	To			
17	740130	741685	1555	Gopiganj	26
18	750880	751095	215	Madhosingh	26
19	752965	754915	1950	Aurai	26
20	755700	756215	515	Kothra	26
21	756900	758000	1100	Kothra	26
22	759400	760700	1300	Tiatrahi	26
23	761500	762025	525	Vikrampur	26
24	762675	763900	1225	Kotka	26
25	764700	766100	1400	Babusarai	26
26	770435	771245	810	Kachwa Bazar	26
27	771245	771445	200	Kachwa Bazar	25
28	773460	773685	225	Rupapur	25
29	776745	777035	290	Rupapur	22
30	783025	783805	780	Rajatalab	26

3.3 Pavement Construction

The stretch of the project highway includes rigid pavement and flexible pavement.

Rigid pavement details are as given in the below table.

Side	Design Chainage (m)		Length (m)	Side	Design Chainage (m)		Length (m)
	From	To			From	To	
Left	742850	744435	1585	Right	771242	772685	1443
	745220	745385	165		773460	773685	225
	745385	746600	1215		773685	774785	1100
	746600	747257	657		774785	775630	845
	747257	748585	1328		777865	779125	1260
	748585	749105	520		779805	779890	85
	749745	750105	360		780685	783025	2340
	750880	751095	215		783025	783805	780
	751095	752325	1230		784760	785544	784
	752965	753975	1010		**Total**		**8862**
	754915	755745	830				
	756385	756535	150				
	756535	757085	550				
	757085	757445	360				
	758085	758235	150				
	758235	759185	950				
	759185	759325	140				
	760110	761405	1295				
	762025	762320	295				
	763145	763545	400				
	763545	764555	1010				
	764555	764685	130				
	765425	766085	660				
	766085	767485	1400				
	767485	767585	100				
	768245	769580	1335				
	770435	771242	807				
	771242	772685	1443				

Side	Design Chainage (m)		Length (m)	Side	Design Chainage (m)		Length (m)
	From	To			From	To	
	773460	773685	225				
	773685	774785	1100				
	774785	775630	845				
	777865	779125	1260				
	779805	779890	85				
	780685	783025	2340				
	783025	783805	780				
	784760	785544	784				
	Total		**27709**				

Flexible Pavement details are as given in the below table.

Side	Design Chainage (m)		Length (m)	Side	Design Chainage (m)		Length (m)
	From	To			From	To	
Left	712900	713397	496.6	**Right**	712900	713397	496.6
	713397	715797	2400		713397	715797	2400
	715797	716280	483.4		715797	716280	483.4
	716280	717445	1165		716280	717445	1165
	717445	717746	300.5		717445	717746	300.5
	717746	717753	7		717746	717753	7
	717753	718085	332.5		717753	718085	332.5
	718085	718235	150		718085	718235	150
	718235	718985	750		718235	718985	750
	718985	719165	180		718985	719165	180
	719165	719472	306.5		719165	719472	306.5
	719472	719479	7		719472	719479	7
	719479	719785	306.5		719479	719785	306.5
	719785	720905	1120		719785	720905	1120
	720905	721222	316.5		720905	721222	316.5
	721222	721229	7		721222	721229	7
	721229	721525	296.5		721229	721525	296.5
	721525	721630	105		721525	721630	105
	721630	722089	459		721630	722089	459
	722089	723840	1751		722089	723840	1751
	723840	724330	490		723840	724330	490
	724330	725220	890		724330	725220	890
	725220	725648	428		725220	725648	428
	725648	727141	1493		725648	727141	1493
	727141	727570	429		727141	727570	429
	727570	728435	865		727570	728435	865
	728435	728525	90		728435	728525	90
	728525	728842	316.5		728525	728842	316.5
	7288415	728849	7		728842	728849	7
	7288485	729155	306.5		728849	729155	306.5
	729155	729270	115		729155	729270	115
	729270	729649	379		729270	729649	379
	729649	729661	12		729649	729661	12
	729661	730045	384		729661	730045	384
	730045	731100	1055		730045	731100	1055
	731100	731491	391		731100	731491	391

Side	Design Chainage (m)		Length (m)	Side	Design Chainage (m)		Length (m)
	From	To			From	To	
	731491	731503	12		731491	731503	12
	731503	731900	397		731503	731900	397
	731900	732365	465		731900	732365	465
	732365	733785	1420		732365	733785	1420
	733785	734169	384		733785	734169	384
	734169	734181	12		734169	734181	12
	734181	734585	404		734181	734585	404
	734585	734645	60		734585	734645	60
	734645	735015	370		734645	735015	370
	735015	736105	1090		735015	736105	1090
	736105	736417	311.5		736105	736417	311.5
	736417	736424	7		736417	736424	7
	736424	736725	301.5		736424	736725	301.5
	736725	737885	1160		736725	737885	1160
	737885	738269	384		737885	738269	384
	738269	738281	12		738269	738281	12
	738281	738665	384		738281	738665	384
	738665	739830	1165		738665	739830	1165
	739830	740291	461		739830	740291	461
	740291	742413	2122		740291	742413	2122
	742413	742850	437		742413	742850	437
	744435	744814	379		742850	744435	1585
	744814	744826	12		744435	744814	379
	744826	745220	394		744814	744826	12
	749105	749422	316.5		744826	745220	394
	749422	749429	7		745220	745385	165
	749429	749745	316.5		745385	746600	1215
	750105	750493	388		746600	747257	657
	750493	750505	12		747257	748585	1328
	750505	750880	375		748585	749105	520
	752325	752640	314.5		749105	749422	316.5
	752640	752647	7		749422	749429	7
	752647	752965	318.5		749429	749745	316.5
	753975	754423	448		749745	750105	360
	754423	754458	35		750105	750493	388
	754458	754915	457		750493	750505	12
	755745	756067	321.5		750505	750880	375
	756067	756074	7		750880	751095	215
	756074	756385	311.5		751095	752325	1230
	757445	757767	321.5		752325	752640	314.5
	757767	757774	7		752640	752647	7
	757774	758085	311.5		752647	752965	318.5
	759325	759722	397		752965	753975	1010
	759722	759734	12		753975	754423	448
	759734	760110	376		754423	754458	35
	761405	761702	296.5		754458	754915	457
	761702	761709	7		754915	755745	830
	761709	762025	316.5		755745	756067	321.5
	762320	762740	420		756067	756074	7
	762740	762752	12		756074	756385	311.5

Side	Design Chainage (m)		Length (m)	Side	Design Chainage (m)		Length (m)
	From	To			From	To	
	762752	763145	393		756385	756535	150
	764685	765044	359		756535	757085	550
	765044	765056	12		757085	757445	360
	765056	765425	369		757445	757767	321.5
	767585	767900	314.5		757767	757774	7
	767900	767907	7		757774	758085	311.5
	767907	768245	338.5		758085	758235	150
	769580	769950	370		758235	759185	950
	769950	769985	35		759185	759325	140
	769985	770435	450		759325	759722	397
	772685	773051	366		759722	759734	12
	773051	773063	12		759734	760110	376
	773063	773460	397		760110	761405	1295
	775630	776085	454.7		761405	761702	296.5
	776085	776750	665.3		761702	761709	7
	776750	777383	633		761709	762025	316.5
	777383	777865	482		762025	762320	295
	779125	779442	316.5		762320	762740	420
	779442	779449	7		762740	762752	12
	779449	779805	356.5		762752	763145	393
	779890	780272	382		763145	763545	400
	780272	780284	12		763545	764555	1010
	780284	780685	401		764555	764685	130
	783805	784235	430		764685	765044	359
	784235	784355	120		765044	765056	12
	784355	784760	405		765056	765425	369
	Total		**44935**		765425	766085	660
					766085	767485	1400
					767485	767585	100
					767585	767900	314.5
					767900	767907	7
					767907	768245	338.5
					768245	769580	1335
					769580	769950	370
					769950	769985	35
					769985	770435	450
					770435	771242	807
					772685	773051	366
					773051	773063	12
					773063	773460	397
					775630	776085	454.7
					776085	776750	665.3
					776750	777383	633
					777383	777865	482
					779125	779442	316.5
					779442	779449	7
					779449	779805	356.5
					779890	780272	382
					780272	780284	12
					780284	780685	401

Side	Design Chainage (m)		Length (m)	Side	Design Chainage (m)		Length (m)
	From	To			From	To	
					783805	784235	430
					784235	784355	120
					784355	784760	405
					Total		**63782**

3.4 Service Roads and Slip Road

Service Road

Service roads have been constructed at 53 locations along the project highway. The total length of service road (including LHS and RHS) is 78.534 kms and the width of service road is 5.5 to 7.0 m. Service roads are provided in both built-up sections and in open country. The details of service roads are provided in the table below.

Table 3-3 Details of Service Roads

Sr. No.	Design Chainage (km)		Length (m)	Width (m)	Remarks
	From	To			
1	716280	717445	1165	5.5	Both Side
2	718085	718235	150	5.5	Both Side
3	718235	718985	750	5.5	Both Side
4	718985	719165	180	5.5	Both Side
5	719785	720905	1120	5.5	Both Side
6	721525	721630	105	5.5	Both Side
7	724330	725220	890	7.0	Both Side
8	727570	728435	865	5.5	Both Side
9	728435	728525	90	7.0	Both Side
10	729155	729270	115	5.5	Both Side
11	730045	731100	1055	5.5	Both Side
12	731900	732365	465	5.5	Both Side
13	732365	733785	1420	7.0	Both Side
14	734585	734645	60	7.0	Both Side
15	734645	735015	370	7.0	Both Side
16	735015	736105	1090	5.5	Both Side
17	736725	737885	1160	5.5	Both Side
18	738665	739830	1165	5.5	Both Side
19	742850	744435	1585	5.5	Both Side
20	745220	745385	165	5.5	Both Side
21	745385	746600	1215	5.5	Both Side
22	747257	748585	1328	5.5	Both Side
23	748585	749105	520	5.5	Both Side
24	749745	750105	360	5.5	Both Side
25	750880	751095	215	7.0	Both Side
26	751095	752325	1230	5.5	Both Side
27	752965	753975	1010	7.0	Both Side
28	754915	755745	830	7.0	Both Side
29	756385	756535	150	7.0	Both Side
30	756535	757085	550	5.5	Both Side
31	757085	757445	360	5.5	Both Side
32	758085	758235	150	5.5	Both Side
33	758235	759185	950	5.5	Both Side

Sr. No.	Design Chainage (km)		Length (m)	Width (m)	Remarks
	From	To			
34	759185	759325	140	7.0	Both Side
35	760110	761405	1295	5.5	Both Side
36	762025	762320	295	5.5	Both Side
37	763145	763545	400	7.0	Both Side
38	763545	764555	1010	5.5	Both Side
39	764555	764685	130	7.0	Both Side
40	765425	766085	660	5.5	Both Side
41	766085	767485	1400	5.5	Both Side
42	767485	767585	100	5.5	Both Side
43	768245	769580	1335	5.5	Both Side
44	770435	771242	807	7.0	Both Side
45	771242	772685	1443	5.5	Both Side
46	773460	773685	225	5.5	Both Side
47	773685	774785	1100	5.5	Both Side
48	774785	775630	845	5.5	Both Side
49	777865	779125	1260	5.5	Both Side
50	779805	779890	85	5.5	Both Side
51	780685	783025	2340	5.5	Both Side
52	783025	783805	780	7.0	Both Side
53	784760	785544	784	5.5	Both Side
Total			**39267**		
Grand Total			**78534**		

Slip Road

The details of slip road constructed at Site is tabulated as below.

Table 3-4 Details of Slip Roads

Sr. No.	Design Chainage (Km)		Length (m)	Width (m)	Remarks
	From	To			
1	712900	713397	496.6	7	Both Side
2	713397	715797	2400	10	Both Side (Existing Carriageway Under Elevated Structure)
3	715797	716280	483.4	5.5	Both Side
4	717445	717746	300.5	5.5	Both Side
5	717746	717753	7	5.5	Both Side
6	717753	718085	332.5	5.5	Both Side
7	719165	719472	306.5	7	Both Side
8	719472	719479	7	7	Both Side
9	719479	719785	306.5	7	Both Side
10	720905	721222	316.5	7	Both Side
11	721222	721229	7	7	Both Side
12	721229	721525	296.5	7	Both Side
13	721630	722089	459	7	Both Side
14	722089	723840	1751	10	Both Side (Existing Carriageway Under Elevated Structure)
15	723840	724330	490	7	Both Side
16	725220	725648	428	5.5	Both Side
17	725648	727141	1493	10	Both Side (Existing Carriageway Under Elevated Structure)

Sr. No.	Design Chainage (Km)		Length (m)	Width (m)	Remarks
	From	To			
18	727141	727570	429	7	Both Side
19	728525	728842	316.5	7	Both Side
20	728842	728849	7	7	Both Side
21	728849	729155	306.5	7	Both Side
22	729270	729649	379	7	Both Side
23	729649	729661	12	7	Both Side
24	729661	730045	384	7	Both Side
25	731100	731491	391	7	Both Side
26	731491	731503	12	7	Both Side
27	731503	731900	397	7	Both Side
28	733785	734169	384	7	Both Side
29	734169	734181	12	7	Both Side
30	734181	734585	404	7	Both Side
31	736105	736417	311.5	7	Both Side
32	736417	736424	7	7	Both Side
33	736424	736725	301.5	5.5	Both Side
34	737885	738269	384	7	Both Side
35	738269	738281	12	7	Both Side
36	738281	738665	384	7	Both Side
37	739830	740291	461	7	Both Side
38	740291	742413	2122	10	Both Side (Existing Carriageway Under Elevated Structure)
39	742413	742850	437	7	Both Side
40	744435	744814	379	7	Both Side
41	744814	744826	12	7	Both Side
42	744826	745220	394	7	Both Side
43	749105	749422	316.5	7	Both Side
44	749422	749429	7	7	Both Side
45	749429	749745	316.5	7	Both Side
46	750105	750493	388	5.5	Both Side
47	750493	750505	12	5.5	Both Side
48	750505	750880	375	5.5	Both Side
49	752325	752640	314.5	7	Both Side
50	752640	752647	7	7	Both Side
51	752647	752965	318.5	7	Both Side
52	753975	754423	448	7	Both Side
53	754423	754458	35	7	Both Side
54	754458	754915	457	7	Both Side
55	755745	756067	321.5	7	Both Side
56	756067	756074	7	7	Both Side
57	756074	756385	311.5	7	Both Side
58	757445	757767	321.5	7	Both Side
59	757767	757774	7	7	Both Side
60	757774	758085	311.5	7	Both Side
61	759325	759722	397	7	Both Side
62	759722	759734	12	7	Both Side
63	759734	760110	376	7	Both Side
64	761405	761702	296.5	5.5	Both Side
65	761702	761709	7	5.5	Both Side
66	761709	762025	316.5	5.5	Both Side
67	762320	762740	420	5.5	Both Side

Sr. No.	Design Chainage (Km)		Length (m)	Width (m)	Remarks
	From	To			
68	762740	762752	12	5.5	Both Side
69	762752	763145	393	5.5	Both Side
70	764685	765044	359	7	Both Side
71	765044	765056	12	7	Both Side
72	765056	765425	369	7	Both Side
73	767585	767900	314.5	7	Both Side
74	767900	767907	7	7	Both Side
75	767907	768245	338.5	7	Both Side
76	769580	769950	370	7	Both Side
77	769950	769985	35	7	Both Side
78	769985	770435	450	7	Both Side
79	772685	773051	366	7	Both Side
80	773051	773063	12	7	Both Side
81	773063	773460	397	7	Both Side
82	775630	776085	454.7	7	Both Side
83	776085	776750	665.3	10	Both Side (Existing Carriageway Under Elevated Structure)
84	776750	777383	633	10	
85	777383	777865	482	7	Both Side
86	779125	779442	316.5	5.5	Both Side
87	779442	779449	7	5.5	Both Side
88	779449	779805	356.5	5.5	Both Side
89	779890	780272	382	5.5	Both Side
90	780272	780284	12	5.5	Both Side
91	780284	780685	401	5.5	Both Side
92	783805	784235	430	7	Both Side
93	784235	784355	120	7	Both Side
94	784355	784760	405	7	Both Side
Total			**32720**		
Grand Total (2 x 32720)			**65440**		

The photographs taken at the time of site visit is presented as below.

Figure 3-1 Photographs of Service / Slip Road

Slip Road at km. 784+400

Service Road at km. 781+450

Service Road at km. 780+750

Service Road at km. 765+150

Slip Road at km. 764+700

Service Road at km. 734+175

Entry / Exit Ramps

Entry / Exit and Acceleration / Deceleration lanes for entering into or exiting from the six lane carriageway provided in lengths indicated in table below.

Table 3-5 Details of Entry/ Exit Ramps

Sr. No.	Entry and Exit	
	Left	Right
1	718085	718085
2	724330	724330
3	730045	730045
4	738665	738665
5	746500	746500
6	747350	747350
7	750880	750880
8	760110	760110
9	770435	770435
10	784760	784760

The photographs taken at the time of site visit is presented as below.

Figure 3-2 Photographs of Entry / Exit Ramp

km. 738+680

km. 730+100

km. 724+350

3.5 Major Intersections

The Concessionaire has replaced at-grade intersections at 4 nos. locations. The Concessionaire has also provided proper connectivity i.e., approaches leading to and exit from these underpasses to the roads crossing the project highway. The details of the Major Intersections provided are presented as below.

Table 3-6 Details of Major Intersections

Sr. No.	Description	Chainage (km)	Location	Remarks
1	SH-87 Mirzapur - Gyanpur	741+010	Gopaiganj	
2	Mirzapur – Bhadohi	754+441	Aurai Village	Flyovers
3	Katkama – Kaptitai	769+967	Katchhwa Village	
4	Jakhani – Jansa	784+297	Rajatalab Village	

Figure 3-3 Photographs of Major Intersection

km. 741+010

km. 754+441

km. 769+967

km. 784+297

3.6 Minor Intersections

The existing minor intersections were improved as at-grade intersections in accordance with standard mentioned in the Schedule-D. The details of the Minor Intersections provided are presented as below.

Table 3-7 Details of Minor Intersections

Sr. No.	Description	Chainage (km)	
		Left	Right
1	Hirihiri Village	712+810	
2	Saripur	713+355	
3	Magha	713442	
4	Lalak bazzar	713+735	
5	Hirihiri Village	714+009	
6	Sikisaripur Village	714+273	
7	Sikisaripur Village		714+273
8	Lachhai		714+448
9	Janghai Village	714+835	
10	Bhatropur		715+197
11	Miyalganj Village	715+253	
12	Bhatropur		715+421
13	Handia Ploytechnic	715+855	
14	Lalbahdur Shastri		715+855
15	Handia Ploytechnic		716+005
16	Jagha		716+530
17	Basupur Village	716+530	
18	Dighari	717+945	
19	Tilakpur	721+523	
20	Baraut Village		722+800
21	Tela		722+962
22	Gudohate	723+245	
23	Tivarepur Village	723+639	
24	Navacharha Village	724+331	
25	Rashara Village	724+900	
26	Rashara	725+252	
27	Navacharha	725+556	
28	Sitamarahi		725+561
29	Mugraha		728+810
30	Kurmaicha	729+170	
31	Nawdhan	729+540	
32	Sitamarhi		729+655
33	Nawdhan	730+038	
34	Bashi		730+040
35	Navaganj	730+738	
36	Suryawan	731 +497	
37	Darwashin		731+818
38	Godhna	732+395	
39	Railway Station		732+408
40	Darwansi		732+655
41	Baragano	732+842	
42	PG College		733+200
43	Jangiganj		733+562

Sr. No.	Description	Chainage (km)	
		Left	Right
44	Sitamarhi		734+175
45	Mangalapur	734+570	
46	Dhainpur		734+788
47	Suryanwan	734+870	
48	Dhainpur		734 +950
49	Baragano	735+475	
50	Kisindavpur		735+900
51	Visundevpur		736+168
52	Damanpur	736+270	
53	Firorpur		736+685
54	Amanabad		737+390
55	Allpur	737+520	
56	Chhatmi		737+580
57	Madanpur	738+24 0	
58	Danpitty		738+275
59	Tulsipur		738+580
60	Gaharpur	738+690	
61	Koulapur		739+598
62	Kathouta	740+045	
63	Jugan ka	740+447	
64	Railway Station		740+442
65	Juganka	740+447	
66	Gyan pur	741 +000	
67	Mirzapur		741 +01 0
68	Mirzapur		741 +415
69	Bikapur	741 +565	
70	Baresu		742+050
71	Carpet Company		742+737
72	Gopepur		743+235
73	Obeetee Pvt. Ltd	743+500	
74	Amwan		743+965
75	Lohra	744+257	
76	Mowan		744+320
77	Parwathpur	744+472	
78	Saripur	744+820	
79	Amwan		745+013
80	Madhopur	745+705	
81	Aimauhot		745+830
82	Madhopur	745+975	
83	Axanpur	746+320	
84	Koilara		746-r717
85	Koilara		746+953
86	Gyanpur	746+992	
87	Kamaria		747+400
88	Kaidara		748+030
89	Aourangabad	748+638	
90	Natwa		749+015
91	Natwa		749+425
92	Cimli	749+666	
93	Factory		750+320
94	Khamharia		750+499

Sr. No.	Description	Chainage (km)	
		Left	Right
95	Makuwa	751+408	
96	Laxmanadihwa Airport		751 +530
97	Airport	751+785	
98	Bhawanipur	752+070	
99	Ghosia	752+300	
100	Bhawanipur		752 +643
101	Maduosingh	753+685	
102	Bhadohi	754+441	
103	Mirzapur		754+441
104	Railway Station	755+875	
105	Kayarmau		756+041
106	Sarau	756+070	
107	Meduipur		757+130
108	Bansdevpir	757+275	
109	Matkipur		757+770
110	Tiwvi		758+155
111	Tiwvi		758+295
112	Banavli		758+847
113	Chakopur	759+370	
114	Bhogamn		759+728
115	Chouri	759+735	
116	Umrata	759+895	
117	Bakholi		760+543
118	I twan		761+245
119	Lilapur	761+482	
120	Vikrampur		761+720
121	Katka	762+015	
122	P atkhovli		762+275
123	Kach hwa		762+757
124	Girlbara	762+935	
125	Katka		764+670
126	Saripur	764+918	
127	Shivrampur	765+050	
128	Bihra	765+628	
129	Gudiya		766+030
130	Gudiya		766+632
131	Buhra	766+875	
132	Land	767+152	
133	Land		767 +152
134	Land	767 +172	
135	Jhawwa		767+900
136	Thathra	769+205	
137	Thathra	769+536	
138	Kaptitai	769+967	
139	Kaptitai		769 +967
140	Chitrasinpur	770+183	
141	Purey		770 +625
142	Banpur	771+342	
143	Cochana		771 +760
144	Bahanavar		772 +345
145	Rupapur		773+057

Sr. No.	Description	Chainage (km)	
		Left	Right
146	Khochwan	773+057	
147	Haliya		773+353
148	Danghariya		773+975
149	Mugalari		775+000
150	Rane		776+400
151	Rane	776+400	
152	Mirzapur		776+417
153	Pa rtappur		777+800
154	Karuthapur		778+727
155	Chanja	779+445	
156	Narayaanpur		779+582
157	Khajuri		780+278
158	Khajuri	780+278	
159	Saidapur	781+400	
160	Rakhauna		781 +943
161	Mediganj	782+630	
162	Bhikha rip ur		783+347
163	Rajatalab Village	783+810	
164	Jakhani		784+440
165	Kachnar		784+850
166	Vebhanpur	784+850	
167	Gangapur	784+215	

Figure 3-4 Photographs of Minor Intersection

km. 730+411

km. 749+015

km. 766+632

km. 783+347

3.7 Condition Survey of Bridges

The inventory of structures including major bridges, minor bridges, underpasses and culverts is presented in table as below:

Table 3-8 Summary of Structures

Type of Structure	Total Number of Structures
Major Structures:	
Road Over Bridge (ROB)	Nil
Elevated Structure	5
Flyover	03
Vehicular Underpass (VUP)	11
Pedestrian Underpass (PUP)	12
Foot Over Bridge	02
Major Bridges (MJB)	Nil
Minor Bridges (MNB)	03
Culverts:	
Pipe Culverts	15
Box Culverts	33
Slab culvert	1
Total	**85**

The detailed condition survey of structures was carried out by visual inspection. The observations and findings are presented in table below:

Table 3-9 Structure Condition Survey - Flyover

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
1	754+441	Flyover 1 x 35	Age	New	New	The structure is in sound condition.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Single span (2x3 walls)	RCC Single span (2x3 walls)	
			Super Structure	04 Nos RCC Girder, RCC Slab	04 Nos RCC Girder, RCC Slab	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Mirzapur-Bhadoi Junction	Mirzapur-Bhadoi Junction	
			Parapet / Railing	RCC	RCC	
			Expansion Joint	Good	Good	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
2	769+967	Flyover 1 x 35	Age	New	New	The structure is in sound condition.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Single span (2x3 walls)	RCC Single span (2x3 walls)	
			Super Structure	04 Nos RCC Girder, RCC Slab	04 Nos RCC Girder, RCC Slab	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Mirzapur Road Junction	Mirzapur Road Junction	
			Parapet / Railing	RCC	RCC	
			Expansion Joint	Good	Good	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
3	784+297	Flyover 4 x 30	Age	New	New	The structure is in sound condition.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC, 3 Piers (3x3 walls), 2 Abutments (2x3 walls)	RCC, 3 Piers (3x3 walls), 2 Abutments (2x3 walls)	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
			Super Structure	04 Nos RCC Girder in each span, RCC Slab	04 Nos RCC Girder in each span, RCC Slab	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Raja Talab Village	Raja Talab Village	
			Parapet / Railing	RCC	RCC	
			Expansion Joint	Good	Good	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	

Figure 3-5 Photographs of Flyover

km. 754+441

km. 754+441

km. 754+441

km. 769+967

km. 769+967

km. 769+967

km. 784+297

km. 784+297

km. 784+297

Table 3-10 Structure Condition Survey - Elevated Structure

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
1	713+397 to 715+797, Total Length 2400m.	Elevated Structure-01 60 x 40	Age	New		The structure is in sound condition.
			Foundation	RCC		
			Sub structure Abutment / Pier	RCC, 59 Piers, 2 Abutments		
			Super Structure	Precast Segment + Wings		
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Handia Town		
			Parapet / Railing	RCC	RCC	
			Expansion Joint	Good	Good	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
2	722+085 to 723+845, Total Length 1760m.	Elevated Structure-02 44 x 40	Age	New		The structure is in sound condition.
			Foundation	RCC		
			Sub structure Abutment / Pier	RCC, 43 Piers, 2 Abutments		
			Super Structure	Precast Segment + Wings		
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Baraut Town		
			Parapet / Railing	RCC	RCC	
			Expansion Joint	Good	Good	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
3	725+650 to 727+140, Total Length 1490m.	Elevated Structure-03 03 x 30 + 35 x 40	Age	New		The structure is in sound condition.
			Foundation	RCC		
			Sub structure Abutment / Pier	RCC, 37 Piers, 2 Abutments		
			Super Structure	Precast Segment + Wings		
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Bhitti Town		
			Parapet / Railing	RCC	RCC	
			Expansion Joint	Good	Good	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
4	740+303 to 742+423, Total Length 2120m	Elevated Structure-04 53 x 40	Age	New		The structure is in sound condition.
			Foundation	RCC		
			Sub structure Abutment / Pier	RCC, 52 Piers, 2 Abutments		
			Super Structure	Precast Segment + Wings		
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Gopigunj Town		
			Parapet / Railing	RCC	RCC	
			Expansion Joint	Good	Good	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
5	776+086 to 777+386, Total Length 1300m.	Elevated Structure-05 02 x 30 + 31 x 40	Age	New		The structure is in sound condition.
			Foundation	RCC		
			Sub structure Abutment / Pier	RCC, 32 Piers, 2 Abutments		
			Super Structure	Precast Segment + Wings		
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Mirzamurad Town		
			Parapet / Railing	RCC	RCC	
			Expansion Joint	Good	Good	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	

Figure 3-6 Photographs of Elevated Structure

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 713+397 to km. 715+797

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 722+085 to km. 723+845

km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

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km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

km. 725+650 to km. 727+140

km. 740+303 to km. 742+423

km. 740+303 to km. 742+423

km. 740+303 to km. 742+423

km. 740+303 to km. 742+423

km. 740+303 to km. 742+423

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km. 740+303 to km. 742+423

km. 740+303 to km. 742+423

km. 740+303 to km. 742+423

km. 776+086 to km. 777+386

km. 776+086 to km. 777+386

km. 776+086 to km. 777+386

km. 776+086 to km. 777+386

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km. 776+086 to km. 777+386

km. 776+086 to km. 777+386

km. 776+086 to km. 777+386

km. 776+086 to km. 777+386

Table 3-11 Structure Condition Survey - Minor Bridge

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
1	722+035	Minor Bridge 3 x 3.5	Age	New	New	The structure is in sound condition.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	Stone Pitching	Stone Pitching	
			Nalla Bed	Riverbed	Riverbed	
			Parapet / Railing	RCC	RCC	
			Expansion Joint	NA	NA	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
2	730+411	Minor Bridge 3 x 8.5	Age	New	New	The structure is in sound condition.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	Stone Pitching	Stone Pitching	
			Nalla Bed	Riverbed	Riverbed	
			Parapet / Railing	RCC	RCC	
			Expansion Joint	NA	NA	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
3	767+162	Minor Bridge 3 x 3.0	Age	New	New	The structure is in sound condition.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	Stone Pitching	Stone Pitching	
			Nalla Bed	Riverbed	Riverbed	
			Parapet / Railing	RCC	RCC	
			Expansion Joint	NA	NA	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	

Figure 3-7 Photographs of Minor Bridge

km. 722+035

km. 730+411

km. 767+162

Table 3-12 Structure Condition Survey - Vehicular underpass

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
1	729+655	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
2	731+497	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
3	734+175	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
4	738+275	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
5	744+820	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
6	750+499	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
7	759+728	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
8	762+746	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
9	765+050	Vehicular Underpass 1 x 12	Age	New	New	The condition of the
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
			Super Structure	RCC Box	RCC Box	structure is good.
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
10	773+057	Vehicular Underpass 1 x 12	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
11	780+278	Vehicular Underpass 1 x 12				De-scoped.

Figure 3-8 Photographs of Vehicular Underpass

km. 729+655

km. 729+655

km. 729+655

km. 731+497

km. 731+497

km. 731+497

km. 734+175

km. 734+175

km. 734+175

km. 738+275

km. 738+275

km. 738+275

km. 744+820

km. 744+820

km. 744+820

km. 750+499

km. 750+499

km. 750+499

km. 759+700

km. 759+700

km. 759+700

km. 762+746

km. 762+746

km. 762+746

km. 765+050

km. 765+050

km. 765+050

km. 773+057

km. 773+057

km. 773+057

Table 3-13 Structure Condition Survey - Pedestrian underpass

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
1	717+749	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
2	719+474	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
3	721+225	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
4	728+845	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
5	736+420	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
6	749+425	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
7	752+643	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
8	756+070	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
9	757+770	Pedestrian Underpass 1 x 7	Age	New	New	The condition of
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
			Super Structure	RCC Box	RCC Box	the structure is good.
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
10	761+720	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
11	767+903	Pedestrian Underpass 1 x 7	Age	New	New	The condition of the structure is good.
			Foundation	RCC	RCC	
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	
12	779+445		Age	New	New	

Sr. No.	Chainage (km)	Type of Bridge / Spans (m)	Features and Observation			General Comments
			Component	LHS	RHS	
		Pedestrian Underpass 1 x 7	Foundation	RCC	RCC	The condition of the structure is good.
			Sub structure Abutment / Pier	RCC Box	RCC Box	
			Super Structure	RCC Box	RCC Box	
			Slope Protection	RE Walls	RE Walls	
			Nalla Bed	Village Road, Minor Junctions	Village Road, Minor Junctions	
			Parapet / Railing	RCC	RCC	
			Wearing Coat / Surface	BC, fair condition	BC, fair condition	
			Approach Slope	Stable	Stable	
			Drainage	Good	Good	

Figure 3-9 Photographs of Pedestrian Underpass

km. 717+749

km. 717+749

km. 717+749

km. 719+474

km. 719+474

km. 721+225

km. 721+225

km. 728+845

km. 736+420

km. 749+425

km. 749+425

km. 752+643

km. 752+643

km. 756+070

km. 757+770

km. 757+770

km. 761+720

km. 761+720

km. 761+720

km. 767+903

km. 767+903

km. 779+445

km. 779+445

km. 779+445

3.8 Condition Survey of Culverts

The cross-drainage structure includes hume pipe culverts and box culverts at various locations. There are 15 Nos. of pipe culverts, 34 Nos. of box culverts along the project road. The height of culvert varies from 1.0 m to 3.0 m from bed level. During the condition survey of structure, these culverts were inspected on sample basis.

The project involves strengthening and widening of existing road to six lane divided carriageway. The culverts beneath existing alignment are either widened or reconstructed. The structural condition of culverts is generally found to be in sound condition. The quality of surface concrete of box culverts is satisfactory. The RCC parapet, metal beam crash barrier or RCC railing has been provided at culvert locations, which is maintained properly.

Vegetation growth and accumulation of debris at waterway is being removed and cleaned by the Concessionaire on regular basis.

Table 3-14 Condition Survey - Box Culvert

Sr. No.	Chainage (km)	Type of Structure	Span Arrangement	Length (m)		Clear vent way		Invert Level	Remarks
				LHS	RHS	Width (m)	Height (m)		
1	716+397	RCC Box	1 x 3.0	12.400	12.600	3.070	2.550	97.9	The culverts are in sound condition. As informed, vegetation is being cleaned on regular basis.
2	724+843	RCC Box	1 x 2.0	14.300	14.500	2.150	1.930	97.09	
3	727+013	RCC Box	1 x 5.0	2.000	2.000	5.000	3.400	95.640	
4	731+244	RCC Box	1 x 1.9	23.400	23.400	2.000	2.500	95.854	
5	734+729	Slab Culvert	1 x 5.5	6.500	12.000	3.750	2.820	92.81	
6	734+871	RCC Box	1 x 2.0	15.030	12.000	1.950	2.800	93.26	
7	739+137	RCC Box	1 x 3.0	11.850	12.500	2.000	2.150	93.4	
8	743+339	RCC Box	1 x 1.0	12.600	11.800	1.000	1.150	94.02	
9	748+851	RCC Box	1 x 3.75	12.900	11.500	4.230	2.280	93.9	
10	751+756	RCC Box	1 x 1.0	13.000	12.135	1.300	1.130	94.090	
11	753+647	RCC Box	1 x 2.0	6.680	6.770	2.000	1.690	94.24	
12	760+900	RCC Box	1 x 2.0	12.810	13.120	2.000	1.800	92.57	
13	765+726	RCC Box	1 x 4.5	12.370	12.435	4.500	3.700	91.85	
14	775+078	RCC Box	1 x 3.0	7.900	7.730	3.000	2.400	90.63	
15	782+674	RCC Box	1 x 2.0	12.850	13.000	2.450	1.740	88.84	
16	783+455	RCC Box	1 x 3.0	13.450	13.850	3.000	2.100	89.242	
17	720+995	RCC Box	1 x 3.0	23.340	23.340	3.000	2.600	95.320	
18	729+112	RCC Box	1 x 2.0	23.340	23.340	2.000	2.300	95.701	
19	736+420	RCC Box	1 x 5.0	22.090	22.090	5.000	3.500	91.313	
20	742+647	RCC Box	1 x 4.0	21.775	21.775	4.000	2.600	92.011	
21	750+619	RCC Box	1 x 3.85	20.900	20.900	3.850	2.900	92.33	
22	759+473	RCC Box	1 x 3.0	23.340	23.340	3.000	3.800	88.690	
23	761+850	RCC Box	1 x 2.0	21.840	21.840	2.000	1.500	90.67	
24	764+911	RCC Box	1 x 1.0	23.340	23.340	1.000	2.250	90.198	
25	770+138	RCC Box	1 x 2.0	23.340	23.340	2.000	2.300	89.48	
26	777+476	RCC Box	1 x 4.0	21.775	21.775	4.000	3.480	87.94	
27	778+164	RCC Box	1 x 1.0	24.500	24.500	1.000	1.480	89.18	
28	784+312	RCC Box	1 x 1.25	23.340	23.340	1.250	2.280	87.92	
29	713+049	RCC Box	1 x 5.0	21.775	21.775	5.000	2.480	96.189	
30	724+275	RCC Box	2 x 2.0	21.715	21.715	2.000	1.500	96.872	

Sr. No.	Chainage (km)	Type of Structure	Span Arrangement	Length (m)		Clear vent way		Invert Level	Remarks
				LHS	RHS	Width (m)	Height (m)		
31	717+146	RCC Box	2 x 2.0	24.250	24.250	2.000	1.500	98.628	
32	764+485	RCC Box	2 x 2.0	24.250	24.250	2.000	1.500	97.528	
33	714+849	RCC Box	1 x 1.85						
34	722+428	RCC Box	1 x 2.0						

Table 3-15 Condition Survey - Pipe Culvert

Sr. No.	Chainage	Dia of pipe in mm	No. of ROW	Length in Mts.	Invert Level		Remarks
					LHS	RHS	
1	716+590	1200	1	23.800	98.553	98.441	The culverts are in sound condition. As informed, vegetation is being cleaned on regular basis.
2	718+733	1200	1	20.000	96.558	96.589	
3	719+364	1200	1	20.000	96.601	96.523	
4	728+100	1200	1	28.000	96.053	96.156	
5	733+378	1200	2	25.000	95.379	95.329	
6	733+727	1200	2	25.000	94.439	94.369	
7	745+018	1200	1	20.000	94.288	94.342	
8	749+247	1200	1	35.000	89.825	89.849	
9	751+142	1200	1	24.000	92.321	91.930	
10	761+343	1200	1	22.400	90.952	90.804	
11	768+294	1200	3	21.440	89.825	89.849	
12	713+892	1000	2				
13	723+733	1000	1				
14	726+020	1000	2				
15	740+608	1000	1				

Figure 3-10 Photographs of Culverts

km. 783+455

km. 775+100

km. 765+700

km. 764 +900

km. 764 + 485

km. 759 + 473

km. 748 +851

km. 736 + 400

km. 718+737(pipe)

km. 739 + 600

Table 3-16 Condition Survey - Foot Over Bridge (FOB)

Sr. No.	Chainage (km)	Type of Structure	Length (m)	Clear vent way		Remarks
				Width (m)	Vertical clearance (m)	
1	771+765	FOB	60.0	3.000	5.50	Structure is in sound condition
2	781+937	FOB	60.0	3.000	5.50	Structure is in sound condition

Figure 3-11 Photographs of Foot Over Bridge

FOB at km. 771+765

FOB at km. 781+937

FOB at km. 781+937

3.9 Drainage System

There are RCC box drains at the built-up areas and RCC open drain at rural areas provided for the project highway. Lined median longitudinal drain is provided at super-elevated sections. The roadside drainage along the project highway including median portion needs to be maintained by cleaning debris on regular basis. Some of the photographs of the drains provided are presented as below.

Figure 3-12 Photographs of Drain

RCC Open Drain at km. 762+000

Drain at Service Road at km. 757+200

3.10 Road Furniture

Pavement Marking

Pavement marking for the project highway is done as per the design standards indicated in section 12 of Schedule-D. The painting is being done wherever is required on regular basis including the pavement marking where recently overlaid at the time of routine maintenance. Some of the photographs of road marking are presented below.

Figure 3-13 Photographs of Road Markings

Road Marking to be done at km. 779+850

Road Marking at km. 761+200.

Traffic Signage

Traffic signs includes roadside signs, overhead signs, kerb mounted signs and median signs along the project highway. The design for the traffic signs along the project highway is done as per the design standards indicated in section 11 of Schedule-D.

The height, lateral clearance, location and installation are as per relevant clauses of Schedule 'D'. Overhead sign has been installed ahead of major intersections, toll plazas, start / end of project highway and urban areas as per detailed design requirements.

The sign boards, kilometer stones and hectometer stones are being replaced wherever damaged.

Some of the photographs of sign boards are presented below.

Figure 3-14 Photographs of Road Sign Boards

Overhead Gantry Sign at km. 785+040

Cantilever Gantry Sign at km. 782+500

Sign Board at km. 767+100.

Cantilever Gantry Sign at km. 713+000.

Km Stone at km. 776+000

Km Stone at km. 751+000

Highway Lighting

Highway lighting is provided at underpasses, flyovers, truck lay-byes, toll plaza and built-up locations. High mast lighting is provided at toll plaza location.

At underpass and flyover locations, highway lighting is provided at the structure locations and at its approaches.

Solar amber blinker signals are provided at each at-grade intersections and at median opening locations. These lights are properly maintained and are in good working condition. Regular maintenance work is carried out to ensure their efficient operation. Some of the photographs of highway lightings are presented below.

Figure 3-15 Photographs of Highway Lighting

Highway Lighting at km. 773+100

Highway Lighting at km. 740+300

LED Blinker at km. 741+010

LED Blinker at km. 754+441

Crash Barriers

Metal beam crash barriers are provided at bridge approaches, in between main road and service road locations. All the crash barriers provided by the Concessionaire are well maintained at site. Some of the photographs of metal beam crash barriers are presented below.

Figure 3-16 Photographs of Crash Barriers

Crash Barrier at km. 785+240

Crash Barrier at km. 782+000

Pedestrian Guard Rail

The pedestrian guard rails are provided between main road and truck lay bye locations. Some of the photographs of pedestrian guard rails are presented below.

Figure 3-17 Photographs of Pedestrian Guard Rail

Pedestrian Guard Rail at km. 727+900

Pedestrian Guard Rail at km.766+600

3.11 Median Plantation

Median Plantation is available intermittently along the project highway. Variety of trees and plants are planted throughout the corridor at median side. Median plantation is maintained along the project highway. The plantation is being done wherever required on regular basis. Some of the photographs of avenue plantation and median plantation are presented below.

Figure 3-18 Photographs of Median Plantation

Median Plantation at km. 752+000

Median Plantation at km. 732+000

3.12 Project Facilities

Toll Plaza

The Concession Agreement requires construction of Toll Plaza in a staggered manner. Accordingly, Concessionaire has constructed Toll Plaza at following locations.

1. Toll Plaza-1 at km. 747+581 (LHS) and at km. 747+822 (RHS)

The construction of toll plaza is completed and is in operational. Each direction of toll plaza has 7 No. of toll lane and all are under operation. Concessionaire has constructed administration, operation and maintenance facility at toll plaza. All required facilities are available at the toll plaza. Some of the photographs of toll plaza are presented below.

Figure 3-19 Photographs at Toll Plaza

Toll Plaza including Admin Building at km. 747+581

Toll Plaza including Admin Building at km. 747+822

Weigh-in-Motion

Ambulance at Toll Plaza

Toll Signal light

Toilet Block at Toll Plaza

Truck Lay Byes

Concession Agreement has proposed construction of truck lay-byes at 4 Nos. of locations. The work is completed as per requirement of Concession Agreement. Truck lay byes are provided at the following locations.

Figure 3-20 Photographs at Truck Lay Bye

Truck Lay Bye at km. 727+900

Truck Lay Bye at km. 767+330

Table 3-17 Details of Truck Lay-Byes

Sr. No.	Location (km)	Side
1	727+900	RHS
2	728+200	LHS
3	766+600	RHS
4	767+330	LHS

Bus Bay and Passenger Shelter

Bus Bays and passenger shelters are constructed at the various locations along the project highway. 15 Nos. of bus bays with passenger shelters are provided with project highway and 21 Nos. of passenger shelters are provided along project highway. Bus bays are equipped with all necessary signage as per relevant IRC guidelines mentioned in Schedule-D of Concession Agreement. The details of the bus bays and passenger shelters provided are as tabulated below.

Table 3-18 Details of Bus Bays along Project Highway

Sr. No.	Chainage (km)	Side	Remarks
1	713+200	LHS	Bus bay with Bus shelter
2	713+200	RHS	Bus bay with Bus shelter
3	716+120	LHS	Bus shelter
4	716+120	RHS	Bus shelter
5	721+880	LHS	Bus bay with Bus shelter
6	721+880	RHS	Bus bay with Bus shelter
7	724+460	LHS	Bus bay with Bus shelter
8	724+460	RHS	Bus bay with Bus shelter
9	728+605	LHS	Bus bay with Bus shelter
10	728+655	RHS	Bus bay with Bus shelter

Sr. No.	Chainage (km)	Side	Remarks
11	732+480	LHS	Bus bay with Bus shelter
12	732+497	RHS	Bus bay with Bus shelter
13	733+815	RHS	Bus bay with Bus shelter
14	733+900	LHS	Bus bay with Bus shelter
15	736+100	LHS	Bus bay with Bus shelter
16	736+100	RHS	Bus bay with Bus shelter
17	739+395	LHS	Bus shelter
18	739+420	RHS	Bus shelter
19	742+700	RHS	Bus shelter
20	743+100	LHS	Bus shelter
21	749+575	LHS	Bus shelter
22	750+225	RHS	Bus bay with Bus shelter
23	753+885	LHS	Bus shelter
24	753+885	RHS	Bus shelter
25	760+030	LHS	Bus shelter
26	760+030	RHS	Bus shelter
27	764+770	LHS	Bus shelter
28	764+770	RHS	Bus shelter
29	766+420	LHS	Bus shelter
30	768+420	RHS	Bus shelter
31	770+550	LHS	Bus shelter
32	770+700	RHS	Bus shelter
33	775+900	RHS	Bus shelter
34	775+900	LHS	Bus shelter
35	784+880	LHS	Bus shelter
36	785+020	RHS	Bus shelter

Figure 3-21 Photographs of Bus Bay

Bus Shelter at km. 775 + 900

Bus Shelter at km. 767+915

Bus Shelter

Bus Bay and Bus Shelter

Toilet Block

Toilet block are provided at following locations.

Sr. No.	Chainage (km)	Location	Side	Location
1	713+260	Handia	RHS	Toilet Block, Bus Shelter
2	713+270	Handia	LHS	Toilet Block, Bus Shelter
3	715+930	Handia	LHS	Toilet Block, Bus Shelter
4	716+120	Handia	RHS	Toilet Block, Bus Shelter
5	721+910	Baraut	LHS	Toilet Block, Bus Shelter
6	721+880	Baraut	RHS	Toilet Block, Bus Shelter
7	728+660	Unj Thana	RHS	Toilet Block, Bus Shelter
8	732+500	Vahida	RHS	Toilet Block, Bus Shelter
9	732+500	Vahida	LHS	Toilet Block, Bus Shelter
10	733+900	Jangiganj	RHS	Toilet Block, Bus Shelter
11	742+810	Gopiganj	RHS	Toilet Block, Bus Shelter
12	747+900	Toll Plaza	RHS	Toilet Block, Bus Shelter
13	747+900	Toll Plaza	LHS	Toilet Block,
14	750+200	Madhosingh	RHS	Toilet Block, Bus Shelter
15	753+885	Auarai	LHS	Toilet Block, Bus Shelter
16	754+130	Auarai	RHS	Toilet Block, Bus Shelter
17	760+080	Maharajganj	LHS	Toilet Block, Bus Shelter
18	764+770	Babusaray	RHS	Toilet Block,
19	768+420	Thathara	RHS	Toilet Block, Bus Shelter
20	770+750	Kachhwa	RHS	Toilet Block, Bus Shelter
21	775+900	Mirzamurad	RHS	Toilet Block, Bus Shelter
22	775+910	Mirzamurad	LHS	Toilet Block, Bus Shelter

Figure 3-22 Photographs of Toilet Block

Toilet Block at km. 764+770

Toilet Block at km. 768+420

Toilet Block at km. 754+130

Toilet Block at km. 775+910

Rest Area

Rest Areas are provided at following locations.

Sr. No	Chainage (km)	Location	Side	Location
1	727+800	Bheetee	RHS	Rest Area
2	766+320	Bihada	LHS	Rest Area
3	767+500	Bihada	RHS	Rest Area

Figure 3-23 Photographs of Rest Area

Rest Area at km. 727+800

Rest Area at km. 767+500

4 PAVEMENT AND SITE INVESTIGATION

4.1 General

The project has been developed through Public Private Partnership (PPP) on Hybrid (Annuity) mode basis. The concession period of the project is 17.5 years including 2.5 years (910 days) of construction period.

The Provisional Completion Certificate (PCOD) for the length of 72.644 kms has been received on 2nd November 2020. The project is currently under O&M stage. The Operation and Maintenance period of the project highway is 15 years from Provisional Completion Certificate (PCOD).

4.2 Details of As-built Pavement

The project highway comprises of rigid pavement (42.842 kms out of 72.644 kms) and flexible pavement (9.456 kms out of 72.644 kms) and combined pavement (one side flexible pavement and another side rigid pavement) (20.346 kms out of 72.644 kms) on main carriageway. The details of the as-built pavement crust from pavement design report as submitted by the Company has been tabulated as below:

The rigid pavement is designed for the design life of 30 years and 8% CBR with specifications as per IRC:58-2015.

Table 4-1 Rigid Pavement Details

Sr. No.	Location	Panel Size (m)	Crust	Dowel bar	Tie bar
1	Main Carriageway (3rd lane in Widening on either side	4.5 x 4	PQC - 310 mm DLC - 150 mm GSB - 150 mm	36 mm dia. Spacing - 300 mm, Length - 450 mm	12 mm dia. Spacing - 500 mm, Length - 640 mm
2		4.5 x 4.5			12 mm dia. Spacing - 450 mm, Length - 640 mm
3	Slip Road along Elevated Structure	4.5 x 2.5	PQC - 270 mm DLC - 150 mm GSB - 150 mm	32 mm dia. Spacing -300 mm, Length -450 mm	12 mm dia. Spacing - 720 mm, Length - 640 mm

The flexible pavement is designed for the design life of 15 years, design traffic of 95 MSA and 8% CBR as per specifications of IRC:37-2012.

The flexible pavement is designed as stage construction. The 1st stage is designed for a period from year 2021 to year 2026 and 2nd stage will be designed for a period from year 2027 to year 2035 using FWD method of deflection measurement or any other suitable technique prevailing at that time.

The details of as built flexible pavement as per Stage-I is given below:

Table 4-2 Flexible Pavement Details

Location	Crust Composition	Thickness at widening section (mm)
Main Carriageway 3rd lane in Widening on either side)	BC (VG-40)	50 mm
	DBM (VG-40)	100 mm
	WMM	250 mm
	GSB	200 mm
Main Carriageway at the Approach of the Structure	BC (VG-40)	50 mm
	DBM (VG-40)	65 mm
	WMM	250 mm
	GSB	200 mm

The service / slip road pavement is designed for the design life of 15 years for design traffic of 10 MSA and 8% CBR as per specifications of IRC:37-2012.

Table 4-3 Service / Slip Road Pavement Details

Location	Crust Composition	Thickness (mm)
Service Roads and Slip Road (excluding Elevated structure and Flyovers)	BC (VG-30)	40 mm
	DBM (VG-30)	60 mm
	WMM	200 mm
	GSB	200 mm

4.3 Surveys and Investigation

4.3.1 Pavement Condition Survey

Pavement condition survey was carried out from **7th August to 9th August 2022** through visual inspection for the entire project length. The details of the visual condition survey are provided in **Annexure-IV.**

The summary of pavement condition based on the visual inspection is tabulated below.

Table 4-4 Summary of Pavement Condition

Design Chainage (km)		Length (km)	Visual Condition (As per IRC:115-2014)	
From	To		LHS Carriageway	RHS Carriageway
712.900	715.000	2.100	Good	Good
715.000	720.000	5.000	Good/fair	Good
720.000	725.000	5.000	Good/fair	Good
725.000	730.000	5.000	Good/fair	Good
730.000	735.000	5.000	Good/fair	Good
735.000	740.000	5.000	Good/fair	Good
740.000	745.000	5.000	Good/fair	Good
745.000	750.000	5.000	Good/fair	Good
750.000	755.000	5.000	Good/fair	Good
755.000	760.000	5.000	Good/fair	Good
760.000	765.000	5.000	Good/fair	Good
765.000	770.000	5.000	Good/fair	Good
770.000	775.000	5.000	Good/fair	Good/fair
775.000	780.000	5.000	Good/fair	Good
780.000	785.544	5.544	Good/fair	Good/fair

Observation and Conclusion:

From the above table, it is observed that the overall pavement condition for the entire project stretch is found to be Good / Fair.

Following Photographs were taken at the time of visual pavement condition survey.

Figure 4-1 Photographs of Pavement Condition Survey

Pavement Condition at km. 785+200 (RHS)

Pavement Condition at km. 785+650 (RHS)

Pavement Condition at km. 782+500 (RHS)

Pavement Condition at km. 779+600 (RHS)

Pavement Condition at km. 765+100 (RHS)

Pavement Condition at km. 722+100 (RHS)

4.3.2 Roughness Index test

Prior period report for the Roughness Index Test conducted by **Aadharshila Infratech Pvt. Ltd.** Dated **21st and 22nd January 2022** has been provided by the Concessionaire. This test was done using Car Mounted Bump Integrator to assess the riding quality on each direction (each lane) of the carriageway of project highway.

As per IRC:SP:16-2019, condition of pavement is categorised under:

Table 4-5 Maximum Permissible Values of Roughness (BI Value - mm / km)

Sr. No.	Roughness Range (m/km)	Severity	Inner Lane (Lane-1) LHS Length (km)	Divided Lane 1 (Lane-2) LHS (Length in Km)	Outer Lane (Lane-3) LHS Length (km)	Inner Lane (Lane-1) RHS Length (km)	Divided Lane 1 (Lane-2) RHS (Length in Km)	Outer Lane (Lane-3) RHS Length (km)
1	Less than 2.81	Good	50.100	48.200	71.944	63.944	63.844	72.444
2	2.81-3.30	Fair	22.544	24.444	0.700	8.700	8.800	0.200
3	More Than	Poor	-		-	-		-

TDD Consultant's Observations:

TDD Consultants have visited the project site to understand the status of project under O&M stage. Observations during site visit are as presented below:

1. At few locations hair cracks have developed in main carriageway.
2. Service road & main carriageway has been maintained as per O&M Agreement. At few locations BC overlay has done at distressed locations.
3. The PQC cracks have been filled with the suitable materials.
4. Thermoplastic paint on main carriageway and service road has faded at some locations.
5. At several places, unauthorized access has made by the locals which is being closed by the Concessionaire.
6. At many locations, MBCB has broken. The Concessionaire is maintaining the rectification on daily basis.

7. At few locations, cover of drain has cracks which needs to be rectified.
8. It has been observed visually that overall condition of all structures is good. However, vegetation, bushes and waterway need to be cleaned in minor bridges, pipe & box culverts as well as chute drain need to be cleaned from debris / vegetation.

However, the Concessionaire is repairing / rectifying the damaged portion on regular basis as a part of routine maintenance.

5 BALANCE WORKS

The project has received Provisional Completion Certificate (PCOD) on 02nd November 2020 with minor balance works to be executed. As informed by the Concessionaire, 125 m of service road and 385 m of RCC drain, 6 Nos. of bus bays, 16 Nos. toilet blocks, 1 No. of rest area at truck lay-bye location is pending. The balance work is pending due to non availability of required land.

As informed by the Concessionaire, an amount of Rs. 4.88 Crores of work is balance at Site.

6 REVIEW OF CONCESSION AGREEMENT

6.1 General

The National Highways Authority of India (NHAI) in accordance with the statutory powers vested on it by the Government of India has entered into a Concession Agreement with the M/s. Varanasi Sangam Expressway Private Limited, a Special Purpose Vehicle (SPV) formed for implementing this project, a company incorporated under Indian Companies Act, 2013 for Design, Engineering, Construction, Development, Operation and Maintenance of the 6-Laning of Handia Varanasi Section of NH-2 from km. 713+416 to km. 785+544 in the State of Uttar Pradesh. The project is to be developed on Design, Build, Operate and Transfer on DBOT Annuity basis.

6.2 Specific Comments on Articles

We have reviewed the provisions under various clauses of the Agreement concerned with post construction period. Our specific comments are indicated below clause-wise.

Sr. No.	Article and Clause No.	Description in brief	Remark
1	Definitions O&M	O&M means the operation and maintenance With provision of this Agreement.	The Operation and Maintenance is defined.
2	Definitions O&M	"O&M Expenses" means expenses incurred by the concessionaire, O&M Contractor or on behalf of the Concessionaire or by the Authority, as the case may be, for all 0&M including (a) cost of salaries and other compensation to employees, [b] cost of materials, supplies, utilities and other services, (c) premier for insurance, (d) all taxes, duties, cess and fees due and payable for O&M, (e) all repair, replacement, reconstruction, reinstatement, improvement and maintenance costs, if payments required to be made under the O&M Agreement or any other contract in connection with or incidental to 0&M, and is) all other expenditure required to be incurred under Applicable Laws, Applicable Permits or this Agreement.	The items which include the expenses is explained.
3	Article 2 Scope of Project	2.1 Scope of Project The scope oi the Project [the "Scope of the Project") shall mean and include during Concession Period: (b) operation and maintenance of-the Project in accordance with the provisions of this Agreement	The O&M of road after COD is in scope of Concessionaire as per specifications & standards of Agreement.
4	Article 3 Grant of Concession	3.1 The Concession 3.1.1 Subject to and in accordance with the provisions of this Agreement, Applicable laws and Applicable Permits, the Authority hereby grants to the Concessionaire the forth herein including the exclusive right, license and	The construction period is 910 days and the O&M period is 15 years from COD.

Sr. No.	Article and Clause No.	Description in brief	Remark
		authority to construct, operate and maintain the Project (the "Concession" during the Construction Period of 910 (nine hundred and tenth day) days and Operation Period of 15 [Fifteen] years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.	
5	Article 5 Clause 5.3 Obligations relating to Change in owner	5.3.1 The Concessionaire shall not undertake or permit any Change in Ownership, except with the prior written approval of the Authority.	The risk and safety of Authority and Lender is covered.
6	Article 8 Disclaimer	Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the Authority shall not be liable in any manner for such risks or the consequences thereof.	All risk in project is of Concessionaire and its consequences.
7	Article 9 Performance Security	9.1.1 The Concessionaire shall for the performance of its obligations hereunder, provide to the Authority no later than 30 (thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank for Sum equivalent to Rs 122.35 crore (Rupees one hundred twenty-two crore and thirty-five lakh only) in the form set forth in Schedule-F (the "Performance Security").	The Concessionaire has to work and perform as per Agreement to protect the Performance Security.
8	Article 17 Clause 17.1 O&M Obligations of the Concessionaire	17.1.1 During the Operation Period, the Concessionaire shall operate and maintain the Project in accordance with this Agreement either by Itself, or through the O&M Contractor and if required, modify, repair or otherwise make improvements to the Project to comply with the previsions of this Agreement, Applicable Laws and Applicable Permits, and conform to Specifications and Standards and Good Industry Practice. The obligations of the Concessionaire hereunder shall include: (a) Procuring and ensuring safe. smooth and uninterrupted use of the Project, including prevention of loss or damage thereto, during normal operating conditions; (b) Minimizing disruption in the event of accidents or other incidents affecting the safety and use of the Project by providing a rapid and effective response and maintaining liaison with emergency services of the State; (c) Carrying out periodic preventive maintenance of the Project;	The responsibility of O&M is of Concessionaire as per provision of Agreement, standards and specifications. The Concessionaire has to take care of safety. Routine periodically major maintenance is in scope.

Sr. No.	Article and Clause No.	Description in brief	Remark
		(d) undertaking routine maintenance including prompt repairs of potholes, cracks, joints, drains, embankments, structures, markings, lighting, signage and other control devices (e) Undertaking major maintenance such as resurfacing, repairs to structures, and repairs and refurbishment of system and equipment;	
9	Article 17 Clause 17.4 Maintenance Program	17.4.1 On or before COD and no later than 45 (forty live) days prior to the beginning of each Accounting Year during the Operation Period, as the case may be, the Concessionaire shall provide to the Authority and the independent Engineer, its. proposed annual program of preventive, urgent and other scheduled maintenance [the “Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Concessionaire has to work as per approved maintenance program for O&M works in operation period.
10	Article 17 Clause 17.5 Safety, breakdowns and accidents	The Concessionaire shall ensure sale conditions for the Users, and in the event of unsafe conditions, closures. diversions, breakdowns and accidents. it shall follow the relevant operating procedures including the setting up of temporary Lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good Industry Practice.	The safety of users of Highway is given priority.
11	Article 17 Clause 17.8	17.8.1 In the Event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% [two per cent] of the Performance Security, and (b) 0.1% [zero point one per cent of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of the Termination thereof.	The Concessionaire has to do the work as per requirement and scope of O&M to avoid action of damages and Termination.
12	Article 19 Monitoring of Operation and Maintenance	19.2 Inspection The Independent Engineer shall inspect the Project at least once a month. it shall make a report of such inspection {the “O&M Inspection Report") stating in reasonable detail the defects or deficiencies, if any. With particular reference to the Maintenance Requirements, Maintenance Manual, the Maintenance Program and Safety Requirements, and send a copy thereof to the	The regular inspection of maintenance work by IE will control the quality, progress & safety or work.

Sr. No.	Article and Clause No.	Description in brief	Remark
		Authority and the Concessionaire within 7 (seven) days of such inspection.	
13	Article 20 Clause 20.1 Traffic regulation by the Concessionaire	The Concession shall regulate traffic on the Project in accordance with Applicable Laws, and subject to the supervision and control of the State authorities or a substitute thereof empowered in this behalf under Applicable laws.	The Concessionaire has to do the management of Traffic, medical aid to users of Highway with help of Police Medical Dept of Govt.
14	Article 23 Payment of Bid Project Cost	23.7.1 The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the Authority, which shall be computed on Rs. 19.87 crore (Rupees nineteen crore and eighty-seven lakh only) (the "First Year O&M Cost in accordance with the provisions of this Clause 23.7 [the ”0&M Payments"). The Parties further acknowledge and agree that any O&M Expenses In excess of the O&M Payments shall be borne solely by the Concessionaire. save and except as expressly provided in this Agreement. For avoidance of doubt it is clarified that the M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.	The Concessionaire will be paid lumpsum Rs. 19.87 crores adjusted for Price Index Multiple in form of Biannual payment during O&M period.
15	Article 26 Insurance during Concession Period	26.1 The Concessionaire shall effect and maintain at its own cost. during the Construction Period and the Operation Period. such insurances for such maximum sums as may be required under the Financing Agreements and Applicable Laws, and Such insurances as may be necessary or prudent in accordance with Good industry Practice.	The safety, risk of Authority, Concessionaire, Lender is covered.
16	Article 31 Termination Clause 31.1 Termination for Concessionaire Default	31.1.2 Without prejudice to any other rights or remedies which the Authority may have under this Agreement, upon occurrence of a Concessionaire Default, the Authority shall be entitled to terminate this Agreement by issuing a Termination Notice to the Concessionaire; provided that before issuing the Termination Notice, the Authority shall by a notice inform the Concessionaire of its intention to issue such Termination Notice and grant 15 (fifteen) days to the Concessionaire to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation. issue the Termination Notice, subject to the provisions of Clause 31.1.3.	The Authority can terminate the CA on occurrence of default by Concessionaire. The default may be in maintenance Requirements as per clause 31.1.1 (d). Hence concessionaire needs to take care not doing any default during O&M period.

Sr. No.	Article and Clause No.	Description in brief	Remark
17	Article 38 Dispute Resolution Clause 38.1 Arbitration	38.3.1 Any Dispute which is not resolved amicably by conciliation, as provided in Clause 38.2, shall be finally decided by reference to arbitration by an arbitral tribunal constituted in accordance with Clause 38.3.2. Such arbitration shall be held in accordance with the Rules of Society tor Affordable Redressal of Disputes ("SAROD"]. New Delhi (the "Rules"), or such other rules as may be mutually agreed by the Parties, and shall be subject to the previsions of the Arbitration and Conciliation Act, 1996.	There is provision of Arbitration for in case of unresolved issues or dispute between Authority and Concessionaire

7 REVIEW OF O&M CONTRACT

The Operation and Maintenance Agreement was signed between **M/s Varanasi Sangam Expressway Limited (VSEL)** and **G R Infraprojects Limited (O&M Contractor)** on 02nd November 2021 and addendum O&M Agreement has been signed on 26th July 2022 for a period of 1 year.

We have reviewed the provisions under various clauses of this O&M Contract and our specific comments are indicated below clause-wise.

Sr. No.	Clause No.	Description in Brief	Remark
1	Agreement Para (ii)	The Concessionaire now wishes to appoint M/s G R lnfraproiects Limited for Operation and Maintenance of Project Highway as 0&M Contractor in accordance with Scope of Work as mentioned in Annexure 1 hereto, under the Concession Agreement.	The Contractor M/s. G R Infraprojects Ltd. is appointed for O&M work as per scope in CA.
2	Clause n Definition	"O&M Contractor" means the person, if any, with whom the Concessionaire has entered into an O&M agreement for discharging O&M obligations for and on behalf of the Concessionaire.	The Contractor is appointed to discharge duties of O&M work on behalf of Concessionaire as per scope in O&M Agreement.
3	Clause r Definition	"O&M Period" O&M Agreement means operation and maintenance period of 1 year commencing from Commencement Date.	The Agreement of O&M is for one year and addendum is signed for 1 year from the date of 01st April 2022 to 31st March 2023.
4	Clause 2 Availability of Documents	The O&M Contractor also acknowledges the fact that the Concession Agreement is always binding and applicable back to back on the 0&M Agreement, limited to the obligations during the O&M period under the Concession Agreement and the scope of the O&M Contractor as per this Agreement. In case of any discrepancy in whatsoever matter, the clauses or' Concession Agreement shall prevail over and above this 0&M Agreement.	The copy of Concession Agreement & Maintenance Manual is provided to Contractor. It is always binding to Contractor for implementation during O&M work.
5	Para 6 O&M Contractor's obligation	6.1 During Operation Period, provisions of Article 17 of the Concession Agreement shall apply. The O&M Contractor shall operate and maintain the Project Highway in accordance with Article 17 of the Concession Agreement and if required, modify, repair or otherwise make improvements to the Project Highway comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and confirm to Specifications and Standards and Good Industry Practice.	The obligation of O&M are as per Article 17 of CA.

Sr. No.	Clause No.	Description in Brief	Remark
6	Clause 6.3 Maintenance Requirements	The O&M Contractor shall procure that at all times during the Operation Period; the Project Highway conforms to the maintenance requirements set forth in Schedule-K of the Concession Agreement (the "Maintenance Requirements").	The maintenance required to be done as per Schedule K of CA only.
7	Clause 6.4 Maintenance Program	Not later than 55 days prior to the beginning of each Accounting Year during the Operation Period, the O&M Contractor shall provide to the Concessionaire, its proposed annual program of preventive. urgent and other scheduled maintenance (the "Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Contractor has to submit the programme and work for O&M with maintenance requirement and safety.
8	Clause 6 Maintenance Requirements 6.5 Safety, Breakdown and accident	6.5.1 The 0&M Contractor shall ensure safe conditions for the users, and in the event of unsafe conditions, closures, diversions, breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary Lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good industry Practice.	Safety of users including breakdown, accident rescue operations is covered.
9	Clause 6 Maintenance Requirements 6.10 Damages for Breach of Maintenance obligations	In the event that the O&M Contractor fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be this Agreement and the cm Contractor shall pay to the Concessionaire Damages at such rate as the Concessionaire Is required to pay to the Authority under the Concession Agreement. Recovery of such Damages shall be without prejudice to the rights of the Concessionaire under this Agreement, including the right of Termination thereof.	The provision of Levy of Damage for breach of Agreement, defective work will keep pressure on contractor to work as per requirement.
10	Clause 6 Maintenance Requirements 6.17 Tests	For determining that the Project Highway conforms to the Maintenance Requirements, the Project Manager/IE shall require the O&M Contractor to carry out, or cause to be carried out, tests specified by it in accordance with Good Industry Practice.	This will maintain quality of work.
11	Clause 6 Maintenance Requirements 6.19 Safety Requirements	6.19.1 The 0&M Contractor shall comply with the provisions of this Agreement and [or Concession Agreement, Applicable Laws and Applicable Permits and confirm to Good Industry Practice for securing the safety of the Users. in particular, the O&M Contractor shall develop, implement and administer a surveillance and safety program for	The O&M Contractor has to provide requirements provision for safety of Highway users. The safety of users is given priority.

Sr. No.	Clause No.	Description in Brief	Remark
		providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in Schedule L of the Concession Agreement (the “Safety Requirements").	
12	Clause 13 Sub-contracts	13.1 The O&M Contractor shall notify to the Project Manager in writing of its intent to subcontract the O&M works in part or full and without the written approval of the Project Manager no subcontractor shall be appointed by the O&M Contractor.	The sub contractor cannot be appointed without approval of Project Manager. This will keep control over contractor to appoint competent contractor.
13	Clause 16 Insurance	16.1 The Concessionaire shall. procure and maintain the insurance for the Project Highway including all facilities in accordance with the Article 26 of the Concession Agreement.	The risks and security of Authority, concessionaire and lender is covered.
14	Clause 17 Defect Liability Period	17.1 The Concessionaire and/or the EPC Contractor ls responsible for all the defects and deficiencies in construction of the Project Highway or any section thereof and rectify the Same, without any cost to the O&M Contractor. during the cam period. Under this agreement the O&M Contractor is only under obligation of Operation 8r Maintenance of the Project Highway. For avoidance of doubt, any repair or restoration on account of usual wear and tear in the Project Highway shall form a part of the maintenance.	The Contractor is responsible for any defects during Defect Liability period i.e. O&M Period. This will maintain the quality to avoid any action for defective work as proposed.
15	Clause 21 Acknowledgement	The O&M Contractor acknowledges and accepts that this agreement entitles the Authority and/or Lenders Representative to step into this agreement, in its sole discretion, in Substitution-of the Concessionaire In the event of Termination or Suspension of the Concessionaire. Further, provision of clause 5.2 of the Concession Agreement relating to Project Agreement shall apply mutatis mutandis.	The Contractor has agreed for step in right of Authority or Lender in case of Termination of Concessionaire.
16	Clause 22 O&M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the 0&M Contractor to carryout routine maintenance Works as detailed in Annexure-I to this 0&M Agreement and in lieu thereof; a fixed lump sum fee amounting to Rs. 7.00 crore exclusive of taxes for the entire year in the form of biannual payment shall be due and payable by the Concessionaire.	The O&M Contractor will be paid fixed & Lumpsum payment of Rs. 7.00 crores plus GST. Biannual payment during year for his work as per scope. The contractor has to manage O&M work responsibility within this payment. Over & above these

Sr. No.	Clause No.	Description in Brief	Remark
			expenses, Concessionaire is incurring expenses for insurance, electricity, IE & professional fees etc.,
17	Clause 27 Termination 27.1 Termination For O&M Contractor Default	In the event of any defaults specified below shall have occurred, and the 0&M Contractor falls to cure the default within the Cure Period of 60 (sixty) days, the O&M Contractor shall be deemed to be in default of this Agreement (the "0&M Contractor Default"), unless the default has occurred as a result of any breach of this Agreement by the Concessionaire or due to Force Majeure.	The Contractor shall note this. This provision of termination keep pressure on contractor to work as per scope of O&M responsibility.
18	Clause 32 Liability and Indemnification	The O&M Contractor shall fully indemnify and hold harmless and defend the Concession extent that the Concessionaire has provided any indemnities to Authority in terms of Article Concession Agreement, Insofar as such indemnities relate to the Services.	The Concessionaire is secured from contractor for any loss, claim.

7.1 Conclusion

i. Operation and Maintenance Contract is comprehensive and correct for Major Concerned with Lender.

ii. The provision of O&M Contract Agreement is consistent with the provision of the Concession Agreement

8 OPERATION AND MAINTENANCE

8.1 Introduction

Article 17 and Schedule-K of the Concession Agreement defines the Operation and Maintenance requirement during concession period.

The Provisional Completion Certificate (PCOD) for the length of 72.398 kms has been received on 02nd November 2020. The project is currently under O&M stage. The Operation and Maintenance period of the project highway is 15 years from the date of PCOD.

8.2 O & M Set Up

O & M Contract

As per Clause 17.1 of the Concession Agreement, the Concessionaire shall operate and maintain the project highway by itself, or through O&M Contractors and if required, modify, repair, improve the project highway to comply with Specifications and Standards, and other requirements set forth in the Agreement through Good Industry Practice, Applicable Laws and Applicable Permits and manufacturer's guidelines and instructions with respect to toll systems. The Operation and Maintenance activities will confirm to all the requirements laid down in MoRT&H, IRC Specifications and the Concession Agreement.

Under Routine maintenance, the road is to be maintained in good, safe and motorable condition. The specification in contracts are kept as same as per design and construction specification.

The periodical maintenance will have to be done during O&M period as per requirement of Concession Agreement and as per site requirement to maintain the design standards and level.

List of Manpower (SPV):

Sr. No.	Employee Name	Designation	Remarks
1	Virendra Kumar Kushwaha	Project Manager	
2	Chhagan Singh	Manager	
3	Sureshwar Dayal Singh	Senior Engineer	
4	Nawneet Kumar Singh	Senior Officer	
5	Kuldeep	Officer	
6	Dayaram Mishra	Control Room Officer	
7	Adarsh Kumar	Senior Computer Operator	
8	Shubham Singh	Computer Operator	
9	Avanish Kumar Sharma	Junior Computer Operator	
10	Bahadur Singh Gurjar	Foreman	
11	Amrendra Pratap Singh	Senior Supervisor	
12	Rajendra Prasad	Senior Supervisor	
13	Gaurishankar .	Supervisor	
14	Vishal Tiwari	Supervisor	
15	Satendra Ray	Senior Route Patrol Officer	
16	Vinit Kumar	Auto – Electrician	
17	Bhoop Singh Rathore	Junior Electrician	
18	Sandeep Mishra	Junior Electrician	
19	Anand Kumar	Plumber	

Sr. No.	Employee Name	Designation	Remarks
20	Gaya Prasad Vishwakarma	Welder	
21	Munna .	Junior Welder	
22	Satyendra Mahto	Junior Plumber	
23	Surya Pratap Singh	Junior Electrician	
24	Ram Naresh Yadav	Attendant	
25	Kuldeep Singh	Paver Operator (Concrete Scale 3)	
26	Ram Mani Shukla	Senior Excavator Operator	
27	Md Jainulhaque	Mechanic	
28	Vakil Ram	Junior Mechanic	
29	Pawan Kumar	Electrician	
30	Vibhor Goel	Electrician	
31	Atulesh Tiwari	Plant Operator (HOTMIX Scale 1)	
32	Jay Prakash Kumar	Senior Paver Operator	
33	Vinod Kumar	Trailor Driver	
34	Mahesh Kumar	Grader Operator	
35	Arvind Kumar	JCB Operator	
36	Tarkeshwar Gupta	JCB Operator	
37	Mohammad Pappu	JCB Operator	
38	Subhash Kumar Yadav	HMV Driver	
39	Jilajeet Saroj	Roller Operator Tandem	
40	Jagyanarayan Patel	Excavator Operator	
41	Basarat Ali	Senior HMV Driver	
42	Pradeep Kumar Prajapati	HMV Driver	
43	Rajesh Kumar	HMV Driver	
44	Pawan Yadav	HMV Driver	
45	Ashok Kumar Dubey	HMV Driver	
46	Sanjay Yadav	HMV Driver	
47	Manoj Kushwaha	HMV Driver	
48	Pankaj Kumar Shukla	HMV Driver	
49	Ram Bali	HMV Driver	
50	Gyandeep Mishra	HMV Driver	
51	Pramod Kumar Yadav	HMV Driver	
52	Santosh Kumar	Hydra Operator	
53	Sanjay Sahani	Hydra Operator	
54	Banaras Kumar	Hydra Operator	
55	Prashant Kumar	LMV Driver	
56	Dharmendra Kumar Mishra	LMV Driver	
57	Vansh Bahadur Chaurasiya	LMV Driver	
58	Akhileshwar Singh	LMV Driver	
59	Ramesh Kumar Yadav	Tractor Driver	
60	Bittu Kumar Singh	Junior Plant Operator (HOTMIX)	
61	Pradeep Kumar Yadav	Nurse	
62	Sandeep Kumar	Cook	
63	Ashok Laoodhar	Sweeper	
64	Dheeraj Kumar	Helper	
65	Jitendra Kumar	Helper	
66	Anand Kumar	Helper	
67	Akash Kumar Bind	Helper	
68	Ashok Kumar Bind	Helper	
69	Shivshankar	Helper	
70	Mohan	Helper	

8.3 Operation Cost

Operations cost is comprised of manpower cost, power and electricity cost, office operating expenses, vehicle running expenses, administrative expenses and other miscellaneous expenses. The Concessionaire has provided the expenses occurred towards operation expenses for current / past years. Necessary assumptions have made from the expenses of similar type of projects to arrive at the operation cost. The estimates are projected based on best industry practices and are compared with the operating cost in the vicinity of the project area.

The Estimated Operating Cost for the base month of August 2022 is **Rs. 9.97 Crores**. The detailed working of the same is attached in **Annexure-I**.

8.4 Routine Maintenance Cost

The Routine Maintenance cost is derived based on the Ministry of Road Transport and Highways - Report of the Committee on Norms for Maintenance of Roads in India (published by Indian Road Congress New Delhi 2001) along with actual pavement condition assessed during condition survey.

Maintenance cost constitutes the routine, day-to-day maintenance activities for project assets, including road pavement, shoulders, embankment, drainage, structures, plantations, roadside furniture, traffic signs, traffic safety devices etc. Past data has been used to assess maintenance costs due to normal usage or “wear-and-tear”. Likely costs of maintenance of structures are assessed based on their present condition and vintage, in combination with well-established guidelines and thumb rules given in Indian codes and standards.

The Estimated Cost of Routine Maintenance works out to be **Rs. 3.22 Crores (4.43 Lakhs per km)** base month of August 2022. The detailed working of the same is attached in **Annexure-II**.

8.5 Major Maintenance Cost

Unlike the old Concession Agreements where periodicity and threshold limits were clearly described for the major maintenance, the Concession Agreement of this project does not specify the periodicity or the threshold limits for carrying out the full-length major maintenance. Schedule-K of the Concession Agreement specifies the threshold limits and the timelines for carrying out repairs to the distresses during the operation period.

The maintenance thus can be carried out as and when required basis and to the compliance of Schedule-K requirement to maintain the road in serviceable condition. Only improvement to Riding Quality is expected if the roughness value exceeds 2750 mm/km. However, the average roughness value of the project highway lies within the limit as mentioned above.

Any New pavement is not expected to show any distresses at least for 6 to 7 years with the proper routine maintenance. Mere Routine Maintenance would suffice to meet the performance standard mentioned in Schedule-K. In this project, there is no specific requirement to carry out the major maintenance at the end of concession period.

Hence, major maintenance is planned every 7th year from the date of COD till end of concession period.

The summary of the major maintenance planned up to end of concession period is presented in the below table.

The total base cost of major maintenance works out to be **Rs. 210.26 Crores** for base month of August 2022 i.e., till 31st August 2022. The detailed working for the same is shown in **Annexure-III**.

8.6 Paved Shoulders

As per design specifications, the paved shoulder is designed as an integral part of the pavement for main carriageway. Therefore, the total pavement thickness in paved shoulder would be the same as in the carriageway

8.7 Summary of Major Maintenance Cycle

The table below shows the major maintenance cycle throughout the concession period for the project stretch.

Table 8-1 Maintenance Cycle

Sr. No.	Year	Main Carriageway	Service Road
1	FY 2023	-	-
2	FY 2024	-	
3	FY 2025	-	-
4	FY 2026	-	-
5	FY 2027	1st Major Maintenance (100% BC + 100% DBM)	1st Major Maintenance (10% BC + 90% Micro-surfacing)
6	FY 2028		
7	FY 2029	-	-
8	FY 2030	-	-
9	FY 2031	-	-
10	FY 2032	-	-
11	FY 2033	-	-
12	FY 2034	2nd Major Maintenance (100% BC + 5% DBM)	2nd Major Maintenance (10% BC + 90% Micro-surfacing)
13	FY 2035		
14	FY 2036	-	-

8.8 Projected Maintenance Cost without escalation

The below table shows the total cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period without escalation.

Table 8-2 Summary of Operation & Maintenance Cost without escalation

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
1	**Total Operation and Routine Maintenance Cost**	72.644	Every year	18.16	**13.19**
2	**Major Maintenance Cost**				
i)	1st major maintenance	72.644	FY 2027	177.95	**129.27**
ii)	2nd major maintenance	72.644	FY 2034	111.49	**80.99**
	Total Major Maintenance Cost				**210.26**

Notes:

1. It is to be noted that, the rates considered for calculating all the above cost are exclusive of Goods and Service Tax (GST).
2. The estimated cost in table above is for base month of August 2022 i.e., till 31st August 2022.
3. The material rates are based on SOR of Govt. of Gorakhpur and Prayagraj, Uttar Pradesh for the year 2020-21. The plant & machinery rates are adopted from the revised standard data book 2019. The current market rates are considered for bitumen, cement, and steel those rates not available in SOR.

8.9 Projected Maintenance Cost with escalation

The below table shows the total cost of operation and routine maintenance and major maintenance cost up to end of the concession period with assumed escalation of 5% every year.

Table 8-3 Summary of Operation & Maintenance Cost with escalation

Sr. No.	Year	WPI Inflation	Total O & M Cost	Major Maintenance Cost
1	FY 2023		13.19	-
2	FY 2024	2.87*%	13.57	-
3	FY 2025	5.00%	14.25	-
4	FY 2026	5.00%	14.96	-
5	FY 2027	5.00%	15.71	76.97
6	FY 2028	5.00%	16.49	80.82
7	FY 2029	5.00%	17.32	-
8	FY 2030	5.00%	18.18	-
9	FY 2031	5.00%	19.09	-
10	FY 2032	5.00%	20.04	-
11	FY 2033	5.00%	21.05	-
12	FY 2034	5.00%	22.10	67.85
13	FY 2035	5.00%	23.20	71.25
14	FY 2036	5.00%	14.21	-
	Total Cost (Cr)		**243.35**	**296.89**

* Considering the base month for calculation as August 2022.

The company may carry out necessary investigation prior to O&M and Major Maintenance. This will help in proper assessment of maintenance work based on the actual pavement condition. The spending on major maintenance can then be reduced if the road is adequately and timely maintained.

9 TOLL PLAZA EQUIPMENT STATUS & ATMS

An assessment of Toll Plaza in terms of no of lanes, Toll Collection System installed and working status is carried out based on Section 10 of IRC:SP:87-2014 (The Manual) and the Authority's requirements of Hybrid ETC System. Advanced Traffic Management System (ATMS) is assessed based on Section 816 of MoRTH Specifications for Road and Bridge Works as required by Section 12.12 of the Manual.

9.1 Toll Plaza and Toll Collection System

Toll plaza is provided at km. 747+581 (LHS) and km. 747+822 (RHS). The Toll Collection System installed at the toll plaza is provided by Green Tech ITS Ltd.

The toll plazas have 6+6 lanes as stipulated in Concession Agreement and 1+1 additional lanes serving VIP vehicles, ambulances and extra wide vehicles. All lanes are equipped with Hybrid ETC equipment. View of the toll plazas are shown in Figure 9-1. Toll Lane Controller (TLC) at each toll booth controls the toll collection function, transmitting information and data on all lane activities to a central server (TMS) and receiving other control information and data from the TMS.

Figure 9-1 View of Toll Plaza

Toll Plaza including Admin Building at km. 747+581

Toll Plaza including Admin Building at km. 747+822

Weigh-in-Motion

Ambulance at Toll Plaza

Toll Signal light

Toilet Block at Toll Plaza

9.2 Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

1. RFID ETC Transceiver
2. Lane Controller with Industrial PC
3. AVC Sensors
4. Automatic Lane Barrier (ALB)
5. Incident Capture Camera
6. Overhead Lane Signals
7. Traffic Lights
8. Toll Booth Equipment

9.2.1.1 RFID ETC Transceiver

RFID ETC Transceiver reads tags installed on the windshield of vehicles and mounted on the canopy. Hand held RFID readers are provided (1 no. in each direction) in case a tag is not detected by the fixed reader.

Figure 9-2 RFID Transceiver

9.2.1.2 Lane Controller with Industrial PC

Toll Lane Controller is located within the Electronic Enclosure placed inside each toll booth which are connected to the common server and are capable of independent storage of data. The industrial PC has i3 processor with 500 GB HDD storage and 4GB RAM.

9.2.1.3 Automatic Vehicle Classification (AVC) Sensors

The AVC equipment comprises of a pair of height sensor poles, axle sensors and inductive loops. The height detector has a high sensing resolution and detects height when object blocks the path. The presence of vehicle is detected by inductive loop. The loop sensors embedded on the pavement trigger the AVC height sensors located on parallel pillars.

9.2.1.4 Automatic Lane Barrier (ALB)

Boom barriers installed on all lanes are in working condition and have a working time of 0.6 – 0.9s. Automatic Lane Barrier is used to allow only authorized vehicles to pass through the lane. The barrier is activated only on generation of user fee receipt or other relevant vehicle processing activity. A torque motor powers the barrier for raising and lowering the boom. The motor can be blocked at any position without causing any damage. In the event of power failure, the boom is automatically raised. The boom weight is exactly balanced by built-in springs.

9.2.1.5 Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. The LTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done; the LTL turns Green to instruct the vehicle to pass through the lane.
The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The user fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

9.2.1.6 Incident Capture Camera (AVC Camera)

The incident capture camera is installed on island of the booth to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.

9.2.1.7 License Plate Image Capture Camera (LPIC)

License Plate Image capture camera is installed on a 3m pole facing incoming vehicle to capture the image of the vehicle number plate.

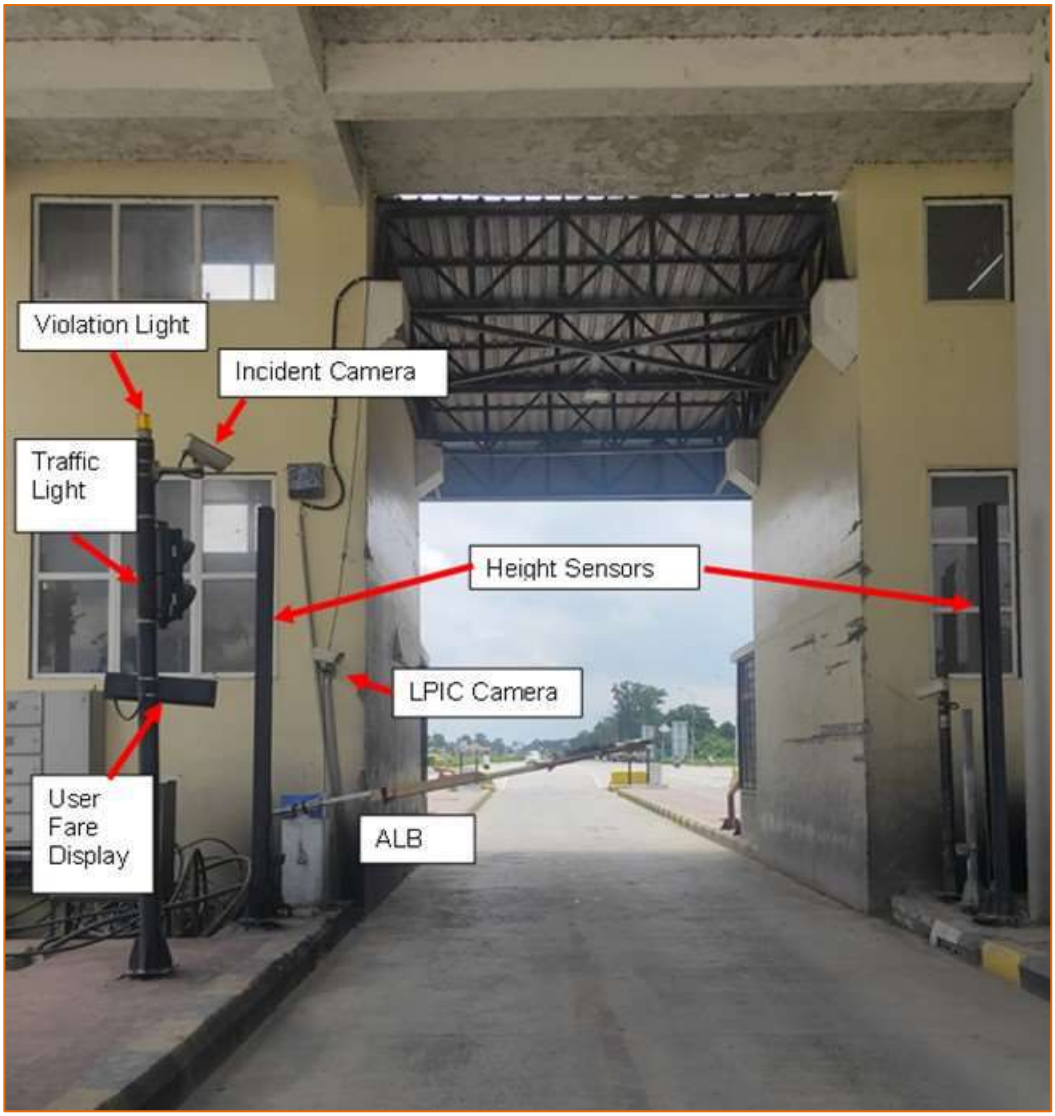

Figure 9-3 Lane Equipment

9.2.1.8 Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane "Open" and "Close" sign consists of a pair of "GREEN" (arrow) and "RED" (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed.

9.2.1.9 Toll Booth Equipment

Toll Booth Hardware / Equipment provided are:

- Toll Collector Display (Operator Monitor)
- Customized Industrial Keyboard
- Receipt Printer
- Intercom Slave unit
- Bar code reader
- Violation Light and alarm
- Manual Booth Control (MBC)
- Booth Camera

The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a programmable keyboard for Registration of toll operations and is customized for different vehicle types and type of ticket.

Figure 9-4 Booth Equipment

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Violation system has an alarm switch which is triggered whenever there is a violation such as run-through happening on the lane. When there is an emergency, a foot switch pressed by the booth operator alerts the control room.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room. Manual Booth Controller is used to release exempt vehicles.

9.2.1.10 Medium Speed Weigh in Motion (MSWIM)

Medium Speed Weigh in Motion (MSWIM) is installed on entry lanes with a platform size of 1500 mm x 620 mm for normal lanes and 1750 mm x 620 mm for extra wide lanes and capacity of 30 ton/axle. Bending plate strain gauge technology is used with hardware and software support to calculate weight of vehicles running through it up to a speed of 50 km/hr.

9.2.2 Plaza Equipment

9.2.2.1 Plaza Server

Plaza Server is provided in a hot standby configuration (Intel i5 CPU with 4 GB RAM, 1 TB Hard disk) and provided with 42 U switch rack and 24port non POE network switch . The server manages the TMS application and integration of lane level data with CCH.

9.2.2.2 55" LED screen for CCTV monitoring

55" LED screen for CCTV monitoring installed at the toll plaza admin block provides view of all the toll booths , important zones within the plaza where cash transactions take place (server room, control room, cash up).

Figure 9-5 55" LED screen for CCTV monitoring

The toll plaza manager is able to observe the activities at the toll lanes and toll booth. When the toll collector calls up on the intercom, the manager is able to comprehend the situation at the lane by a zoomed view of the particular lane.

9.2.2.3 Workstations in Control Room, PoS and Cash up room

Workstations are available in control room (lane monitoring, administration and audit), cash room and PoS with 4 GB RAM and 1 TB HDD.

9.3 Advance Traffic Management System (ATMS)

Advanced Traffic Management System (ATMS) installed for the project road is controlled by the ATMS centre. It comprises of the following:

- Emergency Call Back System (ECB)
- Mobile Radio communication system
- Meteorological Data system
- Variable Message Signboards (VMS)
- Automatic Traffic Counter cum Classifier (ATCC)
- CCTV system

ATMS control room has a central server, network computers for each subsystem with Graphic User Interface.

9.3.1 Emergency Call Back System (ECB)

13 pairs of Emergency Call Booths are installed along the project road stretch. The users can access these ECBs and communicate to the ATMS control centre in case of emergency such as vehicle breakdown.

Figure 9-6 ECB at km. 751.200

9.3.2 Mobile Radio communication System (MRCS)

Communication between patrol vehicles, ambulances, crane operators and the control centre are managed using MRCS installed at the two locations, km. 731.000 and km. 775.100.

9.3.3 MET system

Meteorological sensors comprise of sensors to measure the atmospheric temperature, humidity, pavement surface temperature, visibility and equipment for measuring wind speed and direction and installed at km. 746.750.

Figure 9-7 MET Equipment

9.3.4 Variable Message Signboards (VMS)

Variable message sign boards are installed at 5 locations. These display specific messages to the users based on the prevailing conditions on the highway. The message can be changed at any point of time from the ATMS centre. About 250 customised messages can be stored on the system.

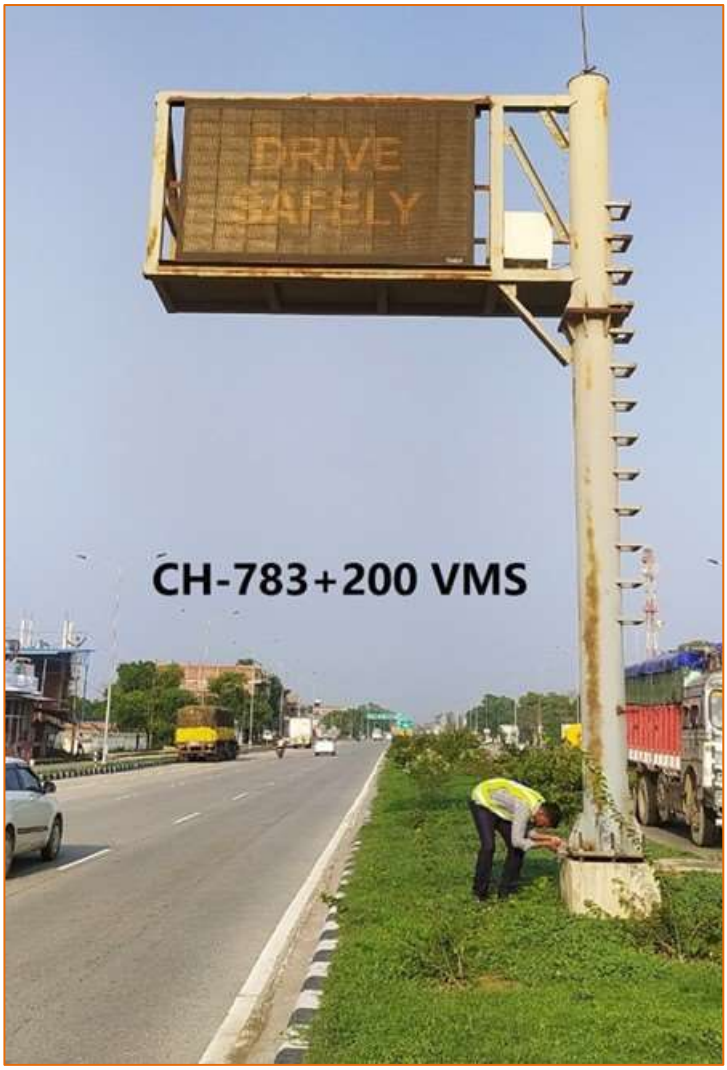

Figure 9-8 Variable Message Signboard

9.3.5 Surveillance Cameras / Video Incident Detection System

Surveillance Cameras and Video Incident Detection System are installed at 11 locations along the project corridor. The ATMS control room has video wall to monitor these locations through the cameras installed. VIDS detects and gives alarm for incidents such as queue, stop, movement in wrong direction, speed drop, fog/smoke, no video signal and error.

Figure 9-9 PTZ camera at km. 778.000

Figure 9-10 Video wall in ATMS control centre

9.4 Adequacy of Toll Collection System and ATMS

- Adequacy - The software and hardware as a part of Toll Collection and Management System (TMS) are as per Hybrid ETC system stipulated by NHAI in Technical specifications of Hybrid ETC system. TMS shall be upgraded every 5 years, at the cost of the Authority

- Advanced Traffic Management System (ATMS) installed is as per specifications required by the Authority and in working condition.

10 ACCIDENT DATA ANALYSIS

Accident Data Records for the project have been studied in order to analyse the nature of accidents occurring on the stretch and identify blackspots.

10.1 Accident Trend

Accident Data for the period 1st Jan 2015 to 30th June 2022 has been made available for analysis. 697 Accidents have occurred out of which 58 were fatal, 425 major and 238 were minor. More number of accidents have occurred during the daytime than at night-time. Over speeding has been recorded as a major cause of accident which alone or in combination with faulty driver behaviour.

10.2 Blackspots Identification

Details of accidents in the project length are given in Table below:

Sr. No.	Month	Total Accident	Details of Accident Victims		
			Fatal	Major Injury	Minor Injury
1	Jan-15	7	0	4	3
2	Feb-15	4	2	5	0
3	Mar-15	7	1	14	0
4	Apr-15	10	2	6	2
5	May-15	8	0	25	0
6	Jun-15	7	1	3	3
7	Jul-15	6	1	3	2
8	Aug-15	17	3	13	1
9	Sep-15	5	1	2	2
10	Oct-15	4	2	1	1
11	Nov-15	7	0	3	2
12	Dec-15	7	2	0	5
13	Jan-16	9	0	13	0
14	Feb-16	4	0	3	1
15	Mar-16	5	0	5	0
16	Apr-16	9	2	2	3
17	May-16	7	2	10	1
18	Jun-16	6	0	5	1
19	Jul-16	26	3	37	0
20	Aug-16	38	1	46	0
21	Sep-16	7	1	8	0
22	Oct-16	10	1	11	2
23	Nov-16	7	2	11	1
24	Dec-16	8	1	13	1
25	Jan-17	5	0	0	5
26	Feb-17	1	1	5	0
27	Mar-17	2	1	1	0
28	Apr-17	4	1	2	1
29	May-17 to Nov 17	NA	NA	NA	NA
30	Dec-17	7	0	0	11
31	Jan-18	3	0	0	6
32	Feb-18	7	0	0	10
33	Mar-18	5	3	8	8
34	Apr-18	4	0	5	4

Sr. No.	Month	Total Accident	Details of Accident Victims		
			Fatal	Major Injury	Minor Injury
35	May-18	3	2	5	3
36	Jun-18	1	1	1	15
37	Jul-18	5	1	2	9
38	Aug-18	3	0	1	5
39	Sep-18	3	0	1	3
40	Oct-18	1	0	0	3
41	Nov-18	4	0	4	7
42	Dec-18	3	0	0	4
43	Jan-19	5	0	2	11
44	Feb-19	3	0	0	6
45	Mar-19	4	1	2	1
46	Apr-19	1	0	0	1
47	May-19	4	0	2	2
48	Jun-19	2	0	0	4
49	Jul-19	6	0	5	2
50	Aug-19	3	0	2	1
51	Sep-19	2	0	1	1
52	Oct-19	1	0	1	0
53	Nov-19	4	0	3	1
54	Dec-19	4	0	1	4
55	Jan-20	2	0	1	1
56	Feb-20	4	1	3	2
57	Mar-20	2	1	1	0
58	Apr-20	0	0	0	0
59	May-20	5	0	5	2
60	Jun-20	3	0	1	2
61	Jul-20	3	0	1	2
62	Aug-20	5	0	0	5
63	Sep-20	NA	NA	NA	NA
64	Oct-20	NA	NA	NA	NA
65	Nov-20	21	1	7	10
66	Dec-20	21	1	8	10
67	Jan-21	28	0	6	2
68	Feb-21	15	1	4	2
69	Mar-21	14	1	4	3
70	Apr-21	15	0	13	2
71	May-21	15	0	2	8
72	Jun-21	10	0	1	8
73	Jul-21	5	0	2	3
74	Aug-21	10	0	6	1
75	Sep-21	15	0	10	2
76	Oct-21	8	0	5	3
77	Nov-21	15	2	1	5
78	Dec-21	7	1	6	0
79	Jan-22	20	1	5	1
80	Feb-22	12	2	4	1
81	Mar-22	22	1	6	3
82	Apr-22	29	1	10	0
83	May-22	35	4	13	1
84	Jun-22	31	1	3	0
Total		**697**	**58**	**425**	**238**

Use of Mobile Phones while driving: This has become a great menace. Most of the people are on call while driving thus they drive recklessly and accidents happen as most of the peoples now have mobile phones, this is the most potential reason. Distractions could be outside or inside the vehicle. The major distraction now a day is talking on mobile phone while driving. Act of talking on phone occupies major portion of brain and the smaller part handles the driving skills. This division of brain hamper's reaction time and ability of judgement. This becomes one of the reason of crashes.

Over Speeding: Most of the fatal accidents occur due to over speeding. It is natural psyche of humans to excel. Increase in speed multiplies the risk of accident and severity at injury thing.

10.3 Conclusions & Recommendations

Concessionaire need to maintain all signs, markings and road safety devices as per schedule given in CA.

Annexures

Annexure I : Operation Cost

Sr. No.	Particulars	Cost per Annum (Rs.)	Cost per Annum (Cr.)
1	Incidental Management Expenses		
a	Ambulance - 1 Nos.	1,898,591	0.19
b	Patrolling Vehicle - 1 Nos.	4,064,156	0.41
c	Crane - 1 Nos.	1,538,398	0.15
d	Other Vehicle - 3 Nos.	2,039,758	0.20
e	JCB - 2 Nos.	1,275,887	0.13
f	Corridor Manager & Officer	953,280	0.10
2	Maintenance Staff Expenses	6,000,000	0.60
3	Routine Maintenance Cost (Civil Works)	32,152,477	3.22
4	Professional & IE Fee	5,100,000	0.51
5	Insurance Expenses	22,037,986	2.20
6	Staff Welfare Expenses	600,000	0.06
7	Electricity Expenses + Maintenance of parts	42,720,737	4.27
8	ATMS Expenses	6,755,892	0.68
9	Contingency @ 5% (Excl. Civil works)	4,749,234	0.47
	Total Cost (Rs)	**131,886,396**	**13.19**
	Per km Cost (Lakh)	**1,815,516.716**	**18.16**

Annexure II: Routine Maintenance Cost

Routine Maintenance Cost - VSEPL	
Ordinary Repair Cost for Flexible	**30,057,210.38**
(Exclusive of GST @ 12%)	**= 5 lakhs per km**
Ordinary Repair Cost for Rigid	**5,953,564.13**
(Exclusive of GST @ 12%)	**= 2.9 lakhs per km**
Total Cost (Exclusive of GST @ 12%)	**32,152,477.24**
	= 4.43 lakhs per km

CONVERSION FACTORS									
National Highways / State Highways - Rigid Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Rigid Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				73,257	**104,814**				
						Normal	**Urban**	**Normal**	**Urban**
1	Six lane with divided carriageway and service lane on either side	without Paved shoulder	2.90	212445.00	303960.00	-	-	-	-
		with Paved shoulder	3.10	227096.00	324923.00	-	18.32	-	5,953,564.13
					TOTAL		**18.32**		**5,953,564.13**

CONVERSION FACTORS									
National Highways / State Highways - Flexible Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Flexible Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				152,461	**184,018**				
						Normal	**Urban**	**Normal**	**Urban**
1	Six lane with divided carriageway and service lane on either side	without Paved shoulder	2.90	442137.00	533652.00	-	15.10	-	8,058,145.20
		with Paved shoulder	3.10	472629.00	570456.00	-	38.56	-	21,999,065.18
					TOTAL		**53.664**		**30,057,210.38**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity**
				More than 4500 CVD
				CC Surface
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.00%
	Volume (cum)			0.00
	Rs/m^3			0
	Cost in Rupees			0
	ii) Patch repair	100 % Patch less	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			426
	Cost in Rupees			0
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			83
	Cost in Rupees			4,144
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			55
	Cost in Rupees			4,116
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			426
	Cost in Rupees			0
	v) Road marking	10%	Once in 10 year & @ Repaired location	0
	vi) Joint Sealant Repair/Replacement	5%		29007

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	SUB TOTAL			**37,267**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	10%	As & when required	3,467
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			
	SUB TOTAL			**3,467**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debris removal		Once in a Year	3467

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	3467
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**73,257**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	10%	Once in 10 year & @ Repaired location	19886
	ii)Repairs to footpath	0%	As & when required	0
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**31,557**
	GRAND TOTAL (Urban)			**104,814**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.50%
	Volume (cum)			2.50
	Rs/m^3			10640
	Cost in Rupees			26,600
	ii) Patch repair	100 % Patch less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			426
	Cost in Rupees			21,280
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	1.00%
	Area (sqm)			100
	Rs/m^2			83
	Cost in Rupees			8,288
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			55
	Cost in Rupees			4,116
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			426
	Cost in Rupees			31,920
	v) Road marking	10%	Once in 10 year & @ Repaired location	0
	SUB TOTAL			**92,204**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	80%	As & when required	27,734
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			
	SUB TOTAL			**27,734**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debries removal		Once in a Year	3467
	iii) Lettering, Painting of Km stones & kerbs, sign boards, Hectometer stone etc.		Once in a Year	3467
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. More than 4500 CVD BT Surface**
1	**2**	**3**	**4**	**5**
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**152,461**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	10%	Once in 10 years with thermoplastic paint	19886
	ii)Repairs to footpath	0%	As & when required	0
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**31,557**
	GRAND TOTAL (Urban)			**184,018**

Annexure III: Major Maintenance Cost

Periodic Maintenance Cost - FY 2027										
Sr. No.	**Description**	**Unit**	**No.**	**Length**	**Width**	**Depth**	**Quantity**	**Total Quantity**	**Rate**	**Amount**
I. Main Carriageway, Service Road / Slip Road & Miscellaneous location										
A	**Main Carriageway: Flexible Pavement**									
1	Milling	Sqm	100%	44,095.50	22.00		970,101.00	970,101.00	55.00	53,355,555
2	Tack Coat for DBM	Sqm	100%	44,095.50	22.00		970,101.00	970,101.00	10.00	9,701,010
3	DBM Overlay	Cum	100%	44,095.50	22.00	0.05	48,505.05	48,505.05	9,198.00	446,149,450
4	Tack Coat for BC	Sqm	1	44,095.50	24.66		1,087,247.69	1,087,247.69	10.00	10,872,477
5	BC Overlay	Cum	1	44,095.50	24.66	0.04	43,489.91	43,489.91	10,654.00	463,341,477
6	Filling of Earthen shoulder	Cum	1	24,357.00	4.00	0.04	3,897.12	3,897.12	281.00	1,095,091
B	**Main Carriageway: Rigid Pavement**									
7	Replacement of Joint Sealant	Rmt	5%	204,752.25			10,237.61	10,237.61	99.00	1,013,524
8	Dismantling of CC Panels @ 1.5% area	Cum	1.5%	18,323.00	22.00	0.30	1,813.98	1,813.98	756.00	1,371,367
9	Replacement of Panels - PQC @ 1.5% area	Cum	1.5%	18,323.00	22.00	0.30	1,813.98	1,813.98	8,330.00	15,110,428
10	Diamond Grinding	Sqm	3%	18,323.00	22.00		12,093.18	12,093.18	50.00	604,659
C	**Rigid Pavement at Toll Plaza**									
11	Replacement of Joint Sealant	Rmt	5%	16,668.20			833.41	833.41	99.00	82,508
12	Dismantling of CC Panels @ 1.5% area	Cum	2%	32,815.51		0.30	147.67	147.67	756.00	111,638
13	Replacement of Panels - PQC @ 1.5% area	Cum	2%	32,815.51		0.30	147.67	147.67	8,330.00	1,230,089
D	**Service Roads (Flexible Pavement)**									
14	Tack Coat for BC	Sqm	10%	70,689.00	13.06		92,312.10	92,312.10	10.00	923,121
15	BC Overlay with 30mm	Cum	10%	70,689.00	13.06	0.03	2,769.36	2,769.36	10,654.00	29,504,793
16	Micro surfacing	Sqm	90%	70,689.00	13.06		830,808.90	830,808.90	133.00	110,497,584
17	Filling of Earthen shoulder	Cum							281.00	-
E	**Service Roads (Rigid Pavement)**									
18	Replacement of Joint Sealant	Rmt	5%	13,186.03			659.30	659.30	99.00	65,271
19	Dismantling of CC Panels @ 1% area	Cum	1.0%	1,298.00	20.00	0.30	77.88	77.88	756.00	58,877
20	Replacement of Panels - PQC @ 1% area	Cum	1.0%	1,298.00	20.00	0.30	77.88	77.88	8,330.00	648,740
F	**Structural Deck area**									
21	Milling	Sqm	50%	9,568.50	21.65		103,593.90	103,593.90	55.00	5,697,665
22	Tack Coat	Sqm	50%	9,568.50	21.65		103,593.90	103,593.90	10.00	1,035,939
23	Mastic Asphalt Overlay	Sqm	50%	9,568.50	21.65		103,593.90	103,593.90	517.00	53,558,048
G	**Miscellaneous**									
24	Raising of Kerb	Rmt	10%	141,378.00			14,137.80	14,137.80	268.00	3,788,930
25	Painting of Kerbs	Sqm	1	141,378.00		0.32	44,534.07	44,534.07	73.00	3,250,987
26	Painting of Crash Barrier	Sqm	1	63,850.00		1.12	71,192.75	71,192.75	73.00	5,197,071
27	Thermoplastic paint									
	a) Median & Edge line	Sqm	100%				60,503.88	60,503.88	530.00	32,067,058
	Main Carriageway 6L		4	53,664.00	0.15		32,198.40			
	Service Road		2	70,689.00	0.10		14,137.80			
	b) Lane line									
	Main Carriageway 6L		4	18,782.40	0.10		7,512.96			
	Service Road		1	11,543.70	0.10		1,154.37			
	c) Junction crossing / Miscellaneous						5,500.35			
28	Replacement of Road Stud	No	100%				19,784.00	19,784.00	239.00	4,728,376
	Main Carriageway 6L/4L		4	2,982.00			11,928.00			
	Service Road		2	3,928.00			7,856.00			
29	Miscellaneous	3%								37,651,852
									Total Amount (MCW)	**1,292,713,585**
									Total Cost in Lakhs (MCW)	**12,927.14**
									Per km Cost in lakhs (MCW)	**177.95**

Periodic Maintenance Cost - FY 2034										
Sr. No.	**Description**	**Unit**	**No.**	**Length**	**Width**	**Depth**	**Quantity**	**Total Quantity**	**Rate**	**Amount**
I. Main Carriageway, Service Road / Slip Road & Miscellaneous location										
A	**Main Carriageway: Flexible Pavement**									
1	Milling	Sqm	5%	44,095.50	22.00		48,505.05	48,505.05	55.00	2,667,778
2	Tack Coat for DBM	Sqm	5%	44,095.50	22.00		48,505.05	48,505.05	10.00	485,051
3	DBM Overlay	Cum	5%	44,095.50	22.00	0.05	2,425.25	2,425.25	9,198.00	22,307,472
4	Tack Coat for BC	Sqm	1	44,095.50	24.66		1,087,247.69	1,087,247.69	10.00	10,872,477
5	BC Overlay	Cum	1	44,095.50	24.66	0.04	43,489.91	43,489.91	10,654.00	463,341,477
6	Filling of Earthen shoulder	Cum	1	24,357.00	4.00	0.04	3,897.12	3,897.12	281.00	1,095,091
B	**Main Carriageway: Rigid Pavement**									
7	Replacement of Joint Sealant	Rmt	5%	204,752.25			10,237.61	10,237.61	99.00	1,013,524
8	Dismantling of CC Panels @ 1.5% area	Cum	1.5%	18,323.00	22.00	0.30	1,813.98	1,813.98	756.00	1,371,367
9	Replacement of Panels - PQC @ 1.5% area	Cum	1.5%	18,323.00	22.00	0.30	1,813.98	1,813.98	8,330.00	15,110,428
10	Diamond Grinding	Sqm	3%	18,323.00	22.00		12,093.18	12,093.18	50.00	604,659
C	**Rigid Pavement at Toll Plaza**									
11	Replacement of Joint Sealant	Rmt	5%	16,668.20			833.41	833.41	99.00	82,508
12	Dismantling of CC Panels @ 1.5% area	Cum	2%		32,815.51	0.30	147.67	147.67	756.00	111,638
13	Replacement of Panels - PQC @ 1.5% area	Cum	2%		32,815.51	0.30	147.67	147.67	8,330.00	1,230,089
D	**Service Roads (Flexible Pavement)**									
14	Tack Coat for BC	Sqm	10%	70,689.00	13.06		92,312.10	92,312.10	10.00	923,121
15	BC Overlay with 30mm	Cum	10%	70,689.00	13.06	0.03	2,769.36	2,769.36	10,654.00	29,504,793
16	Micro surfacing	Sqm	90%	70,689.00	13.06		830,808.90	830,808.90	133.00	110,497,584
17	Filling of Earthen shoulder	Cum							281.00	-
E	**Service Roads (Rigid Pavement)**									
18	Replacement of Joint Sealant	Rmt	5%	13,186.03			659.30	659.30	99.00	65,271
19	Dismantling of CC Panels @ 1% area	Cum	1.0%	1,298.00	20.00	0.30	77.88	77.88	756.00	58,877
20	Replacement of Panels - PQC @ 1% area	Cum	1.0%	1,298.00	20.00	0.30	77.88	77.88	8,330.00	648,740
F	**Structural Deck area**									
21	Milling	Sqm	50%	9,568.50	21.65		103,593.90	103,593.90	55.00	5,697,665
22	Tack Coat	Sqm	50%	9,568.50	21.65		103,593.90	103,593.90	10.00	1,035,939
23	Mastic Asphalt Overlay	Sqm	50%	9,568.50	21.65		103,593.90	103,593.90	517.00	53,558,048
G	**Miscellaneous**									
24	Raising of Kerb	Rmt	10%	141,378.00			14,137.80	14,137.80	268.00	3,788,930
25	Painting of Kerbs	Sqm	1	141,378.00		0.32	44,534.07	44,534.07	73.00	3,250,987
26	Painting of Crash Barrier	Sqm	1	63,850.00		1.12	71,192.75	71,192.75	73.00	5,197,071
27	Thermoplastic paint									
	a) Median & Edge line	Sqm	100%				60,503.88	60,503.88	530.00	32,067,058
	Main Carriageway 6L		4	53,664.00	0.15		32,198.40			
	Service Road		2	70,689.00	0.10		14,137.80			
	b) Lane line									
	Main Carriageway 6L		4	18,782.40	0.10		7,512.96			
	Service Road		1	11,543.70	0.10		1,154.37			
	c) Junction crossing / Miscellaneous						5,500.35			
28	Replacement of Road Stud	No	100%				19,784.00	19,784.00	239.00	4,728,376
	Main Carriageway 6L/4L		4	2,982.00			11,928.00			
	Service Road		2	3,928.00			7,856.00			
29	Miscellaneous	5%								38,565,801
									Total Amount (MCW)	**809,881,820**
									Total Cost in Lakhs (MCW)	**8,098.82**
									Per km Cost in lakhs (MCW)	**111.49**

Annexure IV: Pavement Condition Survey

LHS - Varanasi to Handia

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	712.900	713.000	G	BT	Flexible					1.5		Moderate							G	F		
2	713.000	713.100	G	BT	Flexible					1.5		Moderate							G	F		
3	713.100	713.200	G	BT	Flexible					1.5		Moderate							G	F		
4	713.200	713.300	G	BT	Flexible					1.5		Moderate							G	F		
5	713.300	713.400	G	BT	Flexible					1.5		Moderate							G	F		
6	713.400	713.500	G	BT	Flexible					1.5		Moderate							G	F		
7	713.500	713.600	G	BT	Flexible					1.5		Moderate							G	F		
8	713.600	713.700	G	BT	Flexible					1.5		Moderate							G	F		
9	713.700	713.800	G	BT	Flexible					1.5		Moderate							G	F		
10	713.800	713.900	G	BT	Flexible					1.5		Moderate							G	F		
11	713.900	714.000	G	BT	Flexible					1.5		Moderate							G	F		
12	714.000	714.100	G	BT	Flexible					1.5		Moderate							G	F		
13	714.100	714.200	G	BT	Flexible					1.5		Moderate							G	F		
14	714.200	714.300	G	BT	Flexible					1.5		Moderate							G	F		
15	714.300	714.400	G	BT	Flexible					1.5		Moderate							G	F		
16	714.400	714.500	G	BT	Flexible					1.5		Moderate							G	F		
17	714.500	714.600	G	BT	Flexible					1.5		Moderate							G	F		
18	714.600	714.700	G	BT	Flexible					1.5		Moderate							G	F		
19	714.700	714.800	G	BT	Flexible					1.5		Moderate							G	F		
20	714.800	714.900	G	BT	Flexible					1.5		Moderate							G	F		
21	714.900	715.000	G	BT	Flexible					1.5		Moderate							G	F		
22	715.000	715.100	G	BT	Flexible					1.5		Moderate							G	F		
23	715.100	715.200	G	BT	Flexible					1.5		Moderate							G	F		
24	715.200	715.300	G	BT	Flexible					1.5		Moderate							G	F		
25	715.300	715.400	G	BT	Flexible					1.5		Moderate							G	F		
26	715.400	715.500	G	BT	Flexible					1.5		Moderate							G	F		
27	715.500	715.600	G	BT	Flexible					1.5		Moderate							G	F		
28	715.600	715.700	G	BT	Flexible					1.5		Moderate							G	F		
29	715.700	715.800	G	BT	Flexible					1.5		Moderate							G	F		
30	715.800	715.900	G	BT	Flexible					1.5		Moderate							G	F		
31	715.900	716.000	G	BT	Flexible					1.5		Moderate							G	F		
32	716.000	716.100	G	BT	Flexible					1.5		Moderate							G	F		
33	716.100	716.200	G	BT	Flexible					1.5		Moderate							G	F		
34	716.200	716.300	G	BT	Flexible					1.5		Moderate							G	F		
35	716.300	716.400	G	BT	Flexible					1.5		Moderate							G	F		
36	716.400	716.500	G	BT	Flexible					1.5		Moderate							G	F		
37	716.500	716.600	G	BT	Flexible					1.5		Moderate							G	F		
38	716.600	716.700	G	BT	Flexible					1.5		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
39	716.700	716.800	G	BT	Flexible					1.5		Moderate							G	F		
40	716.800	716.900	G	BT	Flexible					1.5		Moderate							G	F		
41	716.900	717.000	G	BT	Flexible					1.5		Moderate							G	F		
42	717.000	717.100	F	BT	Flexible					2		Moderate							G	F		
43	717.100	717.200	F	BT	Flexible					2.5		Moderate							G	F		
44	717.200	717.300	F	BT	Flexible					2		Moderate							G	F		
45	717.300	717.400	F	BT	Flexible					2		Moderate							G	F		
46	717.400	717.500	F	BT	Flexible					2		Moderate							G	F		
47	717.500	717.600	F	BT	Flexible					2		Moderate							G	F		
48	717.600	717.700	F	BT	Flexible					2		Moderate							G	F		
49	717.700	717.800	F	BT	Flexible					2.5		Moderate							G	F		
50	717.800	717.900	G	BT	Flexible					1.5		Moderate							G	F		
51	717.900	718.000	F	BT	Flexible					2		Moderate							G	F		
52	718.000	718.100	F	BT	Flexible					2		Moderate							G	F		
53	718.100	718.200	F	BT	Flexible					2		Moderate							G	F		
54	718.200	718.300	F	BT	Flexible					2		Moderate							G	F		
55	718.300	718.400	G	BT	Flexible					1.5		Moderate							G	F		
56	718.400	718.500	F	BT	Flexible					2		Moderate							G	F		
57	718.500	718.600	F	BT	Flexible					2		Moderate							G	F		
58	718.600	718.700	F	BT	Flexible					2		Moderate							G	F		
59	718.700	718.800	G	BT	Flexible					1.5		Moderate							G	F		
60	718.800	718.900	F	BT	Flexible					2		Moderate							G	F		
61	718.900	719.000	F	BT	Flexible					2		Moderate							G	F		
62	719.000	719.100	G	BT	Flexible					1.5		Moderate							G	F		
63	719.100	719.200	F	BT	Flexible					2		Moderate							G	F		
64	719.200	719.300	F	BT	Flexible					2		Moderate							G	F		
65	719.300	719.400	F	BT	Flexible					2		Moderate							G	F		
66	719.400	719.500	F	BT	Flexible					2		Moderate							G	F		
67	719.500	719.600	G	BT	Flexible					1.5		Moderate							G	F		
68	719.600	719.700	F	BT	Flexible					2		Moderate							G	F		
69	719.700	719.800	G	BT	Flexible					1.5		Moderate							G	F		
70	719.800	719.900	F	BT	Flexible					2		Moderate							G	F		
71	719.900	720.000	G	BT	Flexible					1.5		Moderate							G	F		
72	720.000	720.100	G	BT	Flexible					1.5		Moderate							G	F		
73	720.100	720.200	G	BT	Flexible					1.5		Moderate							G	F		
74	720.200	720.300	G	BT	Flexible					1.5		Moderate							G	F		
75	720.300	720.400	G	BT	Flexible					1.5		Moderate							G	F		
76	720.400	720.500	G	BT	Flexible					1.5		Moderate							G	F		
77	720.500	720.600	G	BT	Flexible					1.5		Moderate							G	F		
78	720.600	720.700	G	BT	Flexible					1.5		Moderate							G	F		
79	720.700	720.800	G	BT	Flexible					1.5		Moderate							G	F		
80	720.800	720.900	F	BT	Flexible					2		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
81	720.900	721.000	F	BT	Flexible					2		Moderate							G	F		
82	721.000	721.100	F	BT	Flexible					2		Moderate							G	F		
83	721.100	721.200	G	BT	Flexible					1.5		Moderate							G	F		
84	721.200	721.300	G	BT	Flexible					1.5		Moderate							G	F		
85	721.300	721.400	F	BT	Flexible					2		Moderate							G	F		
86	721.400	721.500	F	BT	Flexible					2		Moderate							G	F		
87	721.500	721.600	G	BT	Flexible					1.5		Moderate							G	F		
88	721.600	721.700	G	BT	Flexible					1.5		Moderate							G	F		
89	721.700	721.800	G	BT	Flexible					1.5		Moderate							G	F		
90	721.800	721.900	G	BT	Flexible					1.5		Moderate							G	F		
91	721.900	722.000	F	BT	Flexible					2		Moderate							G	F		
92	722.000	722.100	F	BT	Flexible					2		Moderate							G	F		
93	722.100	722.200	G	BT	Flexible					1.5		Moderate							G	F		
94	722.200	722.300	G	BT	Flexible					1.5		Moderate							G	F		
95	722.300	722.400	F	BT	Flexible					2		Moderate							G	F		
96	722.400	722.500	G	BT	Flexible					1.5		Moderate							G	F		
97	722.500	722.600	F	BT	Flexible					2		Moderate							G	F		
98	722.600	722.700	F	BT	Flexible					2		Moderate							G	F		
99	722.700	722.800	F	BT	Flexible					2		Moderate							G	F		
100	722.800	722.900	F	BT	Flexible					2		Moderate							G	F		
101	722.900	723.000	F	BT	Flexible					2		Moderate							G	F		
102	723.000	723.100	F	BT	Flexible					2		Moderate							G	F		
103	723.100	723.200	F	BT	Flexible					2		Moderate							G	F		
104	723.200	723.300	F	BT	Flexible					2		Moderate							G	F		
105	723.300	723.400	F	BT	Flexible					2		Moderate							G	F		
106	723.400	723.500	G	BT	Flexible					1.5		Moderate							G	F		
107	723.500	723.600	F	BT	Flexible					2		Moderate							G	F		
108	723.600	723.700	F	BT	Flexible					2		Moderate							G	F		
109	723.700	723.800	G	BT	Flexible					1.5		Moderate							G	F		
110	723.800	723.900	G	BT	Flexible					1.5		Moderate							G	F		
111	723.900	724.000	G	BT	Flexible					1.5		Moderate							G	F		
112	724.000	724.100	G	BT	Flexible					1.5		Moderate							G	F		
113	724.100	724.200	G	BT	Flexible					1.5		Moderate							G	F		
114	724.200	724.300	G	BT	Flexible					1.5		Moderate							G	F		
115	724.300	724.400	G	BT	Flexible					1.5		Moderate							G	F		
116	724.400	724.500	G	BT	Flexible					1.5		Moderate							G	F		
117	724.500	724.600	G	BT	Flexible					1.5		Moderate							G	F		
118	724.600	724.700	G	BT	Flexible					1.5		Moderate							G	F		
119	724.700	724.800	G	BT	Flexible					1.5		Moderate							G	F		
120	724.800	724.900	G	BT	Flexible					1.5		Moderate							G	F		
121	724.900	725.000	G	BT	Flexible					1.5		Moderate							G	F		
122	725.000	725.100	G	BT	Flexible					1.5		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
123	725.100	725.200	G	BT	Flexible					1.5		Moderate							G	F		
124	725.200	725.300	F	BT	Flexible					2		Moderate							G	F		
125	725.300	725.400	F	BT	Flexible					2		Moderate							G	F		
126	725.400	725.500	F	BT	Flexible					2		Moderate							G	F		
127	725.500	725.600	F	BT	Flexible					2		Moderate							G	F		
128	725.600	725.700	F	BT	Flexible					2		Moderate							G	F		
129	725.700	725.800	G	BT	Flexible					1.5		Moderate							G	F		
130	725.800	725.900	G	BT	Flexible					1.5		Moderate							G	F		
131	725.900	726.000	G	BT	Flexible					1.5		Moderate							G	F		
132	726.000	726.100	G	BT	Flexible					1.5		Moderate							G	F		
133	726.100	726.200	F	BT	Flexible					2		Moderate							G	F		
134	726.200	726.300	F	BT	Flexible					2		Moderate							G	F		
135	726.300	726.400	F	BT	Flexible					2		Moderate							G	F		
136	726.400	726.500	F	BT	Flexible					2		Moderate							G	F		
137	726.500	726.600	F	BT	Flexible					2		Moderate							G	F		
138	726.600	726.700	F	BT	Flexible					2		Moderate							G	F		
139	726.700	726.800	G	BT	Flexible					1.5		Moderate							G	F		
140	726.800	726.900	G	BT	Flexible					1.5		Moderate							G	F		
141	726.900	727.000	G	BT	Flexible					1.5		Moderate							G	F		
142	727.000	727.100	G	BT	Flexible					1.5		Moderate							G	F		
143	727.100	727.200	G	BT	Flexible					1.5		Moderate							G	F		
144	727.200	727.300	G	BT	Flexible					1.5		Moderate							G	F		
145	727.300	727.400	G	BT	Flexible					1.5		Moderate							G	F		
146	727.400	727.500	G	BT	Flexible					1.5		Moderate							G	F		
147	727.500	727.600	G	BT	Flexible					1.5		Moderate							G	F		
148	727.600	727.700	G	BT	Flexible					1.5		Moderate							G	F		
149	727.700	727.800	G	BT	Flexible					1.5		Moderate							G	F		
150	727.800	727.900	G	BT	Flexible					1.5		Moderate							G	F		
151	727.900	728.000	G	BT	Flexible					1.5		Moderate							G	F		
152	728.000	728.100	G	BT	Flexible					1.5		Moderate							G	F		
153	728.100	728.200	G	BT	Flexible					1.5		Moderate							G	F		
154	728.200	728.300	G	BT	Flexible					1.5		Moderate							G	F		
155	728.300	728.400	G	BT	Flexible					1.5		Moderate							G	F		
156	728.400	728.500	G	BT	Flexible					1.5		Moderate							G	F		
157	728.500	728.600	G	BT	Flexible					1.5		Moderate							G	F		
158	728.600	728.700	G	BT	Flexible					1.5		Moderate							G	F		
159	728.700	728.800	G	BT	Flexible					1.5		Moderate							G	F		
160	728.800	728.900	G	BT	Flexible					1.5		Moderate							G	F		
161	728.900	729.000	G	BT	Flexible					1.5		Moderate							G	F		
162	729.000	729.100	G	BT	Flexible					1.5		Moderate							G	F		
163	729.100	729.200	G	BT	Flexible					1.5		Moderate							G	F		
164	729.200	729.300	G	BT	Flexible					1.5		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
165	729.300	729.400	G	BT	Flexible					1.5		Moderate							G	F		
166	729.400	729.500	G	BT	Flexible					1.5		Moderate							G	F		
167	729.500	729.600	G	BT	Flexible					1.5		Moderate							G	F		
168	729.600	729.700	G	BT	Flexible					1.5		Moderate							G	F		
169	729.700	729.800	G	BT	Flexible					1.5		Moderate							G	F		
170	729.800	729.900	G	BT	Flexible					1.5		Moderate							G	F		
171	729.900	730.000	G	BT	Flexible					1.5		Moderate							G	F		
172	730.000	730.100	G	BT	Flexible					1.5		Moderate							G	F		
173	730.100	730.200	G	BT	Flexible					1.5		Moderate							G	F		
174	730.200	730.300	G	BT	Flexible					1.5		Moderate							G	F		
175	730.300	730.400	G	BT	Flexible					1.5		Moderate							G	F		
176	730.400	730.500	G	BT	Flexible					1.5		Moderate							G	F		
177	730.500	730.600	G	BT	Flexible					1.5		Moderate							G	F		
178	730.600	730.700	G	BT	Flexible					1.5		Moderate							G	F		
179	730.700	730.800	G	BT	Flexible					1.5		Moderate							G	F		
180	730.800	730.900	G	BT	Flexible					1.5		Moderate							G	F		
181	730.900	731.000	G	BT	Flexible					1.5		Moderate							G	F		
182	731.000	731.100	G	BT	Flexible					1.5		Moderate							G	F		
183	731.100	731.200	G	BT	Flexible					1.5		Moderate							G	F		
184	731.200	731.300	G	BT	Flexible					1.5		Moderate							G	F		
185	731.300	731.400	G	BT	Flexible					1.5		Moderate							G	F		
186	731.400	731.500	G	BT	Flexible					1.5		Moderate							G	F		
187	731.500	731.600	F	BT	Flexible					2		Moderate							G	F		
188	731.600	731.700	F	BT	Flexible					2		Moderate							G	F		
189	731.700	731.800	F	BT	Flexible					2		Moderate							G	F		
190	731.800	731.900	F	BT	Flexible					2		Moderate							G	F		
191	731.900	732.000	G	BT	Flexible					1.5		Moderate							G	F		
192	732.000	732.100	G	BT	Flexible					1.5		Moderate							G	F		
193	732.100	732.200	F	BT	Flexible					2		Moderate							G	F		
194	732.200	732.300	G	BT	Flexible					1.5		Moderate							G	F		
195	732.300	732.400	F	BT	Flexible					2		Moderate							G	F		
196	732.400	732.500	F	BT	Flexible					2		Moderate							G	F		
197	732.500	732.600	G	BT	Flexible					1.5		Moderate							G	F		
198	732.600	732.700	G	BT	Flexible					1.5		Moderate							G	F		
199	732.700	732.800	F	BT	Flexible					2		Moderate							G	F		
200	732.800	732.900	G	BT	Flexible					1.5		Moderate							G	F		
201	732.900	733.000	F	BT	Flexible					2		Moderate							G	F		
202	733.000	733.100	G	BT	Flexible					1.5		Moderate							G	F		
203	733.100	733.200	G	BT	Flexible					1.5		Moderate							G	F		
204	733.200	733.300	F	BT	Flexible					2		Moderate							G	F		
205	733.300	733.400	G	BT	Flexible					1.5		Moderate							G	F		
206	733.400	733.500	G	BT	Flexible					1.5		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
207	733.500	733.600	F	BT	Flexible					2		Moderate							G	F		
208	733.600	733.700	G	BT	Flexible					1.5		Moderate							G	F		
209	733.700	733.800	F	BT	Flexible					2		Moderate							G	F		
210	733.800	733.900	G	BT	Flexible					1.5		Moderate							G	F		
211	733.900	734.000	G	BT	Flexible					1.5		Moderate							G	F		
212	734.000	734.100	F	BT	Flexible					2		Moderate							G	F		
213	734.100	734.200	G	BT	Flexible					1.5		Moderate							G	F		
214	734.200	734.300	G	BT	Flexible					1.5		Moderate							G	F		
215	734.300	734.400	F	BT	Flexible					2		Moderate							G	F		
216	734.400	734.500	G	BT	Flexible					1.5		Moderate							G	F		
217	734.500	734.600	F	BT	Flexible					2		Moderate							G	F		
218	734.600	734.700	G	BT	Flexible					1.5		Moderate							G	F		
219	734.700	734.800	F	BT	Flexible					2		Moderate							G	F		
220	734.800	734.900	G	BT	Flexible					1.5		Moderate							G	F		
221	734.900	735.000	G	BT	Flexible					1.5		Moderate							G	F		
222	735.000	735.100	F	BT	Flexible					2		Moderate							G	F		
223	735.100	735.200	G	BT	Flexible					1.5		Moderate							G	F		
224	735.200	735.300	G	BT	Flexible					1.5		Moderate							G	F		
225	735.300	735.400	F	BT	Flexible					2		Moderate							G	F		
226	735.400	735.500	G	BT	Flexible					1.5		Moderate							G	F		
227	735.500	735.600	F	BT	Flexible					2		Moderate							G	F		
228	735.600	735.700	G	BT	Flexible					1.5		Moderate							G	F		
229	735.700	735.800	G	BT	Flexible					1.5		Moderate							G	F		
230	735.800	735.900	F	BT	Flexible					2		Moderate							G	F		
231	735.900	736.000	G	BT	Flexible					1.5		Moderate							G	F		
232	736.000	736.100	F	BT	Flexible					2		Moderate							G	F		
233	736.100	736.200	F	BT	Flexible					2		Moderate							G	F		
234	736.200	736.300	G	BT	Flexible					1.5		Moderate							G	F		
235	736.300	736.400	F	BT	Flexible					2		Moderate							G	F		
236	736.400	736.500	G	BT	Flexible					1.5		Moderate							G	F		
237	736.500	736.600	F	BT	Flexible					2		Moderate							G	F		
238	736.600	736.700	G	BT	Flexible					1.5		Moderate							G	F		
239	736.700	736.800	F	BT	Flexible					2		Moderate							G	F		
240	736.800	736.900	G	BT	Flexible					1.5		Moderate							G	F		
241	736.900	737.000	F	BT	Flexible					2		Moderate							G	F		
242	737.000	737.100	G	BT	Flexible					1.5		Moderate							G	F		
243	737.100	737.200	F	BT	Flexible					2		Moderate							G	F		
244	737.200	737.300	G	BT	Flexible					1.5		Moderate							G	F		
245	737.300	737.400	F	BT	Flexible					2		Moderate							G	F		
246	737.400	737.500	G	BT	Flexible					1.5		Moderate							G	F		
247	737.500	737.600	F	BT	Flexible					2		Moderate							G	F		
248	737.600	737.700	F	BT	Flexible					2		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
249	737.700	737.800	G	BT	Flexible					1.5		Moderate							G	F		
250	737.800	737.900	F	BT	Flexible					2		Moderate							G	F		
251	737.900	738.000	G	BT	Flexible					1.5		Moderate							G	F		
252	738.000	738.100	F	BT	Flexible					2		Moderate							G	F		
253	738.100	738.200	G	BT	Flexible					1.5		Moderate							G	F		
254	738.200	738.300	F	BT	Flexible					2		Moderate							G	F		
255	738.300	738.400	G	BT	Flexible					1.5		Moderate							G	F		
256	738.400	738.500	F	BT	Flexible					2.5		Moderate							G	F		
257	738.500	738.600	G	BT	Flexible					1.5		Moderate							G	F		
258	738.600	738.700	G	BT	Flexible					1.5		Moderate							G	F		
259	738.700	738.800	G	BT	Flexible					1.5		Moderate							G	F		
260	738.800	738.900	F	BT	Flexible					2		Moderate							G	F		
261	738.900	739.000	G	BT	Flexible					1.5		Moderate							G	F		
262	739.000	739.100	F	BT	Flexible					2		Moderate							G	F		
263	739.100	739.200	G	BT	Flexible					1.5		Moderate							G	F		
264	739.200	739.300	F	BT	Flexible					2		Moderate							G	F		
265	739.300	739.400	G	BT	Flexible					1.5		Moderate							G	F		
266	739.400	739.500	F	BT	Flexible					2		Moderate							G	F		
267	739.500	739.600	G	BT	Flexible					1.5		Moderate							G	F		
268	739.600	739.700	F	BT	Flexible					2		Moderate							G	F		
269	739.700	739.800	G	BT	Flexible					1.5		Moderate							G	F		
270	739.800	739.900	F	BT	Flexible					2		Moderate							G	F		
271	739.900	740.000	G	BT	Flexible					1.5		Moderate							G	F		
272	740.000	740.100	F	BT	Flexible					2		Moderate							G	F		
273	740.100	740.200	G	BT	Flexible					1.5		Moderate							G	F		
274	740.200	740.300	F	BT	Flexible					2		Moderate							G	F		
275	740.300	740.400	G	BT	Flexible					1.5		Moderate							G	F		
276	740.400	740.500	F	BT	Flexible					2		Moderate							G	F		
277	740.500	740.600	G	BT	Flexible					1.5		Moderate							G	F		
278	740.600	740.700	F	BT	Flexible					2		Moderate							G	F		
279	740.700	740.800	G	BT	Flexible					1.5		Moderate							G	F		
280	740.800	740.900	F	BT	Flexible					2		Moderate							G	F		
281	740.900	741.000	G	BT	Flexible					1.5		Moderate							G	F		
282	741.000	741.100	F	BT	Flexible					2.5		Moderate							G	F		
283	741.100	741.200	F	BT	Flexible					2		Moderate							G	F		
284	741.200	741.300	G	BT	Flexible					1.5		Moderate							G	F		
285	741.300	741.400	F	BT	Flexible					2		Moderate							G	F		
286	741.400	741.500	G	BT	Flexible					1.5		Moderate							G	F		
287	741.500	741.600	F	BT	Flexible					2		Moderate							G	F		
288	741.600	741.700	G	BT	Flexible					1.5		Moderate							G	F		
289	741.700	741.800	F	BT	Flexible					2		Moderate							G	F		
290	741.800	741.900	G	BT	Flexible					1.5		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
291	741.900	742.000	F	BT	Flexible					2.5		Moderate							G	F		
292	742.000	742.100	G	BT	Flexible					1.5		Moderate							G	F		
293	742.100	742.200	F	BT	Flexible					2		Moderate							G	F		
294	742.200	742.300	G	BT	Flexible					1.5		Moderate							G	F		
295	742.300	742.400	F	BT	Flexible					2		Moderate							G	F		
296	742.400	742.500	G	BT	Flexible					1.5		Moderate							G	F		
297	742.500	742.600	G	BT	Flexible					1.5		Moderate							G	F		
298	742.600	742.700	G	BT	Flexible					1.5		Moderate							G	F		
299	742.700	742.800	G	BT	Flexible					1.5		Moderate							G	F		
300	742.800	742.870	G	BT	Flexible					1.5		Moderate							G	F		
301	742.870	743.000	F	Cemented	Rigid				3										G	F		
302	743.000	743.100	F	Cemented	Rigid				2										G	F		
303	743.100	743.200	F	Cemented	Rigid				2										G	F		
304	743.200	743.300	F	Cemented	Rigid				2										G	F		
305	743.300	743.400	F	Cemented	Rigid				2										G	F		
306	743.400	743.500	F	Cemented	Rigid				2										G	F		
307	743.500	743.600	F	Cemented	Rigid				2										G	F		
308	743.600	743.700	F	Cemented	Rigid				2.5										G	F		
309	743.700	743.850	G	Cemented	Rigid				0										G	F		
310	743.850	743.950	G	Cemented	Rigid				0										G	F		
311	743.950	744.050	G	Cemented	Rigid				1.5										G	F		
312	744.050	744.150	G	Cemented	Rigid				0										G	F		
313	744.150	744.250	G	Cemented	Rigid				0										G	F		
314	744.250	744.350	G	Cemented	Rigid				0										G	F		
315	744.350	744.450	G	Cemented	Rigid				0										G	F		
316	744.450	744.550	G	Cemented	Rigid				0										G	F		
317	744.550	744.700	G	BT	Flexible					1.5		Moderate							G	F		
318	744.700	744.800	G	BT	Flexible					1.5		Moderate							G	F		
319	744.800	744.900	G	BT	Flexible					1.5		Moderate							G	F		
320	744.900	745.000	F	BT	Flexible					2		Moderate							G	F		
321	745.000	745.100	G	BT	Flexible					1.5		Moderate							G	F		
322	745.100	745.190	F	BT	Flexible					2		Moderate							G	F		
323	745.190	745.290	G	Cemented	Rigid					1.5		Moderate							G	F		
324	745.290	745.390	F	Cemented	Rigid				2										G	F		
325	745.390	745.490	G	Cemented	Rigid				0										G	F		
326	745.490	745.590	G	Cemented	Rigid				0										G	F		
327	745.590	745.690	G	Cemented	Rigid				0										G	F		
328	745.690	745.790	G	Cemented	Rigid				0										G	F		
329	745.790	745.890	G	Cemented	Rigid				0										G	F		
330	745.890	745.990	G	Cemented	Rigid				0										G	F		
331	745.990	746.090	G	Cemented	Rigid				0										G	F		
332	746.090	746.190	G	Cemented	Rigid				0										G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
333	746.190	746.290	G	Cemented	Rigid				0										G	F		
334	746.290	746.390	G	Cemented	Rigid				0										G	F		
335	746.390	746.490	G	Cemented	Rigid				0										G	F		
336	746.490	746.590	G	Cemented	Rigid				0										G	F		
337	746.590	746.690	G	Cemented	Rigid				0										G	F		
338	746.690	746.790	G	Cemented	Rigid				0										G	F		
339	746.790	746.890	G	Cemented	Rigid				0										G	F		
340	746.890	746.990	G	Cemented	Rigid				0										G	F		
341	746.990	747.090	G	Cemented	Rigid				0										G	F		
342	747.090	747.190	G	Cemented	Rigid				1.5										G	F		
343	747.190	747.290	G	Cemented	Rigid				1.5										G	F		
344	747.290	747.390	G	Cemented	Rigid				0										G	F		
345	747.390	747.490	G	Cemented	Rigid				0										G	F		
346	747.490	747.590	G	Cemented	Rigid				0										G	F		
347	747.590	747.690	G	Cemented	Rigid				0										G	F		
348	747.690	747.790	G	Cemented	Rigid				0										G	F		
349	747.790	747.890	G	Cemented	Rigid				0										G	F		
350	747.890	747.990	G	Cemented	Rigid				0										G	F		
351	747.990	748.090	G	Cemented	Rigid				0										G	F		
352	748.090	748.190	G	Cemented	Rigid				0										G	F		
353	748.190	748.290	G	Cemented	Rigid				0										G	F		
354	748.290	748.390	G	Cemented	Rigid				1.5										G	F		
355	748.390	748.490	G	Cemented	Rigid				0										G	F		
356	748.490	748.590	G	Cemented	Rigid				0										G	F		
357	748.590	748.690	G	Cemented	Rigid				0										G	F		
358	748.690	748.790	G	Cemented	Rigid				0										G	F		
359	748.790	748.890	G	Cemented	Rigid				0										G	F		
360	748.890	748.990	G	Cemented	Rigid				0										G	F		
361	748.990	749.105	G	Cemented	Rigid				0										G	F		
362	749.105	749.200	G	BT	Flexible					1.5		Moderate							G	F		
363	749.200	749.300	F	BT	Flexible					2		Moderate							G	F		
364	749.300	749.400	G	BT	Flexible					1.5		Moderate							G	F		
365	749.400	749.500	F	BT	Flexible					2		Moderate							G	F		
366	749.500	749.600	G	BT	Flexible					1.5		Moderate							G	F		
367	749.600	749.740	F	BT	Flexible					2		Moderate							G	F		
368	749.740	749.800	G	Cemented	Rigid				1.5										G	F		
369	749.800	749.900	G	Cemented	Rigid				1.5										G	F		
370	749.900	750.000	G	Cemented	Rigid				1.5										G	F		
371	750.000	750.110	G	Cemented	Rigid				1.5										G	F		
372	750.110	750.200	G	BT	Rigid				1.5										G	F		
373	750.200	750.300	G	BT	Flexible					1.5		Moderate							G	F		
374	750.300	750.400	F	BT	Flexible					2		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
375	750.400	750.500	G	BT	Flexible					1.5		Moderate							G	F		
376	750.500	750.600	G	BT	Flexible					1.5		Moderate							G	F		
377	750.600	750.700	F	BT	Flexible					2.5		Moderate							G	F		
378	750.700	750.800	G	BT	Flexible					1.5		Moderate							G	F		
379	750.800	750.885	F	BT	Flexible					2		Moderate							G	F		
380	750.885	751.000	G	Cemented	Rigid				1.5										G	F		
381	751.000	751.100	G	Cemented	Rigid				1.5										G	F		
382	751.100	751.200	G	Cemented	Rigid				1.5										G	F		
383	751.200	751.300	G	Cemented	Rigid				1.5										G	F		
384	751.300	751.400	G	Cemented	Rigid				1.5										G	F		
385	751.400	751.500	G	Cemented	Rigid				0										G	F		
386	751.500	751.600	G	Cemented	Rigid				0										G	F		
387	751.600	751.700	G	Cemented	Rigid				0										G	F		
388	751.700	751.800	G	Cemented	Rigid				0										G	F		
389	751.800	751.900	G	Cemented	Rigid				0										G	F		
390	751.900	752.000	G	Cemented	Rigid				0										G	F		
391	752.000	752.100	G	Cemented	Rigid				0										G	F		
392	752.100	752.200	G	Cemented	Rigid				0										G	F		
393	752.200	752.325	G	Cemented	Rigid				0										G	F		
394	752.325	752.400	G	BT	Flexible					1.5		Moderate							G	F		
395	752.400	752.500	G	BT	Flexible					1.5		Moderate							G	F		
396	752.500	752.600	F	BT	Flexible					2.5		Moderate							G	F		
397	752.600	752.700	G	BT	Flexible					1.5		Moderate							G	F		
398	752.700	752.800	F	BT	Flexible					2		Moderate							G	F		
399	752.800	752.900	G	BT	Flexible					1.5		Moderate							G	F		
400	752.900	752.985	G	BT	Flexible					1.5		Moderate							G	F		
401	752.985	753.085	G	Cemented	Rigid				1.5										G	F		
402	753.085	753.185	G	Cemented	Rigid				0										G	F		
403	753.185	753.285	G	Cemented	Rigid				0										G	F		
404	753.285	753.385	G	Cemented	Rigid				0										G	F		
405	753.385	753.485	G	Cemented	Rigid				0										G	F		
406	753.485	753.585	G	Cemented	Rigid				0										G	F		
407	753.585	753.685	G	Cemented	Rigid				0										G	F		
408	753.685	753.785	G	Cemented	Rigid				0										G	F		
409	753.785	753.885	G	Cemented	Rigid				0										G	F		
410	753.885	753.985	G	Cemented	Rigid				0										G	F		
411	753.985	754.020	G	Cemented	Rigid				1.5										G	F		
412	754.020	754.120	G	BT	Flexible					1.5		Moderate							G	F		
413	754.120	754.220	G	BT	Flexible					1.5		Moderate							G	F		
414	754.220	754.320	G	BT	Flexible					1.5		Moderate							G	F		
415	754.320	754.420	F	BT	Flexible					2		Moderate							G	F		
416	754.420	754.520	G	BT	Flexible					1.5		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
417	754.520	754.620	G	BT	Flexible					1.5		Moderate							G	F		
418	754.620	754.720	F	BT	Flexible					2		Moderate							G	F		
419	754.720	754.820	G	BT	Flexible					1.5		Moderate							G	F		
420	754.820	754.910	G	BT	Flexible					1.5		Moderate							G	F		
421	754.910	755.010	G	Cemented	Rigid				1.5										G	F		
422	755.010	755.110	G	Cemented	Rigid				1.5										G	F		
423	755.110	755.210	G	Cemented	Rigid				1.5										G	F		
424	755.210	755.310	G	Cemented	Rigid				1.5										G	F		
425	755.310	755.410	G	Cemented	Rigid				1.5										G	F		
426	755.410	755.510	G	Cemented	Rigid				1.5										G	F		
427	755.510	755.610	G	Cemented	Rigid				1.5										G	F		
428	755.610	755.750	G	Cemented	Rigid				1.5										G	F		
429	755.750	755.850	F	BT	Flexible					2		Moderate							G	F		
430	755.850	755.950	G	BT	Flexible					1.5		Moderate							G	F		
431	755.950	756.050	G	BT	Flexible					1.5		Moderate							G	F		
432	756.050	756.150	G	BT	Flexible					1.5		Moderate							G	F		
433	756.150	756.250	F	BT	Flexible					2		Moderate							G	F		
434	756.250	756.350	G	BT	Flexible					1.5		Moderate							G	F		
435	756.350	756.390	G	BT	Flexible					1.5		Moderate							G	F		
436	756.390	756.490	G	Cemented	Rigid				1.5										G	F		
437	756.490	756.590	G	Cemented	Rigid				0										G	F		
438	756.590	756.690	G	Cemented	Rigid				0										G	F		
439	756.690	756.790	G	Cemented	Rigid				0										G	F		
440	756.790	756.890	G	Cemented	Rigid				0										G	F		
441	756.890	756.990	G	Cemented	Rigid				0										G	F		
442	756.990	757.090	G	Cemented	Rigid				0										G	F		
443	757.090	757.190	G	Cemented	Rigid				0										G	F		
444	757.190	757.290	G	Cemented	Rigid				1.5										G	F		
445	757.290	757.420	G	Cemented	Rigid				0										G	F		
446	757.420	757.520	F	BT	Flexible					2		Moderate							G	F		
447	757.520	757.620	G	BT	Flexible					1.5		Moderate							G	F		
448	757.620	757.720	G	BT	Flexible					1.5		Moderate							G	F		
449	757.720	757.820	G	BT	Flexible					1.5		Moderate							G	F		
450	757.820	757.920	F	BT	Flexible					2		Moderate							G	F		
451	757.920	758.020	G	BT	Flexible					1.5		Moderate							G	F		
452	758.020	758.085	G	BT	Flexible					1.5		Moderate							G	F		
453	758.085	758.185	G	Cemented	Rigid				0										G	F		
454	758.185	758.285	F	Cemented	Rigid				2										G	F		
455	758.285	758.385	F	Cemented	Rigid				2.5										G	F		
456	758.385	758.485	G	Cemented	Rigid				1.5										G	F		
457	758.485	758.585	G	Cemented	Rigid				1.5										G	F		
458	758.585	758.685	F	Cemented	Rigid				2										G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
459	758.685	758.785	G	Cemented	Rigid				1.5										G	F		
460	758.785	758.885	G	Cemented	Rigid				1.5										G	F		
461	758.885	758.985	G	Cemented	Rigid				1.5										G	F		
462	758.985	759.085	G	Cemented	Rigid				1.5										G	F		
463	759.085	759.185	G	Cemented	Rigid				1.5										G	F		
464	759.185	759.285	G	Cemented	Rigid				1.5										G	F		
465	759.285	759.325	F	Cemented	Rigid				2										G	F		
466	759.325	759.425	G	BT	Flexible					1.5		Moderate							G	F		
467	759.425	759.525	G	BT	Flexible					1.5		Moderate							G	F		
468	759.525	759.625	F	BT	Flexible					2		Moderate							G	F		
469	759.625	759.725	G	BT	Flexible					1.5		Moderate							G	F		
470	759.725	759.825	G	BT	Flexible					1.5		Moderate							G	F		
471	759.825	759.925	F	BT	Flexible					2		Moderate							G	F		
472	759.925	760.025	G	BT	Flexible					1.5		Moderate							G	F		
473	760.025	760.120	G	Cemented	Rigid				1.5										G	F		
474	760.120	760.220	G	Cemented	Rigid				1.5										G	F		
475	760.220	760.320	G	Cemented	Rigid				1.5										G	F		
476	760.320	760.420	G	Cemented	Rigid				1.5										G	F		
477	760.420	760.520	G	Cemented	Rigid				0										G	F		
478	760.520	760.620	G	Cemented	Rigid				0										G	F		
479	760.620	760.720	G	Cemented	Rigid				0										G	F		
480	760.720	760.820	G	Cemented	Rigid				0										G	F		
481	760.820	760.920	G	Cemented	Rigid				0										G	F		
482	760.920	761.020	G	Cemented	Rigid				0										G	F		
483	761.020	761.120	G	Cemented	Rigid				0										G	F		
484	761.120	761.220	G	Cemented	Rigid				0										G	F		
485	761.220	761.320	G	Cemented	Rigid				0										G	F		
486	761.320	761.405	G	Cemented	Rigid				1.5	1.5									G	F		
487	761.405	761.505	F	BT	Flexible					2		Moderate							G	F		
488	761.505	761.605	G	BT	Flexible					1.5		Moderate							G	F		
489	761.605	761.705	G	BT	Flexible					1.5		Moderate							G	F		
490	761.705	761.805	F	BT	Flexible					2		Moderate							G	F		
491	761.805	761.905	G	BT	Flexible					1.5		Moderate							G	F		
492	761.905	762.020	G	BT	Flexible					2		Moderate							G	F		
493	762.020	762.120	G	Cemented	Rigid				0										G	F		
494	762.120	762.220	F	Cemented	Rigid				2										G	F		
495	762.220	762.315	G	Cemented	Rigid				1.5										G	F		
496	762.315	762.415	G	BT	Flexible					1.5		Moderate							G	F		
497	762.415	762.515	F	BT	Flexible					2		Moderate							G	F		
498	762.515	762.615	G	BT	Flexible					1.5		Moderate							G	F		
499	762.615	762.715	G	BT	Flexible					1.5		Moderate							G	F		
500	762.715	762.815	F	BT	Flexible					2		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
501	762.815	762.915	G	BT	Flexible					1.5		Moderate							G	F		
502	762.915	763.015	G	BT	Flexible					1.5		Moderate							G	F		
503	763.015	763.120	G	BT	Flexible					1.5		Moderate							G	F		
504	763.120	763.220	G	Cemented	Rigid				0										G	F		
505	763.220	763.320	G	Cemented	Rigid				0										G	F		
506	763.320	763.420	G	Cemented	Rigid				0										G	F		
507	763.420	763.520	F	Cemented	Rigid				2										G	F		
508	763.520	763.620	G	Cemented	Rigid				1.5										G	F		
509	763.620	763.720	F	Cemented	Rigid				2										G	F		
510	763.720	763.820	G	Cemented	Rigid				1.5										G	F		
511	763.820	763.920	F	Cemented	Rigid				2										G	F		
512	763.920	764.020	G	Cemented	Rigid				1.5										G	F		
513	764.020	764.120	G	Cemented	Rigid				1.5										G	F		
514	764.120	764.220	F	Cemented	Rigid				2										G	F		
515	764.220	764.320	G	Cemented	Rigid				1.5										G	F		
516	764.320	764.420	F	Cemented	Rigid				2										G	F		
517	764.420	764.520	G	Cemented	Rigid				1.5										G	F		
518	764.520	764.620	F	Cemented	Rigid				3										G	F		
519	764.620	764.680	F	Cemented	Rigid				2										G	F		
520	764.680	764.780	F	BT	Flexible					2.5		Moderate							G	F		
521	764.780	764.880	G	BT	Flexible					1.5		Moderate							G	F		
522	764.880	764.980	F	BT	Flexible					2		Moderate							G	F		
523	764.980	765.080	G	BT	Flexible					1.5		Moderate							G	F		
524	765.080	765.180	F	BT	Flexible					2.5		Moderate							G	F		
525	765.180	765.280	F	BT	Flexible					2		Moderate							G	F		
526	765.280	765.380	G	BT	Flexible					2		Moderate							G	F		
527	765.380	765.430	G	BT	Flexible					2		Moderate							G	F		
528	765.430	765.530	G	Cemented	Rigid				1.5										G	F		
529	765.530	765.630	G	Cemented	Rigid				1.5										G	F		
530	765.630	765.730	G	Cemented	Rigid				1.5										G	F		
531	765.730	765.830	G	Cemented	Rigid				1.5										G	F		
532	765.830	765.930	G	Cemented	Rigid				2										G	F		
533	765.930	766.030	G	Cemented	Rigid				1.5										G	F		
534	766.030	766.130	G	Cemented	Rigid				1.5										G	F		
535	766.130	766.230	G	Cemented	Rigid				2										G	F		
536	766.230	766.330	G	Cemented	Rigid				1.5										G	F		
537	766.330	766.430	G	Cemented	Rigid				2										G	F		
538	766.430	766.530	G	Cemented	Rigid				1.5										G	F		
539	766.530	766.630	G	Cemented	Rigid				2										G	F		
540	766.630	766.730	F	Cemented	Rigid				1.5										G	F		
541	766.730	766.830	G	Cemented	Rigid				2										G	F		
542	766.830	766.930	G	Cemented	Rigid				1.5										G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
543	766.930	767.030	F	Cemented	Rigid				2										G	F		
544	767.030	767.130	G	Cemented	Rigid				1.5										G	F		
545	767.130	767.230	F	Cemented	Rigid				1.5										G	F		
546	767.230	767.330	G	Cemented	Rigid				1.5										G	F		
547	767.330	767.430	F	Cemented	Rigid				2										G	F		
548	767.430	767.530	G	Cemented	Rigid				1.5										G	F		
549	767.530	767.585	F	Cemented	Rigid				1.5										G	F		
550	767.585	767.685	G	BT	Flexible					1.5		Moderate							G	F		
551	767.685	767.785	F	BT	Flexible					2		Moderate							G	F		
552	767.785	767.885	G	BT	Flexible					1.5		Moderate							G	F		
553	767.885	767.985	F	BT	Flexible					2		Moderate							G	F		
554	767.985	768.085	G	BT	Flexible					2		Moderate							G	F		
555	768.085	768.185	G	BT	Flexible					2		Moderate							G	F		
556	768.185	768.250	G	BT	Flexible					2		Moderate							G	F		
557	768.250	768.350	G	Cemented	Rigid				2										G	F		
558	768.350	768.450	F	Cemented	Rigid				1.5										G	F		
559	768.450	768.540	G	Cemented	Rigid				2										G	F		
560	768.540	768.640	F	BT	Flexible					2		Moderate							G	F		
561	768.640	768.740	G	BT	Flexible					1.5		Moderate							G	F		
562	768.740	768.840	F	BT	Flexible					2.5		Moderate							G	F		
563	768.840	768.940	G	BT	Flexible					1.5		Moderate							G	F		
564	768.940	769.040	G	BT	Flexible					1.5		Moderate							G	F		
565	769.040	769.140	G	BT	Flexible					1.5		Moderate							G	F		
566	769.140	769.240	G	BT	Flexible					1.5		Moderate							G	F		
567	769.240	769.340	G	BT	Flexible					1.5		Moderate							G	F		
568	769.340	769.440	G	BT	Flexible					1.5		Moderate							G	F		
569	769.440	769.540	F	BT	Flexible					2		Moderate							G	F		
570	769.540	769.640	G	BT	Flexible					1.5		Moderate							G	F		
571	769.640	769.740	G	BT	Flexible					1.5		Moderate							G	F		
572	769.740	769.840	F	BT	Flexible					2.5		Moderate							G	F		
573	769.840	769.940	G	BT	Flexible					1.5		Moderate							G	F		
574	769.940	770.040	G	BT	Flexible					1.5		Moderate							G	F		
575	770.040	770.140	G	BT	Flexible					1.5		Moderate							G	F		
576	770.140	770.240	G	BT	Flexible					1.5		Moderate							G	F		
577	770.240	770.370	G	BT	Flexible					1.5		Moderate							G	F		
578	770.370	770.470	G	Cemented	Rigid				1.5										G	F		
579	770.470	770.570	G	Cemented	Rigid				1.5										G	F		
580	770.570	770.670	G	Cemented	Rigid				1.5										G	F		
581	770.670	770.770	G	Cemented	Rigid				1.5										G	F		
582	770.770	770.870	G	Cemented	Rigid				1.5										G	F		
583	770.870	770.970	G	Cemented	Rigid				0										G	F		
584	770.970	771.070	G	Cemented	Rigid				0										G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
585	771.070	771.170	G	Cemented	Rigid				0										G	F		
586	771.170	771.270	G	Cemented	Rigid				0										G	F		
587	771.270	771.370	G	Cemented	Rigid				0										G	F		
588	771.370	771.470	G	Cemented	Rigid				0										G	F		
589	771.470	771.570	G	Cemented	Rigid				0										G	F		
590	771.570	771.670	G	Cemented	Rigid				0										G	F		
591	771.670	771.770	G	Cemented	Rigid				0										G	F		
592	771.770	771.870	G	Cemented	Rigid				1.5										G	F		
593	771.870	771.970	F	Cemented	Rigid				3										G	F		
594	771.970	772.070	F	Cemented	Rigid				2										G	F		
595	772.070	772.170	F	Cemented	Rigid				2.5										G	F		
596	772.170	772.270	G	Cemented	Rigid				1.5										G	F		
597	772.270	772.370	G	Cemented	Rigid				1.5										G	F		
598	772.370	772.470	G	Cemented	Rigid				0										G	F		
599	772.470	772.570	G	Cemented	Rigid				1.5										G	F		
600	772.570	772.680	G	Cemented	Rigid				1.5										G	F		
601	772.680	772.780	G	BT	Flexible					1.5		Moderate							G	F		
602	772.780	772.880	G	BT	Flexible					1.5		Moderate							G	F		
603	772.880	772.980	G	BT	Flexible					1.5		Moderate							G	F		
604	772.980	773.080	G	BT	Flexible					1.5		Moderate							G	F		
605	773.080	773.180	F	BT	Flexible					2.5		Moderate							G	F		
606	773.180	773.280	G	BT	Flexible					1.5		Moderate							G	F		
607	773.280	773.380	G	BT	Flexible					1.5		Moderate							G	F		
608	773.380	773.450	G	BT	Flexible					1.5		Moderate							G	F		
609	773.450	773.550	G	Cemented	Rigid				1.5										G	F		
610	773.550	773.650	G	Cemented	Rigid				1.5										G	F		
611	773.650	773.750	G	Cemented	Rigid				1.5										G	F		
612	773.750	773.850	G	Cemented	Rigid				1.5										G	F		
613	773.850	773.950	F	Cemented	Rigid				2										G	F		
614	773.950	774.050	G	Cemented	Rigid				1.5										G	F		
615	774.050	774.150	G	Cemented	Rigid				1.5										G	F		
616	774.150	774.250	G	Cemented	Rigid				1.5										G	F		
617	774.250	774.350	G	Cemented	Rigid				1.5										G	F		
618	774.350	774.450	F	Cemented	Rigid				2.5										G	F		
619	774.450	774.550	G	Cemented	Rigid				1.5										G	F		
620	774.550	774.650	G	Cemented	Rigid				1.5										G	F		
621	774.650	774.750	G	Cemented	Rigid				1.5										G	F		
622	774.750	774.850	G	Cemented	Rigid				1.5										G	F		
623	774.850	774.950	G	Cemented	Rigid				1.5										G	F		
624	774.950	775.050	G	Cemented	Rigid				1.5										G	F		
625	775.050	775.150	G	Cemented	Rigid				1.5										G	F		
626	775.150	775.250	G	Cemented	Rigid				1.5										G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
627	775.250	775.350	F	Cemented	Rigid				2.5										G	F		
628	775.350	775.450	G	Cemented	Rigid				2										G	F		
629	775.450	775.545	G	Cemented	Rigid				2										G	F		
630	775.545	775.645	G	Cemented	Rigid				2.5										G	F		
631	775.645	775.745	G	Cemented	Rigid				2										G	F		
632	775.745	775.845	G	Cemented	Rigid				2										G	F		
633	775.845	775.945	G	Cemented	Rigid				1.5										G	F		
634	775.945	776.045	G	Cemented	Rigid				1.5										G	F		
635	776.045	776.145	G	Cemented	Rigid				1.5										G	F		
636	776.145	776.245	G	Cemented	Rigid				1.5										G	F		
637	776.245	776.345	G	Cemented	Rigid				2										G	F		
638	776.345	776.410	G	Cemented	Rigid				1.5										G	F		
639	776.410	776.510	G	BT	Flexible					1.5		Moderate							G	F		
640	776.510	776.610	G	BT	Flexible					1.5		Moderate							G	F		
641	776.610	776.710	G	BT	Flexible					1.5		Moderate							G	F		
642	776.710	776.810	G	BT	Flexible					1.5		Moderate							G	F		
643	776.810	776.910	G	BT	Flexible					1.5		Moderate							G	F		
644	776.910	777.010	F	BT	Flexible					2.5		Moderate							G	F		
645	777.010	777.110	G	BT	Flexible					1.5		Moderate							G	F		
646	777.110	777.210	G	BT	Flexible					1.5		Moderate							G	F		
647	777.210	777.310	G	BT	Flexible					1.5		Moderate							G	F		
648	777.310	777.410	G	BT	Flexible					1.5		Moderate							G	F		
649	777.410	777.510	G	BT	Flexible					1.5		Moderate							G	F		
650	777.510	777.610	F	BT	Flexible					2.5		Moderate							G	F		
651	777.610	777.710	G	BT	Flexible					2		Moderate							G	F		
652	777.710	777.840	G	BT	Flexible					2		Moderate							G	F		
653	777.840	777.940	G	Cemented	Rigid				1.5										G	F		
654	777.940	778.040	G	Cemented	Rigid				2										G	F		
655	778.040	778.140	G	Cemented	Rigid				1.5										G	F		
656	778.140	778.240	G	Cemented	Rigid				1.5										G	F		
657	778.240	778.340	G	Cemented	Rigid				2										G	F		
658	778.340	778.440	G	Cemented	Rigid				2.5										G	F		
659	778.440	778.540	G	Cemented	Rigid				2										G	F		
660	778.540	778.640	G	Cemented	Rigid				1.5										G	F		
661	778.640	778.740	F	Cemented	Rigid				2										G	F		
662	778.740	778.840	F	Cemented	Rigid				2										G	F		
663	778.840	778.940	G	Cemented	Rigid				1.5										G	F		
664	778.940	779.100	G	Cemented	Rigid				1.5										G	F		
665	779.100	779.200	G	BT	Flexible					1.5		Moderate							G	F		
666	779.200	779.300	G	BT	Flexible					1.5		Moderate							G	F		
667	779.300	779.400	G	BT	Flexible					1.5		Moderate							G	F		
668	779.400	779.500	G	BT	Flexible					1.5		Moderate							G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
669	779.500	779.600	G	BT	Flexible					1.5		Moderate							G	F		
670	779.600	779.700	F	BT	Flexible					2		Moderate							G	F		
671	779.700	779.780	F	BT	Flexible					2		Moderate							G	F		
672	779.780	779.880	F	Cemented	Rigid				2										G	F		
673	779.880	779.980	F	Cemented	Rigid				2										G	F		
674	779.980	780.080	F	Cemented	Rigid				2										G	F		
675	780.080	780.180	F	Cemented	Rigid				2										G	F		
676	780.180	780.280	F	Cemented	Rigid				2										G	F		
677	780.280	780.380	F	Cemented	Rigid				2										G	F		
678	780.380	780.480	F	Cemented	Rigid				2										G	F		
679	780.480	780.580	F	Cemented	Rigid				2										G	F		
680	780.580	780.680	F	Cemented	Rigid				2										G	F		
681	780.680	780.780	F	Cemented	Rigid				2										G	F		
682	780.780	780.880	F	Cemented	Rigid				2										G	F		
683	780.880	780.980	F	Cemented	Rigid				2										G	F		
684	780.980	781.080	G	Cemented	Rigid				1.5										G	F		
685	781.080	781.180	G	Cemented	Rigid				1.5										G	F		
686	781.180	781.280	G	Cemented	Rigid				1.5										G	F		
687	781.280	781.380	F	Cemented	Rigid				2										G	F		
688	781.380	781.480	F	Cemented	Rigid				2										G	F		
689	781.480	781.580	F	Cemented	Rigid				2										G	F		
690	781.580	781.680	F	Cemented	Rigid				2										G	F		
691	781.680	781.780	F	Cemented	Rigid				2										G	F		
692	781.780	781.880	F	Cemented	Rigid				2										G	F		
693	781.880	781.980	F	Cemented	Rigid				2										G	F		
694	781.980	782.080	F	Cemented	Rigid				2										G	F		
695	782.080	782.180	G	Cemented	Rigid				1.5										G	F		
696	782.180	782.280	F	Cemented	Rigid				2										G	F		
697	782.280	782.380	F	Cemented	Rigid				2										G	F		
698	782.380	782.480	F	Cemented	Rigid				2										G	F		
699	782.480	782.580	F	Cemented	Rigid				2										G	F		
700	782.580	782.680	F	Cemented	Rigid				2										G	F		
701	782.680	782.780	F	Cemented	Rigid				2										G	F		
702	782.780	782.880	F	Cemented	Rigid				2										G	F		
703	782.880	782.980	G	Cemented	Rigid				0										G	F		
704	782.980	783.080	G	Cemented	Rigid				1.5										G	F		
705	783.080	783.180	F	Cemented	Rigid				2										G	F		
706	783.180	783.280	G	Cemented	Rigid				1.5										G	F		
707	783.280	783.380	F	Cemented	Rigid				2										G	F		
708	783.380	783.480	G	Cemented	Rigid				0										G	F		
709	783.480	783.580	G	Cemented	Rigid				0										G	F		
710	783.580	783.680	G	Cemented	Rigid				1.5										G	F		

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
711	783.680	783.780	G	Cemented	Rigid				1.5										G	F		
712	783.780	783.880	G	BT	Flexible					1.5		Moderate							G	F		
713	783.880	783.980	G	BT	Flexible					1.5		Moderate							G	F		
714	783.980	784.080	G	BT	Flexible					1.5		Moderate							G	F		
715	784.080	784.180	G	BT	Flexible					1.5		Moderate							G	F		
716	784.180	784.280	G	BT	Flexible					1.5		Moderate							G	F		
717	784.280	784.380	G	BT	Flexible					1.5		Moderate							G	F		
718	784.380	784.480	G	BT	Flexible					1.5		Moderate							G	F		
719	784.480	784.580	G	BT	Flexible					2		Moderate							G	F		
720	784.580	784.720	G	BT	Flexible					2		Moderate							G	F		
721	784.720	784.820	G	Cemented	Rigid				0										G	F		
722	784.820	784.920	G	Cemented	Rigid				0										G	F		
723	784.920	785.020	F	Cemented	Rigid				2										G	F		
724	785.020	785.120	G	Cemented	Rigid				0										G	F		
725	785.120	785.220	G	Cemented	Rigid				0										G	F		
726	785.220	785.320	G	Cemented	Rigid				0										G	F		
727	785.320	785.420	G	Cemented	Rigid				0										G	F		
728	785.420	785.544	G	Cemented	Rigid				1.5										G	F		

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Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
1	712.900	713.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
2	713.000	713.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
3	713.100	713.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
4	713.200	713.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
5	713.300	713.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
6	713.400	713.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
7	713.500	713.600	G	BT	Flexible		40	G		2		Moderate						G			F	
8	713.600	713.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
9	713.700	713.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
10	713.800	713.900	G	BT	Flexible		40	G		2		Moderate						G			F	
11	713.900	714.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
12	714.000	714.100	G	BT	Flexible		40	G		2		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
13	714.100	714.200	G	BT	Flexible		40	G		2		Moderate						G			F	
14	714.200	714.300	G	BT	Flexible		40	G		2		Moderate						G			F	
15	714.300	714.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
16	714.400	714.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
17	714.500	714.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
18	714.600	714.700	G	BT	Flexible		40	G		2		Moderate						G			F	
19	714.700	714.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
20	714.800	714.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
21	714.900	715.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
22	715.000	715.100	G	BT	Flexible		40	G		2		Moderate						G			F	
23	715.100	715.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
24	715.200	715.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
25	715.300	715.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
26	715.400	715.500	G	BT	Flexible		40	G		2		Moderate						G			F	
27	715.500	715.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
28	715.600	715.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
29	715.700	715.800	G	BT	Flexible		40	G		1.5		Moderate	5					G			F	
30	715.800	715.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
31	715.900	716.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
32	716.000	716.100	G	BT	Flexible		40	G		3		Moderate						G			F	
33	716.100	716.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
34	716.200	716.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
35	716.300	716.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
36	716.400	716.500	G	BT	Flexible		40	G		3		Moderate						G			F	
37	716.500	716.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
38	716.600	716.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
39	716.700	716.800	G	BT	Flexible		40	G		2		Moderate						G			F	
40	716.800	716.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
41	716.900	717.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
42	717.000	717.100	G	BT	Flexible		40	G		3		Moderate						G			F	
43	717.100	717.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
44	717.200	717.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
45	717.300	717.400	G	BT	Flexible		40	G		2		Moderate						G			F	
46	717.400	717.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
47	717.500	717.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
48	717.600	717.700	G	BT	Flexible		40	G		3		Moderate						G			F	
49	717.700	717.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
50	717.800	717.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
51	717.900	718.000	G	BT	Flexible		40	G		2		Moderate						G			F	
52	718.000	718.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
53	718.100	718.200	G	BT	Flexible		40	G		3		Moderate						G			F	
54	718.200	718.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
55	718.300	718.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
56	718.400	718.500	G	BT	Flexible		40	G		2		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
57	718.500	718.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
58	718.600	718.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
59	718.700	718.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
60	718.800	718.900	G	BT	Flexible		40	G		3		Moderate						G			F	
61	718.900	719.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
62	719.000	719.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
63	719.100	719.200	G	BT	Flexible		40	G		2		Moderate						G			F	
64	719.200	719.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
65	719.300	719.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
66	719.400	719.500	G	BT	Flexible		40	G		3		Moderate						G			F	
67	719.500	719.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
68	719.600	719.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
69	719.700	719.800	G	BT	Flexible		40	G		2		Moderate						G			F	
70	719.800	719.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
71	719.900	720.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
72	720.000	720.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
73	720.100	720.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
74	720.200	720.300	G	BT	Flexible		40	G		3		Moderate						G			F	
75	720.300	720.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
76	720.400	720.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
77	720.500	720.600	G	BT	Flexible		40	G		2		Moderate						G			F	
78	720.600	720.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
79	720.700	720.800	G	BT	Flexible		40	G		2		Moderate						G			F	
80	720.800	720.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
81	720.900	721.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
82	721.000	721.100	G	BT	Flexible		40	G		2		Moderate						G			F	
83	721.100	721.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
84	721.200	721.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
85	721.300	721.400	G	BT	Flexible		40	G		2		Moderate						G			F	
86	721.400	721.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
87	721.500	721.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
88	721.600	721.700	G	BT	Flexible		40	G		2		Moderate						G			F	
89	721.700	721.800	G	BT	Flexible		40	G		2		Moderate						G			F	
90	721.800	721.900	G	BT	Flexible		40	G		2		Moderate						G			F	
91	721.900	722.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
92	722.000	722.100	G	BT	Flexible		40	G		3		Moderate						G			F	
93	722.100	722.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
94	722.200	722.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
95	722.300	722.400	G	BT	Flexible		40	G		3		Moderate						G			F	
96	722.400	722.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
97	722.500	722.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
98	722.600	722.700	G	BT	Flexible		40	G		2		Moderate						G			F	
99	722.700	722.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
100	722.800	722.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
101	722.900	723.000	G	BT	Flexible		40	G		3		Moderate						G			F	
102	723.000	723.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
103	723.100	723.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
104	723.200	723.300	G	BT	Flexible		40	G		2		Moderate						G			F	
105	723.300	723.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
106	723.400	723.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
107	723.500	723.600	G	BT	Flexible		40	G		3		Moderate						G			F	
108	723.600	723.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
109	723.700	723.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
110	723.800	723.900	G	BT	Flexible		40	G		2		Moderate						G			F	
111	723.900	724.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
112	724.000	724.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
113	724.100	724.200	G	BT	Flexible		40	G		3		Moderate						G			F	
114	724.200	724.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
115	724.300	724.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
116	724.400	724.500	G	BT	Flexible		40	G		2		Moderate						G			F	
117	724.500	724.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
118	724.600	724.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
119	724.700	724.800	G	BT	Flexible		40	G		3		Moderate						G			F	
120	724.800	724.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
121	724.900	725.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
122	725.000	725.100	G	BT	Flexible		40	G		2		Moderate						G			F	
123	725.100	725.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
124	725.200	725.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
125	725.300	725.400	G	BT	Flexible		40	G		3		Moderate						G			F	
126	725.400	725.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
127	725.500	725.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
128	725.600	725.700	G	BT	Flexible		40	G		2		Moderate						G			F	
129	725.700	725.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
130	725.800	725.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
131	725.900	726.000	G	BT	Flexible		40	G		2		Moderate						G			F	
132	726.000	726.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
133	726.100	726.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
134	726.200	726.300	G	BT	Flexible		40	G		2		Moderate						G			F	
135	726.300	726.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
136	726.400	726.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
137	726.500	726.600	G	BT	Flexible		40	G		3		Moderate						G			F	
138	726.600	726.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
139	726.700	726.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
140	726.800	726.900	G	BT	Flexible		40	G		2.5		Moderate						G			F	
141	726.900	727.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
142	727.000	727.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
143	727.100	727.200	G	BT	Flexible		40	G		2.5		Moderate						G			F	
144	727.200	727.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
145	727.300	727.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
146	727.400	727.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
147	727.500	727.600	G	BT	Flexible		40	G		2		Moderate						G			F	
148	727.600	727.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
149	727.700	727.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
150	727.800	727.900	G	BT	Flexible		40	G		2		Moderate						G			F	
151	727.900	728.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
152	728.000	728.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
153	728.100	728.200	G	BT	Flexible		40	G		2		Moderate						G			F	
154	728.200	728.300	G	BT	Flexible		40	G		2		Moderate						G			F	
155	728.300	728.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
156	728.400	728.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
157	728.500	728.600	G	BT	Flexible		40	G		2		Moderate						G			F	
158	728.600	728.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
159	728.700	728.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
160	728.800	728.900	G	BT	Flexible		40	G		2		Moderate						G			F	
161	728.900	729.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
162	729.000	729.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
163	729.100	729.200	G	BT	Flexible		40	G		2		Moderate						G			F	
164	729.200	729.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
165	729.300	729.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
166	729.400	729.500	G	BT	Flexible		40	G		2		Moderate						G			F	
167	729.500	729.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
168	729.600	729.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
169	729.700	729.800	G	BT	Flexible		40	G		2		Moderate						G			F	
170	729.800	729.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
171	729.900	730.000	G	BT	Flexible		40	G		2		Moderate						G			F	
172	730.000	730.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
173	730.100	730.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
174	730.200	730.300	G	BT	Flexible		40	G		2		Moderate						G			F	
175	730.300	730.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
176	730.400	730.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
177	730.500	730.600	G	BT	Flexible		40	G		2		Moderate						G			F	
178	730.600	730.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
179	730.700	730.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
180	730.800	730.900	G	BT	Flexible		40	G		2		Moderate						G			F	
181	730.900	731.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
182	731.000	731.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
183	731.100	731.200	G	BT	Flexible		40	G		2		Moderate						G			F	
184	731.200	731.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
185	731.300	731.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
186	731.400	731.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
187	731.500	731.600	G	BT	Flexible		40	G		2		Moderate						G			F	
188	731.600	731.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
189	731.700	731.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
190	731.800	731.900	G	BT	Flexible		40	G		2		Moderate						G			F	
191	731.900	732.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
192	732.000	732.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
193	732.100	732.200	G	BT	Flexible		40	G		2		Moderate						G			F	
194	732.200	732.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
195	732.300	732.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
196	732.400	732.500	G	BT	Flexible		40	G		2		Moderate						G			F	
197	732.500	732.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
198	732.600	732.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
199	732.700	732.800	G	BT	Flexible		40	G		2		Moderate						G			F	
200	732.800	732.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
201	732.900	733.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
202	733.000	733.100	G	BT	Flexible		40	G		2		Moderate						G			F	
203	733.100	733.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
204	733.200	733.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
205	733.300	733.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
206	733.400	733.500	G	BT	Flexible		40	G		2		Moderate						G			F	
207	733.500	733.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
208	733.600	733.700	G	BT	Flexible		40	G		2		Moderate						G			F	
209	733.700	733.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
210	733.800	733.900	G	BT	Flexible		40	G		2		Moderate						G			F	
211	733.900	734.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
212	734.000	734.100	G	BT	Flexible		40	G		2		Moderate						G			F	
213	734.100	734.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
214	734.200	734.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
215	734.300	734.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
216	734.400	734.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
217	734.500	734.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
218	734.600	734.700	G	BT	Flexible		40	G		2		Moderate						G			F	
219	734.700	734.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
220	734.800	734.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
221	734.900	735.000	G	BT	Flexible		40	G		2		Moderate						G			F	
222	735.000	735.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
223	735.100	735.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
224	735.200	735.300	G	BT	Flexible		40	G		2		Moderate						G			F	
225	735.300	735.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
226	735.400	735.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
227	735.500	735.600	G	BT	Flexible		40	G		2		Moderate						G			F	
228	735.600	735.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
229	735.700	735.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
230	735.800	735.900	G	BT	Flexible		40	G		2		Moderate						G			F	
231	735.900	736.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
232	736.000	736.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
233	736.100	736.200	G	BT	Flexible		40	G		2		Moderate						G			F	
234	736.200	736.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
235	736.300	736.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
236	736.400	736.500	G	BT	Flexible		40	G		2		Moderate						G			F	
237	736.500	736.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
238	736.600	736.700	G	BT	Flexible		40	G		3		Moderate						G			F	
239	736.700	736.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
240	736.800	736.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
241	736.900	737.000	G	BT	Flexible		40	G		2		Moderate						G			F	
242	737.000	737.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
243	737.100	737.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
244	737.200	737.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
245	737.300	737.400	G	BT	Flexible		40	G		2		Moderate						G			F	
246	737.400	737.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
247	737.500	737.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
248	737.600	737.700	G	BT	Flexible		40	G		2		Moderate						G			F	
249	737.700	737.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
250	737.800	737.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
251	737.900	738.000	G	BT	Flexible		40	G		3		Moderate						G			F	
252	738.000	738.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
253	738.100	738.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
254	738.200	738.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
255	738.300	738.400	G	BT	Flexible		40	G		2		Moderate						G			F	
256	738.400	738.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
257	738.500	738.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
258	738.600	738.700	G	BT	Flexible		40	G		3		Moderate						G			F	
259	738.700	738.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
260	738.800	738.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
261	738.900	739.000	G	BT	Flexible		40	G		2		Moderate						G			F	
262	739.000	739.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
263	739.100	739.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
264	739.200	739.300	G	BT	Flexible		40	G		3		Moderate						G			F	
265	739.300	739.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
266	739.400	739.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
267	739.500	739.600	G	BT	Flexible		40	G		2		Moderate						G			F	
268	739.600	739.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
269	739.700	739.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
270	739.800	739.900	G	BT	Flexible		40	G		3		Moderate						G			F	
271	739.900	740.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
272	740.000	740.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
273	740.100	740.200	G	BT	Flexible		40	G		2		Moderate						G			F	
274	740.200	740.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
275	740.300	740.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
276	740.400	740.500	G	BT	Flexible		40	G		3		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
277	740.500	740.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
278	740.600	740.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
279	740.700	740.800	G	BT	Flexible		40	G		2		Moderate						G			F	
280	740.800	740.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
281	740.900	741.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
282	741.000	741.100	G	BT	Flexible		40	G		3		Moderate						G			F	
283	741.100	741.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
284	741.200	741.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
285	741.300	741.400	G	BT	Flexible		40	G		2		Moderate						G			F	
286	741.400	741.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
287	741.500	741.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
288	741.600	741.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
289	741.700	741.800	G	BT	Flexible		40	G		3		Moderate						G			F	
290	741.800	741.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
291	741.900	742.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
292	742.000	742.100	G	BT	Flexible		40	G		2		Moderate						G			F	
293	742.100	742.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
294	742.200	742.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
295	742.300	742.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
296	742.400	742.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
297	742.500	742.600	G	BT	Flexible		40	G		2		Moderate						G			F	
298	742.600	742.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
299	742.700	742.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
300	742.800	742.900	G	BT	Flexible		40	G		3		Moderate						G			F	
301	742.900	743.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
302	743.000	743.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
303	743.100	743.200	G	BT	Flexible		40	G		2		Moderate						G			F	
304	743.200	743.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
305	743.300	743.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
306	743.400	743.500	G	BT	Flexible		40	G		3		Moderate						G			F	
307	743.500	743.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
308	743.600	743.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
309	743.700	743.800	G	BT	Flexible		40	G		2		Moderate						G			F	
310	743.800	743.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
311	743.900	744.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
312	744.000	744.100	G	BT	Flexible		40	G		3		Moderate						G			F	
313	744.100	744.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
314	744.200	744.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
315	744.300	744.400	G	BT	Flexible		40	G		2		Moderate						G			F	
316	744.400	744.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
317	744.500	744.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
318	744.600	744.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
319	744.700	744.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
320	744.800	744.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
321	744.900	745.000	G	BT	Flexible		40	G		3		Moderate						G			F	
322	745.000	745.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
323	745.100	745.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
324	745.200	745.300	G	BT	Flexible		40	G		2		Moderate						G			F	
325	745.300	745.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
326	745.400	745.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
327	745.500	745.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
328	745.600	745.700	G	BT	Flexible		40	G		3		Moderate						G			F	
329	745.700	745.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
330	745.800	745.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
331	745.900	746.000	G	BT	Flexible		40	G		2		Moderate						G			F	
332	746.000	746.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
333	746.100	746.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
334	746.200	746.300	G	BT	Flexible		40	G		3		Moderate						G			F	
335	746.300	746.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
336	746.400	746.500	G	BT	Flexible		40	G		2		Moderate						G			F	
337	746.500	746.600	G	Cemented	Rigid		40	G	2									G			F	
338	746.600	746.700	F	Cemented	Rigid		40	F	3									G			F	
339	746.700	746.800	G	Cemented	Rigid		40	G	1.5									G			F	
340	746.800	746.900	G	Cemented	Rigid		40	G	1.5									G			F	
341	746.900	747.000	G	Cemented	Rigid		40	G	1.5									G			F	
342	747.000	747.100	G	Cemented	Rigid		40	G	1.5									G			F	
343	747.100	747.200	G	Cemented	Rigid		40	G	2									G			F	
344	747.200	747.300	G	Cemented	Rigid		40	G	2.5									G			F	
345	747.300	747.400	G	Cemented	Rigid		40	G	1.5									G			F	
346	747.400	747.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
347	747.500	747.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
348	747.600	747.700	G	BT	Flexible		40	G		3		Moderate						G			F	
349	747.700	747.800	G	Cemented	Rigid		40	G	2									G			F	
350	747.800	747.900	G	Cemented	Rigid		40	G	2									G			F	
351	747.900	748.000	G	Cemented	Rigid		40	G	2									G			F	
352	748.000	748.100	G	Cemented	Rigid		40	G	2									G			F	
353	748.100	748.200	G	Cemented	Rigid		40	G	2									G			F	
354	748.200	748.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
355	748.300	748.400	G	BT	Flexible		40	G		2		Moderate						G			F	
356	748.400	748.500	G	BT	Flexible		40	G		3		Moderate						G			F	
357	748.500	748.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
358	748.600	748.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
359	748.700	748.800	G	BT	Flexible		40	G		2		Moderate						G			F	
360	748.800	748.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
361	748.900	749.000	G	BT	Flexible		40	G		3		Moderate						G			F	
362	749.000	749.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
363	749.100	749.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
364	749.200	749.300	G	BT	Flexible		40	G		2		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
365	749.300	749.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
366	749.400	749.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
367	749.500	749.600	G	BT	Flexible		40	G		3		Moderate						G			F	
368	749.600	749.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
369	749.700	749.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
370	749.800	749.900	G	BT	Flexible		40	G		2		Moderate						G			F	
371	749.900	750.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
372	750.000	750.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
373	750.100	750.200	G	BT	Flexible		40	G		3		Moderate						G			F	
374	750.200	750.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
375	750.300	750.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
376	750.400	750.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
377	750.500	750.600	G	BT	Flexible		40	G		2		Moderate						G			F	
378	750.600	750.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
379	750.700	750.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
380	750.800	750.900	G	BT	Flexible		40	G		2		Moderate						G			F	
381	750.900	751.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
382	751.000	751.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
383	751.100	751.200	G	BT	Flexible		40	G		2		Moderate						G			F	
384	751.200	751.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
385	751.300	751.400	G	BT	Flexible		40	G		2		Moderate						G			F	
386	751.400	751.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
387	751.500	751.600	G	BT	Flexible		40	G		2		Moderate						G			F	
388	751.600	751.700	G	BT	Flexible		40	G		2		Moderate						G			F	
389	751.700	751.800	G	BT	Flexible		40	G		2		Moderate						G			F	
390	751.800	751.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
391	751.900	752.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
392	752.000	752.100	G	BT	Flexible		40	G		2		Moderate						G			F	
393	752.100	752.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
394	752.200	752.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
395	752.300	752.400	G	BT	Flexible		40	G		2		Moderate						G			F	
396	752.400	752.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
397	752.500	752.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
398	752.600	752.700	G	BT	Flexible		40	G		2		Moderate						G			F	
399	752.700	752.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
400	752.800	752.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
401	752.900	753.000	G	BT	Flexible		40	G		2		Moderate						G			F	
402	753.000	753.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
403	753.100	753.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
404	753.200	753.300	G	BT	Flexible		40	G		2		Moderate						G			F	
405	753.300	753.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
406	753.400	753.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
407	753.500	753.600	G	BT	Flexible		40	G		2		Moderate						G			F	
408	753.600	753.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
409	753.700	753.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
410	753.800	753.900	G	BT	Flexible		40	G		2		Moderate						G			F	
411	753.900	754.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
412	754.000	754.100	G	BT	Flexible		40	G		2		Moderate						G			F	
413	754.100	754.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
414	754.200	754.300	G	BT	Flexible		40	G		2		Moderate						G			F	
415	754.300	754.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
416	754.400	754.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
417	754.500	754.600	G	BT	Flexible		40	G		2		Moderate						G			F	
418	754.600	754.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
419	754.700	754.800	G	BT	Flexible		40	G		2		Moderate						G			F	
420	754.800	754.900	G	BT	Flexible		40	G		2		Moderate						G			F	
421	754.900	755.000	G	BT	Flexible		40	G		2		Moderate						G			F	
422	755.000	755.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
423	755.100	755.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
424	755.200	755.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
425	755.300	755.400	G	BT	Flexible		40	G		2		Moderate						G			F	
426	755.400	755.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
427	755.500	755.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
428	755.600	755.700	G	BT	Flexible		40	G		2		Moderate						G			F	
429	755.700	755.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
430	755.800	755.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
431	755.900	756.000	G	BT	Flexible		40	G		2		Moderate						G			F	
432	756.000	756.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
433	756.100	756.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
434	756.200	756.300	G	BT	Flexible		40	G		2		Moderate						G			F	
435	756.300	756.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
436	756.400	756.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
437	756.500	756.600	G	BT	Flexible		40	G		2		Moderate						G			F	
438	756.600	756.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
439	756.700	756.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
440	756.800	756.900	G	BT	Flexible		40	G		2		Moderate						G			F	
441	756.900	757.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
442	757.000	757.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
443	757.100	757.200	G	BT	Flexible		40	G		2		Moderate						G			F	
444	757.200	757.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
445	757.300	757.400	G	BT	Flexible		40	G		2		Moderate						G			F	
446	757.400	757.500	G	BT	Flexible		40	G		2		Moderate						G			F	
447	757.500	757.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
448	757.600	757.700	G	BT	Flexible		40	G		2		Moderate						G			F	
449	757.700	757.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
450	757.800	757.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
451	757.900	758.000	G	BT	Flexible		40	G		2		Moderate						G			F	
452	758.000	758.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
453	758.100	758.200	G	BT	Flexible		40	G		2		Moderate						G			F	
454	758.200	758.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
455	758.300	758.400	G	BT	Flexible		40	G		2		Moderate						G			F	
456	758.400	758.500	G	BT	Flexible		40	G		2		Moderate						G			F	
457	758.500	758.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
458	758.600	758.700	G	BT	Flexible		40	G		2		Moderate						G			F	
459	758.700	758.800	G	BT	Flexible		40	G		2		Moderate						G			F	
460	758.800	758.900	G	BT	Flexible		40	G		2		Moderate						G			F	
461	758.900	759.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
462	759.000	759.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
463	759.100	759.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
464	759.200	759.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
465	759.300	759.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
466	759.400	759.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
467	759.500	759.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
468	759.600	759.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
469	759.700	759.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
470	759.800	759.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
471	759.900	760.000	G	BT	Flexible		40	G		2		Moderate						G			F	
472	760.000	760.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
473	760.100	760.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
474	760.200	760.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
475	760.300	760.400	G	BT	Flexible		40	G		2		Moderate						G			F	
476	760.400	760.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
477	760.500	760.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
478	760.600	760.700	G	BT	Flexible		40	G		2		Moderate						G			F	
479	760.700	760.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
480	760.800	760.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
481	760.900	761.000	G	BT	Flexible		40	G		2		Moderate						G			F	
482	761.000	761.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
483	761.100	761.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
484	761.200	761.300	G	BT	Flexible		40	G		2		Moderate						G			F	
485	761.300	761.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
486	761.400	761.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
487	761.500	761.600	G	BT	Flexible		40	G		2		Moderate						G			F	
488	761.600	761.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
489	761.700	761.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
490	761.800	761.900	G	BT	Flexible		40	G		2		Moderate						G			F	
491	761.900	762.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
492	762.000	762.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
493	762.100	762.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
494	762.200	762.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
495	762.300	762.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
496	762.400	762.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
497	762.500	762.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
498	762.600	762.700	G	BT	Flexible		40	G		2		Moderate						G			F	
499	762.700	762.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
500	762.800	762.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
501	762.900	763.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
502	763.000	763.100	G	BT	Flexible		40	G		2		Moderate						G			F	
503	763.100	763.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
504	763.200	763.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
505	763.300	763.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
506	763.400	763.500	G	BT	Flexible		40	G		2		Moderate						G			F	
507	763.500	763.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
508	763.600	763.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
509	763.700	763.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
510	763.800	763.900	G	BT	Flexible		40	G		2		Moderate						G			F	
511	763.900	764.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
512	764.000	764.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
513	764.100	764.200	G	BT	Flexible		40	G		2		Moderate						G			F	
514	764.200	764.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
515	764.300	764.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
516	764.400	764.500	G	BT	Flexible		40	G		2		Moderate						G			F	
517	764.500	764.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
518	764.600	764.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
519	764.700	764.800	G	BT	Flexible		40	G		2		Moderate						G			F	
520	764.800	764.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
521	764.900	765.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
522	765.000	765.100	G	BT	Flexible		40	G		2		Moderate						G			F	
523	765.100	765.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
524	765.200	765.300	G	BT	Flexible		40	G		2		Moderate						G			F	
525	765.300	765.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
526	765.400	765.500	G	BT	Flexible		40	G		2		Moderate						G			F	
527	765.500	765.600	G	BT	Flexible		40	G		2		Moderate						G			F	
528	765.600	765.700	G	BT	Flexible		40	G		2		Moderate						G			F	
529	765.700	765.800	G	BT	Flexible		40	G		2		Moderate						G			F	
530	765.800	765.900	G	BT	Flexible		40	G		2		Moderate						G			F	
531	765.900	766.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
532	766.000	766.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
533	766.100	766.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
534	766.200	766.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
535	766.300	766.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
536	766.400	766.500	G	BT	Flexible		40	G		2		Moderate						G			F	
537	766.500	766.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
538	766.600	766.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
539	766.700	766.800	G	BT	Flexible		40	G		2		Moderate						G			F	
540	766.800	766.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
541	766.900	767.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
542	767.000	767.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
543	767.100	767.200	G	BT	Flexible		40	G		2		Moderate						G			F	
544	767.200	767.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
545	767.300	767.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
546	767.400	767.500	G	BT	Flexible		40	G		2		Moderate						G			F	
547	767.500	767.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
548	767.600	767.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
549	767.700	767.800	G	BT	Flexible		40	G		2		Moderate						G			F	
550	767.800	767.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
551	767.900	768.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
552	768.000	768.100	G	BT	Flexible		40	G		2		Moderate						G			F	
553	768.100	768.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
554	768.200	768.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
555	768.300	768.400	G	BT	Flexible		40	G		2		Moderate						G			F	
556	768.400	768.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
557	768.500	768.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
558	768.600	768.700	G	BT	Flexible		40	G		2		Moderate						G			F	
559	768.700	768.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
560	768.800	768.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
561	768.900	769.000	G	BT	Flexible		40	G		2		Moderate						G			F	
562	769.000	769.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
563	769.100	769.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
564	769.200	769.300	G	BT	Flexible		40	G		2		Moderate						G			F	
565	769.300	769.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
566	769.400	769.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
567	769.500	769.600	G	BT	Flexible		40	G		2		Moderate						G			F	
568	769.600	769.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
569	769.700	769.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
570	769.800	769.900	G	BT	Flexible		40	G		2		Moderate						G			F	
571	769.900	770.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
572	770.000	770.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
573	770.100	770.200	G	BT	Flexible		40	G		2		Moderate						G			F	
574	770.200	770.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
575	770.300	770.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
576	770.400	770.500	G	BT	Flexible		40	G		2		Moderate						G			F	
577	770.500	770.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
578	770.600	770.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
579	770.700	770.800	G	BT	Flexible		40	G		2		Moderate						G			F	
580	770.800	770.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
581	770.900	771.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
582	771.000	771.100	G	BT	Flexible		40	G		2		Moderate						G			F	
583	771.100	771.200	G	BT	Flexible		40	G		2		Moderate						G			F	
584	771.200	771.300	G	Cemented	Rigid		40	G	2									G			F	

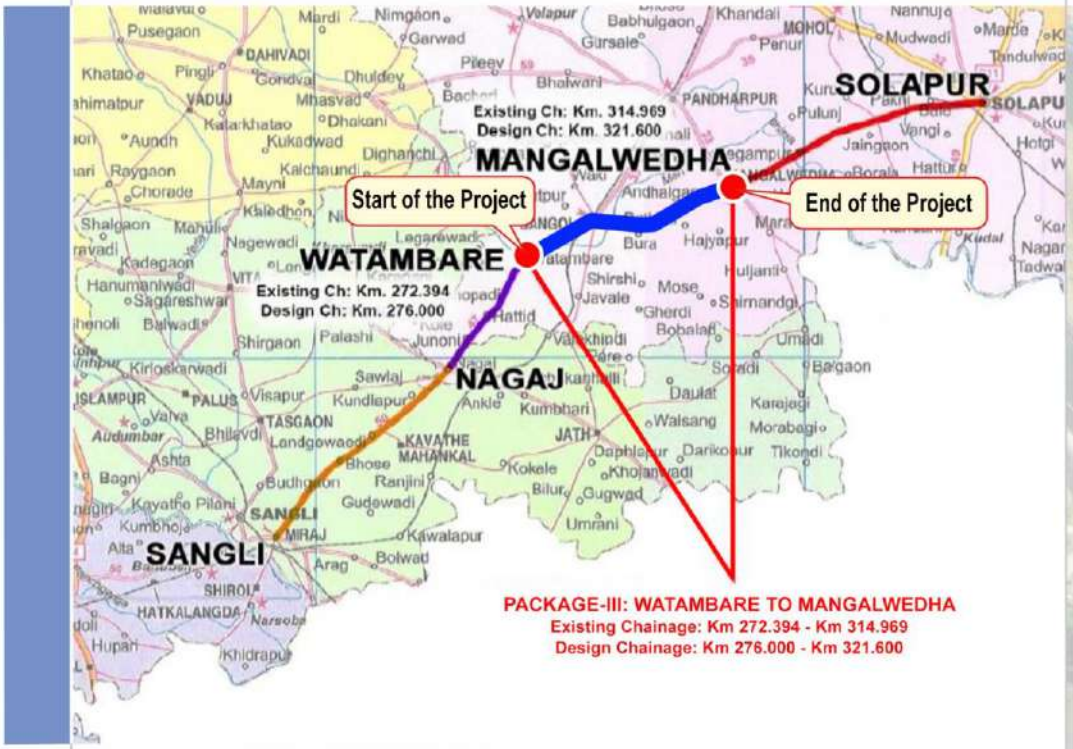
Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
585	771.300	771.400	G	Cemented	Rigid		40	G	2									G			F	
586	771.400	771.500	G	Cemented	Rigid		40	G	2									G			F	
587	771.500	771.600	G	Cemented	Rigid		40	G	2									G			F	
588	771.600	771.700	G	Cemented	Rigid		40	G	2									G			F	
589	771.700	771.800	G	Cemented	Rigid		40	G	2									G			F	
590	771.800	771.900	F	Cemented	Rigid		40	F	3									G			F	
591	771.900	772.000	F	Cemented	Rigid		40	F	3									G			F	
592	772.000	772.100	F	Cemented	Rigid		40	F	3									G			F	
593	772.100	772.200	F	Cemented	Rigid		40	F	3									G			F	
594	772.200	772.300	G	Cemented	Rigid		40	G	2.5									G			F	
595	772.300	772.400	G	Cemented	Rigid		40	G	2.5									G			F	
596	772.400	772.500	G	Cemented	Rigid		40	G	2									G			F	
597	772.500	772.600	F	Cemented	Rigid		40	F	3									G			F	
598	772.600	772.680	G	Cemented	Rigid		40	G	2									G			F	
599	772.680	772.800	G	BT	Flexible		40	G		1.5		Moderate						G			F	
600	772.800	772.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
601	772.900	773.000	G	BT	Flexible		40	G		2		Moderate						G			F	
602	773.000	773.100	G	BT	Flexible		40	G		1.5		Moderate						G			F	
603	773.100	773.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
604	773.200	773.300	G	BT	Flexible		40	G		2		Moderate						G			F	
605	773.300	773.400	G	BT	Flexible		40	G		1.5		Moderate						G			F	
606	773.400	773.450	F	BT	Flexible		40	F		3		Moderate						G			F	
607	773.450	773.550	F	Cemented	Rigid		40	F	3									G			F	
608	773.550	773.650	F	Cemented	Rigid		40	F	3									G			F	
609	773.650	773.750	G	Cemented	Rigid		40	G	2									G			F	
610	773.750	773.850	G	Cemented	Rigid		40	G	2									G			F	
611	773.850	773.950	G	Cemented	Rigid		40	G	2									G			F	
612	773.950	774.050	G	Cemented	Rigid		40	G	2									G			F	
613	774.050	774.150	G	Cemented	Rigid		40	G	2									G			F	
614	774.150	774.250	G	Cemented	Rigid		40	G	2.5									G			F	
615	774.250	774.350	G	Cemented	Rigid		40	G	2									G			F	
616	774.350	774.450	G	Cemented	Rigid		40	G	2									G			F	
617	774.450	774.550	G	Cemented	Rigid		40	G	2									G			F	
618	774.550	774.650	G	Cemented	Rigid		40	G	2									G			F	
619	774.650	774.750	G	Cemented	Rigid		40	G	2.5									G			F	
620	774.750	774.850	G	Cemented	Rigid		40	G	2									G			F	
621	774.850	774.950	G	Cemented	Rigid		40	G	2									G			F	
622	774.950	775.050	G	Cemented	Rigid		40	G	2									G			F	
623	775.050	775.150	G	Cemented	Rigid		40	G	2									G			F	
624	775.150	775.250	F	Cemented	Rigid		40	F	3									G			F	
625	775.250	775.350	G	Cemented	Rigid		40	G	2									G			F	
626	775.350	775.450	G	Cemented	Rigid		40	G	2									G			F	
627	775.450	775.575	G	Cemented	Rigid		40	G	2									G			F	
628	775.575	775.700	G	Cemented	Rigid		40	G	1.5									G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
629	775.700	775.800	G	Cemented	Rigid		40	G	2									G			F	
630	775.800	775.900	G	Cemented	Rigid		40	G	1.5									G			F	
631	775.900	776.000	G	Cemented	Rigid		40	G	1.5									G			F	
632	776.000	776.100	G	Cemented	Rigid		40	G	2									G			F	
633	776.100	776.200	G	Cemented	Rigid		40	G	1.5									G			F	
634	776.200	776.300	G	Cemented	Rigid		40	G	1.5									G			F	
635	776.300	776.440	G	Cemented	Rigid		40	G	2									G			F	
636	776.440	776.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
637	776.600	776.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
638	776.700	776.800	G	BT	Flexible		40	G		2		Moderate						G			F	
639	776.800	776.900	G	BT	Flexible		40	G		1.5		Moderate						G			F	
640	776.900	777.000	G	BT	Flexible		40	G		1.5		Moderate						G			F	
641	777.000	777.100	G	BT	Flexible		40	G		2		Moderate						G			F	
642	777.100	777.200	G	BT	Flexible		40	G		1.5		Moderate						G			F	
643	777.200	777.300	G	BT	Flexible		40	G		1.5		Moderate						G			F	
644	777.300	777.400	G	BT	Flexible		40	G		2		Moderate						G			F	
645	777.400	777.500	G	BT	Flexible		40	G		1.5		Moderate						G			F	
646	777.500	777.600	G	BT	Flexible		40	G		1.5		Moderate						G			F	
647	777.600	777.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
648	777.700	777.870	G	BT	Flexible		40	G		3		Moderate						G			F	
649	777.870	777.970	G	Cemented	Rigid		40	G		1.5								G			F	
650	777.970	778.100	G	Cemented	Rigid		40	G		1.5								G			F	
651	778.100	778.200	G	Cemented	Rigid		40	G		2.5								G			F	
652	778.200	778.300	G	Cemented	Rigid		40	G		2								G			F	
653	778.300	778.400	G	Cemented	Rigid		40	G		2								G			F	
654	778.400	778.500	G	Cemented	Rigid		40	G		2								G			F	
655	778.500	778.600	G	Cemented	Rigid		40	G		2								G			F	
656	778.600	778.700	G	Cemented	Rigid		40	G		2								G			F	
657	778.700	778.800	G	Cemented	Rigid		40	G		2.5								G			F	
658	778.800	778.900	G	Cemented	Rigid		40	G		2								G			F	
659	778.900	779.000	G	Cemented	Rigid		40	G		2								G			F	
660	779.000	779.130	G	Cemented	Rigid		40	G		2								G			F	
661	779.130	779.300	G	Cemented	Rigid		40	G		2.5								G			F	
662	779.300	779.440	G	Cemented	Rigid		40	G		1.5								G			F	
663	779.440	779.600	G	BT	Flexible		40	G		2		Moderate						G			F	
664	779.600	779.700	G	BT	Flexible		40	G		1.5		Moderate						G			F	
665	779.700	779.810	G	BT	Flexible		40	G		1.5		Moderate						G			F	
666	779.810	779.910	G	Cemented	Rigid		40	G		1.5								G			F	
667	779.910	780.010	G	Cemented	Rigid		40	G		2								G			F	
668	780.010	780.110	G	Cemented	Rigid		40	G		1.5								G			F	
669	780.110	780.210	G	Cemented	Rigid		40	G		1.5								G			F	
670	780.210	780.310	G	Cemented	Rigid		40	G		2								G			F	
671	780.310	780.410	G	Cemented	Rigid		40	G		2								G			F	
672	780.410	780.510	G	Cemented	Rigid		40	G		2.5								G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
673	780.510	780.610	G	Cemented	Rigid		40	G		2								G			F	
674	780.610	780.710	G	Cemented	Rigid		40	G		2								G			F	
675	780.710	780.810	G	Cemented	Rigid		40	G		2								G			F	
676	780.810	780.910	G	Cemented	Rigid		40	G		2								G			F	
677	780.910	781.010	G	Cemented	Rigid		40	G		2								G			F	
678	781.010	781.110	G	Cemented	Rigid		40	G		2.5								G			F	
679	781.110	781.210	F	Cemented	Rigid		40	F		3								G			F	
680	781.210	781.310	G	Cemented	Rigid		40	G		2								G			F	
681	781.310	781.410	G	Cemented	Rigid		40	G		2								G			F	
682	781.410	781.510	G	Cemented	Rigid		40	G		2								G			F	
683	781.510	781.610	G	Cemented	Rigid		40	G		2								G			F	
684	781.610	781.710	F	Cemented	Rigid		40	F		3								G			F	
685	781.710	781.810	G	Cemented	Rigid		40	G		2.5								G			F	
686	781.810	781.910	G	Cemented	Rigid		40	G		2								G			F	
687	781.910	782.010	G	Cemented	Rigid		40	G		2.5								G			F	
688	782.010	782.110	F	Cemented	Rigid		40	F		3								G			F	
689	782.110	782.210	G	Cemented	Rigid		40	G		2								G			F	
690	782.210	782.310	G	Cemented	Rigid		40	G		2.5								G			F	
691	782.310	782.410	G	Cemented	Rigid		40	G		2								G			F	
692	782.410	782.510	G	Cemented	Rigid		40	G		2								G			F	
693	782.510	782.610	G	Cemented	Rigid		40	G		2								G			F	
694	782.610	782.710	G	Cemented	Rigid		40	G		2								G			F	
695	782.710	782.810	G	Cemented	Rigid		40	G		2								G			F	
696	782.810	782.910	F	Cemented	Rigid		40	F		3								G			F	
697	782.910	783.010	G	Cemented	Rigid		40	G		2								G			F	
698	783.010	783.110	F	Cemented	Rigid		40	F		3								G			F	
699	783.110	783.210	G	Cemented	Rigid		40	G		2								G			F	
700	783.210	783.310	G	Cemented	Rigid		40	G		2								G			F	
701	783.310	783.410	G	Cemented	Rigid		40	G		2								G			F	
702	783.410	783.510	G	Cemented	Rigid		40	G		2								G			F	
703	783.510	783.610	G	Cemented	Rigid		40	G		2								G			F	
704	783.610	783.710	G	Cemented	Rigid		40	G		2								G			F	
705	783.710	783.810	G	Cemented	Rigid		40	G		2.5								G			F	
706	783.810	783.900	G	BT	Flexible		40	G		2		Moderate						G			F	
707	783.900	784.000	G	BT	Flexible		40	G		2		Moderate						G			F	
708	784.000	784.100	G	BT	Flexible		40	G		2		Moderate						G			F	
709	784.100	784.200	G	BT	Flexible		40	G		2		Moderate						G			F	
710	784.200	784.300	G	BT	Flexible		40	G		2		Moderate						G			F	
711	784.300	784.400	G	BT	Flexible		40	G		2		Moderate						G			F	
712	784.400	784.500	G	BT	Flexible		40	G		2		Moderate						G			F	
713	784.500	784.600	G	BT	Flexible		40	F		2		Moderate						G			F	
714	784.600	784.750	G	BT	Flexible		40	G		2		Moderate						G			F	
715	784.750	784.850	G	Cemented	Rigid		40	G		2								G			F	
716	784.850	784.950	G	Cemented	Rigid		40	G		2								G			F	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
717	784.950	785.050	G	Cemented	Rigid		40	G		2								G			F	
718	785.050	785.150	G	Cemented	Rigid		40	G		2								G			F	
719	785.150	785.250	G	Cemented	Rigid		40	G		2								G			F	
720	785.250	785.350	G	Cemented	Rigid		40	G		2								G			F	
721	785.350	785.450	G	Cemented	Rigid		40	G		2								G			F	
722	785.450	785.544	F	Cemented	Rigid		40	F		5								G			F	

FP Project Management



Four laning of Sangli - Solapur (Package-III of length 45.600 kms) section of NH-166 from Design km. 276.000 to km. 321.600 in the state of Maharashtra on HAM

Technical Due Diligence Study

Final Report

November 2022

Submitted by:

FP Project Management
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Commercial in Confidence

Delivering Commitment

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REVISION RECORD					
Document No. 225028 / HE / LIE / TDD_Final / R0					
Rev	**Description**	**Date**	**Originator**	**Checked**	**Approved**
R0	Final Report	08-Nov-2022	RW / STP	CSB	SMA

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FOUR LANING OF SANGLI - SOLAPUR (PACKAGE-III: WATAMBARE TO MANGALWEDHA OF LENGTH 45.600 KMS) SECTION OF NH-166 FROM EXISTING KM. 272.394 TO KM. 314.969 (DESIGN CHAINAGE KM. 276.000 TO KM. 321.600) OF LENGTH 45.600 KMS IN THE STATE OF MAHARASHTRA ON HYBRID ANNUITY MODE

TECHNICAL DUE DILIGENCE STUDY

FINAL REPORT

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1 INTRODUCTION

1.1 Background

The Government of India had entrusted to Authority the development, maintenance and management of National Highway No. 166 including the section from km. 276.000 to km. 321.600 (approx. 45.600 kms). The Authority had resolved to augment the existing road from km. 272.394 to km. 314.969 (approx. 42.575 kms) on the Watambare - Mangalwedha section of National Highway No. 166 in the state of Maharashtra by four laning on design, build, operate and transfer (the "DBOT Annuity" or "Hybrid Annuity") basis.

Based on competitive bid process completed, NHAI has signed Concession Agreement with **M/s. GR Sangli Solapur Highway Private Limited (GSSHPL)**, a Special Purpose Vehicle (SPV) formed for implementing this project.

The Appointed Date of the project was 31st December 2018. The concession period of the project highway is 17 years from the Appointed Date including construction period of 2 years. The Scheduled Completion Date of the project highway was on 30th December 2020. The NHAI had granted Extension of Time (EOT) for 180 days. The project highway has received Provisional Completion Certificate on 28th June 2021.

During maintenance of the project highway, **M/s. GR Highways Investment Manager Pvt. Ltd.** (in its capacity as the Investment Manager of Bharat Highways InvIT) has appointed **FP Project Management Consultancy Services Private Limited** [Formerly Frischmann Prabhu (I) Pvt. Ltd.] Technical Consultant for carrying out technical study, and assessment of Opex and major maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, FP Project Management undertook the site visits to carry out site inspection. The report is based on findings during this period.

1.2 Our Approach Philosophy

Composition of Team

Our team consists of well-qualified Engineers and other professionals, whose experience covers all the skills and specializations required for undertaking such assignments. All the team personnel proposed are our regular employees and have a long and stable working relationship with our firm.

The Team Leader coordinates the activities between all the key staff who work closely together. The key staff is assisted by various support staff, who report to the respective key staff in their field of expertise. The Team Leader is the point of contact for Client on Technical Study.

The technical study includes review of all the available documents namely:

a) Concession Agreement including Technical Schedules
b) EPC Agreement
c) Pavement design reports
d) O&M Manual prepared by the Concessionaire
e) O&M Contract, work order and their provisions
f) Recent O&M Report submitted to Authority
g) Quality of construction based on available data, design and drawings
h) Documents on historical expenditure on operation and maintenance

i) Reports on past accidents
j) O&M cost schedule for the concession period
k) Completion / Provisional Completion and status of items in punch list items
l) Correspondence regarding scope of works and during O&M

The review of above documents is the first step towards accomplishment of the assignment. This gives the complete idea of the project and is used as input data for preparation of report after necessary analysis.

Site Visit and Data Collection

A team of experts from various streams has carried out the preliminary site visit to understand the assessment of project assets mainly condition of the pavement and structures.

- The site visit is undertaken for detailed reconnaissance and visual pavement condition assessment
- The condition assessment of major structures by visual inspection
- The information like material sources and the probable cost to be collected for the purpose of cost estimate

The detailed design / drawings viz. Plan & L-sections, drainage design, structure design, layout drawings for project facilities like toll plaza, bus bay, truck lay-byes, highway lighting facilities etc. would be studied. Also, design / drawing and provision pertaining to road furniture are studied.

The adequacy of design is verified in accordance with the concession agreement, manual of specifications and standards as well as relevant IRC standards.

The information on availability of material in the vicinity is gathered. It has direct impact on cost of maintenance work and balance work if any.

The basic approach for preparation for cost estimates for operation and maintenance is as per the practice of State PWD / MoRT&H in respect of highways and structures.

Data Analysis

Based on the study of the available information and preliminary site visits, the consultants share their preliminary observations with the Client.

1.3 About this Report

This report has been prepared based on the information, reports and documents made available to us by the Company. We have also referred to publicly available reports, literature etc., and have made our best efforts to check the authenticity of the information available, analyse the same as per the best engineering / industry practices.

The site visit and inspection were carried out between the periods of **16th August 2022 to 18th August 2022**.

The report is organized with the following chapters for easy understanding of various issues.

- **Introduction -** This chapter gives an overview of the project background, approach and methodology of Due Diligence studies.

- **Project Description -** This chapter describes existing project features.
- **Development of Project Highway -** This chapter gives an overview of project development.
- **Balance works -** This chapter summarizes the balance works to be executed at Site.
- **Pavement and Site Investigation -** This chapter describes present condition of pavement, surveys and investigations carried out on site and proposals for maintenance as per contract requirements.
- **Operation and Maintenance -** This chapter describes O&M set up as well as O&M cost over the concession period.
- **Review of Concession Agreement -** This chapter summarizes the observations on the Concession Agreement.
- **Review of O&M Agreement -** This chapter summarizes the observations on the O&M Agreement executed.
- **Toll Plaza Equipment and ATMS -** This chapter summarizes assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and working status is presented under this section.
- **Accident Data Analysis -** This chapter deals with the analysis of nature of accidents occurring on the stretch and to identify blackspots.
- **Annexures**

2 PROJECT DESCRIPTION

2.1 Location

The project highway (Package-III) starts at Watambare at km. 276.000 and ends at Mangalwedha at km. 321.600. This entire package lies in Solapur District. The project highway passes through the built-up sections of Watambare, Yalgarmangewadi, Kamlapur, Godsewadi, Vasud, Sangola, Wadegaon, Rajapur, Landevenchinchole, Lakshmidahiwadi, Andhalgaon, Ganeshwadi and Mangalwedha.

The design length of the project highway is 45.600 kms. The project involved development of existing 2-lane carriageway to 4-lane divided carriageway with 1.5 m wide paved shoulder and 2.0 m earthen shoulder on either side.

The Location Map of the project highway is presented below:

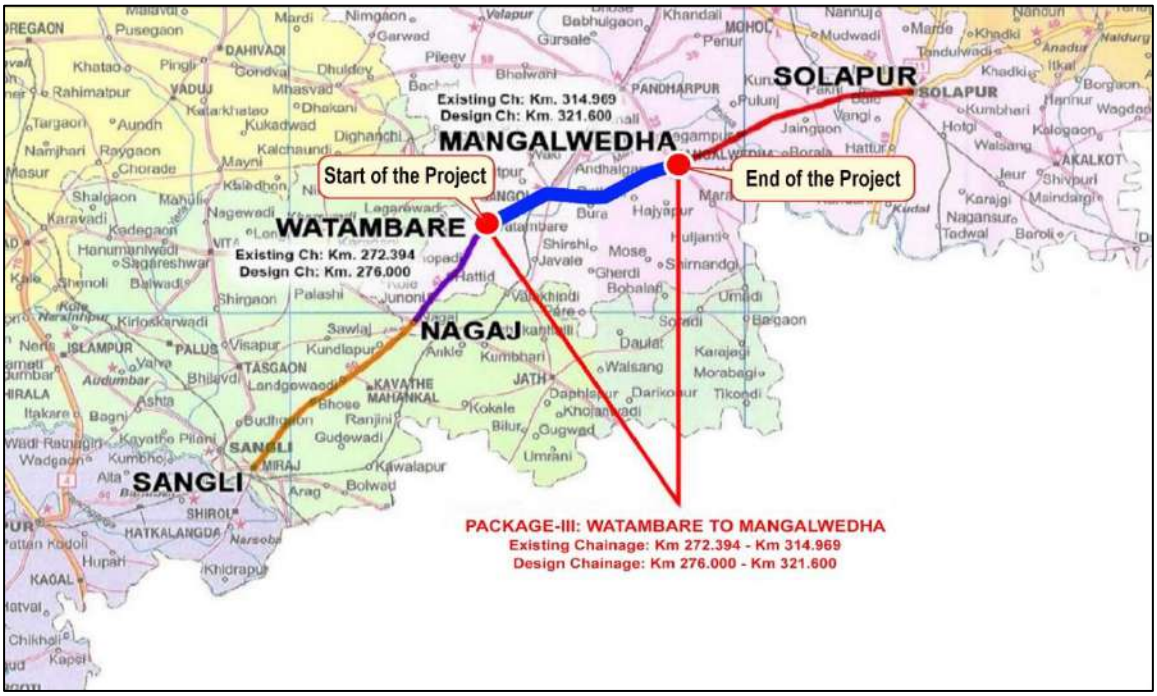

Figure 2-1 Location Map

2.2 Climate

The climate of the project area is generally dry except during the South-West monsoon season between July and August are being the peak rainy months. The average annual rainfall in the area is around 751.5 mm to 1087.7 mm. The average annual temperature of the project area is 15 ^{0}C Minimum & 42 ^{0}C Maximum. The relative humidity of the area varies between 19% to 85%.

2.3 Terrain

This section of National Highway traverses through plain / rolling terrain.

2.4 Abutting Land Use

The land use along the highway is predominantly agriculture, built up and barren.

2.5 Right of Way

The width of existing Right of Way (RoW) throughout the project stretch is 60.0 m.

2.6 Existing Utilities

During widening of the project highway, various affected utility services located along the project road were shifted to the PROW. The different types of utilities found along the road include, electrical poles, telephone poles, OFC Cables, etc.

3 DEVELOPMENT OF PROJECT ROAD

3.1 Project Road

The existing two-lane road with earthen shoulder from km. 276.000 to km. 321.600 has been developed as four lane divided carriageway during the construction stage for the length of 45.600 kms. The project road passes through rural as well as built-up sections. The stretches falling in built-up areas have been provided with service road as per scope of works. The development of entire project road has been carried out in accordance with schedule-B and schedule-C as per standards set forth in schedule-D under the Concession Agreement.

M/s GR Sangli Solapur highway Private Limited has completed construction of the project road for the length of 45.390 kms as on 18th August 2022.

The stretch of the project highway under the scope of study runs predominantly through plain / rolling terrain. The design standards have been adhered to with a realistic compatibility with the existing ROW, utilities and optimum land acquisition. Generally, the cross-sectional dimensions of project road are as below:

Table 3-1 Cross sectional dimension

Main Carriageway	Width (m)
Carriageway width excluding edge strip	17.0
Paved Shoulder width - one side	1.5
Earthen Shoulder width - one side	2.0
Median width	2.0 - 4.5
Service Road	7.5

3.2 Width of Carriageway

The paved carriageway is 18.0 m [(2 x 7.5 m) + (2 x 1.5 m)] wide including paved shoulders, shyness and excluding the median for 4 - lane divided carriageway except at the following locations.

Sr. No.	Name of Township	Design Chainage (km)		Width (m)
		From	To	
1	Watambare	276.380	276.600	19
		276.600	277.200	26
		277.200	278.270	19
		278.270	279.110	26
		279.110	279.180	19
2	Kamlapur	282.720	284.000	26
3	Godasewadi	284.000	285.100	19
4	Sangola	285.100	288.466	26
		289.440	293.160	
		293.780	294.866	
5	Wadegaon	298.311	299.700	26
6	Rajaptir	304.600	304.8 0	26
7	Landevechinchole	304.850	305.200	26
8	Andhalgaon	306.450	307.050	26
		310.590	311.790	

Sr. No.	Name of Township	Design Chainage (km)		Width (m)
		From	To	
9	Ganeshwadi	314.435	315.035	26
10	Mangalwedha	320.600	321.200	26

3.3 Bypass and Realignment

A) Realignment

There are 09 locations where realignment is done. The same is as listed below.

Table 3-2 Details of Realignment

Sr. No.	Chainage (km)		Design Length (m)
	From	To	
1	279.780	280.990	1210
2	282.040	282.810	770
3	303.380	303.520	140
4	304.970	305.160	190
5	309.110	309.840	730
6	310.610	310.790	180
7	310.940	311.850	910
8	319.940	320.200	260
9	321.500	321.600	100

B) Bypasses

There is one bypass on the project highway. The same is as listed below,

Table 3-3 Details of Bypasses

Name of Bypass	Existing Chainage (km)		Design Chainage		Length (km)
	From	To	From	To	
Sangola Bypass	283.310	292.310	287.050	299.120	12.070

Figure 3-1 Photographs of Bypass

Start point of Sangola Bypass at km. 287+050

End point of Sangola Bypass at km. 299+150

3.4 Typical Cross Sections

A) Cross Section Type along the Project Corridor

The Typical Cross Section is as listed below,

Table 3-4 Details of Typical Cross Sections

Sr. No.	Design Chainage (km)		Length (m)	TCS Type	Remarks
	From	To			
1	276.00000	276.38000	380	TCS - 04	Fig 2.4 (C)
2	276.38000	276.60000	220	TCS - 02	Fig 2.6 (A)
3	276.60000	276.89400	294	TCS - 06 B	Fig 2.8 (B)
4	276.89400	276.90600	12	LVUP at Km. 276.900	Fig 2.8
5	276.90600	277.20000	294	TCS - 06 B	Fig 2.8 (B)
6	277.20000	278.27000	1070	TCS - 02	Fig 2.6 (A)
7	278.27000	278.69400	424	TCS - 06 B	Fig 2.8 (B)
8	278.69400	278.70600	12	LVUP at km. 278.700	Fig 2.8
9	278.70600	279.11000	404	TCS - 06 B	Fig 2.8 (B)
10	279.11000	279.18000	70	TCS - 02	Fig 2.6 (A)
11	279.18000	279.78000	600	TCS - 03	Fig 2.4 (A)
12	279.78000	280.32600	546	TCS - 05	Fig 2.4
13	280.32600	280.50600	180	MJB at km 280.416	Fig 2.8
14	280.50600	280.99000	484	TCS - 05	Fig 2.4
15	280.99000	281.26350	273.5	TCS - 03	Fig 2.4 (B)
16	281.26350	281.29050	27	MIB at km 281.277	
17	281.29050	282.04000	749.5	TCS - 03	Fig 2.4 (B)
18	282.04000	282.53480	494.8	TCS - 05	Fig 2.4
19	282.53480	282.56120	26.4	MIB at km. 282.548	
20	282.56120	282.72000	158.8	TCS - 05	Fig 2.4
21	282.72000	282.81000	90	TCS - 06 D	Fig 2.8 (D)
22	282.81000	283.15900	349	TCS - 06 B	Fig 2.8 (B)
23	283.15900	283.17100	12	LVUP at km 283.165	Fig 2.8
24	283.17100	283.64400	473	TCS - 06 B	Fig 2.8 (B)
25	283.64400	283.65600	12	LVUP at km. 283.650	Fig 2.8
26	283.65600	284.00000	344	TCS - 06 B	Fig 2.8 (B)
27	284.00000	284.82980	829.8	TCS - 02	Fig 2.6 (A)
28	284.82980	284.84020	10.4	MIB at km 284.835	
29	284.84020	285.10000	259.8	TCS - 02	Fig 2.6 (A)
30	285.10000	285.42600	326	TCS - 06 B	Fig 2.8 (B)
31	285.42600	285.43800	12	LVUP at km. 285.432	Fig 2.8
32	285.43800	287.05000	1612	TCS - 06 B	Fig 2.8 (B)
33	287.05000	287.29250	242.5	TCS - 06 D	Fig 2.8 (D)
34	287.29250	287.30750	15	VUP at km. 287.300	Fig 2.8
35	287.30750	288.02000	712.5	TCS - 06 D	Fig 2.8 (D)
36	288.02000	288.05000	30	MIB at km 288.035	
37	288.05000	288.11000	60	TCS - 06 D	Fig 2.8 (D)
38	288.11000	288.12200	12	LVUP at km. 288.116	Fig 2.8
39	288.12200	288.46600	344	TCS - 06 D	Fig 2.8 (D)
40	288.46600	289.25300	787	TCS - 05	Fig 2.4
41	289.25300	289.27300	20	MIB at km 289.263	
42	289.27300	289.44000	167	TCS - 05	Fig 2.4
43	289.44000	290.69000	1250	TCS - 06 D	Fig 2.8 (D)

Sr. No.	Design Chainage (km)		Length (m)	TCS Type	Remarks
	From	To			
44	290.69000	290.71000	20	VUP at km. 290.700	Fig 2.8
45	290.71000	292.14100	1431	TCS - 06 D	Fig 2.8 (D)
46	292.14100	292.15500	14	MIB at km 292.148	
47	292.15500	292.22000	65	TCS - 06 D	Fig 2.8 (D)
48	292.22000	292.24000	20	VUP at km. 292.230	Fig 2.8
49	292.24000	292.75050	510.5	TCS - 06 D	Fig 2.8 (D)
50	292.75050	292.76550	15	VUP at km. 292.758	Fig 2.8
51	292.76550	293.16000	394.5	TCS - 06 D	Fig 2.8 (D)
52	293.16000	293.78000	620	TCS - 05	Fig 2.4
53	293.78000	294.09040	310.4	TCS - 06 C	Fig 2.8 (C)
54	294.09040	294.15960	69.2	ROB at km 294.125	
55	294.15960	294.44600	286.4	TCS - 06 C	Fig 2.8 (C)
56	294.44600	294.46600	20	VUP at km. 294.456	Fig 2.8
57	294.46600	294.86000	394	TCS - 06 C	Fig 2.8 (C)
58	294.86000	295.61200	752	TCS - 05	Fig 2.4
59	295.61200	295.63200	20	MIB at km. 295.622	
60	295.63200	296.57300	941	TCS - 05	Fig 2.4
61	296.57300	296.58700	14	MIB at km. 296.580	
62	296.58700	298.07100	1484	TCS - 05	Fig 2.4
63	298.07100	298.31100	240	MJB at km. 298.191	
64	298.31100	298.60700	296	TCS - 06 D	Fig 2.8 (D)
65	298.60700	298.61900	12	LVUP at km. 298.613	Fig 2.8
66	298.61900	299.12000	501	TCS - 06 D	Fig 2.8 (D)
67	299.12000	299.33050	210.5	TCS - 06 B	Fig 2.8 (B)
68	299.33050	299.34550	15	VUP at km. 299.338	Fig 2.8
69	299.34550	299.70000	354.5	TCS - 06 B	Fig 2.8 (B)
70	299.70000	303.38000	3680	TCS - 04	Fig 2.8 (C)
71	303.38000	303.52000	140	TCS - 05	Fig 2.4
72	303.52000	304.60000	1080	TCS - 04	Fig 2.4 (C)
73	304.60000	304.89400	294	TCS - 06 A	Fig 2.8 (A)
74	304.89400	304.90600	12	LVUP at km. 304.900	Fig 2.8
75	304.90600	304.97000	64	TCS - 06 A	Fig 2.8 (A)
76	304.97000	305.16000	190	TCS - 06 C	Fig 2.8 (C)
77	305.16000	305.20000	40	TCS - 06 A	Fig 2.8 (A)
78	305.20000	306.45000	1250	TCS - 04	Fig 2.8 (C)
79	306.45000	306.74400	294	TCS - 06 A	Fig 2.8 (A)
80	306.74400	306.75600	12	LVUP at km. 306.750	Fig 2.8
81	306.75600	307.05000	294	TCS - 06 A	Fig 2.8 (A)
82	307.05000	309.11000	2060	TCS - 04	Fig 2.4 (C)
83	309.11000	309.41700	307	TCS - 05	Fig 2.4
84	309.41700	309.42700	10	MIB at km. 309.422	
85	309.42700	309.84000	413	TCS - 05	Fig 2.4
86	309.84000	310.22000	380	TCS - 04	Fig 2.4 (C)
87	310.22000	310.36000	140	TCS - 03	Fig 2.4 (B)
88	310.36000	310.59000	230	TCS - 04	Fig 2.4 (C)
89	310.59000	310.61000	20	TCS - 06 A	Fig 2.4 (A)
90	310.61000	310.79000	180	TCS - 06 C	Fig 2.4 (C)
91	310.79000	310.88400	94	TCS - 06 A	Fig 2.4 (A)
92	310.88400	310.89600	12	LVUP at km. 310.890	Fig 2.8
93	310.89600	310.94000	44	TCS - 06 A	Fig 2.8 (A)
94	310.94000	311.48400	544	TCS - 06 C	Fig 2.8 (C)

Sr. No.	Design Chainage (km)		Length (m)	TCS Type	Remarks
	From	To			
95	311.48400	311.49600	12	LVUP at km. 311.490	Fig 2.8
96	311.49600	311.79000	294	TCS - 06 C	Fig 2.8 (C)
97	311.79000	311.85000	60	TCS - 05	Fig 2.4
98	311.85000	314.27150	2421.5	TCS - 03	Fig 2.4 (B)
99	314.27150	314.28650	15	MIB at km. 314.279	
100	314.28650	314.43500	148.5	TCS - 03	Fig 2.4 (B)
101	314.43500	314.72900	294	TCS - 06 B	Fig 2.8 (B)
102	314.72900	314.74100	12	LVUP at km. 314.735	Fig 2.8
103	314.74100	315.03500	294	TCS - 06 B	Fig 2.8 (B)
104	315.03500	319.84440	4809.4	TCS - 03	Fig 2.4 (B)
105	319.84440	319.85360	9.2	MIB at km. 319.849	
106	319.85360	319.94000	86.4	TCS - 03	Fig 2.4 (B)
107	319.94000	320.20000	260	TCS - 05	Fig 2.4
108	320.20000	320.60000	400	TCS - 03	Fig 2.4 (B)
109	320.60000	320.89400	294	TCS - 06 C	Fig 2.8 (C)
110	320.89400	320.90600	12	LVUP at km. 320.900	Fig 2.8
111	320.90600	321.20000	294	TCS - 06 C	Fig 2.8 (C)
112	321.20000	321.50000	300	TCS - 03	Fig 2.4 (B)
113	321.50000	321.60000	100	TCS - 05	Fig 2.4

B) Applicable TCS for strengthening of existing 2/4-lane road

Existing road is rehabilitated & strengthened as per Schedule-D, where bypasses / realignments are proposed for built-up locations. The locations are given below.

Sr. No.	Existing Chainage (km)		Existing Length (km)	Existing Chainage (km)		Existing Length (km)	Type of TCS	Place	Existing lane configuration
	From	To		From	To				
1	283.310	287.200	3.890	287.050	299.120	12.070	TCS-08 (B)	Sangola	4-Lane
	287.200	283.310	5.110				TCS-08 (A)		2-Lane
2	304.373	305.2633	0.890	310.940	311.850	0.910	TCS-08 (A)	Andhalgaon	2-Lane

Note:

1) Repair and Rehabilitation measures have been carried out for existing bridges and culverts in above specified locations.
2) The strengthening of these sections is one time improvement, and these stretches are handed over to State Government on COD.

Figure 3-2 Start of Project Road

Start of Project Road at km. 276.000

Start of Project Road at km. 276.000

Figure 3-3 End of Project Road

End of Project Road at km. 321.600

End of Project Road km. 321.600

3.5 Pavement Construction

The entire stretch of the project highway including service road and slip road are rigid pavement.

3.6 Service Road

Service roads have been constructed at 6 locations along the project highway. The total length of service road (including LHS and RHS) is 28.510 kms and the width of service road varies from 7.0 m to 5.5 m. Service roads are provided in both built-up sections and in open country. Built-up sections are provided with RCC built-up drains on outer side of service roads. The details of service roads provided are as tabulated below.

Sr. No.	Design Chainage (km)		Design Length (m)
	From	To	
1	276.380	279.180	2800
2	282.720	288.466	5746
3	289.440	293.160	3720

Sr. No.	Design Chainage (km)		Design Length (m)
	From	To	
4	298.311	299.700	1389
6	314.435	315.035	600

3.7 Slip Roads

Slip roads have been constructed at 6 locations along the project highway. The total length of Slip Road (including LHS and RHS) is 8.021 kms and the width of Slip Road varies from 7.0 m to 5.5 m. Slip Roads are provided in both built-up sections and in open country. Built-up sections are provided with RCC built-up drains on outer side of Slip Roads. The details of Slip Roads provided are as tabulated below.

Sr. No.	Design Chainage (km)		Design Length (m)
	From	To	
1	293.780	294.090	310.4
2	294.159	294.860	700.4
3	304.600	305.200	600
4	306.450	307.050	600
5	310.590	311.790	1200
6	320.600	321.200	600

Figure 3-4 Photographs of Service Road

km. 295+150 (LHS)

km. 320+900 to km. 321+000 (LHS)

km. 314+735 (RHS)

km. 311+054 to km. 311+180 (RHS)

km. 298+613 (LHS)

km. 284+500 (RHS)

3.8 Built up Area

The Project Highway passes through the following built up areas.

Sr. No.	Name of Township	Design Chainage (km)		Length (m)
		From	To	
1	Watambare	276.380	279.180	2800
2	Kamlapur	282.720	284.000	1280
3	Godaewadi	284.000	285.100	1100
4	Sangola	285.100	288.466	3366
5	-	288.466	293.160	4694
6	Wadegoan	298.311	299.700	1389
7	Ganeshwadi	314.435	315.035	600

3.9 At grade intersections

At grade intersections have been constructed with the intersecting roads at the following locations.

(A) Major Intersections:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Junction	Cross Road Category	Side	Leads to
1	-	299.120	Y-junction	Bypass End	RHS	Sangola

(B) Minor Intersections:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Junction	Side	Leads to	Type of Road
1	272.545	276.150	X-Junction	LHS	To Chinke	Metal Road
				RHS		Metal Road
2	273.154	276.757	+-Junction	LHS	To Chinke	Metal Road
				RHS		Metal Road
3	274.262	277.867	Y-Junction	LHS		Cart Track Road
4	275.333	278.915	+-Junction	LHS	To Solapur	BT Road
				RHS	To Watambare	
5	276.124	279.690	T-Junction	RHS	To Vasud	BT Road
6	277.446	281.030	Y-Junction	LHS	To Yelmar Mangewadi	BT Road
7	277.898	281.500	T-Junction	LHS	To Miraj Pandharpur	Metal Road
8	278.632	282.200	X-Junction	LHS	To Kamlapur	Metal Road
				RHS		Metal Road
9	279.385	282.985	X-Junction	LHS	To Kamlapur	BT Road
				RHS	To Vasud	Metal Road
10	280.345	284.040	T-Junction	LHS	To Godasewadi	BT Road
11	280.677	284.380	Y-Junction	RHS	To Godasewadi	Metal Road
12	280.980	284.690	Y-Junction	LHS	To Godasewadi	Metal Road
13	281.140	284.850	Y-Junction	RHS		Cart Track Road
14	282.105	285.800	T-Junction	LHS	To Industries	BT Road
15	282.505	286.130	Y-Junction	RHS		Cart Track Road
16	283..160	286.750	T-Junction	LHS	To Industries	BT Road
17	Bypass	287.990	Y-Junction	LHS		BT Road
18	Bypass	288.330	T-Junction	LHS		Metal Road

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Junction	Side	Leads to	Type of Road
19	Bypass	290.022	+-Junction	LHS	To Ekhatpur	BT Road
				RHS	To Sangole	
20	Bypass	295.165	X-Junction	LHS		BT Road
				RHS	To Sangole	
21	Bypass	297.700	T-Junction	RHS	To Sangole	
22	292.538	299.200	Y-Junction	RHS	To Wadegaon	BT Road
23	294.369	301.175	T-Junction	RHS		Cart Track Road
24	294.716	301.520	Y-Junction	LHS		Cart Track Road
28	295.160	301.925	Y-Junction	RHS		Cart Track Road
26	296.153	302.725	T-Junction	RHS	To Raut Vast--Lazmi Dahiwadi Road	BT Road
27	296.696	303.270	X-Junction	LHS		BT Road
				RHS		Cart Track Road
28	299.465	306.025	Y-Junction	LHS	To Rajapur	BT Road
29	301.610	308.180	T-Junction	LHS		Cart Track Road
				RHS		Cart Track Road
30		311.742	X-Junction	LHS	To Andhalgaon	BT Road
				RHS	To Pathkal	
31	305.253	311.840	Staggered	LHS		Cart Track Road
	305.275	311.865		RHS		BT Road
32	306.813	313.400	T-Junction	LHS	To Shelewadi	BT Road
33	307.663	314.250	T-Junction	RHS	To Pathkal	BT Road
34	309.901	316.500	T-Junction	LHS		Cart Track Road
35	310.615	317.220	X-Junction	LHS	To Akole	Metal Road
				RHS	To Kacharewadi	Metal Road
36	312.130	318.740	T-Junction	LHS		Cart Track Road
37	319.420	319.420	Y-Junction	RHS		Cart Track Road
38	313.903	320.520	X-Junction	LHS		Cart Track Road
				RHS	To Kacharewadi	
39	314.281	320.900	Y-Junction	RHS	To Kacharewadi	BT Road

Figure 3-5 Photographs of Minor Intersection

km. 311+900

km. 314+250

km. 303+250

km. 281+000

km. 303+290

km. 279+750

3.10 Underpasses

The underpasses constructed at Site are as tabulated below.

Sr. No.	Design Chainage (km)	Span / Opening (m)	Road to be carried over / under the structures
1	276.900	1 x 12.00 x 4.00	Light Vehicular Underpass
2	278.700	1 x 12.00 x 4.50	Light Vehicular Underpass
3	283.165	1 x 12.00 x 4.00	Light Vehicular Underpass
4	253.650	1 x 12.00 x 4.50	Light Vehicular Underpass
5	285.432	1 x 12.00 x 4.50	Light Vehicular Underpass
6	287.300	1 x 15.00 x 5.50	Vehicular Underpass
7	288.116	1 x 12.00 x 4.00	Light Vehicular Underpass
8	290.700	1 x 20.00 x 5.50	Vehicular Underpass
9	292.230	1 x 20.00 x 5.50	Vehicular Underpass
10	292.758	1 x 15.00 x 5.50	Vehicular Underpass
11	294.456	1 x 20.00 x 5.50	Vehicular Underpass
12	298.613	1 x 12.00 x 4.00	Light Vehicular Underpass
13	299.338	1 x 15.00 x 5.50	Vehicular Underpass
14	304.900	1 x 12.00 x 4.00	Light Vehicular Underpass
15	306.750	1 x 12.00 x 4.00	Light Vehicular Underpass
16	310.890	1 x 12.00 x 4.00	Light Vehicular Underpass
17	311.490	1 x 12.00 x 4.00	Light Vehicular Underpass
18	314.735	1 x 12.00 x 4.00	Light Vehicular Underpass
19	320.900	1 x 12.00 x 4.00	Light Vehicular Underpass

3.11 Culverts

The culverts reconstructed / widened / constructed as new are as given below:

A. Widening of Culverts:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Structure		Span Arrangement	
			Existing	Proposed	Existing	Proposed
1	272.578	276.186	HPC	HPC	4 x 1.00	4 x 1.00
2	280.675	284.231	HPC	HPC	2 x 1.20	2 x 1.20
3	281.840	285.390	HPC	HPC	3 x 1.20	3 x 1.20
4	282.474	286.025	HPC	HPC	2 x 0.90	2 x 0.90

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Structure		Span Arrangement	
			Existing	Proposed	Existing	Proposed
5	283.440	286.979	HPC	HPC	2 x 1.20	2 x 1.20
6	305.964	312.567	HPC	HPC	2 x 0.90	2 x 0.90
7	311.371	317.979	HPC	HPC	4 x 0.90	4 x 0.90
8	312.049	318.657	HPC	HPC	1 x 0.90	1 x 0.90
9	312.882	319.491	HPC	HPC	1 x 0.90	1 x 0.90
10	313.651	320.266	HPC	HPC	4 x 0.90	4 x 0.90

B. Dismantling & Reconstruction of Culverts:

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Type of Structure		Span Arrangement	
			Existing	Proposed	Existing	Proposed
1	273.370	276.979	HPC	HPC	1 x 0.70	1 x 1.20
2	275.316	278.921	HPC	HPC	1 x 0.30	1 x 1.20
3	278.393	281.959	HPC	HPC	1 x 0.60	1 x 1.20
4	280.556	284.112	RCC Slab	BC	1 x 2.50	1 x 4.00 x 4.00
5	281.720	285.275	RCC Slab	BC	1 x 2.00	1 x 2.00 x 1.50
6	293.364	300.021	HPC	HPC	1 x 0.90	1 x 1.20
7	294.749	301.408	HPC	HPC	1 x 0.50	1 x 1.20
8	298.375	304.930	HPC	HPC	1 x 0.75	1 x 1.20
9	299.272	305.821	HPC	HPC	2 x 0.75	2 x 1.20
10	299.450	305.995	HPC	HPC	2 x 0.70	2 x 1.20
11	300.139	306.714	HPC	HPC	1 x 0.70	1 x 1.20
12	301.118	307.692	HPC	HPC	2 x 0.80	2 x 1.20
13	301.393	307.971	HPC	HPC	1 x 0.70	1 x 1.20
14	301.894	308.468	HPC	HPC	2 x 0.75	2 x 1.20
15	303.528	310.084	HPC	HPC	1 x 0.70	1 x 1.20
16	303.652	310.207	HPC	HPC	1 x 0.75	1 x 1.20
17	304.355	310.903	HPC	HPC	1 x 0.50	1 x 1.20
18	306.381	312.947	HPC	HPC	1 x 0.80	1 x 1.20
19	307.175	313.758	HPC	HPC	1 x 0.80	1 x 1.20
20	308.547	315.136	HPC	HPC	1 x 1.00	1 x 1.20
21	308.779	315.369	HPC	HPC	1 x 0.80	1 x 1.20
22	309.548	316.136	HPC	HPC	1 x 0.80	1 x 1.20
23	310.602	317.203	HPC	HPC	1 x 0.80	1 x 1.20
24	311.670	318.279	HPC	HPC	1 x 0.80	4 x 1.20
25	312.843	319.451	HPC	HPC	2 x 0.80	2 x 1.20
26	313.049	319.667	HPC	HPC	2 x 0.80	2 x 1.20
27	314.015	320.629	HPC	HPC	1 x 0.70	1 x 1.20
28	314.410	321.024	HPC	HPC	2 x 0.80	2 x 1.20

C. New Culverts

Sr. No.	Design Chainage (km)	Proposed Structure	Proposed Span arrangement (m)
1	276.141	BC	1 x 4.00 x 1.50
2	277.879	HPC	1 x 1.20
3	281.836	HPC	1 x 1.20
4	283.256	HPC	1 x 1.20
5	283.856	HPC	I x 1.20
6	287.060	HPC	2 x 1.20
7	289.820	HPC	1 x 1.20
8	290.25	HPC	1 x 1.20

Sr. No.	Design Chainage (km)	Proposed Structure	Proposed Span arrangement (m)
9	290.634	BC	1 x 5.00 x 6.00
10	291.800	BC	1 x 3.00 x 2.00
11	292.515	HPC	1 x 1.20
12	297.130	HPC	1 x 1.20
13	297.510	HPC	I x 1.20
14	299.507	HPC	I x 1.20
15	301.057	HPC	I x 1.20
16	301.443	HPC	1 x 1.20
17	302.159	HPC	I x 1.20
18	302.459	HPC	1 x 1.20
19	303.220	HPC	1 x 1.20
20	304.369	HPC	I x 1.20
21	306.554	HPC	1 x 1.20
22	307.175	HPC	1 x 1.20
23	310.423	HPC	1 x 1.20
24	311.054	HPC	3 x 1.20
25	311.128	HPC	1 x 1.20
26	311.515	HPC	I x 1.20
27	311.734	BC	1 x 5.00 x 2.00
28	311.801	HPC	I x 1.20
29	314.589	HPC	1 x 1.20
30	314.840	HPC	1 x 1.20
31	316.550	HPC	1 x 1.20
32	317.808	HPC	1 x 1.20

3.12 Bridges

Details of Major Bridges and Minor Bridges reconstructed / widened / constructed as new are as given below:

A. Construction of New Major Bridges:

Sr. No.	Name of the River	Existing Chainage (Km)	Design Chainage (km)	Type of Structure	Proposed Span Arrangement (m)	Total Width (m)
1	Manganga	276.860	280.420	PSC Girder type	6 x 30.0	16.0 + varies + 16.0
2	Manganga	251.600	298.190	PSC Girder pipe	8 x 30.0	16.0 + varies + 16.0

B. Construction of New Minor Bridges:

Sr. No.	Design Chainage (km)	Type of Structure	Proposed Span Arrangement (m)	Remarks	Total Width (m)
1	282.548	RCC Box type	4 x 6.60		16.0 + 3.0 + 16.0
	258.035	RCC Girder Type	2 x 15.0	New Bridges on Service/ Slip road also to be constructed	14.5 + 3.0 + 14.5
3	289.26	RCC Box type	2 x 10.0	-	16.0 + 3.0 + 16.0

Sr. No.	Design Chainage (km)	Type of Structure	Proposed Span Arrangement (m)	Remarks	Total Width (m)
4	292.148	RCC Girder Type	1 x 14.0	New Bridges on Service/ Slip road also to be constructed	14.5 + 3.0 + 14.5
5	295.622	RCC Box type	2 x 10.0	-	16.0 + 3.0 + 16.0
6	296.58	RCC Girder Type	1 x 14.0	-	16.0 + 3.0 + 16.0

C. Dismantling and Reconstruction of Existing Minor Bridges:

The following Minor Bridges are dismantled and reconstructed.

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Total Width (m)	Span Arrangement (m)	Remarks
1	281.300	284.835	14.5 + 3.0 + 14.5	2 x 5.20	New Bridges on Service / Slip road also to be constructed
2	-	309.422	16.0 + 3.0 + 16.0	1x 10.0	-
3	307.700	314.279	16.0 + 3.0 + 16.0	1 x 15.0	-

D. Widening, Repairs and Rehabilitation of Existing Minor Bridges:

The following existing minor bridges are retained and utilized as a bridge for main carriageway on one side and repaired / strengthened as per the details given below and new 3-Lane bridge are constructed on the other side.

Sr. No.	Existing Chainage (km)	Design Chainage (km)	Total Width of the Bridge (m)	Span Arrangement (m)
1	277.722	281.277	16.0 + 3.0 + 16.0	3 x 9.00
2	313.228	319.849	16.0 + 3.0 + 16.0	l x 9.20

3.13 ROBs:

A. The details of New ROBs constructed are given below:

Sr. No.	Location	ROB / RUB	Design Chainage (km)	Type of Structure	Proposed Span Arrangement (m)	Total width of the Structure (m)
1	Sangola	ROB	294.125	RCC Girder	1 x 16.0 + 1 x 37.2 + 1 x 16.0	16.0 + 3.0 + 16.0

3.14 Right of Way

Right of Way is 60 m for the entire length except for Wayside Amenities whereas additional land is proposed and is under land acquisition process.

3.15 Condition Survey of Bridges

The inventory of structures including major bridges, minor bridges, ROB, underpasses and culverts is presented in table as below:

Table 3-5 Summary of Structures

Type of Structure	Total Number of Structures
Major Structures:	
Road Over Bridge (ROB)	1
Overpasses	Nil
Flyover	Nil
Vehicular Underpass (VUP)	6
Light Vehicular Underpass (LVUP)	13
Pedestrian Underpass (PUP)	1
Cattle Underpass (CUP)	Nil
Major Bridges (MJB)	2
Minor Bridges (MNB)	11
Culverts:	
Pipe Culvert	65
Box Culvert	6
Total	**105**

The detailed condition survey of structures was carried out by visual inspection. The observations and findings are presented in table below:

Table 3-6 Structure Condition Survey

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
1	276.900	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
2	278.700	l x 12.00 x 4.50	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed, Electrification work is completed in the Underpass.
3	280.420	6 x 30.0	New Major Bridge (Manganga river)	16.0 + varies + 16.0	**LHS**	RCC Pier	RCC Slab	A1 & P1 Pile Foundation and others are Open Foundation,	Precast Concrete Girders, 5 nos. per span, Structure is Newly constructed. It is sound and satisfactory. RCC Railing is constructed, Expansion Joints are satisfactory. PTFE Type bearings

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
								RCC footing	are used. For slope protection Quarter cone pitching is done. Drainage spouts are cleaned.
					RHS	RCC Pier	RCC Slab	A1 & P1 Pile Foundation and others are Open Foundation, RCC footing	Precast Concrete Girders, 5 nos. per span, Structure is Newly constructed. it is sound and satisfactory. RCC Railing is constructed. Expansion Joints are satisfactory. PTFE Type bearings are used. For slope protection Quarter cone pitching is done. Drainage spouts are cleaned
4	281.277	3 x 9.00	R & R Minor Bridge	16.0 + 3.0 + 16.0	**LHS**	RCC Pier	RCC Slab	Open Foundation, RCC footing	The Structure is Newly constructed. it is sound and satisfactory. RCC Parapet is constructed. For slope protection Quarter cone pitching is done.
					RHS	RCC / Stone Masonry Pier	RCC Slab	Open Foundation, New RCC Footings and Existing Stone Masonry footing	Existing Structure Pier Stone Masonry and Widening Portion RCC pier, Existing Structure Repair and Rehabilitation Completed. The structure is Sound and Satisfactory. RCC Parapet is constructed, for slope protection Quarter cone pitching is done.
5	282.548	4 x 6.60	New Minor Bridge	16.0 + 3.0 + 16.0	**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type Minor Bridge, Structure is Newly constructed. It is sound and satisfactory. RCC Railing is constructed. For Slope protection Wing walls are

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed on both sides. Apron soling done.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type Minor Bridge, Structure is Newly constructed. It is sound and satisfactory. RCC Railing is constructed. For Slope protection Wing walls are constructed on both sides. Apron soling done.
6	283.165	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory, RCC Parapet is constructed. Electrification work is completed in the Underpass.
7	283.650	1 x 10.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									Electrification work is completed in the Underpass, but lights are stolen by locals.
8	284.500	1 x 7.00	Pedestrian Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory, RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
9	284.835	2 x 5.20	Reconstruction on Minor Bridge New Bridges on Service / Slip Road also to be constructed	14.5 + 3.0 + 14.5	**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, Newly Constructed on MCW As well as Service Road, on Road Bridge Foot path with RCC Railing. The structure is sound and satisfactory
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, Newly Constructed on MCW As well as Service Road, on Road Bridge Foot path with RCC Railing. The structure is sound and satisfactory
10	285.432	l x 12.00 x 4.50	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed, Electrification work is completed in

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									the Underpass, but lights are stolen by locals.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
11	287.300	1 x 15.00 x 5.50	Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
12	288.035	2 x 10.00	Minor Bridge		**LHS**	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Girders 5 nos each span is used for Main Carriageway and deck slab with supporting Beam for Service Road. RCC Parapet are constructed for Main Carriageway and RCC Railing on outer side and inner side RCC Parapet is constructed for Service Road. Structure is Newly constructed. It is sound and

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									satisfactory. Elastomeric Type bearings are used
					RHS	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Girders 5 nos each span is used for Main Carriageway and deck slab with supporting Beam for Service Road. RCC Parapet are constructed for Main Carriageway and RCC Railing on outer side and inner side RCC Parapet is constructed for Service Road. Structure is Newly constructed. It is sound and satisfactory. Elastomeric Type bearings are used.
12	288.116	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
13	289.260	2 x 10.0	New Minor Bridge	16.0 + 3.0 + 16.0	**LHS**	RCC Pier	RCC Slab	Open Foundation, RCC footing	RCC slab is constructed. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed for Main Carriageway and RCC Railing is on outer side and inner side. RCC

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									Parapet is constructed for Service Road.
					RHS	RCC Pier	RCC Slab	Open Foundation, RCC footing	RCC slab is constructed. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed for Main Carriageway and RCC Railing is on outer side and inner side RCC Parapet is constructed for Service Road.
14	290.700	1 x 20.0 x 5.50	Vehicular Underpass		**LHS**	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders, 5 nos. per span, Structure is Newly constructed. it is sound and satisfactory. RCC Parapet is constructed, Elastomeric Type bearings are used. Electrification work completed.
					RHS	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders, 5 nos. per span, Structure is Newly constructed. it is sound and satisfactory. RCC Parapet is constructed, Elastomeric Type bearings are used. Electrification work completed.
15	292.148	1 x 14.0	New Minor Bridge New Bridges on Service/ Slip road also to be constructed	14.5 + 3.0 + 14.5	**LHS**	4 no. of RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders 5 nos. per span. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed for Main Carriageway and RCC Railing is on outer side and inner side RCC Parapet is constructed for Service Road.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									Elastomeric Type bearings are used It is on Canal Crossing.
					RHS	5 no. of RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders 5 nos. per span. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed for Main Carriageway and RCC Railing is on outer side and inner side RCC Parapet is constructed for Service Road. Elastomeric Type bearings are used It is on Canal Crossing.
16	292.230	l x 20.00 x 5.50	Vehicular Underpass		**LHS**	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders 5 nos. per span. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed. Elastomeric Type bearings are used.
					RHS	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders 5 nos. per span. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed. Elastomeric Type bearings are used.
17	292.758	1 x 15.00 x 5.50	Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. it is sound and satisfactory, RCC Parapet is constructed, Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation,	RCC Box type underpass, Structure is Newly constructed. It

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
								RCC footing	is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
18	294.125	1 x 16.0 + 1 x 37.2 + 1 x 16.0	ROB	16.0 + 3.0 + 16.0	**LHS**	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders 5 nos. per span Except Railway main Span and 6 no. of Composite Girders per span are used for main span of Railway. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed for Main span of Railway. RCC Railing is constructed for non-Railway span. PTFE Type bearings are used. Drainage spouts are cleaned.
					RHS	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders 5 nos. per span Except Railway main Span and 6 no. of Composite Girders per span are used for main span of Railway. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed for Main span of Railway. RCC Railing is constructed for non-Railway span. PTFE Type bearings are used. Drainage spouts are cleaned
19	294.456	1 x 20.00 x 5.50	Vehicular Underpass		**LHS**	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders 5 nos. per span. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed. Elastomeric Type bearings are used. Electrification work is completed in the Underpass.
					RHS	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders 5 nos. per span. The structure is newly constructed. It is sound and Satisfactory. RCC Parapet are constructed. Elastomeric Type bearings are used. Electrification work is completed in the Underpass.
20	295.622	2 x 10.0	New Minor Bridge	16.0 + 3.0 + 16.0	**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, the structure is newly constructed. It is sound and Satisfactory. RCC Railing is constructed, For Slope Protection both side Wing Walls are constructed. BC Wearing Coat is Raveling.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, the structure is newly constructed. It is sound and Satisfactory. RCC Railing is constructed, For Slope Protection both side Wing Walls are constructed. BC Wearing Coat is Raveling.
21	296.580	1 x 7.00	New Minor Bridge	16.0 + 3.0 + 16.0	**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, It is in Skew, The structure is newly constructed. It is sound and Satisfactory. RCC Parapet is constructed, For Slope Protection

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									both side Wing Walls are constructed.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, It is in Skew, The structure is newly constructed. It is sound and Satisfactory. RCC Parapet is constructed. For Slope Protection both side Wing Walls are constructed.
22	298.190	8 x 30.0	New Major Bridge (Manganga river)	16.0 + varies + 16.0	**LHS**	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders, 5 nos. per span, Structure is Newly constructed. it is sound and satisfactory. RCC Railing with footpath is constructed, Expansion Joints are satisfactory. PTFE Type bearings are used. For slope protection wing wall are constructed. Drainage spouts are cleaned
					RHS	RCC Pier	RCC Slab	Open Foundation, RCC footing	Precast Concrete Girders, 5 nos. per span, Structure is Newly constructed. It is sound and satisfactory. RCC Railing with footpath is constructed. Expansion Joints are satisfactory. PTFE Type bearings are used. For slope protection Quarter cone pitching is done. Drainage spouts are cleaned.
23	298.613	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation,	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
								RCC footing	Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
24	299.338	1 x 15.00 x 5.50	Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
25	304.900	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation,	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
								RCC footing	Parapet is constructed. Electrification work is completed in the Underpass.
26	306.750	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
27	309.422	2x 5.00	Reconstruction on Minor Bridge	16.0 + 3.0 + 16.0	**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, It is in Skew, The structure is newly constructed. It is sound and Satisfactory. RCC Parapet is constructed, For Slope Protection, both side quarter coning not done
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, It is in Skew, The structure is newly constructed. It is sound and Satisfactory. RCC Parapet is constructed, For Slope Protection quarter coning done on A1 Sangli side and A2 Solapur side is balance.

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
28	310.890	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
29	311.490	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass, but lights are stolen by locals.
30	314.279	3 x 5.00	Reconstruction on Minor Bridge	16.0 + 3.0 + 16.0	**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, the structure is newly constructed. It is sound and Satisfactory. For Slope Protection wing walls are

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
									constructed is done. Waterway cleaning is required
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	Box Type Minor Bridge, the structure is newly constructed. It is sound and Satisfactory. For Slope Protection wing walls are constructed is done. Waterway cleaning is required.
31	314.735	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
32	319.849	l x 9.20	R & R Minor Bridge	16.0 + 3.0 + 16.0	**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type Minor Bridge, it is constructed on Canal Structure is Newly constructed. It is sound and satisfactory. Footpath with RCC Railing is constructed,
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type Widening of Existing Minor Bridge. It is constructed on Canal. Existing Bridge Repair and Rehabilitation completed. It is sound and satisfactory. Footpath with RCC Railing is constructed,

Sr. No.	Chainage (km)	Span Arrangement (m)	Type	Width (m)	Side	Type of Sub structure	Type of Super structure	Type of foundation	Remarks
33	320.900	1 x 12.00 x 4.00	Light Vehicular Underpass		**LHS**	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.
					RHS	RCC Box Type	RCC Slab	Open Foundation, RCC footing	RCC Box type underpass, Structure is Newly constructed. It is sound and satisfactory. RCC Parapet is constructed. Electrification work is completed in the Underpass.

Figure 3-6 Photographs of Major Structures

Light Vehicular Underpass at km. 276.900

Light Vehicular Underpass at km. 278.700

New Major Bridge at km. 280.420

New Major Bridge Bottom View of Girder and Pier at km. 280.420

Widening of Existing Minor Bridge at km. 281.277

New Minor Bridge at km. 282.548

Light Vehicular Underpass at km. 283.165

Light Vehicular Underpass at km. 283.650

Pedestrian Underpass at km. 284.500

Reconstruction of Minor Bridge at km. 284.835

Light Vehicular Underpass at km. 285.432

Vehicular Underpass at km. 287.300

New Minor Bridge at km. 288.035

Light Vehicular Underpass at km. 288.116

New Minor Bridge at km. 289.260

Vehicular Underpass at km. 290.700

New Minor Bridge at km. 292.148

Vehicular Underpass at km. 292.230

Vehicular Underpass at km. 292.758

Rail Over Bridge at km. 294.125

Rail Over Bridge at km. 294.125

Rail Over Bridge at km. 294.125

Vehicular Underpass at km. 294.456

New Minor Bridge at km. 295.622

New Minor Bridge at km. 296.580

New Major Bridge at km. 298.190

New Major Bridge at km. 298.190

Light Vehicular Underpass at km. 298.613

Vehicular Underpass at km. 299.338

Light Vehicular Underpass at km. 304.900

Vehicular Underpass at km. 306.750

Reconstruction of Minor Bridge at km. 309.422

Light Vehicular Underpass at km. 310.890

Light Vehicular Underpass at km. 311.490

Reconstruction of Minor Bridge at km. 314.279

Light Vehicular Underpass at km. 314.735

Existing Minor Bridge widening at km. 319.849 on RHS

New Minor Bridge at km. 319.849 on LHS

Light Vehicular Underpass at km. 320.900

3.16 Condition Survey of Culverts

The cross-drainage structure includes hume pipe culverts at various locations. There are 64 nos. of pipe culverts along the project highway. There were 6 nos. box / slab culverts along the project highway. During the condition survey of structure, these culverts were inspected on Site.

The project involves strengthening and widening of existing road to four lane divided carriageway. The culverts beneath existing alignment are either widened or reconstructed. The condition of culverts is generally found in sound condition. The quality of surface concrete of box culverts is satisfactory. The RCC parapet, has been provided at culvert locations, which is maintained properly.

Vegetation growth and accumulation of debris at waterway is being removed and cleaned by the Concessionaire on regular basis.

Figure 3-7 Photographs of Culverts

Pipe Culvert at km. 321.024

Pipe culvert at km. 317.979

Pipe culvert at km. 318+657

Pipe culvert at km. 310+423

Pipe culvert at km. 311+550

Pipe culvert at km. 304+300

Box culvert at km. 302+500

Pipe Culvert at km. 302+150

Pipe Culvert at km. 300+020

Pipe Culvert at km. 299+507

Box Culvert at km. 284+112

Box Culvert at km. 285+300

Pipe Culvert at km. 276+190

Pipe Culvert at km. 292+135

Box Culvert at km. 311.734

3.17 Drainage System

There are RCC box drains at the built-up areas and earthen drain at rural area provided for the project stretch. Lined median longitudinal drain is provided at super-elevated sections. The roadside drainage along the project highway as well as lined drains at median portion is maintained by cleaning debris on regular basis. Some of the photographs of the drains provided are presented as below.

Figure 3-8 Photographs of Drains provided

Built-up Drain at km. 314+735

Built-up Drain at km. 299+350

3.18 Slope Protection Measures

Slope protection for high embankment of height greater than 3.0 m has been provided with stone pitching and turfing has been provided for height upto 3.0 m. At sections of stone pitching is provided and some sections stone pitching is in progress. The same is found to be regularly maintained at most the locations. Some of the photographs of slope protection work are presented below.

Figure 3-9 Photographs of Slope Protection Works

Slope Protection work at km. 284+500.000

Slope Protection work at km. 298+300

3.19 Road Furniture

Pavement Marking

Pavement marking for the project highway is done as per the design standards indicated in section 12 of Schedule-D. Pavement marking is faded at some locations which needs rectification. As informed by Concessionaire, the painting is being done wherever is required on regular basis as a part of routine maintenance. Some of the photographs of road marking are presented below.

Figure 3-10 Photographs of Road Markings

Road Markings at km. 306+500

Road Markings at km. 286+600

Traffic Signage

Traffic signs includes roadside signs, overhead signs, kerb mounted signs and median signs along the project highway. The design for the traffic signs along the project highway is done as per the design standards indicated in section 11 of Schedule-D.

The height, lateral clearance, location and installation are as per relevant clauses of Schedule 'D'. Overhead sign has been installed ahead of major intersections, start / end of project highway and urban areas as per detailed design requirements.

The sign boards, kilometre stones and hectometre stones are being replaced wherever damaged.

Some of the photographs of sign boards are presented below.

Figure 3-11 Photographs of Road Sign Boards

Cantilever Gantry Sign at km. 321+600

VMS Board at km. 301+100

Highway Lighting

Highway lighting is provided at underpasses, flyovers, ROBs and built-up locations.

At underpass and flyover locations, highway lighting is provided at the structure locations and at its approaches.

Solar amber blinker signals are provided at each at-grade intersections and at median opening locations. These lights are properly maintained and are in good working condition. Regular maintenance work is carried out to ensure their efficient operation. Some of the photographs of highway lightings are presented below.

Figure 3-12 Photographs of Highway Lighting

Highway Lighting at km. 313+700

Lighting arrangement made under structures

Crash Barriers

Metal beam crash barriers are provided at bridge approaches, locations of high embankment and sharp curves. All the crash barriers provided by the Concessionaire are well maintained at site. Some of the photographs of metal beam crash barriers are presented below.

Figure 3-13 Photographs of Crash Barriers

Crash Barrier at km. 285+650

Crash Barrier at High Embankment Location

Road Land Boundary

Road land (ROW) boundary demarcation is required to be maintained by the Concessionaire on the project highway during the concession period. The road land boundary pillars are being fixed at required locations whenever required.

3.20 Avenue Plantation and Median Plantation

Avenue plantation and median plantation is available intermittently along the project highway. Variety of trees and plants are planted throughout the corridor at road side and at median side respectively. Median plantation is maintained along the project highway. The plantation is being done wherever required on regular basis. Some of the photographs of avenue plantation and median plantation are presented below.

Figure 3-14 Photographs of Avenue and Median Plantation

Avenue Plantation at km. 293+700

Median Plantation at km. 313+450

3.21 Project Facilities

Toll Plaza

As per Concession Agreement, there is no Toll plaza proposed in the project stretch.

Truck Lay Byes

As per Concession Agreement, there is no Truck Lay Bye proposed in the Project stretch.

Rest Area

Rest area location is shifted from km. 302.200 to km. 303.140 on RHS due to existence of HPCL pipeline. It is not constructed due to LA issue. As informed by the Company, 3A is completed and 3D is in progress for the required land.

Bus Bay and Passenger Shelter

Bus bays and passenger shelters are constructed at the various locations along the project highway. 34 Nos. of bus bays with passenger shelters are provided in project highway and 34 Nos. of passenger shelters are provided on service roads along project highway. Bus bays are equipped with all necessary signage as per relevant IRC guidelines mentioned in Schedule-D of Concession Agreement. The details of the bus bays and passenger shelters provided as below.

Table 3-7 Details of Bus Bays along Project Highway

Sr. No.	Design Chainage (km)	Name of Village	Side
1	277.000	Ankhada	LHS
2	277.150	Ankhada	RHS
3	278.450	Watambare	LHS
4	278.990	Watambare	RHS
5	283.350	Kamalapur	LHS
6	283.100	Kamalapur	RHS
7	284.400	Godeshwadi	LHS
8	284.600	Godeshwadi	RHS

Sr. No.	Design Chainage (km)	Name of Village	Side
9	285.600	Sugar Factory	LHS
10	285.750	Sugar Factory	RHS
11	287.700	Sangola Bypass	LHS
12	287.850	Sangola Bypass	RHS
13	290.550	Sangola Bypass	LHS
14	290.885	Sangola Bypass	RHS
15	295.100	Sangola Bypass	LHS
16	295.250	Sangola Bypass	RHS
17	297.200	Sangola Bypass	LHS
18	297.900	Sangola Bypass	RHS
19	299.450	Vadegaon	LHS
20	299.600	Vadegaon	RHS
21	301.200	Dhikawadi	LHS
22	301.635	Dhikawadi	RHS
23	305.900	Rajpur	LHS
24	306.100	Malwadi	RHS
25	310.800	Andhalgaon	LHS
26	311.200	Andhalgaon	RHS
27	312.200	Shelewadi	LHS
28	312.350	Shelewadi	RHS
29	316.440	Ganeshwadi	LHS
30	316.800	Ganeshwadi	RHS
31	318.532	Mangalwedha	LHS
32	318.980	Mangalwedha	RHS
33	320.800	Mangalwedha	LHS
34	321.100	Mangalwedha	RHS

Figure 3-15 Photographs of Bus Bay

Bus Bay at km. 312+150 (Andhalgaon)

Bus Bay at km. 285+650 (Sut Girni)

Bus Bay on service road at km. 305+800

Bus Bay at km. 301+600 (Dighewadi)

4 BALANCE WORKS

The project has received Provisional Completion Certificate (PCOD) on 28th June 2021 with balance works to be executed at Site as mentioned in punch list items. During site visit, it is noticed that there is a balance work of service road which is hindered due to non-availability of land. It is also found that construction of 210 m of main carriageway is in progress which was balance due to High Tension Line.

The cost of balance work is estimated as Rs. 30.50 Crores. The detailed estimated balance work is presented in **Annexure-IV** for reference.

5 PAVEMENT AND SITE INVESTIGATION

5.1 General

The project has been developed on Design, Build, Operate and Transfer (DBOT) basis.

The concession period of the project is 17 years from Appointment Date i.e., 31st December 2018 including construction period of 2 years. The Provisional Completion (PCOD) for the entire project has been achieved on 28th June 2021. The project is currently under operation and maintenance (O&M) stage.

5.2 Details of As-built Pavement

The following table shows crust details based on pavement design report submitted by the Concessionaire. The details of pavement crust are as provided during the development of existing two lane to four lane divided carriageway. The pavement design report states that pavement was designed as per IRC:58-2015.

Table 5-1 Existing Pavement Crust Details

Particulars	Chainage (km)		Design Life	Pavement Thickness (mm)		
	From	To		PQC	DLC	GSB
Main Carriageway	276.000	321.600	30 years	300	150	150
Service Road	-	-	30 years	250	150	150

5.3 Surveys and Investigation

5.3.1 Pavement Condition Survey

Pavement condition survey was carried out from **16th August to 18th August 2022** through visual inspection for the entire project length. The details of the visual condition survey are provided in **Annexure-V.**

The summary of pavement condition based on the visual inspection is tabulated below.

Table 5-2 Summary of Pavement Condition

Design Chainage (km)		Length	Visual Condition (As per IRC:115-2014)	
From	To		LHS Carriageway	RHS Carriageway
276.000	280.000	4.000	Good	Good
280.000	285.000	5.000	Good	Good
285.000	290.000	5.000	Good	Good
290.000	295.000	5.000	Good	Good
295.000	300.000	5.000	Good	Good
300.000	305.000	5.000	Good	Good
305.000	310.000	5.000	Good	Good
310.000	315.000	5.000	Good	Good
315.000	320.000	5.000	Good	Good
320.000	321.600	1.600	Good	Good

Observation and Conclusion:

From the above table, it is observed that the overall pavement condition for the entire project stretch is found to be good.

Following Photographs were taken at the time of visual pavement condition survey.

Figure 5-1 Photographs of Pavement Condition Survey

Pavement Condition at km. 306+500 (LHS)

Pavement Condition at km. 319+100 (RHS)

Pavement Condition at km. 285+750 (BHS)

Pavement Condition at km. 287+700 (RHS)

Panel Repair work done at km. 276+050 (LHS)

Pavement Condition at km. 304+600 (LHS)

5.3.2 Roughness Index test

Prior period report for the Roughness Index Test conducted by **Eclat Engineering Consultant** Dated **13th and 14th May 2021** has been provided by the Concessionaire. This test was done using Car Mounted Bump Integrator to assess the riding quality on each direction (each lane) of the carriageway of project highway.

As per IRC:SP:16-2004, condition of pavement is categorised under:

Table 5-3 Roughness Values (BI Value - mm / km)

Sr. No.	Roughness Range (m/km)	Severity	Inner Lane (Lane-1) LHS Length (km)	Outer Lane (Lane-2) LHS Length (km)	Inner Lane (Lane-1) RHS Length (km)	Outer Lane (Lane-2) RHS Length (km)
1	Less than 2.55	Good	40.685	40.685	39.618	39.618
2	2.55 - 3.30	Fair	-	-	-	-
3	More Than 3.30	Poor	-	-	-	-

6 OPERATION AND MAINTENANCE

6.1 Introduction

Article 17 and Schedule-K of the Concession Agreement defines the Operation and Maintenance requirement during the concession period.

The Company has received Provisional Completion Certificate on 28th June 2021.

The project is currently under Operation and Maintenance stage. The concession period of the project is 17 years form the Appointed Date including construction period of 2 years.

6.2 O & M Set Up

O & M Contract

As per Clause 17.1 of the Concession Agreement, the Concessionaire shall operate and maintain the Project Highway by itself, or through O&M Contractors and if required, modify, repair, improve the Project Highway to comply with Specifications and Standards, and other requirements set forth in the Agreement through Good Industry Practice, Applicable Laws and Applicable Permits and manufacturer's guidelines. The Operation and Maintenance activities will confirm to all the requirements laid down in MoRT&H, IRC Specifications and the Concession Agreement.

The Concessionaire (**GR Sangli Solapur Highways Limited**) has appointed **G R Infraprojects Limited** as a O&M Contractor to carry out the activities related to operation and maintenance of the project highway.

Under Routine maintenance, the road is to be maintained in good, safe and motorable condition. The specification in contracts are kept as same as per design and construction specification.

The periodical maintenance will have to be done during O&M period as per requirement of Concession Agreement and as per site requirement to maintain the design standards and level.

List of Manpower

Sr. No.	Name of Employee's	Designation	Department
1	Dnyaneshwar Rajendra Kamble	Engineer	Highway
2	Deepak Tanaji Waghmode	Junior Supervisor	Highway
3	Shali Gram Chouhan	Supervisor	Highway
4	Swapnil Maruti Chavan	Surveyor	Survey
5	Akash Bhikaji Lendave	Junior Engineer	Survey
6	Deepak Popat Ingvale	Helper	Highway
7	Shivaji Krushna Kumbhar	Helper	Highway
8	Siddheshwar Subhash Sonalkar	Helper	Highway
9	Siddheshwar Baburao Bhosale	Assistant	Legal & Liasoning
10	Niranjan Singh	Supervisor	Safety
11	Devkaran	Nurse	First Aider
12	Rupesh Kumar Yadav	Electrician	Plants & Equipments
13	Sayappa Hanumant Pandhare	HMV Driver	Plants & Equipments
14	Dilip Machindra Pawar	HMV Driver	Plants & Equipments
15	Sawai Ram	HMV Driver	Plants & Equipments

Sr. No.	Name of Employee's	Designation	Department
16	Vinayak Madhukar Lendave	HMV Driver	Plants & Equipments
17	Farkande Santosh Antram	HMV Driver	Plants & Equipments
18	Ramnarayan Mahto	Hydra Operator	Plants & Equipments
19	Dinesh Ram	Hydra Operator	Plants & Equipments
20	Chandan Kumar Mehata	Hydra Operator	Plants & Equipments
21	Ashutosh Patel	JCB Operator	Plants & Equipments
22	Dayanand Shankar Kharpade	LMV Driver	Plants & Equipments
23	Satish Gajendra Khatkale	LMV Driver	Plants & Equipments
24	Ghan Shyam	LMV Driver	Plants & Equipments
25	Istakhar Ali	LMV Driver	Plants & Equipments
26	Rampal Gurjar	LMV Driver	Plants & Equipments

6.3 Operation Cost

Operations cost is comprised of manpower cost, power and electricity cost, office operating expenses, vehicle running expenses, administrative expenses and other miscellaneous expenses. The Concessionaire has provided the expenses occurred towards operation expenses for current / past years. Necessary assumptions have made from the expenses of similar type of projects to arrive at the operation cost. The estimates are projected based on best industry practices and are compared with the operating cost in the vicinity of the project area.

The estimated Operating Cost for the base month of August 2022 is **Rs. 4.46 Crores**. The detailed working of the same is attached in **Annexure-I**.

6.4 Routine Maintenance Cost

The Routine Maintenance cost is derived based on the Ministry of Road Transport and Highways-Report of the Committee on Norms for Maintenance of Roads in India (published by Indian Road Congress New Delhi 2001) along with actual pavement condition assessed during condition survey.

Maintenance cost constitutes the routine, day-to-day maintenance activities for project assets, including road pavement, shoulders, embankment, drainage, structures, plantations, roadside furniture, traffic signs, traffic safety devices etc. Past data has been used to assess maintenance costs due to normal usage or “wear-and-tear”. Likely costs of maintenance of structures are assessed based on their present condition and vintage, in combination with well-established guidelines and thumb rules given in Indian codes and standards.

The estimated cost of Routine Maintenance works out to be **Rs. 0.76 Crores (1.67 Lakhs per km)** for the base month August 2022. The detailed working of the same is attached in **Annexure-II**.

6.5 Major Maintenance Cost

Unlike the old Concession Agreements where periodicity and threshold limits were clearly described for the major maintenance, the Concession Agreement of this project does not specify the periodicity or the threshold limits for carrying out the full-length major maintenance. Schedule-K of the Concession Agreement specifies the threshold limits and the timelines for carrying out repairs to the distresses during the operation period.

The maintenance thus can be carried out as and when required basis and to the compliance of Schedule-K requirement to maintain the road in serviceable condition. Only improvement to Riding Quality is expected if the roughness value exceeds 2750 mm/km. However, the average roughness value of the project highway lies within the limit as mentioned above.

Any New pavement is not expected to show any distresses at least for 6 to 7 years with the proper routine maintenance. Mere Routine Maintenance would suffice to meet the performance standard mentioned in Schedule-K. In this project, there is no specific requirement to carry out the major maintenance at the end of concession period.

Hence, major maintenance is planned every 7th year from the date of COD till end of concession period.

The summary of the major maintenance planned up to end of concession period is presented in the below table.

The total base cost of major maintenance works out to be **Rs. 16.24 Crores** for the base month of August 2022 i.e., till 31st August 2022. The detailed working for the same is shown in **Annexure-III**.

6.6 Paved Shoulders

As per design specifications, the paved Shoulder is designed as an integral part of the pavement for main carriageway. Therefore, the total pavement thickness in paved shoulders would be the same as in the carriageway.

6.7 Summary of Major Maintenance Cycle

The table below shows the major maintenance cycle throughout the concession period for the project stretch.

Table 6-1 Maintenance Cycle

Sr. No.	Year	Main Carriageway	Service Road
1	FY 2023	-	-
2	FY 2024	-	-
3	FY 2025	-	-
4	FY 2026	-	-
5	FY 2027	-	-
6	FY 2028	1st Major Maintenance	1st Major Maintenance
7	FY 2029	1st Major Maintenance	1st Major Maintenance
8	FY 2030	-	-
9	FY 2031	-	-
10	FY 2032	-	-
11	FY 2033	-	-
12	FY 2034	-	-
13	FY 2035	2nd Major Maintenance	2nd Major Maintenance
14	FY 2036	2nd Major Maintenance	2nd Major Maintenance
15	FY 2037	-	-

6.8 Projected Maintenance Cost without escalation

The below table shows the total cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period without escalation.

Table 6-2 Summary of Operation & Maintenance Cost without escalation

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
1	**Total Operation and Routine Maintenance Cost**	45.600	Every year	11.45	**5.22**
2	**Periodic Maintenance Cost**				
i)	1st Periodic maintenance - MCW & SR	45.600	FY 2028	17.81	**8.12**
ii)	2nd Periodic Maintenance - MCW & SR	45.600	FY 2035	17.81	**8.12**
	Total Strengthening Cost				**16.24**

Notes:

1. It is to be noted that, the rates considered for calculating all the above cost are exclusive of Goods and Service Tax (GST).
1. The estimated cost in table above is for base month of August 2022 i.e., till 31st August 2022.
2. The rates are based on SOR of Govt. of Maharashtra for the year 2022-2023. The current market rates are considered for Bitumen, cement and steel.
3. The labour rate adopted from Govt. of India, Ministry of Labour and Employment Office of the Chief Labour Commissioner © w.e.f. 25.07.2022.

6.9 Projected Maintenance Cost with escalation

The below table shows the total cost of operation and routine maintenance, periodic maintenance and strengthening up to end of the concession period with escalation as per WPI provided by the company.

Table 6-3 Summary of Operation & Maintenance Cost with escalation

Sr. No.	Year	WPI Inflation	Total O & M Cost (Crores)	Major Maintenance Cost (Crores)
1	FY 2023		5.22	-
2	FY 2024	2.87*%	5.37	-
3	FY 2025	5.00%	5.64	-
4	FY 2026	5.00%	5.93	-
5	FY 2027	5.00%	6.22	-
6	FY 2028	5.00%	6.53	5.08
7	FY 2029	5.00%	6.86	5.33
8	FY 2030	5.00%	7.20	-
9	FY 2031	5.00%	7.56	-
10	FY 2032	5.00%	7.94	-
11	FY 2033	5.00%	8.34	-
12	FY 2034	5.00%	8.75	-
13	FY 2035	5.00%	9.19	7.14
14	FY 2036	5.00%	9.65	7.50
15	FY 2037	5.00%	2.53	-
	Total Cost (Cr)		**102.96**	**25.05**

* Considering the base month for calculation as August 2022.

The company may carry out necessary investigation prior to O&M and major maintenance. This will help in proper assessment of maintenance work based on the actual pavement condition. The spending on periodic maintenance / strengthening can then be reduced if the road is adequately and timely maintained.

7 REVIEW OF CONCESSION AGREEMENT

The NHAI accordance with the statutory powers vested on it by the Government of India has entered into a Concession Agreement with the M/s. GR Sangli Solapur Highway Pvt. Ltd., a Special Purpose Vehicle (SPV) formed for implementing this project, a company incorporated under Indian Companies Act, 2013 to Design, Built, Finance, Operate and Transfer (The "DBFOT Annuity" or Hybrid Annuity") basis for the Four laning of Sangli - Solapur (Package - III: Watambare to Mangalwedha of length 45.600 km.) section of NH-166 from existing km. 272.394 to km. 314.969 (Design chainage km. 276.00 to km. 321.600) of length 45.600 km in the state of Maharashtra on Hybrid Annuity Mode.

We have reviewed the provisions under various clauses of the Agreement concerned with post construction period. Our specific comments are indicated below clause-wise.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 3 Clause 3.1	The Concession	Subject to and in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits, the Authority hereby grants to the Concessionaire the concession set forth herein including the exclusive right, license and authority to construct, operate and maintain the Project (the "**Concession**") during the Construction Period of 730 (Seven hundred and thirty) days and Operation Period of 15 (Fifteen) years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.	This construction work is completed, and PCOD is achieved on 28th June 2021. The project is in O&M stage.
Article 4 Clause 4.1.2	Conditions Precedent	The Condition precedent required to be satisfied by the Authority shall be deemed to have been fulfilled when the Authority shall have (a) Procured for the Concessionaire the Right of Way to the site in accordance with the provisions of Clauses 10.3.1 and 10.3.2 (b) Procured all Applicable Permits relating to environmental protection, and conservation in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2 (c) Procured forest clearance for and in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2, save and except permission for cutting trees; and	All issues complied and PCOD is achieved.
Article 4 Clause 4.2	Conditions Precedent-	In the event that (i) the Authority does not procure fulfillment of any or all the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an	All issues complied and PCOD is achieved.

Article & Clause No.	Subject	Description in Brief	Remarks
	Damages for delay by the Authority	amount calculated at the rate of 0.2% (zero point two percent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent, subject to the maximum limit equal to the amount of 1% of the Estimated Project Cost as mentioned in RFP and upon reaching such limit, the Concessionaire may, in its sole discretion terminate the Agreement.	
Article 4 Clause 4.3	Damages for delay by the concessionaire	In the event that (i) the Concessionaire does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.3 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of failure to fulfill the obligations under Clause 4.1.2 or other breach of this Agreement by the Authority, or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.3% (zero point three per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent. Provided, however, that the Damages payable hereunder shall be subject to the maximum limit equal to the amount of 1% of the Estimated Project Cost as mentioned in the RFP and upon reaching such limit, the Concessionaire may, in its sole discretion and subject to the provisions of Clause 9.2, terminate the Agreement	The PCOD is achieved.
Article 5 Clause 5.1.4 (d, e & f)	Obligation of the Concessionaire	The Concessionaire shall, at its own cost and expense, in addition to and not in derogation of its obligations elsewhere set out in this Agreement d) The Concessionaire shall make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement. e) Make reasonable efforts to facilitate the acquisition of land required for the purposes of the Agreement f) Ensure and procure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Concessionaire's obligations under this agreement.	The Concessionaire followed actions and PCOD is achieved.
Article 5 Clause 5.3.1	Obligation relating to Change in ownership	The Concessionaire shall not undertake or permit any Change in Ownership, except with the prior written approval of the Authority.	The risk of Lender is covered.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 8 Clause 8.1.5	Disclaimer	Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the Authority shall not be liable in any manner for such risks or the consequences thereof.	The Concessionaire shall note this and perform according to Concession Agreement Provision. All risks are with Concessionaire.
Article 9 Clause 9.1.1	Performance Security	The Concessionaire shall, for the performance of its obligations hereunder during the Construction Period, provide to the Authority no later than 30 (thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank For a sum equivalent to Rs.47.85 (Rupees Forty-Seven Crores and Eighty Five Lakhs only) in the form set forth in schedule-F (the "Performance Security").	The PCOD is achieved.
Article 10 Clause 10.3.2	Procurement of the site -	Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree that on or prior to the Appointment Date, the Authority shall have granted vacant access and Right of Way such that the Appendix shall not include land which shall in any manner prevent the Concessionaire from undertaking construction of the project to the extent of at least 80% (eighty percent) of the length thereof, and in the event Financial Close is delayed on account of delay in grant of such vacant access and Right of Way, the Authority shall be liable to payable to damages solely under the provisions of Clause 4.2.	The PCOD is achieved.
Article 10 Clause 10.3.4	Procurement of the site-Right of Way	The Authority shall make best efforts to procure and grant no later than 90 (ninety) days from the Appointed date, Right of Way to the Concessionaire in respect of all land included in the Appendix, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Concessionaire, it shall pay to the Concessionaire Damages in a sum calculated at the rate of Rs.1 per day for every 10 square meter or part thereof, commencing from the 91st day of the Appointed Date and until such Right of Way is procured or 180 days from Appointed date whichever is earlier.	The PCOD is achieved.
Article 11 Clause 11.4	Utilities, Associated Roads and Trees-Felling of trees	The Authority shall assist the Concessionaire in Obtaining the Applicable Permits for felling of trees to be identified by the Authority for this purpose if and only if such trees cause a material adverse effect on the construction, operation or maintenance of Project Highway. The Cost of such felling shall be borne by the Authority and in the event of any delay in felling thereof for reasons beyond the control of the Concessionaire, it shall be excused to perform any of its obligations hereunder if such failure is a direct consequence of delay in the felling of trees.	The work is completed. No obstructions of trees.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 12 Clause 12.3.1	Construction of the Project	On or after the Appointed Date, the Concessionaire shall undertake construction of the Project as specified in Schedule-B and Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D. The 730th (Seven hundred and thirty)) day from the Appointed Date shall be the scheduled date for completion of the Project (the **"Scheduled Completion Date"**) and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	The work is now completed, and PCOD is achieved.
Article 12 Clause 12.3.2	Construction of the Project Highway and Milestone	The Concessionaire shall construct the Project Highway in accordance with the Project Completion schedule set forth in Schedule-G. In the event that the Concessionaire fails to achieve any Project Milestone within a period of 90 (ninety) days from the date set forth for such Milestone in Schedule G, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, it shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one percent) of the amount of performance Security for delay of each day until such Milestone is achieved.	The work is competed as per Milestone.
Article 12 Clause 12.3.3	Construction of the Project Highway and Milestone	In the event that the project is not completed, and COD does not occur within 270 (two hundred and seventy) days from the Scheduled Completion Date, unless the delay is on account of reasons solely attributable to the Authority or due to Force Majeure, the Authority shall be entitled to terminate this Agreement.	The work is completed, and PCOD is achieved.
Article 13 Clause 13.2	Inspection	During the construction period, the independent Engineer shall inspect the Project at least once a month and make a report of such inspection (the "Inspection Report") stating all reasonable detail the defects or deficiencies, if any, with particular reference to the Project Completion Schedule, Scope of the Project and specification and standards	The work is completed with quality. The defect will be attended during Defect Liability Period.
Article 14 Clause 14.3.2	Provisional Certificate	The parties here to expressly agree that a Provisional Certificate under this Clause 14.3 may, upon requested of the Concessionaire to this effect, be issued for operating part of the Project, if the Concessionaire has completed construction of 100% of the site made available to the Concessionaire up to 146 days from the Appointed Date. Upon issue of such Provisional Certificate, the provisions of Article 15 shall apply to such completed part, and the rights and obligations of the Concessionaire for and in respect of such completed part of the Project shall be constructed accordingly.	The project is completed as per Schedule Completion Date.
Article 15 Clause 15.2	Entry into commercial	Subject to the provisions of Clause 12.3, if COD does not occur prior to the 91st (ninety first) day after the Scheduled completion Date, unless the delay is on account of reasons	The PCOD is achieved on 28th June 2021.

Article & Clause No.	Subject	Description in Brief	Remarks
	service-Damages for delay	attributable to the Authority or due to force Majeure, the Concessionaire shall pay Damages to the Authority in a sum calculated at the rate of 0.2% of the amount of performance Security for delay of each day until COD is achieved.	
Article 17 Clause 17.8.1	Damages for beach of maintenance obligations	In the event that the concessionaire fails to repair any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% (two per cent) of the Performance Security and (b) 0.1 (zero point one per cent) of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.	The Maintenance of completed Highway is in progress after COD as per O&M Contractor executed between Concessionaire & Contractor. The scope specifications, standards as per CA is being followed.
Article 23 Clause 23.1	Bid Project cost	The parties expressly agree that the cost of construction of the project, as on the Bid Date, which is due and payable by the Authority to the Concessionaire shall deemed to be Rs. 957.00 Crores (Rupees Nine Hundred Fifty-Seven Crore)	The work is completed within Project Cost.
Article 23 Clause 23.2.1	Payment of Bid Project Cost	The bid project cost specified in Clause 23.1 shall be revised from time to time in accordance with the provisions of this Clause 23.2 to reflect the variation in Price Index occurring after the Reference Index Date immediately preceding the Bid Date.	This is paid during construction work.
Article 23 Clause 23.3.1	Payment of Bid Project Cost	40% of the Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable to the Concessionaire is 10 equal installments of 5% during the construction Period in accordance with the provisions of Clause 23.4.	This is paid during construction work.
Article 23 Clause 23.4	Payment during construction period	For the purpose of this clause 23.4, the payment Milestone for release of payment during construction period shall be as under: (a) I (first) payment Milestone - On achievement of 5% Physical Progress. (b) II (Second) payment Milestone-On achievement of 10% Physical Progress. (c) III (Third) payment Milestone-On achievement of 20% Physical Progress. (d) IV (Fourth) payment Milestone - On achievement of 30% Physical Progress. (e) V (Fifth) payment Milestone-On achievement of 40% Physical Progress. (f) VI (Sixth) payment Milestone-On achievement of 50% Physical Progress. (g) VII (Seventh) payment Milestone - On achievement of 60% Physical Progress.	This amount is released and paid during construction activities.

Article & Clause No.	Subject	Description in Brief	Remarks
		(h) VIII (Eighth) payment Milestone-On achievement of 70% Physical Progress. (i) IX (Ninth) payment Milestone-On achievement of 80% Physical Progress. (j) X (Tenth) payment Milestone-On achievement of 90% Physical Progress.	
Article 23 Clause 23.5	Bonus on early completion	In the event that the concessionaire shall achieve COD on or more than 30 days prior to the Scheduled Completion Date, the Authority shall pay to the Concessionaire a bonus equal to 0.5% of 60% of the Bid project cost for the first 30 days by which COD shall precede the Schedule Completion date and there after the said bonus shall be calculated on the pro-rata basis for each day preceding the said 30 days period. The Bonus shall be due and payable to the Concessionaire along with the 1st Annuity Payment.	The Concessionaire should claim this if it is eligible.
Article 23 Clause 23.6.2	Annuity Payments during operation period	The completion cost remaining to be paid in pursuance of the provisions Clause 23.6.1 shall be due and payable in biannual installments over a period of 15 (fifteen) years commencing from COD, (the Authority Payments) the 1st (first) installment of Annuity Payments shall be due and payable within 15 (fifteen) days of the 180th (one hundred and eighteen) day of COD and the remaining installments shall be due and payable within 15 (fifteen) days of completion of each of the successive six months (the "Annuity Payment Date").	The Concessionaire is getting this as per Concession Agreement as PCOD is achieved.
Article 23 Clause 23.7.1	O & M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the Authority, which shall be computed on Rs.3.00 crores (Rupees Three crores only) (the first year O&M), in accordance with the provisions of this Clause 23.7 (the "**O&M Payments**"). The Parties further acknowledge and agree that any O&M Expenses in excess of the O&M Payments shall be borne solely by the Concessionaire, save and except as expressly provided in this Agreement. For avoidance of doubt it is clarified that the O&M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.	Expenses towards O&M shall be the responsibility of Concessionaire and biannual O&M payments shall be of Authority.
Article 23 Clause 23.8	Mobilization advance	The Authority shall, on request of the Concessionaire, make an advance payment in a sum not exceeding 10% (ten percent) of the bid project cost (the Mobilization Advance). This advance payment shall be made in two equal installments. The concessionaire may request the Authority for the first installment of the advance payment at any time after the appointed date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority. The concessionaire may request the Authority for the second installment of	The Concessionaire has received this Mobilization Advance and work is completed.

Article & Clause No.	Subject	Description in Brief	Remarks
		the advance payment at any time after 60 (Sixty) days from the appointed date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority	
Article 26 Clause 26.1	Insurance-Insurance during Concessionaire period	The Concessionaire shall affect and maintain at its own cost, during the Construction Period and the Operation Period, such insurances for such maximum sums as may be required under the Financing Agreements and Applicable laws, and such insurances as may be necessary or prudent in accordance with Good Industry Practice.	The Concessionaire, has taken all Insurances.
Article 34 Clause 34.3.1	Substitution Agreement	The Lender's Representative, on behalf of Senior Lenders, may exercise the right to substitute the Concessionaire pursuant to the agreement for substitution of the Concessionaire (the '**Substitution Agreement**') to be entered into amongst the Concessionaire, the Authority and the Lenders' Representative, on behalf of Senior Lenders, Substantially, in the form set forth in Schedule-R.	The Lender's risk is covered with provision of Substitution Agreement. This will be operated if situation needs.
Article 38 Clause 38.3.1	Dispute Resolution	Any dispute which is not resolved amicably by conciliation as provide in Clause 38.2 shall be finally settled by arbitration as set forth below:	There is provision of Arbitration in case of unresolved dispute between Authority and concessionaire.
Article 41 Clause 41.17	State support agreement	The Concessionaire acknowledges that it has received from the authority a certified true copy of the agreement executed between MORTH and the state government for providing the support and services specified therein (the "State support agreement"), and the parties here to agree to make their best endeavors to procure the support of the state government.	This provision will help the Concessionaire for obtaining permission, approval and land acquisition faster.

Most of the points above are brought out to see that the Agreement is generally enforceable in law without ambiguities.

7.1 Conclusions

The Concession Agreement is comprehensive and covers most of the concerns of Lenders and all risk factors.

8 REVIEW OF O&M AGREEMENT

The Operation and Maintenance Agreement was signed between **M/s GR Sangli Solapur Highway Private Limited (GSSHPL)** and **G R Infraprojects Limited (O&M Contractor)** on 02nd November 2021 and addendum O&M Agreement has been signed on 26th July 2022 for a period of 1 year.

We have reviewed the provisions under various clauses of this O&M Contract and our specific comments are indicated below clause-wise.

Sr. No.	Clause No.	Description in Brief	Remark
1	Agreement Para (ii)	The Concessionaire now wishes to appoint M/s G R lnfraproiects Limited for Operation and Maintenance of Project Highway as 0&M Contractor in accordance with Scope of Work as mentioned in Annexure 1 hereto, under the Concession Agreement.	The Contractor M/s. G. R. Infraprojects Ltd. is appointed for O&M work as per scope in CA.
2	Clause (n) Definition	"O&M Contractor" means the person, if any, with whom the Concessionaire has entered into an O&M agreement for discharging O&M obligations for and on behalf of the Concessionaire.	The Contractor is appointed to discharge duties of O&M work on behalf of Concessionaire as per scope in O&M Agreement.
3	Clause r Definition	"O&M Period" O&M Agreement means operation and maintenance period of 1 year commencing from Commencement Date.	The Agreement of O&M is for one year and addendum is signed for another 1 year.
4	Clause 2 Availability of Documents	The O&M Contractor also acknowledges the fact that the Concession Agreement is always binding and applicable back to back on the O&M Agreement, limited to the obligations during the O&M period under the Concession Agreement and the scope of the O&M Contractor as per this Agreement. In case of any discrepancy in whatsoever matter, the clauses or' Concession Agreement shall prevail over and above this O&M Agreement.	The copy of Concession Agreement & Maintenance Manual is provided to Contractor. It is always binding to Contractor for implementation during O&M work.
5	Para 6 O&M Contractor's obligation	6.1 During Operation Period, provisions of Article 17 of the Concession Agreement shall apply. The O&M Contractor shall operate and maintain the Project Highway in accordance with Article 17 of the Concession Agreement and if required, modify, repair or otherwise make improvements to the Project Highway comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and confirm to Specifications and Standards and Good Industry Practice.	The obligation of O&M is as per Article 17 of CA. These cover periodical routine & major repair work and safety of users.

Sr. No.	Clause No.	Description in Brief	Remark
6	Clause 6 Maintenance Requirements	6.3 The O&M Contractor shall procure that at all times during the Operation Period; the Project Highway conforms to the maintenance requirements set forth in Schedule-K of the Concession Agreement (the "Maintenance Requirements").	The maintenance required to be done as per Schedule K of CA only.
7	Clause 6 Maintenance Program	6.4 Not later than 55 days prior to the beginning of each Accounting Year during the Operation Period, the O&M Contractor shall provide to the Concessionaire, its proposed annual program of preventive. urgent and other scheduled maintenance (the "Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Contractor has to submit the programme and work for O&M with maintenance requirement and safety.
8	Clause 6 Maintenance Requirements 6.5 Safety, Breakdown and accident	6.5.1 The 0&M Contractor shall ensure safe conditions for the users, and in the event of unsafe conditions, closures, diversions, breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary Lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good industry Practice.	Safety of users including breakdown, accident rescue operations is covered.
9	Clause 6 Maintenance Requirements 6.10 Damages for Breach of Maintenance obligations	In the event that the O&M Contractor fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be this Agreement and the cm Contractor shall pay to the Concessionaire Damages at such rate as the Concessionaire Is required to pay to the Authority under the Concession Agreement. Recovery of such Damages shall be without prejudice to the rights of the Concessionaire under this Agreement, including the right of Termination thereof.	The provision of Levy of Damage or Termination for breach of Agreement, defective work will keep pressure on contractor to work as per requirement.
10	Clause 6 Maintenance Requirements 6.16 Monthly Status report during Operation Period	During the Operation Period, the O&M Contractor shall, no later than 7 (seven) days after the close of each English calendar month, furnish to the Concessionaire, a monthly report stating in reasonable detail the condition of the Project including its compliance or otherwise with the Maintenance Requirements, Maintenance Manual. Maintenance Program and Safety Requirements and shall promptly give such other relevant information as may be required by the Concessionaire/ IE/ Authority.	It is binding on Contractor to submit status report on monthly basis for information of Authority, Concessionaire, IE & Lender.
11	Clause 6 Maintenance Requirements	For determining that the Project Highway conforms to the Maintenance Requirements, the Project Manager/IE shall require the O&M Contractor to carry	This will maintain quality of work.

Sr. No.	Clause No.	Description in Brief	Remark
	6.17 Tests	out, or cause to be carried out, tests specified by it in accordance with Good Industry Practice.	
12	Clause 6 Maintenance Requirements 6.19 Safety Requirements	6.19.1 The O&M Contractor shall comply with the provisions of this Agreement and [or Concession Agreement, Applicable Laws and Applicable Permits and confirm to Good Industry Practice for securing the safety of the Users. in particular, the O&M Contractor shall develop, implement and administer a surveillance and safety program for providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in Schedule L of the Concession Agreement (the “Safety Requirements").	The O&M Contractor has to provide requirements provision for safety of Highway users. The safety of users is given priority.
13	Clause 13 Sub-contracts	13.1 The O&M Contractor shall notify to the Project Manager in writing of its intent to subcontract the O&M works in part or full and without the written approval of the Project Manager no subcontractor shall be appointed by the O&M Contractor.	The sub-contractor cannot be appointed without approval of Project Manager. This will keep control over contractor to appoint competent contractor.
14	Clause 16 Insurance	16.1 The Concessionaire shall. procure and maintain the insurance for the Project Highway including all facilities in accordance with the Article 26 of the Concession Agreement.	The risks and security of Authority, concessionaire and lender is covered.
15	Clause 17 Defect Liability Period	17.1 The Concessionaire and/or the EPC Contractor ls responsible for all the defects and deficiencies in construction of the Project Highway or any section thereof and rectify the Same, without any cost to the O&M Contractor. during the O&M period. Under this agreement the O&M Contractor is only under obligation of Operation 8r Maintenance of the Project Highway. For avoidance of doubt, any repair or restoration on account of usual wear and tear in the Project Highway shall form a part of the maintenance.	The Contractor is responsible for any defects during Defect Liability period of 1 year. This will maintain the quality to avoid any action for defective work as proposed.
16	Clause 21 Acknowledgement	The O&M Contractor acknowledges and accepts that this agreement entitles the Authority and/or Lenders Representative to step into this agreement, in its sole discretion, in Substitution-of the Concessionaire In the event of Termination or Suspension of the Concessionaire. Further, provision of clause 5.2 of the Concession Agreement relating to Project Agreement shall apply *mutatis mutandis.*	The Contractor has agreed for step in right of Authority or Lender in case of Termination of Concessionaire.
17	Clause 22 O&M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the 0&M Contractor to carryout routine maintenance Works as detailed in Annexure-I to this 0&M Agreement and in lieu thereof; a fixed lump sum fee amounting to Rs.	The O&M Contractor will be paid of Rs. 3.00 crores. Biannual payment during year for his work

Sr. No.	Clause No.	Description in Brief	Remark
		3,00,00,000 inclusive of taxes for the entire year in the form of biannual payment shall be due and payable by the Concessionaire.	as per scope. The contractor has to manage O&M work responsibility within this payment. Over & above these expenses, Concessionaire is incurring expenses for insurance, electricity, IE & professional fees etc.,
18	Clause 27 Termination 27.1 Termination For O&M Contractor Default	In the event of any defaults specified below shall have occurred, and the 0&M Contractor falls to cure the default within the Cure Period of 60 (sixty) days, the O&M Contractor shall be deemed to be in default of this Agreement (the "08M Contractor Default"), unless the default has occurred as a result of any breach of this Agreement by the Concessionaire or due to Force Majeure.	The Contractor shall note this. This provision of termination keep pressure on contractor to work as per scope of O&M responsibility.
19	Clause 32 Liability and Indemnification	The O&M Contractor shall fully indemnify and hold harmless and defend the Concession extent that the Concessionaire has provided any indemnities to Authority in terms of Article Concession Agreement, in so far as such indemnities relate to the Services.	The Concessionaire is secured from contractor for any loss, claim.

8.1 Conclusion

i. Operation and Maintenance Contract is comprehensive and correct for major concerns of Lender.
ii. The provision of O&M Contract Agreement is consistent with the provision of the Concession Agreement.

9 TOLL PLAZA EQUIPMENT STATUS & ATMS

There is no proposed Toll Plaza on the project highway. However, the Concessionaire has to provide Advanced Management Traffic System (ATMS) as specified in Clause 12.12 of IRC:SP:84-2014. Accordingly, the Concessionaire has provided the ATMS such as Emergency Call Box (ECB) [Foundation for the same is completed and installation is yet to be done] and Variable Message Sign System on the project highway.

10 ACCIDENT DATA ANALYSIS

Accident Data Records for the project have been studied in order to analyse the nature of accidents occurring on the stretch and identify blackspots.

10.1 Accident Trend

Accident Data for the period January 2019 to June 2022 has been made available for analysis. 23 Accidents have occurred out of which 9 no. were fatal, 5 were grievous injury and 9 were minor. More number of accidents have occurred during the day time than at night time. Monthly data analysis does not show any consistent seasonal trend. Fault of the driver has been recorded as a major cause of accident (65%) followed by over speeding.(35%).

10.2 Blackspots Identification

There are no black spot found in the project stretch. Details of accidents in the project length are given in Table below:

Table 10-1 Accidents details on Project Road

Date	Time	Accident Location	Causes	Fatal	Grievous	Minor
18-01-2019	10:30	Andhalgaon Rural	Over speeding Fault of driver of Motor Vehicle	1		
11.02.2019	14:30	Sangola Rural	Over speeding Fault of driver of Motor Vehicle		1	
06-03-2019	19:30	Sangola Rural	Over speeding Fault of driver of Motor Vehicle			1
01.04.2019	21:00	Wadhegaon Rural	Over speeding Fault of driver of Motor Vehicle	1		
28.05.2019	20:00	Mangalwedha Urban	Over speeding Fault of driver of Motor Vehicle	1		
05.06.2019	18:30	Kamlapur	Over speeding		1	
06.06.2019	18:00	Mangalwedha	Over speeding			1
09.06.2019	18:30	Sangola Urban	Over speeding	2	1	
05.01.2020	22:30	Wadhegaon (Not In Construction Area)	Fault of Driver of motor Vehicle	1		
05.01.2020	23:30	Watambare (No Construction Activity started yet)	Fault of Driver of motor Vehicle		1	
23-12-2021	10:40	Andhalgaon (No Construction Activity started yet)	Fault of Driver of motor Vehicle	1		
16-12-2021	14:00	Vasud (No Construction Activity started yet)	Fault of Driver of motor Vehicle	1		
20-12-2021	14:30	Kamlapur (No Construction Activity started yet)	Fault of Driver of motor Vehicle	1		

Date	Time	Accident Location	Causes	Fatal	Grievous	Minor
01-03-2022	09:15	Godsewadi (Not In Construction Area)	Fault of Driver of motor Vehicle	0	1	1
04-03-2022	10:00	Andhalgaon (No Construction Activity started yet)	Fault of Driver of motor Vehicle	0	1	
27-03-2022	09:30	Kamlapur (No Construction Activity started yet)	Fault of Driver of motor Vehicle	0		2
08-05-2022	10:00	Andhalgaon (No Construction Activity started yet)	Fault of Driver of motor Vehicle			3
10-06-2022	09:00	No construction Activity started yet	Fault of Driver of motor Vehicle	1		3
16-06-2022	18:15	No construction Activity started yet	Fault of Driver of motor Vehicle			6
18-06-2022	13:25	No construction Activity started yet	Fault of Driver of motor Vehicle			3
22-06-2022	10:06	No construction Activity started yet	Fault of Driver of motor Vehicle			1
24-06-2022	16:28	No construction Activity started yet	Fault of Driver of motor Vehicle			1
25-06-2022	9:20 PM	No construction Activity started yet	Fault of Driver of motor Vehicle			1

10.3 Conclusions & Recommendations

There are no accident blackspots based on analysis of recorded data. Concessionaire need to maintain all signs, markings and road safety devices as per schedule given in CA.

Annexures

Annexure I: Operation Cost

Sr. No.	Particulars	Cost per Annum (Rs)	Cost per Annum (Cr)
1	Incidental Management Expenses		
a	*Ambulance - 1 Nos.*	1,962,925	0.20
b	*Patrolling Vehicle - 1 Nos.*	2,207,911	0.22
c	*Crane - 1 Nos.*	1,699,231	0.17
d	*Other Vehicle - 2 Nos.*	1,330,411	0.13
e	*JCB - 1 Nos.*	691,554	0.07
f	*Corridor Manager & Officer*	953,280	0.10
2	Maintenance Staff Expenses	5,400,000	0.54
3	Routine Maintenance Cost (Civil Works)	7,601,029	0.76
4	Professional & IE Fee	8,400,000	0.84
5	Insurance Expenses	7,461,778	0.75
6	Staff Welfare Expenses	1,320,000	0.13
7	Electricity Expenses + Maintenance of parts	8,977,172	0.90
8	ATMS Expenses	2,115,065	0.21
9	Contingency @ 5% (Excl. Civil works)	2,125,966	0.21
	Total Cost (Rs)	**52,246,323**	**5.22**
	Per km Cost (Lakh)		**11.46**

Annexure II: Routine Maintenance Cost

Routine Maintenance Cost – GSSHPL	
Ordinary Repair Cost for Rigid without GST	**7,601,029**
(Exclusive of GST @ 12%)	**= 1.67 lakhs per km**

CONVERSION FACTORS									
National Highways / State Highways - Rigid Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Rigid Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				96,083	**111,305**				
						Normal	**Urban**	**Normal**	**Urban**
1	Four-lane with divided carriageway	Without paved shoulder	1.53	131094.00	154383.00	-	-	-	-
		Paved shoulder	1.70	145660.00	171537.00	29.15	-	4,246,425.98	-
2	Six lane with divided carriageway	without Paved shoulder	2.43	208208.00	245197.00	-	-	-	-
		with Paved shoulder	2.60	222774.00	262351.00	1.22	15.23	271,383.29	3,995,343.38
TOTAL						**45.60**		**8,513,152.65**	

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.00%
	Volume (cum)			0.00
	Rs/m^3			0
	Cost in Rupees			0
	ii) Patch repair	100 % Patch less	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			467
	Cost in Rupees			0
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			90
	Cost in Rupees			4,480
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			64
	Cost in Rupees			4,788
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			467
	Cost in Rupees			0

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	v) Road marking	7%	Once in 15 year & @ Repaired location	6341
	vi) Joint Sealant Repair/Replacement	5%		20217
	vii) Slab Replacement	0.00%		0
	SUB TOTAL			**35,826**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	50%	As & when required	17,334
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	SUB TOTAL			**17,334**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debris removal		Once in a Year	3467
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	3467
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**85,682**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	7%	Once in 15 years with thermoplastic paint	3550
	ii)Repairs to footpath	0%	As & when required	0
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**15,222**
	GRAND TOTAL (Urban)			**100,904**

Annexure III: Periodic Maintenance Cost

Periodic Maintenance Cost (Every 6th / 7th year) (FY2028 & FY2035)											
Sr. No.	**Description**	**Unit**	**No.**	**Length (m)**	**Width (m)**	**Depth (m)**	**Quantity**	**Total Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
I. Main Carriageway, Service Road / Slip Road & Miscellaneous location										
A	**Main Carriageway: Rigid Pavement**									
1	Replacement of Joint Sealant	Rmt	5%	435,480.87			21,774.04	21,774.04	69.00	1,502,409
2	Dismantling of CC Panels @ 2% area	Cum	2%	44,653.80	19.20	0.30	5,144.12	5,144.12	655.00	3,369,397
3	Replacement of Panels - PQC @ 2% area	Cum	2%	44,653.80	19.20	0.30	5,144.12	5,144.12	6,439.00	33,122,974
4	Replacement of Panels - DLC @ 0% area	Cum	0%	44,653.80	19.20	0.15	-	-	3,445.00	-
5	Diamond Grinding	Sqm	3%	44,653.80	19.20		25,720.59	25,720.59	50.00	1,286,029
B	**Service Road : Rigid Pavement**									
6	Replacement of Joint Sealant	Rmt	3%	140,124.95			4,203.75	4,203.75	69.00	290,059
7	Dismantling of CC Panels @ 1% area	Cum	1%		275,871.00	0.30	827.61	827.61	655.00	542,087
8	Replacement of Panels - PQC @ 1% area	Cum	1%		275,871.00	0.30	827.61	827.61	6,439.00	5,329,000
9	Replacement of Panels - DLC @ 0% area	Cum	0%		275,871.00	0.15	-	-	3,445.00	-
10	Diamond Grinding	Sqm	0%		275,871.00		-	-	50.00	-
C	**Structural Deck area**									
11	Milling	Sqm	50%	946.20	26.00		12,300.60	12,300.60	55.00	676,533
12	Tack Coat	Sqm	50%	946.20	26.00		12,300.60	12,300.60	15.00	184,509
13	Mastic Asphalt Overlay	Sqm	50%	946.20	26.00		12,300.60	12,300.60	599.00	7,368,059
D	**Miscellaneous**									
14	Replacement of Kerb	Rmt	10%	125,208.40			12,520.84	12,520.84	210.00	2,629,376
15	Painting of Kerb	Sqm	1	125,208.40		0.32	39,440.65	39,440.65	110.00	4,338,471
16	Painting of Crash Barrier	Sqm	1	34,786.40		1.12	38,786.84	38,786.84	110.00	4,266,552
17	Thermoplastic paint									
	a) Median & Edge line	Sqm	50%				22,634.81	22,634.81	425.00	9,619,793
	Main Carriageway 4L		4	29,736.06	0.15		17,841.64			
	Main Carriageway 6L		4	16,775.94	0.15		10,065.56			
	Service Road		2	37,518.46	0.10		7,503.69			
	b) Lane line									
	Main Carriageway 4L		2	10,407.62	0.10		2,081.52			
	Main Carriageway 6L		4	5,871.58	0.10		2,348.63			
	Service Road		1	13,131.46	0.10		1,313.15			
	c) Junction crossing						4,115.42			
18	Replacement of Road Stud	No	50%				8,190.00	8,190.00	343.00	2,809,170
	Main Carriageway 4L		4	1,653.00			6,612.00			
	Main Carriageway 6L		6	933.00			5,598.00			
	Service Road		2	2,085.00			4,170.00			
19	Miscellaneous	5%								3,866,721
									Total Amount (MCW)	**81,201,139.45**
									Total Cost in Lakhs (MCW)	**812.01**
									Per km Cost in lakhs (MCW)	**17.81**

Annexure-IV: Balance Cost

Sr. No.	Item	No.	Length (m)	Width (m)	Depth (m)	Qty.	Rate (Rs.)	Amount (Rs.)
1	Balance DLC & PQC, RCC Drain work of Service road							
	PQC	1.00	818.00	7.50	0.25	1,533.75	6,439.43	9,876,475.76
	DLC	1.00	818.00	7.50	0.15	920.25	3,444.85	3,170,123.21
	RCC Drain	1.00	367.00			367.00	21,818.00	8,007,206.00
2	W-Beam Crash Barrier	1.00	54.00			54.00	3,804.00	205,416.00
3	MCW Work at Ch. 292+460 to Ch. 297+670 (WIP & completed upto Emb. Top)							
	Subgrade	1.00	210.00	31.00	0.50	3,255.00	468.00	1,523,340.00
	GSB	1.00	210.00	31.00	0.15	976.50	1,476.15	1,441,460.48
	DLC	1.00	210.00	31.00	0.15	976.50	3,444.85	3,363,896.03
	PQC	1.00	210.00	31.00	0.30	1,953.00	6,439.43	12,576,206.79
4	Median Filling	1.00	350.00			350.00	468.00	163,800.00
5	Kerb Laying	1.00	330.00			330.00	210.00	69,300.00
6	Kerb Painting	1.00	480.00			480.00	110.00	52,800.00
7	Plantation	1.00	480.00			480.00	473.00	227,040.00
8	Road Marking							
	Edge Line	4.00	360.00	0.15		216.00	425.00	91,800.00
	Centre Line	4.00	360.00	0.10		144.00	425.00	61,200.00
9	Road Studs	8.00	360.00			2,880.00	343.00	987,840.00
10	Construction of Rest Area	1.00						263,175,000.00
								304,992,904.27

Annexure-V: Pavement Condition Survey

LHS - Watambare to Mangalwedha

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP) *	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
1	276.000	277.000	G	-	PQC	300	-	G	0.5	-	-	-	-	-	G	PQC	G	G	G	F	-	Junction at Km 276.200
2	277.000	278.000	G	-	PQC	300	-	G	0.25	-	-	-	-	-	G	PQC	G	G	G	F	-	Drain 276.400 to 277.000
3	278.000	279.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	F	-	Drain 278.000 to 279.200
4	279.000	280.000	G	-	PQC	300	-	G	0.25	-	-	-	-	-	G	PQC	G	G	G	F	-	
5	280.000	281.000	G	-	PQC	300	-	G	-	2.5	-	-	-	-	G	PQC	G	G	-	-	-	
6	281.000	282.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Junction at Km 281.000
7	282.000	283.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	F	-	Drain 282.700 to 283.000
8	283.000	284.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	F	-	
9	284.000	285.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	F	-	
10	285.000	286.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	F	-	
11	286.000	287.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	F	-	
12	287.000	288.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	F	-	
13	288.000	289.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	F	-	Drain up to 288.460
14	289.000	290.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
15	290.000	291.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
16	291.000	292.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
17	292.000	292.460	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
18	292.460	292.670	Left side Subgrade in progress																			
19	292.670	293.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
20	293.000	294.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
21	294.000	295.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
22	295.000	296.000	G	-	PQC	300	-	G	-	0.25	-	-	-	-	G	PQC	G	G	-	-	-	Junction at Km 295.200
23	296.000	297.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Bus bay at Km. 295.150
24	297.000	298.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
25	298.000	299.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
26	299.000	300.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
27	300.000	301.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
28	301.000	302.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Bus bay at Km. 301.200
29	302.000	303.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
30	303.000	304.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Junction at Km 303.270
31	304.000	305.000	G	-	PQC	300	-	G	0.25	-	-	-	-	-	G	PQC	G	G	-	-	-	
32	305.000	306.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Bus bay at Km. 305.800
33	306.000	307.000	G	-	PQC	300	-	G	1	0.5	-	-	-	-	G	PQC	G	G	-	-	-	
34	307.000	308.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
35	308.000	309.000	G	-	PQC	300	-	G	0.5	-	-	-	-	-	G	PQC	G	G	-	-	-	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP) *	Cracking (%)	Raveling (%)	Potholing (%) **	Rut (None/ Moderate/ Severe)	Patching (%) **			Type	Condition			Left	Right	
36	309.000	310.000	G	-	PQC	300	-	G	0.5	0.5	-	-	-	-	G	PQC	G	G	-	-	-	
37	310.000	311.000	G	-	PQC	300	-	G	2.0	-	-	-	-	-	G	PQC	G	G	-	-	-	
38	311.000	312.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Junction at Km 311.900
39	312.000	313.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Bus bay at Km. 312.180
40	313.000	314.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Junction at Km 313.450
41	314.000	315.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
42	315.000	316.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
43	316.000	317.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Bus bay at Km. 316.460
44	317.000	318.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Junction at Km 317.230
45	318.000	319.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
46	319.000	320.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
47	320.000	321.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
48	321.000	322.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	

RHS - Mangalwedha to Watambare

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	322.000	321.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
2	321.000	320.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
3	320.000	319.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
4	319.000	318.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
5	318.000	317.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
6	317.000	316.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
7	316.000	315.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
8	315.000	314.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	Junction at Km 314.270
9	314.000	313.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
10	313.000	312.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
11	312.000	311.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
12	311.000	310.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
13	310.000	309.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
14	309.000	308.000	G	-	PQC	300	-	G	0.5	-	-	-	-	-	G	PQC	G	G	-	-	-	
15	308.000	307.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
16	307.000	306.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
17	306.000	305.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
18	305.000	304.000	G	-	PQC	300	-	G	0.25	-	-	-	-	-	G	PQC	G	G	-	-	-	
19	304.000	303.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
20	303.000	302.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
21	302.000	301.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
22	301.000	300.000	G	-	PQC	300	-	G	0.25	-	-	-	-	-	G	PQC	G	G	-	-	-	
23	300.000	299.000	G	-	PQC	300	-	G	0.25	-	-	-	-	-	G	PQC	G	G	-	-	-	
24	299.000	298.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
25	298.000	297.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
26	297.000	296.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
27	296.000	295.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
28	295.000	294.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
29	294.000	293.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
30	293.000	292.670	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
31	292.670	292.460	On RHS Embankment filling & RE Wall in Progress																			
32	292.460	292.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	-	-	
33	292.000	291.000	G	-	PQC	301	-	G	-	-	-	-	-	-	G	PQC	G	G	G	-	F	Drain 291.00 to 291.200
34	291.000	290.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
35	290.000	289.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
36	289.000	288.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	-	F	
37	288.000	287.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	-	F	
38	287.000	286.000	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	G	-	F	
39	286.000	285.000	G	-	PQC	300	-	G	-	0.25	-	-	-	-	G	PQC	G	G	G	-	F	
40	285.000	284.000	G	-	PQC	300	-	G	-		-	-	-	-	G	PQC	G	G	G	-	F	
41	284.000	283.000	G	-	PQC	300	-	G	-		-	-	-	-	G	PQC	G	G	G	-	-	
42	283.000	282.000	G	-	PQC	300	-	G	-		-	-	-	-	G	PQC	G	G	G	-	F	Drain 283.000 to 282.750
43	282.000	281.000	G	-	PQC	300	-	G	-		-	-	-	-	G	PQC	G	G	G	-	-	
44	281.000	280.000	G	-	PQC	300	-	G	-		-	-	-	-	G	PQC	G	G	G	-	-	
45	280.000	279.000	G	-	PQC	300	-	G	-	0.5	-	-	-	-	G	PQC	G	G	G	-	-	Junction at Km 279.700
46	279.000	278.000	G	-	PQC	300	-	G	-	0.5	-	-	-	-	G	PQC	G	G	G	-	F	
47	278.000	277.000	G	-	PQC	300	-	G	-	0.5	-	-	-	-	G	PQC	G	G	G	-	F	
48	277.000	276.000	G	-	PQC	300	-	G	-	0.5	-	-	-	-	G	PQC	G	G	G	-	F	Drain 276.500 to 277.000

FP Project Management

Four Laning of Dwarka (Kuranga) - Khambhaliya - Devariya Section of NH-151A from km. 203+500 to km. 176+500 and from km. 171+800 to km. 125+000 in the State of Gujarat under Bharatmala Project on Hybrid Annuity mode (Package I)

Technical Due Diligence Study

Final Report

November 2022

Submitted by:

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FP/QD/05

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FOUR LANING OF DWARKA (KURANGA) – KHAMBHALIYA - DEVARIYA SECTION OF NH-151A FROM KM. 203+500 TO KM. 176+500 AND FROM KM. 171+800 TO KM. 125+000 [DESIGN LENGTH 71.890 KM] IN THE STATE OF GUJARAT UNDER BHARATMALA PROJECT ON HYBRID ANNUITY MODE (PACKAGE-I)

TECHNICAL DUE DILIGENCE STUDY

FINAL REPORT

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1 INTRODUCTION

1.1 Background

The Government of India in the Ministry of Shipping, Road Transport and Highways had authorized NHAI for the development of National Highways and as a part of this endeavor, the authority has decided to undertake development and operation / maintenance of the Four Lanning of Dwarka - Devariya section of NH-151 (Old NH-8E) from existing carriageway km. 203+500 to km. 176+500 (Design km. 0+000 to km. 26+800) and km. 171+800 to km. 125+000 (Design km. 31+500 to km. 71+820) as well as km. 71+820 to km. 76+270 under COS (approx. 67.12 + 4.45 = 71.57 kms) in the state of Gujarat through Design, Build, Operate and Transfer (the "DBOT Annuity" or "Hybrid Annuity") basis, which shall be partly financed by the Concessionaire who shall recover its investment and costs through payments to be received from the Authority, in accordance with the terms and conditions to be set forth in a Concession Agreement to be executed. Total length of the project highway a per CA is 67.12 kms and including COS is 71.57 kms.

Based on competitive bid process completed, NHAI has signed Concession Agreement with **M/s GR Dwarka Devariya Highway Private Limited (GDDHPL)**, a Special Purpose Vehicle (SPV) formed for implementing this project.

The Appointed Date of the project was 8th February 2020. The Scheduled Completion Date of the project highway was on 07th August 2022. Operation period of the project is 15 years from the COD. The Concessionaire has applied for Provisional Completion Certificate to IE / NHAI vide letter no. GDDHPL/2022/DW-KH/2421 Dated: 11-07-2022 and IE has drafted a PCOD letter and sent to RO, NHAI vide letter no. LASA/MUM/IE/DKD-73709/ 2022/3949 Dated 02-08-2022. The NHAI had granted Extension of Time (EOT) for 180 days.

During maintenance of the project highway, **M/s. GR Highways Investment Manager Pvt. Ltd.** (in its capacity as the Investment Manager of Bharat Highways InvIT) has appointed **FP Project Management Consultancy Services Private Limited** [Formerly Frischmann Prabhu (I) Pvt. Ltd.] Technical Consultant for carrying out technical study, and assessment of Opex and major maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, FP Project Management undertook the site visits to carry out site inspection. The report is based on findings during this period.

1.2 Our Approach Philosophy

Composition of Team

Our team consists of well-qualified Engineers and other professionals, whose experience covers all the skills and specializations required for undertaking such assignments. All the team personnel proposed are our regular employees and have a long and stable working relationship with our firm.

The Team Leader coordinates the activities between all the key staff who work closely together. The key staff is assisted by various support staff, who report to the respective key staff in their field of expertise. The Team Leader is the point of contact for Client on Technical Study.

The technical study includes review of all the available documents namely:

a) Concession Agreement including Technical Schedules
b) EPC Agreement
c) Pavement design reports
d) O&M Manual prepared by the Concessionaire
e) O&M Contract, work order and their provisions
f) Recent O&M Report submitted to Authority
g) Quality of construction based on available data, design and drawings
h) Documents on historical expenditure on operation and maintenance
i) Reports on past accidents
j) O&M cost schedule for the concession period
k) Completion / Provisional Completion and status of items in punch list items
l) Correspondence regarding scope of works and during O&M
m) Toll operation manual / ATMS related documents

The review of above documents is the first step towards accomplishment of the assignment. This gives a complete idea of the project and is used as input data for preparation of report after necessary analysis.

Site Visit and Data Collection

A team of experts from various streams has carried out the preliminary site visit to understand the assessment of project assets mainly condition of the pavement and structures.

- The site visit is undertaken for detailed reconnaissance and visual pavement condition assessment
- The condition assessment of major structures by visual inspection
- The information like material sources and the probable cost to be collected for the purpose of cost estimate

The detailed design / drawings viz. Plan & L-sections, drainage design, structure design, layout drawings for project facilities like toll plaza, bus bay, truck lay-byes, highway lighting facilities etc., would be studied. Also, design / drawing and provision pertaining to road furniture are studied.

The adequacy of design is verified in accordance with the concession agreement, manual of specifications and standards as well as relevant IRC standards.

The information on availability of material in the vicinity is gathered. It has direct impact on cost of maintenance work and balance work if any.

The basic approach for preparation for cost estimates for operation and maintenance is as per the practice of State PWD / MORT&H in respect of highways and structures.

Data Analysis

Based on the study of the available information and preliminary site visits, the consultants share their preliminary observations with the Client.

1.3 About this Report

This report has been prepared based on the information, reports and documents made available to us by the Company. We have also referred to publicly available reports, literature etc. and have made our best efforts to check the authenticity of the information available, analyse the same as per the best engineering / industry practices.

The site visit and inspection were carried out between the periods of **07th August 2022 to 10th August 2022**.

The report is organized with the following chapters for easy understanding of various issues.

- **Introduction -** This chapter gives an overview of the project background, approach and methodology of Due Diligence studies.
- **Project Description -** This chapter describes existing project features.
- **Development of Project Highway -** This chapter gives an overview of project development.
- **Pavement and Site Investigation -** This chapter describes present condition of pavement, surveys and investigations carried out on site and proposals for maintenance as per contract requirements.
- **Balance works -** This chapter summarizes the balance works to be executed at Site.
- **Review of Concession Agreement -** This chapter summarizes the observations on the Concession Agreement.
- **Operation and Maintenance -** This chapter describes O&M set up as well as O&M cost over the concession period.
- **Toll Plaza Equipment and ATMS -** This chapter summarizes assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and working status is presented under this section.
- **Accident Data Analysis -** This chapter deals with the analysis of nature of accidents occurring on the stretch and to identify blackspots.
- **Annexures**

2 PROJECT DESCRIPTION

2.1 Location

The project corridor road is a section of National Highway Number 151A (Old NH-08E), NH-151A in the state of Gujarat which starts near Kuranga village from km. 0+000 and end at km. 76+270 in Jakhar Patia and total design length as per Concession Agreement is 67.12 kms and the length of the project highway including COS is 71.57 kms.

The project highway passes through the built-up areas of towns and villages enroute. Important towns along the alignment are Bhatia, Kuvadia, Bamnsa, Dhandusar, Vadinar and Devariya etc.,

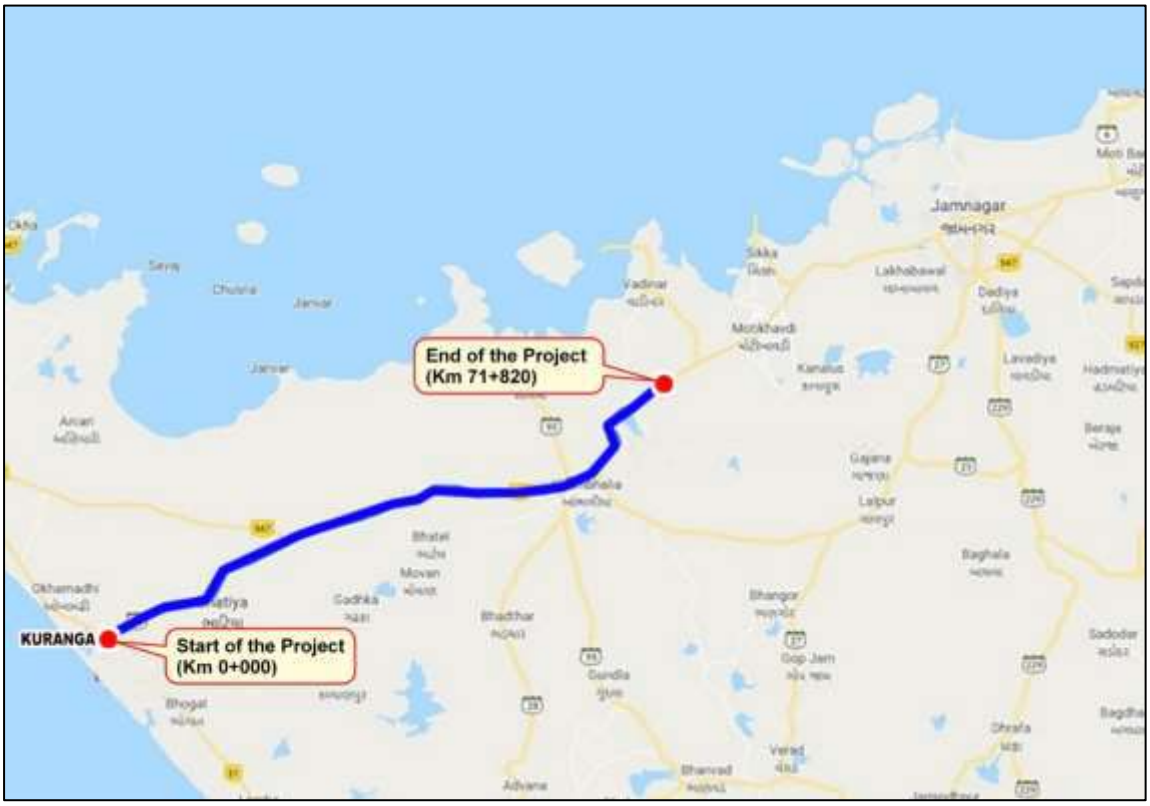

Figure 2-1 Location Map

Figure 2-2 Start of project highway at km. 0+000

Figure 2-3 End of project highway at km. 76+270

2.2 Climate

The climate of the project area is generally dry except during the South-West monsoon season between July to September. The average annual rainfall in the area is around 520 mm. The driest month is May. The average annual temperature of the project area is 28.5^{0}C & June is being the warmest month. The highest relative humidity is in August @ 77.83% and the lowest relative humidity is in January @ 39.92%.

2.3 Terrain

This section of National Highway traverses through plain / rolling terrain.

2.4 Abutting Land Use

The land use along the highway is predominantly agriculture or barren.

2.5 Right of Way

The width of existing Right of Way (RoW) throughout the project stretch varies from 45 m to 60 m. However, at many locations ROW as per site condition is 30 m. Details of ROW for the project highway are as given below.

Table 2-1 RoW Details

Section	Existing Chainage (km)		Design Chainage (km)		Proposed RoW (m)
	Start	End	Start	End	
NH - 151A (Dwarka from Kuranga to Devariya)	203+500	202+580	0+000	1+000	45
	202+580	200+100	1+000	3+400	45
	200+100	199+800	3+400	3+700	45
	199+800	196+000	3+700	7+500	45
	196+000	195+700	7+500	7+800	45
	195+700	191+700	7+800	11+800	45
	191+700	190+400	11+800	13+100	60
	190+400	187+680	13+100	15+800	45
	187+680	187+200	15+800	16+200	45
	187+200	185+950	16+200	17+450	45
	185+950	185+400	17+450	18+000	45
	185+400	180+850	18+000	22+500	45

Section	Existing Chainage (km)		Design Chainage (km)		Proposed RoW (m)
	Start	End	Start	End	
	180+850	179+850	22+500	23+500	60
	179+850	176+500	23+500	26+800	45
	176+500	171+800	26+800	31+500	Air Strip: Not in Scope
	171+800	171+100	31+500	32+200	45
	171+100	163+450	32+200	39+800	45
	163+450	162+000	39+800	41+300	45
	162+000	161+270	41+300	42+000	45
	161+270	160+550	42+000	42+700	45
	160+550	158+500	42+700	44+800	45
	158+500	155+000	44+800	48+200	45
	155+000	153+400	48+200	49+800	45
	153+400	152+000	49+800	51+070	45
	152+000	149+200	51+070	53+400	45
	149+200	148+120	53+400	54+500	60
	148+120	147+700	54+500	54+960	45
	147+700	146+970	54+960	55+700	60
	146+970	144+700	55+700	57+900	45
	144+700	143+450	57+900	59+150	60
	143+450	141+400	59+150	61+200	45
	141+400	140+500	61+200	62+100	45
	140+500	140+200	62+100	62+400	45
	140+200	139+600	62+400	63+000	45
	139+600	139+060	63+000	63+500	45
	139+060	136+800	63+500	65+000	60
	136+800	136+400	65+000	65+400	45
	136+400	135+300	65+400	66+500	45
	135+300	134+300	66+500	67+500	45
	134+300	132+000	67+500	69+800	45
	132+000	131+700	69+800	70+100	45
	131+700	130+700	70+100	71+100	45
	130+700	130+000	71+100	71+820	45

2.6 Existing Utilities

During widening of the project highway, various affected utility services located along the project road were shifted to the PROW. The different types of utilities found along the road include, electrical poles, water pipeline, OFC Cables, etc.,

3 DEVELOPMENT OF PROJECT ROAD

3.1 Project Road

The Road from Kuranga (Dwarka) km. 203+500 to Devariya km. 176+500 (design km. 0+000 to km. 26+800) and km. 171+800 to 125+000 (Design km. 31+500 to km. 71+820) as well as from km. 71+820 to km. 76+270 under COS (approx. 67.12 + 4.45 = 71.57 km length) was proposed to be developed as four lane divided carriageway with median width varies from 1.0 m to 4.0 m, service road and other arrangements. The project road passes through rural as well as built-up sections. The stretches falling in built-up areas have been provided with service road as per scope of works. The development of entire project road has been carried out in accordance with schedule-B and schedule-C as per standards set forth in schedule-D under the Concession Agreement.

M/s. GR Dwarka Devariya Highway Private Limited (GDDHPL) has been involved in construction of the project road for the length of 71.57 kms (67.12 + 4.45). The Concessionaire has applied for Provisional Completion Certificate on 11th July 2022.

The stretch of the project highway under the scope of study runs predominantly through plain / rolling terrain. The design standards have been adhered to with a realistic compatibility with the existing ROW, utilities and optimum land acquisition. Generally, the cross-sectional dimensions of project road are as below:

Table 3-1 Cross sectional dimension

Main Carriageway	Width (m)
Carriageway width	18
Paved Shoulder width - one side	1.5
Earthen Shoulder width - one side	2.0
Median width	1.00 - 4.50
Service Road	7.0

3.2 Bypass and Realignment

There are no bypass and realignment on the project highway.

3.3 Pavement Construction

Both carriageway of the project highway including Toll Plaza, service road and slip road is rigid pavement.

3.4 Service Roads

Service roads have been constructed at 05 locations along the project highway. However, as per CA there are 7 locations to construct the service road and two nos. of service roads are descoped. The total length of service road (including LHS and RHS) is 9.09 kms and the width of service road is 7.0 m. Service roads are provided in both built-up sections and in open country. Built-up sections are provided with HPC drains on outer side of service roads. The details of service roads are provided in the table below.

Table 3-2 Details of Service Roads as per CA

Sr. No.	Existing Chainage (km)		Design Chainage (km)		Length (km)	Width (m)	Side	Remark
	From	To	From	To				
1	191+700	190+400	11+800	13+100	1.300	7.0	Both	
2	180+850	179+850	22+500	23+500	1.000	7.0	Both	
3	149+200	148+120	53+400	54+500	1.100	7.0	Both	De-scoped
4	147+700	146+970	54+960	55+700	0.740	7.0	Both	
5	146+970	144+700	55+700	57+900	2.200	7.0	Both	
6	144+700	143+450	57+900	59+150	1.250	7.0	Both	
7	139+060	136+800	63+500	65+000	1.500	7.0	Both	De-scoped

Figure 3-1 Photographs of Service Road

km. 11+800 to km. 13+100 (LHS)

km. 22+500 to km. 23+500 (LHS)

km. 22+500 to km. 23+500 (LHS)

km. 54+960 to km. 55+700 (LHS)

km. 55+260 to km. 55+700 (LHS)

km. 57+900 to km. 59+150 (LHS)

km. 57+900 to km. 59+150 (LHS)

km. 56+950 to km. 56.550 (RHS)

km. 23+500 to km. 22+500 (RHS)

km. 11+800 to km. 13+100 (RHS)

3.5 Major Intersections

There is no major intersection in the project highway.

3.6 Minor Junctions

There are 55 Nos. of minor junctions along project highway. The details of the minor junctions are presented as below.

Table 3-3 Details of Minor Intersections

Sr. No.	Chainage (km)		Type of Junction	Side	Road Type	Going to Village
	Existing	Design				
1	200+540	3+010	T	RHS	BT	BT Road To Suines
2	197+400	6+045	T	LHS	BT	BT Road to Gaga Marine Sanctuary
3	195+740	7+830	T	RHS	GR	Towards Wind World Pvt.
4	192+820	10+710	T	LHS	BT	Towards Bhatiya Road
5	186+875	16+600	X	LHS	BT	Towards Gurgadh
6	186+875	16+600	X	RHS	BT	Towards Nandana
7	185+915	17+560	X	LHS	GR	Towards Village
8	185+915	17+560	X	RHS	BT	Towards Nandana
9	181+580	21+845	T	LHS	GR	Towards Shiv Mandir
10	180+570	22+850	T	RHS	GR	Towards Bharatpur Village
11	177+990	25+430	T	LHS	GR	Towards Ran Village
12	177+740	25+660	T	RHS	GR	Towards Juvanpur Village
13	176+620	26+780	T	RHS	GR	Towards Juvanpur Village
14	171+450	31+910	X	LHS	BT	LHS To Datrana
15	171+450	31+910	X	RHS	BT	Towards Hanjdapar

Sr. No.	Chainage (km)		Type of Junction	Side	Road Type	Going to Village
	Existing	Design				
16	169+550	33+800	T	RHS	BT	Towards Hanjdapar
17	168+285	35+075	X	LHS	GR	To Zakasiva
18	168+285	35+075	X	RHS	BT	Towards Gokul
19	167+680	35+675	X	LHS	GR	Towards Dhandusar
20	167+680	35+675	X	RHS	GR	Towards Sonardi
21	167+580	35+780	T	LHS	GR	Towards Bara Village
22	163+450	39+900	T	LHS	BT	Towards Baikapatiya Village
23	162+560	40+780	T	RHS	BT	Towards Bhatel Village
24	162+140	41+200	X	LHS	BT	Towards Village
25	162+140	41+200	X	RHS	BT	Towards Vadatara Village
26	159+000	44+300	X	LHS	GR	Towards Ithal Village
27	159+000	44+300	X	RHS	GR	Towards Kajurda Village
28	158+000	45+300	T	LHS	BT	Towards Hansthal
29	156+540	46+790	T	RHS	BT	Towards Viramdad Village
30	155+330	47+950	T	LHS	BT	Towards Sam or village
31	152+935	50+340	T	LHS	BT	Towards Kuvadiya Village
32	149+975	52+850	T	RHS	CC	Towards Suplat Village
33	149+055	53+650	X	LHS	CC	Towards DN School
34	149+055	53+650	X	RHS	GR	Towards Temple
35	146+750	55+910	T	RHS	GR	Towards Khambhaliya
36	146+242	56+425	T	LHS	BT	Towards Haripur
37	144+470	58+165	T	LHS	BT	Towards JKV Nagar
38	144+135	58+500	T	LHS	BT	Towards JKV Nagar
39	144+100	58+590	T	RHS	BT	Towards Lalpur SH-23
40	143+625	59+010	T	RHS	BT	Towards Brick Field
41	142+845	59+825	T	RHS	BT	Towards Kanchanpur
42	142+240	60+410	T	RHS	GR	Towards Kanchanpur
43	140+420	62+200	T	RHS	GR	Towards Factory
44	140+420	62+200	Y	RHS	GR	Towards Khatabadi Village
45	137+010	64+890	T	LHS	BT	Towards Danta
46	136+460	65+220	T	LHS	GR	Towards Shavan farm
47	135+850	66+080	X	LHS	GR	Towards Danta
48	135+850	66+080	X	RHS	GR	Towards Dam
49	134+950	66+900	T	LHS	BT	Towards Forest
50	134+480	67+400	T	LHS	BT	Towards Motarnadha
51	134+445	67+450	T	RHS	BT	Towards Vadalia Sihan
52	133+185	68+680	T	LHS	BT	Towards Kajurda
53	132+350	69+570	X	LHS	BT	Towards Essar Power Plant
54	132+350	69+570	X	RHS	ER	Towards Shrihorrow Village
55	130+165	71+760	T	LHS	BT	Towards Devariya

Figure 3-2 Photographs of Minor Intersection

km. 3+000

km. 10+710

km. 16+600

km. 25+660

km. 33+800

km. 35+700

km. 41+200

km. 44+300

km. 50+340

3.7 Condition Survey of Bridges

The inventory of structures including major bridges, minor bridges, ROB, underpasses and culverts is presented in table as below:

Table 3-4 Summary of Structures

Sr. No.	Type of Structure	Total No. of Structures	De-Scope	COS	Net Total
1	ROB	01			01
2	Flyover	00			00
3	Major Bridge (New)	04			04
4	Minor Bridge (Re-construction)	16			16

Sr. No.	Type of Structure	Total No. of Structures	De-Scope	COS	Net Total
5	Minor Bridge (Widening & Repairing)	04			04
6	Vehicular Underpass	06	01		05
7	Slab Culvert (New)	16	03		13
8	Slab Culvert (Reconstruction)	08			08
9	Box Culvert (Widening)	11			11
10	Pipe Culverts (New)	29		7	36
11	Pipe culvert (Widening)	16			16
12	Pipe culvert (Reconstruction)	40			40

The detailed condition survey of structures was carried out by visual inspection. The observations and findings are presented in table below:

Table 3-5 Structure Condition Survey

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
1	0+527	ROB 1 x 18 + 1 x 24 + 1 x 18 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition. Drainage grating to be cleaned at both sides.
			Foundation	Pile Foundation	Pile Foundation	
			Sub structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition – Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	3 Span Composite Girders/RCC Girders & RCC Slab Footpath - Both side Condition – Satisfactory	3 Span Composite Girders/RCC Girders & RCC Slab Footpath - Both side Condition - Satisfactory	
			Bearing	Bearing – POT/PTFE + PIN & Metallic Bearing for Steel Girder	Bearing – POT/PTFE + PIN & Metallic Bearing for Steel Girder	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	RCC railing with Crash Barrier - Condition – Satisfactory	RCC railing with Crash Barrier Condition - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - No problem	BC - No problem	
			Approach Slope	Earthen slope with Turfing Stable in condition	Earthen slope with Turfing Stable in condition	
			Drainage	Water grating clear	Water grating clear	
2	0+580	Minor Bridge 1 x 9.0 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition. Waterspouts to be clean at both sides.
			Foundation	RCC Raft	RCC Raft	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Condition - Satisfactory	Abutment - RCC Wall type Condition - Satisfactory	
			Super Structure	Single Span	Single Span	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				RCC Solid Slab Condition - Satisfactory	RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	-	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	RE Block Wall	RE Block Wall	
			Drainage	Water grating not clear	Water grating not clear	
3	1+620	Minor Bridge 2 x 4.625 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition. Waterspouts to be clean at both sides.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Pier – Pier RCC wall type Condition - Satisfactory	Abutment - RCC Wall type Pier - Pier RCC wall type Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Earthen slope washed out, need to be rectified	Earthen slope washed out, need to be rectified	
			Drainage	Waterspouts not clear	Waterspouts not clear	
4	3+010	Minor Bridge 4 x 4.9875 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Pier – Pier RCC wall type Condition - Satisfactory	Abutment - RCC Wall type Pier – Pier RCC wall type Condition - Satisfactory	Waterspouts to be clean at both sides.
			Super Structure	4 Span RCC Solid Slab Condition - Satisfactory	4 Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	RCC Railing with Crash Barrier	RCC Railing with Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Earthen slope	Earthen slope	
			Drainage	Waterspouts clear	Waterspouts clear	
5	9+230	Major Bridge 4 x 24.0 m (Rabari Local Stream)	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	Pile Foundation	Pile Foundation	
			Sub structure Abutment / Pier	Abutment - RCC Wall type & RCC Piers Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type & RCC Piers Piers - RCC piers Condition - Satisfactory	
			Super Structure	4 Span PSC Girders & RCC Deck Slab Condition - Satisfactory	4 Span PSC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT-PTFE	POT-PTFE	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Earthen slope with turfing	Earthen slope with turfing	
			Drainage	Water grating clear	Water grating clear	
6	9+880	Minor Bridge 1 x 7.20 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Condition - Satisfactory	Abutment - RCC Wall type Condition - Satisfactory	
			Super Structure	Single Span RCC Solid Slab Condition - Satisfactory	Single Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier	Crash Barrier	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Earthen slope	Earthen slope	
			Drainage	Waterspouts clear	Waterspouts clear	
7	12+420	VUP 2 x 25.0 m x 5.5 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	Pile Foundation	Pile Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	2 Span PSC Girders & RCC Deck Slab Condition - Satisfactory	2 Span PSC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT/PTFE	POT/PTFE	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier @A2 side-Pending	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	-	-	
			Drainage	Water grating clear	Water grating clear	
8	13+410	Minor Bridge 2 x 4.625 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - Pier RCC wall type Condition - Satisfactory	Abutment - RCC Wall type Piers - Pier RCC wall type Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier -Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	Wearing coat pending	
			Approach Slope	Earthen slope not maintained	Earthen slope not maintained	
			Drainage	Waterspouts clear	Waterspouts clear	
9	15+270	Minor Bridge 3 x 7.55 m	Age	New - 2 Lane	New – 2 Lane	The Structure is in sound condition,
			Foundation	RCC Raft	RCC Raft	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - Pier RCC wall type	Abutment - RCC Wall type Piers - Pier RCC wall type	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				Condition - Satisfactory	Condition - Satisfactory	
			Super Structure	3 Span RCC Solid Slab Condition - Satisfactory	3 Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier -Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	Wearing coat pending	
			Approach Slope	Earthen slope not maintained	Earthen slope not maintained	
			Drainage	Drainage spouts clear	Drainage spouts pending	
10	21+955	Minor Bridge 3 x 6.30 m (Skew)	Age	New - 2 Lane	New – 2 Lane	The Structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - Pier RCC wall type Condition - Satisfactory	Abutment - RCC Wall type Piers - Pier RCC wall type Condition - Satisfactory	
			Super Structure	3 Span RCC Solid Slab Condition - Satisfactory	3 Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier -Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - damaged	
			Approach Slope	Earthen slope not maintained	Earthen slope not maintained	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Drainage	Waterspouts clear	Waterspouts clear	
11	22+495	Minor Bridge 2 x 25.0 m	Age	New - 2 Lane	New – 2 Lane	The Structure is in sound condition,
			Foundation	Pile Foundation	Pile Foundation	
			Sub structure Abutment / Pier	Abutment – RCC Wall & RCC Piers Piers - RCC Piers Condition - Satisfactory	Abutment – RCC Wall & RCC Piers Piers - RCC Piers Condition - Satisfactory	
			Super Structure	2 Span PSC Girders & RCC Deck Slab Condition - Satisfactory	2 Span PSC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT/PTFE	POT/PTFE	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - damaged	BC - Satisfactory	
			Approach Slope	Earthen slope damaged	Earthen slope	
			Drainage	Water grating clear	Water grating clear	
12	23+120	VUP 2 x 25.0 x 5.5 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	2 Span PSC Girders & RCC Deck Slab Condition - Satisfactory	2 Span PSC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT/PTFE	POT/PTFE	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	-	-	
			Drainage	Water grating clear	Water grating clear	
13	23+600	Major Bridge 4 x 18.3 m (Skew) (Vankvaya River)	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers Condition - Satisfactory	
			Super Structure	4 Span RCC Girders & RCC Deck Slab Condition - Satisfactory	4 Span RCC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT-PTFE	POT-PTFE	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC – Pending @ A1 side approach slab portion	BC – Damaged @ approach slab portion	
			Approach Slope	Earthen slope – Pending @ A1 side	Earthen slope	
			Drainage	Water grating clear	Water grating clear	
14	34+400	Minor Bridge 1 x 7.8 m	Age	New - 2 lane	New - 2 lane	The Structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	RCC wall Condition - Satisfactory	RCC wall Condition - Satisfactory	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Super Structure	RCC solid slab Condition - Satisfactory	RCC solid slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier-Satisfactory	Crash Barrier-Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Earthen slope @ A1 & A2 side to be maintained	Stable	
			Drainage	Waterspouts - Clear	Waterspouts - Clear	
15	40+807	Minor Bridge 2 x 10.35 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition. .
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Pier - RCC wall type Condition - Satisfactory	Abutment - RCC Wall type Pier - RCC wall type Condition - Satisfactory	
			Super Structure	RCC solid slab Condition - Satisfactory	RCC solid slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier-Satisfactory	Crash Barrier-Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Earthen slope @ A1 & A2 side washed out, to be maintained	Earthen slope @ A2 side washed out, to be maintained	
			Drainage	Waterspouts - Clear	Waterspouts - Clear	
16	45+893	Minor Bridge (Widened)	Age	New - 2 lane (Upper side)	Widened (Old) - 2 lane (Lower side)	The structure is in sound condition.

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
		4 x 3.4 m	Foundation	RCC Raft	RCC Open Foundation/ RCC Raft	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Pier - RCC wall type Condition - Satisfactory	Abutment - RCC Wall type Pier - RCC wall type Condition - Satisfactory	
			Super Structure	2 Span RCC solid slab Condition - Satisfactory	4 Span RCC solid slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier-Satisfactory	Crash Barrier-Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Earthen slope & MBCB @ A2 side are pending due to Shifting of Electrical line.	Stable	
			Drainage	Waterspouts - Clear	Waterspouts - Clear	
17	46+965	Minor Bridge (Skew) 1 x 7.2 m	Age	New - 2 lane	New - 2 lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Condition - Satisfactory	Abutment - RCC Wall type Condition - Satisfactory	
			Super Structure	Single Span RCC solid slab Condition - Satisfactory	Single Span RCC solid slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier-Satisfactory	Crash Barrier-Satisfactory	
			Expansion Joint	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	Stable	Stable	
			Drainage	Waterspouts - Clear	Waterspouts - Clear	
18	47+700	Minor Bridge 2 x 4.625 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers -RCC type Condition - Satisfactory	Abutment – RCC wall Piers - RCC type Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts clear	Waterspouts clear	
19	49+243	Minor Bridge (Widened) 2 x 7.45 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers -RCC type Condition - Satisfactory	Abutment – RCC wall Piers - RCC type Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts not provided	Waterspouts not provided	
20	51+293	Minor Bridge 2 x 4.625 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers -RCC type Condition - Satisfactory	Abutment – RCC wall Piers - RCC type Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts clear	Waterspouts clear	
21	51+730	Minor Bridge 2 x 18.3 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC Circular pier Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC Circular pier Condition - Satisfactory	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Super Structure	Double Span RCC Girders & RCC Deck Slab Condition - Satisfactory	Double Span RCC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT-PTFE	POT-PTFE	
			Slope Protection	RCC Return and CC Pitching damaged @ A2 side	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
22	54+245	Minor Bridge 2 x 12.5 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers -RCC wall type Condition - Satisfactory	Abutment – RCC wall Piers - RCC wall type Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts not provided	Waterspouts not provided	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
23	54+855	Major Bridge 7 x 21.8 m	Age	New - 3 Lane	New – 3 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC piers & Pier Caps Condition - Satisfactory	Abutment - RCC Wall type Piers - RCC piers & Pier Caps Condition - Satisfactory	
			Super Structure	7 Span RCC Girders & RCC Deck Slab Condition - Satisfactory	7 Span RCC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT-PTFE	POT-PTFE	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
24	55+300	VUP 1 x 25 x 5.5 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	Single Span PSC Girders & RCC Deck Slab Condition - Satisfactory	Single Span PSC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT/PTFE	POT/PTFE	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	-	-	
			Drainage	Water grating clear	Water grating clear	
25	57+975 instead of 54+030	VUP 1 x 25 x 5.5 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	
			Super Structure	Single Span PSC Girders & RCC Deck Slab Condition - Satisfactory	Single Span PSC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT/PTFE	POT/PTFE	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	-	-	
			Drainage	Water grating clear	Water grating clear	
26	58+520	VUP 1 x 25 x 5.5 m	Age	New - 2 Lane	New – 2 Lane	The structure is in sound condition.
			Foundation	RCC Open Foundation	RCC Open Foundation	
			Sub Structure Abutment / Pier	Abutment – RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	Abutment - RE Block & RCC Circular type Piers - RCC Circular type Condition - Satisfactory	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
			Super Structure	Single Span PSC Girders & RCC Deck Slab Condition - Satisfactory	Single Span PSC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT/PTFE	POT/PTFE	
			Slope Protection	-	-	
			Nalla Bed	Service Road	Service Road	
			Parapet / Railing	Crash Barrier -Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC - Satisfactory	BC - Satisfactory	
			Approach Slope	-	-	
			Drainage	Water grating clear	Water grating clear	
27	64+635	VUP 1 x 12 x 5.5 m	Age	-	-	This structure is descoped.
			Foundation	-	-	
			Sub Structure Abutment / Pier	-	-	
			Super Structure	-	-	
			Bearing	-	-	
			Slope Protection	-	-	
			Nalla Bed	-	-	
			Parapet / Railing	-	-	
			Expansion Joint	-	-	
			Wearing Coat / Surface	-	-	
			Approach Slope	-	-	
			Drainage	-	-	
28	64+660	Minor Bridge 2 x 5.125 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers -RCC wall type	Abutment – RCC wall Piers - RCC wall type	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
				Condition - Satisfactory	Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts not provided	Waterspouts not provided	
29	64+765	Minor Bridge 2 x 5.125 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers -RCC wall type Condition - Satisfactory	Abutment – RCC wall Piers - RCC wall type Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	
			Nalla Bed	Clear	Clear	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Waterspouts not provided	Waterspouts not provided	
30	66+310	Major Bridge	Age	New - 2 Lane	New – 2 Lane	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	**LHS**	**RHS**	
		4 x 18.0 m (Sihan River)	Foundation	RCC Open Foundation	RCC Open Foundation	The structure is in sound condition.
			Sub Structure Abutment / Pier	Abutment - RCC Wall type Piers - RCC Circular piers & Pier Caps Condition - Satisfactory	Abutment - RCC Wall type Piers – RCC Circular piers & Pier Caps Condition - Satisfactory	
			Super Structure	4 Span RCC Girders & RCC Deck Slab Condition - Satisfactory	4 Span RCC Girders & RCC Deck Slab Condition - Satisfactory	
			Bearing	POT-PTFE	POT-PTFE	
			Slope Protection	RCC Return and CC Pitching	RCC Return and CC Pitching	
			Nalla Bed	Flowing water	Flowing water	
			Parapet / Railing	RCC Railing with Crash Barrier -Satisfactory RCC Railing at both ends to be provided	RCC Railing with Crash Barrier - Satisfactory	
			Expansion Joint	Available (Require cleaning)	Available (Require cleaning)	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Stable in condition	
			Drainage	Water grating clear	Water grating clear	
31	67+865	Minor Bridge 2 x 10.65 m	Age	New - 2 Lane	New - 2 Lane	The structure is in sound condition.
			Foundation	RCC Raft	RCC Raft	
			Sub Structure Abutment / Pier	Abutment – RCC wall Piers -RCC wall type Condition - Satisfactory	Abutment – RCC wall Piers - RCC wall type Condition - Satisfactory	
			Super Structure	Double Span RCC Solid Slab Condition - Satisfactory	Double Span RCC Solid Slab Condition - Satisfactory	
			Bearing	-	-	
			Slope Protection	RCC Return & CC Pitching	RCC Return & CC Pitching	

Sr. No.	Design Chainage (km)	Type of Bridge / Spans	Features and Observation			General Comments
			Component	LHS	RHS	
			Nalla Bed	Flowing Water	Flowing Water	
			Parapet / Railing	Crash Barrier - Satisfactory	Crash Barrier - Satisfactory	
			Expansion Joint	-	-	
			Wearing Coat / Surface	BC is in good condition	BC is in good condition	
			Approach Slope	Stable in condition	Side Slope @ A1 side washed out, need to be rectified.	
			Drainage	Waterspouts not provided	Waterspouts not provided	

Figure 3-3 Photographs of Major Structures

Side View of ROB at km. 0+527 (LHS)

Bottom View of ROB's Girders at km. 0+527

Side View of ROB at km. 0+527 (RHS)

Wearing Coat of ROB at km. 0+527 (RHS)

Side Slope @ A2 side of ROB at km. 0+527 (RHS)

Side View of Minor Bridge at km. 0+580 (LHS)

Side View of Minor Bridge at km. 1+620 (LHS)

Side View of Minor Bridge at km. 1+620 (RHS)

Wearing Coat of Minor Bridge at km. 3+010 (LHS)

Side View of Minor Bridge at km. 3+010 (RHS)

Side View of Major Bridge at km. 9+230 (LHS)

Side View of Minor Bridge at km. 9+880 (LHS)

Side View of Minor Bridge at km. 9+880 (RHS)

Side View of VUP at km. 12+420 (LHS)

Bottom View of VUP at km. 12+420

Side View of VUP at km. 12+420 (RHS)

Wearing Coat of VUP at km. 12+420 (BHS)

Wearing Coat of Minor Bridge at km. 13+410 (LHS)

Side View of Minor Bridge at km. 13+410 (RHS)

Side View of Minor Bridge at km. 15+270 (LHS)

Side View of Minor Bridge at km. 21+955 (LHS)

Side view of Minor Bridge at km. 22+495 (LHS)

Side View of VUP (Limdi) at km. 23+120 (LHS)

Wearing Coat of VUP (Limdi) at km. 23+120 (BHS)

Side View of VUP (Limdi) at km. 23+120 (RHS)

Wearing Coat pending of Major Bridge at km. 23+600 (LHS)

Side View of Major Bridge at km. 23+600 (LHS)

Side View of Minor Bridge at km. 34+400 (LHS)

Side View of Minor Bridge at km. 34+400 (RHS)

Side View of Minor Bridge at km. 40+807 (RHS)

Side View of Minor Bridge at km. 45+893 (RHS)

Side View of Minor Bridge at km. 47+700 (LHS)

Side View of Minor Bridge at km. 47+700 (RHS)

Side View of Minor Bridge at km. 49+243 (RHS)

Side View of Minor Bridge at km. 51+293 (LHS)

MCW pending (1-lane) of Minor Bridge (New) at km. 51+293 (LHS)

Side View of Minor Bridge at km. 51+730 (RHS)

Side View of Minor Bridge at km. 51+730 (LHS)

Side View of Minor Bridge at km. 54+945 (RHS)

Wearing Coat of Major Bridge at km. 54+855 (LHS)

Side View of Major Bridge at km. 54+855 (LHS)

Wearing Coat of Major Bridge at km. 54+855 (RHS)

Side View of VUP at km. 55+300 (LHS)

Bottom View of VUP at km. 55+300

Side View of VUP at km. 57+975 (LHS)

Side View of VUP at km. 57+975 (RHS)

Side View of VUP at km. 58+570 (LHS)

Wearing Coat of Minor Bridge at km. 64+660 (LHS)

Side View of Minor Bridge at km. 64+660 (LHS)

Side View of Minor Bridge at km. 64+660 (RHS)

Side View of Minor Bridge at km. 64+765 (RHS)

Side View of Minor Bridge at km. 64+765 (LHS)

Wearing Coat of Major Bridge at km. 66+310 (LHS)

Wearing Coat of Major Bridge at km. 66+310 (RHS)

Expansion joint of Major Bridge at km. 66+310 (RHS)

Side View of Minor Bridge at km. 67+865 (LHS)

Side View of Minor Bridge at km. 67+865 (RHS)

3.8 Condition Survey of Culverts

The cross-drainage structure includes hume pipe culverts, box culverts and slab culverts at various locations. There are 92 Nos. of pipe culverts including COS and 32 Nos. of box culverts including de-scope along the project road. The height of culvert varies from 1.0 m to 3.0 m from bed level. During the condition survey of structure, these culverts were inspected on sample basis.

The project involves strengthening and widening of existing road to four lane divided carriageway. The culverts beneath existing alignment are either widened or reconstructed. The structural condition of culverts is generally found in sound condition. The quality of surface concrete of box culverts and slab culverts is satisfactory. The RCC parapet, metal beam crash barrier or RCC railing has been provided at culvert locations, which is maintained properly.

Vegetation growth and accumulation of debris at waterway is being removed and cleaned by the Concessionaire on regular basis.

Figure 3-4 Photographs of Culverts

Box culvert at km. 0+060 (LHS)

Box culvert at km. 0+060 (RHS)

Box culvert at km. 7+240 (LHS)

Box culvert at km. 7+240 (RHS)

Box culvert at km. 11+950 (LHS)

Box culvert at km. 11+950 (RHS)

Box culvert at km. 62+720 (LHS)

Box culvert at km. 62+720 (RHS)

HPC at km. 5+800 (RHS)

HPC at km. 5+800 (LHS)

HPC at km. 32+520 (RHS)

HPC at km. 32+520 (LHS)

HPC at km. 66+010 (RHS)

HPC at km. 66+010 (LHS)

HPC at km. 70+640 (RHS)

HPC at km. 70+640 (LHS)

3.9 Drainage System

There are hume pipe drains at the built-up areas and earthen drains at rural areas provided for the project stretch. The roadside drainage along the project highway needs to be maintained by cleaning debris on regular basis wherever it is completed. Some of the photographs of the drains provided are presented as below.

Figure 3-5 Photographs of Drains provided

km. 11+800 to km. 13+100 (LHS)

km. 11+800 to km. 13+100 (LHS)

km. 22+500 to km. 23+500 (LHS)

km. 50+300 to km. 50+900 (LHS)

km. 57+900 to km. 59+150 (LHS)

km. 66+000 to km. 67+000 (RHS)

km. 60+000 to km. 59+000 (RHS)

km. 50+000 to km. 49+000 (RHS)

3.10 Slope Protection Measures

Slope protection for high embankment of height greater than 3 m has not been provided with stone pitching although at few locations turfing has been provided for height up to 3 m. At many places, rain cut found in the slope which need rectification. Some of the photographs of slope are presented below.

Figure 3-6 Photographs of Slope Protection Works

km. 0+000 to km. 1+000 (LHS)

km. 6+000 to km. 7+000 (LHS)

km. 7+000 to km. 8+000 (LHS)

km. 8+000 to km. 9+000 (LHS)

km. 25+000 to km. 26+000 (LHS)

km. 40+000 to km. 41+000 (LHS)

km. 34+000 to km. 35+000

km. 54+000 to km. 55+000 (LHS)

km. 65+000 to km. 66+000 (LHS)

km. 71+000 to km. 72+000 (LHS)

km. 74+000 to km. 73+000 (RHS)

km. 69+000 to km. 68+000 (RHS)

km. 64+000 to km. 63+000 (RHS)

km. 53+000 to km. 54+000 (RHS)

km. 44+000 to km. 43+000 (RHS)

km. 39+000 to km. 38+000 (RHS)

km. 21+000 to km. 20+000 (RHS)

km. 9+000 to km. 8+000 (RHS)

km. 1+000 to km. 0+000 (RHS)

3.11 Road Furniture

Pavement and Kerb Marking

Pavement and kerb marking for the project highway is done as per the design standards indicated in section 12 of Schedule-D. Pavement marking work was in progress wherever front is available. The painting is being done wherever is required on regular basis as a part of routine maintenance.. Some of the photographs of road marking are presented below.

Figure 3-7 Photographs of Road Markings

LHS

km. 0+600

km. 2+900

km. 5+000 to km. 6+000

km. 13+000 to km. 14+000

km. 21+00 to km. 22+000

km. 45+060

km. 50+260

km. 76+100

km. 8+160

km. 9+900

km. 13+400
RHS

km. 21+050

km. 75+100

km. 68+100

km. 61+360

km. 53+450

km. 45+300

km. 20+000

km. 10+700

Road Studs

Road studs for the project highway is done as per the design standards indicated in section 12 of Schedule-D. Road studs have been fixed at junction and pedestrian crossings. Some of the photographs of road studs are presented below.

Figure 3-8 Photographs of Road Studs

km. 0+000

km. 2+650

km. 35+700

km. 41+200

km. 45+160

km. 60+350

Traffic Signage / km Stone

Traffic signs includes roadside signs, overhead signs, kerb mounted signs and median signs along the project highway. The design for the traffic signs along the project highway is done as per the design standards indicated in section 12 of Schedule-D.

The height, lateral clearance, location and installation are as per relevant clauses of Schedule-D. Overhead sign has been installed ahead of major intersections, toll plazas, start / end of project highway and urban areas as per detailed design requirements.

Kilometre stones, vertical post of sign boards, chevron boards and median kerb paint are faded at few locations. The same is being done wherever is required. Concessionaire needs to rectify the same. Some of the photographs of sign boards are presented below.

Figure 3-9 Photographs of Road Sign Boards

LHS

km. 0+100

km. 10+500

km. 11+000

km. 13+500

km. 45+060

km. 60+000

km. 71+500

km. 0+000

km. 2+000

km. 11+000

km. 15+000

km. 65+000

km. 72+000

km. 0+100

km. 10+710

km. 2+450

km. 2+500

km. 4+900

km. 14+900

km. 15+000

km. 15+950

km. 17+300

km. 34+685

km. 34+700

km. 41+200

km. 49+900
RHS

km. 53+400

km. 75+100

km. 71+700

km. 54+550

km. 23+450

km. 75+100

km. 71+700

km. 66+000

km. 60+150

km. 59+900

km. 55+900

km. 53+850

km. 45+000

km. 25+700

km. 25+700

km. 23+450

km. 8+260

km. 0+100

km. 75+000

km. 47+000

km. 45+000

km. 20+000

km. 1+000

Highway Lighting

Highway lighting is provided at underpasses, flyovers, toll plaza, ROB and built-up locations. High mast lighting is provided at toll plaza locations.

At underpass and flyover locations, highway lighting is provided at the structure and at its approaches.

Solar amber blinker signals are provided at each median opening locations. These lights are properly maintained and are in good working condition. Regular maintenance work is carried out to ensure their efficient operation. Some of the photographs of highway lightings are presented below.

Figure 3-10 Photographs of Highway Lighting

km. 0+500

km. 11+900 to km. 12+900

km. 22+650

km. 46+800

km. 55+050

km. 45+160

km. 2+600

km. 10+710

km. 25+660

km. 33+700

km. 50+340

km. 71+700

Crash Barriers

Metal beam crash barriers are provided at bridge approaches, locations of high embankment and sharp curves. Some of the photographs of metal beam crash barriers are presented below.

Figure 3-11 Photographs of Crash Barriers

km. 0+100 (LHS)

km. 0+150 (LHS)

km. 9+300 (LHS)

km. 15+950 (LHS)

km. 40+900 (LHS)

km. 49+300 (LHS)

km. 64+900 (RHS)

km. 62+450 (RHS)

km. 40+800 (RHS)

km. 38+400 (RHS)

km. 8+260 (RHS)

km. 0+100 (RHS)

Delineators

The Traffic Delineators are provided by Concessionaire for road users in abnormal condition of weather in the project highway. It is maintained by the Concessionaire. Some of the photographs are presented below.

Figure 3-12 Photographs of Delineator

km. 7+360 (LHS)

km. 11+100 (LHS)

km. 40+400 (LHS)

km. 66+000 (RHS)

km. 68+100 (RHS)

Pedestrian Guard Rail

The pedestrian guard rails are provided at the bus shelters only. It is maintained by the Concessionaire. Some of the photographs of pedestrian guard rails are presented below.

Figure 3-13 Photographs of Pedestrian Guard Rail

km. 2+600 (LHS)

km. 5+700 (LHS)

km. 46+800 (LHS)

km. 71+700 (RHS)

km. 60+550 (RHS)

km. 45+160 (RHS)

Road Land Boundary

Road land (ROW) boundary demarcation is maintained by the Concessionaire on the project highway during the concession period. The road land boundary pillars are being fixed at required locations wherever required. Some of the photographs of boundary pillars are presented below.

Figure 3-14 Photographs of Road Land Boundary

km. 7+260 (LHS)

km. 10+760 (LHS)

km. 13+760 (LHS)

km. 35+500 (LHS)

km. 49+900 (LHS)

km. 73+700 (RHS)

km. 63+450 (RHS)

km. 43+300 (RHS)

km. 38+400 (RHS)

km. 7+860 (RHS)

3.12 Avenue Plantation and Median Plantation

Avenue and median plantation are available along the project highway. Variety of trees and plants are planted throughout the corridor at median and at roadside. Median plantation is maintained along the project highway. The plantation is being done wherever required on regular basis. All plantation is maintained in good condition except some locations of the project highway. Some of the photographs of plantation are presented below.

Figure 3-15 Photographs of Avenue and Median Plantation

km. 0+1100

km. 1+650 (LHS)

km. 4+900 (LHS)

km. 8+160

km. 13+760

km. 21+050

km. 25+100

km. 40+400

km. 44+300

km. 60+000

km. 70+625

km. 70+625 (RHS)

3.13 Project Facilities

Toll Plaza

The Concession Agreement requires construction of Toll Plaza at 1 No. of location. Concessionaire has constructed 1 No. of Toll Plazas at following location.

1. Toll Plaza at km. 61+400

The construction of toll plaza is completed and is in operation. 8 (4+4) Nos. of lanes has been constructed although some work is in progress. Concessionaire has constructed administration, operation and maintenance facility at base camp. All required facilities are available at the toll plaza. Some of the photographs of toll plaza are presented below.

Figure 3-16 Photographs at Toll Plaza

Toll Plaza

Toll Plaza

Admin Building

Crane

Ambulance

DG Room

Toilets

Highway / Medical / Traffic Post at Toll Plaza

Sign Bords

CCTV Camera

Tunnel / passage

High Mast

Truck Lay Byes

There is one rest area cum truck lay bye proposed in the Concession Agreement. Due to land unavailability, the same is not constructed. However, Concessionaire will construct the same as and when land is made available.

Bus Bay and Passenger Shelter

Bus bays and passenger shelters are constructed at the various locations wherever land available along the project highway. As per CA, there are 50 Nos. of bus bays to be constructed with passenger shelters. Due to land problem, Concessionaire has provided bus shelters wherever land available along project highway. Bus bays are equipped with all necessary signage as per relevant IRC guidelines mentioned in Schedule-D of Concession Agreement. The details of the bus bays and passenger shelters provided as below.

Table 3-6 Details of Bus Bays along Project Highway

Sr. No.	Project Facility	Location	Design Requirements	
			LHS	RHS
1	Bus-bay	Start of SH-25 Kuranga	0+000	0+000
2	Bus-bay	BT Road To Suines	2+645	3+245
3	Bus-bay	BT Road To Ganga Sanctuary Village Bamanasa	5+685	5+800
4	Bus-bay	BT Road To Bhatiya Village	12+250	12+800
5	Bus-bay	Nandana Village	17+065	16+815
6	Bus-bay	Limbdi Jnc	23+450	22+950
7	Bus-bay	Juvanpur Village	25+430	25+100
8	Bus-bay	BT Road To Datrana and Hanjdapar	32+240	32+130
9	Bus-bay	BT Road To Hanjdapar	33+475	33+955
10	Bus-bay	To Village Zakasiya and Dhandusar	34+685	35+360
11	Bus-bay	To Village Vadatara	41+380	41+430
12	Bus-bay	To Village Kajurda	43+955	43+820
13	Bus-bay	To Village Hansthal	45+400	45+040
14	Bus-bay	To Viramdad Village	46+440	46+545
15	Bus-bay	To Kuvadiya Village	50+050	50+475
16	Bus-bay	BT Road To Porbander	53+100	53+225
17	Bus-bay	5-leg Jnc	55+945	55+600
18	Bus-bay	BT Road To Khambhaliya	57+570	57+210
19	Bus-bay	BT Road To Lalpur	58+800	58+200

Sr. No.	Project Facility	Location	Design Requirements	
			LHS	RHS
20	Bus-bay	BT Road To Kanchanpur	60+170	60+520
21	Bus-bay	Towards Danta	63+470	63+470
22	Bus-bay	Aradhana Dham	66+675	66+900
23	Bus-bay	BT Road To Motamadha and Vadaliya Sinhan to Vadaliya Sinhan	67+600	67+570
24	Bus-bay	BT Road To Village Kajurda	68+400	68+800
25	Bus-bay	BT Road To Devariya Road	71+500	71+710

4 PAVEMENT AND SITE INVESTIGATION

4.1 General

The project has been developed through on Hybrid (Annuity) mode basis. The concession period of the project is 17.5 years including 2.5 years (912 days) of construction period.

The Concessionaire has applied for issue of Provisional Completion Certificate (PCOD) for the length of 54.210 kms. The operation period of the project highway is 15 years from COD.

4.2 Details of As-built Pavement

The project highway built with the rigid pavement for both main carriageway and service road. The details of the as built pavement crust from pavement design report as submitted by the Company has been tabulated as below:

The rigid pavement is designed for the design life of 30 years and 10% CBR with specifications as per IRC:58-2015.

Table 4-1 Rigid Pavement Details

Location	Panel Size	Crust (mm)	Dowel bar	Tie bar
Main Carriageway (*Existing km. 203+500 to km. 176+500 & km. 171+800 to km. 130+000)	TCS Type - A, B, C, D, E & F Panel Size: 4.5 m x 4.5 m	PQC - 300 DLC - 150 GSB - 150	32 mm dia. Spacing - 300 mm for Contraction & 240 mm for Expansion Joint, Length - 500 mm	12 mm dia. Spacing - 400 mm, Length - 640 mm
	TCS Type - G & H Panel Size: 4.5 m x 3.5 m			12 mm dia. Spacing - 590 mm, Length - 640 mm
Service / Slip Road	TCS F & G Panel Size: 4.5 m x 3.5 m	PQC - 200 DLC - 150 GSB - 150	-	12 mm dia. Spacing - 890 mm, Length - 640 mm

*(Design km. 0+000 to km. 26+800 & km. 31+500 to km. 71+820)

As per CA, following overlay (minimum) is to be laid over existing bituminous road from existing km. 130+000 to km. 125+000 (end of toll road, maintained by M/s L&T Ltd.), section length of 4.6 kms (approx.): Bituminous Concrete: 50 mm and Dense Bituminous Macadam (DBM): 100 mm. However, during site visit it is observed that the above mentioned stretch (Design km. 71+820 to km. 76+270) is constructed with the rigid pavement under COS as recommended by the IE.

4.3 Surveys and Investigation

4.3.1 Pavement Condition Survey

Pavement condition survey was carried out from **7th August 2022 to 10th August 2022** through visual inspection for the entire project length. The details of the visual condition survey are given as under**.** The details of the visual condition survey are provided in **Annexure-IV.**

The summary of pavement condition based on the visual inspection is tabulated below.

Table 4-2 Summary of Pavement Condition (MCW)

Sr. No.	Design Chainage (km)		Length (km)	Visual Condition (As per IRC:115-2014)		Remark
	From	To		LHS Carriageway	RHS Carriageway	
1	0+000	1+000	1.000	Good	Good	
2	1+000	2+000	1.000	Good	Fair/Good	
3	2+000	3+000	1.000	Good	Good	
4	3+000	4+000	1.000	Good	Good	
5	4+000	5+000	1.000	Good	Good	
6	5+000	6+000	1.000	Good	Good	
7	6+000	7+000	1.000	Fair/Good	Good	
8	7+000	8+000	1.000	Fair/Good	Good	
9	8+000	9+000	1.000	Fair/Good	Good	
10	9+000	10+000	1.000	Good	Good	
11	10+000	11+000	1.000	Fair/Good	Good	
12	11+000	12+000	1.000	Good	Good	Partially constructed / single lane RHS due to LA
13	12+000	13+000	1.000	Good	Good	Partially constructed/single lane RHS due to LA
14	13+000	14+000	1.000	Good	Good	
15	14+000	15+000	1.000	Good	Fair/Good	
16	15+000	16+000	1.000	Fair/Good	Good	Partially constructed RHS due to LA
17	16+000	17+000	1.000	Good	Good	
18	17+000	18+000	1.000	Good	Good	Partially constructed RHS due to LA
19	18+000	19+000	1.000	Good	Good	
20	19+000	20+000	1.000	Good	Fair/Good	
21	20+000	21+000	1.000	Good	Good	
22	21+000	22+000	1.000	Good	Good	
23	22+000	23+000	1.000	Good	Good	Partially constructed RHS due to LA
24	23+000	24+000	1.000	Good	Good	Partially Constructed LHS due to LA
25	24+000	25+000	1.000	Good	Good	
26	25+000	26+000	1.000	Good	Good	
27	26+000	27+000	1.000	Good	Good	
28	27+000	28+000	Air Strip and it is not in scope of work			
29	28+000	29+000				
30	29+000	30+000				
31	30+000	31+000				
32	31+000	32+000				
33	32+000	33+000	1.000	Good	Good	
34	33+000	34+000	1.000	Fair / Good	Good	Partially constructed RHS due to LA
35	34+000	35+000	1.000	Good	Good	
36	35+000	36+000	1.000	Good	Good	
37	36+000	37+000	1.000	Fair / Good	Good	
38	37+000	38+000	1.000	Fair / Good	Good	

Sr. No.	Design Chainage (km)		Length (km)	Visual Condition (As per IRC:115-2014)		Remark
	From	To		LHS Carriageway	RHS Carriageway	
39	38+000	39+000	1.000	Fair / Good	Fair / Good	
40	39+000	40+000	1.000	Good	Good	
41	40+000	41+000	1.000	Good	Good	
42	41+000	42+000	1.000	Good	Good	
43	42+000	43+000	1.000	Good	Good	
44	43+000	44+000	1.000	Good	Good	
45	44+000	45+000	1.000	Good	Good	
46	45+000	46+000	1.000	Good	Good	
47	46+000	47+000	1.000	Good	Good	Only single lane constructed LHS due to LA
48	47+000	48+000	1.000	Good	Good	
49	48+000	49+000	1.000	Good	Good	
50	49+000	50+000	1.000	Good	Good	Only single lane constructed RHS due to LA
51	50+000	51+000	1.000	Good	Fair / Good	Only single lane constructed LHS due to LA
52	51+000	52+000	1.000	Good	Good	
53	52+000	53+000	1.000	Good	Fair / Good	
54	53+000	54+000	1.000	Good	Good	
55	54+000	55+000	1.000	Fair / Good	Good	
56	55+000	56+000	1.000	Good	Good	
57	56+000	57+000	1.000	Fair / Good	Good	
58	57+000	58+000	1.000	Good	Good	Only single lane constructed RHS due to LA
59	58+000	59+000	1.000	Good	Good	
60	59+000	60+000	1.000	Good	Good	
61	60+000	61+000	1.000	Good	Good	
62	61+000	62+000	1.000	Good	Good	
63	62+000	63+000	1.000	Good	Fair / Good	
64	63+000	64+000	1.000	Fair / Good	Fair / Good	
65	64+000	65+000	1.000	Fair / Good	Good	
66	65+000	66+000	1.000	Good	Good	
67	66+000	67+000	1.000	Good	Good	
68	67+000	68+000	1.000	Good	Good	
69	68+000	69+000	1.000	Good	Good	Only single lane constructed RHS due to LA
70	69+000	70+000	1.000	Good	Good	
71	70+000	71+000	1.000	Good	Good	
72	71+000	72+000	1.000	Good	Good	
73	72+000	73+000	1.000	Fair / Good	Good	Under COS
74	73+000	74+000	1.000	Good	Good	
75	74+000	75+000	1.000	Good	Good	
76	75+000	76+000	1.000	Good	Good	
77	76+000	76+270	0.270	Good	Good	

Table 4-3 Summary of Pavement Condition (SR)

Sr. No.	Existing Chainage (km)		Design Chainage (km)		Length (km)	Visual Condition (As per IRC:115-2014)		Remark
	From	To	From	To		LHS Carriageway	RHS Carriageway	
1	191+700	190+400	11+800	13+100	1.300	Fair / Good	Fair / Good	Partially Constructed B/S due to LA
2	180+850	179+850	22+500	23+500	1.000	Good	Good	Partially Constructed B/S due to LA
3	149+200	148+120	53+400	54+500	1.100	-	-	De scope
4	147+700	146+970	54+960	55+700	0.740	Good	Good	Partially Constructed- B/S
5	146+970	144+700	55+700	57+900	2.200	Good	Good	Partially completed – B/S
6	144+700	143+450	57+900	59+150	1.250	Fair / Good	Good	Partially completed – B/S
7	139+060	136+800	63+500	65+000	1.500			De Scope

Observation and Conclusion:

From the above table, it is observed that the overall pavement condition for the entire project stretch is found to be fair to good.

Following Photographs were taken at the time of visual pavement condition survey.

Figure 4-1 Photographs of Pavement Condition Survey

LHS

km. 0+600

km. 6+350

km. 8+900

km. 9+900

km. 10+760

km. 25+700

km. 56+650

km. 64+700

km. 72+000

km. 23+400 LA

km. 26+800 Air Strip

km. 32+450 Work in Progress

km. 32+450 Work in Progress

km. 46+000 single lane constructed

km. 50+900 LA

RHS

km. 76+100

km. 63+960

km. 62+700

km. 50+500

km. 38+400

km. 6+000

km. 68+650 LA

km. 57+000 LA

km. 49+760 LA

km. 33+000 LA

km. 26+750 Air Strip

km. 22+360 LA

km. 17+340 LA

km. 16+150 LA

km. 12+500 LA

4.3.2 Roughness Index test

Prior period report for the Roughness Index Test conducted by Aadharshila Infratech Pvt. Ltd. Dated **17th June 2022** has been provided by the Concessionaire. This test was done using Car Mounted Bump Integrator to assess the riding quality on each direction (each lane) of the carriageway of project highway.

As per IRC:SP:16-2019, condition of pavement is categorised under:

Table 4-4 Roughness Value (BI Value - mm / km)

Sr. No.	Roughness Range (mm / km)	Severity	Inner Lane (Lane - 1) LHS Length (km)	Outer Lane (Lane - 2) LHS Length (km)	Inner Lane (Lane - 1) RHS Length (km)	Outer Lane (Lane - 2) RHS Length (km)
1	Less than 2000	Good	54.210	54.210	54.210	54.210
2	2000 - 2400	Fair	-	-	-	-
3	More than 2400	Poor	-	-	-	-

TDD Consultant's Observations:

TDD Consultants have visited the project road along with Mr. Ankur, Manager from Concessionaire on 06th August 2022 to understand the status of the project although site visit / survey conducted between 07-08-22 to 10-08-22. TDD Consultants have the following observations:

1. During survey, it has been come to know that work is under construction and Concessionaire has requested to IE / NHAI for Provisional Completion Certificate. The same is recommended by IE in draft manner and send to RO, NHAI.

2. The project chainages are km. 0.000 to 26.800 & 31.500 to 71.820. In between chainages from km. 26.800 to 31.500 (Air strip) are in scope of another Contractor. Although Concessionaire has done additional MCW length from km. 71.820 to km. 76.270 which is under COS.

3. Concessionaire informed to TDD Consultant that they will establish their O&M office at Bhatia at km. 13+100.

4. Double lane shall be constructed post the required land is handed over to the concessionaire by the authority.

5. There are no ATMS in Toll Plaza. Only TMS provision is given in CA.

6. Concessionaire has completed 90% of the work regarding Toll Plaza System.

7. Avenue plantation has been done as per CA wherever land is available.

8. Concessionaire Informed to TDD Consultant that due to un precedented rainfall in the zone, lots of damages have occurred at site. Hence, they are claiming for insurance which is under estimation at Insurance dept.

9. One VUP and 3 slab box culverts has descoped from the project length.

10. IE has recommended the consolidated COS to NHAI which is under review at NHAI end.

11. Concessionaire has done the all the test results as per schedule-I and submitted to IE. The same has been forward by the IE to RO,

12. To complete the balance work, the Company has sufficient resources at site.

5 BALANCE WORKS

5.1 Introduction

During site visit it has been come to know that work is under construction and Concessionaire has requested / compliance to IE / NHAI for the Provisional Completion Certificate. The same is recommended by IE in draft manner and send to RO, NHAI. IE has recommended for issue of Provisional Completion Certificate draft for the length 54.210 kms on 02-08-2022.

As per details given by the Company, till the end of July 2022 cumulative 87.07% of physical progress achieved. The balance work is as listed in below table.

Table 5-1 Balance work details

Sr. No.	Balance work details	Unit	Quantity
1	**Earthwork up to top of the sub-grade**	km	1.73
2	**Granular work (sub- base, shoulders)**		
a	GSB	km	1.98
3	**Shoulders**	km	12.94
4	**Rigid Pavement**		
a	DLC	km	2.78
b	PQC	km	4.11
5	**Widening and repair of culverts**	No	2.00
6	**Culverts**	No	7.50
7	Reinforced Earth Wall (includes Approaches of ROB, Underpasses, Overpasses, Flyover etc.	Sqm	1,130.35
	Other Works		
1	**Service roads / Slip Roads**	km	4.74
2	**Roadside drains**	km	12.47
3	**Road signs, markings, km stones, safety devices**		
a	Road signs, markings, km stones	km	47.18
4	**Project facilities**		
a	Bus bays	No	33.00
b	Truck lay-byes	No	2.00
c	Rest areas	No	
5	**Roadside plantation, median plantation and Transplantation**	km	32.81
6	**Protection works**		
a	Boulder Pitching on slopes	km	0.74
7	**Miscellaneous**		
a	Junctions	No	18.00
b	Kerb	Lkm	13.17
c	Median Fill	km	12.83
d	Others	LS	1.00

6 REVIEW OF CONCESSION AGREEMENT

6.1 General

The NHAI accordance with the statutory powers vested on it by the Government of India has entered into a Concession Agreement with the **M/s. GR Dwarka Devariya Highway Pvt. Ltd., a** Special Purpose Vehicle (SPV) formed for implementing this project, a company incorporated under Indian Companies Act, 2013 for Four Laining of Dwarka (Kurangak Khambhallya - Devariya section from km. 203+500 to km. 176+500 and from km. 171+800 to km. 125+000 (design length 71.890 kms) of NH-151A in the state of Gujarat under Bharatmala project on Hybrid Annuity Mode (Package-I).

The Documents we studied from the point of interest of Lenders and our comments on Concession Agreement are given below.

6.2 Specific Comments on Articles

We have reviewed the provisions under various clauses of the Agreement and our specific comments are indicated below clause-wise.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 3 Clause 3.1.1	The Concession	Subject to and in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits, the Authority hereby grants to the Concessionaire the concession set forth herein including the exclusive right, license and authority to construct, operate and maintain the Project (the "**Concession**") during the Construction Period of 912 (Seven Hundred and thirty) days and Operation Period of 15 (Fifteen) years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.	The Concessionaire has to complete the construction work in 912 days. The Operation Period is 15 Years from COD.
Article 4 Clause 4.1.2	Conditions Precedent-Damages for delay by the Authority	The Conditions Precedent required to be satisfied by the Authority shall be deemed to have been fulfilled when the Authority shall have: (a) procured for the Concessionaire the Right of Way to the Site in accordance with the provisions of Clauses 10.3.1 and 10.3.2. (b) procured all Applicable Permits relating to environmental protection, and conservation in respect land forming part of the	The Authority has to complete activities like Land Acquisition, Environmental, Forest Clearances, Tree cutting and Approval to GAD of ROB prior to Appointment Date. This will complete the work within stipulated date of completion.

Article & Clause No.	Subject	Description in Brief	Remarks
		Right of Way under Clause 10.3.1 and 10.3.2. (c) procured forest clearance for and in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2, save and except permission for cutting trees; and (d) procured approval of the General Arrangement Drawings for the road over bridges/under bridges at level crossings on the Project.	
Article 4 Clause 4.2	Conditions Precedent-Damages for delay by the Authority	In the event that (i) the Authority does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.2% (zero point two per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent, subject to the maximum limit equal to the amount of bid security and upon reaching such limit, the Concessionaire may, in its sole discretion terminate the Agreement.	The Concessionaire should follow up all issues in Cl.4.1.2 so that situation of damage or termination does not arise and delay the project.
Article 4 Clause 4.3	Damages for delay by the concessionaire	In the event that (i) the Concessionaire does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.3 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of failure to fulfill the obligations under Clause 4.1.2 or other breach of this Agreement by the Authority, or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.3% (zero point three per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent.	Follow up by Concessionaire is these actions is required to avoid the delay and damages.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 5 Clause 5.1.4 (d, e & f)	Obligation of the Concessionaire	The Concessionaire shall, at its own cost and expense, in addition to and not in derogation of its obligations elsewhere set out in this Agreement: d) The Concessionaire shall make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement. e) Make reasonable efforts to facilitate the acquisition of land required for the purposes of the Agreement f) Ensure and procure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Concessionaire's obligations under this agreement.	The Concessionaire shall follow up these issues for achieving COD timely.
Article 8 Clause 8.1.5	Disclaimer	Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the Authority shall not be liable in any manner for such risks or the consequences thereof.	The Concessionaire shall note this and perform according to Concession Agreement. Provision to avoid consequences as all risk is with Concessionaire
Article 9 Clause 9.1.1	Performance Security	The Concessionaire shall, for the performance of its obligations hereunder during the Construction Period, provide to the Authority no later than 30 (thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank for a sum equivalent to Rs. 55.05 crore (Rupees Fifty Five crore and Five Lakhs only) in the form set forth in Schedule-F (the "Performance Security"). Until such time the Performance Security is provided by the Concessionaire pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security pursuant hereto, the Authority shall	The Concessionaire should perform as per Agreement to safeguard the Performance Security of Rs. 55.05 Crores in forms of Bank Guarantee.

Article & Clause No.	Subject	Description in Brief	Remarks
		release the Bid Security to the Concessionaire.	
Article 10 Clause 10.3.2	Procurement of the site -	Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree that on or prior to the Appointment Date, the Authority shall have granted vacant access and Right of Way such that the Appendix shall not include land which shall in any manner prevent the Concessionaire from undertaking construction of the project to the extent of at least 80% (eighty percent) of the length thereof, and in the event Financial Close is delayed on account of delay in grant of such vacant access and Right of Way, the Authority shall be liable to payable to damages solely under the provisions of Clause 4.2.	The Concessionaire shall confirm that total 80% of length is available to work at the time of Appointment date. The follow up is necessary to get balance land earliest for timely completion.
Article 10 Clause 10.3.4	Procurement of the site-Right of Way	The Authority shall make best efforts to procure and grant, no later than 90 (ninety) days from the Appointed Date, the Right of Way to the Concessionaire in respect of all land included in the Appendix, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Concessionaire, it shall pay to the Concessionaire Damages in a sum calculated at the rate of Re. 1 Rupee one) per day for every 10 (ten) square meters or part thereof, commencing from the 91st (ninety first) day of the Appointed Date and until such Right of Way is procured or 180 (one hundred and eighty) days from the Appointed Date whichever is earlier.	The provision of payment of damages is small as compared with the loss due to delay in availability of land. Hence follow up by Concessionaire to get balance ROW is required to avoid delay the work
Article 11 Clause 11.4	Utilities, Associated Roads and Trees-Felling of trees	The Authority shall assist the Concessionaire in obtaining the Applicable Permits for felling of trees to be identified by the Authority for this purpose if and only if such trees cause a material adverse effect on the construction, operation, or maintenance of the Project Highway. The cost of such felling shall be borne by the Authority, and in the event of any delay in felling thereof for reasons beyond the control of the	Tree cutting may delay the project. Hence such situation needs to be avoided with follow up and obtaining the permission timely.

Article & Clause No.	Subject	Description in Brief	Remarks
		Concessionaire, it shall be excused for failure to perform any of its obligations hereunder if such failure is a direct consequence of delay in the felling of trees.	
Article 12 Clause 12.3.1	Construction of the Project	On or after the Appointed Date, the Concessionaire shall undertake construction of the Project as specified in Schedule-B and Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D. The 912th (nine hundred and twelfth) day from the Appointed Date shall be the scheduled date for completion of the Project (the "Scheduled Completion Date") and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	The Concessionaire has to complete the project within 912 days from Appointed Date. However, Concessionaire has received EOT for 180 days.
Article 12 Clause 12.3.2	Construction of the Project Highway and Mile Stone	The Concessionaire shall construct the Project Highway in accordance with the Project Completion schedule set forth in Schedule-G. In the event that the Concessionaire fails to achieve any Project Milestone within a period of 90 (ninety) days from the date set forth for such Milestone in Schedule G, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, it shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one percent) of the amount of performance Security for delay of each day until such Milestone is achieved.	The Concessionaire shall avoid such situations (payment of LD) by achieving Milestone timely. Milestone Payments are being received on time.
Article 12 Clause 12.3.3	Construction of the Project Highway and Mile Stone	In the event that the project is not completed and COD does not occur within 270 (two hundred and seventy) days from the Scheduled Completion Date, unless the delay is on account of reasons solely attributable to the Authority or due to Force Majeure, the Authority shall be entitled to terminate this Agreement.	The Concessionaire shall achieve COD timely to avoid such situation of Termination of Agreement.
Article 13 Clause 13.2	Monitoring of Construction - Inspection	During the construction period, the Independent Engineer shall inspect the Project at least once a month	The Concessionaire has to maintain quality of work as per

Article & Clause No.	Subject	Description in Brief	Remarks
		and make a report of such inspection (the "Inspection Report") stating in reasonable detail the defects or deficiencies, if any, with particular reference to the Project Completion Schedule, Scope of the Project and specifications and standard.	standard and specifications of CA. The Independent Engineer will control by Regular Inspector.
Article 14 Clause 14.3.2	Provisional Certificate	The Parties hereto expressly agree that a Provisional Certificate under this Clause 14.3 may, upon request of the Concessionaire to this effect, be issued for operating part of t he Project, if the Concessionaire has completed construction of 100% (Hundred per cent) of the Site made available to the Concessionaire up to 180 days from the Appointed Date. Upon issue of such Provisional Certificate, the provisions of Article 15 shall apply to such completed part, and the rights and obligations of the Concessionaire for and in respect of such completed part of the Project shall be construed accordingly.	This Clause covers the risk and give relief to Concessionaire and Lender in case full Project Completion is delayed due to land or utility problems. The Concessionaire has to complete 100% work on site made available upto 180 days from Appointment Date.
Article 15 Clause 15.2	Entry into commercial service- Damages for delay	Subject to the provisions of Clause 12.3, if COD does not occur prior to the 91st (ninety first) day after the Scheduled completion Date, unless the delay is on account of reasons attributable to the Authority or due to force Majeure, the Concessionaire shall pay Damages to the Authority in a sum calculated at the rate of 0.2% of the amount of performance Security for delay of each day until COD is achieved.	The Concessionaire shall note this provision of L.D. and avoid such situation of delay by achieving COD within stipulated time
Article 18 Clause 18.1.1	Safety Requirements	The Concessionaire shall comply with the provisions of this Agreement, Applicable Laws and Applicable Permits and conform to Good Industry Practice for securing the safety of the Users. In particular, the Concessionaire shall develop, implement and administer a surveillance and safety program for providing a safe environment on or about the Project, and shall comply with the safety requirements set forth in Schedule-L (the **"Safety Requirements").**	The safety of users is given priority and importance.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 23 Clause 23.1	Bid Project cost	The Parties expressly agree that the cost of construction of the Project, as on the Bid Date, which is due and payable by the Authority to the Concessionaire, shall be deemed to be Rs. 1101.00 Crores (Rupees Eleven Hundred One Crore only) (The " Bid Project Cost ")	The Concessionaire shall note this cost of project and complete work within this cost of Rs. 981 crores Variation in price index is payable.
Article 23 Clause 23.3.1	Payment of Bid Project Cost	40% (forty per cent)] of the Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable to the Concessionaire in 5 (five) equal installments of (8% (eight per cent) each during the Construction Period in accordance with the provisions of Clause 23.4.	This is Financial support to Concessionaire from Authority for planned progress during construction.
Article 23 Clause 23.4	Payment during construction period	For the purpose of this Clause 23.4, the Payment Milestone for release of payment during Construction Period shall be as under: a) I (first) Payment Milestone - On achievement of 10% Physical Progress b) II (second) Payment Milestone - On achievement of 30% Physical Progress c) Ill (third) Payment Milestone - On achievement of 50% Physical Progress d) IV (fourth) Payment Milestone - On achievement of 75% Physical Progress e) V (fifth) Payment Milestone - On achievement of 90% Physical Progress	This financial supports to the Concessionaire in instalments during construction for progress and timely completion.
Article 23 Clause 23.5	Bonus on early completion	In the event that the Concessionaire shall achieve COD on or more than 30 (thirty) days prior to the Scheduled Completion Date, the Authority shall pay to the Concessionaire a bonus equal to 0.5% of 60 % of the Bid Project Cost for the first 30 days by which COD shall precede the Scheduled Completion Date and thereafter the said bonus shall be calculated on the pro-rata basis for each day preceding the said 30 days period. The Bonus shall be due and payable	This provision of Bonus will encourage the Concessionaire for early completion of work.

Article & Clause No.	Subject	Description in Brief	Remarks
		to the Concessionaire along with the 1st Annuity Payment.	
Article 23 Clause 23.6.2	Annuity Payments during operation period	The Completion Cost remaining to be paid in pursuance of the provisions of Clause 23.6.1 shall be due and payable in biannual installments over a period of 15 (fifteen) years commencing from COD, (the "Annuity Payments").	This is for the returns of balance investment, expense, overhead, profit etc, of Concessionaire.
Article 23 Clause 23.7.1	O & M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the Authority, which shall be computed on Rs. 3.50 Crore (Rupees Three Crore Fifty Lakh only) (the "First Year O&M Cost") £, in accordance with the provisions of this Clause 23.7 {the "O&M Payments"). The Parties further acknowledge and agree that any O&M Expenses in excess of the O&M Payments shall be borne solely by the Concessionaire, save and except as expressly provided in this Agreement. For avoidance of doubt it is clarified that the O&M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.	Expenses towards O&M shall be the responsibility of Concessionaire and biannual O&M payments shall be of Authority.
Article 23 Clause 23.8	Mobilization Advance	The Authority shall, on request of the Concessionaire, make an advance payment in a sum not exceeding 10% (ten per cent) of the Bid Project Cost (the "Mobilization Advance"). This advance payment shall be made in two equal instalments. The Concessionaire may request the Authority for the first instalment of the advance payment at any time after the Appointed Date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority. The Concessionaire may request the Authority for the second instalment of the advance payment at any time, after 60 (sixty) days from the Appointed Date, along with	The 10% Mobilization Advance is financial support to Concessionaire for timely start and progress the work. The Bank Guarantee is to be submitted by Concessionaire to Authority for security.

Article & Clause No.	Subject	Description in Brief	Remarks
		furnishing a Bank Guarantee in a form satisfactory to the Authority.	
Article 26 Clause 26.1	Insurance during Concession Period	The Concessionaire shall effect and maintain at its own cost, during the Construction Period and the Operation Period, such insurances for such maximum sums as may be required under the Financing Agreements and Applicable Laws, and such insurances as may be necessary or prudent in accordance with Good Industry Practice. The Concessionaire shall also effect and maintain such insurances as may be necessary for mitigating the risks that may devolve on the Authority as a consequence of any act or omission of the Concessionaire during the Construction Period. The Concessionaire shall procure that in each insurance policy, the Authority shall be a co-insured and that the insurer shall pay the proceeds of insurance into the Escrow Account.	The Concessionaire, has taken all Insurances.
Article 31 Clause 31.1.2	Termination	Without prejudice any other rights or remedies which the Authority may have under this Agreement, upon occurrence of a Concessionaire Default, the Authority shall be entitled to terminate this Agreement by issuing a Termination Notice to the Concessionaire; provided that before issuing the Termination Notice, the Authority shall by a notice inform the Concessionaire of its intention to issue such Termination Notice and grant 15 (fifteen) days to the Concessionaire to make a representation, and may after the expiry of such 15 (fifteen) days, whether or not it is in receipt of such representation, issue the Termination Notice, subject to provision of Clause 31.1.3.	The Concessionaire shall note the provisions of Termination and take care by not doing any default.
Article 34 Clause 34.3.1	Substitution Agreement	The Lender's Representative, on behalf of Senior Lenders, may exercise the right to substitute the Concessionaire pursuant to the agreement for substitution of the Concessionaire (the '**Substitution Agreement**') to be entered into	The Lender's risk and interest is covered with provision of Substitution Agreement.

Article & Clause No.	Subject	Description in Brief	Remarks
		amongst the Concessionaire, the Authority and the Lenders' Representative, on behalf of Senior Lenders, Substantially in the form set forth in Schedule-R.	
Article 38.3 Clause 38.3.1	Arbitration	Any Dispute which is not resolved amicably by conciliation, as provided in Clause 38.2, shall be finally decided by reference to arbitration by an arbitral tribunal constituted in accordance with Clause 38.3 .2. Such arbitration shall be held in accordance with the Rules of Society for Affordable Redressal of Disputes ("SAROD"), New Delhi (the "Rules"), or such other rules as may be mutually agreed by the Parties, and shall be subject to the provisions of the Arbitration and Conciliation Act, 1996.	The provision of Arbitration will help to solve unresolved dispute between concessionaire and Authority.
Article 41.17	State Support Agreement	The concessionaire acknowledges that it has received from the Authority a certified true copy of the agreement executed between MoRTH and the State Government for providing the support and services specified therein (the "State Support Agreement"), and the Parties hereto agree to make their best endeavors to procure the support of the State Government.	This provision will help the Concessionaire for obtaining permission, approval and land acquisition faster and for timely completion of work.

Most of the points above are brought out to see that the Agreement is generally enforceable in law without ambiguities.

6.3 Conclusions

The Concession Agreement is comprehensive and covers most of the concerns of Lenders and all risk factors.

7 OPERATION AND MAINTENANCE

7.1 Introduction

Article 17 and Schedule-K of the Concession Agreement defines the Operation and Maintenance requirement during concession period.

During site visit it has been come to know that work is under construction and Concessionaire has requested for Provisional Completion Certificate for the project road. The same is recommended by IE in draft manner and send to RO, NHAI on 02-08-2022. TDD Consultant has considered that the project is currently under O&M stage. The O&M of the project highway is 15 years from COD.

7.2 O & M Set Up

O & M Contract

As per Clause 17.1 of the Concession Agreement, the Concessionaire shall operate and maintain the project by itself, or through O&M Contractors and if required, modify, repair, improve the project highway to comply with Specifications and Standards, and other requirements set forth in the Agreement through Good Industry Practice, Applicable Laws and Applicable Permits and manufacturer's guidelines and instructions with respect to toll systems. The Operation and Maintenance activities will confirm to all the requirements laid down in MORT&H, IRC Specifications and the Concession Agreement.

Under routine maintenance, the road is to be maintained in good, safe and motorable condition. The specifications in contracts are kept as same as per design and construction specification.

The periodical maintenance will have to be done during O&M period as per requirement of Concession Agreement and as per site requirement to maintain the design standards and level.

Details of Maintenance Staff

The details of maintenance staff as provided by the Company is presented below. The team controls the maintenance activities along with other supporting staff.

Table 7-1 Details of Maintenance Staff

Sr. No.	Responsibilities	Name
1.	O&M In-Charge	Mr. Phool Chand
2.	Route Patrol Officer	i) Mr. Sanjay Singh ii) Mr. Dashrath Bhai
3.	O&M Supervisors	i) Mr. Sachin Anand Mishra ii) Mr. Sunil Kumar Meena
4.	Medical Attendants	iii) Mr. Aman Patel iv) Mr. Hari Liriya

Sr. No.	Responsibilities	Name
5.	Drivers	i) Mr. Norat Ram ii) Mr. Rajendra Kumar Meena iii) Mr. Bajrang Singh iv) Mr. Samat Kariya v) Mr. Mahesh Yogi vi) Mr. Nakum Arjanbhai vii) Mr. Pramod Kumar viii) Mr. Devsi Bhai Sutreja ix) Mr. Babulal Meena x) Mr. Dalveer Singh xi) Mr. Laxman Singh xii) Mr. Budhani Yaseen
6.	Electrician	i) Mr. Sanjay Singh
7.	Administration & Accounts, In-Charge	i) Mr. Mahesh Kumar ii) Mr. Dinesh Kumar
8.	In-charge HSMU	i) Mr. Raniya Rizvan

Note: As informed by the Company, there are enough manpower to complete the balance work at Site.

7.3 Operation Cost

Operations cost is comprised of manpower cost, power and electricity cost, office operating expenses, vehicle running expenses, administrative expenses and other miscellaneous expenses. The Concessionaire has provided the expenses occurred towards operation expenses for current year. Necessary assumptions have made from the expenses of similar type of projects to arrive at the operation cost. The estimates are projected based on best industry practice and are compared with the operating cost in the vicinity of the project area.

The estimated operating cost for the base month of August 2022 is **Rs. 4.83 Crores**. The detailed working of the same is attached in **Annexure-I**.

7.4 Routine Maintenance Cost

The Routine Maintenance cost is derived based on the Ministry of Road Transport and Highways - Report of the Committee on Norms for Maintenance of Roads in India (published by Indian Road Congress New Delhi 2001) along with actual pavement condition assessed during condition survey.

Maintenance cost constitutes the routine, day-to-day maintenance activities for project assets, including road pavement, shoulders, embankment, drainage, structures, plantations, roadside furniture, traffic signs, traffic safety devices etc., Past data has been used to assess maintenance costs due to normal usage or “wear-and-tear”. Likely costs of maintenance of structures are assessed based on their present condition and vintage, in combination with well-established guidelines and thumb rules given in Indian codes and standards.

The estimated cost of Routine Maintenance works out to be **Rs. 1.09 Crores (1.52 Lakhs per km)** for the base month of August 2022. The detailed working of the same is attached in **Annexure-II**.

7.5 Major Maintenance Cost

Unlike the old Concession Agreements where periodicity and threshold limits were clearly described for the major maintenance, the Concession Agreement of this project does not specify the periodicity or the threshold limits for carrying out the full-length major maintenance. Schedule-K of the Concession Agreement specifies the threshold limits and the timelines for carrying out repairs to the distresses during the operation period.

The maintenance thus can be carried out as and when required basis and to the compliance of Schedule-K requirement to maintain the road in serviceable condition. Only improvement to Riding Quality is expected if the roughness value exceeds 2750 mm/km. However, the average roughness value of the project highway lies within the limit as mentioned above.

Any New pavement is not expected to show any distresses at least for 6 to 7 years with the proper routine maintenance. Mere Routine Maintenance would suffice to meet the performance standard mentioned in Schedule-K. In this project, there is no specific requirement to carry out the major maintenance at the end of concession period.

Hence, major maintenance is planned every 7th year from the date of COD till end of concession period.

The summary of the major maintenance planned up to end of concession period is presented in the below table.

The total base cost of major maintenance works out to be **Rs. 18.49 Crores** for the base year of base month of August 2022. The detailed working for the same is shown in **Annexure-III**.

7.6 Paved Shoulders

As per design specifications, the paved shoulder is designed as an integral part of the pavement for main carriageway. Therefore, the total pavement thickness in paved shoulder would be the same as in the carriageway.

7.7 Summary of Major Maintenance Cycle

The table below shows the major maintenance cycle throughout the concession period for the project stretch.

Table 7-2 Maintenance Cycle

Sr. No.	Year	Main Carriageway	Service Road
1	FY 2023	-	-
2	FY 2024	-	
3	FY 2025	-	-
4	FY 2026	-	-
5	FY 2027	-	-
6	FY 2028	-	-
7	FY 2029	1st Major Maintenance	-
8	FY 2030	1st Major Maintenance	1st Major Maintenance
9	FY 2031	-	-
10	FY 2032	-	-

Sr. No.	Year	Main Carriageway	Service Road
11	FY 2033	-	-
12	FY 2034	-	-
13	FY 2035	-	-
14	FY 2036	2nd Major Maintenance	-
15	FY 2037	2nd Major Maintenance	2nd Major Maintenance
16	FY 2038	-	-

7.8 Projected Maintenance Cost without escalation

The below table shows the total cost of operation and routine maintenance, major maintenance up to end of the concession period without escalation.

Table 7-3 Summary of Operation & Maintenance Cost without escalation

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
1	**Total Operation and Routine Maintenance Cost**	71.57	Every year	8.26	**5.91**
2	**Major Maintenance Cost**				
i)	1st major maintenance	71.57	FY 2029	12.92	**9.245**
ii)	2nd major maintenance	71.57	FY 2036	12.92	**9.245**
	Total Major Maintenance Cost				**18.49**

Notes:

1. It is to be noted that, the rates considered for calculating all the above cost are exclusive of Goods and Service Tax (GST).
2. The estimated cost in table above is for base month of August 2022 i.e., till 31st August 2022.
3. The material rates are based on SOR of Govt. of Gujrat NH Division Rajkot for the year 2015-2016. The plant & machinery rates are adopted from the revised standard data book 2019 and escalated @ 5% every year. The current market rates are considered for bitumen, cement and steel.
4. The labour rate adopted from Govt. of India, Ministry of Labour and Employment Office of the Chief Labour Commissioner (C) w.e.f. 29/07/2022.

7.9 Projected Maintenance Cost with escalation

The below table shows the total cost of operation and routine maintenance and major maintenance cost up to end of the concession period with assumed escalation of 5% every year.

Table 7-4 Summary of Operation & Maintenance Cost with escalation

Sr. No.	Year	WPI Inflation	Total O&M Cost (Crores)	Major Maintenance Cost (Crores)
1	FY 2023		3.94	-
2	FY 2024	2.87*%	6.08	-
3	FY 2025	5.00%	6.39	-
4	FY 2026	5.00%	6.71	-
5	FY 2027	5.00%	7.04	-
6	FY 2028	5.00%	7.39	-
7	FY 2029	5.00%	7.76	6.07

Sr. No.	Year	WPI Inflation	Total O&M Cost (Crores)	Major Maintenance Cost (Crores)
8	FY 2030	5.00%	8.15	6.37
9	FY 2031	5.00%	8.56	-
10	FY 2032	5.00%	8.99	-
11	FY 2033	5.00%	9.44	-
12	FY 2034	5.00%	9.91	-
13	FY 2035	5.00%	10.40	-
14	FY 2036	5.00%	10.92	8.54
15	FY 2037	5.00%	11.47	8.97
16	FY 2038	5.00%	4.01	-
	Total Cost (Crores)		**127.18**	**29.95**

* Considering the base month for calculation as August 2022.

The company may carry out necessary investigation prior to O&M and Major Maintenance. This will help in proper assessment of maintenance work based on the actual pavement condition. The spending on major maintenance can then be reduced if the road is adequately and timely maintained.

8 TOLL PLAZA EQUIPMENT STATUS & ATMS

An assessment of Toll Plaza in terms of nos. of lanes, Toll Collection System installed and working status is carried out based on Section 10 of IRC:SP:84-2014 (The Manual) and the Authority's requirements of Hybrid ETC System. There is no ATMS specified as part of facilities in Schedule-C of CA.

8.1 Toll Plaza and Toll Collection System

Toll plaza is provided at km. 61+400 at Dharampur Danta. Toll Management System installed at the toll plaza is provided by Qualix Ltd.

Toll Plaza layout is based on NHAI's latest policy wherein toll booths with cash payment option is provided only on the outer extra-wide lane on each direction. The toll plaza has 3+3 normal lanes without cash option and 1+1 Extra wide lanes. Views of the toll plaza are shown in Figure below.

Figure 8-1 Views of Dharampur Dante Toll Plaza

8.2 Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

1. RFID ETC Transceiver
2. Lane Controller with Industrial PC
3. AVC Sensors
4. Automatic Lane Barrier (ALB)
5. Incident Capture Camera
6. Overhead Lane Signals
7. Traffic Lights
8. Toll Booth Equipment

8.2.1 RFID ETC Transceiver

RFID ETC Transceiver reads tags installed on the windshield of vehicles and mounted on a pole at about 6 m height. Handheld RFID readers are provided (1 no. in each direction) in case a tag is not detected by the fixed reader.

Figure 8-2 RFID Scanner located on pole

8.2.2 Lane Controller with Industrial PC

Lane controller with industrial Grade computer contains the basic electronic equipment needed for the lane to operate, such as CPU, memory, disks, I/O cards, interface cards, inductive loop controllers, etc. The computer has Intel i3 Processor, storage of 1 TB HDD SATA, DDR4 4 GB RAM.

Toll Lane Controllers for lanes without booths are placed side by side with separate enclosures while it is located inside toll booth on extra wide lanes. These are connected to the common server and are capable of independent storage of data.

Figure 8-3 Lane Controllers for normal ETC lanes

8.2.3 Automatic Vehicle Classification (AVC) Profiler and Sensors

The AVC equipment comprises of a pair of laser profilers & axle counters and inductive loops. When the vehicle enters in AVC profiler range & loop gets activated, 2 D image of the vehicle is generated which is compared with the stored images in the system and classified accordingly.

8.2.4 Automatic Lane Barrier

Boom barriers installed on all lanes are in working condition and have a working time of 0.5 seconds. Automatic Lane Barrier is used to allow only authorized vehicles to pass through the lane. The barrier is activated only on generation of user fee receipt or other relevant vehicle processing activity. A torque motor powers the barrier for raising and lowering the boom. The motor can be blocked at any position without causing any damage. In the event of power failure, the boom is automatically raised. The boom weight is exactly balanced by built-in springs.

8.2.5 Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. The LTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done; the LTL turns Green to instruct the vehicle to pass through the lane.
The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The user fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

Figure 8-4 Lane Traffic Light (LTL) and User Fare Display (UFD)

8.2.6 Incident Capture Camera (AVC Camera)

The incident capture camera is installed on island of the booth to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.

8.2.7 License Plate Image Capture Camera (LPIC)

License Plate Image capture camera is installed on a 3m pole facing incoming vehicle to capture the image of the vehicle number plate.

8.2.8 Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane “Open” and “Close” sign consists of a pair of “GREEN” (arrow) and “RED” (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed.

Figure 8-5 Over Head Lane Signal (OHLS)

8.2.9 Toll Booth Equipment

Toll booths are provided on one lane (extra wide lane) in each direction. The equipment provided are:

- Toll Collector Display (Operator Monitor)
- Customized Industrial Keyboard
- Receipt Printer
- Intercom Slave unit
- Bar code reader
- Violation Light and alarm
- Manual Booth Control (MBC)
- Booth Camera

The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a programmable keyboard for Registration of toll operations and is customized for different vehicle types and type of ticket.

Figure 8-6 Booth Equipment

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Violation system has an alarm switch which is triggered whenever there is a violation such as run-through happening on the lane. When there is an emergency, a foot switch pressed by the booth operator alerts the control room.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room. Manual Booth Controller is used to release exempt vehicles.

8.2.10 Medium Speed Weigh in Motion (MSWIM)

Medium Speed Weigh in Motion (MSWIM) is installed on entry lanes with a platform size of 1500mm x 620mm for normal lanes and 1750mm x 620mm for extra wide lanes and capacity of 30 ton/axle. Bending plate strain gauge technology is used with hardware and software support to calculate weight of vehicles running through it up to a speed of 50 km/hr.

Figure 8-7 Medium Speed Weigh in Motion (MSWIM)

8.3 Plaza Equipment

8.3.1 Plaza Server

Plaza Server is provided in a hot standby configuration (8 Core Intel® Xeon® E5-2620v4, 2.1 GHz, 2.1 GHz) and provided with 42 U switch rack, 16 port non POE network switch and 8 Port PoE switch. UPS-6 KVA is available for Plaza whereas 3 KVA is available for the lanes.

Figure 8-8 Control Room Equipment - Server & Switch rack/UPS Room

8.3.2 55" LED screen for CCTV monitoring

55" LED screen for CCTV monitoring installed at the toll plaza admin block provides view of all the toll booths , important zones within the plaza where cash transactions take place (server room, control room, cash up).

Figure 8-9 CCTV screen at the Toll Plaza Control Room

The toll plaza manager is able to observe the activities at the toll lanes and toll booth. When the toll collector calls up on the intercom, the manager is able to comprehend the situation at the lane by a zoomed view of the particular lane.

8.3.3 Workstations in Control Room, PoS and Cash up room

Workstations are available in control room (LSDU, audit), cash up and PoS with intel core i5 CPU, 8 GB RAM and 1 TB HDD.

Figure 8-10 Workstations at Control room

8.4 Adequacy of Toll Collection System and ATMS

- Adequacy - The software and hardware as a part of Toll Collection and Management System is installed.

- Advanced Traffic Management System (ATMS) is not available on the project highway. The same is not mentioned in Schedule C Project Facilities.

9 ACCIDENT DATA ANALYSIS

Accident Data Records for the project have been studied in order to analyze the nature of accidents occurring on the stretch and identify blackspots. However, work is still under construction and final data can be collected after completion of the work.

9.1 Accident Trend

Accident data for the period of June 2022 has been made available for analysis. 21 Accidents have occurred out of which 3 nos. were fatal, and 02 nos. were minor, 01 no. major. More number of accidents have occurred during the evening to night-time. Monthly data analysis does not show any consistent seasonal trend. Over speeding has been recorded as a major cause of accident which alone or in combination with faulty driver behaviour.

9.2 Blackspots Identification

There is no black spot found in the project stretch. However, the details of accidents in the project length are given in table below:

Table 9-1 Accidents details on Project Road

Sl. No	Date	Chainage (km)	Time of Accident	Sex (M/F)	No. of affected Persons			Help Provided by
					Fatal	Major	Minor	
1.	02-06-2022	48+500	9:00 AM	M/F	1	0	1	Public
2.	11-06-2022	65+200	10:30 AM	M	0	0	1	Public
3.	04-06-2022	17+500	06:15 PM	M	0	1	0	Public
4.	09-06-2022	5+900	04:00 PM	M	1	0	0	Public
5.	12-06-2022	23+100	12:00 PM	M	1	0	0	Public

9.3 Conclusions & Recommendations

As the work is under construction and final assessment can be done after work completion. Company informed that all accidents occur due to over speeding and uncontrolled driving on the highway. Hence, there are no black spot detected from IE as well as from Concessionaire. However, Concessionaire needs to maintain all road furniture as per schedule given in CA.

Annexures

Annexure I : Operation Cost

Sr. No.	Particulars	Cost per Annum (Rs)	Cost per Annum (Cr)
1	Incidental Management Expenses		
a	*Ambulance - 1 Nos.*	1,894,868	0.19
b	*Patrolling Vehcile - 2 Nos.*	4,045,539	0.40
c	*Crane - 1 Nos.*	1,529,089	0.15
d	*Other Vehicle - 2 Nos.*	1,186,970	0.12
e	*JCB - 1 Nos.*	841,617	0.08
f	*Corridor Manager & Officer*	953,280	0.10
2	Maintenance Staff Expenses	6,600,000	0.66
3	Routine Maintenance Cost (Civil Works)	10,876,496	1.09
4	Professional & IE Fee	5,630,261	0.56
5	Insurance Expenses	9,447,240	0.94
6	Staff Welfare Expenses	622,659	0.06
7	Electricity Expenses + Maintenance of parts	9,342,869	0.93
8	ATMS Expenses	3,864,780	0.39
9	Contingency @ 5% (Excl. Civil works)	2,297,959	0.23
	Total Cost (Rs)	**59,133,628**	**5.91**
	Per km Cost (Lakh)		**8.26**

Annexure II : Routine Maintenance Cost

Routine Maintenance Cost	
Ordinary Repair Cost for Rigid	**1,08,76,496.04**
(Exclusive of GST)	**= 1.52 lakhs per km**

CONVERSION FACTORS									
National Highways / State Highways - Rigid Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Rigid Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				95,120	**1,10,126**				
						Normal	**Urban**	**Normal**	**Urban**
1	Four-lane with divided carriageway	Without paved shoulder	1.53	145534.00	168492.00	-	-	-	-
		Paved shoulder	1.70	161704.00	187214.00	64.08	-	1,03,61,992.32	-
2	Four-lane with divided carriageway and service lane on either side	Without paved shoulder	2.00	190240.00	220251.00	-	-	-	-
		Paved shoulder	2.20	209264.00	242276.00		6.49	-	15,72,371.24
3	Six lanes with divided carriageway	without Paved shoulder	2.43	231142.00	267605.00	-	-	-	-
		with Paved shoulder	2.60	247312.00	286327.00	1.00	-	2,47,312.00	-
					TOTAL		**71.570**		**1,21,81,675.56**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.00%
	Volume (cum)			0.00
	Rs/m^3			10360
	Cost in Rupees			0
	ii) Patch repair	100 % Patch less	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			414
	Cost in Rupees			0
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			84
	Cost in Rupees			4,220
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			57
	Cost in Rupees			4,270
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	0.00%
	Area (sqm)			0
	Rs/m^2			414
	Cost in Rupees			0
	v) Road marking	7%	Once in 15 year & @ Repaired location	10258
	vi) Joint Sealant Repair/Replacement	5%		16115

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity**
				More than 4500 CVD
				CC Surface
1	**2**	**3**	**4**	**5**
	SUB TOTAL			**34,863**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	70%	Once in a Year	5177
	ii) Jungle Clearance	70%	Twice in a Year	1359
	iii) Kuccha Drain Maintenance	70%	Twice in a Year	728
	SUB TOTAL			**7,264**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	70%	Once in a Year	1835
	ii) Repair of floors	70%	Once in a Year	3320
	iii) Repair of parapets	70%	As & when required	1383
	SUB TOTAL			**6,538**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	80%	As & when required	27,734
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			
	SUB TOTAL			**27,734**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	2311
	ii) Maintenance of gang hut store, sheds, animal & debries removal		Once in a Year	3467

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	3467
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	6934
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1156
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1386
	SUB TOTAL			**18,721**
	GRAND TOTAL (Normal)			**95,120**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	7%	Once in 15 years with thermoplastic paint	1023
	ii)Repairs to footpath	50%	As & when required	2311
	iii) ROB/ Fly-over Railings & repair	50%	As & when required	2311
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	50%	As & when required	3583
	vi) Repair of divider/ Railing in City portion	50%	As & when required	4623
	vii) Provision for maintenance of pedestrian underpass	50%	As & when required	1156
	SUB TOTAL			**15,005**
	GRAND TOTAL (Urban)			**1,10,126**

Annexure III : Major Maintenance Cost

Periodic Maintenance Cost (Every 6th / 7th Year) FY 2029 & FY 2034											
Sr. No.	**Description**	**Unit**	**No.**	**Length (m)**	**Width (m)**	**Depth (m)**	**Quantity**	**Total Quantity**	**Rate (Rs.)**	**Amount (Rs.)**
I. Main Carriageway, Service Road / Slip Road & Miscellaneous location										
A	**MCW - Rigid Pavement**									
1	Replacement of Joint Sealant	Rmt	5%	5,34,809.52			26,740.48	26,740.48	55.00	14,70,726
2	Dismantling of CC Panels @ 2% area	Cum	2%	70,193.75	15.00	0.30	6,317.44	6,317.44	874.00	55,21,440
3	Replacement of Panels - PQC @ 2% area	Cum	2%	70,193.75	15.00	0.30	6,317.44	6,317.44	6,563.00	4,14,61,342
4	Replacement of Panels - DLC @ 0% area	Cum	0%	70,193.75	15.00	0.15	-	-	2,899.00	-
5	Diamond Grinding	Sqm	3%	70,193.75	15.00		31,587.19	31,587.19	50.00	15,79,359
B	**Rigid Pavement at Toll Plaza**									
6	Replacement of Joint Sealant	Rmt	5%	5,986.95			299.35	299.35	55.00	16,464
7	Dismantling of CC Panels @ 2% area	Cum	2%		11,786.80	0.30	70.72	70.72	874.00	61,810
8	Replacement of Panels - PQC @ 2% area	Cum	2%		11,786.80	0.30	70.72	70.72	6,563.00	4,64,141
9	Replacement of Panels - DLC @ 0% area	Cum	0%		11,786.80	0.15	-	-	2,899.00	-
10	Diamond Grinding	Sqm	0%		11,786.80		-	-	50.00	-
C	**Rigid Pavement (Service Road/Slip Road)**									
6	Replacement of Joint Sealant	Rmt	5%	46,151.11			2,307.56	2,307.56	55.00	1,26,916
7	Dismantling of CC Panels @ 1% area	Cum	1%	6,490.00	14.00	0.20	181.72	181.72	874.00	1,58,823
8	Replacement of Panels - PQC @ 1% area	Cum	1%	6,490.00	14.00	0.20	181.72	181.72	6,563.00	11,92,628
9	Replacement of Panels - DLC @ 0% area	Cum	0%	6,490.00	14.00	0.15	-	-	2,899.00	-
10	Diamond Grinding	Sqm	0%	6,490.00	14.00		-	-	50.00	-
D	**Structural Deck Area**									
11	Milling	Sqm	50%	1,037.25	25.79		13,377.65	13,377.65	55.00	7,35,770
12	Tack Coat for BC	Sqm	50%	1,037.25	25.79		13,377.65	13,377.65	19.00	2,54,175
13	Mastic Asphalt Overlay	Cum	50%	1,037.25	25.79		13,377.65	13,377.65	510.00	68,22,599
E	**Miscellaneous**									
14	Replacement of Kerb	Rmt	10%	1,32,240.00			13,224.00	13,224.00	231.00	30,54,744
15	Painting of Kerbs	Sqm	1	1,32,240.00		0.32	41,655.60	41,655.60	89.00	37,07,348
16	Painting of Crash Barriers	Sqm	4	17,020.00		1.12	75,909.20	75,909.20	89.00	67,55,919
17	Thermoplastic paint									
	a) Median & Edge line	Sqm	50%				28,612.23	28,612.23	451.00	1,29,04,118
	4 Lane		4	73,001.40	0.15		43,800.84			
	Service Road		2	13,239.60	0.10		2,647.92			
	b) Lane line									
	4 Lane		2	25,550.49	0.10		5,110.10			
	Service Road		1	4,633.86	0.10		463.39			
	c) Junction crossing						5,202.22			
18	Replacement of Road Stud	No	50%				8,851.00	8,851.00	201.00	17,79,051
	4 Lane		4	4,057.00			16,228.00			
	Service Road		2	737.00			1,474.00			
19	Miscellaneous	5%								44,03,369
Total Amount (MCW + Service Road + Toll Plaza + Miscellaneous)										**9,24,70,743**
Total Cost in Lakhs (MCW + Service Road + Toll Plaza + Miscellaneous)										**924.71**
Per km Cost in lakhs (MCW + Service Road + Toll Plaza + Miscellaneous)										**12.92**

Annexure IV : Pavement Condition Survey

LHS :

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	0	1	Good	-	PQC	300	-	G	-	-	-	-	-	-	P	PQC	G	F	-	-	-	
2	1	2	Good	-	PQC	300	-	G	-	-	-	-	-	-	P	PQC	G	F/P	-	-	-	
3	2	3	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
4	3	4	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	F	-	-	-	
5	4	5	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
6	5	6	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
7	6	7	G/F	-	PQC	300	-	G/F	0.2	-	-	-	-	-	P	PQC	F	P	-	-	-	One panel settles
8	7	8	G/F	-	PQC	300	-	G/F	0.15	-	-	-	-	-	P	PQC	F	P	-	-	-	One panel settles
9	8	9	G/F	-	PQC	300	-	G	0.1	-	-	-	-	-	P	PQC	G	P	-	-	-	
10	9	10	G	-	PQC	300	-	G	-	-	-	-	-	-	P	PQC	G	P	-	-	-	
11	10	11	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
12	11	12	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
13	12	13	Good	-	PQC	300	-	G	-		-	-	-	-	F	PQC	G	F	-	-	-	
14	13	14	Good	-	PQC	300	-	G		-	-	-	-	-	P	PQC	G	P	-	-	-	
15	14	15	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
16	15	16	G/F	-	PQC	300	-	G	-	-	-	-	-	-	P	PQC	G	P	-	-	-	
17	16	17	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
18	17	18	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	F	-	-	-	
19	18	19	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
20	19	20	G/F	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
21	20	21	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
22	21	22	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	F	-	-	-	
23	22	23	Good	-	PQC	300	-	G		-	-	-	-	-	P	PQC	G	P	-	-	-	
24	23	24	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	MCW Partially Completed due to LA
25	24	25	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
26	25	26	Good/F	-	PQC	300	-	G/F	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
27	26	26.8	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
28	26.8	28																	-	-	-	This MCW are in another concessionaire scope
29	28	29																	-	-	-	
30	29	30																	-	-	-	
31	30	31.5																	-			
32	31.5	32	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
33	32	33	Good	-	PQC	300	-	G	-	-	-	-	-	-	WIP	PQC	G	WIP	-	-	-	Shoulder filling work in progress
34	33	34	G/F	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
35	34	35	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
36	35	36	G	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
37	36	37	G/F	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
38	37	38	G/F	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
39	38	39	Good	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
40	39	40	G/F	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
41	40	41	Good	-	PQC	300	-	G	-	-	-	-	-	-	G/P	PQC	P	F/P	-	-	-	
42	41	42	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
43	42	43	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	F	-	-	-	
44	43	44	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
45	44	45	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
46	45	46	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	F	-	-	-	
47	46	47	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	F	-	-	-	Only Single Lane constructed due to LA. Side shoulder partially done
48	47	48	Good	-	PQC	300	-	G		-	-	-	-	-	WIP	PQC	G	WIP	-	-	-	MCW Work in progress
49	48	49	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
50	49	50	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
51	50	51	Good		PQC	300		G		-	-				WIP	PQC	G	WIP	-	-	-	Only Single Lane constructed due to LA. Side shoulder partially done
52	51	52	Good		PQC	300		G		-	-				G	PQC	G	G/F	-	-	-	
53	52	53	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
54	53	54	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
55	54	55	G/F		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
56	55	56	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
57	56	57	G/F		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
58	57	58	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
59	58	59	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
60	59	60	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
61	60	61	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
62	61	62	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
63	62	63	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
64	63	64	G/F		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
65	64	65	G/F		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
66	65	66	Good		PQC	300		G		-	-				F	PQC	G	F		-	-	
67	66	67	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
68	67	68	Good		PQC	300		G		-	-				P	PQC	G	F	-	-	-	
69	68	69	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
70	69	70	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
71	70	71	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
72	71	72	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
73	72	73	G/F		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
74	73	74	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
75	74	75	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	MCW Under COS
76	75	76	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	
77	76	77	Good		PQC	300		G		-	-				F	PQC	G	F	-	-	-	

RHS

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
1	0	1	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
2	1	2	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F/P	-	-	-	
3	2	3	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
4	3	4	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	F	-	-	-	
5	4	5	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
6	5	6	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
7	6	7	Good	-	PQC	300	-	G	0.2	-	-	-	-	-	F	PQC	F	F	-	-	-	
8	7	8	Good	-	PQC	300	-	G	0.15	-	-	-	-	-	F	PQC	F	F	-	-	-	
9	8	9	Good	-	PQC	300	-	G	0.1	-	-	-	-	-	F	PQC	G	P	-	-	-	
10	9	10	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	P	-	-	-	
11	10	11	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
12	11	12	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
13	12	13	Good	-	PQC	300	-	G	-		-	-	-	-	WIP	PQC	G	WIP	-	-	-	Work partially completed due to LA. Side shoulder partially done
14	13	14	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	P	-	-	-	
15	14	15	G/F	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
16	15	16	G/F	-	PQC	300	-	G	-	-	-	-	-	-	WIP	PQC	G	WIP	-	-	-	Work partially completed due to LA. Side shoulder partially done
17	16	17	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
18	17	18	Good	-	PQC	300	-	G		-	-	-	-	-	WIP	PQC	G	WIP	-	-	-	Work partially completed due to LA. Side shoulder partially done
19	18	19	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
20	19	20	G/F	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
21	20	21	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
22	21	22	Good	-	PQC	300	-	G		-	-	-	-	-	F	PQC	G	F	-	-	-	
23	22	23	Good	-	PQC	300	-	G		-	-	-	-	-	WIP	PQC	G	WIP	-	-	-	Work partially completed due to LA. Side shoulder partially done
24	23	24	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
25	24	25	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
26	25	26	Good/F	-	PQC	300	-	G/F	-	-	-	-	-	-	F	PQC	G	F	-	-	-	
27	26	26.8	Good	-	PQC	300	-	G	-	-	-	-	-	-	WIP	PQC	G	WIP	-	-	-	
28	26.8	28																	-	-	-	This MCW are in another concessionaire scope
29	28	29																	-	-	-	
30	29	30																	-	-	-	
31	30	31.5																	-			
32	31.5	32	Good	-	PQC	300	-	G	-	-	-	-	-	-	WIP	PQC	G	WIP	-	-	-	
33	32	33	Good	-	PQC	300	-	G	-	-	-	-	-	-	WIP	PQC	G	WIP	-	-	-	
34	33	34	Good	-	PQC	300	-	G	-	-	-	-	-	-	F	PQC	G	F	-	-	-	Work partially completed due to LA. Side shoulder partially done
35	34	35	Good	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G/F	-	-	-	
36	35	36	G	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
37	36	37	G/F	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
38	37	38	G/F	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
39	38	39	Good	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
40	39	40	G/F	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
41	40	41	Good	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	P	F/P	-	-	-	
42	41	42	Good	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
43	42	43	Good	-	PQC	300	-	G		-	-	-	-	-	G	PQC	G	G	-	-	-	
44	43	44	Good	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
45	44	45	G/F	-	PQC	300	-	G	-	-	-	-	-	-	G	PQC	G	G	-	-	-	
46	45	46	Good	-	PQC	300	-	G		-	-	-	-	-	G	PQC	G	G	-	-	-	
47	46	47	Good	-	PQC	300	-	G		-	-	-	-	-	G	PQC	G	G	-	-	-	
48	47	48	G/F	-	PQC	300	-	G		-	-	-	-	-	G	PQC	G	G	-	-	-	
49	48	49	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
50	49	50	Good		PQC	300		G		-	-				WIP	PQC	G	WIP	-	-	-	Only Single lane constructed due to LA. Side shoulder partially done
51	50	51	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
52	51	52	Good		PQC	300		G		-	-				G	PQC	G	G/F	-	-	-	

Sr. No.	Chainage (km)		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Roadside Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From	To	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr.)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
53	52	53	G/F		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
54	53	54	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
55	54	55	G/F		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
56	55	56	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
57	56	57	G/F		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
58	57	58	Good		PQC	300		G		-	-				WIP	PQC	G	WIP	-	-	-	Only Single lane constructed due to LA. Side shoulder partially done
59	58	59	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
60	59	60	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
61	60	61	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
62	61	62	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
63	62	63	G/F		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
64	63	64	G/F		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
65	64	65	G/F		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
66	65	66	Good		PQC	300		G		-	-				G	PQC	G	G		-	-	
67	66	67	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
68	67	68	Good		PQC	300		G		-	-				G	PQC	G	F	-	-	-	
69	68	69	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	Only Single lane constructed due to LA. Side shoulder partially done
70	69	70	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
71	70	71	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
72	71	72	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
73	72	73	G/F		PQC	300		G		-	-				G	PQC	G	G	-	-	-	MCW Under COS
74	73	74	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
75	74	75	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
76	75	76	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	
77	76	77	Good		PQC	300		G		-	-				G	PQC	G	G	-	-	-	

FP Project Management

Technical Due Diligence of Aligarh - Kanpur Section of NH-91 (km. 302+108 to km. 373+085) in the State of Uttar Pradesh on Hybrid Annuity Mode

Final Report

June 2024

Submitted to:

BHARAT HIGHWAYS INVIT

Submitted by:

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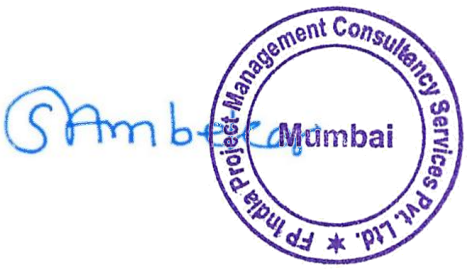

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1 INTRODUCTION

1.1 Background

The Government of India had entrusted to Authority the development, maintenance and management of National Highway No. 91 including the section from km. 289+000 (Design km. 302+108) to km. 356+000 (Design km. 373+085). The Authority had resolved to augment the existing road from km. 289+000 (Design km. 302+108) to km. 356+000 (Design km. 373+085) (approximately 70.977 kms) on Aligarh - Kanpur Section of NH-91 in the state of Uttar Pradesh by Four Laning on design, build, operate and transfer (the "DBOT Annuity" or "Hybrid Annuity") basis.

Based on the competitive bid process completed, NHAI has signed Concession Agreement with **M/s. GR Aligarh Kanpur Highway Private Limited (GAKHPL)**, a Special Purpose Vehicle (SPV) formed for implementing this project.

The Appointed Date of the project was 18th February 2021. The concession period of the Project Road is 17.5 years from the Appointed Date including construction period of 2.5 years. The Scheduled Completion Date of the Project Road was on 16th August 2023. The Project Road has received Provisional Completion Certificate on 24th February 2023.

M/s. GR Highways Investment Manager Pvt. Ltd. (in its capacity as the Investment Manager of Bharat Highways InvIT) has appointed **FP Project Management Consultancy Services Private Limited** [Formerly Frischmann Prabhu (I) Pvt. Ltd.] as Technical Consultant for carrying out technical study, and assessment of opex and major maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, FP Project Management undertook the site visits to carry out site inspection. The report is based on findings during this period.

1.2 Our Approach Philosophy

Composition of Team

Our team consists of well-qualified engineers and other professionals, whose experience covers all the skills and specializations required for undertaking such assignments. All the team personnel are our regular employees and have a long and stable working relationship with our firm.

The Team Leader coordinates the activities between all the key staff who work closely together. The key staff is assisted by various support staff, who report to the respective key staff in their field of expertise. The Team Leader is the point of contact for Client on Technical Study.

The technical study includes review of all the available documents namely:

a) Concession Agreement including Technical Schedules
b) EPC Agreement
c) Pavement design reports
d) O&M Manual prepared by the Concessionaire
e) O&M Contract, work order and their provisions
f) Recent O&M Report submitted to Authority
g) Quality of construction based on available data, design and drawings
h) Documents on historical expenditure on operation and maintenance

i) Reports on past accidents
j) O&M cost schedule for the concession period
k) Completion / Provisional Completion and status of items in punch list items
l) Correspondence regarding scope of works and during O&M

The review of above documents is the first step towards accomplishment of the assignment. This gives the complete idea of the project and is used as input data for preparation of report after necessary analysis.

Site Visit and Data Collection

A team of experts from various streams has carried out the preliminary site visit to understand the assessment of project assets mainly condition of the pavement and structures.

- The site visit is undertaken for detailed reconnaissance and visual pavement condition assessment.
- The condition assessment of major structures by visual inspection.
- The information like material sources and the probable cost to be collected for the purpose of cost estimate.

The detailed design / drawings viz. Plan & L-sections, drainage design, structure design, layout drawings for project facilities like toll plaza, bus bay, truck lay-byes, highway lighting facilities etc. would be studied. Also, design / drawing and provision pertaining to road furniture are studied.

The adequacy of design is verified in accordance with the Concession Agreement, Manual of Specifications and Standards as well as relevant IRC standards.

The information on availability of material in the vicinity is gathered. It has direct impact on cost of maintenance work and balance work if any.

The basic approach for preparation for cost estimates for operation and maintenance is as per the practice of State PWD / MoRT&H in respect of highways and structures.

Data Analysis

Based on the study of the available information and preliminary site visits, the consultants share their preliminary observations with the Client.

1.3 About this Report

This report has been prepared based on the information, reports and documents made available to us by the Company. We have also referred to publicly available reports, literature etc., and have made our best efforts to check the authenticity of the information available, analyse the same as per the best engineering / industry practices.

The site visit and inspection were carried out between the periods from **8th April 2024 to 10th April 2024**.

The report is organized with the following chapters for easy understanding of various issues.

Chapter 1 **Introduction:** This chapter gives an overview of the project background, approach and methodology of Due Diligence studies.

Chapter 2 **Project Description:** This chapter describes existing project features.

Chapter 3 **Development of Project Road:** This chapter gives an overview of project development.

Chapter 4 **Toll Plaza Equipment:** This chapter summarizes assessment of Toll Plaza in terms of no. of lanes, Toll Collection System installed and their working status.

Chapter 5 **Balance works:** This chapter summarizes the balance works to be executed at Site.

Chapter 6 **Pavement and Site Investigation:** This chapter describes present condition of pavement, surveys and investigations carried out on site and proposals for maintenance as per contract requirements.

Chapter 7 **Review of O&M Agreement:** This chapter summarizes the observations on the O&M Agreement executed.

Chapter 8 **Review of Concession Agreement:** This chapter summarizes the observations on the Concession Agreement.

Chapter 9 **Review of O&M Agreement:** This chapter summarizes the observations on the O&M Agreement executed.

Chapter 10 **Accident Data Analysis:** This chapter deals with the analysis of nature of accidents occurring on the stretch and to identify blackspots.

2 PROJECT DESCRIPTION

2.1 Location

The Project Road (Package-IV) starts at Naviganj at km. 302+108 and ends at Mitrasen at km. 373+085. The Project Road passes through the built-up sections of Prempur, Chhibramau, Khurhawa, Hasanpur, Karmallapur, Sarai Daulat, Sarai Prayag, Fatehpur Jasoda, Kannauj, Bahadurpur, Manimau, Dedaura Baju, Tikhawa and Mitrasen.

The design length of the Project Road is 70.977 kms. The project involved development of existing 2-lane carriageway to 4-lane divided carriageway with 1.5 m wide paved shoulder and 2.0 m earthen shoulder on either side.

The Location Map of the Project Road is presented below:

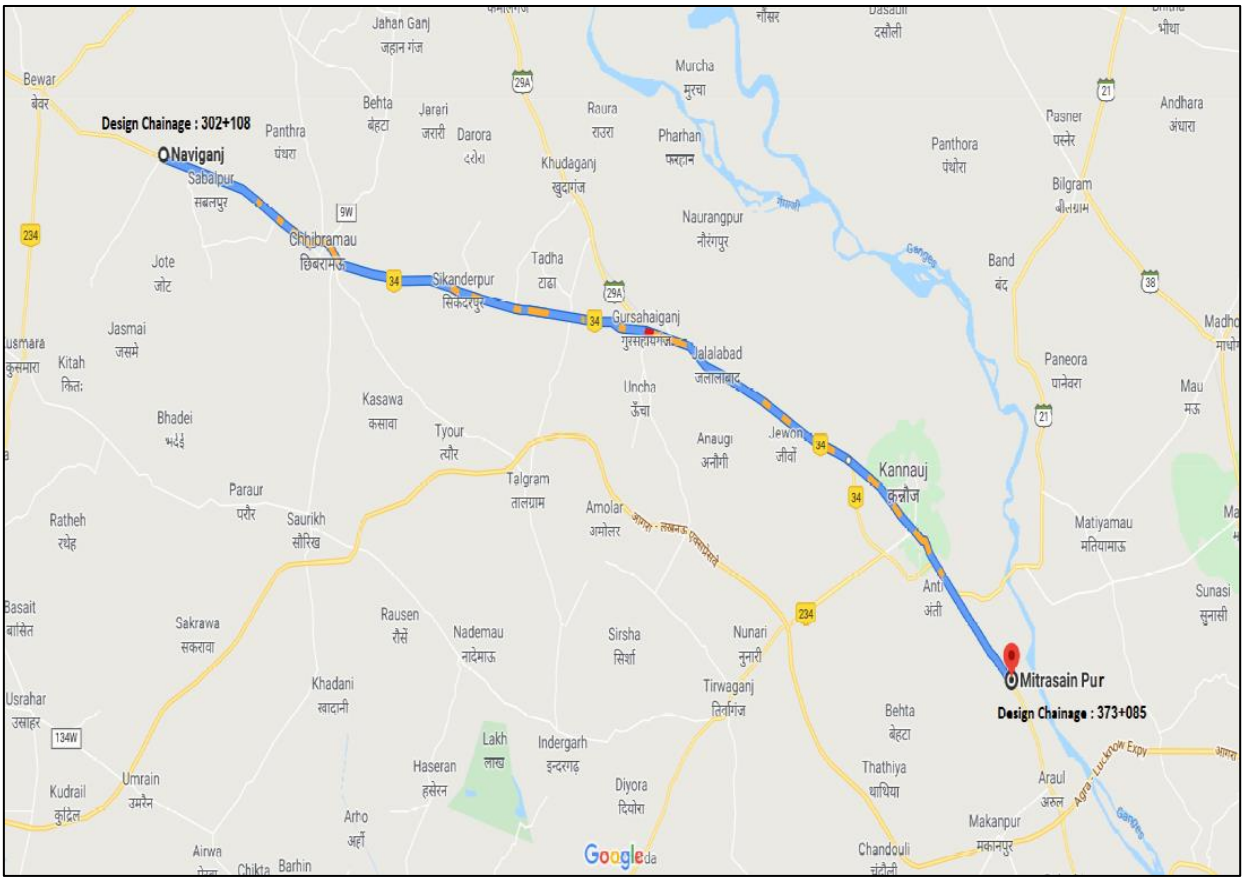


Figure 2-1 Location Map

2.2 Climate

January is the coldest month with an average mean monthly temperature of 14 ^{o}C and May is the hottest month with mean monthly temperature of 38 ^{o}C in this area. The relative humidity is lowest during summers when it reaches as low as 24% and during monsoon it goes to as high as 80%.

2.3 Terrain

This section of National Highway traverses through plain / rolling terrain.

2.4 Abutting Land Use

Agriculture is predominant land use along the Project Road. However, there are some dense built-up areas and large-scale ribbon developments observed intermittently along the Project Road. At many places, large numbers of trees have been observed along the Project Road.

2.5 Right of Way

The width of existing Right of Way (RoW) for the project stretch varies from 45 m to 60 m.

2.6 Existing Utilities

During widening of the Project Road, various affected utility services located along the Project Road were shifted to the Proposed Right of Way (PROW). The different types of utilities found along the road includes electrical poles, telephone poles, OFC Cables, etc.

3 DEVELOPMENT OF PROJECT ROAD

3.1 Project Road

The two-lane road with earthen shoulder from km. 302+108 to km. 373+085 has been developed as four lane divided carriageway during the construction stage for the length of 70.977 kms. The Project Road passes through rural as well as built-up sections. The stretches falling in built-up areas have been provided with service road as per scope of work. The development of the entire Project Road has been carried out in accordance with schedule-B and schedule-C as per standards set forth in schedule-D of the Concession Agreement.

M/s. GR Aligarh Kanpur Highway Private Limited has completed construction of the Project Road for the length of 68.907 kms on 24th February 2023.

The stretch of the Project Road under the scope of study runs predominantly through plain terrain. The design standards have been adhered to with a realistic compatibility with the existing ROW, utilities and optimum land acquisition. Generally, the cross-sectional dimensions of Project Road are as below:

Table 3-1 Cross Sectional Dimension

Main Carriageway	Width (m)
Carriageway width excluding edge strip	7.0
Paved Shoulder width - one side	1.5
Earthen Shoulder width - one side	2.0
Median width	2.0 - 5.0
Service Road	7.5

3.2 Typical Cross Sections

The Typical Cross Section is as listed below.

Table 3-2 Details of Typical Cross Sections (As built)

Sr. No.	Chainage (km)		Length (m)	Type of Typical Cross Section	Reference
	From	To			
1	302+108	303+560	1452	I-A	
2	303+560	304+620	1060	V-A	
3	304+620	308+380	3760	I-A	
4	308+380	309+200	820	II-A	
5	309+200	309+700	500	I-A	
6	309+700	310+400	700	V-D	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
7	310+400	310+800	400	I-A	
8	310+800	311+200	400	V-A	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
9	311+200	311+680	480	V-A	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
10	311+680	311+960	280	XV	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022

Sr. No.	Chainage (km)		Length (m)	Type of Typical Cross Section	Reference
	From	To			
11	311+960	316+100	4140	XV	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
12	316+100	318+680	2580	I-B	
13	318+680	319+480	800	XV	
14	319+480	322+210	2730	I-B	
15	322+210	322+660	450	II-B	
16	322+660	323+020	360	XI-D	
17	323+020	323+500	480	XII-A	
18	323+500	323+560	60	XI-E	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
19	323+560	324+700	1140	XII-A	
20	324+700	324+910	210	XI-A	
21	324+910	325+780	870	V-A	
22	325+780	326+170	390	II-A	
23	326+170	326+670	500	II-B	
24	326+670	328+050	1380	I-B	
25	328+050	328+940	890	V-A	
26	328+940	330+010	1070	II-A	
27	330+010	330+800	790	V-A	
28	330+800	331+550	750	I-B	
29	331+550	332+600	1050	V-A	
30	332+600	333+533	933	I-B	
31	333+533	333+720	187	I-C	
32	333+720	333+975	255	I-B	
33	333+975	333+980	5	V-B	
34	333+980	334+470	490	V-B	
35	334+470	334+475	5	V-B	
36	334+475	334+975	500	XI-C	
37	334+975	334+980	5	VII-A	
38	334+980	335+626	646	VII-A	
39	335+626	335+640	14	XI-C	
40	335+640	336+136	496	XI-C	
41	336+136	336+150	14	X-B	
42	336+150	337+056	906	X-B	
43	337+056	337+070	14	XII-A	
44	337+070	337+566	496	XII-A	
45	337+566	337+580	14	VII-A	
46	337+580	338+180	600	VII-A	
47	338+180	338+186	6	VII-A	
48	338+186	338+500	314	XII-A	
49	338+500	338+506	6	XII-A	
50	338+506	338+930	424	IX-B	
51	338+930	338+936	6	IX-B	
52	338+936	339+860	924	XI-C	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
53	339+860	340+146	286	VI-E	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
54	340+146	340+460	314	VII-A	
55	340+460	340+471	11	VII-A	
56	340+471	341+700	1229	XI-C	

Sr. No.	Chainage (km)		Length (m)	Type of Typical Cross Section	Reference
	From	To			
57	341+700	341+711	11	XI-C	
58	341+711	343+510	1799	VII-A	
59	343+510	343+512	2	VII-A	
60	343+512	344+320	808	XI-C	
61	344+320	344+510	190	XII-B	Under COS - Rf. IE Lt. No. 19810 Dt. 05.12.2022
62	344+510	345+025	515	XII-B	Under COS - Rf. IE Lt. No. 19810 Dt. 05.12.2022
63	345+025	345+050	25	XI-C	
64	345+050	345+500	450	XI-C	
65	345+500	345+540	40	VIII-A	
66	345+540	345+996	456	VIII-A	
67	345+996	346+020	24	IV-C	
68	346+020	346+700	680	IV-C	
69	346+700	346+708	8	IV-C	
70	346+708	346+923	215	VIII-B	
71	346+923	347+000	77	VIII-B	
72	347+000	347+530	530	XI-B	
73	347+530	347+538	8	XI-B	
74	347+538	348+715	1177	XI-C	
75	348+715	348+800	85	VIII-A	
76	348+800	349+220	420	VIII-A	
77	349+220	349+228	8	VIII-A	
78	349+228	350+310	1082	III-A	
79	350+310	350+318	8	III-A	
80	350+318	351+110	792	VII-A	
81	351+110	351+210	100	VII-A	
82	351+210	351+750	540	III-A	
83	351+750	351+755	5	III-A	
84	351+755	352+390	635	IV-C	
85	352+390	352+480	90	VIII-A	
86	352+480	352+900	420	VIII-A	
87	352+900	352+995	95	VIII-A	
88	352+995	353+510	515	XI-C	
89	353+510	353+515	5	XI-C	
90	353+515	354+250	735	VI-D	
91	354+250	354+255	5	VI-D	
92	354+255	354+500	245	VI-C	
93	354+500	354+505	5	VI-C	
94	354+505	355+080	575	XIII-B	
95	355+080	355+115	35	XIII-B	
96	355+115	355+260	145	X-B	
97	355+260	355+279	19	X-B	
98	355+279	355+660	381	V-B	
99	355+660	355+670	10	I-A	
100	355+670	356+900	1230	I-A	
101	356+900	357+670	770	V-E	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
102	357+670	357+740	70	V-E	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022

Sr. No.	Chainage (km)		Length (m)	Type of Typical Cross Section	Reference
	From	To			
103	357+740	358+440	700	II-A	
104	358+440	358+450	10	I-A	
105	358+450	359+765	1315	I-A	
106	359+765	359+780	15	V-A	
107	359+780	360+795	1015	V-A	
108	360+795	360+810	15	I-A	
109	360+810	361+860	1050	I-A	
110	361+860	361+870	10	V-A	
111	361+870	362+720	850	V-A	
112	362+720	362+730	10	I-A	
113	362+730	363+635	905	I-A	
114	363+635	363+650	15	V-B	
115	363+650	364+185	535	V-B	
116	364+185	364+200	15	X-A	
117	364+200	364+347	147	X-A	
118	364+347	364+430	83	X-B	
119	364+430	364+500	70	XIII-B	
120	364+500	364+570	70	XIII-B	
121	364+570	364+580	10	XI-C	
122	364+580	365+105	525	XI-C	
123	365+105	365+115	10	VII-A	
124	365+115	365+485	370	VII-A	
125	365+485	365+500	15	IX-B	
126	365+500	366+185	685	IX-B	
127	366+185	366+200	15	VIII-A	
128	366+200	367+295	1095	VIII-A	
129	367+295	367+310	15	III-A	
130	367+310	368+440	1130	III-A	
131	368+440	368+460	20	IV-B	
132	368+460	368+640	180	IV-B	
133	368+640	368+660	20	VIII-A	
134	368+660	369+880	1220	VIII-A	
135	369+880	369+900	20	IV-B	
136	369+900	370+520	620	IV-B	
137	370+520	370+540	20	III-B	
138	370+540	371+400	860	III-B	
139	371+400	371+420	20	IV-A	
140	371+420	371+780	360	IV-A	
141	371+780	371+800	20	IV-B	
142	371+800	372+280	480	IV-B	
143	372+280	372+300	20	III-A	
144	372+300	373+085	785.00	III-A	
Total			**70977**		

Figure 3-1 Start of Project Road

Start of Project Road at km. 302+108

Start of Project Road at km. 302+108

Figure 3-2 End of Project Road

End of Project Road at km. 373+085

End of Project Road at km. 373+085

3.3 Pavement Construction

The entire stretch of the Project Road including Toll Plaza are Rigid Pavement and service road and slip road are Flexible Pavement.

3.4 Bypass and Realignment

A) Realignment

The locations where realignment is to be done are as listed below.

Table 3-3 Details of Realignment

Sr. No.	Name of Realignment	Existing Chainage (km)		Side w.r.t Project Alignment	Design Chainage (km)		Length (km)
		From	To		From	To	
Nil							

B) Bypasses

There are five bypasses on the Project Road. The same is listed below.

Table 3-4 Details of Bypasses

Sr. No.	Name of Bypass	Existing Chainage (km)		Side w.r.t Project Alignment	Design Chainage (km)		Length (Km)
		From	To		From	To	
1	Sikanderpur	309+768	311+711	Right	322+809	324+899	2.090
2	Gursaiganj and Jalalabad Combined	321+161	331+369	Left	334+359	345+609	11.250
3	Fatehpur Jasoda	332+572	334+528	Left	346+809	348+909	2.100
4	Jalalpur Panwara	338+422	0+670	Left	352+806	355+392	2.586
5	Bahadurpur	9+408	349+263	Left	364+051	366+303	2.252
						Total Length (km)	**20.278**

3.5 Service Road

The details of service roads provided are as tabulated below.

Table 3-5 Details of Service Road (As-built)

Location (Chainage)		Length	Side	Width (m)	Remarks
From	To				
303+560	304+620	1.060	Both	7.00	
308+380	309+200	0.820	Both	7.00	Punch List ’B’ [Ch.-308+760 to 308+910 RHS] 150m
309+700	310+400	0.700	Both	7.00	Under COS - Rf. NHAI Lt No. 3760 Di. 25.03.2022
310+800	311+200	0.400	Both	7.00	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
311+200	311+680	0.480	Both	7.00	
322+210	322+660	0.450	Left	7.00	Punch List 'B' [Ch.-322+210 to 322+540 LHS] 330m
324+910	326+170	1.260	Both	7.00	Punch List 'B’ [Ch.-325+300 to 326+170 LHS] 870m Punch List 'B' [Ch-324+910 to 326+170 RHS] 1260m
326+170	326+670	0.500	Left	7.00	Punch List rB' [Ch.-326+170 to 326+190 LHS] 20m
328+050	330+010	1.960	Both	7.00	Punch List 'B' [Ch.-328+060 to 328+200 RIIS] 140m Punch List 'B' [Ch.-328+820 to 328+870 RHS] 50m
330+010	330+800	0.790	Both	7.00	
331+550	332+600	1.050	Both	7.00	Punch List 'B' [Ch.331+900 to 331+920 RHS] 20m Punch List ’B’ [Ch.-332+200 to 332+250 RHS] 50m
333+980	334+470	0.490	Both	7.00	
338+500	338+930	0.430	Left	7.00	
338+506	338+936	0.430	Right	7.00	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022

Location (Chainage)		Length	Side	Width (m)	Remarks
From	To				
338+936	340+146	1.210	Both	7.00	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
345+540	346+020	0.480	Both	7.00	
346+020	346+250	0.230	Right	7.00	
346+250	346+700	0.450	Right	7.00	
346+700	346+923	0.223	Right	7.00	
348+800	349+220	0.420	Both	7.00	
351+750	352+480	0.730	Right	7.00	
352+480	352+900	0.420	Both	7.00	
353+510	354+250	0.740	Both	7.00	
354+250	354+500	0.250	Left	7.00	
354+500	355+080	0.580	Left	7.00	
355+260	355+670	0.410	Both	7.00	
356+900	357+670	0.770	Both	7.00	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
357+670	358+450	0.780	Both	7.00	
359+780	360+810	1.030	Both	7.00	
361+870	362+730	0.860	Both	7.00	
363+650	364+500	0.850	Both	7.00	
364+500	364+580	0.080	Left	7.00	
365+500	367+310	1.810	Both	7.00	
368+460	368+660	0.200	Right	7.00	
368+660	369+900	1.240	Both	7.00	Punch List 'B' [Ch.-369+350 to 369+400 LHS] 50m
369+900	370+540	0.640	Right	7.00	
371+420	371+800	0.380	Both	7.00	
371+800	372+300	0.500	Right	7.00	
Subtotal in Side	**Both**	20.410			(-Ve) CoS - 5.220 Km, (+Ve)CoS - 3.080 Km [22.550 -5.220 +3.080 = 20.410 Km]
Subtotal in Side	**Right**	3.403			(+Ve) CoS - 0.430 Km [2.973+.430 = 3.403 Km]
Subtotal in Side	**Left**	2.290			
Total Length (Km)		**46.513**			

3.6 Slip Roads

The details of Slip Roads provided are as tabulated below.

Table 3-6 Details of Slip Roads (As-built)

Location (Chainage)		Length	Side	Width (m)	Remarks
From	To				
322+660	323+020	0.360	Both	5.5	
323+500	323+560	0.060	Both	5.5	
324+700	324+910	0.210	Both	5.5	Punch list 'B' [Ch.324+700 to 324+910 RHS] 210m
334+470	334+980	0.510	Both	5.5	

Location (Chainage)		Length	Side	Width (m)	Remarks
From	To				
335+640	336+150	0.510	Both	5.5	
340+460	341+700	1.240	Both	5.5	
343+510	344+510	1.000	Both	5.5	
345+050	345+540	0.490	Both	5.5	
347+530	348+800	1.270	Both	5.5	Punch list 'B' [Ch.347+950 to 348+150 RHS] 200m
352+900	353+510	0.610	Both	5.5	
364+580	365+115	0.535	Both	5.5	
Length in BHS	**Both**	**6.795**		**13.59**	
Total Length (Km)		**13.590**			

Figure 3-3 Photographs of Service / Slip Road

7.0 m wide Service Road at km. 349+500

5.5 m wide Slip Road at km. 340+600

Service Road work pending at km. 348+400

Slip Road work pending at km. 331+550

Service Road work pending at km. 329+600

Service Road work pending at km. 308+400

3.7 At-grade Intersections

At-grade Intersections have been constructed with the intersecting roads at the following locations.

(A) Major Intersections:

Table 3-7 Details of Major Intersections

Sr. No.	Existing Chainage (km)	Chainage (km)	Type of Junction	Remarks
1	-	312+735	3 Legged	To Chhibramau
2	-	313+900	3 Legged	To Farrukhabad
3	-	315+350	3 Legged	To Saurikh

(B) Minor Intersections:

Table 3-8 Details of Minor Intersections

Sr. No.	Existing Chainage (km)	Design Chainage (Km)	Type of Junction	Remarks
1	290+070	303+179	3 Legged	To Kheda
2	292+050	305+124	3 Legged	To Sbalpur
3	292+140	305+220	3 Legged	To Shabrpur
4	292+330	305+409	3 Legged	To Raveya
5	292+930	306+004	3 Legged	To Brua
6	293+160	306+214	3 Legged	To RamkJ1idha
7	293+I35	306+236	3 Legged	To Adamapur
8	293+830	306+909	3 Legged	To Karamllapur
9	294+000	307+074	3 Legged	To Naviganj
10	294+580	307+669	3 Legged	To Amnagla
11	294+895	307+969	3 Legged	To Sundar Nagar
12	296+430	309+502	3 Legged	To Rampura
13	304+390	317+444	3 Legged	To Orpur
14	305+135	318+186	3 Legged	To Village
15	305+230	318+280	3 Legged	To Khuraba
16	306+715	319+759	3 Legged	To Gadanpur
17	308+225	321+269	3 Legged	To Salempur
18	308+605	321+647	3 Legged	To Raipur

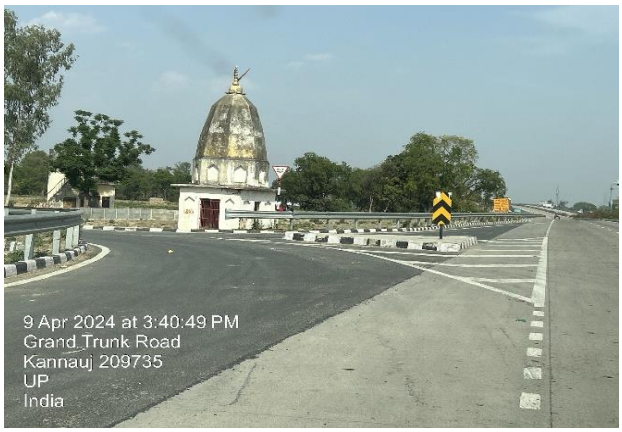
Sr. No.	Existing Chainage (km)	Design Chainage (Km)	Type of Junction	Remarks
19	310+000	323+065	3 Legged	To Sikanderpur
20	313+874	327+064	3 Legged	To Cohrai
21	314+424	327+614	4 Legged	Left Rothpur Right
22	320+090	333+286	3 Legged	To Rajra Mobamal
23	320+345	333+544	3 Legged	To Rajan
24	320+520	333+719	3 Legged	To Rajilapur
25	334+330	348+709	3 Legged	To Village
26	334+670	349+050	3 Legged	To Khitwari
27	335+777	350+150	4 Legged	Left Maunpur Right
28	337+495	351+874	3 Legged	To Bagathgarha
29	2+682	357+330	4 Legged	Left Rampur Right Dodpur
30	4+093	358+741	4 Legged	Left Himmatpur Right Kadrapur
31	6+529	361+177	4 Legged	Left Kannauj Right Shadat Na1rnr
32	8+387	363+035	3 Legged	To Field
33	8+471	363+119	4 Legged	Left Field Right Jalalpur
34	351+070	368+107	3 Legged	To Manimau
35	355+665	372+743	3 Legged	To Chat

Figure 3-4 Photographs of Minor Intersection

Minor Junction at km. 351+000

Minor Junction at km. 356+000

Minor Junction at km. 340+000



Minor Junction at km. 330+000

3.8 Elevated Viaduct

New Elevated Viaducts were at following locations:

Table 3-9 Details of Viaducts

Sr. No.	Location	Existing Chainage (km)	Design Chainage (km)	Type of Structure	Proposed span arrangement (No. x Span in 'm')	Total width of the structure (m)	Consultant's Comments
1	Chhibramau	299+727	312+800	As per design	14 x 40	29	Descoped Under -ve COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022
2	Chhibramau	300+860	313+900	As per design	7 x 40	29	
3	Chhibramau	301+963	315+000	As per design	24 x 40	29	

3.9 Grade Separated Structures

The underpasses constructed at site are as tabulated below:

Table 3-10 Details of Grade Separated Structures

Sr. No.	Chainage (km)	Proposed Span arrangement (No. x Span in 'm')	Minimum Vertical Clerance (m)	Total width of the Structure (m)	Remarks	Consultant's Comments
1	304+205	1x12	4.00	29.000		Overall condition of the structure is good. RE wall is in good condition.
2	310+045	1x12	4.00	22.500	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	
3	311+240	1x17.7	5.50	29.500	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	
4	313+563	1X12	4.00	29.000	Under -ve COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	
5	319+040	1X12	4.00	29.000	Under -ve COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	
6	323+010	1x12	4.00	29.000		
7	323+560	1X12	4.00	32.000	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	
8	323+782	1X12	4.00	29.000		
9	325+203	15+30+15	5.50	29.000		
10	328+550	1X12	4.00	29.000		
11	330+400	1X12	4.00	29.000		
12	332+058	15+30+15	5.50	29.000		
13	334+465	1x30	5.50	29.000		
14	336+136	1 x30	5.50	29.000		
15	337+200	1X12	4.00	29.000		
16	338+500	1X12	4.00	29.000		

Sr. No.	Chainage (km)	Proposed Span arrangement (No. x Span in 'm')	Minimum Vertical Clerance (m)	Total width of the Structure (m)	Remarks	Consultant's Comments
17	339+435	1X12	4.00	32.000	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	
18	341+262	1x15	5.50	29.000		
19	344+005	1x12	4.00	29.000		
20	344+562	1x7	5.00	32.000	Under COS - Rf. IE Lt. No. 19810 Dt. 05.12.2022	
21	345+516	1 x30	5.50	29.000		
22	347+123	1X12	4.00	29.000		
23	347+756	1x12	4.00	29.000		
24	348+730	1x30	5.50	29.000		
25	352+980	1x30	5.50	29.000		
26	354+906	1x20	5.50	29.000		
27	355+289	1x20	5.50	29.000		
28	357+286	1X12	4.00	20.500	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	
29	360+223	2x30	5.50	29.000		
30	362+339	1X12	4.00	29.000		
31	364+169	1x20	5.50	29.000		
32	364+550	15+30+15	5.50	29.000		
33	366+077	1x30	5.50	29.000		
34	366+720	15+30+15	5.50	29.000		
35	369+184	15+30+15	5.50	29.000		

3.10 Bridges

Details of Major Bridges and Minor Bridges reconstructed / widened / constructed as new are as given below:

Table 3-11 Details of Bridges

A. Construction of New Major Bridges:

Sr. No.	Name of the River	Existing Chainage (km)	Design Chainage (km)	Type of Structure	Proposed Span Arrangement (m)	Total Width (m)
Nil						

B. Construction of New Minor Bridges:

Sr. No.	Chainage (km)	Proposed span arrangement (No. x Span in m)	Type of structure	Total Width of structure (m)	Remark	Consultant's Comments
1	323+470	1 x 10	As per design	32.00	Complied Manual/ Sch.-D	Structure seems in good condition.

Sr. No.	Chainage (km)	Proposed span arrangement (No. x Span in m)	Type of structure	Total Width of structure (m)	Remark	Consultant's Comments
2	324+026	1 x 20	As per design	32.00	Complied Manual/ Sch.-D	Structure seems in good condition.
3	324+322	1 x 10	As per design	32.00	Complied Manual/ Sch.-D	Structure seems in good condition.
4	336+292	1 x 10	As per design	28.00	Complied Manual/ Sch.-D	Structure seems in good condition.
5	341+958	2X10	As per design	32.00	Complied Manual/ Sch.-D	Structure seems in good condition.
6	342+686	1x20	As per design	32.00	Complied Manual/ Sch.-D	Structure seems in good condition.
7	343+685	1x7	As per design	55.60	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	Structure seems in good condition.
8	346+927	2x10	As per design	29.00	Complied Manual/ Sch.-D	Structure seems in good condition.
9	350+942	1x10	As per design	32.50	Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	Structure seems in good condition.
10	352+297	2x7.5	As per design	16 (LHS) + 14 (RHS)	Complied Manual/ Sch.-D	Structure seems in good condition.
11	365+916	1x10	As per design	29 00	Complied Manual/ Sch.-D	Structure seems in good condition.

C. Reconstruction of Existing Minor Bridges:

The following Minor Bridges are dismantled and reconstructed.

Sr. No.	Chainage (km)	Proposed span arrangement. (No. x Span in 'm')	Total Width of structure (m)	Remark	Consultant's Comments
1	302+294	1x10	32 00	Complied Manual/ Sch.-D	Structure seems in good condition.
2	314+532	2x7.5		Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	
3	316+526	1x10	32.00	Complied Manual/ Sch.-D	
4	356+005	1x6	32.00	Complied Manual/ Sch.-D	

D. New Construction of Minor Bridges on Service Road

The following Minor Bridges are constructed on Service Road:

Sr. No.	Design Chainage (km)	Proposed span arrangement (No. x Span in 'm')	Type of structure	Total Width of structure	Remark	Consultant's Comments
1	365+916	1x10	Asper design	10.8 (LHS) + 10.8 (RHS)	New construction of 2 lane Service Road Bridge with footpath on both side of main carriageway proposed. Cross section follows the service road section with footpath as per Manual/ Schedule-D	Structure seems in good condition.

E. Reconstruction of Minor Bridges on Service Road:

The following existing Minor Bridges are to be reconstructed on Service Road.

Sr. No.	Design Chainage (km)	Proposed span arrangement (No. x Span in 'm')	Type of structure	Total Width of structure	Remark	Consultant's Comments
1	314+532	2x7.5	As per design	10.8 (LHS) + 10.8 (RHS)	Deleted - Under COS - Rf. NHAI Lt. No. 3760 Dt. 25.03.2022	-
2	346+913	2x10	As per design	10.80 (RHS)	Reconstruction of 2-lane Service Road Bridge with footpath on RHS of main carriageway proposed. Cross section follows the service road section with footpath as per Manual/Schedule-D	Overall structure condition is good.
3	352+292	2X7.5	As per design	10.80 (RHS)		Structure seems in good condition, cleaning required.

3.11 Road Over Bridge (ROB)

The details of ROBs constructed are given below:

Table 3-12 Details of ROB

Sr. No.	Location	Design Chainage (km)	Type of Structure	Proposed span arrangement * (m)	Total width of the structure (m)	Consultant's Comments
1	Gursahayganj & Jalalabad Combined Bypass	336+553	As per approved GAD by Railway	18+31+18	32.00	Structure seems in good condition.
2	Jalalpur Panwara Bypass	355+137	Asper approved GAD by Railway	30+25+18	32.00	Overall condition of the structure is good.
3	Bahadurpur Bypass	364+414	As per approved GAD by Railway	35+37.2+35	32.00	Structure seems in good condition.

3.12 Foot Over Bridge (FOB)

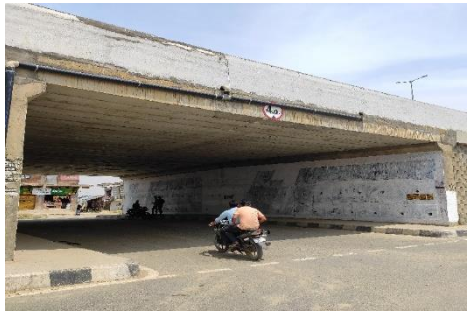
Table 3-13 Details of FOB

Sr. No.	Design Chainage (km)	Width of Structures (m)	Span Arrangement	Vertical Clearance (m)	Remarks	Consultant's Comments
1	318+140	2.20	2x17.0	5.50	New construction of FOB with Ramp.	Foot Over Bridge is newly constructed and is in good condition

The photographs of major structures are presented in table below.

Figure 3-5 Photographs of Major Structures

VUP at km. 304+220


VUP at km. 310+045

VUP at km. 311+240

VUP at km. 323+010

VUP at km. 323+580

VUP at km. 323+782

VUP at km. 325+203

VUP at km. 328+550

VUP at km. 330+400

VUP at km. 332+058

VUP at km. 334+465

VUP at km. 336+136

VUP at km. 337+200

VUP at km. 338+500

VUP at km. 339+435

VUP at km. 341+262

VUP at km. 344+050

VUP at km. 344+500(COS)

VUP at km. 345+516

VUP at km. 347+123

VUP at km. 347+756

VUP at km. 348+703

VUP at km. 352+980

VUP at km. 354+904

VUP at km. 355+289

VUP at km. 357+286

VUP at km. 360+223

VUP at km. 362+339

VUP at km. 364+169

VUP at km. 364+550

VUP at km. 366+077

VUP at km. 366+720

VUP at km. 369+184

MNB at km. 323+478

MNB at km. 324+028

MNB at km. 324+339

MNB at km. 336+300

MNB at km. 341+958

MNB at km. 343+680

MNB at km. 346+913

MNB at km. 352+292

MNB at km. 365+943

MNB at km. 350+943

MNB at km. 316+528

ROB at km. 336+535

ROB at km. 355+129

ROB at km. 364+393

FOB at km. 318+368

3.13 Condition Survey of Culverts

The cross-drainage structure includes hume pipe culverts and box / slab culverts at various locations. There are 53 Nos. of hume pipe culverts and 147 Nos. of box / slab culverts along the project road. The height of culvert varies from 1 m to 5 m from bed level. During the condition survey of structure, these culverts were inspected on sample basis.

The project involves strengthening and widening of existing road to four lane divided carriageway. The culverts beneath existing alignment are either widened or reconstructed. The structural condition of culverts is generally found in sound condition. The quality of surface concrete of box culverts and slab culverts is satisfactory. The RCC parapet, crash barrier has been provided at culvert locations, which is maintained properly.

In most of culverts, the waterway is clear. However, near to urban area and some location, it is found blocked due to debris, drainage water or bushes, tree growth, which must be removed and cleaned before and after monsoon to clear waterway. The rubble pitching has been provided for slope protection.

The culverts are maintained by the Concessionaire during O&M period. However, in case of some culverts, blocked due to vegetation, debris and soil have been observed at culverts, which need to be addressed under routine repair work.

Figure 3-6 Photographs of Culverts

BC at km. 303+545

BC at km. 322+019

BC at km. 322+650

VUP at km. 332+660

BC at km. 337+950

BC at km. 341+550

BC at km. 343+685

BC at km. 344+998

BC at km. 302+256

BC at km. 351+465

BC at km. 352+120

BC at km. 357+980

3.14 Drainage System

There are RCC box drains at the built-up areas and earthen drain at rural area provided for the project stretch. Lined median longitudinal drain is provided at super-elevated sections. The roadside drainage along the Project Road as well as lined drains at median portion is maintained by cleaning debris on regular basis. Some of the photographs of the drains provided are presented below.

Figure 3-7 Photographs of Drains

Median Drain

Median Drain

Chute Drain

Cover Drain

3.15 Slope Protection Measures

Slope protection for high embankment of height greater than 3 m has been provided with stone pitching and turfing has been provided for height upto 3 m. The same is found to be regularly maintained at most the locations. Some of the photographs of slope protection work are presented below.

Figure 3-8 Photographs of Slope Protection Works

Stone Pitching

3.16 Road Furniture

Pavement Marking

Pavement marking for the Project Road is done as per the design standards indicated in Schedule-D. Pavement marking is faded at some locations which needs rectification. As informed by the Concessionaire, the painting is being done wherever is required on regular basis as a part of routine maintenance. Some of the photographs of road marking are presented below.

Figure 3-9 Photographs of Road Markings

Road marking at km. 349+500

Road marking at km. 331+860

Traffic Signage

Traffic signs includes roadside signs, overhead signs, kerb mounted signs and median signs along the Project Road. The design for the traffic signs along the Project Road is done as per the design standards indicated in Schedule-D.

The height, lateral clearance, location and installation are as per relevant clauses of Schedule 'D'. Overhead sign has been installed ahead of major intersections, start / end of Project Road and urban areas as per detailed design requirements.

The sign boards, kilometre stones and hectometre stones are being replaced wherever damaged.

Some of the photographs of sign boards are presented below.

Figure 3-10 Photographs of Road Sign Boards

Overhead Sign Board at km. 309+000

Overhead Sign Board at km. 351+000

Kilometer Stone

Kilometer Stone

NH Helpline Number

Direction Board

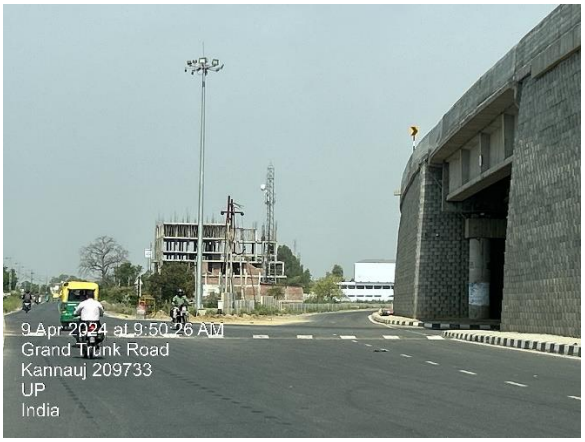
Street Lighting

Street lighting is provided at underpasses, flyovers, ROBs and built-up locations.

At underpass and flyover locations, highway lighting is provided at the structure locations and at its approaches.

Solar amber blinker signals are provided at each at-grade intersections and at median opening locations. These lights are properly maintained and are in good working condition. Regular maintenance work is carried out to ensure their efficient operation. Some of the photographs of highway lightings are presented below.

Figure 3-11 Photographs of Highway Lighting



High mast light at VUP

High mast light at VUP

Highway Lighting at Service Road

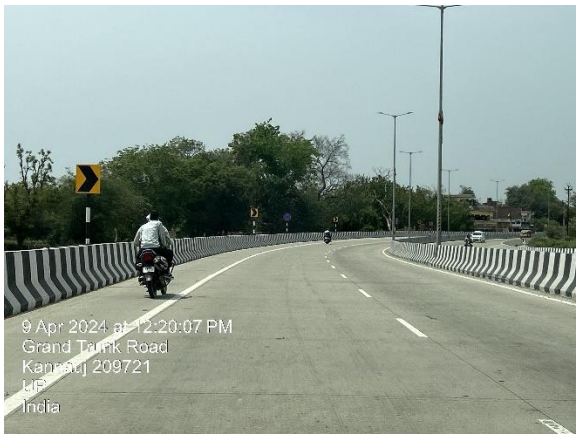
Highway Lighting at MCW

Solar Blinker at median opening

Crash Barriers

Metal beam crash barriers are provided at bridge approaches, locations of high embankment and sharp curves. All the crash barriers provided by the Concessionaire are well maintained at site. Some of the photographs of metal beam crash barriers are presented below.

Figure 3-12 Photographs of Crash Barriers



Concrete Crash Barrier

Metal Beam Crash Barrier

Road Land Boundary

Road land (ROW) boundary demarcation is required to be maintained by the Concessionaire on the Project Road during the concession period. The boundary wall is provided as per the requirement of Concession Agreement.

Figure 3-13 Photographs of Boundary Wall

Cover Drain and Boundary Wall

Boundary Wall

Cycle Track

Cycle track is provided as per the Schedule D of the Concession Agreement. Some of the photographs of Cycle Track are presented below.

Figure 3-14 Photographs of Cycle Track

Cycle Track at km. 315+000

Cycle Track at km. 309+000

3.17 Avenue Plantation and Median Plantation

Avenue plantation and median plantation is available intermittently along the Project Road. Variety of trees and plants are planted throughout the corridor at roadside and at median side respectively. Median plantation is maintained along the Project Road. The plantation is being done wherever required on regular basis. Some of the photographs of avenue plantation and median plantation are presented below.

Figure 3-15 Photographs of Avenue and Median Plantation

Avenue Plantation

Median Plantation

3.18 Project Facilities

Toll Plaza

The Concession Agreement required construction of 01 No. of Toll Plaza at km. 350+605. Subsequently, the Concessionaire has taken up construction of the Toll Plaza at the same location. Presently, the Toll Plaza work is completed and is operational.

1. Toll Plaza at km. 350+709

The construction of toll plaza is completed and is in operation. 16 (8+8) Nos. of lanes has been constructed and all are under operation. The Concessionaire has constructed administration, operation and maintenance facility at base camp. All required facilities are available at the toll plaza. Some of the photographs of Toll Plaza are presented below.

Figure 3-16 Photographs at Toll Plaza

Toll Plaza at km. 350+709

Admin Building at Toll Plaza

Truck Lay Byes

As per Concession Agreement, there are 2 Nos. of Truck Lay Byes provided on Project Road.

Figure 3-17 Photographs of Truck Lay byes

Truck Layby at km. 333+452

Truck Layby at km. 346+650

Rest Area

The Concessionaire has developed the land for Rest Area at both locations of Truck Lay Bye with boundary Wall as per requirement of Schedule-C of CA.

Bus Bay and Passenger Shelter

Bus bays and passenger shelters are constructed at the various locations along the Project Road. Bus bays are equipped with all necessary signage as per relevant IRC guidelines mentioned in Schedule-D of Concession Agreement. Some photographs of the bus bays and passenger shelters provided as below.

Figure 3-18 Photographs of Bus Bay

Bus Shelter at km. 311+000

Bus Shelter at km. 303+000

O&M Centre

O&M Centre is provided as per the Concession Agreement along the Project Road with all the necessary requirements. Some photographs of the bus bays and passenger shelters provided are as below.

Figure 3-19 Photographs of O&M Centre

O&M Centre

Ambulance and Recovery vehicle

Recovery Vehicle

Medical and Traffic Aid Post

4 TOLL PLAZA EQUIPMENT STATUS

An assessment of Toll Plaza in terms of no of lanes, Toll Collection System installed and working status is presented under this section.

Requirements of Toll Plaza are specified in Schedule C-Project Facilities and Schedule D for Specifications. The number of lanes of toll plazas on the Project Road conform to these specifications. Equipment conforms to the standard specifications set down by NHAI for Hybrid ETC (HETC).

4.1 Toll Plaza and Toll Collection System

The Toll Collection System installed at the toll plaza. Toll plaza is provided at km. 350+709 at Basheerpur. The project provides two different methods of toll collection:

- Collection of toll by cash
- Electronic toll collection (ETC) where ETC tags fitted on vehicles are scanned by sensors at the toll plaza

The toll plazas have 7+7 lanes as stipulated in Concession Agreement and 1+1 additional lanes serving VIP vehicles, ambulances, and extra wide vehicles. All lanes are on either side is dedicated ETC lane. View of the toll plazas are shown as below:

View of Basheerpur Toll Plaza

4.2 Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

- Toll Booth Equipment
- Lane Integrator Unit
- AVC Sensors
- Lane Camera
- Incident Capture Camera
- Automatic Vehicle Barrier
- Overhead Lane Signals
- Traffic Lights

4.2.1 Toll Booth Equipment

Toll Booth Hardware / Equipment provided are:

- Industrial Computer with Toll Collector Display (Operator Monitor)
- Customized Keyboard
- Receipt Printer
- Intercom Slave unit
- Smart Card (SC) Reader
- Bar code reader
- Violation System
- Manual Booth Control (MBC)
- Booth Camera

Industrial Computer in the toll booth is provided with the TMS software. The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a programmable keyboard for Registration of toll operations and is customized for different vehicle types and types of ticket.

Booth Equipment

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Violation system has an alarm switch which is pressed by the booth operator in case of violation to set off an alarm.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room.

4.2.2 Lane Controller

Toll Lane Controller is located within the Electronic Enclosure placed inside each toll booth which are connected to the common server and are capable of independent storage of data. The loop sensors embedded on the pavement trigger the AVC height sensors located on parallel pillars. The AVC triggers the incident capture camera in case there is discrepancy in the AVC detection and the toll operator declaration and other incidents such as violations.

4.2.3 Automatic Vehicle Classification (AVC) Sensors

The AVC equipment comprises of height detector, axle & wheel detector and inductive loops. The height detector has a high sensing resolution and detects height when object blocks the path. The presence of vehicle is detected by inductive loop. The axle and double wheel detectors are of optical type, which on passage by a vehicle wheel gives digital output. This output is used to determine the number of axles or the presence of dual wheels at the end of a single axle.

AVC sensors and ALB

4.2.4 Incident Capture Camera System

The incident capture camera is installed on the island of the booth to capture the image of the vehicle from the back side. The AVC triggers the Image capture system in case there is discrepancy in the AVC detection and the toll operator declaration. The Image Capture System can also be triggered on particular events like passage of exempted vehicle or Whitelisted Vehicles.

4.2.5 Automatic Lane Barrier (ALB)

Automatic Lane Barrier is used to allow only authorized vehicles to pass through the lane. The barrier is activated only on generation of user fee receipt or other relevant vehicle processing activity. A torque motor powers the barrier for raising and lowering the boom. The motor can be blocked at any position without causing any damage. In the event of power failure, the boom is automatically raised. The boom weight is exactly balanced by built-in springs.

Automatic Lane Barrier

4.2.6 Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane "Open" and "Close" sign consists of a pair of "GREEN" (arrow) and "RED" (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed.

4.2.7 Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. The LTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done; the LTL turns Green to instruct the vehicle to pass through the lane. The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The user fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

Traffic Light and UFD

4.3 Plaza Equipment

4.3.1 TMS Server

Server for TMS is provided through a Dell Computer housed in the secure server room in the Toll Plaza.

Control Room Equipment - Server & Switch rack

4.3.2 CCTV and Surveillance Cameras

Surveillance Cameras are installed over each lane of the toll plazas. CCTV installed at the Toll Plaza Manager's office provides view of all the toll lanes and important zones within the plaza where cash transactions take place.

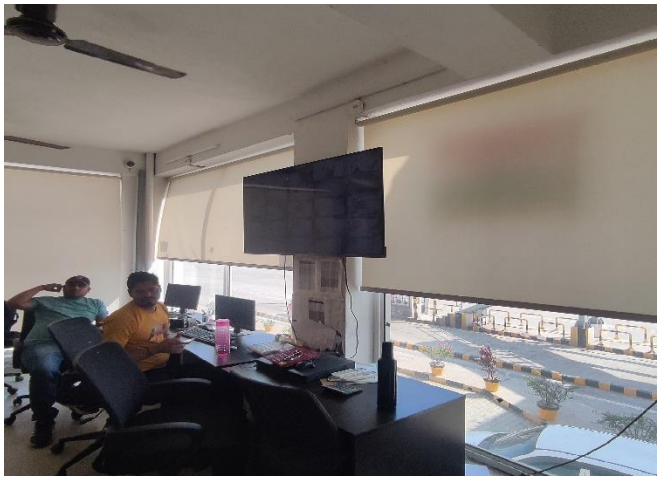
CCTV screen at the Toll Plaza Control Room

The Toll Plaza Manager is able to observe the activities at the toll lanes and toll booth. When the toll collector calls up on the intercom, the manager is able to comprehend the situation at the lane by a zoomed view of the particular lane.

4.3.3 Incident Management Workstation

Whenever the classification done by AVC is different from the Toll Collector Classification, the Incident capture Camera is triggered to capture the image / video of the exiting vehicle.

When AVC is incorrect, the Supervisor corrects the classification based on the video / image captured through the Incident Management Workstation at the Toll Plaza control room. In this case, there is no debit to the Toll Collector. When the Toll Collector had made a wrong classification, the Toll Collector is responsible for any financial loss arising out of the wrong classification that he / she had made. This will be reflected as a Collector Debt on the Collector Cash-Up Report during Cash Up.



Incident Management Workstation at Control Room

4.3.4 Cash up Room Equipment

As all the lane are ETC on Hybrid mode hence there are very less transition in cash however as per CA provision, cash up room is provided which has a computer, Laser Printer and Cash counting machine. Cash collected in each shift is secured inside the strong room. Day cash locker stores small amounts of cash required for float money. Cash is deposited by the Cashier at the Bank accompanied by gunmen on a daily basis.

4.4 Adequacy of Toll Collection System

- Adequacy - The software and hardware as a part of Toll Collection and Management System is installed at Toll Plaza. All lanes are upgraded to Hybrid ETC system as stipulated by NHAI in Technical specifications of Hybrid ETC system through their circular dated 30.11.2017. Weigh in Motion Equipment on the lanes and Static Weigh Bridge are provided at Toll Plaza.

5 BALANCE WORKS

The Project Road has received Provisional Completion Certificate (PCOD) on 24th February 2023 for the length of 68.907 kms out of total length of 70.977 kms. The balance works to be executed at site as mentioned in punch list items.

However, some of the items mentioned in the Punch List A & B cannot be taken up due to non-availability of land. As the Concessionaire has already submitted a Proposal for Descoping of balance Punch List (B) works, there is no any balance work on the Project Road.

6 PAVEMENT AND SITE INVESTIGATION

6.1 General

The Project Road has been developed on Design, Build, Operate and Transfer (DBOT) basis.

The concession period of the project is 17.5 years from Appointment Date i.e., 18th February 2021 including construction period of 2.5 years. The Provisional Completion (PCOD) for the Project has been achieved on 24th February 2023. The project is currently under operation and maintenance (O&M) stage.

6.2 Details of As-built Pavement

The following table shows crust details based on pavement design report submitted by the Concessionaire. The details of pavement crust are as provided during the development of existing two lane to four lane divided carriageway. The pavement design report states that pavement was designed as per IRC:58-2015.

Table 6-1 Existing Pavement Crust Details

Particulars	Chainage (km)		Design Life	Pavement Thickness (mm)		
	From	To		PQC	DLC	GSB
Main Carriageway	302+108	373+085	30 years	300	150	150

Particulars	Design MSA	Pavement Thickness (mm)			
		BC (VG-40)	DBM (VG-40)	WMM	GSB
Service / Slip Road	10 MSA	30	60	175	200

6.3 Surveys and Investigation

6.3.1 Pavement Condition Survey

Pavement condition survey was carried out from **8th April 2024 to 10th April 2024** through visual inspection for the entire project length. The details of the visual condition survey are provided in **Annexure IV.**

The summary of pavement condition based on the visual inspection is tabulated below.

Table 6-2 Summary of Pavement Condition

Design Chainage (km)		Length	Visual Condition (As per IRC:115-2014)	
From	To		Carriageway (LHS)	Carriageway (RHS)
302+108	373+085	70.977	Good	Good

Observation and Conclusion:

From the above table, it is observed that the overall pavement condition for the entire project stretch is found to be good.

Following Photographs were taken at the time of visual pavement condition survey.

Figure 6-1 Photographs of Pavement Condition Survey

km. 350+200

km. 344+700

km. 336+500

km. 331+860

km. 320+600

km. 320+100

km. 302+200

km. 322+900

6.3.2 Roughness Index Test

The Roughness Index Test conducted by Concessionaire in February 2023 has been provided. This test was done using Car Mounted Bump Integrator to assess the riding quality on each direction (each lane) of the carriageway of Project Road.

As per IRC:SP:16-2019, condition of pavement is categorised under:

Table 6-3 Roughness Values (BI Value - mm/km)

Sr. No.	Roughness Range (m/km)	Severity	Inner Lane (Lane-1) LHS Length (km)	Outer Lane (Lane-2) LHS Length (km)	Inner Lane (Lane-1) RHS Length (km)	Outer Lane (Lane-2) RHS Length (km)
1	Less than 3.05	Good	70.977	70.977	70.977	70.977
2	3.05 - 3.55	Fair	-	-	-	-
3	More Than 3.55	Poor	-	-	-	-

7 OPERATION AND MAINTENANCE

7.1 Introduction

Article 17 and Schedule-K of the Concession Agreement defines the Operation and Maintenance requirement during the concession period.

The Company has received Provisional Completion Certificate on 24th February 2023.

The project is currently under Operation and Maintenance stage. The concession period of the project is 17.5 years form the Appointed Date including construction period of 2.5 years.

7.2 O & M Set Up

O & M Contract

As per Clause 17.1 of the Concession Agreement, the Concessionaire shall operate and maintain the Project Road by itself, or through O&M Contractors and if required, modify, repair, improve the Project Road to comply with Specifications and Standards, and other requirements set forth in the Agreement through Good Industry Practice, Applicable Laws and Applicable Permits and manufacturer's guidelines. The Operation and Maintenance activities will conform to all the requirements laid down in MoRT&H, IRC Specifications and the Concession Agreement.

The Concessionaire (**M/s. GR Aligarh Kanpur Highways Limited**) has appointed **G R Infraprojects Limited** as O&M Contractor to carry out the activities related to operation and maintenance of the Project Road.

Under Routine Maintenance, the road is to be maintained in good, safe and motorable condition. The specifications in contracts are kept the same as per design and construction specification.

The periodical maintenance will have to be done during O&M period as per requirement of Concession Agreement and as per site requirement to maintain the design standards and level.

List of Manpower

Sr. No.	Emp. Code No.	Name of Employee's	Designation
1	10024192	Pramod Kumar Garg	Project Manager
2	10012595	Naveen Kumar Yadav	Deputy Manager
3	10040059	Ajeet Kumar Singh	Senior Engineer
4	10010103	Dhiraj Kumar Bhatt	Executive (P&E)
5	10051744	Chandan Singh	Senior Engineer
6	10026907	Vimal Kumar	Engineer
7	10047980	Rajnesh	Executive
8	10049597	Brijesh Kumar	Officer
9	10053084	Mohammad Danish	Computer Operator
10	10053699	Chandrakesh	Control Room Officer
11	10052110	Uday Bhan Singh	Route Patrol Officer
12	10052111	Govind Kumar Mishra	Route Patrol Officer
13	10055527	Shyam Singh	Route Patrol Officer
14	10011609	Lulan Singh	Supervisor

Sr. No.	Emp. Code No.	Name of Employee's	Designation
15	10022219	Praveen Kumar Bind	Supervisor
16	10043697	Bijendra Pratap	Supervisor
17	10043850	Niraj Kumar	Junior Supervisor
18	10053070	Khempal	Nurse
19	10053903	Dinesh Kumar Maurya	Nurse
20	10053934	Yogendra Singh	Nurse
21	10053935	Deependra Singh	Nurse
22	10028574	Ranjeet Kumar	Junior Electrician
23	10054077	Suhel	Junior Electrician
24	10040937	Hari Parit	Junior Mechanic
25	10004251	Gurmeet Singh	Senior Tractor Driver
26	10006945	Nand Lal	Senior HMV Driver
27	10007311	Gajendra Singh	Senior HMV Driver
28	10013605	Sanoj Kumar	HMV Driver
29	10014019	Sunil Kumar Maurya	HMV Driver
30	10014206	Nem Chand	HMV Driver
31	10017860	Davendra	LMV Driver
32	10022298	Navi Akhtar	LMV Driver
33	10023095	Ram Autar	HMV Driver
34	10025964	Satya Narayan	HMV Driver
35	10026317	Karan Singh	HMV Driver
36	10026995	Santosh Shukla	HMV Driver
37	10038290	Ram Jeet Singh	HMV Driver
38	10038356	Omprakash	LMV Driver
39	10038528	Bhola Singh	Welder
40	10038679	Rajesh Kumar Maurya	LMV Driver
41	10038992	Abjal Ahmad	LMV Driver
42	10039166	Nitin Chaudhary	HMV Driver
43	10039983	Manoj Kumar	HMV Driver
44	10039985	Koshal Kishor Rana	HMV Driver
45	10040030	Prem Sagar	LMV Driver
46	10042169	Sanjay Singh	HMV Driver

7.3 Operation Cost

Operations cost is comprised of manpower cost, power and electricity cost, office operating expenses, vehicle running expenses, administrative expenses and other miscellaneous expenses. The Concessionaire has provided the expenses occurred towards operation expenses for current / past years. Necessary assumptions have made from the expenses of similar type of projects to arrive at the operation cost. The estimates are projected based on best industry practices and are compared with the operating cost in the vicinity of the project area.

The estimated Operating Cost for the base month of April 2024 is **Rs. 11.59 Crores**. The detailed working of the same is attached in **Annexure-I**.

7.4 Routine Maintenance Cost

The Routine Maintenance cost is derived based on the Ministry of Road Transport and Highways - Report of the Committee on Norms for Maintenance of Roads in India (published by Indian Road Congress New Delhi 2001) along with actual pavement condition assessed during condition survey.

Maintenance cost constitutes the routine, day-to-day maintenance activities for project assets, including road pavement, shoulders, embankment, drainage, structures, plantations, roadside furniture, traffic signs, traffic safety devices etc. Past data has been used to assess maintenance costs due to normal usage or "wear-and-tear". Likely costs of maintenance of structures are assessed based on their present condition and vintage, in combination with well-established guidelines and thumb rules given in Indian codes and standards.

The estimated cost of Routine Maintenance works out to be **Rs. 2.41 Crores (3.40 Lakhs per km)** for the base month April 2024. The detailed working of the same is attached in **Annexure-II**.

7.5 Major Maintenance Cost

Unlike the old Concession Agreements where periodicity and threshold limits were clearly described for the major maintenance, the Concession Agreement of this project does not specify the periodicity or the threshold limits for carrying out the full-length major maintenance. Schedule-K of the Concession Agreement specifies the threshold limits and the timelines for carrying out repairs to the distresses during the operation period.

The maintenance thus can be carried out as and when required basis and to the compliance of Schedule-K requirement to maintain the road in serviceable condition. Only improvement to Riding Quality is expected if the roughness value exceeds 2750 mm/km. However, the average roughness value of the project highway lies within the limit as mentioned above.

Any New pavement is not expected to show any distresses at least for 6 to 7 years with the proper routine maintenance. Mere Routine Maintenance would suffice to meet the performance standard mentioned in Schedule-K. In this project, there is no specific requirement to carry out the major maintenance at the end of concession period.

Hence, major maintenance is planned every 7th year from the date of COD till end of concession period.

The summary of the major maintenance planned up to end of concession period is presented in the below table.

The total base cost of major maintenance works out to be **Rs. 39.92 Crores** for the base month of April 2024. The detailed working for the same is shown in **Annexure-III**.

7.6 Paved Shoulders

As per design specifications, the paved Shoulder is designed as an integral part of the pavement for main carriageway. Therefore, the total pavement thickness in paved shoulders would be the same as in the carriageway.

7.7 Summary of Major Maintenance Cycle

The table below shows the major maintenance cycle throughout the concession period for the project stretch.

Table 7-1 Maintenance Cycle

Sr. No.	Year	Main Carriageway	Service Road
1	FY 2024	-	-
2	FY 2025	-	-
3	FY 2026	-	-
4	FY 2027	-	-
5	FY 2028	-	-
6	FY 2029	-	-
7	FY 2030		
8	FY 2031	1st Major Maintenance	1st Major Maintenance
9	FY 2032	1st Major Maintenance	1st Major Maintenance
10	FY 2033	-	-
11	FY 2034	-	-
12	FY 2035	-	-
13	FY 2036	-	-
14	FY 2037	2nd Major Maintenance	2nd Major Maintenance
15	FY 2038	2nd Major Maintenance	2nd Major Maintenance

7.8 Projected Maintenance Cost without escalation

The below table shows the total cost of operation and routine maintenance, major maintenance and strengthening up to end of the concession period without escalation.

Table 7-2 Summary of Operation & Maintenance Cost without escalation

Sr. No.	Item Description	Length (km)	Year of Execution	Rate (Lakhs / km)	Total Amount (Crores)
1	**Total Operation and Routine Maintenance Cost**	70.977	Every year	19.73	**14.01**
2	**Major Maintenance Cost**				
i)	1st Major Maintenance - MCW & SR	70.977	FY 2031 & FY 2032	28.12	**19.96**
ii)	2nd Major Maintenance - MCW & SR	70.977	FY 2037 & FY 2038	28.12	**19.96**
	Total Major Maintenance Cost				**39.92**

Notes:

1. It is to be noted that the rates considered for calculating all the above cost are exclusive of Goods and Service Tax (GST).
2. The estimated cost in the table above is for base month of April 2024.
3. The rates are based on SOR of Govt. of Uttar Pradesh for the year 2022-2023.
4. The current market rates are considered for bitumen, cement and steel.
5. The labour rate adopted from Govt. of India, Ministry of Labour and Employment Office of the Chief Labour Commissioner w.e.f. 03.04.2024.

7.9 Projected Maintenance Cost with escalation

The below table shows the total cost of operation and routine maintenance, major maintenance and strengthening up to end of the concession period with escalation as provided by the Company.

Table 7-3 Summary of Operation & Maintenance Cost with escalation

Sr. No.	Year	WPI Inflation	Total O & M Cost (Crores)	Major Maintenance Cost (Crores)
1	FY 2025		14.01	-
2	FY 2026	5.00%	14.71	-
3	FY 2027	5.00%	15.44	-
4	FY 2028	5.00%	16.21	-
5	FY 2029	5.00%	17.02	-
6	FY 2030	5.00%	17.88	-
7	FY 2031	5.00%	18.77	13.37
8	FY 2032	5.00%	19.71	14.04
9	FY 2033	5.00%	20.69	-
10	FY 2034	5.00%	21.73	-
11	FY 2035	5.00%	22.81	-
12	FY 2036	5.00%	23.95	-
13	FY 2037	5.00%	25.15	17.92
14	FY 2038	5.00%	26.41	18.82
	Total Cost (Cr.)		**274.49**	**64.15**

The Company may carry out necessary investigation prior to O&M and major maintenance. This will help in proper assessment of maintenance work based on the actual pavement condition. The spending on major maintenance / strengthening can then be reduced if the road is adequately and timely maintained.

8 REVIEW OF CONCESSION AGREEMENT

The NHAI accordance with the statutory powers vested on it by the Government of India has entered into a Concession Agreement on 23/06/2020 with GR Aligarh Kanpur Highway Pvt. Ltd., a Special Purpose Vehicle (SPV) formed for implementing this project, a company incorporated under Indian Companies Act, 2013 for 4-laning of Aligarh-Kanpur section from km. 289+000 (Design km. 302+108) to km. 356+000 (Design km. 373+085) (Package-IV from Naviganj - Mitrasen) of NH-91 in the state of Uttar Pradesh on Hybrid Annuity mode under Bharatmala Pariyojana.

The provisions under various clauses of the Agreement concerned with post construction period were reviewed. The specific comments are indicated below clause-wise.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 3 Clause 3.1	The Concession	Subject to and in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits, the Authority hereby grants to the Concessionaire the concession set forth herein including the exclusive right, license and authority to construct, operate and maintain the Project (the "**Concession**") during the Construction Period of 910 (Nine hundred and ten) days and Operation Period of 15 (Fifteen) years commencing from COD, and the Concessionaire hereby accepts the Concession and agrees to implement the Project subject to and in accordance with the terms and conditions set forth herein.	This construction period was 910 days, work is completed. The O&M period is in progress.
Article 4 Clause 4.1.2	Conditions Precedent	The Condition precedent required to be satisfied by the Authority shall be deemed to have been fulfilled when the Authority shall have (a) Procured for the Concessionaire the Right of Way to the site in accordance with the provisions of Clauses 10.3.1 and 10.3.2 (b) Procured all Applicable Permits relating to environmental protection, and conservation in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2 (c) Procured forest clearance for and in respect land forming part of the Right of Way under Clause 10.3.1 and 10.3.2, save and except permission for cutting trees; and	All issues complied and PCOD is achieved.
Article 4 Clause 4.2	Conditions Precedent-Damages for delay by the Authority	In the event that (i) the Authority does not procure fulfillment of any or all the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.2% (zero point two percent) of the Performance	All issues complied and PCOD is achieved.

Article & Clause No.	Subject	Description in Brief	Remarks
		Security for each day's delay until the fulfillment of such Conditions Precedent, subject to the maximum limit equal to the amount of 1% of the Estimated Project Cost as mentioned in RFP and upon reaching such limit, the Concessionaire may, in its sole discretion terminate the Agreement.	
Article 4 Clause 4.3	Damages for delay by the concessionaire	In the event that (i) the Concessionaire does not procure fulfillment of any or all of the Conditions Precedent set forth in Clause 4.1.3 within the period specified in respect thereof, and (ii) the delay has not occurred as a result of failure to fulfill the obligations under Clause 4.1.2 or other breach of this Agreement by the Authority, or due to Force Majeure, the Concessionaire shall pay to the Authority Damages in an amount calculated at the rate of 0.3% (zero point three per cent) of the Performance Security for each day's delay until the fulfillment of such Conditions Precedent. Provided, however, that the Damages payable hereunder shall be subject to the maximum limit equal to the amount of 1% of the Estimated Project Cost as mentioned in the RFP and upon reaching such limit, the Concessionaire may, in its sole discretion and subject to the provisions of Clause 9.2, terminate the Agreement	The PCOD is achieved.
Article 5 Clause 5.1.4 (d, e & f)	Obligation of the Concessionaire	The Concessionaire shall, at its own cost and expense, in addition to and not in derogation of its obligations elsewhere set out in this Agreement d) The Concessionaire shall make reasonable efforts to maintain harmony and good industrial relations among the personnel employed by it or its Contractors in connection with the performance of its obligations under this Agreement. e) Make reasonable efforts to facilitate the acquisition of land required for the purposes of the Agreement f) Ensure and procure that its Contractors comply with all Applicable Permits and Applicable Laws in the performance by them of any of the Concessionaire's obligations under this agreement.	The Concessionaire followed actions and PCOD is achieved. However, the Concessionaire shall follow this during O&M Period also.
Article 5 Clause 5.3.1	Obligation relating to Change in ownership	The Concessionaire shall not undertake or permit any Change in Ownership, except with the prior written approval of the Authority.	The risk of Lender is covered during Concession Period including O&M period.
Article 8 Clause 8.1.5	Disclaimer	Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Concessionaire and the Authority shall not be liable in any manner for such risks or the consequences thereof.	The Concessionaire shall note this and perform according to Concession

Article & Clause No.	Subject	Description in Brief	Remarks
			Agreement Provision. All risks are with Concessionaire.
Article 9 Clause 9.1.1	Performance Security	The Concessionaire shall, for the performance of its obligations hereunder during the Construction Period, provide to the Authority no later than 30 (thirty) days from the date of this Agreement, an irrevocable and unconditional guarantee from a Bank For a sum equivalent to **Rs.110.00 Crores (Rupees One hundred and ten Crores only)** in the form set forth in schedule-F (the "Performance Security").	The PCOD is achieved. The performance security might have returned to the Concessionaire.
Article 10 Clause 10.3.2	Procurement of the site -	Without prejudice to the provisions of Clause 10.3.1, the Parties hereto agree that on or prior to the Appointment Date, the Authority shall have granted vacant access and Right of Way such that the Appendix shall not include land which shall in any manner prevent the Concessionaire from undertaking construction of the project to the extent of at least 80% (eighty percent) of the length thereof, and in the event Financial Close is delayed on account of delay in grant of such vacant access and Right of Way, the Authority shall be liable to payable to damages solely under the provisions of Clause 4.2.	The PCOD is achieved.
Article 10 Clause 10.3.4	Procurement of the site-Right of Way	The Authority shall make best efforts to procure and grant no later than 90 (ninety) days from the Appointed date, Right of Way to the Concessionaire in respect of all land included in the Appendix, and in the event of delay for any reason other than Force Majeure or breach of this Agreement by the Concessionaire, it shall pay to the Concessionaire Damages in a sum calculated at the rate of Rs.1 per day for every 10 square meter or part thereof, commencing from the 91st day of the Appointed Date and until such Right of Way is procured or 180 days from Appointed date whichever is earlier.	The PCOD is achieved.
Article 11 Clause 11.4	Utilities, Associated Roads and Trees-Felling of trees	The Authority shall assist the Concessionaire in Obtaining the Applicable Permits for felling of trees to be identified by the Authority for this purpose if and only if such trees cause a material adverse effect on the construction, operation or maintenance of Project Highway. The Cost of such felling shall be borne by the Authority and in the event of any delay in felling thereof for reasons beyond the control of the Concessionaire, it shall be excused to perform any of its obligations hereunder if such failure is a direct consequence of delay in the felling of trees.	The work is completed. However, the provision shall be followed during O&M period also. If there is obstruction to trees.
Article 12	Construction of the Project	On or after the Appointed Date, the Concessionaire shall undertake construction of the Project as specified in Schedule-B and Schedule-C, and in conformity with the	The work is now completed, and PCOD is

Article & Clause No.	Subject	Description in Brief	Remarks
Clause 12.3.1		Specifications and Standards set forth in Schedule-D. The 910th (Nine hundred and ten) days from the Appointed Date shall be the scheduled date for completion of the Project (the **"Scheduled Completion Date"**) and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	achieved. O&M contract is being executed for maintenance of highway.
Article 12 Clause 12.3.2	Construction of the Project Highway and Milestone	The Concessionaire shall construct the Project Highway in accordance with the Project Completion schedule set forth in Schedule-G. In the event that the Concessionaire fails to achieve any Project Milestone within a period of 90 (ninety) days from the date set forth for such Milestone in Schedule G, unless such failure has occurred due to Force Majeure or for reasons solely attributable to the Authority, it shall pay Damages to the Authority in a sum calculated at the rate of 0.1% (zero point one percent) of the amount of performance Security for delay of each day until such Milestone is achieved.	The work is competed as per Milestone.
Article 12 Clause 12.3.3	Construction of the Project Highway and Milestone	In the event that the project is not completed, and COD does not occur within 270 (two hundred and seventy) days from the Scheduled Completion Date, unless the delay is on account of reasons solely attributable to the Authority or due to Force Majeure, the Authority shall be entitled to terminate this Agreement.	The work is completed, and PCOD is achieved.
Article 13 Clause 13.2	Inspection	During the construction period, the independent Engineer shall inspect the Project at least once a month and make a report of such inspection (the "Inspection Report") stating all reasonable detail the defects or deficiencies, if any, with particular reference to the Project Completion Schedule, Scope of the Project and specification and standards	The work is completed with quality. The defect will be attended during Defect Liability Period.
Article 14 Clause 14.3.2	Provisional Certificate	The parties here to expressly agree that a Provisional Certificate under this Clause 14.3 may, upon requested of the Concessionaire to this effect, be issued for operating part of the Project, if the Concessionaire has completed construction of 100% of the site made available to the Concessionaire up to 146 days from the Appointed Date. Upon issue of such Provisional Certificate, the provisions of Article 15 shall apply to such completed part, and the rights and obligations of the Concessionaire for and in respect of such completed part of the Project shall be constructed accordingly.	The project is completed as per Schedule Completion Date.
Article 15 Clause 15.2	Entry into commercial service- Damages for delay	Subject to the provisions of Clause 12.3, if COD does not occur prior to the 91st (ninety first) day after the Scheduled completion Date, unless the delay is on account of reasons attributable to the Authority or due to force Majeure, the Concessionaire shall pay Damages to the Authority in a sum calculated at the rate of 0.2% of the amount of performance Security for delay of each day until COD is achieved.	The PCOD is achieved.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 17 Clause 17.8.1	Damages for beach of maintenance obligations	In the event that the concessionaire fails to repair any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% (two per cent) of the Performance Security and (b) 0.1 (zero point one per cent) of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.	The Maintenance of completed Highway is in progress after COD as per O&M Contract executed between Concessionaire & Contractor. The scope specifications, standards as per CA is to be followed.
Article 23 Clause 23.1	Bid Project cost	The parties expressly agree that the cost of construction of the project, as on the Bid Date, which is due and payable by the Authority to the Concessionaire shall deemed to **be Rs. 2200.00 Crores (Rupees Two Thousand Two Hundred only)**	The work is completed within Project Cost.
Article 23 Clause 23.2.1	Payment of Bid Project Cost	The bid project cost specified in Clause 23.1 shall be revised from time to time in accordance with the provisions of this Clause 23.2 to reflect the variation in Price Index occurring after the Reference Index Date immediately preceding the Bid Date.	This is paid during construction work.
Article 23 Clause 23.3.1	Payment of Bid Project Cost	40% of the Bid Project Cost, adjusted for the Price Index Multiple, shall be due and payable to the Concessionaire is 10 equal installments of 5% during the construction Period in accordance with the provisions of Clause 23.4.	This is paid during construction work.
Article 23 Clause 23.4	Payment during construction period	For the purpose of this clause 23.4, the payment Milestone for release of payment during construction period shall be as under: a) I (first) Payment Milestone - On achievement of 10% Physical Progress b) II (second) Payment Milestone - On achievement of 30% % Physical Progress c) Ill (third) Payment Milestone - On achievement of 50% Physical Progress d) IV (fourth) Payment Milestone - On achievement of 75% Physical Progress e) V (fifth) Payment Milestone - On achievement of 90% Physical Progress	This amount is released and paid during construction activities as per Schedule in CA.
Article 23 Clause 23.5	Bonus on early completion	In the event that the concessionaire shall achieve COD on or more than 30 days prior to the Scheduled Completion Date, the Authority shall pay to the Concessionaire a bonus equal to 0.5% of 60% of the Bid project cost for the first 30 days by which COD shall precede the Schedule Completion date and there after the said bonus shall be calculated	The Concessionaire has submitted application of bonus for early completion of the Project.

Article & Clause No.	Subject	Description in Brief	Remarks
		on the pro-rata basis for each day preceding the said 30 days period. The Bonus shall be due and payable to the Concessionaire along with the 1st Annuity Payment.	
Article 23 Clause 23.6.2	Annuity Payments during operation period	The completion cost remaining to be paid in pursuance of the provisions Clause 23.6.1 shall be due and payable in biannual installments over a period of 15 (fifteen) years commencing from COD, (the Authority Payments) the 1st (first) installment of Annuity Payments shall be due and payable within 15 (fifteen) days of the 180th (one hundred and eighteen) day of COD and the remaining installments shall be due and payable within 15 (fifteen) days of completion of each of the successive six months (the "Annuity Payment Date").	The Concessionaire is getting this as per Concession Agreement as PCOD is achieved.
Article 23 Clause 23.7.1	O & M Payments	The Parties acknowledge and agree that all O&M Expenses shall be borne by the Concessionaire and in lieu thereof; a lump sum financial support in the form of biannual payments shall be due and payable by the Authority, which shall be computed on Rs.5.01 crores (Rupees Five crores one lakh only) (the first year O&M), in accordance with the provisions of this Clause 23.7 (the "**O&M Payments**"). The Parties further acknowledge and agree that any O&M Expenses in excess of the O&M Payments shall be borne solely by the Concessionaire, save and except as expressly provided in this Agreement. For avoidance of doubt it is clarified that the O&M Payments will be subject to any Change in Scope of the Project of the Concessionaire under Article 16 of this Agreement.	Expenses towards O&M shall be the responsibility of Concessionaire and biannual O&M payments shall be by Authority.
Article 23 Clause 23.8	Mobilization advance	The Authority shall, on request of the Concessionaire, make an advance payment in a sum not exceeding 10% (ten percent) of the bid project cost (the Mobilization Advance). This advance payment shall be made in two equal installments. The concessionaire may request the Authority for the first installment of the advance payment at any time after the appointed date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority. The concessionaire may request the Authority for the second installment of the advance payment at any time after 60 (Sixty) days from the appointed date, along with furnishing a Bank Guarantee in a form satisfactory to the Authority	The Concessionaire has received this Mobilization Advance against Bank Guarantee and work is completed.
Article 26 Clause 26.1	Insurance-Insurance during Concessionaire period	The Concessionaire shall affect and maintain at its own cost, during the Construction Period and the Operation Period, such insurances for such maximum sums as may be required under the Financing Agreements and Applicable laws, and such insurances as may be necessary or prudent in accordance with Good Industry Practice.	The Concessionaire, has taken all Insurances.

Article & Clause No.	Subject	Description in Brief	Remarks
Article 34 Clause 34.3.1	Substitution Agreement	The Lender's Representative, on behalf of Senior Lenders, may exercise the right to substitute the Concessionaire pursuant to the agreement for substitution of the Concessionaire (the '**Substitution Agreement**') to be entered into amongst the Concessionaire, the Authority and the Lenders' Representative, on behalf of Senior Lenders, Substantially, in the form set forth in Schedule-R.	The Lender's risk is covered with the provision of Substitution Agreement. This will be operated if situation needs.
Article 38 Clause 38.3.1	Dispute Resolution	Any Dispute which is not resolved amicably by conciliation, as provided in Clause 38.2, shall be finally decided by reference to arbitration by an arbitral tribunal constituted in accordance with Clause 38.3.2.	There is provision of Arbitration in case of unresolved dispute between Authority and concessionaire.
Article 41 Clause 41.17	State support agreement	The Concessionaire acknowledges that it has received from the authority a certified true copy of the agreement executed between MORTH and the state government for providing the support and services specified therein (the "State support agreement"), and the parties here to agree to make their best endeavors to procure the support of the state government.	This provision will help the Concessionaire for obtaining permission, approval and land acquisition faster.

Most of the above points are brought out to see that the Agreement is generally enforceable in law without ambiguities.

Conclusions

The Concession Agreement is comprehensive and covers most of the concerns of Lenders and all risk factors.

9 REVIEW OF O&M AGREEMENT

The Operation and Maintenance Agreement was signed between **M/s GR Aligarh Kanpur Highway Private Limited (GAKHPL)** and **G R Infraprojects Limited (O&M Contractor)** on 28/9/2023 for 4-laning of Aligarh - Kanpur section from km 289+000 (Design km. 302+108) to km. 356+000 (Design km. 373+085) (Package-IV from Naviganj - Mitrasen) of NH-91 in the state of Uttar Pradesh on Hybrid Annuity mode under Bharatmala Pariyojana.

The provisions under various clauses of this O&M Contract were reviewed and specific comments are indicated below clause-wise.

Sr. No.	Clause No.	Description in Brief	Remark
1	Agreement Para (ii)	The Concessionaire now wishes to appoint **M/s. G R Infraproiects Limited** for Operation and Maintenance of Project Highway as 0&M Contractor in accordance with Scope of Work as mentioned in Annexure 1 hereto, under the Concession Agreement.	The Contractor **M/s. G R Infraprojects Ltd.** is appointed for O&M work as per scope in Concession Agreement.
2	Clause (n) Definition	"O&M Contractor" means the person, if any, with whom the Concessionaire has entered into an O&M agreement for discharging O&M obligations for and on behalf of the Concessionaire.	The Contractor is appointed to discharge duties of O&M work on behalf of Concessionaire as per scope in O&M Agreement.
3	Clause r Definition	"O&M Period" O&M Agreement means operation and maintenance period of 1 year commencing from Commencement Date 1st April 2023 to 31st March 2024.	The Agreement of O&M is for one year commencing from 1st April 2023.
4	Clause 2 Availability of Documents	The O&M Contractor also acknowledges the fact that the Concession Agreement is always binding and applicable back-to-back on the O&M Agreement, limited to the obligations during the O&M period under the Concession Agreement and the scope of the O&M Contractor as per this Agreement. In case of any discrepancy in whatsoever matter, the clauses or' Concession Agreement shall prevail over and above this O&M Agreement.	A copy of Concession Agreement & Maintenance Manual is provided to Contractor. It is always binding to Contractor for implementation during O&M work.
5	Para 6 O&M Contractor's obligation	6.1 During Operation Period, provisions of Article 17 of the Concession Agreement shall apply. The O&M Contractor shall operate and maintain the Project Highway in accordance with Article 17 of the Concession Agreement and if required, modify, repair or otherwise make improvements to the Project Highway comply with the provisions of this Agreement, Applicable Laws and Applicable Permits, and confirm to Specifications and Standards and Good Industry Practice.	The obligation of O&M is as per Article 17 of CA. These cover periodical routine & major repair work and safety of users specifications.

Sr. No.	Clause No.	Description in Brief	Remark
6	Clause 6 Maintenance Requirements	6.3 The O&M Contractor shall procure that at all times during the Operation Period; the Project Highway conforms to the maintenance requirements set forth in Schedule-K of the Concession Agreement (the "Maintenance Requirements").	The maintenance required to be done as per Schedule K of CA only.
7	Clause 6 Maintenance Program	6.4 Not later than 55 days prior to the beginning of each Accounting Year during the Operation Period, the O&M Contractor shall provide to the Concessionaire, its proposed annual program of preventive. urgent and other scheduled maintenance (the "Maintenance Program") to comply with the Maintenance Requirements, Maintenance Manual and Safety Requirements.	The Contractor has to submit the Programme of Annual work for O&M with maintenance requirement and safety.
8	Clause 6 Maintenance Requirements 6.5 Safety, Breakdown and accident	6.5.1 The 0&M Contractor shall ensure safe conditions for the users, and in the event of unsafe conditions, closures, diversions, breakdowns and accidents, it shall follow the relevant operating procedures including the setting up of temporary Lights and removal of obstruction and debris without delay. Such procedures shall conform to the provisions of this Agreement, Applicable Laws, Applicable Permits and Good industry Practice.	Safety of users including breakdown, accident rescue operations is responsibility of O&M Contractor.
9	Clause 6 Maintenance Requirements 6.10 Damages for Breach of Maintenance obligations	In the event that the O&M Contractor fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be this Agreement and the cm Contractor shall pay to the Concessionaire Damages at such rate as the Concessionaire Is required to pay to the Authority under the Concession Agreement. Recovery of such Damages shall be without prejudice to the rights of the Concessionaire under this Agreement, including the right of Termination thereof.	The provision of Levy of Damage or Termination for breach of Agreement, defective work will keep pressure on contractor to work as per requirement in CA.
10	Clause 6 Maintenance Requirements 6.16 Monthly Status report during Operation Period	During the Operation Period, the O&M Contractor shall, no later than 7 (seven) days after the close of each English calendar month, furnish to the Concessionaire, a monthly report stating in reasonable detail the condition of the Project including its compliance or otherwise with the Maintenance Requirements, Maintenance Manual. Maintenance Program and Safety Requirements and shall promptly give such other relevant information as may be required by the Concessionaire/ IE/ Authority.	It is binding on Contractor to submit status report on monthly basis for information to Authority, Concessionaire, IE & Lender. It should state compliance of all requirements of maintenance, safety.
11	Clause 6 Maintenance Requirements 6.17 Tests	For determining that the Project Highway conforms to the Maintenance Requirements, the Project Manager/IE shall require the O&M Contractor to carry out, or cause to be carried out, tests specified by it in accordance with Good Industry Practice.	This will maintain quality of work.

Sr. No.	Clause No.	Description in Brief	Remark
12	Clause 6 Maintenance Requirements 6.19 Safety Requirements	6.19.1 The O&M Contractor shall comply with the provisions of this Agreement and [or Concession Agreement, Applicable Laws and Applicable Permits and confirm to Good Industry Practice for securing the safety of the Users. in particular, the O&M Contractor shall develop, implement and administer a surveillance and safety program for providing a safe environment on or about the Project Highway, and shall comply with the safety requirements set forth in Schedule L of the Concession Agreement (the “Safety Requirements").	The O&M Contractor has to comply requirements provision for safety of Highway users. The safety of users is given priority. The compliance should be as per provision in CA.
13	Clause 13 Sub-contracts	13.1 The O&M Contractor shall notify to the Project Manager in writing of its intent to subcontract the O&M works in part or full and without the written approval of the Project Manager no subcontractor shall be appointed by the O&M Contractor.	The sub-contractor cannot be appointed without the approval of Project Manager. This will keep control over contractor to appoint proper and competent contractors.
14	Clause 16 Insurance	16.1 The Concessionaire shall. procure and maintain the insurance for the Project Highway including all facilities in accordance with the Article 26 of the Concession Agreement.	The risks and security of Authority, concessionaire and lender is covered by all insurance.
15	Clause 17 Defect Liability Period	17.1 The Concessionaire and/or the EPC Contractor Is responsible for all the defects and deficiencies in construction of the Project Highway or any section thereof and rectify the Same, without any cost to the O&M Contractor. during the O&M period. Under this agreement the O&M Contractor is only under obligation of Operation 8r Maintenance of the Project Highway. For avoidance of doubt, any repair or restoration on account of usual wear and tear in the Project Highway shall form a part of the maintenance.	The Contractor is responsible for any defects during the Defect Liability period of 1 year. This will maintain the quality of work to avoid any action for defective work.
16	Clause 21 Acknowledgement	The O&M Contractor acknowledges and accepts that this agreement entitles the Authority and/or Lenders Representative to step into this agreement, in its sole discretion, in Substitution-of the Concessionaire In the event of Termination or Suspension of the Concessionaire. Further, provision of clause 5.2 of the Concession Agreement relating to Project Agreement shall apply *mutatis mutandis.*	The Contractor has agreed for step in right of Authority or Lender in case of Termination of Concessionaire.
17	Clause 22 O&M Payments	The Parties acknowledge and agree that all 08W] Expenses shall be borne by the O&M Contractor to carryout routine maintenance works as detailed in Annexure-I to this O&M Agreement and in lieu thereof; a fixed lump sum fee amounting to Rs. 6,00,00,000/- plus applicable taxes for the period of 01.04.2023 to 31.03.2024 shall be due and payable by the Concessionaire. The Consideration for O&M	The O&M Contractor will be paid Rs. 6.00 crores for 1 year from 01/04/2023 to 31/03/2024 for routine maintenance. The contractor has to manage O&M work responsibility

Sr. No.	Clause No.	Description in Brief	Remark
		services to contractor/ GRIL shall be subject to receipt of payment from NHAI and all supporting documents from the contactor to the satisfaction of the concessionaire's project manager. For the purpose of any escalation payment on O&M payments will be calculated using the multiplier factor provided under clause 23.7 of the Concession Agreement for the respective period. O&M Expenses here shall mean Fixed O&M Cost. (a) For periodic maintenance works such as renewal cost(overlay), lane marking, replacement of crash barrier, maintenance of building, special repairs if any, or any other work as required to be executed on the Project Highway as per the Concession Agreement or directed by the Project Manager to be carried out by the O&M Contractor during the Maintenance Period. This Periodic maintenance shall be done by the O&M Contractor as and when instructed by the Project Manager. The O&M Contractor shall be entitled for payment for such works, on mutually agreed rates.	within this payment. Over & above these expenses, Concessionaire is incurring expenses for insurance, electricity, IE & professional fees etc. Escalation is payable.
18	Clause 27 Termination 27.1 Termination For O&M Contractor Default	In the event of any defaults specified below shall have occurred, and the O&M Contractor falls to cure the default within the Cure Period of 60 (sixty) days, the O&M Contractor shall be deemed to be in default of this Agreement (the "08M Contractor Default"), unless the default has occurred as a result of any breach of this Agreement by the Concessionaire or due to Force Majeure.	The Contractor shall note this. This provision of termination keep pressure on contractor to work as per scope in O&M contract.
19	Clause 29 Resolution of Disputes	(b) If, either of the party is dissatisfied with the decision of aforesaid panel, the aggrieved party within period of thirty (30) days from the receipt of such decision may refer the dispute to arbitration. If neither party refer the dispute to the arbitration, within 30 days from the decision of the panel, the decision of the panel will be final and binding on both the parties.	There is provision of Arbitration in case of unresolved dispute.
20	Clause 32 Liability and Indemnification	The O&M Contractor shall fully indemnify and hold harmless and defend the Concessionaire to the extent that the Concessionaire has provided any indemnities to Authority in terms of Article-36 of the Concession Agreement, insofar as such indemnities relate to the Services.	The Concessionaire is secured from contractor for any loss, claim.

Conclusion

i. Operation and Maintenance Contract is comprehensive and correct for major concerns of Lender.
ii. The provision of the O&M Contract Agreement is consistent with the provision of the Concession Agreement.

10 ACCIDENT DATA ANALYSIS

No. of accidents and No. of affected persons is shown in the following table:

Sr. No	Month	No of Accidents	No. of Affected Persons			Remarks
			Minor Injury	Serious Injury	Fatal	
1	March-2023	18	10	7	01	
2	April-2023	09	04	00	01	
3	May-2023	14	18	01	01	
4	June-2023	14	16	03	00	
5	July-2023	21	20	03	00	
6	August-2023	21	13	03	08	
7	September-2023	29	18	09	02	
8	October-2023	25	19	05	05	
9	November-23	35	27	01	02	
10	December-23	10	14	00	01	
11	January-24	06	06	03	00	
12	February-24	06	05	00	00	
13	March-24	13	13	02	00	
14	April-24	18	29	03	00	
15	May-2024	10	12	00	00	

Annexures

Annexure I: Operation Cost

Sr. No.	Particulars	Amount per year (from FY 2025 to FY 2038)
1	Incident Management & Emergency Services	
a	Ambulance-2 No.	52,91,179
b	Patrolling Vehicle-2 Nos.	50,40,849
c	Crane-2 No.	38,53,958
d	Other Vehicle-3 Nos.	52,32,000
e	JCB-2 No.	39,55,200
f	Corridor Manager & Officer	16,04,616
2	Maintenance Staff Expenses	95,04,000
3	Electricity & Diesel Charges	2,92,06,179
4	TMS/HTMS/System Expenses	37,55,318
5	Office Operating Expenses	17,74,425
6	Other Equipment's Running Expenses	1,27,26,000
7	Professional Fees Expense	46,13,505
8	Community Development	5,32,328
9	Communication Expenses	3,54,885
10	Conveyance Expenses	3,54,885
11	Insurance Expense	1,24,06,072
12	IE Fees	88,72,125
13	Routine Maintenance Cost (Civil Works)	2,29,88,280
14	PM Fees	13,86,691
15	Contingency @5%	66,03,290
	Total Cost (Rs.)	**14,00,55,785**
	Total Cost (Cr.)	14.01
	Per km Cost (Lakh)	**19.73**

Annexure II: Routine Maintenance Cost

Routine Maintenance Cost	
GR Aligarh Kanpur	
Ordinary Repair Cost for Rigid (with GST)	**2,29,88,280**
(inclusive of GST)	**= 3.24 lakhs per km**

CONVERSION FACTORS									
National Highways / State Highways - Rigid Pavement									
Reference cost taken for Two / four lane (7.0 or 14m or 21m) with 1.5m/2m wide shoulders									
(Refer Chapter 6.17 of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 45)									
Sr. No.	**Description for Flexible Pavement**		**Factor**	**Rigid Pavement**		**Project Length (km)**		**Per Year Project Maintenance Cost**	
				Normal	**Urban**				
				More than 4500 CVD	More than 4500 CVD				
				1,52,718	**2,06,068**				
						Normal	**Urban**	**Normal**	**Urban**
1	Four-lane with divided carriageway	Without paved shoulder	1.53	233659.00	315285.00	-	-	-	-
		Paved shoulder	1.70	259621.00	350316.00	32.269	-	83,77,580	-
2	Four-lane with divided carriageway and service lane on either side	Without paved shoulder	2.00	305437.00	412137.00	-	-	-	-
		Paved shoulder	2.20	335981.00	453351.00	5.120	1.545	17,20,055	7,00,427
3	Six lane with divided carriageway	without Paved shoulder	2.43	371106.00	500746.00	-	-	-	-
		with Paved shoulder	2.60	397068.00	535778.00	4.361	-	17,31,614	-
4	Six lane with divided carriageway and service lane on either side	without Paved shoulder	2.90	442883.00	597598.00	-	-	-	-
		with Paved shoulder	3.10	473427.00	638812.00	18.670	9.01	88,38,882	57,57,613
TOTAL							**70.977**		**2,71,26,170**

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
1	**Maintenance of Carriageway & Paved Shoulders (1.5m wide); B.T. Surface**			
	i) Pot holes repair (50 mm deep)	100 % Pot hole free	As & when required	0.00%
	Volume (cum)			0.00
	Rs/m^3			12390
	Cost in Rupees			0
	ii) Patch repair	100 % Patch less	As & when required	0.00%
	Area (sqm)			10
	Rs/m^2			496
	Cost in Rupees			4,956
	iii) Sealing (Crack)			
	a) Wider than 3 mm	100 % Crack Less	As & when required	0.50%
	Area (sqm)			50
	Rs/m^2			94
	Cost in Rupees			4,685
	b) Width less than 3 mm	75 % Crack Less	As & when required	1.00%
	Area (sqm)			75
	Rs/m^2			63
	Cost in Rupees			4,698
	iv) Repair of ruts and undulations			
	a) Greater than 20 mm	75%	As & when required	0.00%
	Area (sqm)			10
	Rs/m^2			496
	Cost in Rupees			4,956
	v) Road marking	15%	Once in 15 year & @ Repaired location	30503
	vi) Joint Sealant Repair/Replacement	7.5%		37970

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity**
				More than 4500 CVD
				CC Surface
1	**2**	**3**	**4**	**5**
	SUB TOTAL			**87,768**
2	**Maintenance of earthen Shoulders:**			
	i) Renewal of earthen shoulders	50%	Once in a Year	4513
	ii) Jungle Clearance	100%	Twice in a Year	2369
	iii) Kuccha Drain Maintenance	50%	Twice in a Year	635
	SUB TOTAL			**7,517**
3	**Maintenance of Cross Drainage works:**			
	i) Cleaning of culvert bed	30%	Once in a Year	959
	ii) Repair of floors	30%	Once in a Year	1736
	iii) Repair of parapets	30%	As & when required	724
	SUB TOTAL			**3,419**
4	**Maintenance of Minor & Major Bridges:**			
	i) Cleaning and removal of dirt & vegetation from pier caps, Bearings, Expansion Joints, Superstructure, Substructure and Retaining wall etc.	50%	As & when required	21,154
	ii) Spot painting & protective Coating required on Bearing and greasing of Bearings, railing, structural members, Expansion joints			
	iii) Repair of minor washouts, erosion scour and animal holes			
	iv) Sealing Cracks with Cement/ Epoxy Mortar			
	v) Replacement & Correction of safety barriers, Guard rails and damaged members			
	SUB TOTAL			**21,154**
5	**Miscellaneous Items:**			
	i) Turfing and Arboriculture		Once in a Year	5642
	ii) Maintenance of gang hut store, sheds, animal & debris removal		Once in a Year	4231
	iii) Lettering, Painting of Km stones & kerbs, sign boards, hectometer stone etc.		Once in a Year	11424

Details of Ordinary Repair in Rs. For one km. of Two lane (7.0 m) of NH / SH per Year				
(Refer Annex. XXIV-E of REPORT OF THE COMMITTEE ON NORMS FOR MAINTENANCE OF ROADS IN INDIA, Page 112-113)				
Sr. No.	**Activity**	**Performance Standard Level of Maintenance**	**Frequency**	**Cost Per Km. as per Traffic Intensity** **More than 4500 CVD** **CC Surface**
1	**2**	**3**	**4**	**5**
	iv) Replacement and providing additional retro reflective signage	20%	Covering Total Network in 5 Years	8462
	v) Providing first aid kits, Umbrella, Safety Jackets, Vardi etc.		Once in a Year	1410
	vi) Traffic Census		Once in a Year	0
	vii) Provision for roughness measurement		Twice in a Year	1692
	SUB TOTAL			**32,860**
	GRAND TOTAL (Normal)			**1,52,718**
6	**Additional Cost required for Urban Area**			
	i) Renewal of Center Line, Edge Marking, Kerb Marking/ Zebra crossing etc. in City Portion	15%	Once in 15 years with thermoplastic paint	30503
	ii)Repairs to footpath	0%	As & when required	0
	iii) ROB/ Fly-over Railings & repair	100%	As & when required	5641
	iv) Street Lighting	0%	As & when required	0
	v) Encroachment Removal Squad	100%	As & when required	8744
	vi) Repair of divider/ Railing in City portion	50%	As & when required	5641
	vii) Provision for maintenance of pedestrian underpass	100%	As & when required	2821
	SUB TOTAL			**53,350**
	GRAND TOTAL (Urban)			**2,06,068**

Annexure III: Major Maintenance Cost

Major Maintenance Cost (FY 2031 & 2032)										
Sr. No.	**Description**	**Unit**	**No.**	**Length**	**Width**	**Depth**	**Quantity**	**Total Quantity**	**Rate**	**Amount**
A	**Main Carriageway:**									
1	Retexturing and Grinding	Sqm	5%	69,672.10	23.00		80,123	80,123	75	60,09,219
2	Replacement of PQC Slab	Cum	0.50%	69,672.10	23.00	0.30	2,404	2,404	9,615	2,31,10,493
3	Joint sealant (Silicone)	RMT	5%	74,968.81	4.50	4.75	34,673	34,673	82	28,43,192
4	Retexturing and Grinding for Misc. Location	Sqm	5%	80,122.92			4,006	4,006	75	3,00,461
5	Replacement of PQC Slab For Misc. Location	Cum	5%	2,403.69			120	120	9,615	11,55,525
6	Joint sealant (Silicone) For Misc. Location	RMT	5%	34,673.07			1,734	1,734	82	1,42,160
B	**Service Road**									
1	Tack Coat	Sqm	50%	46,393.00	7.50		1,73,974	1,73,974	17	30,30,623
2	BC with 30 mm	Cum	50%	46,393.00	7.50	0.03	5,219	5,219	11,366	5,93,21,204
3	Micro Surfacing	Sqm	50%	46,393.00	7.50		1,73,974	1,73,974	165	2,87,05,669
C	**Slip Road**									
4	Tack Coat	Sqm	50%	12,830.00	5.50		35,283	35,283	17	6,14,621
5	BC with 30 mm	Cum	50%	12,830.00	5.50	0.03	1,058	1,058	11,366	1,20,30,553
6	Micro Surfacing	Sqm	50%	12,830.00	5.50		35,283	35,283	165	58,21,613
D	**Structure- Deck Slab**									
4	Milling	Sqm	50%	1,304.90	26.00		16,964	16,964	75	12,72,278
5	Tack Coat	Sqm	50%	1,304.90	26.00		16,964	16,964	17	2,95,508
6	Bituminous Concrete	Cum	50%	1,304.90	26.00	0.05	848	848	11,689	99,14,774
7	Painting of Crash Barrier	Rmt	50%	72,243.00	1.00	1.20	43,346	43,346	76	32,94,281
E	**Miscellaneous**									
8	Kerb Replacement	Rmt	10%	2,47,039.00			24,704	24,704	270	66,70,053
9	Painting of Kerbs	Sqm	50%	2,47,039.00		0.32	38,909	38,909	76	29,57,057
10	Replacement of Metal beam Crash Barrier	RMT	5%	36,298.00			1,815	1,815	3,644	66,13,496
11	Thermoplastic paint									
	a) Median & Edge line	Sqm	40%				28,947	28,947	517	1,49,65,427
	Main Carriageway 4L		4	38,933.00	0.15		23,360			
	Main Carriageway 6L		4	32,044.00	0.15		19,226			
	Service/Slip Road		2	59,223.00	0.10		11,845			

Major Maintenance Cost (FY 2031 & 2032)										
Sr. No.	**Description**	**Unit**	**No.**	**Length**	**Width**	**Depth**	**Quantity**	**Total Quantity**	**Rate**	**Amount**
	b) Lane line									
	Main Carriageway 4L		2	13,626.55	0.10		2,725			
	Main Carriageway 6L		4	11,215.40	0.10		4,486			
	Service/Slip Road		2	20,728.05	0.10		4,146			
	c) Junction crossing						6,579			
12	Replacement of Road Stud	No	50%				11,181	11,181	220	24,59,820
	Main Carriageway 4L		4	2,164.00			8,656			
	Main Carriageway 6L		4	1,781.00			7,124			
	Service/Slip Road		2	3,291.00			6,582			
13	Filling of Earthen Shoulder	Cum	20%	46,609.00	2.00	0.05	932	932	408	3,80,329
14	Miscellaneous	3%								57,57,251
15	PM Fees	1%								19,19,084
									Total Major Maintenance Cost (Rs.)	**19,95,84,687**
									Total Major Maintenance Cost (Cr.)	**19.96**

Major Maintenance Cost (FY 2037 & 2038)										
Sr. No.	**Description**	**Unit**	**No.**	**Length**	**Width**	**Depth**	**Quantity**	**Total Quantity**	**Rate**	**Amount**
A	**Main Carriageway:**									
1	Retexturing and Grinding	Sqm	5%	69,672.10	23.00		80,123	80,123	75	60,09,219
2	Replacement of PQC Slab	Cum	0.50%	69,672.10	23.00	0.30	2,404	2,404	9,615	2,31,10,493
3	Joint sealant (Silicone)	RMT	5%	74,968.81	4.50	4.75	34,673	34,673	82	28,43,192
4	Retexturing and Grinding For Misc. Location	Sqm	5%	80,122.92			4,006	4,006	75	3,00,461
5	Replacement of PQC Slab for Misc. Location	Cum	5%	2,403.69			120	120	9,615	11,55,525
6	Joint sealant (Silicone) For Misc. Location	RMT	5%	34,673.07			1,734	1,734	82	1,42,160
B	**Service Road**									
1	Tack Coat	Sqm	50%	46,393.00	7.50		1,73,974	1,73,974	17	30,30,623
2	BC with 30 mm	Cum	50%	46,393.00	7.50	0.03	5,219	5,219	11,366	5,93,21,204
3	Micro Surfacing	Sqm	50%	46,393.00	7.50		1,73,974	1,73,974	165	2,87,05,669
C	**Slip Road**									
4	Tack Coat	Sqm	50%	12,830.00	5.50		35,283	35,283	17	6,14,621

Major Maintenance Cost (FY 2037 & 2038)										
Sr. No.	**Description**	**Unit**	**No.**	**Length**	**Width**	**Depth**	**Quantity**	**Total Quantity**	**Rate**	**Amount**
5	BC with 30 mm	Cum	50%	12,830.00	5.50	0.03	1,058	1,058	11,366	1,20,30,553
6	Micro Surfacing	Sqm	50%	12,830.00	5.50		35,283	35,283	165	58,21,613
D	**Structure- Deck Slab**									
4	Milling	Sqm	50%	1,304.90	26.00		16,964	16,964	75	12,72,278
5	Tack Coat	Sqm	50%	1,304.90	26.00		16,964	16,964	17	2,95,508
6	Bituminous Concrete	Cum	50%	1,304.90	26.00	0.05	848	848	11,689	99,14,774
7	Painting of Crash Barrier	Rmt	50%	72,243.00	1.00	1.20	43,346	43,346	76	32,94,281
E	**Miscellaneous**									
8	Kerb Replacement	Rmt	10%	2,47,039.00			24,704	24,704	270	66,70,053
9	Painting of Kerbs	Sqm	50%	2,47,039.00		0.32	38,909	38,909	76	29,57,057
10	Replacement of Metal beam Crash Barrier	RMT	5%	36,298.00			1,815	1,815	3,644	66,13,496
11	Thermoplastic paint									
	a) Median & Edge line	Sqm	40%				28,947	28,947	517	1,49,65,427
	Main Carriageway 4L		4	38,933.00	0.15		23,360			
	Main Carriageway 6L		4	32,044.00	0.15		19,226			
	Service/Slip Road		2	59,223.00	0.10		11,845			
	b) Lane line									
	Main Carriageway 4L		2	13,626.55	0.10		2,725			
	Main Carriageway 6L		4	11,215.40	0.10		4,486			
	Service/Slip Road		2	20,728.05	0.10		4,146			
	c) Junction crossing						6,579			
12	Replacement of Road Stud	No	50%				11,181	11,181	220	24,59,820
	Main Carriageway 4L		4	2,164.00			8,656			
	Main Carriageway 6L		4	1,781.00			7,124			
	Service/Slip Road		2	3,291.00			6,582			
13	Filling of Earthen Shoulder	Cum	20%	46,609.00	2.00	0.05	932	932	408	3,80,329
14	Miscellaneous	3%								57,57,251
15	PM Fees	1%								19,19,084
									Total Major Maintenance Cost (Rs.)	**19,95,84,687**
									Total Major Maintenance Cost (Cr.)	**19.96**

Annexure IV: Pavement Condition Survey

LHS:

Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good / Fair/ Poor)	Visual Condition of Roadside Drain (G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality (G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)*	Rut (None/ Moderate/ Severe)	Patching (%)*			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	302.108	302.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		N			G			G				
2	302.500	303.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
3	303.000	303.500	F	Con.	Rigid	300	40	G	1.00%	3.00%		M			G			G				
4	303.500	304.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
5	304.000	304.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		N			G			G				
6	304.500	305.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
7	305.000	305.500	F	Con.	Rigid	300	40	F	1.10%	2.90%		N			G			G				
8	305.500	306.000	F	Con.	Rigid	300	40	F	1.00%	3.50%		N			G			G				
9	306.000	306.500	F	Con.	Rigid	300	40	G	1.00%	3.00%		M			G			G				
10	306.500	307.000	F	Con.	Rigid	300	40	G	1.00%	3.00%		M			G			G				
11	307.000	307.500	G	Con.	Rigid	300	40	G				N			G			G				
12	307.500	308.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			F			G				
13	308.000	308.500	G	Con.	Rigid	300	40	G	1.10%			N			F			G				
14	308.500	309.000	F	Con.	Rigid	300	40	G	1.50%	3.00%		N			G			G				
15	309.000	309.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		N			G			G				
16	309.500	310.000	G	Con.	Rigid	300	40	G				N			G			G				
17	310.000	310.500	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
18	310.500	311.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		N			G			G				
19	311.000	311.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
20	311.500	312.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
21	312.000	312.500	G	Con.	Rigid	300	40	G				N			G			G				
22	312.500	313.000	G	Con.	Rigid	300	40	G				N			G			G				
23	313.000	313.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
24	313.500	314.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
25	314.000	314.500	F	Con.	Rigid	300	40	F	1.30%	2.60%		N			G			G				
26	314.500	315.000	F	Con.	Rigid	300	40	F	1.00%	2.50%		N			G			G				
27	315.000	315.500	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
28	315.500	316.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
29	316.000	316.500	G	Con.	Rigid	300	40	G	1.60%	1.00%		N			G			G				
30	316.500	317.000	G	Con.	Rigid	300	40	G	1.20%			N			F			G				
31	317.000	317.500	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
32	317.500	318.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
33	318.000	318.500	G	Con.	Rigid	300	40	G				N			G			G				
34	318.500	319.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
35	319.000	319.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		N			G			G				
36	319.500	320.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
37	320.000	320.500	F	Con.	Rigid	300	40	F	1.00%	2.50%		N			F			G				
38	320.500	321.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
39	321.000	321.500	G	Con.	Rigid	300	40	G				N			G			G				
40	321.500	322.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				

Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good / Fair/ Poor)	Visual Condition of Roadside Drain (G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality (G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)*	Rut (None/ Moderate/ Severe)	Patching (%)*			Type	Condition			Left	Right	
41	322.000	322.500	G	Con.	Rigid	300	40	G				N			F			G				
42	322.500	323.000	G	Con.	Rigid	300	40	G	1.50%			N			G			G				
43	323.000	323.500	G	Con.	Rigid	300	40	G	1.50%			N			G			G				
44	323.500	324.000	F	Con.	Rigid	300	40	F	1.00%	3.00%		M			G			G				
45	324.000	324.500	F	Con.	Rigid	300	40	G	1.50%	2.10%		M			G			G				
46	324.500	325.000	F	Con.	Rigid	300	40	G	1.00%	2.40%		N			G			G				
47	325.000	325.500	G	Con.	Rigid	300	40	G	1.20%	1.00%		N			G			G				
48	325.500	326.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
49	326.000	326.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
50	326.500	327.000	G	Con.	Rigid	300	40	G	1.30%	1.00%		N			G			G				
51	327.000	327.500	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
52	327.500	328.000	G	Con.	Rigid	300	40	G				N			G			G				
53	328.000	328.500	F	Con.	Rigid	300	40	F	1.00%	2.90%		M			G			G				
54	328.500	329.000	F	Con.	Rigid	300	40	F	0.50%	2.60%		M			G			G				
55	329.000	329.500	F	Con.	Rigid	300	40	F	1.10%	2.20%		M			F			G				
56	329.500	330.000	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			G			G				
57	330.000	330.500	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			G			G				
58	330.500	331.000	G	Con.	Rigid	300	40	G				N			G			G				
59	331.000	331.500	G	Con.	Rigid	300	40	G				N			G			G				
60	331.500	332.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
61	332.000	332.500	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
62	332.500	333.000	G	Con.	Rigid	300	40	G				N			G			G				
63	333.000	333.500	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
64	333.500	334.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
65	334.000	334.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
66	334.500	335.000	G	Con.	Rigid	300	40	G				N			G			G				
67	335.000	335.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
68	335.500	336.000	G	Con.	Rigid	300	40	G				N			G			G				
69	336.000	336.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
70	336.500	337.000	F	Con.	Rigid	300	40	G	1.00%	2.40%		N			G			G				
71	337.000	337.500	G	Con.	Rigid	300	40	G	1.00%			N			F			G				
72	337.500	338.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			F			G				
73	338.000	338.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
74	338.500	339.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
75	339.000	339.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
76	339.500	340.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
77	340.000	340.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
78	340.500	341.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
79	341.000	341.500	F	Con.	Rigid	300	40	G	1.30%	2.60%		M			G			G				
80	341.500	342.000	F	Con.	Rigid	300	40	G	1.30%	2.60%		M			G			G				
81	342.000	342.500	F	Con.	Rigid	300	40	G	1.50%	2.10%		N			G			G				
82	342.500	343.000	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
83	343.000	343.500	G	Con.	Rigid	300	40	G				N			G			G				
84	343.500	344.000	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
85	344.000	344.500	G	Con.	Rigid	300	40	G				N			F			G				

Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good / Fair/ Poor)	Visual Condition of Roadside Drain (G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality (G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)*	Rut (None/ Moderate/ Severe)	Patching (%)*			Type	Condition			Left	Right	
86	344.500	345.000	G	Con.	Rigid	300	40	G	1.20%			N			F			G				
87	345.000	345.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		N			G			G				
88	345.500	346.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		N			G			G				
89	346.000	346.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
90	346.500	347.000	G	Con.	Rigid	300	40	G	1.60%	1.00%		N			G			G				
91	347.000	347.500	G	Con.	Rigid	300	40	G	1.40%	1.00%		N			G			G				
92	347.500	348.000	F	Con.	Rigid	300	40	G	1.20%	2.60%		N			G			G				
93	348.000	348.500	G	Con.	Rigid	300	40	G	1.40%			N			G			G				
94	348.500	349.000	G	Con.	Rigid	300	40	G	1.40%	1.00%		N			G			G				
95	349.000	349.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
96	349.500	350.000	G	Con.	Rigid	300	40	G	1.60%			N			G			G				
97	350.000	350.500	G	Con.	Rigid	300	40	G				N			G			G				
98	350.500	351.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
99	351.000	351.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
100	351.500	352.000	G	Con.	Rigid	300	40	G	1.10%			N			F			G				
101	352.000	352.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
102	352.500	353.000	G	Con.	Rigid	300	40	G				N			G			G				
103	353.000	353.500	F	Con.	Rigid	300	40	G	1.10%	2.30%		N			G			G				
104	353.500	354.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
105	354.000	354.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
106	354.500	355.000	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			G			G				
107	355.000	355.500	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			G			G				
108	355.500	356.000	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
109	356.000	356.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
110	356.500	357.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
111	357.000	357.500	G	Con.	Rigid	300	40	G	1.20%	1.00%		N			G			G				
112	357.500	358.000	F	Con.	Rigid	300	40	F	1.00%	2.40%		M			G			G				
113	358.000	358.500	F	Con.	Rigid	300	40	F	1.00%	2.30%		M			G			G				
114	358.500	359.000	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			G			G				
115	359.000	359.500	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
116	359.500	360.000	G	Con.	Rigid	300	40	G				N			F			G				
117	360.000	360.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
118	360.500	361.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
119	361.000	361.500	F	Con.	Rigid	300	40	G	1.20%	2.60%		N			G			G				
120	361.500	362.000	F	Con.	Rigid	300	40	G	1.20%	2.40%		M			G			G				
121	362.000	362.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
122	362.500	363.000	G	Con.	Rigid	300	40	G	1.20%	1.00%		N			G			G				
123	363.000	363.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
124	363.500	364.000	F	Con.	Rigid	300	40	G	1.00%	3.00%		M			G			G				
125	364.000	364.500	G	Con.	Rigid	300	40	G	1.20%	1.00%		N			G			G				
126	364.500	365.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
127	365.000	365.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
128	365.500	366.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
129	366.000	366.500	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
130	366.500	367.000	F	Con.	Rigid	300	40	G	1.00%	3.10%		N			F			G				

Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good / Fair/ Poor)	Visual Condition of Roadside Drain (G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality (G/ F/ P/ VP)*	Cracking (%)	Raveling (%)	Potholing (%)*	Rut (None/ Moderate/ Severe)	Patching (%)*			Type	Condition			Left	Right	
131	367.000	367.500	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			F			G				
132	367.500	368.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
133	368.000	368.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
134	368.500	369.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
135	369.000	369.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
136	369.500	370.000	F	Con.	Rigid	300	40	F	1.50%	2.50%		N			G			G				
137	370.000	370.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
138	370.500	371.000	G	Con.	Rigid	300	40	G				N			G			G				
139	371.000	371.500	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
140	371.500	372.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		N			G			G				
141	372.000	372.500	F	Con.	Rigid	300	40	G	1.20%	2.40%		N			G			G				
142	372.500	373.000	G	Con.	Rigid	300	40	G				N			F			G				
143	373.000	373.085	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			F			G				

RHS:

Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	373.000	373.085	G	Con.	Rigid	300	40	G	1.10%			N			F			G				
2	372.500	373.000	G	Con.	Rigid	300	40	G	1.00%			N			F			G				
3	372.000	372.500	F	Con.	Rigid	300	40	G	1.00%	2.40%		M			G			G				
4	371.500	372.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
5	371.000	371.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
6	370.500	371.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
7	370.000	370.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
8	369.500	370.000	F	Con.	Rigid	300	40	G	1.50%	2.50%		M			G			G				
9	369.000	369.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
10	368.500	369.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
11	368.000	368.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
12	367.500	368.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
13	367.000	367.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
14	366.500	367.000	F	Con.	Rigid	300	40	F	1.00%	3.10%		M			G			G				
15	366.000	366.500	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
16	365.500	366.000	G	Con.	Rigid	300	40	G	1.30%			N			G			G				
17	365.000	365.500	G	Con.	Rigid	300	40	G	1.10%			N			F			G				
18	364.500	365.000	G	Con.	Rigid	300	40	G	1.20%	1.00%		M			G			G				
19	364.000	364.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
20	363.500	364.000	F	Con.	Rigid	300	40	G	1.50%	3.00%		M			G			G				

Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
21	363.000	363.500	G	Con.	Rigid	300	40	G	1.00%			N			F			G				
22	362.500	363.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
23	362.000	362.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
24	361.500	362.000	F	Con.	Rigid	300	40	F	1.00%	2.40%		M			G			G				
25	361.000	361.500	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			G			G				
26	360.500	361.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
27	360.000	360.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
28	359.500	360.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
29	359.000	359.500	G	Con.	Rigid	300	40	G	1.50%	1.00%		N			G			G				
30	358.500	359.000	F	Con.	Rigid	300	40	G	1.00%	2.60%		N			G			G				
31	358.000	358.500	F	Con.	Rigid	300	40	F	1.50%	2.30%		M			G			G				
32	357.500	358.000	F	Con.	Rigid	300	40	F	1.00%	2.40%		M			G			G				
33	357.000	357.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
34	356.500	357.000	G	Con.	Rigid	300	40	G	1.00%			N			F			G				
35	356.000	356.500	G	Con.	Rigid	300	40	G	1.00%			N			F			G				
36	355.500	356.000	G	Con.	Rigid	300	40	G	1.00%	1.00%		N			G			G				
37	355.000	355.500	F	Con.	Rigid	300	40	G	1.50%	2.60%		M			G			G				
38	354.500	355.000	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			G			G				
39	354.000	354.500	G	Con.	Rigid	300	40	G	1.20%			M			G			G				
40	353.500	354.000	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
41	353.000	353.500	F	Con.	Rigid	300	40	G	1.50%	2.30%		M			G			G				
42	352.500	353.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
43	352.000	352.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
44	351.500	352.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
45	351.000	351.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
46	350.500	351.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
47	350.000	350.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
48	349.500	350.000	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
49	349.000	349.500	G	Con.	Rigid	300	40	G	1.20%	1.00%		M			G			G				
50	348.500	349.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
51	348.000	348.500	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
52	347.500	348.000	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			F			G				
53	347.000	347.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			F			G				
54	346.500	347.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
55	346.000	346.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
56	345.500	346.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
57	345.000	345.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
58	344.500	345.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
59	344.000	344.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
60	343.500	344.000	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
61	343.000	343.500	G	Con.	Rigid	300	40	G	1.50%			N			G			G				
62	342.500	343.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
63	342.000	342.500	F	Con.	Rigid	300	40	F	1.00%	2.10%		M			G			G				

Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
64	341.500	342.000	F	Con.	Rigid	300	40	F	1.30%	2.60%		M			G			G				
65	341.000	341.500	F	Con.	Rigid	300	40	F	1.10%	2.60%		M			F			G				
66	340.500	341.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
67	340.000	340.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
68	339.500	340.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
69	339.000	339.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
70	338.500	339.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
71	338.000	338.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
72	337.500	338.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
73	337.000	337.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
74	336.500	337.000	F	Con.	Rigid	300	40	G	1.00%	2.40%		M			F			G				
75	336.000	336.500	G	Con.	Rigid	300	40	G	1.10%			N			F			G				
76	335.500	336.000	G	Con.	Rigid	300	40	G	1.20%			N			F			G				
77	335.000	335.500	G	Con.	Rigid	300	40	G	1.40%			N			F			G				
78	334.500	335.000	G	Con.	Rigid	300	40	G	1.30%			N			G			G				
79	334.000	334.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
80	333.500	334.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
81	333.000	333.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
82	332.500	333.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
83	332.000	332.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
84	331.500	332.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
85	331.000	331.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
86	330.500	331.000	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
87	330.000	330.500	F	Con.	Rigid	300	40	F	1.50%	2.60%		M			G			G				
88	329.500	330.000	F	Con.	Rigid	300	40	F	1.30%	2.60%		M			G			G				
89	329.000	329.500	F	Con.	Rigid	300	40	F	1.10%	2.20%		M			G			G				
90	328.500	329.000	F	Con.	Rigid	300	40	F	1.00%	2.60%		M			G			G				
91	328.000	328.500	F	Con.	Rigid	300	40	G	1.50%	2.90%		M			G			G				
92	327.500	328.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
93	327.000	327.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
94	326.500	327.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
95	326.000	326.500	G	Con.	Rigid	300	40	G	1.10%			N			F			G				
96	325.500	326.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
97	325.000	325.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
98	324.500	325.000	F	Con.	Rigid	300	40	G	1.50%	2.40%		M			G			G				
99	324.000	324.500	F	Con.	Rigid	300	40	G	1.40%	2.10%		M			G			G				
100	323.500	324.000	F	Con.	Rigid	300	40	G	1.50%	3.00%		M			G			G				
101	323.000	323.500	G	Con.	Rigid	300	40	G	1.50%			N			F			G				
102	322.500	323.000	G	Con.	Rigid	300	40	G	1.50%			N			F			G				
103	322.000	322.500	G	Con.	Rigid	300	40	G	1.00%			N			F			G				
104	321.500	322.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
105	321.000	321.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
106	320.500	321.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				

Sr. No.	Chainage		Visual	Pavement Composition			Riding Quality		Pavement Condition					Pavement Edge drop (mm)	Visual Condition of Shoulders (G/F/P/VP)	Shoulders Condition (G/F/ P/VP)		Embankment Condition (Good /Fair/ Poor)	Visual Condition of Road Side Drain(G/F/P/VP)	Road side Drain (NE/ PF/ F)***		Remarks
	From (Km)	To (Km)	Pavement Condition of (G/F/P/VP)	Composition	Type	Thickness (mm)	Speed (km/hr)	Quality/ G/ F/ P/ VP)*	Cracking (%)	Ravelling (%)	Potholing (%)**	Rut (None/ Moderate/ Severe)	Patching (%)**			Type	Condition			Left	Right	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
107	320.000	320.500	F	Con.	Rigid	300	40	G	1.50%	2.50%		M			G			G				
108	319.500	320.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
109	319.000	319.500	G	Con.	Rigid	300	40	G	1.10%			N			F			G				
110	318.500	319.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
111	318.000	318.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
112	317.500	318.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
113	317.000	317.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
114	316.500	317.000	G	Con.	Rigid	300	40	G	1.20%			N			G			G				
115	316.000	316.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
116	315.500	316.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
117	315.000	315.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
118	314.500	315.000	F	Con.	Rigid	300	40	G	1.70%	2.50%		M			G			G				
119	314.000	314.500	F	Con.	Rigid	300	40	G	1.90%	2.60%		M			G			G				
120	313.500	314.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
121	313.000	313.500	G	Con.	Rigid	300	40	G	1.40%			N			F			G				
122	312.500	313.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
123	312.000	312.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
124	311.500	312.000	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
125	311.000	311.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
126	310.500	311.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
127	310.000	310.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
128	309.500	310.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
129	309.000	309.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
130	308.500	309.000	F	Con.	Rigid	300	40	F	1.50%	3.00%		M			G			G				
131	308.000	308.500	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
132	307.500	308.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
133	307.000	307.500	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
134	306.500	307.000	F	Con.	Rigid	300	40	G	1.00%	3.00%		M			G			G				
135	306.000	306.500	F	Con.	Rigid	300	40	F	1.10%	3.00%		M			G			G				
136	305.500	306.000	F	Con.	Rigid	300	40	F	1.10%	3.50%		M			G			G				
137	305.000	305.500	F	Con.	Rigid	300	40	F	1.10%	2.90%		M			F			G				
138	304.500	305.000	G	Con.	Rigid	300	40	G	1.00%			N			G			G				
139	304.000	304.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			G			G				
140	303.500	304.000	G	Con.	Rigid	300	40	G	1.10%			N			G			G				
141	303.000	303.500	F	Con.	Rigid	300	40	G	1.00%	3.00%		M			G			G				
142	302.500	303.000	G	Con.	Rigid	300	40	G	1.00%			N			F			G				
143	302.108	302.500	G	Con.	Rigid	300	40	G	1.10%	1.00%		M			F			G				

Technical Due Diligence of Four laning of NH-327E from Galgalia (Design km 0.000) to Bahadurganj (Design km 49.000) (Design Length = 49.000 km) Package-I in the State of Bihar under Bharatmala Pariyojana on Hybrid Annuity Mode.

Technical Due Diligence Report (Private and Confidential)

February 2025

Submitted to:

GR Galgalia Bahadurganj Highway Private Limited

Cube Highways Technologies Private Limited

CUBETECH
Cube Highways Technologies Pvt. Ltd.

Technical Due Diligence of Four laning of NH-327E from Galgalia (Design km 0.000) to Bahadurganj (Design km 49.000) (Design Length = 49.000 km) Package-I in the State of Bihar under Bharatmala Pariyojana on Hybrid Annuity Mode.

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S. No.	Revision	Description	Date	Sign
1	R0	Technical Due Diligence Report	February 2025	

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ABBREVIATIONS

Abbreviation	Description
ASTM	American Society for testing and Materials
AVC	Automatic Vehicle Classifier
ABP	Allahabad bypass package
BBD	Benkelman Beam Deflection
BC	Bituminous Concrete
BOT	Built, Operate and Transfer
CA	Concession Agreement
CC Drain	Cement Concrete Drains
COD	Commercial Operation Date
CRRI	Central Road Research Institute
CBR	California Bearing Ratio test
DBFOT	Design, Build, Finance, Operate and Transfer
ETC	Electronic Toll Collection
FWD	Falling Weight Deflectometer
GOI	Government of India
GGBHPL	GR Galgalia Bahadurganj Highway Private Limited
HPC	Hume Pipe Culvert
IE	Independent Engineer
IRC	Indian Roads Congress
LA	Land Acquisition
LHS	Left Hand Side
LOA	Letter of Acceptance
MBCB	Metal Beam Crash Barrier
MJB	Major Bridge
MNB	Minor Bridge

Abbreviation	Description
MOST	Ministry of Surface Transport
MPR	Monthly Progress Report
NH	National Highway
NHAI	National Highway Authority of India
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
OHLS	Overhead Lane Signal
OHM	Object Hazard Marker
PCOD	Provisional Commercial Operation Date
POS	Point of Sale
POS	Point of sale
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road/Rail Over Bridge
ROW	Right of Way
RPV	Route Petrol Vehicle
RUB	Road/Rail Under Bridge
SH	State Highway
SPV	Special Purpose Vehicle
SR	Service Road
SSWIM	Slow Speed Weigh in Motion
SWB	Static Weigh Bridge
TOT	Toll Operate Transfer
TC	Toll Collector
Team	Team of Cube Highways Technologies Pvt Ltd.
TMS	Toll Management System
WIM	Weigh in Motion
WMM	Wet Mix Macadam

Chapter 1
INTRODUCTION

CHAPTER 1. INTRODUCTION

1.1 Background

Infrastructure Sector is a key driver for the Indian economy. In 2014, the Government of India have introduced a new investment vehicle which allows investors to participate in the growth story of infrastructure sector, named Infrastructure Investment Trusts (hereinafter referred to as 'InvITs'). InvITs are instruments on pattern of mutual funds and are designed to pool in money from a number of investors to invest in assets that give cash flow over a period of time. The InvITs are regulated by the SEBI (Infrastructure Investment Trusts) Regulations Act, 2014.

In highway sector, InvIT as an instrument provide greater flexibility to investors and is expected to attract patient capitals (for say, 20-30 years) to the market, as these investors are averse to construction risks and are interested in investment in assets which provide long-term stable returns.

InvIT shall have a (i) Trustee, (ii) Sponsor(s) (iii) Investment Manager and (iv) Project Manager, Sponsor and the Project Manager are the same entity. During maintenance period of the project highway, GR Infraprojects Limited. (In its capacity as the Project Manager of Indus Infra Trust) has appointed M/s Cube Highways Technologies Private Limited as Technical Consultant for carrying out technical study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, Cube Highways Technologies undertook the site visits to carry out site inspection. The report is based on findings during this period.

Indus Infra Trust ("Trust") was settled in Gurugram, India pursuant to the Trust Deed as a contributory irrevocable trust in accordance with the Indian Trusts Act, 1882. The Trust is an Infrastructure Investment Trust (InvIT) established for making investments in special purpose vehicles as defined under Regulation 2(1) (zy) of the InvIT Regulations, or infrastructure projects or securities of Indian companies engaged in the infrastructure sector, as may be permitted in terms of Regulation 18(5) of the InvIT Regulations. IDBI Trusteeship Services Limited is the Trustee to the Trust.

Table 1-1: Projects comprising the Initial Portfolio Assets of Indus Infra Trust

S. No.	Name of the Project
1.	GR Phagwara Expressway Limited
2.	Porbandar Dwarka Expressway Private Limited
3.	Varanasi Sangam Expressway Private limited
4	GR Akkalkot Solapur Highway Private limited
5	GR Sangli Solapur Highway Private Limited

S. No.	Name of the Project
6	GR Gundugolanu Devarapalli Highway Pvt Ltd
7	GR Dwarka Dewariya Highway Pvt Limited
8	GR Aligarh Kanpur Highway Pvt Ltd

1.2 Asset Background

The National Highways Authority of India (NHAI) on behalf of Ministry of Road Transport and Highways (MORT&H), Government of India, have taken up the development of various National Highway corridors where the intensity of traffic has increased significantly and there is requirement of augmentation of capacity for safe and efficient movement of traffic. In this regard, NHAI has been entrusted to develop Projects for selected corridors through design, build, operate and transfer (the "DBOT Annuity" or "Hybrid Annuity") basis.

As part of this endeavour, the Government of India had entrusted to the Authority the development, maintenance, and management of National Highway (NH) 327E including the section from km 0.000 to km 49.000 (Design Length 49.000 km). The Authority had resolved to augment the existing road from km 0.000 of NH-327E to km 49.000 of NH-327E (hereinafter called the "NH 327E") in the State of Bihar by Four laning thereof (the "Project") on Hybrid Annuity basis, which shall be partly financed by the Concessionaire who shall recover its investment and costs through payments to be made by the Authority, in accordance with the terms and conditions as set forth in the Concession Agreement.

The Hybrid Annuity Model (HAM) is a mix of BOT Annuity and EPC models. As per the design, the Authority will contribute up-to 40% of the Project cost in ten equal instalments of 4% each during the construction period of 730 days with the provisions of Clause 23.4 of CA. The remaining payment will be made based on the assets created and the performance of the developer. Here, hybrid annuity means the first 40% payment is made as fixed amount in ten equal instalments whereas the remaining 60% is paid as variable annuity amount after the completion of the Project. As per the design, Authority will contribute 40% of the BPC and the balance cost is funded by Concessionaire through debt and equity.

The Authority had adopted a single stage two envelope bidding process and accordingly invited proposals by its Request for Proposals dated 22nd September 2020 (the "Request for Proposals" or "RFP") for qualification and short listing of bidders for construction, operation and maintenance of the above referred Project on Hybrid Annuity basis. The Authority had prescribed the technical and commercial terms and conditions in the RFP and invited bids comprising technical and financial bids from the bidders for undertaking the Project.

After evaluation of the bids received, the Authority had technically qualified certain bidders including, inter alia, the selected bidder and accepted the financial bid of the selected bidder i.e. M/s GR Infraprojects Limited.

The Authority issued its Letter of Award No. NHAI/BH/NH-327E/Gal-Bah/2020/Proc/E-166819 dated 03rd March 2021 (hereinafter called the "LOA") to the selected bidder requiring, inter alia, the execution of this Concession Agreement within 45 (forty-five) days. However, on 16th April 2021 it was executed on mutually agreed terms, of the date of issue thereof.

Accordingly, SPV GR Galgalia Bahadurganj Highway Private Limited (hereinafter referred to as "GGBHPL") has been formed, for implementing the Project Stretch (the "Concessionaire"). As Concessionaire of this Project, GGBHPL will develop the project, operate, and maintain the facilities after completion of construction. Under Hybrid Annuity Model (HAM), toll collection on the Project Stretch shall be responsibility of NHAI. The Concessionaire will be recovering its costs through annuity payments made during concession period of 17 years (annuity payments during construction as well as in operations period), including construction period of 730 days from the Appointed date and Operation period of 15 years from COD.

Report Structure

The report contains eight chapters, including this Chapter on Introduction.

Chapter 2 Project Overview

Chapter 3 Asset Status

Chapter 4 Review of Structures

Chapter 5 Review of the pavement condition survey

Chapter 6 General Safety Concerns along the Project stretch and Improvements

Chapter 7 Operation and Maintenance

Chapter 2
PROJECT OVERVIEW

CHAPTER 2. PROJECT OVERVIEW

2.1 Location

The Project Stretch starts from km 0.000 near Galgalia and ends at km 49.000 near Bahadurganj. The Start co-ordinate of the project is Latitude 26°30' 58.68" N and Longitude 88°8'18.6" E. The end co-ordinate of the project is Latitude 26°16'1.92" N and Longitude 87°50'17.52" E.

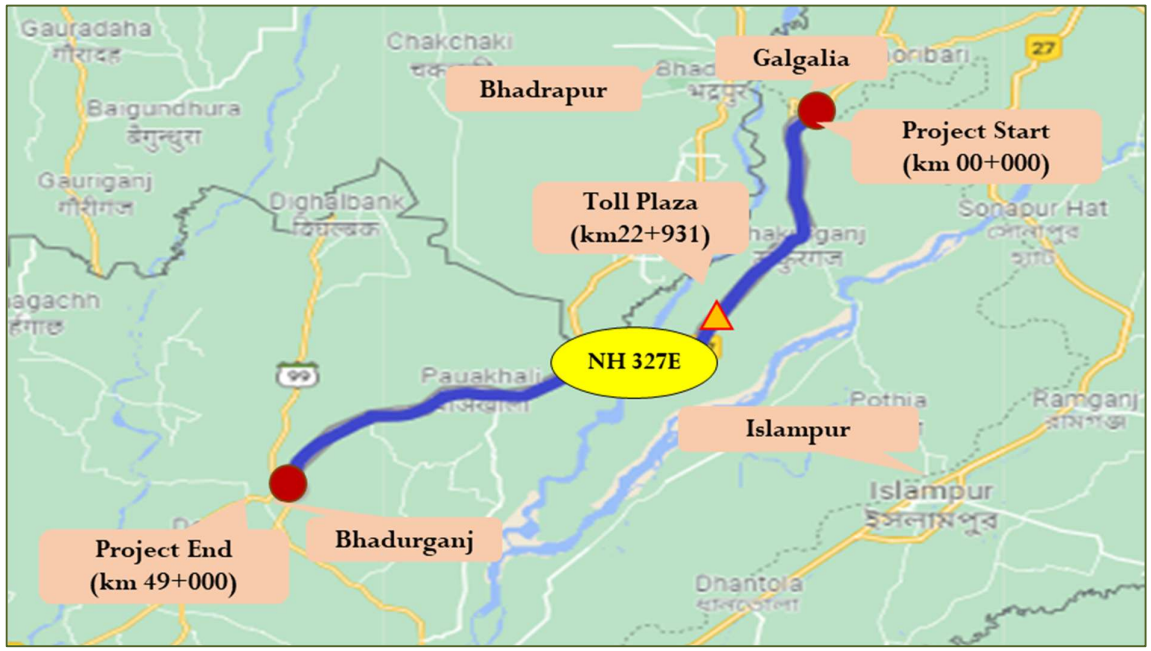

Figure 2.1: Project Alignment

2.2 Salient features

The salient features of the Project are summarised in the table below:

Table 2-1 Project Salient Features

S. No	Scope	Description
1	Name of the Project	Four laning of NH-327E from Galgalia (Design km 0.000) to Bahadurganj (Design km 49.000) (Design Length = 49.000 km) Package-I in the State of Bihar under Bharatmala Pariyojana on Hybrid Annuity Mode
2	Name of Client	National Highways Authority of India
3	Name of Concessionaire	GR Galgalia Bahadurganj Highway Private Limited
4	Independent Engineer	M/s Chaitanya Projects Consultancy Pvt. Ltd JV with M/s K&J Projects Pvt. Ltd
5	Length of the Project	49.000 km
6	Bid Project Cost	Rs.1051 crores
7	Letter of award	NHAI/BH/NH-327E/Gal-Bah/2020/Proc/E-166819 dated 03rd March 2021
8	Signing Concession Agreement date	17th April 2021
9	Appointed Date	10th January 2022
10	Construction Period	730 days from Appointed date
11	Operation Period	15 years from COD
12	Provisional Completion Certificate	06th April 2024

The Provisional Completion certificate was issued for the project effective from 06th Apr 2024 (except of 0.62 km length, for which provisional completion certificate in progress).

2.3 Scope of the Project

The scope of the Project (the "Scope of the Project") shall mean and include,

- Construction of the Project on the site set forth in Schedule-A and as specified in Schedule-B together with provision of Project Facilities as specified in Schedule- C, and in conformity with the Specifications and Standards set forth in Schedule- D of the Concession Agreement.
- Operation and Maintenance of the Project in accordance with the provisions of Concession Agreement; and
- Performance and fulfilment of all other obligations of the Concessionaire in accordance with the provisions of Concession Agreement and matters incidental there to or necessary for the performance of any or all the obligations of the Concessionaire under Concession Agreement.

2.4 Physical features of the Project

The Concessionaire shall operate, manage and maintain the project stretch for entire Concession Period, subject to and in accordance with the provisions of this Agreement. The Concessionaire shall visit the Site and assess the durability and strength of Project Assets and make his own assessment for operation, management. and maintenance as per Specifications and Standards and bear and pay all costs, expenses and charges in connection with or incidental to the performance of operation, management and maintenance.

The project includes the following physical features.

Table 2-2: Project Physical Features

S. No	Project Physical Features	UoM	As per CA	As per Site	Remarks
1	Total Length of project stretch	Km	49.000	49.000	
2	Total length of Service Road	Km	27.400	27.400	
3	Major Bridges	Nos.	12	12	
4	Minor Bridges	Nos.	9	9	
5	SVUPs	Nos.	03	03	
6	LVUPs	Nos.	06	06	
7	Box/Slab Culverts	Nos.	47	47	
8	Junctions	Nos.	31	31	
9	Rest Area	Nos.	1	1	
10	Toll Plaza	Nos.	1	1	No of Lane reduction (in Negative COS)

All the above features as per site have been accounted for the estimation of routine maintenance, repair and rehabilitation, major maintenance and operation expenditure.

2.5 Review of Concession Agreement

Authority had adopted a single stage two envelope bidding process and accordingly invited proposals by its Request for Proposals dated 22nd September 2020 (the "Request for Proposals" or "RFP") for qualification and short listing of bidders for construction, operation and maintenance of the above referred Project on Hybrid Annuity basis.

The Authority had prescribed the technical and commercial terms and conditions in the RFP and invited bids comprising technical and financial bids from the bidders for undertaking the Project.

After evaluation of the bids received, the Authority had technically qualified certain bidders including, inter alia, the selected bidder and accepted the financial bid of the selected bidder i.e. M/s GR Infraprojects Limited and issued its Letter of Award No. NHAI/BH/NH-327E/Gal-Bah/2020/Proc/E-166819 dated 03rd March 2021 (hereinafter called the "LOA") to the selected bidder requiring, inter alia, the execution of this Concession Agreement within 45 (forty five) days and on 17th April 2021 it was accepted.

Table 2-3: Review of CA

Article /Clause of CA	Subject	Description in brief	*Remarks*
Article 3	**Concession period**	Concession period includes construction period of 730 days and operational period of 15 years from COD	
	Total Project Cost	Total project cost is 60 % of the Bid Project Cost If there is an increase in WPI, on an average, by more than 3% per annum for the period between the Bid Date and COD, the Total Project Cost shall be increased such that the effect of increase in WPI, more than such 3%, is reflected in the Total Project Cost	
Clause 23.2	**Adjusted bid project cost**	For every month occurring after the Appointed Date, the Authority shall compute the variation in Price Index occurring between the Reference Index Date preceding the Bid Date and the Reference Index Date preceding the date of Invoice and shall express the latter as a multiple of the former (the "Price Index Multiple").	
Article 14.3	**Provisional completion certificate**	If the Concessionaire has completed construction of 100% of the site made available to the Concessionaire up to 182 days from the appointed date, the Concessionaire is eligible for provisional completion certificate	*Positive for developer*
Article 16	**Change in scope**	The Authority shall pay to Concessionaire any increase in scope of work approved by Independent Engineer. While in case of reduction of scope due to reasons attributed by the Authority, cost of such reduced cost is to be accessed by the Independent Engineer, as per the schedule of rates applicable on the Bid Due Date. The civil cost of the reduced Scope	

Article /Clause of CA	Subject	Description in brief	*Remarks*
		shall be multiplied by 1.06 to arrive at the estimated cost of reduced Scope. The estimated cost of reduced Scope shall then be multiplied by the ratio of Bid Project Cost to Estimated Project Cost to arrive at the Total Cost of Reduced Scope.	
Article 31	**Termination payment**		
	Termination payment in the event of default by Concessionaire during operation	Authority shall pay the Concessionaire an amount equal to 65% (sixty-five per cent) of the sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.	
	Termination payment in the event of default by Authority during operation Period	An amount equal to sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.	
Article 35	**Change in law**		
	Increase in cost	If the Concessionaire suffers aggregate financial effect due to change in law, which exceeds by Rs 1.59 crores or 2% of the total annuity payments in any accounting year the Concessionaire may notify Authority and propose amendments to this agreement so as to place the Concessionaire in the same financial position w/o change in law	*Concessionaire is protected*
	Reduction in cost	If the Concessionaire benefits from reduction in costs and the aggregate financial effect due to change in law, exceeds by Rs 1.59 crores or 2% of the total annuity payments in any accounting year the Authority may notify Concessionaire and propose amendments to this agreement so as to place the Concessionaire in the same financial position w/o change in law	

Article /Clause of CA	Subject	Description in brief	*Remarks*
Clause 6.3	Obligations relating to refinancing	Authority shall permit and enable Concessionaire for refinancing as per prevailing guidelines upon written request. Authority shall respond within 30 days of the receipt of proposal.	*Positive for the developers and lenders*
Article 28	**Force majeure**		
	Time Extension		
	After COD	After COD, the Concessionaire shall be entitled to receive Annuity Payments plus interest due and payable under this Agreement. Provided any payment to be made under this clause shall be subject to deduction of outstanding dues of the Authority, if any	
	Cost arising out of force majeure event		
	After Appointed Date	Non-Political Event: Cost to be shared by respective parties Indirect Political event: To be shared Direct Political: Cost compensated by Authority to concessionaire	*Concessionaire is protected*
Clause 17.8	Damages for breach of Maintenance Obligation	if the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified the Authority shall be entitled to recover damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% of the Performance Security, and (b) 0.1% of the cost of such repair or rectification as estimated by the Independent Engineer	*Concessionaire is made more responsible*
Clause 17.16	Advertising on the site	The Concessionaire shall not undertake or permit any form of commercial advertising, display or hoarding at any place on the site	
Article 20	Traffic aid post, medical aid post etc.	Concessionaire shall construct a traffic aid post of 25 sqm, medical aid post and two residential quarters at its own cost and hand them over to authority.	

Article /Clause of CA	Subject	Description in brief	*Remarks*
		Concessionaire shall provide to the State Police Department or a substitute thereof one Jeep or similar vehicle in good working condition along with chauffeurs for round-the-clock patrolling. The operating costs of such vehicle including the salaries and allowances of the chauffeurs shall be borne by Concessionaire.	
		Concessionaire shall provide to the State Medical Department or a substitute thereof to be designated by the Authority one ambulance in good working condition along with chauffeurs for round-the-clock ambulance services. the operating costs of such ambulance including the salaries and allowances of the chauffeurs	
		The Concessionaire shall also reimburse to the State Medical Department (or a substitute thereof to be designated by the Authority) the actual expenditure incurred by it in each Accounting Year on the medical equipment, and the pay and allowances of up to 2 medical personnel deployed exclusively for the Medical Aid Posts and ambulance and shall maintain the Medical Aid Post buildings.	
Clause 21.3	Payment to independent engineer	The remuneration, cost and expenses of the Independent Engineer shall be paid by Authority and subject to the limits set Schedule-M, one-half of such remuneration, cost and expense shall be reimbursed by the Concessionaire to the Authority within 15 days of receiving a statement of expenditure from the Authority	

2.6 Completion Certificate :

Provisional certificate has been issued by IE vide its letter no CPC/IE-64/GGP-P1/2021/HO/CON/485/17215 dated 01.05.2024 considering effective date from 06.04.2024 for the project except of 0.62 km length, which is considered in the punch list.

The Concessionaire has submitted the notification to the IE for the issuance of provisional certificate-2 for the balance work (expect of 20 m, where shoulder work is balance due to nonavailability of land). It was observed during site visit that all work has been completed after descoping work other than rest area and 20 m shoulder work. During site visit, the rest area finishing work was in progress.

The Independent Engineer has recommended to the Authority for the issuance of completion certificate for the project (expect of 20 m, where shoulder work is balance due to nonavailability of land) vide its letter no CPC/WB/IE-NH 327E/PKG-I/595 dated 31.01.2025.

Table 2-4: Details of Provisional Completion Certificate

Description	Length	Remarks
Total Project Length	**49 Km**	
Provisional Certificate-1 Issued	47.03 Km	
Provisional Certificate 2 (in Progress)	0.60 km	Other than 20 m shoulder work, remaining length has been competed
Land Acquisition issue	0.02 km	For shoulder (Main carriageway)
Constructed earlier (ROB & its Approach portion)	1.35 km	(Km 9+500 to 10+850 is constructed by another agency)

2.7 Change of Scope

A. Positive Change of Scope

- The Authority has granted Change of Scope order for construction of RCC lined drains from Km 37+150 to Km 37+500 amounting Rs 0.90 Crs vide its letter no. NHAI/PIU-Purnia/Gal.Bahad./2020/Vol VII/D-1319 dated 06.11.2023.
- The Authority has granted Change of Scop order for rework arising due to median widening needed for the construction of RUB by railways department at Km 13+700 amounting 2.55 Crs vide its letter no. NHAI/PIU-Purnia/Gal.Bahad./2020/Vol VIII/D-695 dated 05.07.2024.

In total 3.3 Cr amounting COS order for the change of scope has been issued by the Authority. Work for same has been completed at site.

B. Negative Change of Scope:

The Authority has approved for the for the reduction in scope of scope in lieu of the reduction of toll lanes in comparison to Agreement amounting Rs 13.33 Cr (inclusive of GST, multiplication factor 1.05, and factor of bid project cost to estimated project cost as per 16.6.1 of the Concession Agreement) vide its letter no NHAI/PIU-Purnia/Gal.-Bahd./2020/volIII/D-677 dated 02.07.2024

2.8 Hinderences/Land Acquisition

20 m (km 47+140 to Km 47+160) land acquisition for main carriageway acquisition is pending for the project length. At this location only shoulder work is pending, 2 lane carriageway width has already constructed and is in operation.

Figure 2.2: Hindrances

Chapter 3
ASSET STATUS

CHAPTER 3. ASSET STATUS

3.1 Review of Highway Current Status

Provisional certificate has been issued by IE vide its letter no CPC/IE-64/GGP-P1/2021/HO/CON/485/17215 dated 01.05.2024 considering effective date from 06.04.2024 for the project except of 0.62 km length.

The Concessionaire has submitted the notification to the IE for the issuance of provisional certificate-2 for the balance work (expect of 20 m, where shoulder work is balance due to nonavailability of land). It was observed during site visit that all work has been completed after descoping work other than rest area and 20 m shoulder work. Rest area finishing work was in progress.

The Independent Engineer has recommended to the Authority for the issuance of completion certificate for the project (expect of 20 m, where shoulder work is balance due to nonavailability of land) vide its letter no CPC/WB/IE-NH 327E/PKG-I/595 dated 31.01.2025.

Figure 3.1: Project start and end location

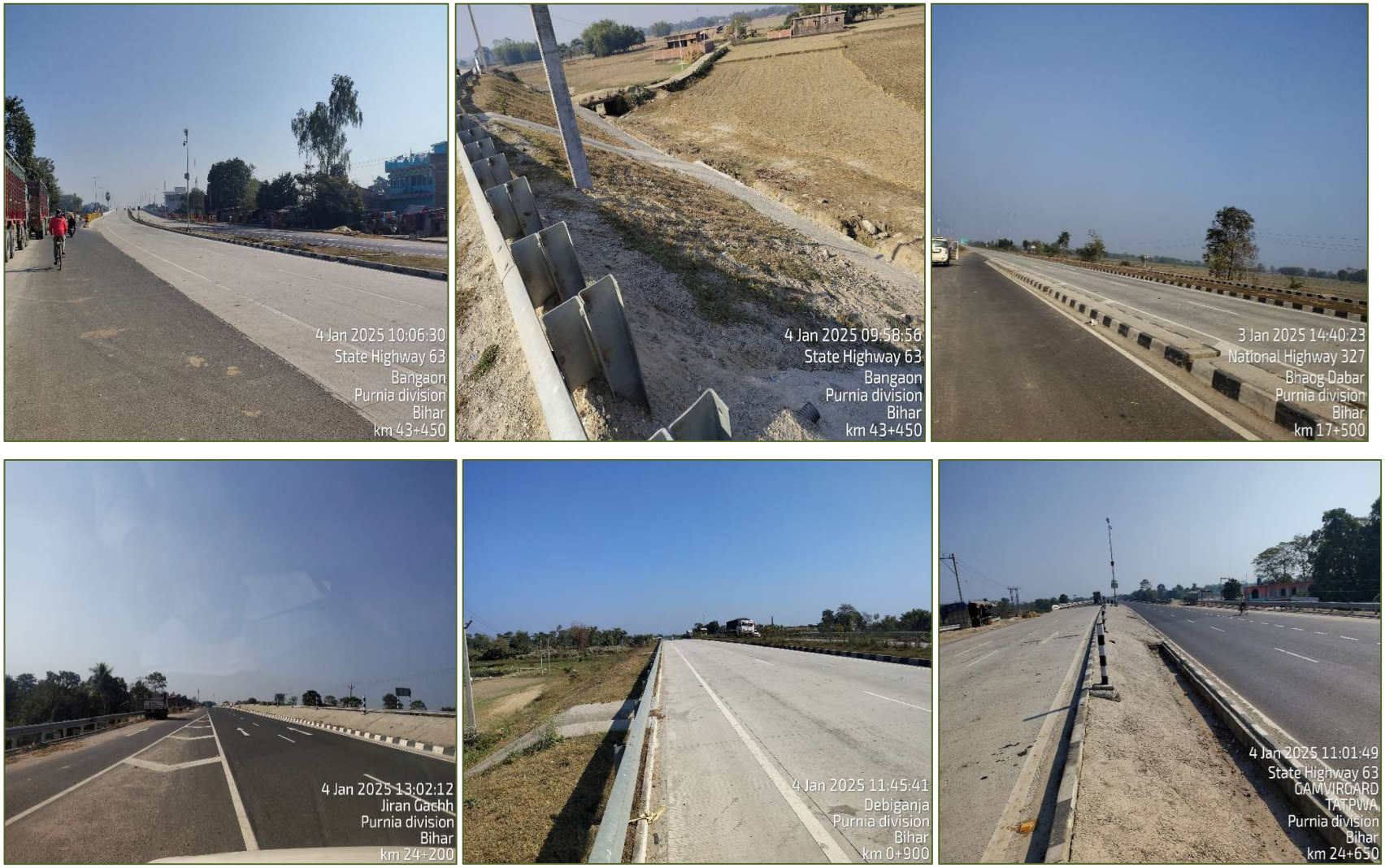

Figure 3.2: Site Photographs

3.2 Drain

Based on the site inventory, side drain and median drain are provided along the project stretches, which includes lined drain. Drain provided along the project stretch is found clean and it is in good condition.

Figure 3.3: Drains

3.3 Junctions

Based on the site observation, there are 30 Minor Junctions and 1 Major junction were found along the project stretch. Junctions are made of flexible pavements connecting the slip/service road with nearby villages. Lighting has been provided on both minor and major junction locations.

Figure 3.4: Junctions

3.4 Road Furniture

Following are the details of road furniture provided along the project stretch as per site.

Table 3-1: List of project furniture's

Type furniture	Unit	Quantity
MBCB	km	17.489 kms
Streetlights		
Single arm	Nos	87
Double arm	Nos	676
High mast	Nos	5

Metal Crash Barrier

Metal Beam crash barriers have been installed along the entire project stretch on shoulder side of the main carriageway and are being well-maintained.

Figure 3.5: Safety crash barrier (MBCB) along the project stretch

Overhead & Cantilever Gantry boards

Overhead Gantry and Cantilever Gantry boards are provided at the Project Stretch.

Figure 3.6: Overhead & Cantilever Gantry boards

Highway Lighting

Highway lighting such as single arm, double arm, and high mast lights have been provided along the project stretch, which includes main carriageway, service roads, built-up areas, bus bays, truck lay byes, junctions, toll plazas etc. As per site observations, streetlights provided along the project stretch are in good condition.

Figure 3.7: Highway lighting

3.5 Project facilities

Following are the details of project facilities along the project stretch. As per the Concession Agreement, bus shelters have been provided, there has been no provision for bus bays.

Table 3-2: List of project facilities

Type facility	Unit	Quantity
Bus shelters	nos.	40
Truck lay bye	nos.	02

3.6 Key Observations (Highway /Project Facilities)

- The pavement was found to be in good condition with good riding quality in general.
- Detailed condition of pavement is enclosed as Annexture.
- Carriageway Water is channelized through chutes even for embankment height less than 3 meters for majority of locations.
- At several locations, slope has been eroded, chute drain damaged and turfing has not been found stable. Embankment slopes in between Km 20 to Km 40 to be rectified on priority basis. Rectification cost has been considered in capital expenditure.
- Basin of chute drains missing for some locations. This should be maintained under routine maintenance work.
- Median plantation has been completed at all locations. However, growth of median plantation to be monitored and maintained as routine maintenance work.
- PCC has not been provided in separator between RE wall and SR for the A1 of Km 33+350 Underpass. Rectification of same to be done under routine maintenance.
- Lighting fixture in bus shelter was found missing at 3 locations. This should be fixed under routine maintenance work
- At site Km 39463 to km 39523 was found to be flexible, however as per as built TCS and CA Rigid pavement constructed. As built TCS to be revised accordingly.\
- The safety consultant had pointed out the need of Metal beam Crash barrier provision in built-up section (median 2.5 m). The Concessionaire has replied that there is no requirement for the MBCB, and plantation will suffice and further provision of MBCB is not mentioned in CA TCS. The IE has also mentioned that there is no need of MBCB in such section. Subsequently the matter has been closed, and Provisional completion Certificate has been issued.
- Minor settlements in approaches were observed near the joint of PQC and flexible pavement, resulting in bumpy ride at few locations. This should be monitored periodically to avoid major settlements

Figure 3.8: Observation Photographs

3.7 Toll Plaza Equipment status and & ATMS

3.7.1 Toll Plaza and Toll Collection System

General Features of Toll Plaza and Toll Collection system

- One toll plaza is located along the stretch: Jeerangachh toll Plaza at KM 22+450 chainage. The Toll Collection Systems at toll plaza is provided by Qualix Information System LLP in 2024.
- Jeerangachh toll plaza has 10 lanes (8 physical lanes and 2 reversible lanes). All 10 lanes are equipped with ETC (Electronic Toll Collection) systems. Out of 10 lanes, only two lanes contain booths, while the remaining eight lanes are boothless.
- TLCs are installed and operational in 10 lanes. Each TLC has the specification of 8 GB RAM and 1TB hard disk with Ubuntu 18.04.2 LTS OS is installed.
- There is an office building for operations at jeerangachh Toll Plaza.
- RFID ETC Transceiver are present and operational in 10 lanes.
- ETC system is running on ICD 2.5.
- The booth components include monitor, customized keyboard, printer, intercom slave and a booth camera etc. are present and working in10 lanes at toll plaza.
- Major lane equipment like user fare display, boom barriers, OHLS, LPIC camera, ICS camera, and traffic light etc. are present in 10 lanes.
- Laser profiler-based system AVC is installed in 10 lanes at the toll plaza.
- Two servers (a primary server and a backup server) are provided, along with a switch rack and a 24-port switch.
- Both servers are HP ProLiant DL380 Gen10 models.
- 52" inch LED screen for CCTV monitoring installed at the toll plaza.
- Four Workstations are available in the control room for lane monitoring, administration, and audit with 8 GB RAM and 1 TB HDD.
- A 6 KVA UPS is present in the UPS Room.
- A 3 KVA UPS is connected to each lane and is in the UPS room

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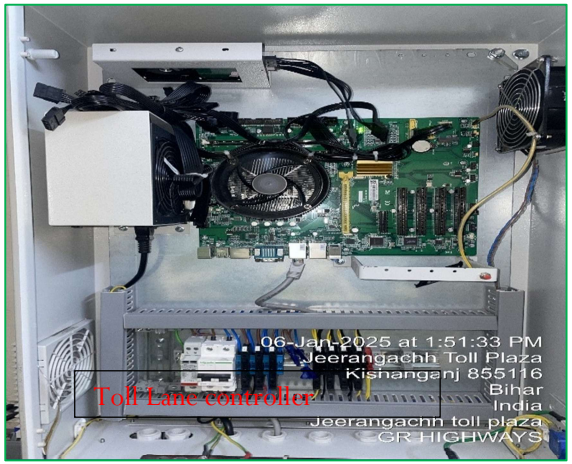
Jeerangachh Toll Plaza
Kishanganj 855116
Bihar
India
Jeerangachh toll plaza
GR HIGHWAYS lane-10
6 Zebra Rfid reader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Kishanganj 855116
Bihar
India
Jeerangachh toll plaza
GR HIGHWAYS
Toll Lane controller

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Bihar
India
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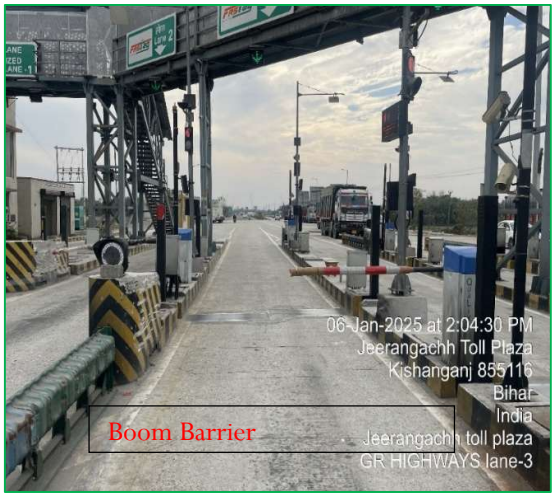
GR HIGHWAYS
AVC Laser Sensor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Kishanganj 855116
Bihar
India
Jeerangachh toll plaza
GR HIGHWAYS lane-3
Boom Barrier

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Kishanganj 855116
Bihar
India
Jeerangachh toll plaza
GR HIGHWAYS lane-10
Traffic Light and User fee

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Jeerangachh Toll Plaza
Kishanganj 855116
Bihar
India
Jeerangachh toll plaza
GR HIGHWAYS lane-9
Damaged Traffic Light

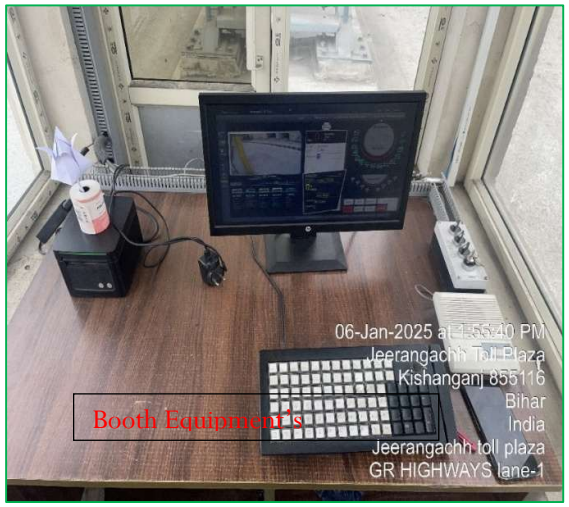

Figure 3.9: Toll Plaza and Toll Collection system

3.7.1 Advanced Traffic Management System (ATMS)

General Features of Toll Plaza and Toll Collection system

The Advanced Traffic Management System (ATMS) is installed and maintained by Qualix Information System LLP in 2024. for the project road which is controlled by the ATMS Centre. It comprises of the following:

- **Emergency Call Back System (ECB):** 10 pairs of Emergency Call Booths (ECBs) are installed.
- **Variable Message Signboards (VMS):** VMS is installed at 4 locations.
- **Portable Variable Message Signboards (PVMS):** one PVMS is present at the toll plaza.
- **Automatic Traffic Counter cum Classifier (ATCC)**: 4 lane Loop-Piezo-Loop Automatic Traffic Counter cum Classifiers (ATCC) is installed in 1 location (KM 22+100 chainage).
- **Meteorological Data system (MDS):** MDS is installed on the top of the toll building, The meteorological sensors include equipment to measure atmospheric temperature, humidity, visibility, road temperature, and wind speed & direction.
- **CCTV system:** Surveillance cameras are installed at 16 locations including two fixed cameras.
- **Video Incident Detection System (VIDS):** VIDS is installed and operational in 14 locations
- **Radio Frequency (RF) Tower:** RF tower with RF devices is installed and operational in 11 locations.
- Two ATMS Servers and one ECB server are provided with a server rack, 24port switch, NVR 32 channel with 8TB HDD, media converter etc.

Figure 3.10: ATMS

3.7.5 Key Observation for toll collection system and ATMS

TMS

- UFD is missing in lane-5 and damaged Traffic Light at lane -9 need to be replaced.
- AVC accuracy needs to be improved.
- WIM and SWB were not in use as there are no overload collection by agency currently. These need to be checked and maintained at regular intervals for proper functioning.

ATMS

- 4 Nos of Emergency Call Booths (ECB) equipment is not operational and should be made functional.
- The ATCC is not operational and needs to be made functional.
- Two Nos of Variable Message Signs (VMS)which are installed at 3+100 chainage and 47+415 chainage are not working and need to be made operational.
- One CCTV camera at chainage KM 37+630 is damaged.
- Rain gauge sensors must be installed in MET devices. Additionally, some meteorological sensors are not working and need to be checked, repaired, or replaced.
- The Mobile Radio Communication System (MRCS) is not installed and needs to be installed.
- The Portable Variable Message Sign (PVMS) should be made functional.
- VMS messages cannot be set from the ATMS application in the control room. This issue needs to be resolved.
- Lightning arresters and earthing should be installed and maintained for certain ATMS devices for which it have not installed and maintained.

TMS and ATMS work are under 2 years warranty and are also covered under comrehensive AMC. It is recommended that matter to be taken up with concerned agencies for the rectification of the above deficiencies.

Figure3.11: General Observations

3.7 Incident Management.

Following provisions at site toll plaza has been made under incident management as per the requirements of concession agreement.

- **Ambulance:** 1 Nos ambulance has been provided at toll plaza location with all the required equipment.
- **Highway Patrol Vehicle**: 1 no highway petrol vehicle has been provide
- **Medical Aid post**: Medical Aid post has been constructed at toll plaza location.
- **Crane Service:** 1 No crane with 35 MT capacity has been provided.
- **Traffic Aid post:** Traffic aid post has been provided at toll plaza location.
- **Vehicular Rescue Post:** Vehicular Rescue post has been provided at toll plaza location.
- **Operation & Maintenance Center :** O&M center has been provided at toll plaza location

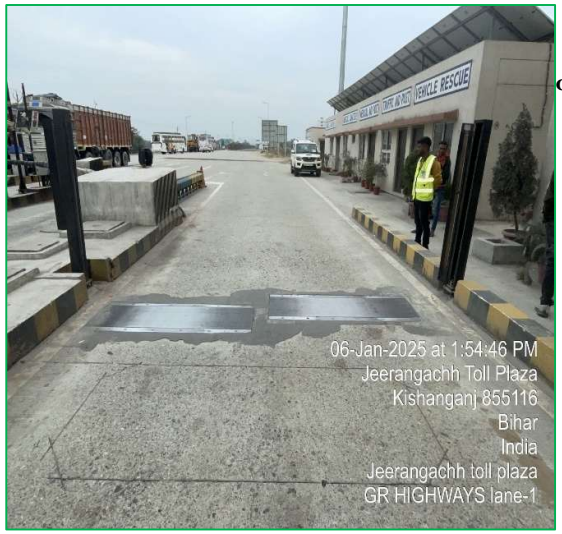

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Figure3.12: Incident Management

Chapter 4
REVIEW OF STRUCTURES

CHAPTER 4. REVIEW OF STRUCTURES

4.1 Structural investigations

Review of structures inventory and detailed condition survey of structures are the essential requirements for preparation of estimates for Capex and also for O & M cost for highway structures. Keeping in view of importance of this task, review of inventory and conducting visual condition survey were carried out as per procedure and guidelines prescribed in IRC: SP:35 bridge engineers. The details of condition survey of structures were furnished below.

4.1.1 Visual Condition Survey

Salient features for which data is collected as part of conditional survey are in accordance with IRC: SP: 35 Proforma.

4.2 General

Details of various types of structures as per CA as well as site inventory survey are furnished below.

Table 4-1: Summary of structures

S. no.	Type of Structure	As per Schedule-A	As per site inspection	Remarks
1	Major Bridges	12	12	
2	Minor Bridges	09	09	
3	LVUPs	06	06	
3	SVUPs	03	03	
4	Box Culverts	47	47	
Total		**77**	**77**	

The condition survey of all structures was conducted by a team of bridge experts by visual as well as with Mobile bridge inspection unit (MBIU) at all the inaccessible locations like bearings, pedestals, girders and soffit of super structure. The detailed condition of all structures with necessary repair and rehabilitation measures is provided in separate report.

4.3 Major Bridges

There are twelve major bridges on the project stretch.

Table 4-2: Major Bridges

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	0.818	2 x 35.00	70.00	LHS	
		2 x 35.00	70.00	RHS	
2	16.201	3 x 20.00	60.00	LHS	Existing
		3 x 20.00	60.00	RHS	
3	21.303	2 x 20.00 + 1 x 21.00	61.00	LHS	Existing
		2 x 20.00 + 1 x 21.00	61.00	RHS	
4	23.125	3 x 26.00	78.00	LHS	Existing
		3 x 26.00	78.00	RHS	
5	24.461	2 x 4.80 + 2 x 12.20 + 5 x 36.40	216.00	LHS	Existing
		2 x 20.00 + 5 x 36.40	222.00	RHS	
6	26.521	2 x 20.50 + 1 x 26.00	67.00	LHS	Existing
		2 x 20.50 + 1 x 26.00	67.00	RHS	
7	31.215	3 x 26.00	78.00	LHS	Existing
		3 x 26.00	78.00	RHS	
8	34.849	2 x 4.80 + 2 x 10.70 + 2 x 36.50	104.00	LHS	Existing
		2 x 18.50 + 2 x 36.50	110.00	RHS	
9	36.190	9x24.6	221.4	LHS	Existing

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
		9 x 24.60	221.40	RHS	
10	37.532	2 x 35.00	70.00	LHS	
		2 x 35.00	70.00	RHS	
11	41.756	2 x 20.35 + 1 x 19.80	60.50	LHS	Existing
		2 x 20.35 + 1 x 19.80	60.50	RHS	
12	45.698	2 x 26.50 + 1 x 26.00	79.00	LHS	Existing
		26.5+26+ 26.5	79	RHS	

Note: ***Refer separate report for detailed coditional survey of the major bridges***

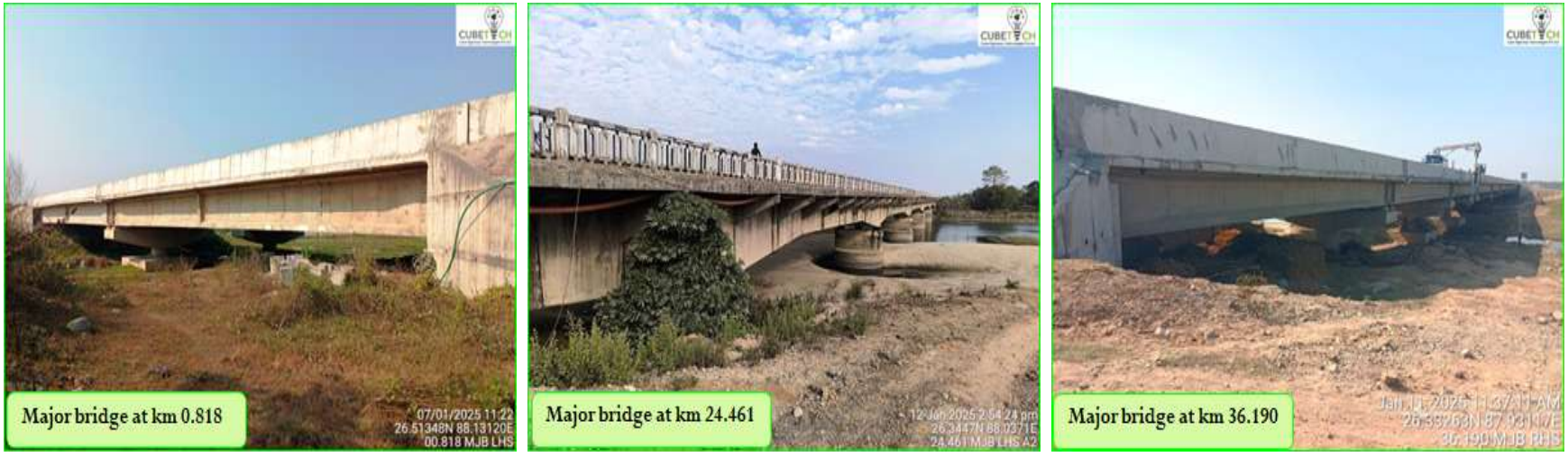


Figure 4.1: Major Bridges

4.4 Minor Bridges

There are nine minor bridges on the project stretch.

Table 4-3: Existing condition and required repairs /maintenance works for Minor Bridges

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	11.077	1 x 13.50	13.50	LHS	Existing
		1 x 13.50	13.50	RHS	
2	15.077	1 x 13.50	13.50	LHS	Existing
		1 x 13.50	13.50	RHS	
3	30.593	1 x 42.50	42.50	LHS	
		1 x 42.50	42.50	RHS	
4	34.245	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
5	38.310	1 x 42.50	42.50	LHS	
		1 x 42.50	42.50	RHS	
6	40.150	2 x 27.50	55.00	LHS	
		2 x 27.50	55.00	RHS	
7	43.415	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
8	44.331	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
9	48.206	1x42.5	42.5	LHS	
		1x42.5	42.5	RHS	

Note: ***Refer separate report for detailed coditional survey of the minor bridges***

Figure 4.2: Condition of Minor Bridges

4.5 Light Vehicular Underpasses (LVUP)

There are Six LVUPs on the project stretch.

Table 4-4: Existing condition and required repairs /maintenance works for LVUPs

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	12.580	1 x 12.00	12.00	BHS	
2	19.582	1 x 12.00	12.00	BHS	
3	28.742	1 x 12.00	12.00	BHS	
4	33.365	1 x 12.00	12.00	BHS	
5	35.605	1 x 12.00	12.00	BHS	
6	41.109	1 x 12.00	12.00	BHS	

Note: ***Refer separate report for detailed coditional survey of the LVUPs***

Figure 4.3: LVUPs

4.6 Small Vehicular Underpasses (SVUP)

There are three SVUPs on the project stretch.

Table 4-5: Existing condition and required repairs /maintenance works for SVUPs

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	20.774	1 x 7.00	7.00	BHS	
2	21.685	1 x 7.00	7.00	BHS	
3	27.452	1 x 7.00	7.00	BHS	

Figure 4.4: Condition of SVUPs

4.7 Box Culverts

There are forty-seven box culverts in the project stretch.

Table 4-6: Box Culverts

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	0.016	1 x 3.00	3.00	BHS	
2	0.323	1 x 5.00	5.00	BHS	
3	2.012	1 x 2.00	2.00	BHS	
4	2.206	1 x 3.00	3.00	BHS	
5	2.264	1 x 4.00	4.00	BHS	
6	5.056	1 x 2.00	2.00	BHS	

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
7	5.517	1 x 2.00	2.00	BHS	
8	5.986	1 x 4.00	4.00	BHS	
9	6.431	1 x 2.00	2.00	BHS	
10	6.690	1 x 2.00	2.00	BHS	
11	7.790	1 x 3.00	3.00	BHS	
12	8.115	1 x 2.00	2.00	BHS	
13	9.009	1 x 2.00	2.00	BHS	
14	9.208	1 x 2.00	2.00	BHS	
15	11.667	1 x 2.00	2.00	BHS	
16	11.937	1 x 2.00	2.00	BHS	
17	13.498	1 x 2.00	2.00	BHS	
18	15.087	1 x 2.00	2.00	BHS	
19	15.304	1 x 2.00	2.00	BHS	
20	18.237	1 x 3.00	3.00	BHS	
21	18.687	1 x 2.00	2.00	BHS	
22	18.952	1 x 6.00	6.00	BHS	
23	20.200	1 x 4.00	4.00	BHS	
24	22.886	1 x 3.00	3.00	BHS	
25	26.234	1 x 2.00	2.00	BHS	
26	27.265	1 x 3.00	3.00	BHS	
27	27.892	1 x 6.00	6.00	BHS	
28	29.667	1 x 3.00	3.00	BHS	
29	32.394	1 x 2.00	2.00	BHS	
30	33.216	1 x 2.00	2.00	BHS	
31	39.326	1 x 3.00	3.00	BHS	

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
32	40.803	1 x 2.00	2.00	BHS	
33	41.525	1 x 2.00	2.00	BHS	
34	42.678	1 x 2.00	2.00	BHS	
35	42.876	1 x 2.00	2.00	BHS	
36	43.278	1 x 2.00	2.00	BHS	
37	43.682	1 x 2.00	2.00	BHS	
38	44.231	1 x 2.00	2.00	BHS	
39	45.265	1 x 2.00	2.00	BHS	
40	46.025	1 x 2.00	2.00	BHS	
41	46.836	1 x 2.00	2.00	BHS	
42	46.979	1 x 2.00	2.00	BHS	
43	47.466	1 x 2.00	2.00	BHS	
44	47.725	1 x 3.00	3.00	BHS	
45	48.000	1 x 3.00	3.00	BHS	Shifted from km 24.929
46	48.435	1 x 2.00	2.00	BHS	
47	48.922	1 x 2.00	2.00	BHS	

Note: ***Refer separate report for detailed coditional survey of the Box Culverts***

Figure 4.5: Condition of SVUPs

4.8 Key Observations on Major structures

4.8.1 Technical note on Major bridge at km 24.461:

During Construction phase a settlement of approximately 600mm was observed in Pier P3 of bridge over the River Mechi on June 23, 2023, just one month after construction of superstructure. The bridge was not opened to traffic when the settlement occurred. The wearing course and expansion joints are yet to be installed on the bridge deck. Pier P3 supports the 36.4m spans between P2-P3 and P3-P4.

After this occurrence NHAI sent a three-member expert committee to investigate and recommend remedial measures for this failure at Pier P3. The committee has given the certain recommendations and conclusions (given in subsequent paragraphs) after thorough investigation duly considering the opinion of the contractor, design report, geotechnical report (both prior to construction and after the failure geo technical reports), and construction records such as Pile Integrity test.

The possible reason for the settlement as per the contractor opinion was likely due to the major bridge's location, where the entire flow of the Mechi River was channelled under the P2-P3-P4 spans during construction. This constricted water flow may have caused excessive scouring of the sandy riverbed, potentially leading to the settlement of the pile foundation at Pier P3.

In their analysis, the expert committee noted that the scour depth at Pier P3 was less than that at Pier P2 at the time of settlement. As a result, the committee recommended conducting soil investigations at all substructure locations. After thoroughly reviewing the confirmatory soil investigation reports for Pier P3 on both the upstream and downstream sides of the river, along with the PIT test results, the committee made the following conclusions:

- The results of the confirmatory geotechnical investigations indicate that the subsoil profile is better than the previously recorded geotechnical investigation. Therefore, the integrity of the piles, the presence of localized loose pockets or cavities beneath the pile group, or a combination of these factors are likely causes of the settlement at Pier P3.
- The pile length of the remaining foundations should be reassessed, as it is currently shorter than the proposed pile length recommended based on the confirmatory geotechnical investigations for Pier P3.
- The percentage of micaceous soil present should be determined based on the confirmatory geotechnical investigations. If this has implications for the pile foundation, expert opinion should be sought.
- As suggested in the interim report, confirmatory geotechnical investigations should be conducted for all foundations on the upstream side. The committee recommends that the test results be analysed to determine any necessary remedial measures for the existing foundations. This should be carried out by the independent engineer to ensure the client's satisfaction and the long-term sustainability of the structure.

The Concessionaire had conducted the confirmatory bore logs and reports were submitted to the Independent Engineer and Authority.

Based on confirmatory boring, the contractor has proposed a new foundation arrangement with a framed substructure to support the superstructure at Pier P3. In this regard, the committee recommends:

- Scour depth should be recalculated, considering the concentration of river flow through spans P1-P2, P2-P3, and P3-P4. The curvilinear flow of the river upstream of the bridge site suggests that the actual scour depth may be greater than the theoretical calculation.
- The proposed foundation consists of a two-pile group on either side of the bridge (upstream and downstream), separated by the width of the superstructure (approximately 15m). The committee suggests examining a three-pile group foundation versus the proposed two-pile group foundation for enhanced structural stability.

- It must be ensured that no differential settlement occurs in the foundations connected through the beam-and-column frame structure due to future river flow concentration, as girder support bearings will be fixed on the beam.

The Concessionaire has submitted the compliance for the issue observations by committee vide its letter no. GGBHPL/GA-BA/2023/1252 dated 15.02.2024.
Further, the contractor with duly approved from Independent Engineer, has carried out the rehabilitation of structure by supporting the superstructure with a portal type pier system at P3 location using two piles of 32.00 m depth for each column. No further settlements are observed during our visual inspection in January 2025, even after 1 year of completion and opened to traffic. Since there is no settlements at other pier locations no rehabilitation measures were carried out other than at Pier P3.

4.8.2 Major observations on Structures:

Following are the key observations on the project stretch,

- In most of the bridges the spherical bearings were observed with excessive rotation and transverse movement. These bearings require periodic monitoring to check the health condition of the bearings.
- At few locations due to excessive rotation, transverse movement and dislocation of the pistons, bearing replacement is recommended for 12 spans of the major structures at Major Bridge km 0.818, km16.201, km 21.303, km 24.461, km 26.52, km 45.698 and Minor Bridge at km 44.331. replacement cost has been considered in capital expenditure.
- Bearing pedestals cast over height of the bearings due to which the side guides of the bearing touching to the bearing pedestal top and having very less gap, limiting the spherical bearing functionality in most of the new bridges. Rectification of same can be taken up on priority basis as a part of routine maintenance.
- Some of the Roller cum Rocker or Rockers bearings were in rusting condition, debris accumulation around the bearings which requires maintenance like cleaning, rust removal, protective painting and lubrication. Rectification of same is considered in capex expenditure.
- Considerable delamination, spalling and corroded rebars were observed in structural components like cantilever deck slab soffit, girder soffits, girder soffit overbearing locations etc., on old bridges. Rectification of same is considered in capex expenditure.
- At Major Bridge km 34.849 LHS A1 foundation scouring was observed. Also, the raft reinforcement was exposed, and concrete was severely eroded and on RHS bridge in pier P2, pile reinforcement was exposed due to lack of pile liner and corroded for all 4 no's of piles below the pile cap. Rectification of same is considered in capex expenditure.
- Leaching was observed on soffit of deck slab in most of the old structures. Rectification of same is considered in capex expenditure.

- Shear cracks were observed on RCC and PSC girders and box girders in some of the bridges, also concrete deterioration was observed on web portion of box girders and RCC and PSC girders due to water dripping on girders outer face on either side of the bridge.Rectification of same is considered in capex expenditure.
- Drainage spouts were missing for the existing retained structures, only a provision of hole was observed in the deck slab and also projection of drainpipes below the soffit of deck slab is also very small in some of the bridges. Rectification of same is considered in capex expenditure.
- For underpasses PVC down take pipes were missing for the drainage holes provided at bottom of crash barrier to drain out the deck water. Rectification of same is considered in capex expenditure.
- A crack was developed on the deck slab concrete along the edge angle of the strip seal expansion joint on most of the structures due to the approach's settlement. It should be monitored periodically, and rectification should be done as routine maintenance.

Figure 4.6 Observations

Chapter 5
CONDITION ASSESSMENT OF EXISTING PAVEMENT CONDITION

CHAPTER 5. CONDITION ASSESSMENT OF EXISTING PAVEMENT CONDITION

To evaluate the existing pavement condition of a Project Highway, investigations are to be carried out on the field to collect data from the field. The collected data is processed and analysed to obtain complete information on the pavement condition.

5.1 Pavement Condition Assessment for Technical Due Diligence

As a part of technical due diligence, the different investigations performed on the Project Highway are listed below.

- Assessment of Pavement Condition based on Visual Condition Survey

Based on the visual condition survey, the type of distress, its quantity, and severity along the Project Highway are obtained. The same is used to evaluate the present condition of pavement, which classifies pavement conditions ranging from 'Good' to 'Fair'.

The pavement investigation studies carried out on the Project Highway from 03rd January to 08th January 2025 as a part of technical due diligence and their outcomes are detailed in the sections below.

Main Carriageway is comprised of both flexible pavement and rigid pavement. Flexible pavement is for stretching section i.e. 30.21 km (including of 2.7 km work done by another agency and 3.12 km of structure length) and rigid pavement is for reconstruction and reconstruction section i.e.67.79 kms.

5.2 Review of Concession Agreement

As per Schedule K of the Concession Agreement, the Concessionaire shall repair and rectify the defects and deficiencies as specified below

Table 5-1: Major maintenance criteria as per CA

S. No	Nature of Defect or Deficiency	Time limit for Repair/Rectification
1	Roughness value exceeding 2750 mm in a stretch of 1km (as measured by a standardized rough meter/bump integrator)	180 Days
2	Cracking in more than 5% of road surface in a stretch of 1 km	30 days
3	Rutting exceeding 10mm in more than 2% of road surface in a stretch of 1km (measured with 3m straight edge)	30days

5.3 Review of Pavement Design Report

- The design of rigid pavement has been carried out in accordance with guidelines of IRC-58-2015.
- The thickness of rigid-layers is designed for a period of 30 years and Subgrade CBR is taken as 10%.
- The design of flexible pavement for has been carried out in accordance with guidelines of IRC-37-2018.
- The thickness of bituminous-layers for Main carriage way is designed for a period of 20 years. Design traffic is 60 MSA and effective Subgrade CBR is taken as 15%.
- The pavement for the service road has been designed as per IRC: 37-2018; Design traffic is 10 MSA and effective Subgrade CBR is taken as 10%.

Table 5-2: Pavement Design Thicknesses of Rigid Pavement for Main carriageway as per Pavement Design Report

Layer	Thickness(mm)
Pavement Quality Concrete (PQC)	240
Dry Lean Concrete (DLC)	150
Granular Sub-base (GSB)	200

Table 5-3: Pavement Design Thicknesses of Flexible Pavement for Main carriageway as per Pavement Design Report

Layer	Thickness(mm)
Bituminous Concrete (BC)	50
Dense Bituminous Macadam (DBM)	100
Wet Mix Macadam (WMM)	250
Existing Granular Layer	200

Table 5-4: Pavement Design Thicknesses for Service roads as per Pavement Design Report (2 types of crust has been followed on site)

Layer	Thickness(mm)
Bituminous Concrete (BC)	30
Dense Bituminous Macadam (DBM)	50

Layer	Thickness(mm)
Wet Mix Macadam (WMM)	150
Cement Treated Sub-base (CTSB)	200

Layer	Thickness(mm)
Bituminous Concrete (BC)	40
Dense Bituminous Macadam (DBM)	-
Wet Mix Macadam (WMM)	150
Cement Treated Sub-base (CTSB)	200

5.4 Key Site Visit Observations

The observations made during the site visit by the pavement investigation team are as follows,

- The majority of the pavement conditions were observed to be good on both hand side of the Project Highway.
- Undulations extending over 500 meters from km 4.000 to km 5.000
- Low severity rutting observed at isolated locations, covering approximately 1000 meters along the flexible pavement stretch.
- Noticed continuous patchwork covering approximately 400 meters in total at isolated locations at km 46.000
- Bituminous mix and bitumen sealant/ epoxy applied as rectification treatment in rigid pavement distress locations.
- Minor settlements observed at approach slabs of few structures
- Pothole patches were observed at regular intervals along the flexible pavement stretch.
- Micro surfacing is carried out over approximately 8 km on the LHS of the Project Highway as a preventive maintenance treatment for flexible pavement.

Location where, distresses were developed and microsurfacing was already carried out, provision of overlay has been considered in due course of time under capital expenditure. For low severity distresses, repair work can be carried out under routine maintenance.

5.5 Pavement Distress Survey

A pavement condition survey gives an indication of the serviceability of the road pavement and is vital in deciding the maintenance activities. Some methods to conduct this survey are the Visual Condition Survey method (manual), Network Survey Vehicle (NSV) method, etc. However, Visual Condition Survey was conducted in this Project.

In a visual condition survey, the technical team makes a traverse along the Project Highway, observing the different types of distresses on the pavement surface, and observations are made on each distress type.

Distresses on Rigid pavements include

- Cracks – Longitudinal, Transverse, Multiple
- Corner break
- Punchout
- Ravelling
- Scaling
- Popouts/potholes
- Joint seal defects
- Spalling of joints

Distresses on flexible pavements include

- Cracks – Longitudinal, Transverse, and Alligator cracks
- Raveling
- Rutting
- Bleeding
- Potholes
- Patches

Observations made during the visual condition survey for Rigid Pavement are detailed below.

5.5.1 Longitudinal, Transverse and Multiple Cracks

Longitudinal cracks develop parallel to the traffic direction and extend through the depth of the bituminous layer, originating either from the bottom-up or top-down. Transverse cracks form perpendicular to the traffic direction and also penetrate the full depth of the bituminous layer. Multiple cracks, also known as interconnected cracks, do not follow a straight line and may link one or more joints or existing cracks, leading to a more complex cracking pattern.

Longitudinal, Transverse and Multiple Cracks were observed at a few locations along the Project Highway. However, bitumen sealant/epoxy is applied for all the cracks.

5.5.2 Corner Break, Punchout and Ravelling

Corner break occurs when a portion of the slab is separated by a crack intersecting the adjacent transverse and longitudinal joints, typically forming a 45-degree angle with the traffic direction, with side lengths ranging from 0.3 m to half the slab width. Punchout refers to a portion of the slab broken out by multiple cracks, usually enclosed by two closely spaced transverse cracks (less than 0.6 m apart), a short longitudinal crack, and either the pavement edge or a longitudinal joint. Raveling is the loss of fine aggregates from the surface due to abrasion, which may or may not be associated with pre-existing cracks.

Corner breaks and Ravelling were observed at few locations along the Project. Bitumen sealant/epoxy is applied at few corner break locations. Punchout were not observed at any locations along the Project Highway.

5.5.3 Scaling, Popout and Pothole

Scaling refers to the peeling off of the upper part of the slab surface (5 mm to 15 mm) due to crazing or improper surface finishing, leading to the loss of surface mortar. Popouts are small holes in the pavement surface, typically 25 mm to 100 mm in diameter and 10 mm to 50 mm deep, caused by the presence of oversized particles of soft aggregates that rise to the surface and break loose under traffic. Potholes, on the other hand, are larger depressions in the pavement, generally exceeding 150 mm in diameter and 50 mm in depth, formed due to the loss of pavement material under traffic loads or adverse environmental conditions.

Scaling is not observed at any locations along the Project Highway. Popouts and Potholes were observed at few locations and however, sealed with bitumen sealant.

5.5.4 Joint seal Defect and Spalling of Joint

Joint seal defects occur when any condition allows incompressible materials or significant water infiltration into the joint from the surface. Common types of damage include adhesive failure (bonding), complete loss of sealant, foreign material intrusion within the joint. Spalling of joints refers to the cracking, breaking, chipping, or fraying of slab edges within 0.3 m from the joint face, which can compromise pavement durability and performance.

Joint seal defect was not observed at any locations whereas spalling of joint was observed at very few locations along the Project Highway. However, it was rectified with bitumen sealant

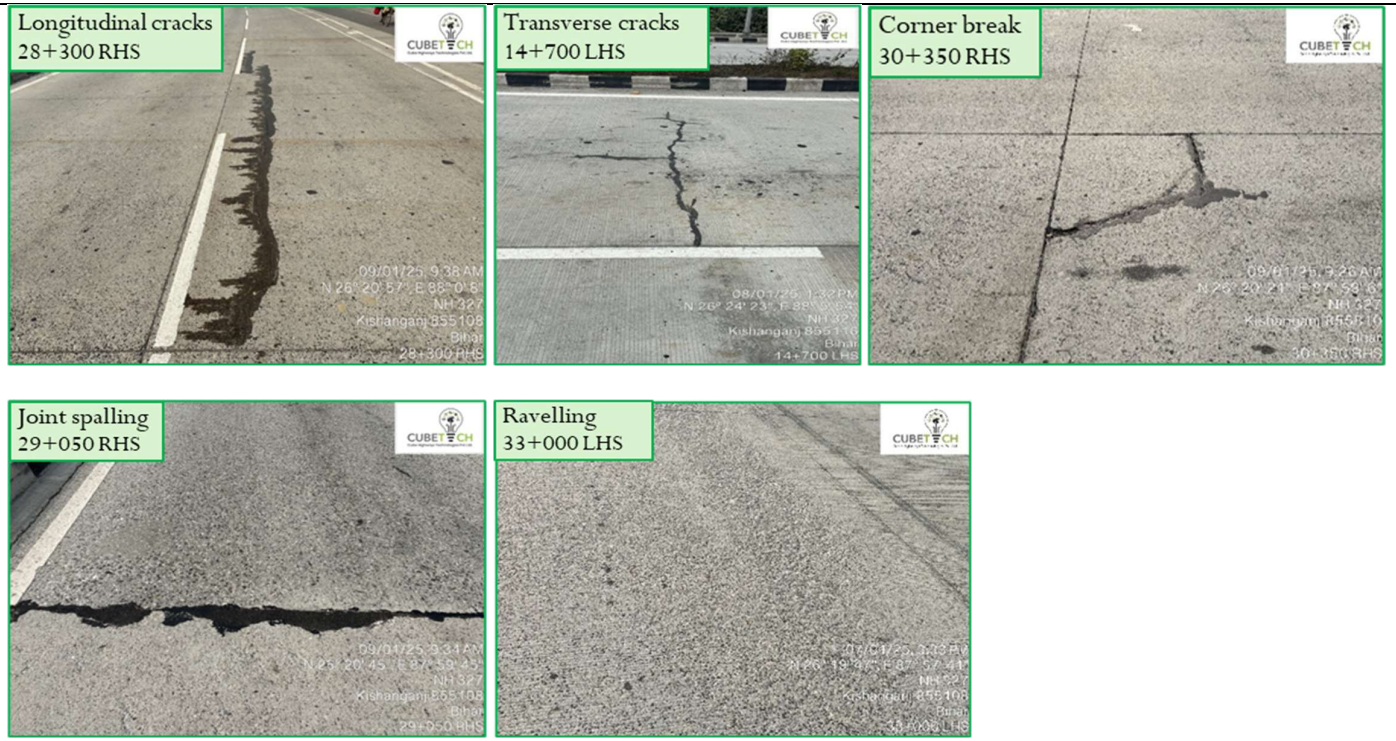


Figure 5.1: Rigid pavement distress pictures

Observations made during the visual condition survey for flexible Pavement are detailed below.

5.5.5 Longitudinal , Transverse and Alligator Cracks (Flexible pavement)

Longitudinal cracks develop parallel to the traffic direction and extend through the depth of the bituminous pavement layer, occurring as either bottom-up or top-down cracks. In contrast, transverse cracks form perpendicular to the traffic direction and also penetrate the full depth of the bituminous layer. Alligator cracks, also known as fatigue or crocodile cracking, appear as interconnected, irregularly shaped blocks resembling an alligator's skin.

Longitudinal cracks were not observed at any locations. Transverse and Alligator cracks were observed at very few locations of the Project Highway.

5.5.6 Raveling , Rutting and Bleeding (Flexible pavement)

Raveling is the wearing away of the pavement surface due to the loss of bitumen binder and the dislodging of aggregate particles. Rutting, common in flexible pavements, appears as surface depressions in wheel paths with possible pavement uplift along the sides, resulting from permanent deformation in any pavement layer or subgrade due to traffic loads. Bleeding, also observed in flexible pavements, occurs when excess bituminous binder forms a shiny, reflective surface that becomes soft in hot weather and slippery in cold or wet conditions, leading to low skid resistance.

Raveling was not observed at any locations. Rutting and bleeding was observed at very few locations of the Project Highway.

5.5.7 Potholes and Patches (Flexible pavement)

Potholes are small (or big, based on severity) bowl-shaped depressions on the pavement surface. In general, potholes are formed in later stages of highly ravelled or cracked pavement surface resulting in bowl-shaped depressions. The patch is an area of the pavement which have been repaired or replaced by new material to remove a certain defect on the pavement. The patch is considered a defect no matter how well it is performing, and some roughness is associated with this type of distress.

Potholes were observed at very few locations and majority of the potholes were rectified with bituminous mix. Patchworks were observed at many locations of the Project Highway.

Figure 5.2: Flexible Pavement distress pictures

Based on the observations made during visual condition survey the pavement condition is categorized into three categories as 'Good', 'Fair' and 'Poor'. The visual survey data and summary of the pavement condition of Project Highway is given below. The pavement visual condition data is represented in Annexure.

Table 5-5: Pavement Visual Condition Survey Results-Main Carriageway

Condition	LHS		RHS	
	Length (Km)	Length (%)	Length (Km)	Length (%)
Good	41511	87%	46650	98%
Fair	6139	13%	1000	2%
Poor	0	0%	0	0%

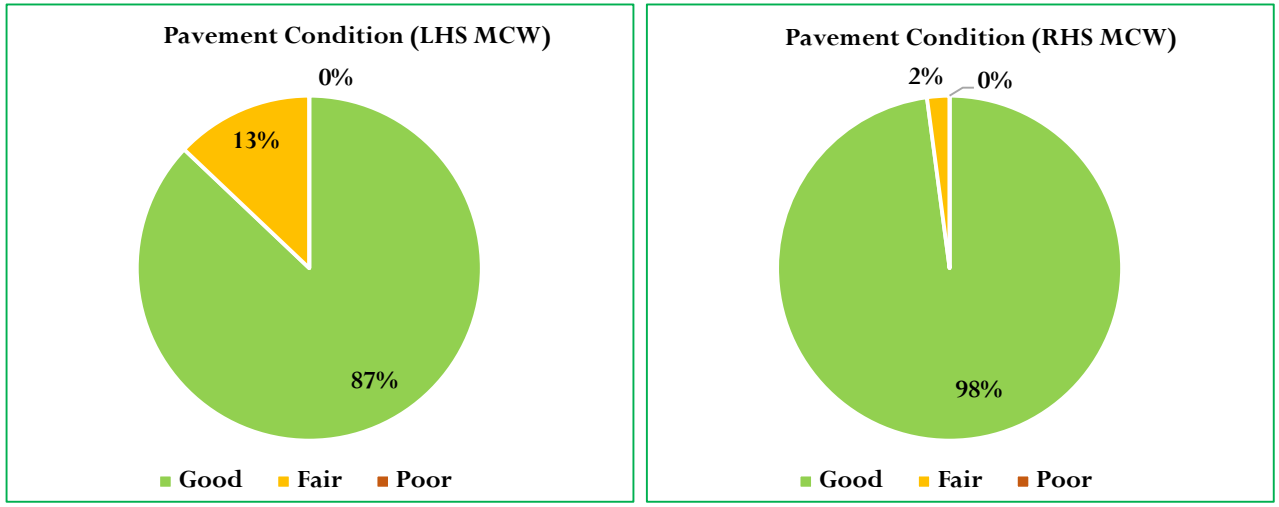


Figure 5.3: Pavement condition based on Visual condition survey-Main Carriageway

5.6 Pavement Roughness

Roughness is one of the important parameters for determining the functional characteristics of pavements. According to the American Society for Testing and Materials (ASTM), roughness is defined as "the deviations of a pavement surface from a true planar surface with characteristic dimensions that affect vehicle dynamics, ride quality, dynamic loads, and drainage, for example, longitudinal profile, transverse profile and cross-slope".

The roughness of road surfaces is measured using different equipment/techniques such as rod and level survey, dip stick profiler, profilographs, response type road roughness meters, and profiling devices.

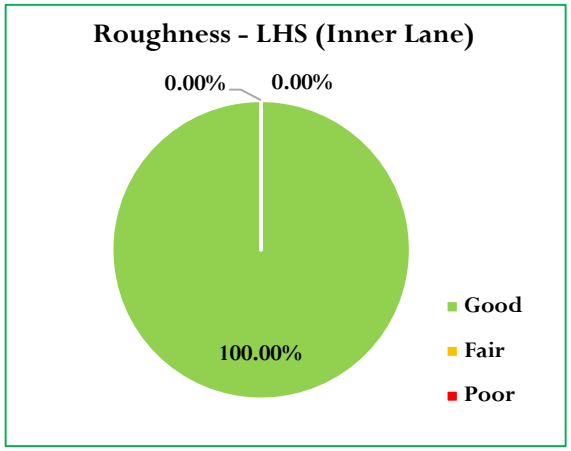
In India, the roughness is measured using the fifth wheel bump integrator (developed by CRRI) and is reported as Unevenness Index (UI) in mm/km. In this report, roughness data is extracted from the NSV report, which measured using a profilometer on February 1, 2024, is incorporated, and a summary of the results is presented below.

Table 5-6: Summary of the Roughness values using NSV

Surface Condition	Roughness Criteria as per IRC SP-16 2019		LHS MCW				RHS MCW			
	Bituminous Surface	Cemented Surface	Inner (m)	Inner (%)	Outer (m)	Outer (%)	Inner (m)	Inner (%)	Outer (m)	Outer (%)
Good	<1800	<2000	47310	100.00%	47310	100.00%	47310	100.00%	47310	100.00%
Fair	1800-2400	2000-2400	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Poor	>2400	>2400	0	0.00%	0	0.00%	0	0.00%	0	0.00%

From the MCW Roughness data, it can be observed that

- Around 100% of all lanes of the highway are in good condition in both directions.



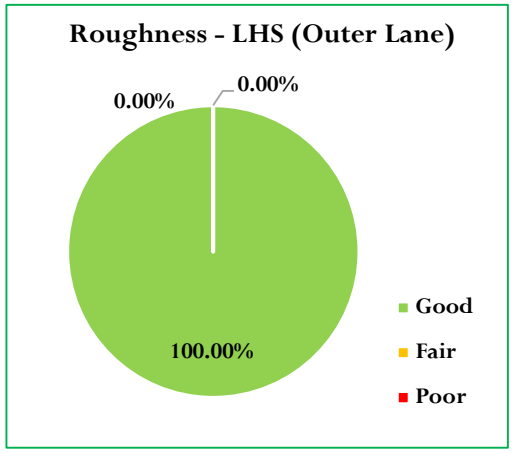
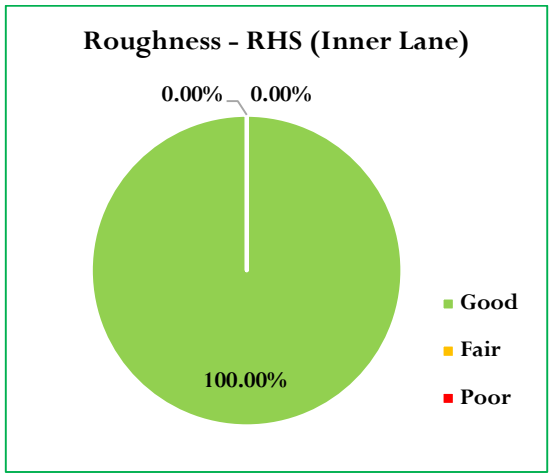


Figure 5.4: Pavement condition based on Roughness in LHS MCW



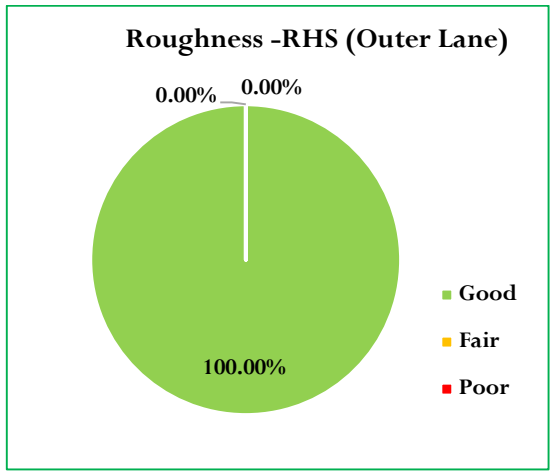


Figure 5.5: Pavement condition based on Roughness in RHS MCW

Pavement Rutting

Rutting is longitudinal depression or groove in the pavement along the wheel path. Rutting is categorized into three types and defined by the cause and layers in which rutting occurs. It can be characterized by two components of the original (initial) pavement profile change, which are direct consequences of permanent deformation such as uplift and downward deformation.

Rutting is measured for MCW by the NSV vehicle using a Profilometer on 01st Feb 2024, and data is summarized below:

Table 5-7: MCW Pavement Condition as per Rutting

Surface Condition	Rutting Criteria	LHS MCW				RHS MCW			
	Bituminous Surface	Inner (m)	Inner (%)	Outer (m)	Outer (%)	Inner (m)	Inner (%)	Outer (m)	Outer (%)
Good	0-4	25148	100.00%	25148	100.00%	Rutting not measured in Rigid pavement section			
Fair	4-10	0	0.00%	0	0.00%				
Poor	>10	0	0.00%	0	0.00%				

From the MCW Rutting data, it can be observed that

- Around 100% of all lanes of the highway are in good condition in LHS flexible pavement section.

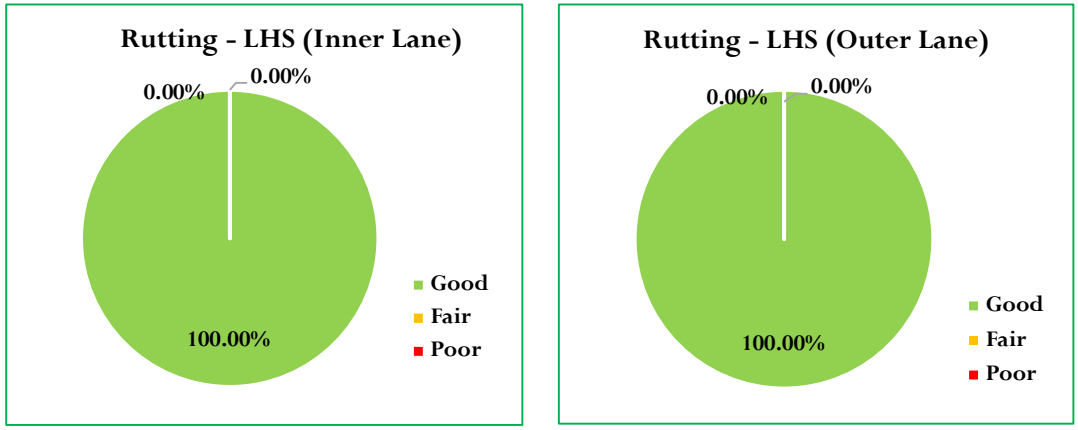


Figure 5.6: Pavement condition based on Rutting in LHS MCW

Chapter 6
ROAD SAFETY ARRANGMENTS

CHAPTER 6. ROAD SAFETY ASSESSMENT ALONG THE PROJECT STRETCH

Major Provision for Road safety

- Signboards, place identification sign boards, gantry boards have been provided throughout the project.
- Metal Beam Crash barriers has been provided at high embankment locations, approaches of major structures.
- Pedestrian Guard rails has been provided at Built-up locations
- Antiglare has been provided at the approaches of underpasses.
- Solar blinkers has been provided at the median opening locations.

Figure 6.1: General Photographs

General observation & Comments

- Unauthorized median opening found at Km 6+200, if it is to be kept as per site requirement, Solar blinker, median opening signboard and hazard marking signboard to be provided as it has become safety hazard.
- Hazard markers signboards to be installed at MBCB start location. Missing at some locations
- Hazard marker signboards to be installed at Bridges pedestrian railing.
- Hazard marker for extended portion of toll booth separator.
- Reflective stickers are recommended to be pasted on Pedestrian Guard rail.

- Height limit board to be placed @ Km 13 Railway line crossing
- Hazard marker to properly placed at Km 47+100 (hindrance at pavement)

It is recommended that above deficiencies should be rectified under routine maintenance work.

Figure 6.2: Site Observation Photographs

Chapter 7
OPERATION & MAINTENANCE COST

CHAPTER 7. OPERATION AND MAINTENANCE COST

7.1 General

This Chapter presents details on the O&M expenditure to be incurred. The expenses are divided into four heads.

- Routine Maintenance Expenses to maintain the asset to the standards set forth in the Concession Agreement.
- Major/ Periodic Maintenance Expenses
- Operating Expenses

7.2 Estimation of Operation & Maintainance cost

The Routine Maintenance activities related to pavement include pothole repair, crack sealing, shoulder repair, drain maintenance, renewal of road markings, maintenance of cross drainage works etc. A before-hand estimate of repairs to be carried annually, must be determined to calculate the anticipated routine maintenance cost of the Project. Most of the annual routine maintenance activities are estimated based on experience and the past data of the Project as these activities varies Project to Project and there are no hard and fast rules to obtain exact quantity.

Routine maintenance cost for this Project is summarized in next section of Cost Estimates. The list of items considered in routine maintenance are summarized in the table below,

Table 7-1: List of Items Considered in Routine Maintenance Cost Estimate

S. No	Description of Item
1	**HIGHWAY**
	Flexible Pavement
	▪ Potholes ▪ Cracks ▪ Rutting/Depression/Settlement ▪ Ravelling/Stripping ▪ Re-surfacing
	Rigid Pavement

S. No	Description of Item
	▪ Slab Replacement ▪ Crack Sealing ▪ Ravelling/honeycombing, scaling, Polished Surface
	Hard/Earth shoulders, side slopes
	▪ Edge drop at shoulders ▪ Blading/reshaping to restore proper slopes and sides so as to maintain the standard formation width ▪ Rain cuts/gullies in slope ▪ Repairs of Stone Pitching/Turfing
2	**STRUCTURES**
	Superstructure of Bridges
	▪ Cracks ▪ Temporary Measures ▪ Permanent Measures ▪ Spalling / Scaling
	Foundation of Bridges
	▪ Scouring and /or Cavitation
	Piers, abutments, return walls and wing walls of bridges
	▪ Cracks and damages including settlement and tilting
	Joints in bridges
	▪ Loosening and malfunctioning of joints
	Other items relating to bridges
	▪ Gathering of dirt in bearings and joints or clogging of spouts, weep holes and vent-holes ▪ Damage or deterioration in parapets and handrails ▪ Rain-cuts or erosion of banks of the side slopes of approaches ▪ Damage to wearing coat ▪ Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds ▪ Growth of vegetation affecting the structure or obstructing the waterway

S. No	Description of Item
3	**ROAD FURNITURES, SIGNAGES AND PAVEMENT MARKING**
	▪ Repair to road signs -damage to shape or position; Poor visibility or loss of retro-reflectivity ▪ Replacing/installing delineators ▪ Replacing uninstalling delineators & all type of road sign ▪ Repairs MBCB ▪ Replacing of MBCB /New jersey crash barrier ▪ Repairs to Handrails /Pedestrian guard rails /flyover railings etc. ▪ Replace Handrails /Pedestrian guardrails/flyover railings etc. ▪ Fixing of distance measurement stone ▪ Hectometre stones ▪ Kilometre stones ▪ 5th Kilometre stones ▪ Boundary stones ▪ Painting ▪ Hectometre stones ▪ Pavement Marking ▪ Hot applied thermoplastic compound ▪ Painting kerb with synthetic enamel paint
4	**MISCELLANEOUS ITEMS**
	Street Lighting, Electrical systems repair and maintenance etc

The routine maintenance expenses to maintain the asset to the standards set forth in the Concession Agreement are given in the table below.

Table 7-2: Routine maintenance cost of the Project for the Base Year FY 26

S. No.	Particulars	Frequency	Cost excluding GST (Cr.)	Remarks
1	**Routine Maintenance Cost**	**Annual**		
	Highway		0.87	
	Structures		0.86	
	Road Furniture, Signage & Pavement marking		0.48	
	Project Facilities		0.31	
	Total RM cost		**2.52**	

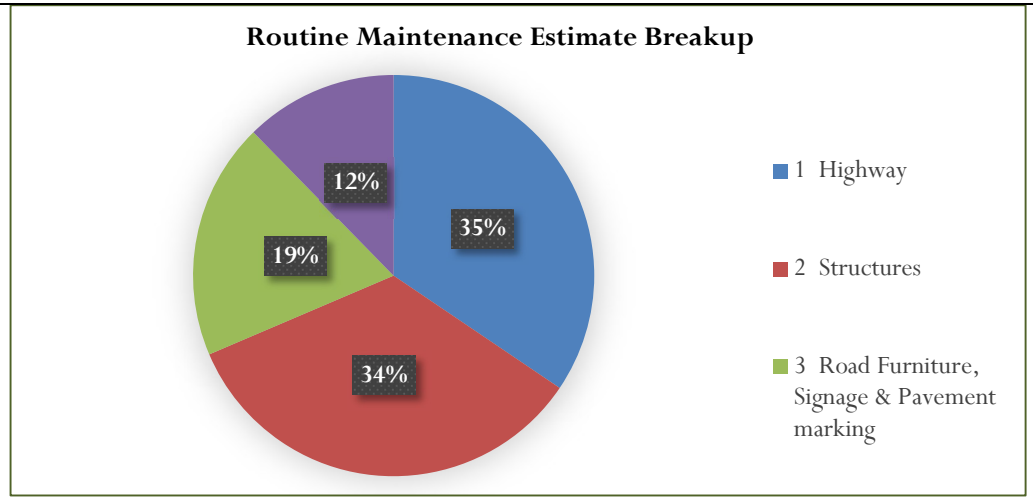


Figure 7.1: Breakup of Routine Maintenance

Table 7-3: Operational Expenditure of the Project for the Base Year FY 26

The calculation of operational expenditure for the base year FY 26 is given below:

S. no.	Description	Manpower	Annual Exp. (in Lakhs)
A.1	SPV staff and salaries	15	68.32
A.2	Tolling Operations Services_Outsourced	0	0.00
A.3	Security Services_Outsourced	4	16.20
A.4	Incident Management Services	24	91.76
A.5	RoW and Horticulture Works_ Manpower	0	94.84
A.6	Electricity and Diesel Charges	0	136.94
A.7	TMS/HTMS System Expenses	0	55.13
A.8	Office Operating Expenses	0	3.22
A.9	Vehicle Running Expenses	0	24.20
A.10	Professional Fee	0	12.14
A.11	Community Development	0	0.00
A.12	Communication Expenses	0	0.72

S. no.	Description	Manpower	Annual Exp. (in Lakhs)
A.13	Conveyance Expenses	0	2.40
A.14	Insurance Expenses	0	87.80
A.15	IE Fees	0	62.40
A.16	Contingency	5.00%	32.80
	Total		**688.86**

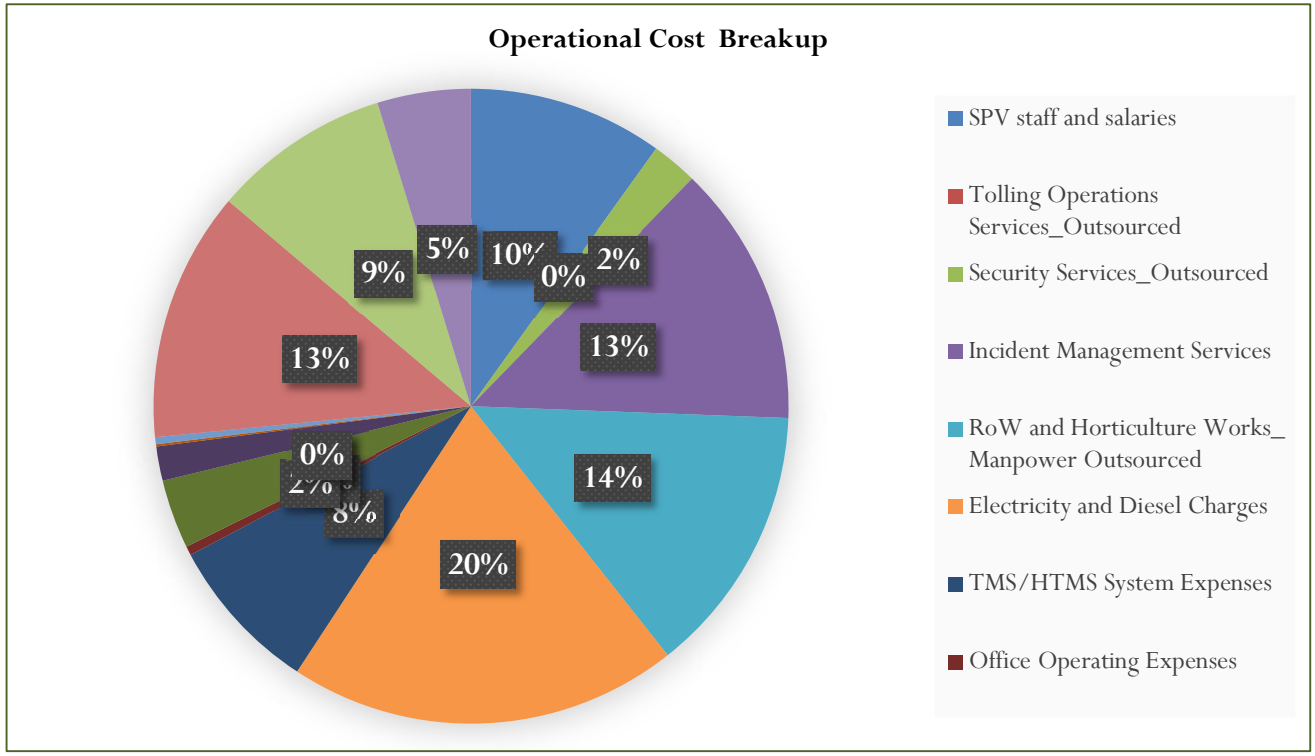


Figure 7.2: Breakup of Operation Cost

7.2.1 Major Maintenance Estimate

Cube Tech has considered 2 cycles for Major Maintenance. For main carriageway BC overlay of 40 mm is considered and for service road microsurfacing/overlay as per requirement is considered.

The estimate for Major Maintenance activities of the Project Stretch is as detailed below:

Table 7-4: Major Maintenance Cost for Base Year

Major Maintenance- Base Year					
S. No.	**Description**	**Unit**	**Qty**	**Rate**	**Amount**
1	Slab replacement cost (PQC)	Cum	8821.28	8269	7,29,43,158
2	Joint seal defects ,spalling and faulting of joints	Rm	10845.92	120	13,01,510
3	PQC Taxing	Sqm	417309.43	110	4,59,04,037
4	Road Marking Flexible	Sqm	22035.98	480	1,05,77,270
5	Road Marking Rigid	Sqm	25041.65	600	1,50,24,989
6	Kerb Painting	Sqm	36232.50	100	36,23,250
7	Tack coat	Sqm	326233.99	16	52,19,744
8	Bituminous Concrete	Cum	13049.36	13621	17,77,45,329
9	Microsurfacing	Sqm	88914.16	190	1,68,93,690
10	Earthen Shoulder	Cum	13996.40	380	53,18,632
11	Miscellaneous and Contingencies (5%)			1,77,27,580	1,77,27,580
			Grand Total		**37,22,79,189**
			Grand Total including GST (18%)		**43,92,89,443**
			Grand Total (In Cr)		**43.92**

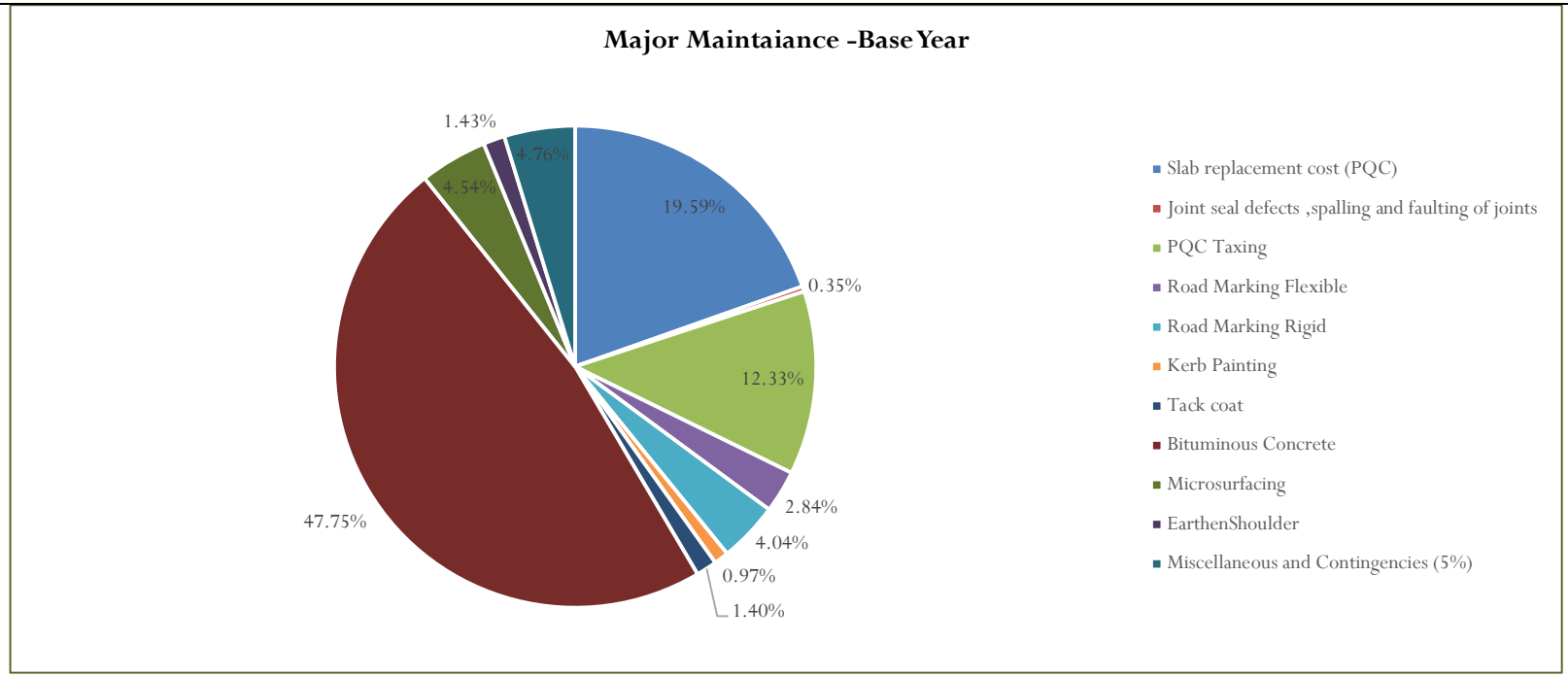


Figure 7.3: Breakup of Major Maintenance Expenses

7.2.2 Major Maintenance expenses during O&M period

As per the Cube Tech estimate, the total Major Maintenance expense including the escalation is Rs.131.84 cr.

7.2.3 Projections of O&M Expenses

The O&M expenses for the entire Concession Period is presented in this section .

The following escalations are considered:

Table 7-5:Escalation Factors

Items	Escalation
Operating Expenses	4.50%
Routine Maintenance	4.50%
Major Maintenance	4.50%

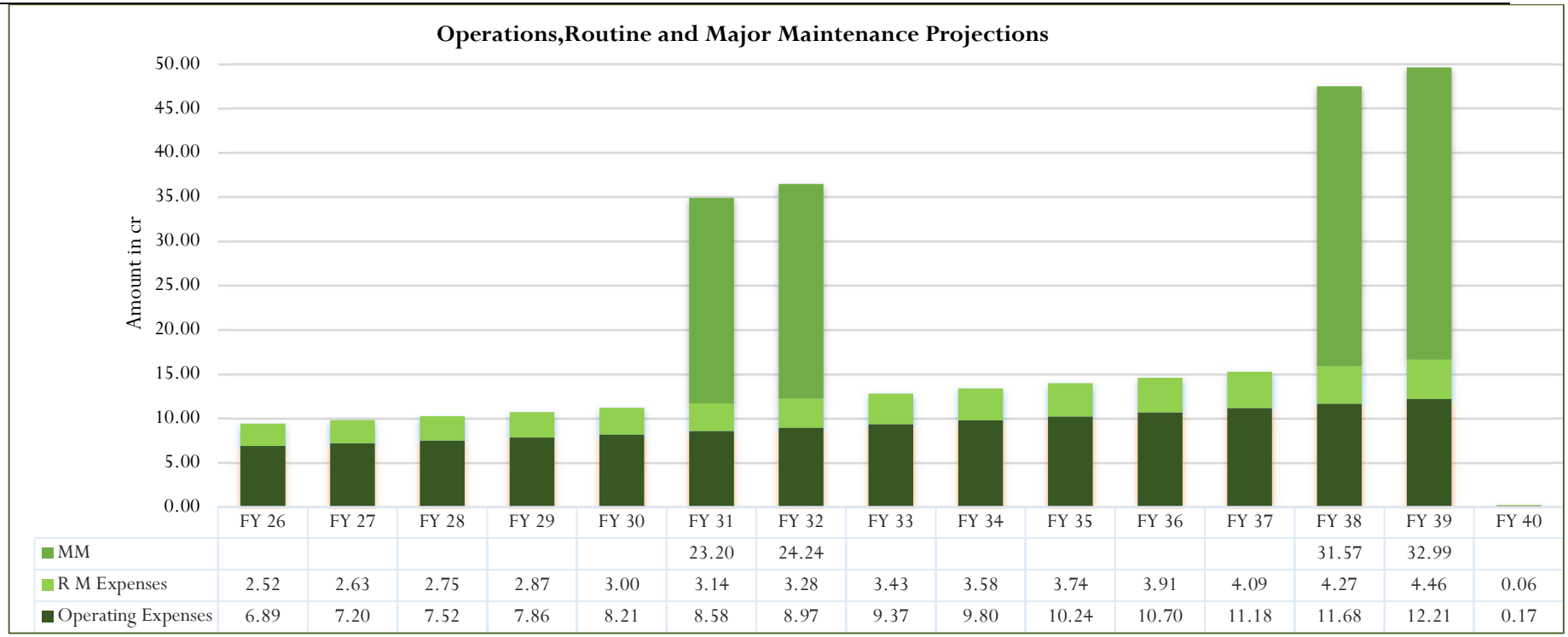
The Projections of total O& M expenses including Major Maintenance for 2 Cycles of the Project Company and CHT is given in the table below

Table 7-6: Projections of total O&M expenses of the Project during O&M period

Particulars	Total Expense (In Cr.)	Base-FY 26	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40
Operating Expenses (CHT)	130.58	6.89	6.89	7.20	7.52	7.86	8.21	8.58	8.97	9.37	9.80	10.24	10.70	11.18	11.68	12.21	0.17
R M Expenses (CHT)	47.73	2.52	2.52	2.63	2.75	2.87	3.00	3.14	3.28	3.43	3.58	3.74	3.91	4.09	4.27	4.46	0.06
MM (CHT)	112	37.23						23.20	24.24						31.57	32.99	
O&M and MM (CHT)	**290.31**		**9.41**	**9.83**	**10.27**	**10.74**	**11.22**	**34.92**	**36.49**	**12.80**	**13.38**	**13.98**	**14.61**	**15.27**	**47.52**	**49.66**	**0.24**

All amounts are in crores and excluding of GST.

The graph for the total cost Projections of expenses during O&M period given by the Cube Highways Technologies is shown in the figure below.



	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
MM						23.20	24.24						31.57	32.99	
R M Expenses	2.52	2.63	2.75	2.87	3.00	3.14	3.28	3.43	3.58	3.74	3.91	4.09	4.27	4.46	0.06
Operating Expenses	6.89	7.20	7.52	7.86	8.21	8.58	8.97	9.37	9.80	10.24	10.70	11.18	11.68	12.21	0.17

Figure 7.4: O&M, RM and MM Expenses Projections

The total O&M cost including Major Maintenance estimated by the CHT is Rs.290.31 Cr exclusive of GST.

7.3 Capital Expenditures

S.no	Description	Amount (in Crs) (Excluding GST)	Remarks
1	Structure repair & rehabilitation Work	1.69	
2	Slope Rehabilitation	0.50	
3	Flexible Pavement Repair work	3.06	
Total		**5.25**	

Capital Expenditure include following works:

- Repair of structure work needed.
- Rehabilitation of the side slope work & raincuts with proper methodologies.
- Repair and rehabiltation of the flexible pavemnet portion where quaility has been detoriated.

ANNEXURES

Annexure I Submission of request for completion certificate

GGBHPL

GR GALGALIA BAHADURGANJ HIGHWAY PRIVATE LIMITED

Ref. No: GBAHPL/GA-BA/2024/1701 **Date: 06.01.2025**

To,

The Independent Engineer,
M/s Chaitanya Projects Consultancy Pvt. Ltd
C/o Mr. Govind Agrawal
Ward No.1, Near SSB Camp,
Thakurganj, Bihar-855116
Email:cpcpl.galgaliabihar@gmail.com

Sub Four laning of Galgalia-Bahadurganj Section of NH-327E from Km. 00.000 to Km.49.000 (Package-I) on Hybrid Annuity Mode in the State of Bihar – **Submission of Test Reports as per Article 14 & Schedule-I of the Concession Agreement (CA) and request for issuance of Completion Certificate under Clause 14.2 of the CA-reg.**

Ref. Concessionaire's letter no:GGBHPL/GA-BA/2024/1639 dated 18.11.2024

Dear Sir,

The Concessionaire, vide letter dated 18.11.2024 and the protracted correspondences made with it, had notified the Independent Engineer regarding the likely completion of balance activities by 31.12.2024 and its intent to subject the Project to Tests where receipt of "encumbrance free land/decision to resume works" was delayed by the Authority. Details of completed balance activities in encumbrance free land are as mentioned below:

Sl. no	Description	Chainage		Length (mtr)	Side	Status
		From	To			
1	Balance work of Rest Area	18+400				Completed
2	Main Carriage way, Service Road, RE Wall, Drain Work and miscellaneous activities	33+370	33+650	280	RHS	Completed
3	Main Carriageway at Existing Toll Plaza	39+260	39+600	340	RHS	Completed
4	Paved and Earthen Shoulder	47+140	47+160	20	RHS	Shall be completed in reasonable time as determined by IE after receipt of encumbrance free land from Authority

REGISTERED OFFICE : GR House, Hiran Magri, Sector-11, Udaipur- 313 001 (Rajasthan)
Ph.:+91-294-2487370, 2483033, Email : spv@grinfra.com, Website : www.grinfra.com
CIN : U45500RJ2021PTC073975

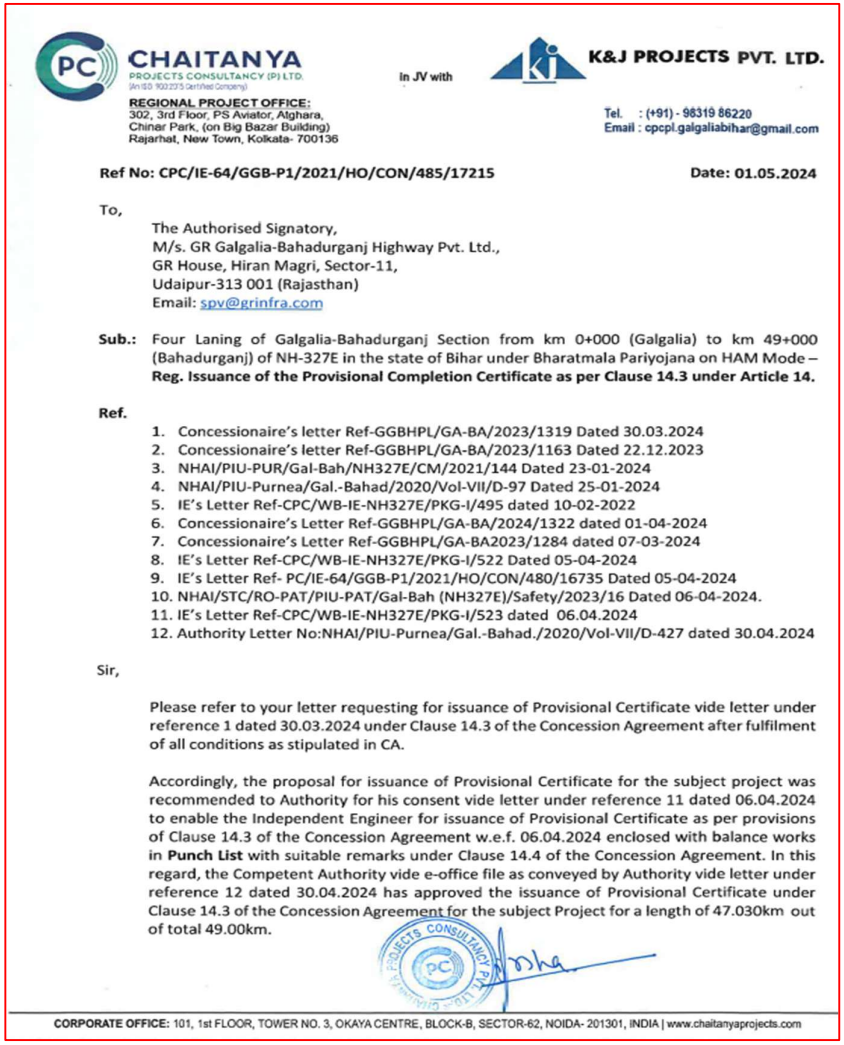
2. The Concessionaire provided assistance to the Independent Engineer for conducting the Tests on the mutually agreed dates, accordingly, all Tests have been conducted and completed in accordance with Schedule-I at the cost and expense of the Concessionaire under the monitoring and observation of the Independent Engineer & Authority's representative. The results of the Tests have been found satisfactory and in compliance of the Project Specifications and Standards. The copies of all Test data including detailed Test results as tabulated below are submitted for your ready reference.

3. Please note that Concessionaire has already completed the balance work within the stipulated time frame as the encumbrance free land was made available. Further, balance work in 20mtr (RHS) land from Km.47+140 to Km.47+160 was expected to be completed after handing over encumbrance free land with the help of administration. However, since the said piece of encumbrance free land has not been handed over yet to the Concessionaire, the balance work shall be completed in reasonable time as determined by IE.

Ref. Clause	Test	Agency	Remarks
2.2 of Schedule- I	Visual and Physical test	Concessionaire and IE's representative	Enclosed as Annexure-I
2.3 of Schedule- I	Test Drive	Concessionaire and IE's representative	Enclosed as Annexure-II
2.4 of Schedule- I	Riding Quality Test (by bump integrator)	Aadharshila Infratech Pvt. Ltd	Enclosed as Annexure-III
2.5 of Schedule- I	Pavement Composition Test	Concessionaire and IE's representative	Enclosed as Annexure-IV
2.6 of Schedule- I	Cross-section Test	Concessionaire and IE's representative	Enclosed as Annexure-V
2.7 of Schedule- I	Structural test for Bridges-NDT and Load Test on Bridge	Aadharshila Infratech Pvt. Ltd	Not required as conducted earlier
2.8 of Schedule- I	Other Tests		
	a. Network Survey Vehicle (NSV) Test Report	Aadharshila Infratech Pvt. Ltd	Enclosed as Annexure-VI
	b. Retro Reflectivity Test of road markings and road sign	Aadharshila Infratech Pvt. Ltd	Enclosed as Annexure-VII
	c. Illumination Test for Highway Lighting	Aadharshila Infratech Pvt. Ltd	Enclosed as Annexure-VIII
2.9 of Schedule- I	Environment Audit	NAKSHATRA ENVIRO SERVICES	Not required as conducted earlier
2.10 of Schedule- I	Safety Review	SHWETA TECHNOPHILE CONSULTANTS PRIVATE LIMITED	Not required as conducted earlier

4. In view of the above, since Tests are successful and works forming part of the Project have been completed in the available land, the Project can be safely and reliably placed in commercial operation, it is requested to issue the Completion Certificate for the Project, as per provisions of Clause 14.2 of Concession Agreement in the form set forth in Schedule-J of the Concession Agreement.

Annexure II Issuance of Provisional certificate-I



CHAITANYA PROJECTS CONSULTANCY (P) LTD.
(An ISO 9001:2015 Certified Company)

In JV with K&J PROJECTS PVT. LTD.

REGIONAL PROJECT OFFICE:
302, 3rd Floor, PS Aviator, Alghara,
Chinar Park, (on Big Bazar Building)
Rajarhat, New Town, Kolkata- 700136

Tel. : (+91) - 98319 86220
Email : cpcpl.galgaliabihar@gmail.com

Ref No: CPC/IE-64/GGB-P1/2021/HO/CON/485/17215 **Date: 01.05.2024**

To,

The Authorised Signatory,
M/s. GR Galgalia-Bahadurganj Highway Pvt. Ltd.,
GR House, Hiran Magri, Sector-11,
Udaipur-313 001 (Rajasthan)
Email: spv@grinfra.com

Sub.: Four Laning of Galgalia-Bahadurganj Section from km 0+000 (Galgalia) to km 49+000 (Bahadurganj) of NH-327E in the state of Bihar under Bharatmala Pariyojana on HAM Mode – **Reg. Issuance of the Provisional Completion Certificate as per Clause 14.3 under Article 14.**

Ref.

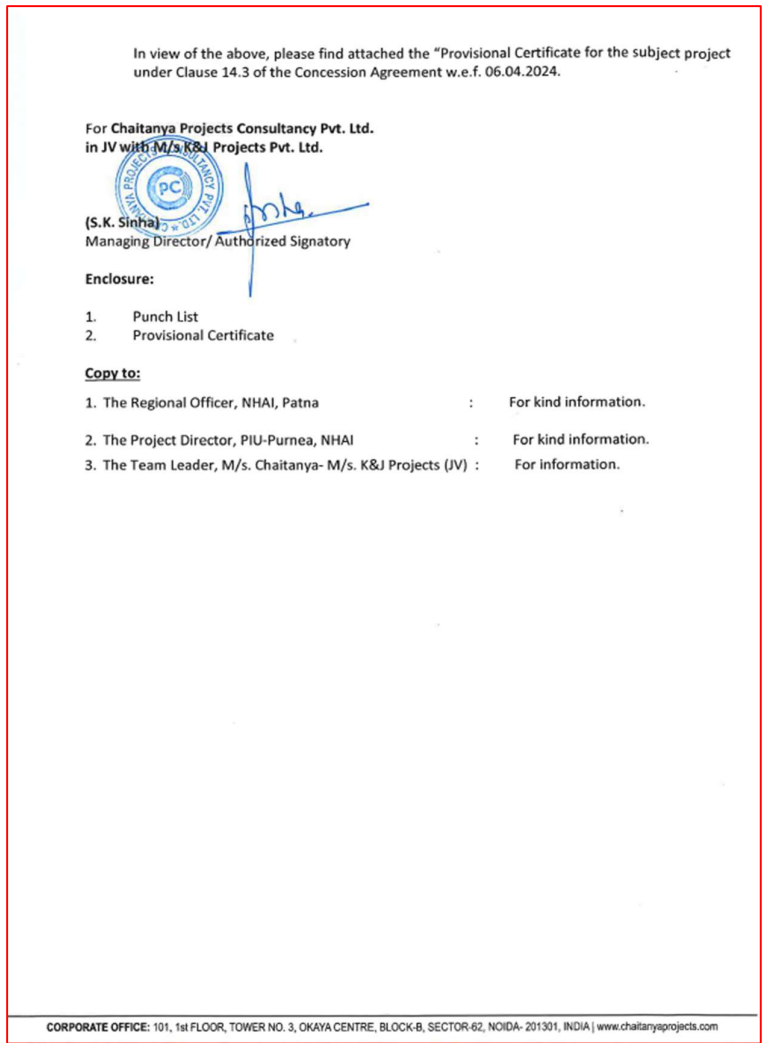
1. Concessionaire's letter Ref-GGBHPL/GA-BA/2023/1319 Dated 30.03.2024
2. Concessionaire's letter Ref-GGBHPL/GA-BA/2023/1163 Dated 22.12.2023
3. NHAI/PIU-PUR/Gal-Bah/NH327E/CM/2021/144 Dated 23-01-2024
4. NHAI/PIU-Purnea/Gal.-Bahad/2020/Vol-VII/D-97 Dated 25-01-2024
5. IE's Letter Ref-CPC/WB-IE-NH327E/PKG-I/495 dated 10-02-2022
6. Concessionaire's Letter Ref-GGBHPL/GA-BA/2024/1322 dated 01-04-2024
7. Concessionaire's Letter Ref-GGBHPL/GA-BA2023/1284 dated 07-03-2024
8. IE's Letter Ref-CPC/WB-IE-NH327E/PKG-I/522 Dated 05-04-2024
9. IE's Letter Ref- PC/IE-64/GGB-P1/2021/HO/CON/480/16735 Dated 05-04-2024
10. NHAI/STC/RO-PAT/PIU-PAT/Gal-Bah (NH327E)/Safety/2023/16 Dated 06-04-2024.
11. IE's Letter Ref-CPC/WB-IE-NH327E/PKG-I/523 dated 06.04.2024
12. Authority Letter No:NHAI/PIU-Purnea/Gal.-Bahad./2020/Vol-VII/D-427 dated 30.04.2024

Sir,

Please refer to your letter requesting for issuance of Provisional Certificate vide letter under reference 1 dated 30.03.2024 under Clause 14.3 of the Concession Agreement after fulfilment of all conditions as stipulated in CA.

Accordingly, the proposal for issuance of Provisional Certificate for the subject project was recommended to Authority for his consent vide letter under reference 11 dated 06.04.2024 to enable the Independent Engineer for issuance of Provisional Certificate as per provisions of Clause 14.3 of the Concession Agreement w.e.f. 06.04.2024 enclosed with balance works in **Punch List** with suitable remarks under Clause 14.4 of the Concession Agreement. In this regard, the Competent Authority vide e-office file as conveyed by Authority vide letter under reference 12 dated 30.04.2024 has approved the issuance of Provisional Certificate under Clause 14.3 of the Concession Agreement for the subject Project for a length of 47.030km out of total 49.00km.

CORPORATE OFFICE: 101, 1st FLOOR, TOWER NO. 3, OKAYA CENTRE, BLOCK-B, SECTOR-62, NOIDA- 201301, INDIA | www.chaitanyaprojects.com



In view of the above, please find attached the "Provisional Certificate for the subject project under Clause 14.3 of the Concession Agreement w.e.f. 06.04.2024.

For **Chaitanya Projects Consultancy Pvt. Ltd.**
in JV with M/s K&J Projects Pvt. Ltd.

(S.K. Sinha)
Managing Director/ Authorized Signatory

Enclosure:

1. Punch List
2. Provisional Certificate

Copy to:

1. The Regional Officer, NHAI, Patna : For kind information.
2. The Project Director, PIU-Purnea, NHAI : For kind information.
3. The Team Leader, M/s. Chaitanya- M/s. K&J Projects (JV) : For information.

CORPORATE OFFICE: 101, 1st FLOOR, TOWER NO. 3, OKAYA CENTRE, BLOCK-B, SECTOR-62, NOIDA- 201301, INDIA | www.chaitanyaprojects.com

SCHEDULE - J
(See Clause 14.3)

PROVISIONAL CERTIFICATE

1. I, S.K. Sinha, M/s Chaitanya Projects Consultancy Pvt. Ltd in JV with K & J Projects Pvt. Ltd. acting as Independent Engineer, under and in accordance with the Concession Agreement dated 17th April 2021, for development and operation of the Construction of **Four-Laning of Galgalia -Bahadurganj section of NH-327E from Km 0 + 000 to Km 49 + 000 (Package-I) in the State of Bihar** Project (the "Project") on design, build, operate and transfer (the "DBOT Annuity or Hybrid Annuity") basis, through M/s Galgalia-Bahadurganj Highway Private Limited, hereby certify that the Tests specified in Article 14 and Schedule-I of the Agreement have been undertaken for the Project/sections from Km. 0+000 to Km. 9+500, Km. 10+850 to Km. 33+370, Km. 33+650 to Km. 39+260 and Km. 39+600 to Km. 49+000 [Total 47.030 Km.] of the Project to determine compliance thereof with the provisions of the Agreement.

2. Construction Works forming part of the Project/section of the Project that were found to be incomplete and/or deficient have been specified in the Punch List appended hereto, and the Concessionaire has agreed and accepted that it shall complete and/or rectify all such works in the time and manner set forth in the Agreement. Some of the incomplete works have been delayed as a result of reasons attributable to the Authority or due to Force Majeure and the Provisional Certificate cannot be withheld on this account. Though the remaining incomplete works have been delayed as a result of reasons attributable to the Concessionaire, I am satisfied that having regard to the nature and extent of such incomplete works, it would not be prudent to withhold commercial operation of the Project/sections from Km. 33+370 to Km. 33+650 and Km. 39+260 to Km. 39+600 [Total 0.620 Km] of the Project, pending completion thereof.

3. In view of the foregoing, I am satisfied that the Project/section of the Project can be safely and reliably placed in commercial service of the Users thereof, and in terms of the Agreement, the Project/sections from Km. 0+000 to Km. 33+370 Km. 33+650 to Km. 39+260 and Km. 39+600 to Km. 49+000 [Total 47.030 Km. Excluding 1.35 Km constructed by other Agency] of the Project is hereby provisionally declared fit for entry into commercial operation on this the 6th day of April 2024.

ACCEPTED, SIGNED, SEALED DELIVERED
For and on behalf of
CONCESSIONAIRE by:

GR Galgalia Bahadurganj Highway Private Limited

(Sunil Agarwal)
Authorized Signatory
GR Galgalia Bahadurganj
Highway Private Limited

SIGNED, SEALED AND DELIVERED
For and on behalf of
INDEPENDENT ENGINEER by:

CHAITANYA PROJECTS CONSULTANCY PVT. LTD. PC

S.K.Sinha
Managing Director/Authorized Signatory

Annexure III Submission for Provisional certificate-2 (Balance work)

GGBHPL

GR GALGALIA BAHADURGANJ HIGHWAY PRIVATE LIMITED

Ref. No. GGBHPL/GA-BA/2024/1639

Date: 18.11.2024

To,
M/s Chaitanya Projects Consultancy Pvt. Ltd.
C/o Mr. Govind Agrawal
Ward No. 1, Near SSB Camp
Thakurganj, Bihar-855116
Email: cpcpl.galgaliabihar@gmail.com

Sub Four laning of Galgalia-Bahadurganj Section of NH-327E from Km. 00.000 to Km.49.000 (Package-I) on Hybrid Annuity Mode in the State of Bihar – **Notification for Tests on balance works as per Clause 14.1.1 of Concession Agreement (CA) for issuance of Completion Certificate under Clause 14.2 of the CA-reg.**

Ref.

1. Concessionaire's letter no. GGBHPL/GA-BA/2023/599 dated 04.02.2023
2. Concessionaire's letter no. GGBHPL/GA-BA/2023/1093 dated 08.11.2023
3. Concessionaire's letter no. GGBHPL/GA-BA/2023/1163 dated 22.12.2023
4. Concessionaire's letter no. GGBHPL/GA-BA/2023/1319 dated 30.03.2024
5. IE's letter no. CPC/WB/IE-NH 327E/PKG-1/523 dated 06.04.2024
6. Authority's letter no. NHAI/PIU-Purnea/Gal.-Bahad./2020/Vol-VII/D-427 dated 30.04.2023
7. IE's letter no. CPC/IE-64/GGB-P1/2021/HO/CON/485/17215 dated 01.05.2024
8. Concessionaire's letter no. GGBHPL/GA-BA/2024/1445 dated 03.07.2024
9. IE's letter no. CPC/WB-IE-NH327E/Pkg-1/552 dated 26.07.2024

Dear Sir,

This has reference to the subject matter and letters cited above.

The Concessionaire, vide letter no. 1163 dt 22.12.23, intimated your good office that construction of Main Carriageway for 47.030 km length available to the Contractor out of total length 49.00 km is nearing completion and requested for subjecting the completed works to various tests as per Schedule-I of the Concession Agreement. Accordingly, tests and safety & environmental audits were successfully conducted at site and reports were submitted vide letter no. 1319 dated 30.03.2024.

The Concessionaire further requested to recommend for issuance of Provisional Certificate for length of 47.030 km out of total project length of 49.00 km to the Authority. The Provisional Certificate was issued on 01.05.2024 vide letter no. 17215 w.e.f 06.04.2024 upon receipt of approval by the Authority vide letter cited at Ref (6). Few minor outstanding works were included in Punch list with a timeline of 90 days to complete such works. Also, the works where receipt of hindrance free land could not be made available by the Authority were included in Punch list on the condition that reasonable time shall be provided for completion of such activities and any damages would not be levied by the Authority for these works.

The Concessionaire, upon completion of minor outstanding works specified in Punch list within stipulated period of 90 days, submitted the compliance report vide letter no. 1445

REGISTERED OFFICE : GR House, Hiran Magri, Sector-11, Udaipur- 313 001 (Rajasthan)
Ph.: +91-294-2487370, 2483033, Email : spv@grinfra.com, Website : www.grinfra.com
CIN : U45500RJ2021PTC073975

dated 03.07.2024 and notified the status of works where encumbrance free land could not be made available by Authority.

Now, the balance activities where receipt of **"encumbrance free land / decision to resume works"** was delayed are in advance stage of completion and are expected to get completed by 31.12.2024. The status of these activities is enclosed as Annexure – **I**.

Further, as mentioned in Concessionaire's letter cited at Ref (8), the decision to resume construction of Rest Area at Ch. 18+400 was accorded by the Authority on 16.04.2024. Subsequently, the Concessionaire resumed the construction of Rest Area work at Ch. 18+400 and is likely to get completed by 31.12.2024.

It is pertinent to mention that the land for construction of "Paved and Earthen Shoulder" from Ch. 47+140 to Ch. 47+160 (20m) is yet to be made available to the Concessionaire. Please be noted that except 20mtr length as stated above for the reasons not attributable to the Concessionaire, all works under the scope of the Concessionaire have been completed and balance works in available land will be completed up to 31.12.2024. The Concessionaire undertakes to complete this work when the land is made available by the Authority during Maintenance period on the condition that no damages shall be levied by the Authority for these works and reasonable time shall be provided to the Concessionaire for completion of these works.

In view of above, the Concessionaire hereby submit the proposed date of the tests to be conducted as applicable in accordance with Schedule – I of the Concession Agreement to the balance works as mentioned in Punch List completed after issuance of Provisional Completion Certificate.

Ref. Clause	Test	Agency	Proposed Start Date
2.2 of Schedule- I	Visual and Physical test	Concessionaire and IE's representative	20.11.2024
2.3 of Schedule- I	Test Drive	Concessionaire and IE's representative	22.11.2024
2.4 of Schedule- I	Riding Quality Test (by bump integrator)	Aadharshila Infratech Pvt. Ltd	22.11.2024
2.5 of Schedule- I	Pavement Composition Test	Concessionaire and IE's representative	21.11.2024
2.6 of Schedule- I	Cross-section Test	Concessionaire and IE's representative	21.11.2024
2.8 of Schedule- I	Other Tests		
	a. Network Survey Vehicle (NSV) Test Report	Aadharshila Infratech Pvt. Ltd	28.11.2024
	b. Retro Reflectivity Test of road markings and road sign	Aadharshila Infratech Pvt. Ltd	26.11.2024
	c. Illumination Test for Highway Lighting	Aadharshila Infratech Pvt. Ltd	26.11.2024

It is requested to intimate the Authority to designate its representative for witnessing the Tests.

This is for your kind information and desired action at earliest.

Thanking you

Yours Faithfully,
For **GR Galgalia Bahadurganj Highway Private Limited.**

(Sanjeev Kumar Singh)
Authorized Signatory
Encl: Annexure - I

Copy to:
1. **The Regional Officer**, NHAI, Regional Office-Patna, Shivmitra Apartment, 1st Floor, Vivekanand Marg, Boring Road, Patna-800013
2. **The Project Director**, PIU – Purnea, NHAI, House of Sikandar Singh, Sahibaan Hata, Near Mahadeva Colony, Purnea – 854301

ARGA Package - 1

Annexure - I

Status of works where receipt of encumbrance free land was delayed

Sl. No.	Description	Chainage From	Chainage To	Length	Side	Status
1	Balance work of Rest Area	18+400		-	-	Will be completed by 31.12.2024
2	Main Carriage way, Service Road, RE Wall, Drain work and miscelleneous activities.	33+370	33+650	280	RHS	Completed
3	Main Carriage way at Existing Toll Plaza	39+260	39+600	340	RHS	Completed
4	Paved and Earthen Shoulder is Balance	47+140	47+160	20	RHS	Shall be completed in reasonable time as determined by IE after receipt of encumbrance free land from Authority.

Annexure IV: Pavement Visual Condition Survey data for MCW

Chainage		LHS			Chainage		RHS		
From	To	Type of pavement	Condition	Remarks	From	To	Type of pavement	Condition	Remarks
0+000	0+441	Flexible	Good	No distresses	0+000	1+000	Rigid	Good	No distresses
0+441	1+000	Rigid	Good	No distresses	1+000	2+000	Rigid	Good	No distresses
1+000	1+840	Rigid	Good	No distresses	2+000	3+000	Rigid	Good	No distresses
1+840	3+000	Flexible	Fair	30m Shoving, 30m ravelling and patchworks	3+000	4+000	Rigid	Good	few shrinkage cracks
3+000	4+000	Flexible	Good	10m shoving, 20m rutting and 30m patchworks	4+000	5+000	Rigid	Good	No distresses
4+000	5+000	Flexible	Fair	500m undulations	5+000	6+000	Rigid	Good	No distresses
5+000	6+000	Flexible	Good	10m patch	6+000	7+000	Rigid	Good	No distresses
6+000	7+000	Flexible	Good	70m patchworks	7+000	8+000	Rigid	Good	No distresses
7+000	8+000	Flexible	Fair	200m Rutting	8+000	9+000	Rigid	Good	No distresses
8+000	9+000	Flexible	Good	10m patch	9+000	9+500	Rigid	Good	No distresses
9+000	9+500	Flexible	Good	20m patch	9+500	10+850			out of scope
9+500	10+850			out of scope	10+850	12+000	Rigid	Good	No distresses
10+850	11+550	Rigid	Good	No distresses	12+000	13+000	Rigid	Good	No distresses
11+550	12+274	Flexible	Good	30m patch and 2 potholes	13+000	14+000	Rigid	Good	No distresses
12+274	13+000	Rigid	Good	No distresses	14+000	15+000	Rigid	Good	No distresses
13+000	14+000	Rigid	Good	No distresses	15+000	16+000	Rigid	Good	No distresses
14+000	15+300	Rigid	Good	100m panels damaged and bitumen mix/sealant applied	16+000	17+000	Rigid	Good	No distresses
15+300	16+000	Flexible	Good	No distresses	17+000	18+000	Rigid	Good	No distresses
16+000	17+000	Flexible	Good	No distresses	18+000	19+000	Rigid	Good	No distresses
17+000	18+000	Flexible	Good	100m patchworks	19+000	20+000	Rigid	Good	No distresses
18+000	18+600	Flexible	Good	one transverse crack	20+000	21+000	Rigid	Good	1 longitudinal crack

Chainage		LHS			Chainage		RHS		
From	To	Type of pavement	Condition	Remarks	From	To	Type of pavement	Condition	Remarks
18+600	19+895	Rigid	Good	No distresses	21+000	22+000	Rigid	Good	No distresses
19+895	20+465	Flexible	Fair	450m low severity rutting	22+000	23+000	Rigid	Good	No distresses
20+465	21+085	Rigid	Good	No distresses	23+000	24+000	Rigid	Fair	300m panels longitudinal cracks sealed
21+085	21+491	Flexible	Good	No distresses	24+000	25+000	Rigid	Good	100m panels longitudinal cracks sealed
21+491	22+031	Rigid	Good	No distresses	25+000	26+000	Rigid	Good	one patch sealed with bituminous mix
22+031	23+085	Flexible	Good	No distresses	26+000	27+000	Rigid	Good	few cracks sealed with bitumen/epoxy
23+085	24+200	Rigid	Good	50m longitudinal cracks & corner break and joint spalling sealed with bitumen	27+000	28+000	Rigid	Good	few cracks sealed with bitumen/epoxy
24+200	24+700	Flexible	Good	No distresses	28+000	29+000	Rigid	Good	few cracks sealed with bitumen/epoxy
24+700	25+300	Rigid	Good	1 corner break	29+000	30+000	Rigid	Good	1 corner break, few cracks and joint spalling sealed with bitumen/mix
25+300	26+800	Flexible	Good	3 pothole patches and 50m structure portion damaged	30+000	31+000	Rigid	Good	1 corner break, and few cracks sealed with bitumen
26+800	27+768	Rigid	Good	No distresses	31+000	32+000	Rigid	Good	1 corner break, popouts and cracks sealed with bitumen
27+768	28+200	Flexible	Good	60m patchworks	32+000	33+000	Rigid	Good	No distresses
28+200	29+048	Rigid	Good	1 transverse crack, 2 corner break, approach slab minor settlement	33+000	34+000	Rigid	Good	100m ravelling
29+048	29+600	Flexible	Good	5 pothole patches	34+000	35+000	Rigid	Good	No distresses
29+600	30+955	Rigid	Good	50m ravelling	35+000	36+000	Rigid	Good	No distresses
30+955	32+100	Flexible	Good	50m patchworks	36+000	37+000	Rigid	Good	No distresses
32+100	33+000	Rigid	Good	No distresses	37+000	38+000	Rigid	Good	approach slab minor settlement
33+000	34+607	Rigid	Good	30m low severity ravelling	38+000	39+000	Rigid	Good	No distresses
34+607	35+291	Flexible	Good	10m patch, approach slab minor settlement	39+000	40+000	Rigid	Good	50m ravelling
35+291	36+700	Rigid	Fair	36+200 structure portion damaged	40+000	41+000	Rigid	Good	No distresses
36+700	37+176	Flexible	Good	No distresses	41+000	42+000	Rigid	Good	No distresses

Chainage		LHS			Chainage		RHS		
From	To	Type of pavement	Condition	Remarks	From	To	Type of pavement	Condition	Remarks
37+176	38+680	Rigid	Good	No distresses	42+000	43+000	Rigid	Good	No distresses
38+680	39+700	Flexible	Good	100m low severity rutting	43+000	44+000	Rigid	Good	No distresses
39+700	41+000	Rigid	Good	No distresses	44+000	45+000	Rigid	Good	No distresses
41+000	41+434	Rigid	Good	No distresses	45+000	46+000	Rigid	Good	No distresses
41+434	42+000	Flexible	Good	No distresses	46+000	47+000	Rigid	Good	No distresses
42+000	43+028	Flexible	Good	10m patch	47+000	48+000	Rigid	Good	No distresses
43+028	44+660	Rigid	Good	No distresses	48+000	49+000	Rigid	Good	No distresses
44+660	45+000	Flexible	Good	200m low severity rutting					
45+000	46+000	Flexible	Good	100m low severity rutting and 50m patchworks					
46+000	47+000	Flexible	Fair	400m patchworks (30 No's)					
47+000	48+000	Flexible	Good	30m low severity rutting					
48+000	49+000	Rigid	Good	No distresses					

Technical Due Diligence of Four laning of NH-327E from Bahadurganj (Design km 49.000) to Araria (Design km 93.983) (Design Length = 44.983 km) Package-II in the State of Bihar under Bharatmala Pariyojana on Hybrid Annuity Mode.

Technical Due Diligence Report (Private and Confidential)

December 2025

Submitted to:

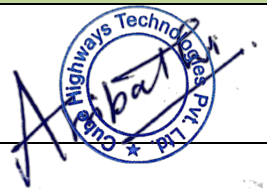
GR Bahadurganj Araria Highway Private Limited

Cube Highways Technologies Private Limited

CUBETECH
Cube Highways Technologies Pvt. Ltd.

Technical Due Diligence of Four laning of NH-327E from Bahadurganj (Design km 49.000) to Araria (Design km 93.983) (Design Length = 44.983 km) Package-II in the State of Bihar under Bharatmala Pariyojana on Hybrid Annuity Mode.

Documents Submittal and Contents Amendment Record

S. No.	Revision	Description	Date	Sign
1	R1	Technical Due Diligence Report	December 2025	

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ABBREVIATIONS

Abbreviation	Description
ASTM	American Society for testing and Materials
AVC	Automatic Vehicle Classifier
BBD	Benkelman Beam Deflection
BC	Bituminous Concrete
BOT	Built, Operate and Transfer
CA	Concession Agreement
CC Drain	Cement Concrete Drains
COD	Commercial Operation Date
CRRI	Central Road Research Institute
CBR	California Bearing Ratio test
DBFOT	Design, Build, Finance, Operate and Transfer
ETC	Electronic Toll Collection
FWD	Falling Weight Deflectometer
GOI	Government of India
GBAHPL	GR Bahadurganj Araria Highway Private Limited
HPC	Hume Pipe Culvert
IE	Independent Engineer
IRC	Indian Roads Congress
LA	Land Acquisition
LHS	Left Hand Side
LOA	Letter of Acceptance
MBCB	Metal Beam Crash Barrier
MJB	Major Bridge
MNB	Minor Bridge
MOST	Ministry of Surface Transport

Abbreviation	Description
MPR	Monthly Progress Report
NH	National Highway
NHAI	National Highway Authority of India
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
OHLS	Overhead Lane Signal
OHM	Object Hazard Marker
PCOD	Provisional Commercial Operation Date
POS	Point of Sale
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road/Rail Over Bridge
ROW	Right of Way
RPV	Route Petrol Vehicle
RUB	Road/Rail Under Bridge
SH	State Highway
SPV	Special Purpose Vehicle
SR	Service Road
SSWIM	Slow Speed Weigh in Motion
SWB	Static Weigh Bridge
TOT	Toll Operate Transfer
TC	Toll Collector
Team	Team of Cube Highways Technologies Pvt Ltd.
TMS	Toll Management System
WIM	Weigh in Motion
WMM	Wet Mix Macadam

Chapter 1
INTRODUCTION

CHAPTER 1. INTRODUCTION

1.1 Background

Infrastructure Sector is a key driver for the Indian economy. In 2014, the Government of India have introduced a new investment vehicle which allows investors to participate in the growth story of infrastructure sector, named Infrastructure Investment Trusts (hereinafter referred to as 'InvITs'). InvITs are instruments on pattern of mutual funds and are designed to pool in money from a number of investors to invest in assets that give cash flow over a period of time. The InvITs are regulated by the SEBI (Infrastructure Investment Trusts) Regulations Act, 2014.

In highway sector, InvIT as an instrument provide greater flexibility to investors and is expected to attract patient capitals (for say, 20-30 years) to the market, as these investors are averse to construction risks and are interested in investment in assets which provide long-term stable returns.

InvIT shall have a (i) Trustee, (ii) Sponsor(s) (iii) Investment Manager and (iv) Project Manager, Sponsor and the Project Manager are the same entity i.e. Aadharshila Infratech Private Limited. Indus Infra Trust has appointed M/s Cube Highways Technologies Private Limited as Technical Consultant for carrying out technical study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, Cube Highways Technologies undertook the site visits to carry out site inspection. The report is based on findings during this period.

Indus Infra Trust ("Trust") was settled in Gurugram, India pursuant to the Trust Deed as a contributory irrevocable trust in accordance with the Indian Trusts Act, 1882. The Trust is an Infrastructure Investment Trust (InvIT) established for making investments in special purpose vehicles as defined under Regulation 2(1) (zy) of the InvIT Regulations, or infrastructure projects or securities of Indian companies engaged in the infrastructure sector, as may be permitted in terms of Regulation 18(5) of the InvIT Regulations. IDBI Trusteeship Services Limited is the Trustee to the Trust.

Table 1-1: Potfolio Assets of of Indus Infra Trust

S. No.	Name of the Project
1.	GR Phagwara Expressway Limited
2.	Porbandar Dwarka Expressway Private Limited
3.	Varanasi Sangam Expressway Private limited
4	GR Akkalkot Solapur Highway Private limited
5	GR Sangli Solapur Highway Private Limited

S. No.	Name of the Project
6	GR Gundugolanu Devarapalli Highway Private Ltd
7	GR Dwarka Dewariya Highway Private Limited
8	GR Aligarh Kanpur Highway Private Ltd
9	GR Galgalia Bahadurganj Highway Private Limited

1.2 Asset Background

The National Highways Authority of India (NHAI) on behalf of Ministry of Road Transport and Highways (MORT&H), Government of India, have taken up the development of various National Highway corridors where the intensity of traffic has increased significantly and there is requirement of augmentation of capacity for safe and efficient movement of traffic. In this regard, NHAI has been entrusted to develop Projects for selected corridors through design, build, operate and transfer (the "DBOT Annuity" or "Hybrid Annuity") basis.

As part of this endeavour, the Government of India had entrusted to the Authority the development, maintenance, and management of National Highway (NH) 327E including the section from km 49.000 to km 93.983 (Design Length 44.983 km). The Authority had resolved to augment the existing road from km 49.000 of NH-327E to km 93.983 of NH-327E (hereinafter called the "NH 327E") in the State of Bihar by four laning thereof (the "Project") on Hybrid Annuity basis, which shall be partly financed by the Concessionaire who shall recover its investment and costs through payments to be made by the Authority, in accordance with the terms and conditions as set forth in the Concession Agreement.

The Hybrid Annuity Model (HAM) is a mix of BOT Annuity and EPC models. As per the design, the Authority will contribute up-to 40% of the Project cost in ten equal instalments of 4% each during the construction period of 730 days with the provisions of Clause 23.4 of CA. The remaining payment will be made based on the assets created and the performance of the developer. Here, hybrid annuity means the first 40% payment is made as fixed amount in ten equal instalments whereas the remaining 60% is paid as variable annuity amount after the completion of the Project. As per the design, Authority will contribute 40% of the BPC and the balance cost is funded by Concessionaire through debt and equity.

The Authority had adopted a single stage two envelope bidding process and accordingly invited proposals by its Request for Proposals dated 22nd September 2020 (the "Request for Proposals" or "RFP") for qualification and short listing of bidders for construction, operation and maintenance of the above referred Project on Hybrid Annuity basis. The Authority had prescribed the technical and commercial terms and conditions in the RFP and invited bids comprising technical and financial bids from the bidders for undertaking the Project.

After evaluation of the bids received, the Authority had technically qualified certain bidders including, inter alia, the selected bidder and accepted the financial bid of the selected bidder i.e. M/s G R Infraprojects Limited.

.

The Authority issued its Letter of Award No. NHAI/BH/NH-327E/Bah-Ara/2020/Proc/E-166821 dated 03rd March 2021 (hereinafter called the "LOA") to the selected bidder requiring, inter alia, the execution of this Concession Agreement within 45 (forty five) days. However, on 17th April 2021 it was executed on mutually agreed terms, of the date of issue thereof.

Accordingly, SPV GR Bahadurganj Araria Highway Private Limited (hereinafter referred to as "GBAHPL") has been formed, for implementing the Project stretch (the "Concessionaire"). As Concessionaire of this Project, GBAHPL had to develop the project, and operate, and maintain the facilities after completion of construction. Under Hybrid Annuity Model (HAM), toll collection on the Project stretch shall be responsibility of NHAI. The Concessionaire shall be recovering its costs through annuity payments made during operation period of 15 years.

Report Structure

The report contains eight chapters, including this Chapter on Introduction.

Chapter 2 Project Overview

Chapter 3 Asset Status

Chapter 4 Review of Structures

Chapter 5 Review of the pavement condition survey

Chapter 6 General Safety Concerns along the Project stretch and Improvements

Chapter 7 Operation and Maintenance

Chapter 2
PROJECT OVERVIEW

CHAPTER 2. PROJECT OVERVIEW

2.1 Location

The Project stretch starts from km.49.000 near Bhadurganj and ends at km 93.983 near Araria. The start co-ordinate of the project is Latitude 26°16'1.92" N and Longitude 87°50'17.52" E. The end co-ordinate of the project is Latitude 26° 6' 58.32" N and Longitude 87° 28' 9.12" E.

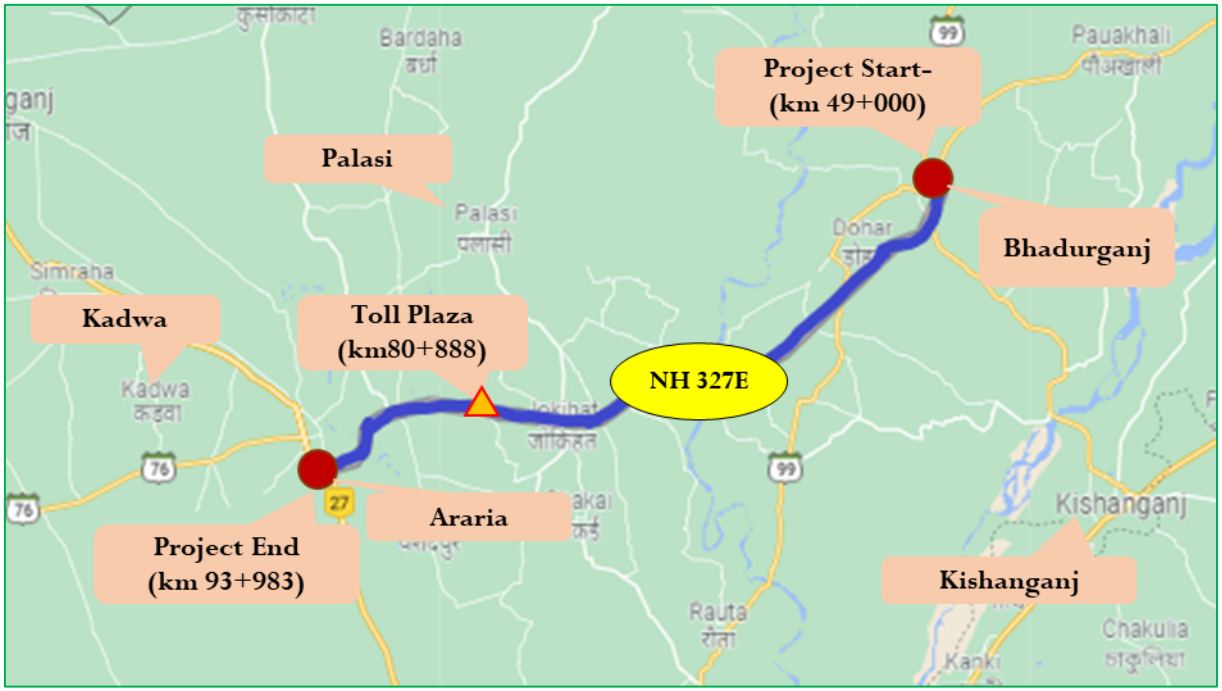


Figure 2.1: Project Alignment

2.2 Salient features

The salient features of the Project are summarised in the table below:

Table 2-1 Project Salient Features

S. No	Scope	Description
1	Name of the Project	Four laning of NH-327E from Bahadurganj (Design km 49.000) to Araria (Design km 93.983) (Design Length = 44.983 km) Package-II in the State of Bihar under Bharatmala Pariyojana on Hybrid Annuity Mode
2	Name of Client	National Highways Authority of India
3	Name of Concessionaire	GR Bahadurganj Araria Highway Private Limited
4	Independent Engineer	M/s Chaitanya Projects Consultancy Pvt. Ltd JV with M/s K&J Projects Pvt. Ltd
5	Length of the Project	44.983 km
6	Bid Project Cost	Rs.1081.70 crores
7	Revised Bid project Cost	Rs. 1057.52 crores
8	Letter of award	NHAI/BH/NH-327E/Bah-Ara/2020/Proc/E-166821 dated 03rd March 2021
9	Concession Agreement date	17th April 2021
10	Appointed Date	10th January 2022
11	Construction Period	730 days from Appointed date
12	Operation Period	15 years from COD
13	Provisional Completion Certificate	10th Aug 2024

The Provisional Completion certificate was issued for the project effective from 10th Aug 2024 (except of 1.3 km length, for which provisional completion certificate in progress).

2.3 Scope of the Project

The scope of the Project (the "Scope of the Project") shall mean and include,

- Construction of the Project on the site set forth in Schedule-A and as specified in Schedule-B together with provision of Project Facilities as specified in Schedule- C, and in conformity with the Specifications and Standards set forth in Schedule- D of the Concession Agreement.
- Operation and Maintenance of the Project in accordance with the provisions of Concession Agreement; and
- Performance and fulfilment of all other obligations of the Concessionaire in accordance with the provisions of Concession Agreement and matters incidental there to or necessary for the performance of any or all the obligations of the Concessionaire under Concession Agreement.

2.4 Physical features of the Project

The project includes the following physical features.

Table 2-2: Project Physical Features

S. No	Project Physical Features	UoM	As per CA	As per Site	Remarks
1	Total Length of project stretch	Km	44.983 km	43.983	200 m work in progress
2	Total length of Service Road	Km	11.602	10.932	860 m pending due to land issues
3	Major Bridges	Nos.	14	14	
4	Minor Bridges	Nos.	18	18	
5	Flyover	Nos	01	01	
6	VUP	Nos.	01	01	
7	LVUPs	Nos.	04	04	
8	Box/Slab Culverts	Nos.	57	57	
9	Junctions	Nos.	35	35	
10	Rest Area	Nos.	1	-	Descoped (only boundary wall & landfilling in the scope of concessionaire)
11	Toll Plaza	Nos.	1	1	No of Lane reduction (in Negative COS)

All the above features as per site have been accounted for the estimation of routine maintenance, repair and rehabilitation, major maintenance and operation expenditure.

2.5 Review of Concession Agreement

The Authority had adopted a single stage two envelope bidding process and accordingly invited proposals by its Request for Proposals dated 22nd September 2020 (the "Request for Proposals" or "RFP") for qualification and short listing of bidders for construction, operation and maintenance of the above referred Project on Hybrid Annuity basis.

After evaluation of the bids received, the Authority had technically qualified certain bidders including, inter alia, the selected bidder and accepted the financial bid of the selected bidder i.e. M/s G R Infraprojects Limited and issued its Letter of Award No No. NHAI/BH/NH-327E/Bah-Ara/2020/Proc/E-166821 dated 03rd March 2021 (hereinafter called the "LOA") to the selected bidder requiring, inter alia, the execution of this Concession Agreement within 45 (forty five) days and on 17th April 2021 it was accepted.

Table 2-3: Review of CA

Article /Clause of CA	Subject	Description in brief	*Remarks*
Article 3	**Concession period**	The concession period includes construction period of 730 days and operational period of 15 years from COD	
	Total Project Cost	Total project cost is 60 % of the Bid Project Cost If there is an increase in WPI, on an average, by more than 3% per annum for the period between the Bid Date and COD, the Total Project Cost shall be increased such that the effect of increase in WPI, more than such 3%, is reflected in the Total Project Cost	
Clause 23.2	**Adjusted bid project cost**	For every month occurring after the Appointed Date, the Authority shall compute the variation in Price Index occurring between the Reference Index Date preceding the Bid Date and the Reference Index Date preceding the date of Invoice and shall express the latter as a multiple of the former (the "Price Index Multiple").	
Article 14.3	**Provisional completion certificate**	If the Concessionaire has completed construction of 100% of the site made available to the Concessionaire up to 146 days from the appointed date, the Concessionaire is eligible for provisional completion certificate	*Positive for developer*
Article 16	**Change in scope**	The Authority shall pay to Concessionaire any increase in scope of work approved by Independent Engineer. While in case of reduction of scope due to reasons attributed by the Authority, cost of such reduced cost is to be accessed by the Independent Engineer, as per the schedule of rates applicable on the Bid Due Date. The civil cost of the reduced Scope shall be multiplied by 1.06 to arrive at the estimated cost of reduced Scope. The estimated cost of reduced Scope shall then be multiplied by the ratio of Bid Project Cost to Estimated Project Cost to arrive at the Total Cost of Reduced Scope.	

Article /Clause of CA	Subject	Description in brief	*Remarks*
Article 31	**Termination payment**		
	Termination payment in the event of default by Concessionaire during operation	Authority shall pay the Concessionaire an amount equal to 65% (sixty-five per cent) of the sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.	
	Termination payment in the event of default by Authority during operation Period	An amount equal to sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.	
Article 35	**Change in law**		
	Increase in cost	If the Concessionaire suffers aggregate financial effect due to change in law, which exceeds by Rs 1.60 crores or 2% of the total annuity payments in any accounting year the Concessionaire may notify Authority and propose amendments to this agreement so as to place the Concessionaire in the same financial position w/o change in law	*Concessionaire is protected*
	Reduction in cost	If the Concessionaire benefits from reduction in costs and the aggregate financial effect due to change in law, exceeds by Rs 1.60 crores or 2% of the total annuity payments in any accounting year the Authority may notify Concessionaire and propose amendments to this agreement so as to place the Concessionaire in the same financial position w/o change in law	
Clause 6.3	Obligations relating to refinancing	Authority shall permit and enable Concessionaire for refinancing as per prevailing guidelines upon written request. Authority shall respond within 30 days of the receipt of proposal.	*Positive for the developers and lenders*
Article 28	**Force majeure**		
	Time Extension		

Article /Clause of CA	Subject	Description in brief	*Remarks*
	After COD	After COD, the Concessionaire shall be entitled to receive Annuity Payments plus interest due and payable under this Agreement. Provided any payment to be made under this clause shall be subject to deduction of outstanding dues of the Authority, if any	
	Cost arising out of force majeure event		
	After Appointed Date	Non-Political Event: Cost to be shared by respective parties Indirect Political event: To be shared Direct Political: Cost compensated by Authority to concessionaire	*Concessionaire is protected*
Clause 17.8	Damages for breach of Maintenance Obligation	if the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified the Authority shall be entitled to recover damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 2% of the Performance Security, and (b) 0.1% of the cost of such repair or rectification as estimated by the Independent Engineer	*Concessionaire is made more responsible*
Clause 17.16	Advertising on the site	The Concessionaire shall not undertake or permit any form of commercial advertising, display or hoarding at any place on the site	
Article 20	Traffic aid post, medical aid post etc.	Concessionaire shall construct a traffic aid post of 25 sqm, medical aid post and two residential quarters at its own cost and hand them over to authority.	
		Concessionaire shall provide to the State Police Department or a substitute thereof one Jeep or similar vehicle in good working condition along with chauffeurs for round-the-clock patrolling. The operating costs of such vehicle including the salaries and allowances of the chauffeurs shall be borne by Concessionaire.	

Article /Clause of CA	Subject	Description in brief	*Remarks*
		Concessionaire shall provide to the State Medical Department or a substitute thereof to be designated by the Authority one ambulance in good working condition along with chauffeurs for round-the-clock ambulance services. the operating costs of such ambulance including the salaries and allowances of the chauffeurs	
		The Concessionaire shall also reimburse to the State Medical Department (or a substitute thereof to be designated by the Authority) the actual expenditure incurred by it in each Accounting Year on the medical equipment, and the pay and allowances of up to 2 medical personnel deployed exclusively for the Medical Aid Posts and ambulance and shall maintain the Medical Aid Post buildings.	
Clause 21.3	Payment to independent engineer	The remuneration, cost and expenses of the Independent Engineer shall be paid by Authority and subject to the limits set Schedule-M, one-half of such remuneration, cost and expense shall be reimbursed by the Concessionaire to the Authority within 15 days of receiving a statement of expenditure from the Authority	

2.6 Completion Certificate :

Provisional certificate has been issued by IE vide its letter no CPC/AE-64/GPA-P2/2021/HO/CON/505/20668 dated 08.10.2024 considering effective date from 10.08.2024 for the project except of 1.3 km length, which was considered in the punch list.

Table 2-4: Details of Provisional Completion Certificate

Description	Length	Remarks
Total Project Length	44.983 Km	
Provisional Certificate Issued	43.683 Km	

Description	Length	Remarks
Balance	1.3 km	Out of these Major bridges locations has already been constructed and balance 200m work is in progress and completed upto WMM Top.

The Independent Engineer has recommended to the Authority for the issuance of completion certificate for the project expect of items, where land is not available to Concessionaire vide its letter no CPC/WB/IE-NH 327E/PKG-II/605 dated 28.02.2025.

2.7 Balance Work

Settlement Agreement

The Concessionaire and the Authority has signed a settlement agreement dated 16th June 2025, in which the balance work due to land acquisition work is proposed to be descoped and concessionaire is to be given reasonable amount of time for the construction of such work upon availability of encumbrances free land.

It is also agreed upon in the Agreement, if encumbrances free land is not made available by 31st Dec 2025 for the items (2,3 &4), the work is deemed to be descoped. Further it is mutually agreed upon by both parties for issuance of completion certificate effective from 01st Jan 2025.

Table 2-5: Details of Balance work

Sl. No	Description	Quantum	Completion Period (As per Settlement Agreement)	Current Status
1	Main Carraige way : Km 73+730 to Km 73+930 RHS	200 m	105 days	Work in Progress, Work up to WMM level Completed
2	Service Road 58+207 to 59+067 LHS	860 m	120 days	Pending, Land Acquisition issue. As per settlement Agreement, deemed to be descoped if encumbrances free land not made available by 31st Dec 2025.
3	Drain Work 58+070 to Km 59+200	1130 m	120 days	
4	Drain work Km 77+340 to	220 m	105 days	

Sl. No	Description	Quantum	Completion Period (As per Settlement Agreement)	Current Status
	Km 77+560 RHS			

2.8 Change of Scope

A. Positive Change of Scope

The Authority has issued for the consolidated positive Change of Scope amounting Rs 24.50 Cr (Inclusive of GST) vide its letter no NHAI/PIU-Purnia/Bahad.-Araria/2020/Vol-VI/D-367 dated 08.04.2024.

Table 2-6: Details of positive change of scope

Sl. No.	Description	Amount (in Crs)	Remarks
1	Increase in Span for Minor Bridges (Km 80+355 & Km 86+923)	5.288	
2	Reconstruction of box Culverts (Km 49+273, Km 57+267, KM 58+532, Km 58+751, Km 61+980)	0.96	
3	Reconstruction of Superstructure for retained Major Bridges (Km 75+873, Km 82+638 & Km 83+620	18.32	

All the works under positive change of scope has been completed at site.

B. Negative Change of Scope:

The Authority has issued the consolidated reduction of scope of three items amounting 24.17 Crs vide its letter no NHAI/PIU-Purnia/Bahad.Araria/2020/Vol. III/E-202632/D-179 dated 11.03.2025. Details of same mentioned below:

I. **Rest Area :** The Authority has communicated for reduction in scope for rest area other than boundary wall and leveling of land.

II. **Toll Plaza :** Rreduction in scope of scope in lieu of the reduction of toll lanes in comparison to Agreement .

III. **Reduction in width of Minor Bridge Service Road:** Reduction in width Minor Bridge in service road at Km 51+860.

2.9 Extension of Time & Project Milestone

Project Milestone	Milestone Dates			Remarks
	Planned Date (based on Appointed date)	Revised Date after EOT	Achievement Date	
I	18 June 2022	19 Oct 2023	03 Dec 2023	The Concessionaire has achieved Project Milestone-I within the 90 days period of scheduled date, pursuant to clause 12.3.2 of the Concession Agreement,
II	04 Jan 2023	-	28 Feb 2023	The Concessionaire has achieved Project Milestone-II within the 90 days period of scheduled date, pursuant to clause 12.3.2 of the Concession Agreement,
III	09 May 2023	01 Nov 2023	31 Mar 2024	**The Independent Engineer has imposed damages under clause 12.3.2 for 61 days (beyond 90 days of grace period) for delay in the achievement of Project milestone III amounting Rs. 1,97,95,110 under clause 12.3.2 of the Concession Agreement.**
Scheduled Completion Date	09 Jan 2024	12 May 2024	10 Aug 2024	The Concessionaire has achieved the provisional completion certificate within the 90 days period of scheduled date, pursuant to clause 12.3.2 of the Concession Agreement,

Project Milestone III & Liquidated Damages: The Independent Engineer has imposed damages under clause 12.3.2 for 61 days (beyond 90 days of grace period) for delay in the achievement of Project milestone III amounting Rs. 1,97,95,110 under clause 12.3.2 of the Concession Agreement.

2.10 Hindrances/Land Acquisition

Details of hindrances are listed below:

Table 2-7: Details of Hindrances:

Sl. No	From	To	Length (in m)	Side	Impacted	Remarks
1	58+300	58+900	600	LHS	Service Road & Drain	
2	77+340	77+560	220	RHS	Drain Work	

Figure 2.2: Hindrances

Chapter 3
ASSET STATUS

CHAPTER 3. ASSET STATUS

3.1 Review of Current Status of Highways

Figure 3.1: Project start and end location

The Independent Engineer has recommended to the Authority for the issuance of completion certificate for the project expect of items, where land is not available to Concessionaire vide its letter no CPC/WB/IE-NH 327E/PKG-II/605 dated 28.02.2025.

The Concessionaire and the Authority has signed a settlement agreement dated 16th June 2025, in which the balance work due to land acquisition work is proposed to be descoped and concessionaire is to be given reasonable amount of time for the construction of such work upon availability of encumbrances free land.

It is also agreed upon in the Agreement, if encumbrances free land is not made available by 31st Dec 2025 for the items (2,3 &4), the work is deemed to be descoped. Further it is mutually agreed upon by both parties for issuance of completion certificate effective from 01st Jan 2025.

Figure 3.2: Site Photographs

3.2 Drain

Based on the site inventory, side drain and median drain are provided along the project stretches, which includes lined drain. Drain provided along the project stretch is found clean and it is in good condition.

Figure 3.3: Drains

3.3 Junctions

Based on the site observation, there are 32 Minor Junctions and 3 Major Junctions were found along the project stretch. Junctions are made of flexible pavements connecting the slip/service road with nearby villages. Lighting has been provided at both minor and major junction locations.

Figure 3.4: Junctions

3.4 Road Furniture

Following are the details of road furniture provided along the project stretch as per site.

Table 3-1: List of project furniture's

Type furniture	Unit	Quantity
MBCB	km	27.051 kms
Streetlights		
Single arm	Nos	97
Double arm	Nos	315
High mast	Nos	8

Metal Crash Barrier

Metal Beam crash barriers have been installed at required locations i.e. high embankment, bridges approaches along the project stretch on shoulder side of the main carriageway and are being well-maintained.

Figure 3.5: Safety crash barrier (MBCB) along the project stretch

Overhead & Cantilever Gantry boards

Overhead Gantry and Cantilever Gantry boards are provided at the Project Stretch.

Figure 3.6: Overhead & Cantilever Gantry boards

Highway Lighting

Highway lighting such as single arm, double arm, and high mast lights have been provided along the project stretch, which includes main carriageway, service roads, built-up areas, bus bays, truck lay byes, junctions, toll plazas etc. As per site observations, streetlights provided along the project stretch are in good condition.

Figure 3.7: Highway lighting

3.6 Project facilities

Following are the details of project facilities along the project stretch. As per the Concession Agreement, bus shelters have been provided, there are no provision for bus bays in Concession Agreement.

Table 3-2: List of project facilities

Type facility	Unit	Quantity
Bus shelters	nos.	36
Truck lay bye	nos.	02

3.6 Key Observations (Highway /Project Facilities)

- The pavement was found to be in good condition with good riding quality in general.
- Detailed condition of pavement is enclosed as Annexture III.
- Carriageway Water is channelized through chutes even for embankment height less than 3 meters for majority of locations.
- At several locations, slope was eroded, chute drain damaged, and turfing has not been found stable. The rectification work has been carried out by the concessionaire.
- Drain work was not found at km 77+000 RHS (aprox 50 m), however mentioned in joint inventory list with IE. The Concessionaire has intimated that this is a part of pending land acquisition issue (which is mentioned as 77+340 in balance work list item).
- Basin of chute drains missing for some locations. This should be maintained under routine maintenance work.
- Median plantation has been completed at all locations. The Concessionaire has deployed several team for maintaining the plantation work as a part of routine maintenance work. However, growth of median plantation to be monitored and maintained as routine maintenance work.
- As per details provided (Schedule B& C comparison signed with IE)15 nos of single poles mentioned at km 93+935. However, only 3 poles were observed at this location.
- Minor settlements in approaches were observed near the joint of PQC and flexible pavement, resulting in bumpy ride at few locations. The rectification work for settlement has been carried out at several locations and remaining are being rectified under routine maintenance work.

Figure 3.8: Observation Photographs

Figure 3.9: Rectification work Photographs

3.7 Toll Plaza Equipment status and & ATMS

3.7.1 Toll Plaza and Toll Collection System

General Features of Toll Plaza and Toll Collection system

- One toll plaza is located along the stretch: Kakan Toll Plaza at KM 80+880. The Toll Collection Systems were provided by Qualix Information System LLP in 2024.
- Kakan Toll Plaza has 10 lanes (8 physical lanes and 2 reversible lanes). All 10 lanes are equipped with ETC (Electronic Toll Collection) systems. Out of 10 lanes, only two lanes contain booths, while the remaining eight lanes are boothless.
- TLCs are installed and operational in 10 lanes. Each TLC has the specification of 8 GB RAM and 1TB hard disk with Ubuntu 18.04.2 LTS OS installed.
- There is an office building for operations at Kakan Toll Plaza.
- RFID ETC Transceiver are present and operational in 10 lanes.
- ETC system is running on ICD 2.5.
- The booth components include monitor, customized keyboard, printer, intercom slave and a booth camera etc. are present and working in two lanes at toll plaza.
- Major lane equipment like User Fare Display, boom barriers, OHLS, LPIC camera, ICS camera, and traffic light etc. are present in 10 lanes.

- MSWIM is installed in all 10 lanes but is not operational at the plaza, as no overload charges are collected.
- SWB is installed on both sides of the plaza but not operational.
- Laser profiler-based system AVC is installed in 10 lanes at the toll plaza.
- Two servers (a primary server and a backup server) are provided, along with a switch rack and a 24-port switch.
- Both servers are of HP ProLiant DL380 Gen10 models.
- 52" inch LED screen is installed for CCTV monitoring at the toll plaza.
- Four Workstations are available in the control room for lane monitoring, administration, and audit with 8 GB RAM and 1 TB HDD.
- A 6 KVA UPS is present in the UPS Room.
- A 3 KVA UPS is connected to each lane and is in the UPS room.

Figure 3.10: Toll Plaza and Toll Collection system

3.7.2 Advanced Traffic Management System (ATMS)

The Advanced Traffic Management System (ATMS) is installed and maintained by Qualix Information System LLP in 2024. for the project road which is controlled by the ATMS Centre. Package -2(KM 49+00 to KM 93+983 chainage) is of 44.983 km stretch. It comprises of the following:

- **Emergency Call Back System (ECB):** 9 pairs of Emergency Call Booths (ECBs) are installed.
- **Variable Message Signboards (VMS):** VMS is installed at 4 locations.
- **Portable Variable Message Signboards (PVMS):** one PVMS is present at the toll plaza.
- **Automatic Traffic Counter cum Classifier (ATCC)**: 4 lane Loop-Piezo-Loop Automatic Traffic Counter cum Classifiers (ATCC) is installed in 1 location (KM 80+470 chainage).
- **Meteorological Data system (MDS):** MDS is installed on the top of the toll building, The meteorological sensors include equipment to measure atmospheric temperature, humidity, visibility, road temperature, and wind speed & direction.
- **CCTV system:** Surveillance cameras are installed at 19 locations.
- **Video Incident Detection System (VIDS):** VIDS is installed and operational in 12 locations
- **Radio Frequency (RF) Tower:** RF tower with RF devices is installed and operational in 10 locations.
- **Mobile Radio Communication Systems (MRCS):** MRCS is not installed.
- Two ATMS Servers and one ECB server are provided with a server rack, 24port switch, NVR 32 channel with 8TB HDD, media converter etc.
- 6 KVA UPS is present in the UPS Room for ATMS servers and control room.
- VIDS, ATCC and CCTV are powered with 1KVA UPS
- VMS is powered by Raw power with 3KVA UPS.
- ECB, PVMS and MET are powered with solar power
- **The following equipment is present in the ATMS control room**.
    - 3x2 Samsung video wall is present for monitoring ATMS equipment's.
    - 5 Workstations with 1TB HDD, 8GB RAM and OS windows 10 are installed with 650VA UPS for each.
    - One network printer.
    - 32 channel NVR with 8TB HDD.
    - Network switch 24 port.
    - PTZ joystick.
    - GSM gateway 4 port (Dinstar make)
    - Two VOIP based landlines for GSM based ECBs.

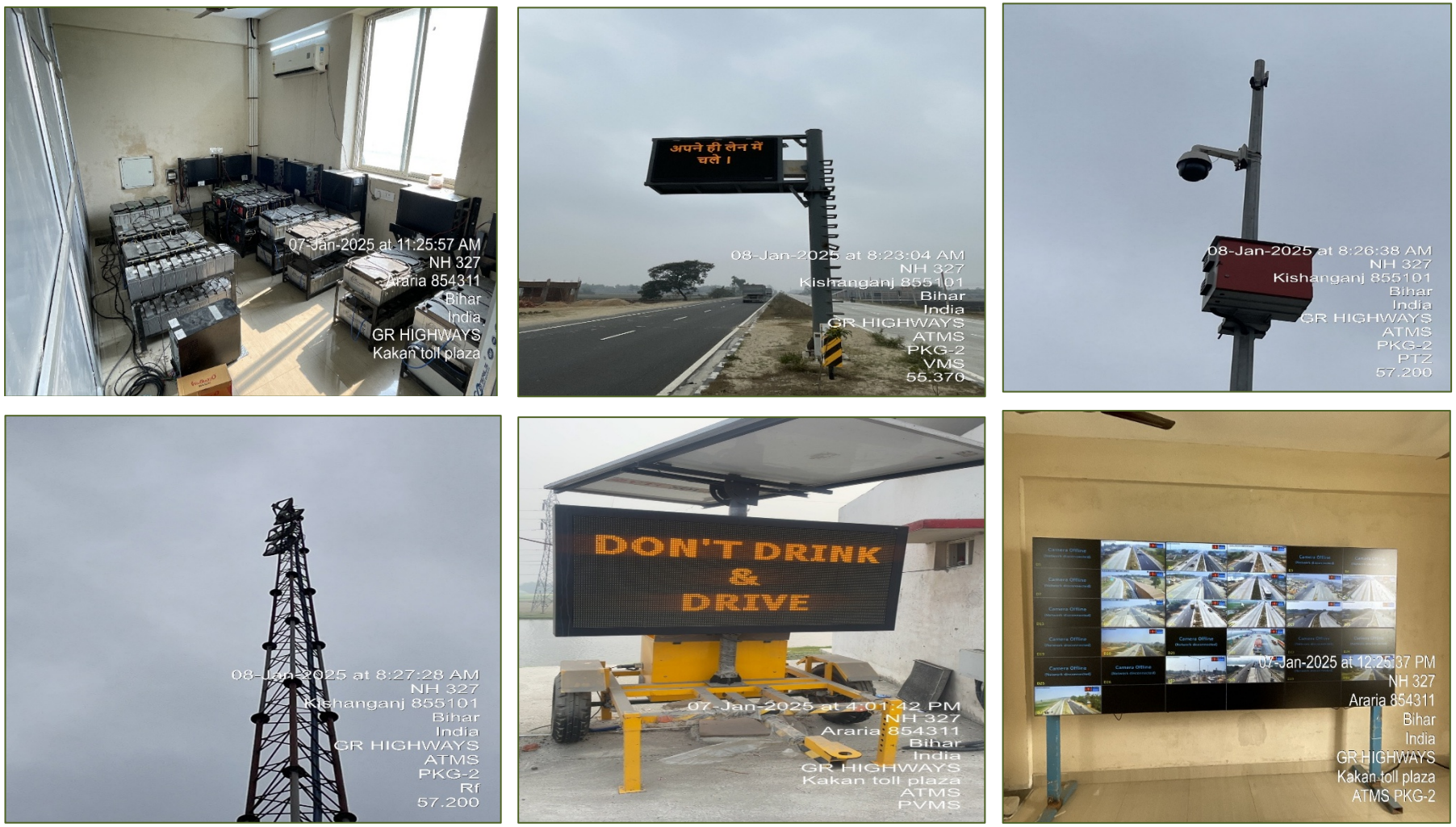


Figure 3.11: ATMS

3.7.3 Key Observation for toll collection system and ATMS

- The accuracy of the ATCC needs to be improved.
- Two Nos of Variable Message Signs (VMS) are not working and need to be made operational.
- Rain gauge sensors must be installed in MET devices. Additionally, some meteorological sensors are not working and need to be checked, repaired, or replaced.
- The Mobile Radio Communication System (MRCS) is not installed and needs to be installed.
- The NVR currently has a backup capacity of up to 10 days at package-2. The memory needs to be increased to support a 30-days backup.
- The Portable Variable Message Sign (PVMS) should be made functional.
- VMS messages cannot be set from the ATMS application in the control room. This issue needs to be resolved.
- Lightning arresters and earthing should be installed and maintained for certain ATMS devices for which it have not installed and maintained.

For above mentioned observations, it is to be noted that TMS and ATMS work are under 2 years warranty and are also covered under comprehensive AMC for remaining concession period. The concessioniore has taken up the rectification work with the assigned agency.

3.8 Incident Management

Following provisions at site toll plaza have been made under incident management as per the requirements of concession agreement.

- **Ambulance:** 1 Nos ambulance has been provided at toll plaza location with all the required equipment.
- **Highway Patrol Vehicle**: 1 no highway patrol vehicle has been provided.
- **Medical Aid post**: Medical Aid post has been constructed at toll plaza location.
- **Crane Service:** 1 No crane with 35 MT capacity has been provided.
- **Traffic Aid post:** Traffic aid post has been provided at toll plaza location.
- **Vehicular Rescue Post:** Vehicular Rescue post has been provided at toll plaza location.
- **Operation & Maintenance Center :** O&M center has been provided at toll plaza location

Figure 3.1: Indident Managment

Chapter 4
REVIEW OF STRUCTURES

CHAPTER 4. REVIEW OF STRUCTURES

4.1 Structural investigations

Review of structures inventory and detailed condition survey of structures are the essential requirements for preparation of estimates for O & M cost for highway structures. Keeping in view of importance of this task, review of inventory and conducting visual condition survey were carried out as per procedure and guidelines prescribed in IRC: SP:35 bridge engineers. The details of condition survey of structures were furnished below.

4.1.1 Visual Condition Survey

Salient features for which data is collected as part of Conditional Survey are in accordance with IRC: SP: 35 Proforma General

Details of various types of structures as per CA as well as site inventory survey are furnished below.

Table 4-1: Summary of structures

S. No	Type of structure	As per Schedule-B	As per inventory	Remarks
1	Major bridge	14	14	
2	Minor bridge	18	18	
3	Flyover	01	01	
4	VUP	01	01	
5	LVUP	04	04	
6	Box Culvert	57	57	
Total		**95**	**95**	

The detailed condition survey is furnished in subsequent sections of this report. The condition survey of all structures was conducted by a team of bridge experts by visual as well as with Mobile bridge inspection unit (MBIU) at all the inaccessible locations like bearings, pedestals, girders and soffit of super structure. The detailed condition of all structures with necessary repair and rehabilitation measures is provided in subsequent sections.

4.2 Major bridges

There are fourteen major bridges on the project stretch.

Table 4-2: Inventory details of the Major Bridges

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	52.995	4 x 43.50	174.00	LHS	Existing old bridge
		4 x 43.50	174.00	RHS	
2	63.780	1x 26.00 + 1 x 25.00+1x26.00	77.00	LHS	Existing old bridge
		1x 26.00 + 1 x 25.00+1x26.00	77.00	RHS	
3	67.761	1 x 6.00 + 5 x 32.00 + 1 x 6.00	172.00	LHS	Existing old bridge
		1 x 38.00 + 3 x 32.00+1x38	172.00	RHS	
4	71.498	4 x 26.50	106.00	LHS	Existing old bridge
		4 x 26.50	106.00	RHS	
5	72.499	2 x 35.00	70.00	LHS	
		2 x 35.00	70.00	RHS	
6	73.695	3 x 22.50	67.50	LHS	Existing old bridge
		3 x 22.50	67.50	RHS	
7	75.873	1 x 15.00 + 2 x 36.50+1x15.00	103.00	LHS	Superstructure reconstruction in COS
		1 x 14.00 + 2 x 36.4+1 x 14.00	103.00	RHS	
8	82.638	1 x 14.00 + 1 x 36.00 +1x14.00	64.00	LHS	Superstructure reconstruction in COS
		1 x 14.00 + 1 x 36.00+1 x 14.00	64.00	RHS	
9	83.620	1 x 14.00 + 1 x 36.00 + 1x14.00	64.00	LHS	Superstructure reconstruction in COS
		1 x 14.00 + 1 x 36.00 + 1x14.00	64.00	RHS	
10	85.245	5 x 26.00	130.00	LHS	Existing old bridge
		5 x 26.35	131.75	RHS	
11	86.923	4 x 30.00	120.00	LHS	Constructed by another agency
		4 x 30.00	120.00	RHS	
12	88.868	4 x 27.00	108.00	LHS	
		4 x 27.00	108.00	RHS	

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
13	91.413	1 x 4.80 + 1 x 13.80 +7 x 38.50 + 1 x 13.80 + 1 x 4.80	306.70	LHS	Existing old bridge
		9 x 38.50	346.50	RHS	
14	92.836	2 x 30.00	60.00	LHS	
				RHS	

Figure 4-1: Major Bridges

4.3 Minor Bridges

There are eighteen minor bridges on the project stretch.

Table 4-3: Inventory details of the Minor Bridges

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	50.456	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
2	51.860	1 x 30.00	30.00	LHS-SR	
				LHS MCW	
		1 x 30.00	30.00	RHS MCW	
				RHS- SR	
3	54.566	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
4	59.770	1 x 13.50	13.50	LHS	Existing old bridge
		1 x 13.50	13.50	RHS	
5	60.587	1 x 6.20	6.20	LHS	
		1 x 6.20	6.20	RHS	
6	61.275	3 x 13.50	40.50	LHS	Existing old bridge
		1 x 41.00	41.00	RHS	
7	62.671	2 x 27.50	55.00	LHS	
		2 x 27.50	55.00	RHS	
8	65.015	3 x 13.50	40.50	LHS	Existing old bridge
		1 x 41.00	41.00	RHS	
9	66.572	3 x 13.50	40.50	LHS	Existing old bridge
		1 x 41.00	41.00	RHS	
10	70.023	1 x 41.00	41.00	LHS	
		3 x 13.50	40.50	RHS	Existing old bridge
11	70.558	3 x 13.50	40.50	LHS	Existing old bridge
		1 x 41.00	41.00	RHS	
12	74.947	1 x 3.75 + 1 x 5.75 + 1 x 20.00 + 1 x 5. 75 + 1 x 3.75	39.00	LHS	Existing old bridge
		1 x 40.00	40.00	RHS	
13	77.438	2 x 13.50	27.00	LHS	Existing old bridge

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
		1 x 27.50	27.50	RHS	
14	78.459	1 x 13.50	13.50	LHS	
		1 x 13.50	13.50	RHS	
15	79.492	1 x 42.50	42.50	LHS	
		1 x 42.50	42.50	RHS	
16	79.802	1 x 13.50	13.50	LHS	Existing old bridge
		1 x 13.50	13.50	RHS	
17	80.364	3 x 30.00	90.00	LHS	Existing Bridge
		3 x 30.00	90.00	RHS	
18	86.447	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	

Figure 4-2: Minor Bridges

4.4 Flyover

There is one flyover on the project stretch.

Table 4-4: Inventory details of the Flyover

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	51.490	2 x 25.00 + 1 x 40.00	90.00	LHS	
		2 x 25.00 + 1 x 40.00	90.00	RHS	

Figure 4-3: Flyover

4.5 Vehicular Underpass

There is one vehicular underpass on the project stretch.

Table 4-5: Inventory details of the Vehicular Underpasses

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	58.596	1 x 20.00	20.00	LHS	
				RHS	

Figure 4-4: Vehicular Underpass

4.6 Light Vehicular Underpasses

There are four light vehicular underpasses on the project stretch.

Table 4-6: Inventory details of the Light Vehicular Underpasses

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	76.401	1 x 12.00	12.00	BHS	
2	77.970	1 x 12.00	12.00	BHS	

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
3	83.205	1 x 12.00	12.00	BHS	
4	87.705	1 x 12.00	12.00	BHS	

Figure 4-5: Light Vehicular Underpasses

4.7 Box Culverts

There are fifty-seven box culverts on the project stretch.

Table4-7: Inventory details of the Box Culverts

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remark
1	49.156	1 x 2.00	2.00	BHS	
2	49.271	1 x 3.00	3.00	BHS	
3	49.784	1 x 2.00	2.00	BHS	

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remark
4	50.256	1 x 2.00	2.00	BHS	
5	50.783	1 x 2.00	2.00	BHS	
6	51.277	1 x 5.00	5.00	BHS	
7	52.564	1 x 2.00	2.00	BHS	
8	53.490	1 x 2.00	2.00	BHS	
9	53.685	1 x 2.00	2.00	BHS	
10	53.703	1 x 2.00	2.00	BHS	
11	54.237	1 x 2.00	2.00	BHS	
12	55.006	1 x 2.00	2.00	BHS	
13	56.092	1 x 2.00	2.00	BHS	
14	56.958	1 x 2.00	2.00	BHS	
15	57.268	1 x 3.00	3.00	BHS	
16	57.765	1 x 2.00	2.00	BHS	
17	58.375	1 x 2.00	2.00	BHS	
18	58.538	1 x 3.00	3.00	BHS	
19	58.753	1 x 3.00	3.00	BHS	
20	59.020	1 x 3.00	3.00	BHS	
21	59.366	1 x 2.00	2.00	BHS	
22	59.686	1 x 2.00	2.00	BHS	
23	61.559	1 x 3.00	3.00	BHS	Shifted to km 81.100 as per Concessionaire's letter no 731 dated 28.03.2023
24	61.982	1 x 5.00	5.00	BHS	
25	63.215	1 x 5.00	5.00	BHS	
26	65.172	1 x 3.00	3.00	BHS	
27	66.447	1 x 3.00	3.00	BHS	
28	67.432	1 x 2.00	2.00	BHS	Shifted to km 81.800 as per Concessionaire's letter no 731 dated 28.03.2023
29	68.069	1 x 3.00	3.00	BHS	Shifted to km 83.980 as per

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remark
					Concessionaire's letter no 930 dated 20.08.2023
30	68.109	1 x 2.00	2.00	BHS	Shifted to km 90.950 as per Concessionaire's letter no 930 dated 20.08.2023
31	70.200	1 x 3.00	3.00	BHS	
32	70.385	1 x 2.00	2.00	BHS	
33	71.003	1 x 2.00	2.00	BHS	
34	72.345	1 x 2.00	2.00	BHS	
35	72.353	1 x 3.00	3.00	BHS	
36	73.267	1 x 2.00	2.00	BHS	
37	74.130	1 x 2.00	2.00	BHS	
38	74.517	1 x 2.00	2.00	BHS	
39	74.797	1x 3.00	3.00	BHS	
40	75.112	1 x 3.00	3.00	BHS	
41	76.497	1 x 3.00	3.00	BHS	
42	77.329	1 x 4.00	4.00	BHS	
43	77.654	1 x 3.00	3.00	BHS	
44	78.264	1 x 2.00	2.00	BHS	
45	78.714	1 x 2.00	2.00	BHS	
46	79.659	1 x 2.00	2.00	BHS	
47	80.231	1 x 3.00	3.00	BHS	
48	80.447	1 x 3.00	3.00	BHS	
49	80.577	1 x 2.00	2.00	BHS	
50	82.345	1 x 2.00	2.00	BHS	
51	82.424	1 x 3.00	3.00	BHS	
52	82.984	1 x 2.00	2.00	BHS	
53	83.205	1 x 4.00	4.00	BHS	
54	85.753	1 x 2.00	2.00	BHS	
55	87.899	1 x 4.50	4.50	BHS	

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remark
56	92.100	1 x 5.00	5.00	BHS	
57	93.912	1 x 3.00	3.00	BHS	Location changed to km. 93.147

Figure 4-6: Box Culverts

4.8 Key observation on Major structures:

Following are the major observations on the project,

- In some bridges, spherical bearings were observed with excessive rotation and transverse/piston displacement, and rocker-cum-roller/rocker bearings were found rusted and seized due to accumulation of dirt and debris. Across some spans of major and minor bridges have been identified for bearing replacement/rectification was required. Maintenance measures such as cleaning, rust removal, protective painting, lubrication, and provision of missing spacer bars were required. During site visit in December 2025, Rrectfication works has commenced, some of them has been rectified, and as per concessioniore for balance location work to be completed by 31st March 2026.

- Bearing pedestals cast over height of the bearings due to which the side guides of the bearing are touching the bearing pedestal top and have very less gap, limiting the spherical bearing functionality in most of the new bridges. The Conceesionre has mobilized the rehabiliation team on site, rectfication work for same is under progress.
- Delamination, spalling, and exposure of corroded rebars were observed on the soffit of the deck slab and girder soffits in old bridges. The Concesssioniore has commenced the rectification work. The Conceesionre has completed the rectification work.
- Cracks were observed on girders in major bridge at km 63.780, km 67.760 and km 91.413. Also hairline cracks were noticed in some of the girders which requires monitoring atleast yearly to ascertain the impact and severity of cracks. The Concessionaire has mobilized the rehabiliation team on site, rectfication work for same is under progress.
- Leaching was observed in the soffit of the deck slab in old bridges. The Concessionaire has mobilized the rehabiliation team on site, rectfication work for same is under progress.
- In some of the bridges, installation of strip seal elastomers were missing in the expansion joints. The Concessionaire has completed the rectification work and shall be continously maintained under routine maintenance.
- Drainage spouts were missing for the existing retained structures, only a provision of hole was observed in the deck slab and also projection of drainpipes below the soffit of deck slab is also very small in some of the bridges. Installation of drainage spots has commenced and is in progress
- For underpasses PVC down take pipes were missing for the drainage holes provided at bottom of crash barrier to drain out the deck water. Installation of Downtake pipe has commenced and is in progress
- A crack was developed on the deck slab concrete along the edge angle of the strip seal expansion joint on most of the structures due to the approach's settlement. The Conceesionre has completed the rectfication work.

Figure 4-7: Structure rectification work

Chapter 5
CONDITION ASSESSMENT OF EXISTING PAVEMENT CONDITION

CHAPTER 5. CONDITION ASSESSMENT OF EXISTING PAVEMENT CONDITION

To evaluate the existing pavement condition of a Project Highway, investigations are to be carried out on the field to collect data from the field. The collected data is processed and analyzed to obtain complete information on the pavement condition.

5.1 Pavement Condition Assessment for Technical Due Diligence

As a part of technical due diligence, the different investigations performed on the Project Highway are listed below.

- Assessment of Pavement Condition based on Visual Condition Survey

Based on the visual condition survey, the type of distress, its quantity, and severity along the Project Highway are obtained. The same is used to evaluate the present condition of pavement, which classifies pavement conditions ranging from 'Good' to 'Fair'.

The pavement investigation studies carried out on the Project Highway from 03rd January to 08th January 2025 as a part of technical due diligence and their outcomes are detailed in the sections below

Main Carriageway is comprised of both flexible pavement and rigid pavement. Flexible pavement is for stretch section i.e. 29.62 km (including of 4.88 km of structure length) and rigid pavement is for reconstruction section i.e.60.35 kms.

5.2 Review of Concession Agreement

As per Schedule K of the Concession Agreement, the Concessionaire shall repair and rectify the defects and deficiencies as specified below

Table 5-1: Major maintenance criteria as per CA

S. No	Nature of Defect or Deficiency	Time limit for Repair/Rectification
1	Roughness value exceeding 2750 mm in a stretch of 1km (as measured by a standardized rough meter/bump integrator)	180 Days
2	Cracking in more than 5% of road surface in a stretch of 1 km	30 days
3	Rutting exceeding 10mm in more than 2% of road surface in a stretch of 1km (measured with 3m straight edge)	30days

5.3 Review of Pavement Design Report

- The design of rigid pavement has been carried out in accordance with guidelines of IRC-58-2015.

- The thickness of rigid-layers is designed for a period of 30 years and Subgrade CBR is taken as 10%.
- The design of flexible pavement has been carried out in accordance with guidelines of IRC-37-2018.
- The thickness of bituminous-layers for Main carriage way is designed for a period of 20 years. Design traffic is 60 MSA and effective Subgrade CBR is taken as 15%.
- The pavement for the service road has been designed as per IRC: 37-2018; Design traffic is 10 MSA and effective Subgrade CBR is taken as 10%.

Table 5-2: Pavement Design Thicknesses of Rigid Pavement for Main carriageway as per Pavement Design Report

Layer	Thickness(mm)
Pavement Quality Concrete (PQC)	240
Dry Lean Concrete (DLC)	150
Granular Sub-base (GSB)	200

Table 5-3: Pavement Design Thicknesses of Flexible Pavement for Main carriageway as per Pavement Design Report

Layer	Thickness(mm)
Bituminous Concrete (BC)	50
Dense Bituminous Macadam (DBM)	100
Wet Mix Macadam (WMM)	250
Existing Granular Layer	200

Table 5-4: Pavement Design Thicknesses for Service roads as per Pavement Design Report (2 types of crust has been followed on site)

Layer	Thickness(mm)
Bituminous Concrete (BC)	30
Dense Bituminous Macadam (DBM)	50
Wet Mix Macadam (WMM)	150
Cement Treated Sub-base (CTSB)	200

Layer	Thickness(mm)
Bituminous Concrete (BC)	40
Dense Bituminous Macadam (DBM)	-
Wet Mix Macadam (WMM)	150
Cement Treated Sub-base (CTSB)	200

5.4 Key Site Visit Observations

The observations made during the site visit by the pavement investigation team are as follows,

- The majority of the pavement conditions was observed to be good on both hand sides of the Project Highway.
- Service roads were observed to be in good condition on both sides of the Project Highway.
- Alligator cracks and rutting were noticed from km 53.600 to 54.200. However, Crack sealing treatment has been carried out at these crack locations. The Concessionaire has carried out the rectification work.
- High severity rutting was observed from km 69.000 to 70.000 RHS of the Project Highway. The Concessionaire has carried out the overlay work at this location.
- Patchworks were observed at a few isolated locations in the flexible pavement stretch.
- Minor settlements was observed at approach slabs of few structures. The concessionaire has rectified the same for majority of settlement locations and for remaining locations rectification work is in progress.

The concessionaire has carried out the overlay work for the distressed pavement locations.

5.5 Pavement Distress Survey

A pavement condition survey gives an indication of the serviceability of the road pavement and is vital in deciding the maintenance activities. Some methods to conduct this survey are the Visual Condition Survey method (manual), Network Survey Vehicle (NSV) method, etc. However, Visual Condition Survey was conducted in this Project.

In a visual condition survey, the technical team makes a traverse along the Project Highway, observing the different types of distresses on the pavement surface, and observations are made on each distress type.

Distresses on Rigid pavements include

- Cracks – Longitudinal, Transverse, Multiple
- Corner break
- Punchout
- Ravelling
- Scaling
- Popouts/potholes
- Joint seal defects
- Spalling of joints

Distresses on flexible pavements include

- Cracks – Longitudinal, Transverse, and Alligator cracks
- Raveling
- Rutting
- Bleeding
- Potholes
- Patches

Observations made during the visual condition survey for Rigid Pavement are detailed below.

5.5.1 Longitudinal, Transverse and Multiple Cracks

Longitudinal cracks develop parallel to the traffic direction and extend through the depth of the bituminous layer, originating either from the bottom-up or top-down. Transverse cracks form perpendicular to the traffic direction and also penetrate the full depth of the bituminous layer. Multiple cracks, also known as interconnected cracks, do not follow a straight line and may link one or more joints or existing cracks, leading to a more complex cracking pattern.

Longitudinal, Transverse and Multiple Cracks were observed at few locations along the Project Highway. However, bitumen sealant/epoxy is applied for all the cracks.

5.5.2 Corner Break, Punchout and Ravelling

Corner break occurs when a portion of the slab is separated by a crack intersecting the adjacent transverse and longitudinal joints, typically forming a 45-degree angle with the traffic direction, with side lengths ranging from 0.3 m to half the slab width. Punchout refers to a portion of the slab broken out by multiple cracks, usually enclosed by two closely spaced transverse cracks (less than 0.6 m apart), a short longitudinal crack, and either the pavement edge or a longitudinal joint. Raveling is the loss of fine aggregates from the surface due to abrasion, which may or may not be associated with pre-existing cracks.

Corner breaks and Ravelling were observed at very few locations along the Project. Bitumen sealant/epoxy has been applied at corner break locations. Punchout were not observed at any locations along the Project Highway.

5.5.3 Scaling, Popout and Pothole

Scaling refers to the peeling off of the upper part of the slab surface (5 mm to 15 mm) due to crazing or improper surface finishing, leading to the loss of surface mortar. Popouts are small holes in the pavement surface, typically 25 mm to 100 mm in diameter and 10 mm to 50 mm deep, caused by the presence of oversized particles of soft aggregates that rise to the surface and break loose under traffic. Potholes, on the other hand, are larger depressions in the pavement, generally exceeding 150 mm in diameter and 50 mm in depth, formed due to the loss of pavement material under traffic loads or adverse environmental conditions.

Scaling is not observed at any locations along the Project Highway. Popouts and Potholes were observed at few locations and However, it have been sealed with bitumen sealant/bituminous mix.

5.5.4 Joint seal Defect and Spalling of Joint

Joint seal defects occur when any condition allows incompressible materials or significant water infiltration into the joint from the surface. Common types of damage include adhesive failure (bonding), complete loss of sealant, foreign material intrusion within the joint. Spalling of joints refers to the cracking, breaking, chipping, or fraying of slab edges within 0.3 m from the joint face, which can compromise pavement durability and performance.

Joint seal defect was not observed at few locations whereas spalling of joint was observed at very few locations along the Project Highway. However, it was rectified with bitumen sealant.

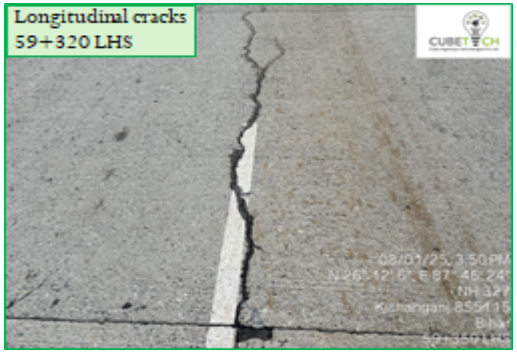


Figure 5.1: Rigid pavement distress pictures

Observations made during the visual condition survey for flexible Pavement are detailed below.

5.5.5 Longitudinal, Transverse and Alligator Cracks (Flexible pavement)

Longitudinal cracks develop parallel to the traffic direction and extend through the depth of the bituminous pavement layer, occurring as either bottom-up or top-down cracks. In contrast, transverse cracks form perpendicular to the traffic direction and also penetrate the full depth of the bituminous layer. Alligator cracks, also known as fatigue or crocodile cracking, appear as interconnected, irregularly shaped blocks resembling an alligator's skin.

Transverse cracks, Longitudinal cracks and Alligator cracks were observed at few locations of the Project Highway. However, Crack sealing has been applied at these crack locations.

5.5.6 Raveling, Rutting and Bleeding (Flexible pavement)

Raveling is the wearing away of the pavement surface due to the loss of bitumen binder and the dislodging of aggregate particles. Rutting, common in flexible pavements, appears as surface depressions in wheel paths with possible pavement uplift along the sides, resulting from permanent deformation in any pavement layer or subgrade due to traffic loads. Bleeding, also observed in flexible pavements, occurs when excess bituminous binder forms a shiny, reflective surface that becomes soft in hot weather and slippery in cold or wet conditions, leading to low skid resistance.

Ravelling, rutting and bleeding was observed at few locations of the Project Highway. The Concessionaire has carried out the rectification work at such locations.

5.5.7 Potholes and Patches (Flexible pavement)

Potholes are small (or big, based on severity) bowl-shaped depressions on the pavement surface. In general, potholes are formed in later stages of highly ravelled or cracked pavement surface resulting in bowl-shaped depressions. The patch is an area of the pavement which have been repaired or replaced by new material to remove a certain defect on the pavement. The patch is considered a defect no matter how well it is performing, and some roughness is associated with this type of distress.

Potholes were observed at few locations However, the same has been rectified with bituminous mix. Patchworks were observed at few locations of the Project Highway. The concessionaire has carried out the rectification work by generally milling and overlaying the stretch for such locations.

Figure 5.2: Flexible Pavement distress pictures

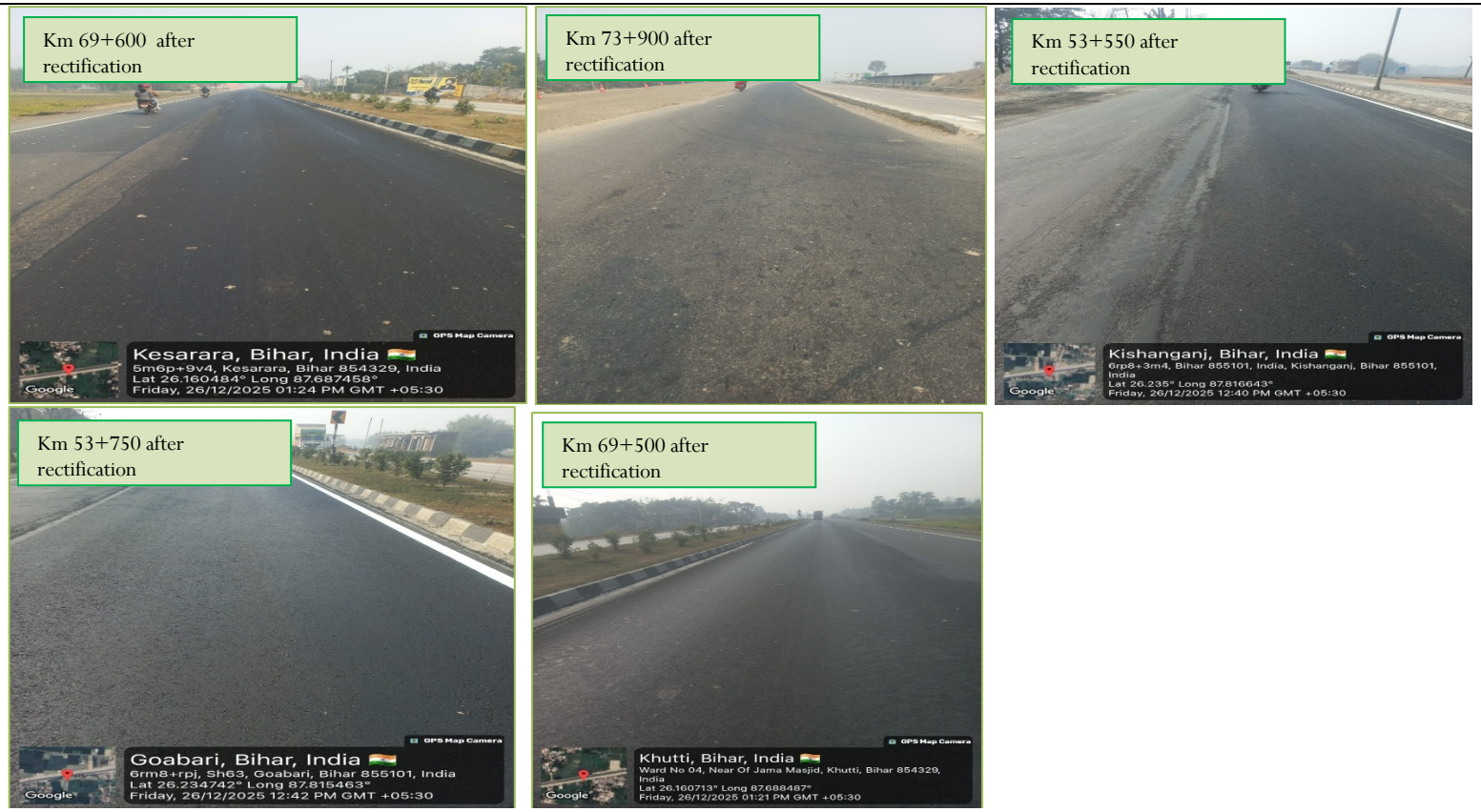


Figure 5.3: Flexible Pavement distress rectification pictures

Based on the observations made during visual condition survey the pavement condition is categorized into three categories as 'Good', 'Fair' and 'Poor'. The visual survey data and summary of the pavement condition of Project Highway is given below. The pavement visual condition data is represented in Annexure.

Table 5-5: Pavement Visual Condition Survey Results-Main Carriageway

Condition	LHS		RHS	
	Length (Km)	Length (%)	Length (Km)	Length (%)
Good	42846	95%	42785	95%

Condition	LHS		RHS	
	Length (Km)	Length (%)	Length (Km)	Length (%)
Fair	2137	5%	2198	5%
Poor	0	0%	0	0%

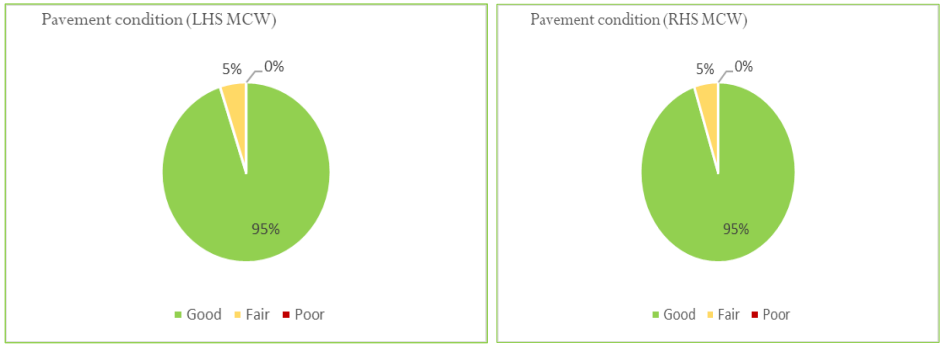


Figure 5.4: Pavement condition based on Visual condition survey-Main Carriageway

5.6 Pavement Roughness

Roughness is one of the important parameters for determining the functional characteristics of pavements. According to the American Society for Testing and Materials (ASTM), roughness is defined as "the deviations of a pavement surface from a true planar surface with characteristic dimensions that affect vehicle dynamics, ride quality, dynamic loads, and drainage, for example, longitudinal profile, transverse profile and cross-slope".

The roughness of road surfaces is measured using different equipment/techniques such as rod and level survey, dip stick profiler, profilographs, response type road roughness meters, and profiling devices.

In India, the roughness is measured using the fifth wheel bump integrator (developed by CRRI) and is reported as Unevenness Index (UI) in mm/km. In this report, roughness data is extracted from the NSV report, which measured using a profilometer on 5th August 2024, is incorporated, and a summary of the results is presented below.

Table 5-6: Summary of the Roughness values using NSV

From the MCW Roughness data, it can be observed that

Rutting is longitudinal depression or groove in the pavement along the wheel path. Rutting is categorized into three types and defined by the cause and layers in which rutting occurs. It can be characterized by two components of the original (initial) pavement profile change, which are direct consequences of permanent deformation such as uplift and downward deformation.

Rutting is measured for MCW by the NSV vehicle using a Profilometer on 05th Aug 2024, and data is summarized below:

- Around 100% of all lanes of the highway are in good condition in both directions

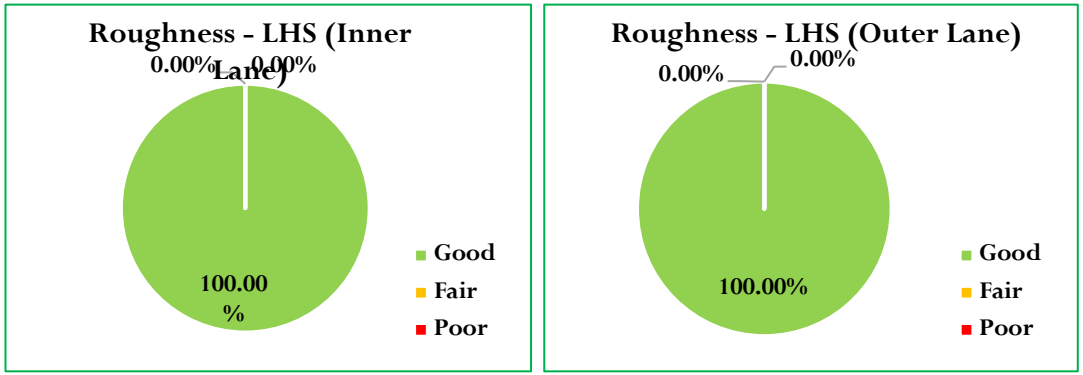


Figure 5.5: Pavement condition based on Roughness in LHS MCW

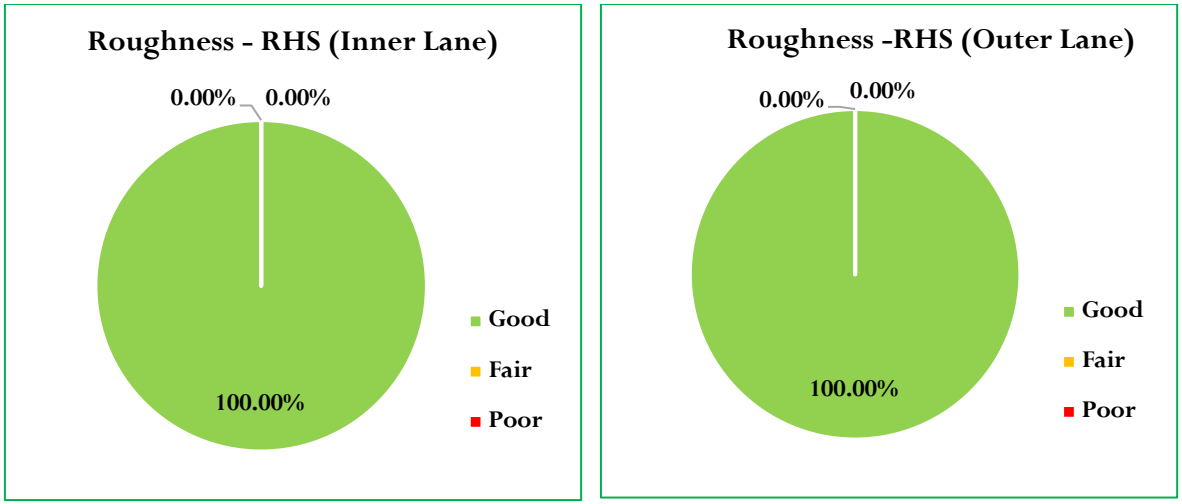


Figure 5.6: Pavement condition based on Roughness in RHS MCW

5.7 Pavement Rutting

Rutting is longitudinal depression or groove in the pavement along the wheel path. Rutting is categorized into three types and defined by the cause and layers in which rutting occurs. It can be characterized by two components of the original (initial) pavement profile change, which are direct consequences of permanent deformation such as uplift and downward deformation.

Rutting is measured for MCW by the NSV vehicle using a Profilometer on 05st Aug 2024, and data is summarized below:

Table 5-6: MCW Pavement Condition as per Rutting

Surface Condition	Rutting Criteria	LHS MCW				RHS MCW			
	Bituminous Surface	Inner (m)	Inner (%)	Outer (m)	Outer (%)	Inner (m)	Inner (%)	Outer (m)	Outer (%)
Good	0-4	25277	100.00%	25277	100.00%	2070	100.00%	2070	100.00%
Fair	4-10	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Poor	>10	0	0.00%	0	0.00%	0	0.00%	0	0.00%

From the MCW Rutting data, it can be observed that

- Around 100% of all lanes of the highway are in good condition in LHS flexible pavement section.

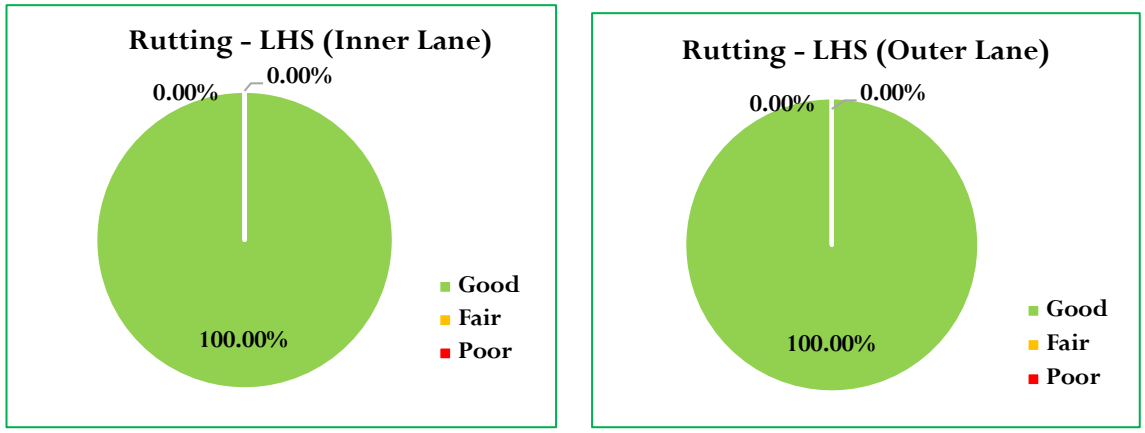


Figure 5.7: Pavement condition based on Rutting in LHS MCW

Chapter 6
ROAD SAFETY ARRANGMENTS

CHAPTER 6. ROAD SAFETY ASSESSMENT ALONG THE PROJECT STRETCH

6.1 Major Provision for Road safety

- Signboards, place identification sign boards, gantry boards have been provided throughout the project.
- Metal Beam Crash barriers have been provided at high embankment locations, approaches of major structures.
- Pedestrian Guard rails have been provided at Built-up locations.
- Solar blinkers have been provided at the median opening locations

Figure 6.1: General Photographs

6.2 General observation & Comments

- Several unauthorized median openings were observed at site. It is recommended to close such median openings.
- Solar Blinker was not found at some median opening location, to be provided at missing locations
- Spacer for MBCB was found missing at few locations.
- Hazard markers signboards to be installed at MBCB start location. Missing at some locations
- Hazard marker signboards to be installed at Bridges pedestrian railing.
- Hazard marker for extended portion of toll booth separator.

It was recommended that above deficiencies should be rectified under routine maintenance work. During our site visit in December 2025, It was observed that rectification of such items was carried out under routine maintenance.

Figure 6.2: Site Observation Photographs

Chapter 7
OPERATION & MAINTENANCE COST

CHAPTER 7. OPERATION AND MAINTENANCE COST

7.1 General

This Chapter presents details on the O&M expenditure to be incurred. The expenses are divided into four heads.

- Routine Maintenance Expenses to maintain the asset to the standards set forth in the Concession Agreement.
- Major/ Periodic Maintenance Expenses
- Operating Expenses

7.2 Estimation of Operation & Maintenance cost

The Routine Maintenance activities related to pavement include pothole repair, crack sealing, shoulder repair, drain maintenance, renewal of road markings, maintenance of cross drainage works etc. A before-hand estimate of repairs to be carried annually, must be determined to calculate the anticipated routine maintenance cost of the Project. Most of the annual routine maintenance activities are estimated based on experience and the past data of the Project as these activities varies Project to Project and there are no hard and fast rules to obtain exact quantity.

Routine maintenance cost for this Project is summarized in next section of Cost Estimates. The list of items considered in routine maintenance are summarized in the table below,

Table 7-1: List of Items Considered in Routine Maintenance Cost Estimate

S. No	Description of Item
1	**HIGHWAY**
	Flexible Pavement
	▪ Potholes ▪ Cracks ▪ Rutting/Depression/Settlement ▪ Ravelling/Stripping ▪ Re-surfacing
	Rigid Pavement

S. No	Description of Item
	▪ Slab Replacement ▪ Crack Sealing ▪ Ravelling/honeycombing, scaling, Polished Surface
	Hard/Earth shoulders, side slopes
	▪ Edge drop at shoulders ▪ Blading/reshaping to restore proper slopes and sides so as to maintain the standard formation width ▪ Rain cuts/gullies in slope ▪ Repairs of Stone Pitching/Turfing
2	**STRUCTURES**
	Superstructure of Bridges
	▪ Cracks ▪ Temporary Measures ▪ Permanent Measures ▪ Spalling / Scaling
	Foundation of Bridges
	▪ Scouring and /or Cavitation
	Piers, abutments, return walls and wing walls of bridges
	▪ Cracks and damages including settlement and tilting
	Joints in bridges
	▪ Loosening and malfunctioning of joints
	Other items relating to bridges
	▪ Gathering of dirt in bearings and joints or clogging of spouts, weep holes and vent-holes ▪ Damage or deterioration in parapets and handrails ▪ Rain-cuts or erosion of banks of the side slopes of approaches ▪ Damage to wearing coat ▪ Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds ▪ Growth of vegetation affecting the structure or obstructing the waterway

S. No	Description of Item
3	**ROAD FURNITURES, SIGNAGES AND PAVEMENT MARKING**
	▪ Repair to road signs -damage to shape or position; Poor visibility or loss of retro-reflectivity ▪ Replacing/installing delineators ▪ Replacing uninstalling delineators & all type of road sign ▪ Repairs MBCB ▪ Replacing of MBCB /New jersey crash barrier ▪ Repairs to Handrails /Pedestrian guard rails /flyover railings etc. ▪ Replace Handrails /Pedestrian guardrails/flyover railings etc. ▪ Fixing of distance measurement stone ▪ Hectometre stones ▪ Kilometre stones ▪ 5th Kilometre stones ▪ Boundary stones ▪ Painting ▪ Hectometre stones ▪ Pavement Marking ▪ Hot applied thermoplastic compound ▪ Painting kerb with synthetic enamel paint
4	**MISCELLANEOUS ITEMS**
	Street Lighting, Electrical systems repair and maintenance etc

The routine maintenance expenses to maintain the asset to the standards set forth in the Concession Agreement are given in the table below.

Table 7-2: Routine maintenance cost of the Project for the Base Year FY 26

S. No.	Particulars	Frequency	Cost excluding GST (Cr.)	Remarks
1	**Routine Maintenance Cost**	**Annual**		
	Highway		1.91	
	Structures		1.59	
	Road Furniture, Signage & Pavement marking		0.86	
	Project Facilities		0.32	
	Total RM cost		**4.68**	

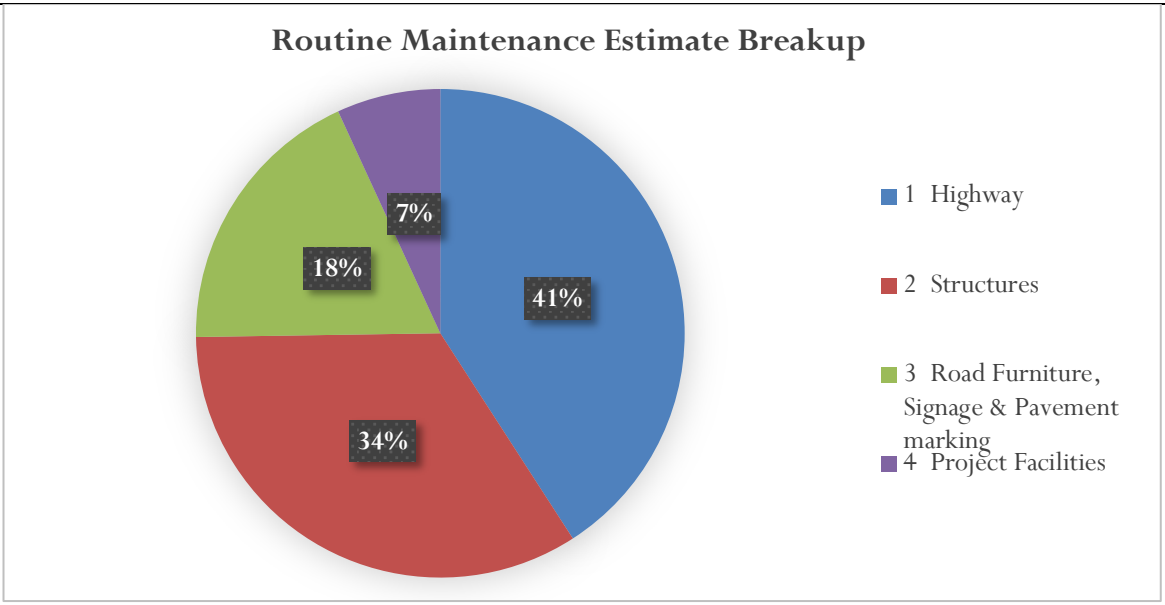


Figure 7.1: Breakup of Routine Maintenance

Table 7-3: Operational Expenditure of the Project for the Base Year FY 26

The calculation of operational expenditure for the base year FY 26 is given below:

S. no.	Description	Manpower	Annual Exp. (in Lakhs)
A.1	SPV staff and salaries	11	44.32
A.2	Tolling Operations Services_Outsourced	0	0.00
A.3	Security Services_Outsourced	0	0.00
A.4	Incident Management Services	18	71.65
A.5	RoW and Horticulture Works_ Manpower	0	69.51
A.6	Electricity and Diesel Charges	0	83.82
A.7	TMS/HTMS System Expenses	0	35.08
A.8	Office Operating Expenses	0	3.65
A.9	Vehicle Running Expenses	0	18.57
A.10	Professional Fee	0	14.06

S. no.	Description	Manpower	Annual Exp. (in Lakhs)
A.11	Community Development	0	5.00
A.12	Communication Expenses	0	1.20
A.13	Conveyance Expenses	0	2.40
A.14	Insurance Expenses	0	91.20
A.15	IE Fees	0	62.40
A.16	Contingency	5.00%	25.14
	Total (in Lakhs)		**528.0**
	Total (in Cr)		**5.28 (in Crs)**

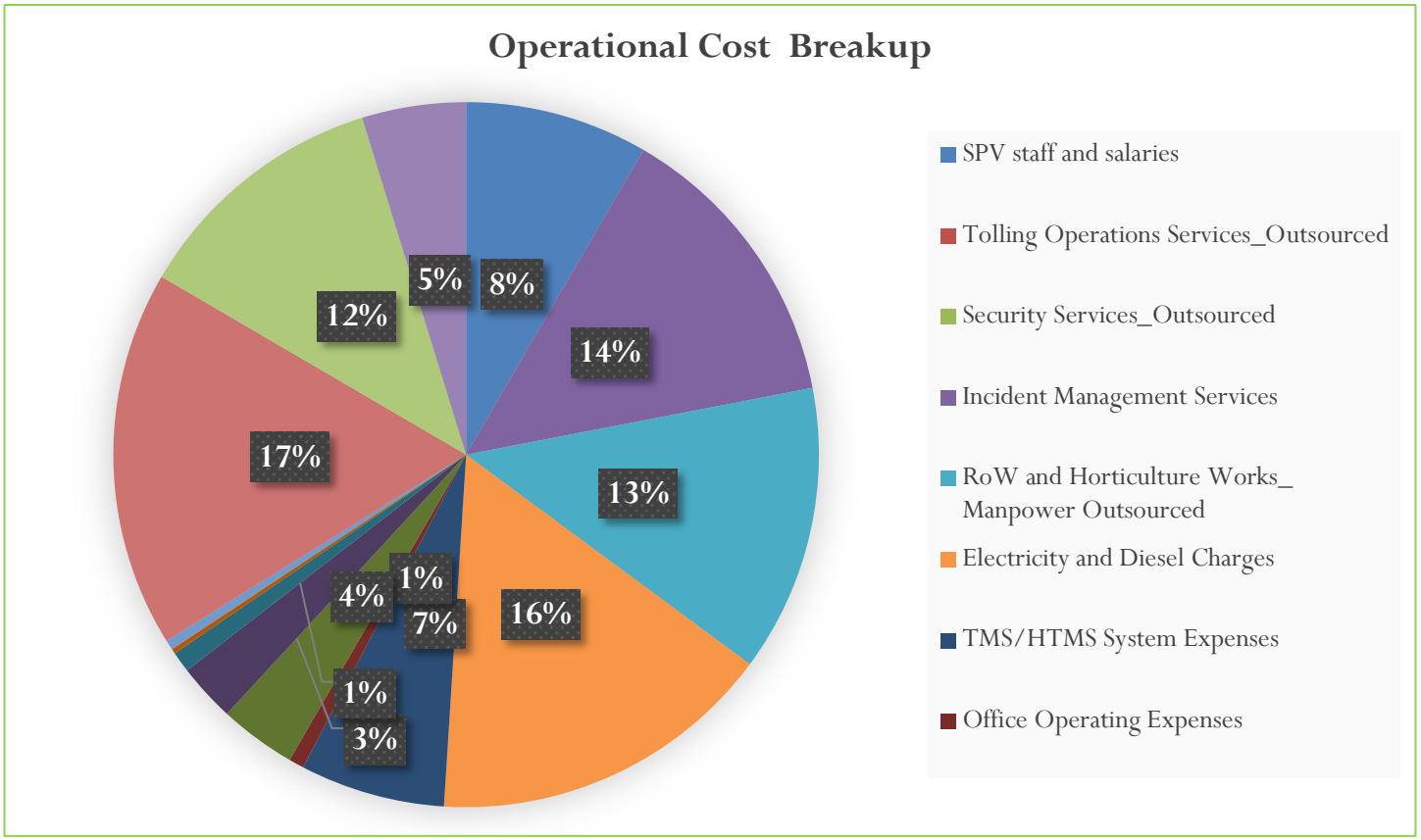


Figure 7.2: Breakup of Operation Cost

7.2.1 Major Maintenance Estimate

Cube Tech has considered 2 cycles for Major Maintenance. For main carriageway BC overlay of 40 mm is considered and for service road microsurfacing/overlay as per requirement is considered.

The estimate for Major Maintenance activities of the Project stretch is as detailed below:

Table 7-4: Major Maintenance Cost for Base Year

Major Maintenance- Base Year					
S. No.	**Description**	**Unit**	**Qty**	**Rate**	**Amount**
1	Slab replacement cost (PQC)	Cum	19972.04	8269	16,51,48,817
2	Joint seal defects, spalling and faulting of joints	Rm	56311.68	120	67,57,402
3	PQC Taxing	Sqm	139749.28	110	1,53,72,420
4	Road Marking Flexible	Sqm	15876.00	480	76,20,480
5	Road Marking Rigid	Sqm	21669.24	600	1,30,01,546
6	Kerb Painting	Sqm	36327.75	100	36,32,775
7	Tack coat	Sqm	286458.00	16	45,83,328
8	Bituminous Concrete	Cum	11458.32	13621	15,60,73,777
9	Microsurfacing	Sqm	118908.00	190	2,25,92,520
10	Earthen shoulder	Cum	58636.80	380	2,22,81,984
11	Miscellaneous and Contingencies (5%)	Ls	-	-	2,08,53,252
			Grand Total		**43,79,18,300**
			Grand Total (In Cr)		**43.79**

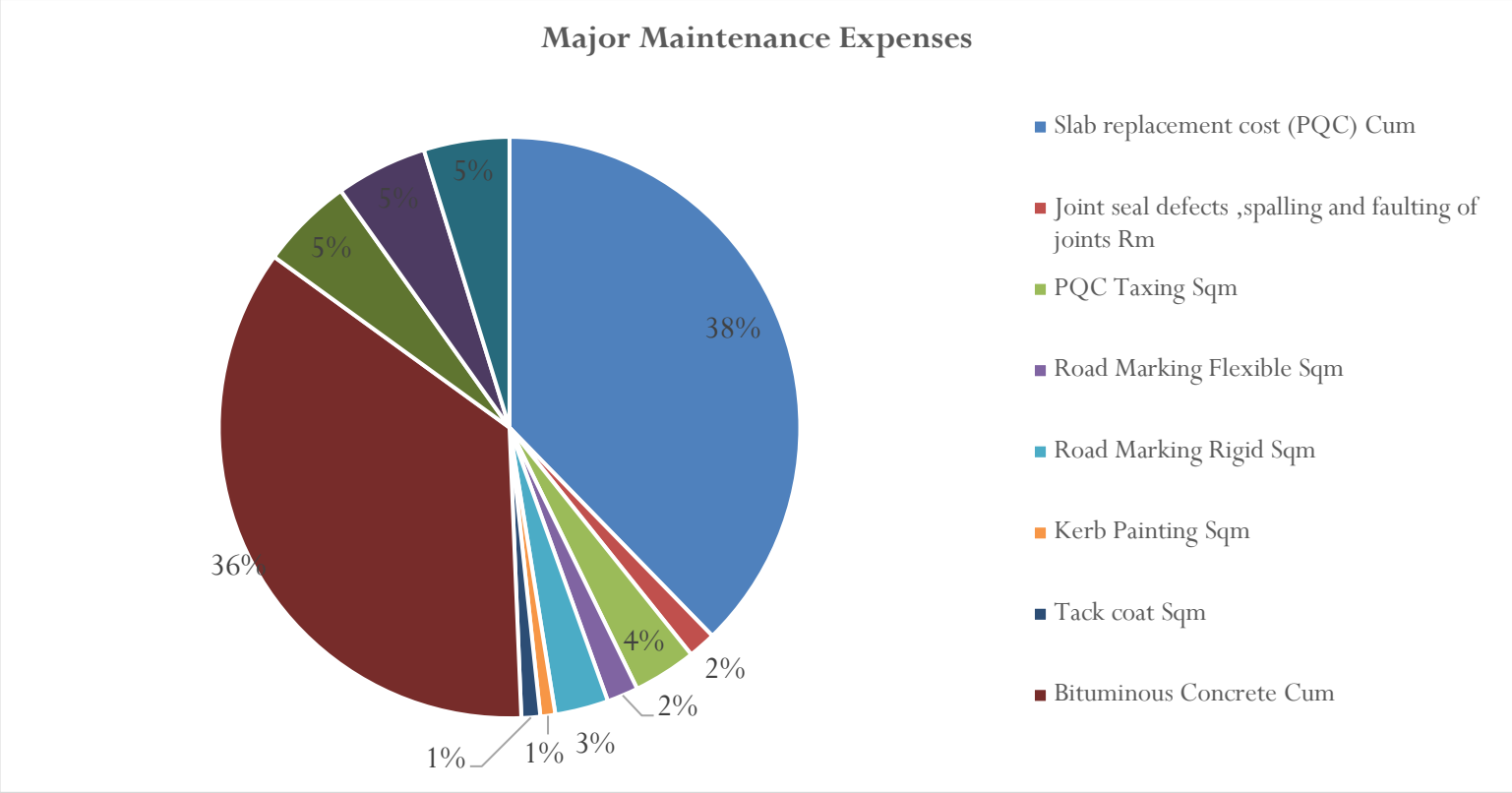


Figure 7.3: Breakup of Major Maintenance Expenses

7.2.2 Major Maintenance expenses during O&M period

As per the Cube Tech estimate, the total Major Maintenance expense including the escalation is Rs.131.84 cr.

7.2.3 Projections of O&M Expenses

The O&M expenses for the entire Concession Period is presented in this section .

The following escalations are considered:

Table 7-5:Escalation Factors

Items	Escalation
Operating Expenses	4.50%
Routine Maintenance	4.50%
Major Maintenance	4.50%

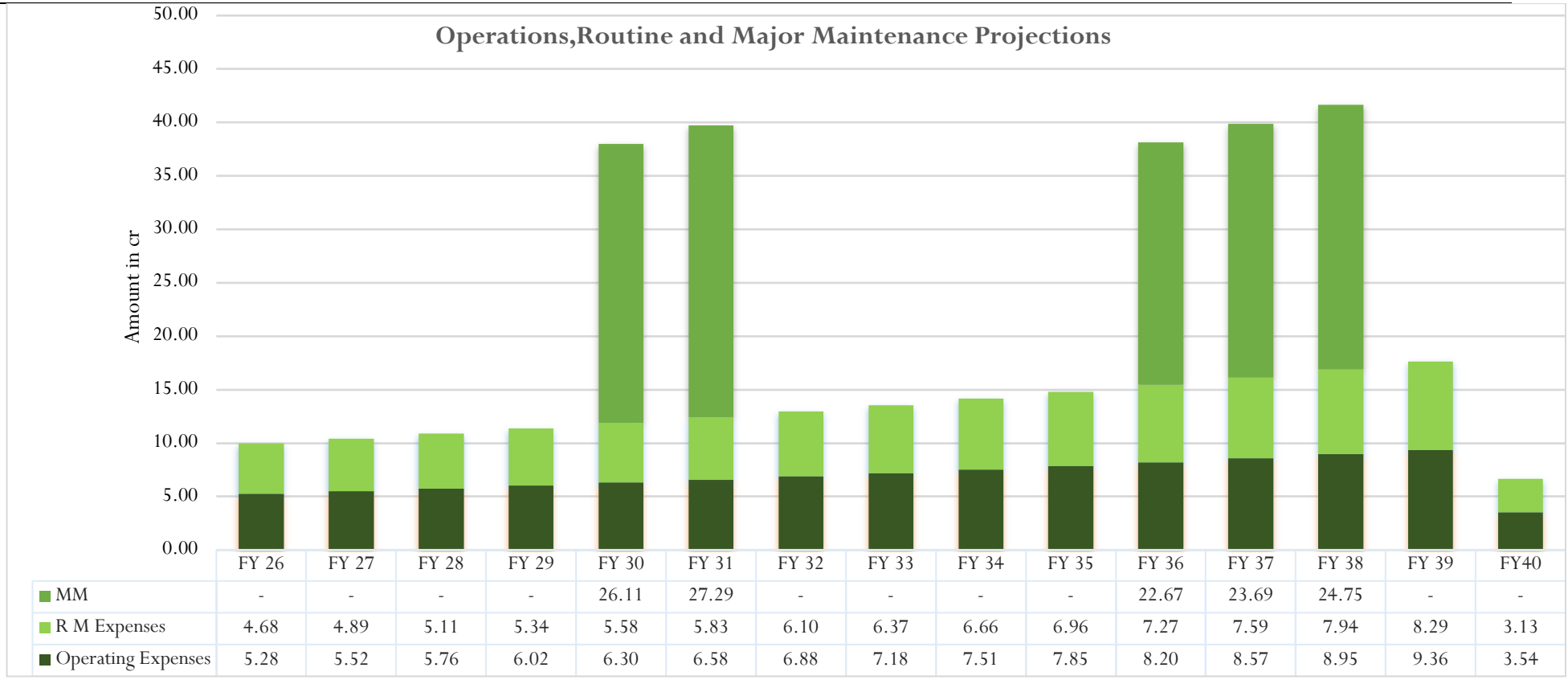
The Projections of total O& M expenses including Major Maintenance for 2 Cycles of the Project Company and CHT is given in the table below

Table 7-6: Projections of total O&M expenses of the Project during O&M period

Particulars	Total Expense (In Cr.)	Base-FY 26	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	FY35	FY36	FY37	FY38	FY39	FY40
Operating Expenses (CHT)	103.50	5.28	5.28	5.52	5.76	6.02	6.30	6.58	6.88	7.18	7.51	7.85	8.20	8.57	8.95	9.36	3.54
R M Expenses (CHT)	91.74	4.68	4.68	4.89	5.11	5.34	5.58	5.83	6.10	6.37	6.66	6.96	7.27	7.59	7.94	8.29	3.13
MM (CHT)	124.51	43.79					26.11	27.29					22.67	23.69	24.75		
O&M and MM (CHT)	**319.75**		9.96	10.41	10.87	11.36	37.99	39.70	12.98	13.55	14.17	14.81	38.14	39.85	41.64	17.65	6.67

All amounts are in crores and excluding of GST.

The graph for the total cost Projections of expenses during O&M period given by the Cube Highways Technologies is shown in the figure below.

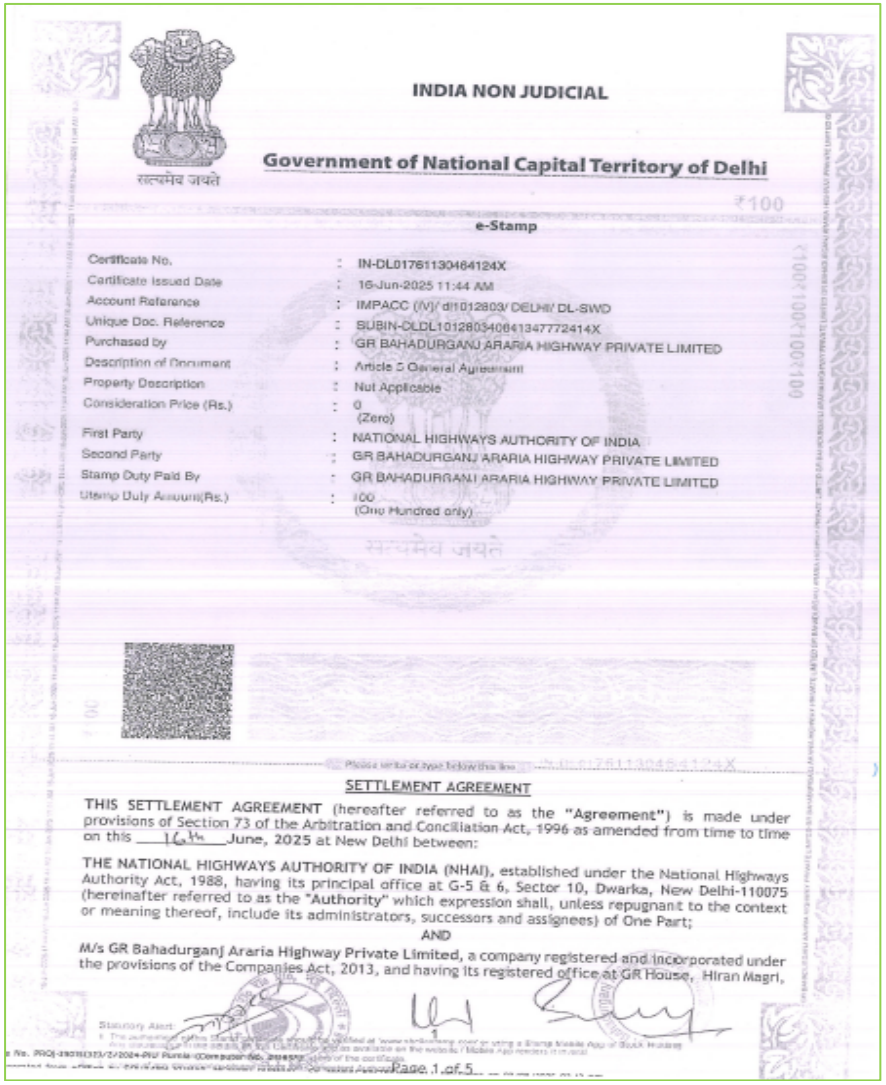


	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY40
MM	-	-	-	-	26.11	27.29	-	-	-	-	22.67	23.69	24.75	-	-
R M Expenses	4.68	4.89	5.11	5.34	5.58	5.83	6.10	6.37	6.66	6.96	7.27	7.59	7.94	8.29	3.13
Operating Expenses	5.28	5.52	5.76	6.02	6.30	6.58	6.88	7.18	7.51	7.85	8.20	8.57	8.95	9.36	3.54

Figure 7.4: O&M, RM and MM Expenses Projections

ANNEXURES

Annexure I Settlement Agreement between Authority and Concessionaire



INDIA NON JUDICIAL

Government of National Capital Territory of Delhi

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₹100

e-Stamp

Certificate No.	:	IN-DL017611304841 24X
Certificate Issued Date	:	16-Jun-2025 11:44 AM
Account Reference	:	IMPACC (IV)/ dl1012803/ DELHI/ DL-SWD
Unique Doc. Reference	:	SUBIN-DLDL1012803406413477724 14X
Purchased by	:	GR BAHADURGANJ ARARIA HIGHWAY PRIVATE LIMITED
Description of Document	:	Article 5 General Agreement
Property Description	:	Not Applicable
Consideration Price (Rs.)	:	0 (Zero)
First Party	:	NATIONAL HIGHWAYS AUTHORITY OF INDIA
Second Party	:	GR BAHADURGANJ ARARIA HIGHWAY PRIVATE LIMITED
Stamp Duty Paid By	:	GR BAHADURGANJ ARARIA HIGHWAY PRIVATE LIMITED
Stamp Duty Amount(Rs.)	:	100 (One Hundred only)

Please verify at www.shcilestamp.com

SETTLEMENT AGREEMENT

THIS SETTLEMENT AGREEMENT (hereafter referred to as the "Agreement") is made under provisions of Section 73 of the Arbitration and Conciliation Act, 1996 as amended from time to time on this 16th June, 2025 at New Delhi between:

THE NATIONAL HIGHWAYS AUTHORITY OF INDIA (NHAI), established under the National Highways Authority Act, 1988, having its principal office at G-5 & 6, Sector 10, Dwarka, New Delhi-110075 (hereinafter referred to as the "Authority" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assignees) of One Part;

AND

M/s GR Bahadurganj Araria Highway Private Limited, a company registered and incorporated under the provisions of the Companies Act, 2013, and having its registered office at GR House, Hiran Magri,

Statutory Alert:

Page 1 of 5

Sector-11, Udaipur, Rajasthan - 313002 (hereinafter referred to as the "Concessionaire", which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assignees) of the SECOND PART.

Each of the parties mentioned above are hereinafter collectively referred to as the "Parties" and individually as the "Party".

WHEREAS

A. The Parties had executed a Concession Agreement dated 17.04.2021 for execution of the works of "Four laning of Bahadurganj-Araria Section of NH-327E from Km. 49.000 to Km.93.983 (Package-II) on Hybrid Annuity Mode in the State of Bihar" (hereinafter referred to as the "Concession Agreement") at a Bid Project Cost of Rs.1081.70 Cr.

B. The Appointed Date of the Project was 10.01.2022 and the Scheduled Completion Date was 09.01.2024. The timeline for achieving project completion as per Schedule:

Sl. No.	Project Milestone	Occurrence day from the appointed date	Date of Mile Stone
1.	Project Milestone -I (20% of physical progress)	160th Day	18.06.2022
2.	Project Milestone -II (35% of physical progress)	360th Day	04.01.2023
3.	Project Milestone -III (75% of physical progress)	485th Day	09.05.2023
4.	Schedule Completion Date (100% of physical progress	730th Day	09.01.2024

C. A Settlement agreement dated 27.02.2024 was signed between the Parties under Section-73 of A&C Act for granting Extension of Time for 176 days for Milestone-III from 09.05.2023 to 01.11.2023 and 124 days for Scheduled Completion date from 09.01.2024 to 12.05.2024 with NIL claims of damages by either Party.

D. Concessionaire completed the balance works and provisional Completion for the project was issued w.e.f. 10.08.2024 with some punch list items as per clause 14.3 of CA. As per clause 14.4.1 of CA, punch list items were to be completed within 90 days of the date of issue of the provisional certificate. Accordingly, the Concessionaire completed some of punch list items within 90 days and some items could not be completed due to non-encumbrance free land available to the concessionaire as certified by the IE vide letter dated 19.11.2024.

E. Concessionaire vide letter dated 01.01.2025 requested IE for issuance of completion certificate as per provision of clause 14.2 of CA and undertook to complete the balance activities within the concession period as per CA in reasonable time as determined by IE after receipt of encumbrance free land by the Concessionaire. IE vide letter dated 31.01.2025 examined the request of Concessionaire and recommended for issuance of Completion Certificate considering delinking of balance punch list work having following details:

Descriptions of work	Location		Length in meters
	From chainage	To chainage	
Service road in LHS of VUP at Ch. 58+596 (Mouza: Mahadev digghi)	58+207	59+067	860 m
Drain in LHS of VUP at Ch. 58+596 (Mouza: Mahadev digghi)	58+070	59+200	1130 m
Drain in RHS (Mouza: Jokihaat)	77+340	77+560	220 m
Part of MCW in RHS (Mouza: Hardar) (Shoulder portion)	73+730	73+930	200 m

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3.2 In case encumbrance free land for the works mentioned above is not given by 31.12.2025, items at sl. No. (i), (ii) & (iii) mentioned in table above will deemed to be descoped as per clause 16.6 of CA. In this case, the Bid Project Cost shall be adjusted and the entitlements of the Concessionaire will be determined and adjusted as per the revised Bid Project Cost in accordance with provisions of Concession Agreement.

3.3 The Concessionaire will be eligible for Price adjustment for the delinked portion as per the provisions of the Concession Agreement. NHAI agreed not to impose any damages on this work if completed within the agreed time period. For any spillage and if the spillage is attributable to the Concessionaire, NHAI reserves the right to impose damages as per the provisions of the Concession Agreement including its right for termination.

3.4 Both the Parties agreed for issuance of Completion Certificate w.e.f. 01.01.2025 following the provisions of the Concession Agreement. The Concessionaire agreed not to claim any damages/loss related to issuance of Completion Certificate.

3.5 Each party hereby confirms that it does not have any residual, pending or any other claims, disputes or differences against each other in respect of the Concession Agreement and all claims, demands, disputes etc. of the Concessionaire including that arising out of or in relation to the Concession Agreement against the other parties namely Authority stands settled without any further recourse whatsoever as on date.

3.6 The terms and conditions of the Concession Agreement dated 17.04.2021 are modified to the above extent. It is clarified that all other terms and conditions of the Concession Agreement dated 17.04.2021, save and except the terms and condition expressed and agreed upon between the parties in this Settlement Agreement, shall remain unaltered / unchanged and remain binding on the parties. This Settlement Agreement is an integral part of the Concession Agreement dated 17.04.2021. In case of conflict between the provision of this Settlement Agreement and related provision of Concession Agreement, the provision of the Settlement Agreement will prevail.

4. PENDING PROCEEDINGS:

4.1 NHAI: NIL.

4.2 CONCESSIONAIRE: NIL

5. REPRESENTATION AND WARRANTIES:

5.1 Each Party hereby represents and warranties to the other that:

5.1.1 They are duly incorporated or created and are validly subsisting under their respective applicable laws including to take any action and execute any documents required by the terms hereof and this Agreement has been duly authorized, duly and validly executed and delivered and constitutes a legal, valid and binding obligation, enforceable in accordance with the terms hereof. The persons executing this Agreement hereby testify that they are duly empowered and authorized to execute this Agreement and to perform all its obligations in accordance with the terms herein;

5.1.2 The Agreement does not violate any of the provisions of its Concession documents;

5.1.3 The Agreement does not breach or result in a default of any agreement entered into by it or of any Concession Agreement, instrument or document to which it is a party or by which it or its assets are bound;

5.1.4 The Agreement does not breach or violate any order, writ, judgment, injunction or decree issued by any governmental official or court or entity and does not violate any law, rule, regulation, ordinance or code, its business or assets.

6. GOVERNING LAW AND JURISDICTION

This Agreement shall be construed and interpreted in accordance with and governed by the laws of India and the Courts at Delhi shall have the exclusive jurisdiction over matters arising out or in relation to this Agreement.

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7. ENTIRE AGREEMENT

This Agreement shall comprise the exclusive terms, conditions and agreements between the Parties. The invalidity of whole or part of any provision hereof shall not affect the validity of the other provisions. No amendment or modification hereto shall be valid and effective unless such modification or amendment is agreed to in writing by the Parties and duly executed by persons especially empowered in this behalf by the Parties.

8. RULE OF CONSTRUCTION

8.1 The Parties acknowledges and agree that they had the opportunity to have this Agreement reviewed by legal counsel of their choosing. Therefore any purported rule that ambiguities should be construed against the drafter shall not apply in connection with the interpretation and construction of this Agreement.

8.2 Each of the Parties have considered and found this Agreement to be in their respective interest and are executing this Agreement without any coercion or undue influence and after taking such legal advice as deemed necessary by each of them.

9. COSTS AND EXPENSES

Each Party shall bear its own costs and expenses incurred in connection with the negotiation and execution of this Agreement and all acts, deeds and things contemplated to be done under this Agreement.

10. ADDITIONAL COVENANTS

The Parties agree to cooperate fully and to take all actions which may be necessary or appropriate to give full force and effect to the terms and intent of this Agreement.

IN WITNESS WHEREOF THE PARTIES HAVE PUT THEIR RESPECTIVE HANDS HEREINTO ON THE DATE MENTIONED ABOVE.

For and on behalf of the
National Highways Authority of India

(Lokesh Singh Rajpurohit)
General Manager (T)-Bihar

WITNESS

1. VIKRANT THAKUR MANAGER (T) - BIHAR

2.

For and on behalf of
M/s GR Bahadurganj Araria Highway Private Limited

(Sunil Kumar Agarwal)
Authorized Representative

WITNESS

1.

2. (NAWAL KISHORE)

Authenticated by Sole Conciliator

I hereby authenticate this Settlement Agreement, as per provisions of Section 73(4) of the Arbitration and Conciliation Act, 1996, that the above settlement between the parties took place between them voluntarily and on their own volition, under my supervision and guidance. The said settlement is fair to both the parties and in larger public interest.

(Shri N.R.Dash) Conciliator

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5

Annexure II Recommendation of completion certificate by IE

CHAITANYA
PROJECTS CONSULTANCY LTD.
CORPORATE OFFICE:
101, 1st Floor, Tower No. 3, Okaya Centre,
Block-B, Sector-62, Noida - 201301, India
Phone: 0120-4128472 | 4110472
Email: ieho.argabihar@cpcmail.in

in JV with

K&J PROJECTS PVT. LTD.
REGIONAL PROJECT OFFICE:
302, 3rd Floor, PS Aviator, Atghara,
Chinar Park, (on Big Bazar Building)
Rajarhat, New Town, Kolkata- 700136
Tel. : (+91) - 98310 98220
Email : cpcpl.galgaliabihar@gmail.com

Ref-CPC/WB/IE-NH 327E/PKG-II/605 **Date: 28-02-2025**

THROUGH E-MAIL

To

The Project Director,
National Highway Authority of India,
Project Implementation Unit,
House of Sri Sikandar Singh, Sahibaan Hata, Mahananda Colony, Janta Chowk,
Purnia-854301.
Tel-06454-243756/244212.
E-mail - piupurnia@nhai.org

Sub Four laning of Bahadurganj Araria Section of NH-327E from Km. 49+000 to Km93+983 (Package-II) on Hybrid Annuity Mode in the State of Bihar –***Regarding Issuance of Completion Certificate-***

Ref.
01.Concessionaire's letter Ref-GBAHPL/BA-AR/2024/1658 Dated 26-11-2024
02.Concessionaire's letter Ref-GBAHPL/BA-AR/2024/1701 Dated 06-01-2025
03.IE's Letter Ref-CPC/AE-64/GBA-P2/2021/HO/CON/505/20668 Dated 08-10-2024
04.IE's Letter Ref-CPC/WB-IE-NH327E/PKG-II/576 Dated 19-11-2024
05.CPC/WB-IE-NH327E/PKG-II/596 Dated 31-01-2025.
06.Mail from Authority on dated 20-02-2025 at 18:26 Hrs
07.Mail to the concessionaire on dated 20-02-2025 at 19:01 Hrs
08.Concessionaire's letter Ref-GBAHPL/BA-AR/2024/1770 Dated 27-02-2025
09.Mail to the concessionaire on dated 28-02-2025 at 10:32 Hrs
10.Mail from the concessionaire on dated 28-02-2025 at 11:18 Hrs

Dear Sir,

The Authority has raised observations vide Ref (06) reference to Clause 14.4.1 of concession agreement, on issuance of Completion Certificate which is reviewed by the Independent Engineer under Ref (05).

In reply to Authority's and IE's mail under Ref (06 & 07) as above, the concessionaire has submitted their letter vide Ref (08) as above which has been reviewed by the Independent Engineer and the observations have been raised to the concessionaire through mail vide Ref (09)

Under Ref (10) as above, the concessionaire has submitted their compliances for the ***"Pending Punch List Items"*** (due to encumbrance free land not made available to the concessionaire as on date and which reasons of delays are attributable to the Authority) which have been reviewed by the Independent Engineer and the comments are as detailed below, in continuation to our earlier letter Ref - CPC/WB-IE-NH327E/PKG-II/596 Dated 31-01-2025.

A. Service Road from Ch-58+207 to Ch-59+067-860 mtr-(LHS) and Drain from Ch-58+070 to Ch-59+200-1130 mtr (LHS)

01. The construction Programme as submitted by the concessionaire for this subject work is 120 days (from resource mobilization to completion) on receipt of the encumbrance free land made available to the concessionaire by the Authority.
02. The tentative cost of this balance works as submitted by the concessionaire is as per SOR-2019-2020 of RCD-Bihar for Rs 2,74,73,047.00 for the estimated quantities of individual items involved in this subject work with respect to site condition. (which is inclusive of GST-12% and seigniorage etc.).
03. The above submittals are reviewed by the Independent Engineer and found in order.

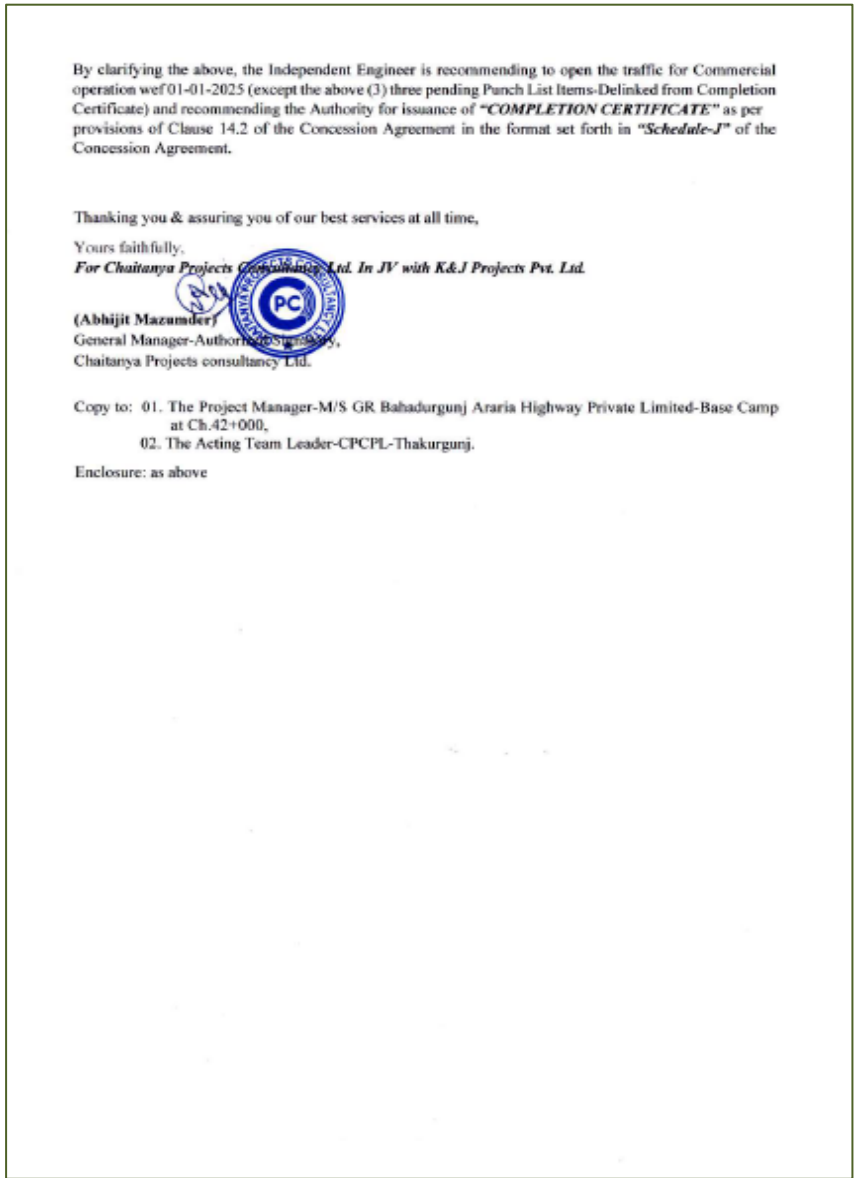
B. Drain from Ch-77+340 to Ch-77+560-220 mtr (RHS)

01. The construction Programme as submitted by the concessionaire for this subject work is 60 days (from resource mobilization to completion) on receipt of the encumbrance free land made available to the concessionaire by the Authority.
02. The tentative cost of this balance works as submitted by the concessionaire is as per SOR-2019-2020 of RCD-Bihar for Rs 21,47,910.00 for the estimated quantities of individual items involved in this subject work with respect to site condition. (which is inclusive of GST-12% and seigniorage etc.).
03. The above submittals are reviewed by the Independent Engineer and found in order.

C. MCW (ROW Available in partial width) from Ch-73+730 to Ch-73+930-200 mtr (RHS)

01. The construction Programme as submitted by the concessionaire for this subject work is 105 days (from resource mobilization to completion) on receipt of the encumbrance free land made available to the concessionaire by the Authority.
02. The tentative cost of this balance works as submitted by the concessionaire is as per SOR-2019-2020 of RCD-Bihar for Rs 21,47,910.00 for the estimated quantities of individual items involved in this subject work with respect to site condition. (which is inclusive of GST-12% and seigniorage etc.).
03. The above submittals are reviewed by the Independent Engineer and found in order.

From the above, the tentative cost of above pending 3 (three) Punch List items are Rs 4,09,24,396.00 (which are inclusive of GST-12% and seigniorage fees). The construction Programme submitted by the concessionaire is on individual item head basis, however, the independent engineer is of their opinion that, the all 3 (three) pending Punch List Item works can be completed in one go of 90 days by deploying adequate manpower and resources from the date of handing over of all the 3 (three) locations encumbrance free land made available to the concessionaire by the Authority. The undertaking for the date of completion for all the 3 (three) Pending Punch List Items may please be taken from the concessionaire on handing over of the locations.



By clarifying the above, the Independent Engineer is recommending to open the traffic for Commercial operation wef 01-01-2025 (except the above (3) three pending Punch List Items-Delinked from Completion Certificate) and recommending the Authority for issuance of ***"COMPLETION CERTIFICATE"*** as per provisions of Clause 14.2 of the Concession Agreement in the format set forth in ***"Schedule-J"*** of the Concession Agreement.

Thanking you & assuring you of our best services at all time,

Yours faithfully,
For Chaitanya Projects Consultancy Ltd. In JV with K&J Projects Pvt. Ltd.

(Abhijit Mazumder)
General Manager-Authorised Signatory,
Chaitanya Projects consultancy Ltd.

Copy to: 01. The Project Manager-M/S GR Bahadurgunj Araria Highway Private Limited-Base Camp at Ch.42+000,
02. The Acting Team Leader-CPCPL-Thakurgunj.

Enclosure: as above

Annexure III Issuance of Provisional certificate-I

CHAITANYA
PROJECTS CONSULTANCY (P) LTD.

In JV with

K&J PROJECTS PVT. LTD.

REGIONAL PROJECT OFFICE:
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Chinar Park, (on Big Bazar Building)
Rajarhat, New Town, Kolkata- 700136

Tel. : (+91) - 98319 86220
Email : cpspl.galgaliabihar@gmail.com

Ref No: CPC/AE-64/GBA-P2/2021/HO/CON/505/20668 **Date: 08.10.2024**

To,

The Authorised Signatory,
M/s GR Bahadurganj-Araria Highway Pvt. Ltd.,
GR House, Hiran Magri, Sector-11,
Udaipur-313 001 (Rajasthan)
Email: spv@grinfra.com

Sub: Four Laning of Bahadurganj-Araria Section from km 49+000 (Bahadurganj) to km 93+983 (Araria) of NH-327E in the state of Bihar under Bharatmala Pariyojana on HAM Mode– **Reg. Issuance of the Provisional Completion Certificate as per Clause 14.3 under Article 14.**

Ref.

1. Concessionaire's letter no:GGBHPL/BA-AR/2024/1519 dated 09.08.2024
2. Concessionaire's letter no:GGBHPL/BA-AR/2024/1516 dated 08.08.2024
3. Concessionaire's letter no:GGBHPL/BA-AR/2024/1514 dated 08.08.2024
4. Concessionaire's letter no:GGBHPL/BA-AR/2024/1513 dated 08.08.2024
5. Concessionaire's letter no:GGBHPL/BA-AR/2024/1437 dated 13.06.2024
6. IE Letter No:CPC/WB/IE-NH 327E-PKG-II/555 dated 10.08.2024
7. IE Letter No:CPC/IE-64/GBA-P2/2021/HO/CON/497/19401 dated 09.08.2024
8. Authority letter no:NHAI/STC/RO-PAT/PIU-PAT/Bah-Ara (NH 327E)/Safety/25 dated 09.08.2024
9. IE Letter No: CPC/WB/IE-NH 327E-PKG-II/556 dated 10.08.2024
10. Authority letter no: NHAI/PIU-Purnea/Bahad.-Araria/2020/Vol-VII/E 261857/D-1025 Dated 07-10-2024

Sir,

1. This is with reference to this office letter cited under Ref. (9) and Authority's letter cited under Ref. (10) above.

2. Pursuant to Article-14 of the Concession Agreement, M/s GR Bahadurganj Araria Highway Pvt. Ltd. "the Concessionaire" vide their letter at Ref. (4) dated 08.08.2024, have requested for Issuance of Provisional Certificate for the captioned project along with Punch List.

3. The Concessionaire's request has been examined by the Independent Engineer and recommended the Issuance of Provisional Certificate as per Clause 14.3 of Concession Agreement for the captioned project to be issued w.e.f. 10.08.2024 for approval of Competent Authority under Clause 14.3 and Clause 13 of terms of reference of Independent Engineer Agreement vide this office letter cited under Ref. (9) above.

4. Authority vide letter cited under Ref. (10) above has conveyed the concurrence of Competent Authority for Issuance of "Provisional Certificate" as per Clause 14.3 of Concession Agreement for the subject project w.e.f. 10.08.2024.

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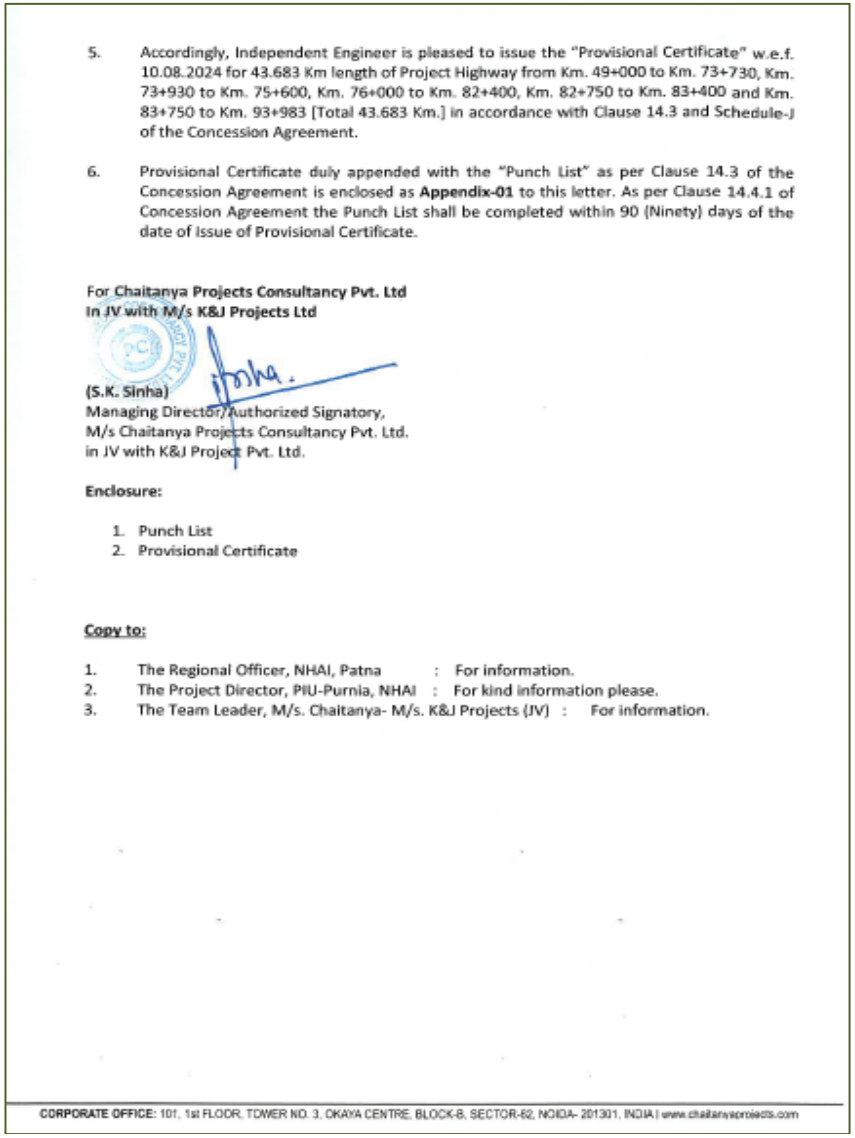

5. Accordingly, Independent Engineer is pleased to issue the "Provisional Certificate" w.e.f. 10.08.2024 for 43.683 Km length of Project Highway from Km. 49+000 to Km. 73+730, Km. 73+930 to Km. 75+600, Km. 76+000 to Km. 82+400, Km. 82+750 to Km. 83+400 and Km. 83+750 to Km. 93+983 [Total 43.683 Km.] in accordance with Clause 14.3 and Schedule-J of the Concession Agreement.

6. Provisional Certificate duly appended with the "Punch List" as per Clause 14.3 of the Concession Agreement is enclosed as **Appendix-01** to this letter. As per Clause 14.4.1 of Concession Agreement the Punch List shall be completed within 90 (Ninety) days of the date of Issue of Provisional Certificate.

For Chaitanya Projects Consultancy Pvt. Ltd
In JV with M/s K&J Projects Ltd

(S.K. Sinha)
Managing Director/Authorized Signatory,
M/s Chaitanya Projects Consultancy Pvt. Ltd.
in JV with K&J Project Pvt. Ltd.

Enclosure:

1. Punch List
2. Provisional Certificate

Copy to:

1. The Regional Officer, NHAI, Patna : For information.
2. The Project Director, PIU-Purnia, NHAI : For kind information please.
3. The Team Leader, M/s. Chaitanya- M/s. K&J Projects (JV) : For information.

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SCHEDULE - J

(See Clause 14.3)

PROVISIONAL CERTIFICATE

1. I, S. K. SINHA , M/s Chaitanya Projects Consultancy Pvt. Ltd in JV with K & J Projects Pvt. Ltd. acting as Independent Engineer, under and in accordance with the Concession Agreement dated 17th April 2021, for development and operation of the Construction of **Four-Laning of Bahadurganj-Araria section of NH-327E from Km.49+000 to Km.93+983 (Package-II) in the State of Bihar (the "Project")** on design, build, operate and transfer (the " Hybrid Annuity") basis, through M/s GR Bahadurganj Araria Highway Private Limited, hereby certify that the Tests specified in Article 14 and Schedule-I of the Agreement have been undertaken for the Project/sections from Km. 49+000 to Km.73+730, Km.73+930 to Km.75+600, Km.76+000 to Km.82+400, Km.82+750 to Km.83+400 and Km.83+750 to Km.93+983 [Total 43.683 Km.] of the Project to determine compliance thereof with the provisions of the Agreement.

2. Construction Works forming part of the Project/section of the Project that were found to be incomplete and/or deficient have been specified in the Punch List appended hereto, and the Concessionaire has agreed and accepted that it shall complete and/or rectify all such works in the time and manner set forth in the Agreement. Some of the incomplete works have been delayed as a result of reasons attributable to the Authority or due to Force Majeure and the Provisional Certificate cannot be withheld on this account. I am satisfied that having regard to the nature and extent of such incomplete works, it would not be prudent to withhold commercial operation of the Project sections from Km 49+000 to Km.73+730, Km.73+930 to Km.75+600, Km.76+000 to Km.82+400, Km.82+750 to Km.83+400 and Km.83+750 to Km.93+983 [Total 43.683 Km.] of the Project, pending completion thereof.

3. In view of the foregoing, I am satisfied that the Project/section of the Project can be safely and reliably placed in commercial service of the Users thereof, and in terms of the Agreement, the Project/sections from Km. 49+000 to Km.73+730, Km.73+930 to Km.75+600, Km.76+000 to Km.82+400, Km.82+750 to Km.83+400 and Km.83+750 to Km.93+983 [Total 43.683 Km.] of the Project is hereby provisionally declared fit for entry into commercial operation on this the 10th day of August 2024.

ACCEPTED, SIGNED, SEALED AND DELIVERED
For and on behalf of
CONCESSIONAIRE by:

(Sunil Agarwal)
Authorized Signatory
M/s GR Bahadurganj Araria Highway Private Limited

SIGNED, SEALED AND DELIVERED
For and on behalf of
INDEPENDENT ENGINEER by:

(S.K. Sinha)
Managing Director/ Authorized Signatory, M/s Chaitanya Projects Consultancy Pvt. Ltd in JV with K & J Projects Pvt. Ltd.

Annexure IV: Pavement Visual Condition Survey data for MCW

Chainage		LHS			Chainage		RHS		
From	To	Type of pavement	Condition	Remarks	From	To	Type of pavement	Condition	Remarks
49.000	49.800	Rigid	Good	2 corner breaks	49.000	50.000	Rigid	Good	No distresses
49.800	50.230	Flexible	Good	50m patchworks	50.000	51.000	Rigid	Good	No distresses
50.230	51.000	Rigid	Good	No distresses	51.000	52.000	Rigid	Good	No distresses
51.000	52.020	Rigid	Good	30m ravelling	52.000	53.000	Rigid	Good	No distresses
52.020	53.000	Flexible	Good	20m patchworks on major bridge	53.000	54.000	Rigid	Good	No distresses
53.000	54.242	Flexible	Fair	100m rutting, 300m alligator cracks sealed	54.000	55.000	Rigid	Good	No distresses
54.242	54.970	Rigid	Good	No distresses	55.000	56.000	Rigid	Good	Popouts at 1 location
54.970	56.000	Flexible	Good	10m patchworks	56.000	57.000	Rigid	Good	No distresses
56.000	57.000	Flexible	Good	No distresses	57.000	58.000	Rigid	Good	20m Ravelling
57.000	57.895	Flexible	Fair	200m patchworks	58.000	59.000	Rigid	Good	No distresses
57.895	59.325	Rigid	Good	10m longitudinal cracks	59.000	60.000	Rigid	Good	No distresses
59.325	60.000	Flexible	Good	No distresses	60.000	61.000	Rigid	Good	No distresses
60.000	61.000	Flexible	Good	10m patchworks	61.000	62.000	Rigid	Good	No distresses
61.000	62.390	Flexible	Good	No distresses	62.000	63.000	Rigid	Good	No distresses
62.390	62.995	Rigid	Good	1 pothole patchwork and 1 transverse crack	63.000	64.000	Rigid	Good	No distresses
62.995	64.013	Flexible	Good	20m patchworks	64.000	65.000	Rigid	Good	No distresses
64.013	64.398	Rigid	Good	No distresses	65.000	66.000	Rigid	Good	No distresses
64.398	65.000	Flexible	Good	No distresses	66.000	67.000	Rigid	Good	No distresses
65.000	66.000	Flexible	Good	No distresses	67.000	67.930	Rigid	Good	No distresses
66.000	67.350	Flexible	Good	No distresses	67.930	69.000	Flexible	Fair	Overlay
67.350	68.000	Rigid	Good	No distresses	69.000	70.128	Flexible	Fair	Overlay
68.000	69.000	Rigid	Good	No distresses	70.128	71.000	Rigid	Good	No distresses
69.000	70.533	Rigid	Good	No distresses	71.000	72.000	Rigid	Good	No distresses

Chainage		LHS			Chainage		RHS		
From	To	Type of pavement	Condition	Remarks	From	To	Type of pavement	Condition	Remarks
70.533	71.000	Flexible	Good	No distresses	72.000	73.000	Rigid	Good	No distresses
71.000	72.230	Flexible	Good	No distresses	73.000	73.730	Rigid	Good	No distresses
72.230	72.778	Rigid	Good	No distresses	73.730	73.930	Flexible	Good	30m patchwork ravelling, LA issue
72.778	73.448	Flexible	Good	No distresses	73.930	75.000	Rigid	Good	No distresses
73.448	74.128	Rigid	Good	No distresses	75.000	76.000	Rigid	Good	No distresses
74.128	75.078	Flexible	Good	No distresses	76.000	77.000	Rigid	Good	No distresses
75.078	76.000	Rigid	Good	No distresses	77.000	78.000	Rigid	Good	No distresses
76.000	77.283	Rigid	Good	20m patchworks	78.000	79.000	Rigid	Good	No distresses
77.283	77.633	Flexible	Good	No distresses	79.000	80.000	Rigid	Good	No distresses
77.633	78.263	Rigid	Good	No distresses	80.000	81.000	Rigid	Good	No distresses
78.263	79.145	Flexible	Good	No distresses	81.000	82.000	Rigid	Good	No distresses
79.145	79.795	Rigid	Good	No distresses	82.000	83.000	Rigid	Good	No distresses
79.795	80.178	Flexible	Good	No distresses	83.000	84.000	Rigid	Good	No distresses
80.178	80.543	Rigid	Good	No distresses	84.000	85.000	Rigid	Good	No distresses
80.543	82.000	Flexible	Good	No distresses	85.000	86.000	Rigid	Good	No distresses
82.000	82.845	Flexible	Good	No distresses	86.000	87.000	Rigid	Good	No distresses
82.845	83.589	Rigid	Good	No distresses	87.000	88.000	Rigid	Good	No distresses
83.589	84.000	Flexible	Good	100m patchworks	88.000	89.000	Rigid	Good	No distresses
84.000	85.000	Flexible	Good	No distresses	89.000	90.000	Rigid	Good	No distresses
85.000	86.145	Flexible	Good	No distresses	90.000	91.000	Rigid	Good	No distresses
86.145	87.000	Rigid	Good	No distresses	91.000	92.000	Rigid	Good	No distresses
87.000	88.328	Rigid	Good	No distresses	92.000	93.000	Rigid	Good	No distresses
88.328	88.922	Flexible	Good	No distresses	93.000	93.983	Rigid	Good	No distresses
88.922	89.130	Rigid	Good	No distresses					
89.130	90.130	Flexible	Good	No distresses					
90.130	91.130	Flexible	Good	20m patchworks					

Chainage		LHS			Chainage		RHS		
From	To	Type of pavement	Condition	Remarks	From	To	Type of pavement	Condition	Remarks
91.130	92.580	Flexible	Good	No distresses					
92.580	93.983	Rigid	Good	No distresses					

Technical Due Diligence for Construction of Four Lane Bilaspur – Urga section of NH-130A from design Ch. 0+000 to Ch. 70+200, (from NH-49 near Dheka village to Bhaisma village) under Bharatmala Pariyojana (Lot-3/ Chhattisgarh/Package-1, Raipur – Dhanbad economic corridor) in the State of Chhattisgarh on HAM Mode.

Technical Due Diligence Report (Private and Confidential)

February 2026

Submitted to:

M/s Indus Infra Trust

Submitted by:

Cube Highways Technologies Private Limited

CUBETECH
Cube Highways Technologies Pvt. Ltd.

Technical Due Diligence for Construction of Four Lane Bilaspur – Urga section of NH-130A from design Ch. 0+000 to Ch. 70+200, (from NH-49 near Dheka village to Bhaisma village) under Bharatmala Pariyojana (Lot-3/ Chhattisgarh/Package-1, Raipur – Dhanbad economic corridor) in the State of Chhattisgarh on HAM Mode.

Documents Submittal and Contents Amendment Record

S. No.	Revision	Description	Date	Sign
1	R0	Technical Due Diligence Report	February 2026	

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ABBREVIATIONS

Abbreviation	Description
ASTM	American Society for testing and Materials
AVC	Automatic Vehicle Classifier
BBD	Benkelman Beam Deflection
BC	Bituminous Concrete
BOT	Built, Operate and Transfer
CA	Concession Agreement
CC Drain	Cement Concrete Drains
COD	Commercial Operation Date
CRRI	Central Road Research Institute
CBR	California Bearing Ratio test
DBFOT	Design, Build, Finance, Operate and Transfer
ETC	Electronic Toll Collection
FWD	Falling Weight Deflectometer
GOI	Government of India
HPC	Hume Pipe Culvert
IE	Independent Engineer
IRC	Indian Roads Congress
LA	Land Acquisition
LHS	Left Hand Side
LOA	Letter of Acceptance
MBCB	Metal Beam Crash Barrier
MJB	Major Bridge
MNB	Minor Bridge
MOST	Ministry of Surface Transport
MPR	Monthly Progress Report

Abbreviation	Description
NH	National Highway
NHAI	National Highway Authority of India
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
OHLS	Overhead Lane Signal
OHM	Object Hazard Marker
PCOD	Provisional Commercial Operation Date
POS	Point of Sale
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road/Rail Over Bridge
ROW	Right of Way
RPV	Route Petrol Vehicle
RUB	Road/Rail Under Bridge
SH	State Highway
SPV	Special Purpose Vehicle
SR	Service Road
SSWIM	Slow Speed Weigh in Motion
SWB	Static Weigh Bridge
TC	Toll Collector
Team	Team of Cube Highways Technologies Pvt Ltd.
TMS	Toll Management System
WIM	Weigh in Motion
WMM	Wet Mix Macadam

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. Introduction

The National Highway Authority of India, New Delhi (the "Authority") is engaged in the development of National Highways and as part of this endeavour, the Authority has decided to undertake development and operation/maintenance of the Construction of Four Lane Bilaspur – Urga section of NH-130A from design Ch. 0+000 to Ch. 70+200, (from NH-49 near Dheka village to Bhaisma village) under Bharatmala Pariyojana (Lot-3/ Chhattisgarh/Package-1, Raipur – Dhanbad economic corridor) in the State of Chhattisgarh on HAM Mode.

National Highways Authority of India (Authority) and M/s M/s G R Bilaspur Urga Highway Private Limited (the Concessionaire) entered into a Concession Agreement on 21st June 2021 for execution of the Project on Hybrid Annuity Mode. Subsequently, the Appointed Date was declared on 25th March 2022, the Authority and M/s GR Bilaspur Urga Highway Private Limited (the Concessionaire) entered into a Concession Agreement on 21st June 2021 for execution of the Project on Hybrid Annuity Mode. Subsequently, the Appointed Date was for the Project was declared by the Authority as 25th March 2022 vide Authority's letter no. NHAI/11012/CG/NH-130A/Bilaspur-Urga/Comp. No. 2341 dated 31.03.2022 and the Scheduled Completion Date is reckoned as 730th days from Appointed Date i.e., 23rd March 2024.

The Scope of the Project during the Concession Period includes construction of the Project on the Site set forth in Schedule-A and as specified in Schedule-B together with provision of Project Facilities as specified in Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D, together with the operation and maintenance of the Project in accordance with the provision of Concession Agreement.

The Scope of Works is a section of National Highway NH-130A (Bilaspur-Urga)commencing at junction of Bilaspur Junction NH-49 with NH-149B near Urga/Kobra and ending at near Urga/Kobra, passing through existing NH-49 and greenfield area (in stretches of realignment and bypasses) with Four-lane highway and construction of new flexible and rigid pavement for carriageway with entry & exit ramps, new construction of major and minor bridges, culverts, drains, underpasses etc. as per Schedule B of the Concession Agreement.

2. Objective of Study

The main objective of this assignment is to assess the physical condition of all existing features of the selected National Highway and review of Concession agreement, technical and maintenance schedules for the major maintenance strategy. Physical condition survey of Project Stretch includes data collection and pavement condition analysis.

MAIN VOLUME

(Technical Due Diligence for Construction of Four Lane Bilaspur – Urga section of NH-130A from design Ch. 0+000 to Ch. 70+200, (from NH-49 near Dheka village to Bhaisma village) under Bharatmala Pariyojana (Lot-3/ Chhattisgarh/Package-1, Raipur – Dhanbad economic corridor) in the State of Chhattisgarh on HAM Mode.)

Chapter 1
INTRODUCTION

CHAPTER 1. INTRODUCTION

1.1 Background

Infrastructure Sector is a key driver for the Indian economy. In 2014, the Government of India have introduced a new investment vehicle which allows investors to participate in the growth story of infrastructure sector, named Infrastructure Investment Trusts (hereinafter referred to as 'InvITs'). InvITs are instruments on pattern of mutual funds and are designed to pool in money from a number of investors to invest in assets that give cash flow over a period of time. The InvITs are regulated by the SEBI (Infrastructure Investment Trusts) Regulations Act, 2014.

In highway sector, InvIT as an instrument provide greater flexibility to investors and is expected to attract patient capitals (for say, 20-30 years) to the market, as these investors are averse to construction risks and are interested in investment in assets which provide long-term stable returns.

InvIT shall have a (i) Trustee, (ii) Sponsor(s) (iii) Investment Manager and (iv) Project Manager, Sponsor and the Project Manager are the same entity i.e. Aadharshila Infratech Private Limited. Indus Infra Trust has appointed M/s Cube Highways Technologies Private Limited as Technical Consultant for carrying out technical study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, Cube Highways Technologies undertook the site visits to carry out site inspection. The report is based on findings during this period.

Indus Infra Trust ("Trust") was settled in Gurugram, India pursuant to the Trust Deed as a contributory irrevocable trust in accordance with the Indian Trusts Act, 1882. The Trust is an Infrastructure Investment Trust (InvIT) established for making investments in special purpose vehicles as defined under Regulation 2(1) (zy) of the InvIT Regulations, or infrastructure projects or securities of Indian companies engaged in the infrastructure sector, as may be permitted in terms of Regulation 18(5) of the InvIT Regulations. IDBI Trusteeship Services Limited is the Trustee to the Trust.

Table 1-1: Potfolio Assets of of Indus Infra Trust

S. No.	Name of the Project
1.	GR Phagwara Expressway Limited
2.	Porbandar Dwarka Expressway Private Limited
3.	Varanasi Sangam Expressway Private limited
4	GR Akkalkot Solapur Highway Private limited
5	GR Sangli Solapur Highway Private Limited
6	GR Gundugolanu Devarapalli Highway Private Ltd

S. No.	Name of the Project
7	GR Dwarka Dewariya Highway Private Limited
8	GR Aligarh Kanpur Highway Private Limited
9	GR Galgalia Bahadurganj Highway Private Limited
10	GR Bahadurganj Araria Highway Private Limited

1.2 Asset Background

The Government of India has envisaged creating an excellent infrastructure facility, to boost the economic development in the country, for which National Highways Authority of India (NHAI) plays a key role. NHAI has been entrusted to implement the development of some of the stretches of National Highways under National Highway Development Program on HAM (Hybrid Annuity Mode) basis.

As part of this endeavour Authority has taken up the development and operation/maintenance of the construction of , the Authority has decided to undertake development and operation/maintenance of the Construction of Four Lane Bilaspur – Urga section of NH-130A from design Ch. 0+000 to Ch. 70+200, (from NH-49 near Dheka village to Bhaisma village) under Bharatmala Pariyojana (Lot-3/ Chhattisgarh/Package-1, Raipur – Dhanbad economic corridor) in the State of Chhattisgarh on HAM Mode.

The Hybrid Annuity Model (HAM) is a mix of BOT Annuity and EPC models. As per the design, the Government will contribute up-to 40% of the Project cost in five equal instalments of 8% each during the construction period of 730 days with the provisions of Clause 23.4 of CA. The remaining payment will be made based on the assets created and the performance of the developer. Here, Hybrid Annuity means the first 40% payment is made as fixed amount in five equal instalments whereas the remaining 60% is paid as variable annuity amount after the completion of the Project. As the Government pays only 40%, during the construction stage, the developer has to raise the remaining 60% in the form of equity or loans.

NHAI had invited proposals from bidders for qualification and prescribed the commercial terms and conditions for selection of a successful bidder under its Request for Proposal (RFP) for Design, Engineering, Finance, Construction, Improvement, Operation and Maintenance of the above referred section of NH- 49.

After evaluation of the bids received, M/s GR Infraprojects limited has emerged as successful bidder; the Authority had accepted the bid of the selected bidder and issued its Letter of Award (LOA), NHAI, New Delhi Letter no NHAI/11012/CG/NH-130A/Bilaspur-Urga/EC/BM/2019/Comp. No. 2341 dated 01st Feb 2021 for the Project

M/s GR Infra projects Limited has formed an SPV, namely, M/s GR Bilaspur-Urga highway private limited (GBUHPL- the "Concessionaire"). The Concession Agreement (CA) for the Project was signed between GBUHPL and NHAI on 21st June 2021.

As the Concessionaire of this Project, GBUHPL will develop the Project and maintain the facilities after completion of construction. GBUHPL will recover its costs through Annuity Payments made during Concession Period of 15 years (annuity payments during construction as well as in operations period), including construction period of 730 days from the appointed date.

Cube Highways Technologies Pvt Ltd (Cube Tech) has been appointed as Technical Due Diligence consultant for the Project stretch. Apropos the above, Cube Tech has carried out a series of investigations as a part of Technical Due Diligence.

The main objective of the consultancy service is to carry out Technical Due Diligence Study for the Project covering review of; contractual documents and reports, condition of existing pavement and structures, evaluating material properties, toll management system, estimating O&M requirements, formulating maintenance strategy for the remaining Concession period.

1.3 Report Structure

The report contains ten chapters, including this Chapter on Introduction.

Chapter 2 Project Overview

Chapter 3 Technical studies

Chapter 4 Asset Status

Chapter 5 Condition Assessment of Existing Pavement and Maintenance Requirement

Chapter 6 Review of Structures

Chapter 7 General Safety Concerns along the Project stretch and Improvements

Chapter 8 Change of scope

Chapter 9 Operation and Maintenance Cost

Chapter 10 Overall Review

Chapter 2
PROJECT OVERVIEW

CHAPTER 2. PROJECT OVERVIEW

2.1 Location

The Project stretch starts at km 0.000 and ends at km 70.200 of NH-130A in the State of Chhattisgarh under "HAM" basis.

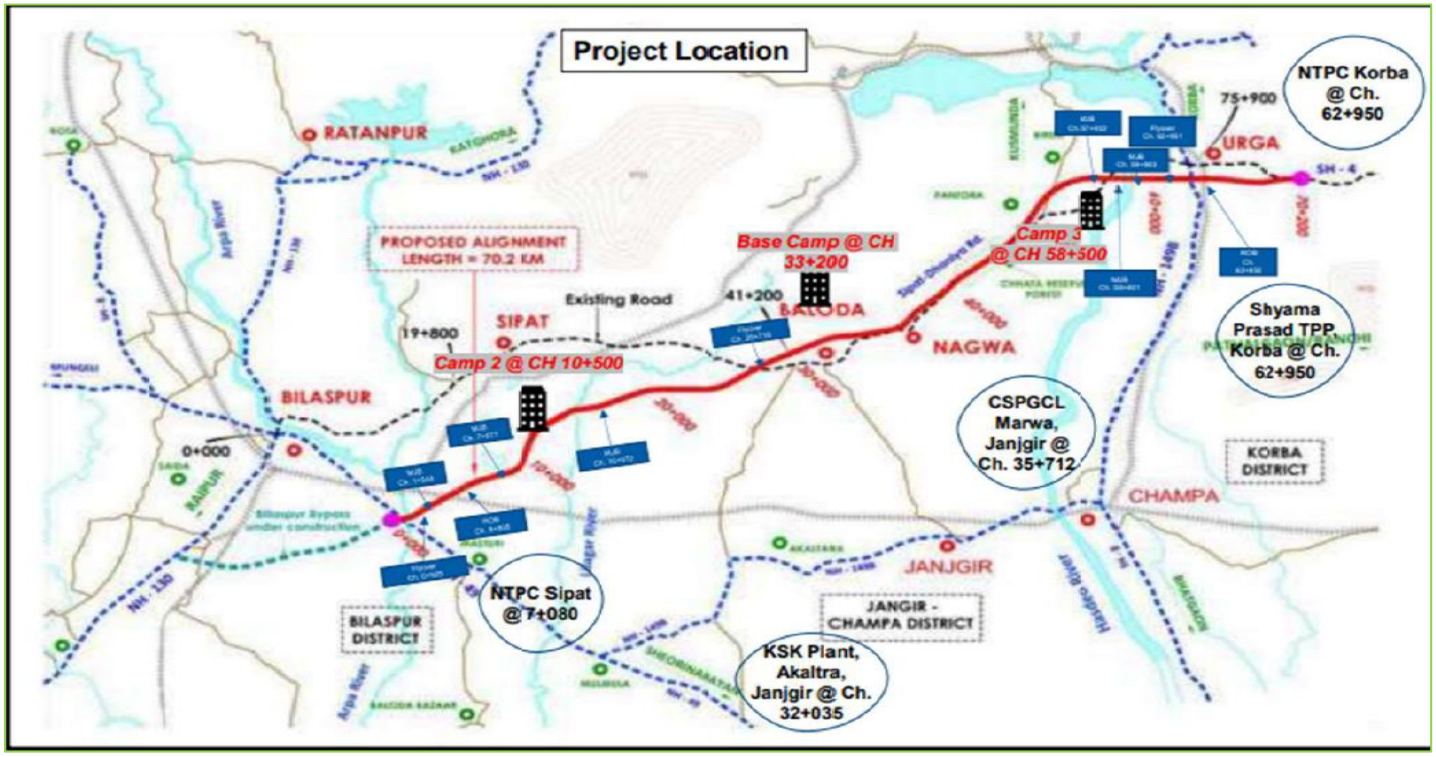


Figure 2-1: Project Alignment

2.2 Salient features

The salient features of the Project are summarised in the table below:

Table 2-1 Project Salient Features

Contract data	
Project Name	4 - Lane Bilaspur – Urga section of NH-130A from design Ch. 0+000 to Ch. 70+200, (from NH-49 near Dheka village to Bhaisma village) under Bharatmala Pariyojana (Lot-3/ Chhattisgarh/Package-1, Raipur – Dhanbad economic corridor) in the State of Chhattisgarh on HAM Mode.
Concessionaire	M/s G R Bilaspur Urga Highway Pvt. Ltd.
Letter of Award	NHAI/11012/CG/NH-130A/Bilaspur-Urga/EC/BM/2019/ Comp. No. 2341 Dated 01.02.2021
Date of Concession agreement	21st June 2021
Appointed Date	25th March 2022
Mode of the Execution	HAM Model
No. of Lanes/Configuration	Fully Access Controlled Highway with 4 Lane Divided Carriageway with Paved Shoulder.
Length of the Project (in Km)	70.200 Km
Total Project Cost (in Cr)	1527 Cr
No. of Toll Plazas	01 Nos. Main Toll Plaza (At KM 18+950) & 12 Nos., (Entry/Exit on S/R-28+410-BHS, 29+100-BHS, 53+470-BHS, 62+680-BHS, 63+210-BHS & 69+850-BHS).
Concession Period	15 Years from the Completion date
Construction Period	2 years from Appointed date
Scheduled Completion Date	23rd March 2024
Date of provisional completion-I	PCC -1 for 55.12 km issued effective from 12th Aug 2024
Date of provisional completion-II	PCC-II for 13.895km (Covering a total of 69.015km out of 70.200km) issued effective from 30th June 2025
Date of final completion certificate	Awaited
Independent Engineer	M/S. L N Malviya Infra Projects Pvt. Ltd Bhopal in Association with Highway Engineering Consultant Bhopal.

2.3 Physical features of the Projectss

The Concessionaire shall operate, manage and maintain the Project stretch for entire Concession Period, subject to and in accordance with the provisions of this.

Agreement.

The Project includes the following physical features.

Table 2-2: Project Physical Features

S. No	Project Physical Features	Units	As per CA	As per Site	Remarks
1	Total Length of Project stretch	km	70.200	69.015	Balance length i: e 1.185km is under progress.
2	Total length of Service Road & Slip Road	km	16.890	16.410	Balance length: 0.48 km
1	Major bridge	No's	06	06	
2	Minor Bridge	No's	14	13	Construction of Minor bridge at km 0.596 yet to start
3	ROB	No's	02	02	
4	Flyover	No's	03	03	
5	VUP	No's	12	12	
6	LVUP	No's	02	02	
7	SVUP	No's	16	15	Construction of SVUP at km 1.196 yet to start
8	Box Culvert	No's	134	134	

Table 2-3: Inventory of the Project stretch

S. No	Description	Side	Units	Qty as per site	Remarks
1	Total Length of the Project	LHS	km	70.200	Km.1.185 Km Balance on MCW
		RHS	km	70.200	
5	At-grade intersections				
	a) Major junctions	BHS	No's	04	Balance Major Jn.at km.0.925
	b) Minor junctions	BHS	No's	29	Balance Minor Jn.at km.1.195 and km,1.800
6	Grade Separated Intersections				
	a) Major junctions	BHS	No's	04	
	b) Minor junctions	BHS	No's	29	
7	Bus bay without shelters	BHS	No's	00	
8	Bus bay with shelters	BHS	No's	14	

S. No	Description	Side	Units	Qty as per site	Remarks
9	Truck lay byes	BHS	No's	04	
10	Toilet blocks at Truck Lay Bye	BHS	No's	04	
11	Lined Open Drain	BHS	km	2.599	Median BHS open drain
12	RCC Covered Drain	BHS	km	2.460	V shape drains km.5.700
13	Metal beam crash barrier	BHS	km		Median entire length MBCB provide both the side shoulder
14	Thire beam crash barrier	BHS	km	NA	
15	Pedestrian guard rail	BHS	km	1.060	
s16	Boundary wall	BHS	km		
17	Breast Wall	BHS	km	NA	
18	RCC Crash Barrier	BHS	km	NA	
	New Jersery Crash Barrier Improvement	BHS	km	NA	
19	Antiglare	Median	No's	NA	
20	Drip Irrigation Pump Shed	Median	No's	NA	
21	Median & Avenue				
	Median Plantation 4.5 m	Median	km		
	Median with checkered tiles	Median	km		
22	**Streetlights**				
a)	Single arm	BHS	No's	349	
b)	Double arm	BHS	No's	365	
23	**Toll Plaza**				
a)	Admin block	BHS	No's	1	
b)	Traffic aid post	BHS	No's	1	
c)	Medical aid post	BHS	No's	1	
d)	Highmast	BHS	No's	29	
e)	Single arm	BHS	No's	0	

S. No	Description	Side	Units	Qty as per site	Remarks
f)	Double arm	BHS	No's	0	
g)	Toilet blocks	BHS	No's	2	
h)	Weigh bridge	BHS	No's	2	
i)	Mini nest	BHS	No's	0	
j)	RPV	BHS	No's	1	
k)	Crane	BHS	No's	1	
l)	Ambulance	BHS	No's	1	
24	**ATMS**				
a)	PTZ cameras	BHS	No's		
b)	VIDS	BHS	No's		

Chapter 4
TECHNICAL STUDIES

CHAPTER 3. TECHNICAL STUDIES

3.1 Review of Concession Agreement

Table 3-1: Review of Concession Agreement

Article (CA)	Subject	Description in brief	Remarks
Clause 2.1	**Scope of the Project**	The Project shall be executed as in Schedule B and C on the site and in conformity with Specifications and standards outlined in Schedule-D	
		Operation and Maintenance of the Project Stretch as per Concession Agreement	
		Performance and fulfillment of all other obligations of the Concession Agreement	
Article 3	**Concession Period**	The concession period includes a construction period of 730 days and an operational period of 15 years from COD.	
Article 4	**Condition precedent**	Authority shall have procured for the Concessionaire the Right of Way to the Site in accordance with the provisions of Clauses 10.3.1 and 10.3.2;	
Clause 4.1.2		The authority shall have procured forest clearance for and in respect land forming part of the ROW, save and except permission for cutting trees;	
		The authority shall have procured all Applicable Permits relating to environmental protection and conservation of the Site;	
Clause 4.2	**Damages for delay by the Authority**	In the event that (i) the Authority does not procure fulfilment of any or all of the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the	

Article (CA)	Subject	Description in brief	Remarks
		rate of 0.2 % (zero point one per cent) of the Performance Security for each day's delay until the fulfilment of such Conditions Precedent, subject to the maximum limit equal to the amount of Bid security and upon reaching such limit.	
Article 5	**Obligations of Concessionaire**	The Concessionaire makes reasonable efforts to facilitate the acquisition of land and procuring of environmental and forest clearances required at his own cost and expenses.	
		Obtain all the necessary Applicable permits, appropriate proprietary rights, licenses, agreements, and permissions for material, methods, processes, and systems used or incorporated into the Project.	
Clause 6.1	**Obligations of Authority**	The Authority provides necessary support and assistance to the Concessionaire in	
		a) providing Applicable permits required from any Govt. instrumentality for implementation and operation of the project.	
		b) obtaining access to all necessary infrastructure facilities and utilities, including water and electricity at rates and on terms no less favourable to the Concessionaire than those generally available.	
Clause 6.2	**Maintenance obligations prior to Appointed Date**	The Concessionaire shall be reimbursed for the cost of maintenance during the Development Period by the Authority after due certification by the Authorized Representative of the Authority. For the purpose of such reimbursement, the lump sum per kilometer rate of reimbursement for a period of 1 (one) year would be Rs. 0 (Rupees Zero) and shall be paid on a pro-rata basis for the period concerned.	
Clause 8.1.5	**Disclaimer**	all risks relating to the Project shall be borne by the Concessionaire and Authority shall not be liable in the manner for such risks or the consequences.	

Article (CA)	Subject	Description in brief	Remarks
Article 9	**Performance Security**	Bank guarantee for Rs.45.81 Cr. to be furnished to Authority within 30 days from the date of signing of the CA, which would be released on spending not less than 30% of Bid Project Cost or one year from the Appointed Date whichever is later.	
Article 10	**Right of Way**	Protection from Encroachments	
Clause 10.5		Throughout the Concession Period, the Concessionaire shall protect the site from all occupations, encumbrances, or encroachments.	
Article 12	**Construction of the Project**	The 730th day of the Appointed Date shall be the scheduled date for completion of the project and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	
Clause 12.3.1			
Article 15	**Commercial Operation Date (COD)**	The Project Stretch shall enter into commercial service on COD where upon the Concessionaire shall be entitled to demand and collect fee in accordance with the provision of Article 14.	
Clause 15.1			
Article 16	**Change of Scope**	As per Clause 16.3, Within 7 (seven) days of issuing a Change of Scope Order, the Authority shall make an advance payment to the Concessionaire in a sum equal to 20% (twenty per cent) of the cost of Change of Scope as agreed hereunder, and in the event of a Dispute, 20% (twenty per cent) of the cost assessed by the Independent Engineer.	
		As per Clause 16.4.2, Notwithstanding anything to the contrary contained in this Article 16, the Concessionaire shall be entitled to nullify any Change of Scope Order if it causes the cumulative costs relating to all the Change of Scope Orders to exceed 10% (ten per cent) of the Bid Project Cost in any continuous period of 3 (three) years immediately preceding the date of such Change of Scope Order or if such cumulative costs exceed 25% (twenty	

Article (CA)	Subject	Description in brief	Remarks
		five per cent) of the Bid Project Cost at any time during the Concession Period.	
		As per Clause 16.5.1, Notwithstanding anything to the contrary contained in Clauses 16.1.1 and 16.3, the Authority may, after giving notice to the Concessionaire and considering its reply thereto, award any works or services, contemplated under Clause 16.1.1, to any person on the basis of open competitive bidding; provided that the Concessionaire shall have the option of matching the first ranked bid in terms of the selection criteria, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services.	
Clause 16.6.1	**Reduction in Scope of Project**	The Authority shall follow the following process for calculation of total cost of reduced Scope	
		I. On direction by the Authority, the Independent Engineer to assess the civil cost of the reduced Scope, as per the schedule of rates applicable on the Bid Due Date.	
		II. The civil cost of the reduced Scope shall be multiplied by 1.05 to arrive at the estimated cost of the reduced Scope.	
		III. The estimated cost of the reduced Scope shall then be multiplied by the ratio of Bid Project Cost to Estimated Project Cost to arrive at the Total Cost of Reduced Scope.	
Article 17	**O&M**	As per Article 17, Concessionaire shall maintain Project Stretch in conformity with Maintenance Requirement, the Maintenance Manual or Maintenance Program as the case may be	
Clause 17.7.3	**Lane Closure**	Upon receiving the permission pursuant to Clause 17.7.1, the Concessionaire shall be entitled to close the designated part of the Project for the period specified therein, and in the event of any delay in re-opening such	

Article (CA)	Subject	Description in brief	Remarks
		part, the Concessionaire shall pay Damages to the Authority calculated at the rate of 0.5 % (zero point Five per cent) of the Performance Security, for each day of delay until that part of the Project has been re-opened for use.	
Clause 17.8	**Damages for breach of maintenance obligations**	In the event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of, (a) 2% of Performance Security, and (b) 0.1% of the cost of such repair or rectification as estimated by the Independent Engineer.	Concessionaire is responsible for maintaining the asset as per Level of service as per Schedule K at all times
Article 19 Clause 19.2	**Monitoring of Operation and Maintenance**	As per Article 19.2, IE shall inspect the Project Stretch at least once a month and IE shall make a report of such inspection (the "O & M Inspection Report") stating in reasonable detail of defects or deficiencies, if any, with particular reference to the Maintenance Requirements, Maintenance Manual, the Maintenance Program and Safety Requirements, and send a copy thereof to the Authority and the Concessionaire within 7 days of such inspection.	
Article 21 **Clause 21.3**	**Remuneration of IE**	The remuneration, cost and expenses of the Independent Engineer shall be paid by the Authority and subject to the limits set forth in Schedule-M, one-half of such remuneration, cost and expenses shall be reimbursed by the Concessionaire to the Authority within 15 days of receiving a statement of expenditure from the Authority.	
Article 23	**Payment of Bid Project Cost**	As per Clause 23.3.1, 40% of the Bid Project Cost, adjusted for Price Index Multiple, shall be paid in 5 equal installments of 8% each during the Construction Period	

Article (CA)	Subject	Description in brief	Remarks
		in accordance with Clause 23.4.	
Clause 23.3		As per Clause 23.3.2, the remaining 60% of the Bid Project Cost, adjusted for Price Index Multiple, shall be paid in 30 biannual installments commencing 180 days after COD in accordance with Clause 23.6.	
Clause 23.4	**Payment during construction period**	As per 23.4 During construction, the Concessionaire gets 8% of Bid Project Cost each time an Independent Engineer certifies a payment milestone. Payments are linked to 5 milestones (from 10% to 90% physical progress). If in case of Change of Scope, the progress milestones are recalculated accordingly.	
Clause 23.5	**Bonus on early completion**	In the event the Concessionaire achieves COD at least 30 days prior to the Scheduled Completion Date, a bonus equivalent to 0.5% of 60% of the Bid Project Cost shall be payable. For each additional day beyond this period, the bonus shall be computed on a pro-rata basis and disbursed along with the first annuity payment.	
Clause 23.6	**Annuity payments during Operation period**	Annuity shall be collected biannually. As per 23.6.4 Interest shall be due and payable in the reducing balance of completion cost at an interest rate equal to applicable bank rate* plus 3%.	
Clause 23.7	**O&M Payments**	23.7.1 The Concessionaire shall bear all O&M Expenses and, in lieu thereof, the Authority shall make O&M Payments at the rate of Rs. 6.37 crore per year, exclusive of GST, it being clarified that no reimbursement shall be made for any excess of the said amount, save and except where a Change in Scope is effected under this Agreement. 23.7.2 The O&M Payments shall be disbursed into two equal biannual installments and shall be released by the Authority concurrently with the corresponding installments of Annuity Payments. 23.7.3 Each installment of O&M Payment shall be determined as one-half of the annual	

Article (CA)	Subject	Description in brief	Remarks
		O&M Payment, duly adjusted by the applicable Price Index Multiple with reference to the Reference Index Date immediately preceding the due date of payment.	
Clause 23.8	**Mobilization Advance**	"The Authority may grant a Mobilization Advance up to 10% of Bid Project Cost, payable in two instalments against Bank Guarantees. The first can be requested post Appointed Date and the second after 60 days. Payments are released within 30 days. The advance carries Bank Rate interest (compounded annually) and is recovered in 4 instalments, with interest as a 5th recovery after 120 days."	
Article 29	**Compensation for default by the Concessionaire**	in the event of the Concessionaire being in material breach or default of this Agreement, it shall pay to the Authority by way of compensation, all direct costs suffered or incurred by the Authority as a consequence of such material breach or default.	
Clause 29.1			
Article 31	**Termination payment**	As per Clause 31.3.1, of the CA, Upon Termination on account of a Concessionaire Default during the Operation Period, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to 65% (sixty five per cent) of the sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.	
		Clause 31.3.3, of the CA, upon Termination on account of an Authority Default, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to:	
		(a) Debt Due; and	
		(b) 150% of the Adjusted Equity.	
		Cl 31.3.4, of the CA Termination Payment shall become due and payable to the Concessionaire within 15 (fifteen) days of a demand being made by the Concessionaire to	

Article (CA)	Subject	Description in brief	Remarks
		the Authority with the necessary particulars, and in the event of any delay, the Authority shall pay interest at a rate equal to 3% (three per cent) above the daily average Bank Rate on the amount of Termination Payment remaining unpaid; provided that such delay shall not exceed 90 (ninety) days. For the avoidance of doubt, it is expressly agreed that Termination Payment shall constitute full discharge by the Authority of its payment obligations in respect thereof hereunder	
Article 35	**Change in Law**	If as a result of Change in Law, the Concessionaire suffers an increase in costs or reduction in net after-tax return or other financial burden, the aggregate financial effect of which exceeds the higher of Rs. 2.34 crore or 2% of the total Annuity Payments in any Accounting Year, the Concessionaire may notify the Authority and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in increased costs, reduction in return or other financial burden as aforesaid.	
	Increase in cost		
	Reduction in cost	If as a result of Change in Law, the Concessionaire benefits from a reduction in costs or increase in net after-tax return or other financial gains, the aggregate financial effect of which exceeds the higher of 2.34 crore or 2% of the total Annuity Payments in any Accounting Year, the Authority may so notify the Concessionaire and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in decreased costs, increase in return or other financial gains as aforesaid.	
Article 38	**Dispute Resolution**	Any dispute, difference or controversy of whatever nature howsoever arising can be resolved in three stages	

Article (CA)	Subject	Description in brief	Remarks
		· Conciliation	
		· Arbitration	
		· Adjudication by a tribunal	
Article 42	**Total Project Cost**	"Total Project Cost" means 60 % (sixty percent) of the Bid Project Cost specified in Clause 23.1 i.e. Rs. 1527 Cr.	

3.2 Settlement Agreement

The Concessionaire requested for issuance of first Provisional Completion Certificate (PCC-1) for 55.12 Km by 25.03.2024, with the grace period of 90 days from Scheduled Completion Date and rescheduling of the Project Milestones as below:

S. No	Milestone as per CA	Physical progress (as per CA)	Days from Appointed date	Scheduled date as per CA	Proposed milestone date as per available 55.120km	Extension (days)	Remarks
1	Project milestone - I	20%	160	01.09.2022	22.02.2023	174	Achieved in February 2023
2	Project milestone -II	35%	365	24.03.2023	20.05.2023	57	Achieved in May 2023
3	Project milestone - III	75%	485	23.07.2023	20.02.2024	212	
4	Scheduled completion date	100%	730	24.03.2024	24.03.2024	0	As per clause 12.3.2 completion within a grace period 90 days from scheduled date

Authority shall issue the Provisional Completion Certificate - 1 by Scheduled Completion Date of the project i.e. 25.03.2024 (with the grace period of 90 days from Scheduled Completion Date), upon completion of the Works in 55.120 km length of the Project Highway & work out the value of work done as per Schedule-G (BPC-1) Authority shall hand over the balance hindered length of 11.62 km by 31st January, 2024. Concessionaire agreed to complete the Works in balance 11.62 km length in next 8 months from the effective date of Provisional Completion Certificate -1, without any additional financial implication to the Authority, except occurrence of any Force Majeure Event.

The balance hindered length of 3.46 km will be made available by Authority before 31st July 2024 and Concessionaire agreed to complete such reaches/ works within a time frame (period "X") to be determined by IE after handing over land by the Authority. Payment Milestone I to V shall be processed as per Clause 23.4 of the Concession Agreement on original Bid Project Cost i.e. Rs.1527 Cr.

The Annuity Payments (Clause 23.6.3 of CA), Interest on reducing balance (Clause 23.6.4 of CA), O&M Payments (Clause 23.7 of CA) will be made following the principles with respect to completed lengths and corresponding BPC as indicated below: -

S. No	Date or likely date of completion	Completed length	BPC Corresponding to completed length
1	PCC-1 (SCD + Grace period)	55.12km	BPC-01
2	PCC-1 + 8 Months	11.62km out of balance 15.08km	BPC-02
3	PCC-1 + 8 Months + Period "X" @	3.46KM	BPC-03

@ Period X defined by IE as per para 2.1 C of settlement agreement

Note: If Concessionaire fails to complete 11.62 km and 3.46 km length within stipulated period after declaration of PCC-1 Clause 12.3 and 15.2 of Concession Agreement will be applicable and continue till the achievement without any interest on subsequent add on amount.

Annuity	Due date	Annuity payment	Interest payment	O&M Payment
1st Annuity	PCC-1 +6 Months	BPC-01 $	BPC-01	BPC-01
2nd Annuity #	PCC-1 +12 Months	BPC-01 +BPC-02	BPC-01	BPC-01 +BPC-02

$ - In the event, the Concessionaire is able to complete 11.62 km out of balance 15.08 km within a period of 6 months after declaration of PCC-1, then the Concessionaire shall be entitled to get the Annuity Payment on the cumulative value of BPC-1 and BPC-2.

Subject to achievement of PCC-2 within stipulated period.

The Annuity Payment on succeeding annuity dates will be made accounting for earlier payments and annuities. In other words, the Concessionaire will be eligible for missed annuities accordingly, without any interest. The payment of succeeding annuity shall also comply the prevailing policies of NHAI at that time.

Further, Authority will give CoS order for COS-1(as explained at para 2.2 of this Settlement Agreement) within 2 weeks of Signing of the Settlement Agreement for Rs.6,55,03,810 (Net). However, Concessionaire agreed to complete all the items of the COS by date of PCC-1.

In consideration of the above, Concessionaire came forward and agreed not to claim any prolongation cost such as Idling Cost of Plant and Machinery, Overhead Cost, Loss of profit, or any other cost whatsoever under any clause of the CA. The Concessionaire also agreed not to claim bonus for the Contract. Upon signing of this Settlement Agreement, the Project Milestones stands modified as per the table above and, in the event the Concessionaire fails to achieve any of the above revised milestones the

provisions of the Agreement with respect to levy of damages shall apply, except occurrence of any Force Majeure Event. For avoidance of doubt, it is clarified that Authority shall release any withheld amount towards liquidated Damaged to the Concessionaire as on date of this agreement.

3.3 Completion Certificate

Provisional completion certificate-I has been issued by IE vide its letter no LNMIPPL/GR/NHAI/Bilaspur-Urga/2024-25/6712 on dated 08.10.2024 considering effective date from 12.08.2024 for the project length 55.120km out of total length of 70.200km.

Provisional completion certificate-II has been issued by IE vide its letter no LNMIPPL/GR/NHAI/Bilaspur-Urga/2025-26/10018 on dated 07-01-2026 considering an effective date from 30-06-2025 for the project length of 13.895km. (Covering a total of 69.015km out of 70.200km)

Table 3-2: Status of Project length

Description	Length	Remarks
Total Project Length	70.2 Km	
Provisional Certificate-I Issued	55.012 Km	
Provisional Certificate-II Issued	13.895 km	
Balance	1.185 km	Land acquisition cleared in the month of December 2025, and the work is in progress

Chapter 4
ASSET STATUS

CHAPTER 4. ASSET STATUS

4.1 Review of Highway Current Status

The Project stretch starts at km 0.000 and ends at km 70.200 of NH-130A in the State of Chhattisgarh under "HAM" basis.

Schedule I tests like comparison of schedule B, C with site execution, visual test, NSV survey, cross section test, ultra sonic pulse velocity test, load test, rebound hammer test, retro reflectivity test on signboards, environmental test, safety audit, test drive has been conducted during the provisional completion certificate tests and found the documents are in line with very few deviations.

- As per the site visit, the project length completed is 69.015 km out of a total 70.200 km.For balance length C&G work has been started recently, the concessioniore has intimated that remaning land has been handed over by the Authority on 2nd Dec 2025.
- At km.63.450 HT line yet to be shift from the site location.

Table 4-1: TCS statement

S. No	Provisions as per Contract Agreement		As per actual/executed at site				Pavement Type	Remarks
	TCS as per CA	Length	TCS - Executed at Site	From	To	Length		
1	TCS1	0.400	TCS1	0.000	0.400	0.400	Rigid	
2	TCS2	0.250	TCS2	0.400	0.650	0.250	Rigid	
3	TCS4A	0.201	TCS4A	0.65	0.851	0.201	Flexible	
4	Flyover	0.165	Flyover	0.851	1.016	0.165		
5	TCS4A	0.174	TCS4A	1.016	1.19	0.174	Flexible	
6	TCS2A	0.090	TCS2A	1.19	1.28	0.09	Flexible	
7	TCS1A	0.520	TCS1A	1.280	1.800	0.520	Rigid	
8	TCS5A	0.140	TCS5A	1.8	1.94	0.14	Flexible	
9	TCS3	0.120	TCS3	1.940	2.060	0.120	Rigid	
10	TCS3A	0.220	TCS3A	2.060	2.280	0.220	Rigid	
11	TCS1A	0.120	TCS1A	2.280	2.400	0.120	Rigid	
12	TCS1	2.880	TCS1	2.400	5.280	2.880	Rigid	

S. No	Provisions as per Contract Agreement		As per actual/executed at site				Pavement Type	Remarks
	TCS as per CA	Length	TCS - Executed at Site	From	To	Length		
13	TCS1B	0.920	TCS1B	5.28	6.2	0.92	Flexible	
14	TCS1	0.700	TCS1	6.200	6.900	0.700	Rigid	
15	TCS1B	1.110	TCS1B	6.9	8.01	1.11	Flexible	
16	TCS1	4.740	TCS1	8.010	12.750	4.740	Rigid	
17	TCS1B	0.400	TCS1B	12.75	13.15	0.4	Flexible	
18	TCS1	0.150	TCS1	13.150	13.300	0.150	Rigid	
19	TCS1A	0.300	TCS1A	13.300	13.600	0.300	Rigid	
20	TCS1	1.900	TCS1	13.600	15.500	1.900	Rigid	
21	TCS1B	0.850	TCS1B	15.5	16.35	0.85	Flexible	
22	TCS1	1.580	TCS1	16.350	17.930	1.580	Rigid	
23	TCS1B	0.420	TCS1B	17.93	18.35	0.42	Flexible	
24	TCS1	0.460	TCS1	18.350	18.810	0.460	Rigid	
25	Toll	0.290	Toll	18.810	19.100	0.290	Rigid	
26	TCS1	2.200	TCS1	19.100	21.300	2.200	Rigid	
27	TCS1A	0.390	TCS1A	21.300	21.690	0.390	Rigid	
28	TCS1	0.510	TCS1	21.690	22.200	0.510	Rigid	
29	TCS1A	0.200	TCS1A	22.200	22.400	0.200	Rigid	
30	TCS1	1.950	TCS1	22.400	24.350	1.950	Rigid	
31	TCS1B	0.250	TCS1B	24.35	24.6	0.25	Flexible	
32	TCS1	1.600	TCS1	24.600	26.200	1.600	Rigid	
33	TCS1A	0.300	TCS1A	26.200	26.500	0.300	Rigid	
34	TCS1	0.620	TCS1	26.500	27.120	0.620	Rigid	
35	TCS1B	0.330	TCS1B	27.12	27.45	0.33	Flexible	
36	TCS1	0.150	TCS1	27.450	27.600	0.150	Rigid	
37	TCS1A	0.220	TCS1A	27.600	27.820	0.220	Rigid	
38	TCS2	0.320	TCS2	27.820	28.140	0.320	Rigid	

S. No	Provisions as per Contract Agreement		As per actual/executed at site				Pavement Type	Remarks
	TCS as per CA	Length	TCS - Executed at Site	From	To	Length		
39	TCS6	0.055	TCS6	28.140	28.195	0.055	Rigid	
40	TCS4	0.095	TCS4	28.195	28.290	0.095	Rigid	
41	TCS4A	0.382	TCS4A	28.29	28.672	0.382	Flexible	
42	Flyover	0.087	Flyover	28.672	28.759	0.087		
43	TCS4A	0.291	TCS4A	28.759	29.050	0.291	Rigid	
44	TCS4	0.035	TCS4	29.050	29.085	0.035	Rigid	
45	TCS6	0.215	TCS6	29.085	29.300	0.215	Rigid	
46	TCS2	0.120	TCS2	29.300	29.420	0.120	Rigid	
47	TCS1A	0.290	TCS1A	29.420	29.710	0.290	Rigid	
48	TCS1	0.630	TCS1	29.710	30.340	0.630	Rigid	
49	TCS1B	0.460	TCS1B	30.34	30.8	0.46	Flexible	
50	TCS1	0.530	TCS1	30.800	31.330	0.530	Rigid	
51	TCS1A	0.300	TCS1A	31.330	31.630	0.300	Rigid	
52	TCS1	0.270	TCS1	31.630	31.900	0.270	Rigid	
53	TCS1B	0.390	TCS1B	31.9	32.29	0.39	Flexible	
54	TCS1	3.210	TCS1	32.290	35.500	3.210	Rigid	
55	TCS1B	0.600	TCS1B	35.5	36.1	0.6	Flexible	
56	TCS1	0.440	TCS1	36.100	36.540	0.440	Rigid	
57	TCS1A	1.040	TCS1A	36.540	37.580	1.040	Rigid	
58	TCS1	3.010	TCS1	37.580	40.590	3.010	Rigid	
59	TCS1A	0.480	TCS1A	40.590	41.070	0.480	Rigid	
60	TCS1	0.840	TCS1	41.070	41.910	0.840	Rigid	
61	TCS1B	0.390	TCS1B	41.91	42.3	0.39	Flexible	
62	TCS1	0.860	TCS1	42.300	43.160	0.860	Rigid	
63	TCS3	0.310	TCS3	43.160	43.470	0.310	Rigid	
64	TCS3A	0.500	TCS3A	43.470	43.970	0.500	Rigid	

S. No	Provisions as per Contract Agreement		As per actual/executed at site				Pavement Type	Remarks
	TCS as per CA	Length	TCS - Executed at Site	From	To	Length		
65	TCS3	0.550	TCS3	43.970	44.520	0.550	Rigid	
66	TCS3A	0.330	TCS3A	44.520	44.850	0.330	Rigid	
67	TCS3	0.400	TCS3	44.850	45.250	0.400	Rigid	
68	TCS3A	1.040	TCS3A	45.250	46.290	1.040	Rigid	
69	TCS3	0.360	TCS3	46.290	46.650	0.360	Rigid	
70	TCS3A	0.260	TCS3A	46.650	46.910	0.260	Rigid	
71	TCS3	0.790	TCS3	46.910	47.700	0.790	Rigid	
72	TCS5	0.130	TCS5	47.700	47.830	0.130	Rigid	
73	TCS5A	0.520	TCS5A	47.83	48.35	0.52	Flexible	
74	TCS5	0.050	TCS5	48.350	48.400	0.050	Rigid	
75	TCS3	0.200	TCS3	48.400	48.600	0.200	Rigid	
76	TCS3A	0.170	TCS3A	48.600	48.770	0.170	Rigid	
77	TCS3	0.200	TCS3	48.770	48.970	0.200	Rigid	
78	TCS1	0.170	TCS1	48.970	49.140	0.170	Rigid	
79	TCS1A	0.660	TCS1A	49.140	49.800	0.660	Rigid	
80	TCS1	1.200	TCS1	49.800	51.000	1.200	Rigid	
81	TCS1B	0.610	TCS1B	51	51.61	0.61	Flexible	
82	TCS1	0.700	TCS1	51.610	52.310	0.700	Rigid	
83	TCS1A	0.340	TCS1A	52.310	52.650	0.340	Rigid	
84	TCS1	0.510	TCS1	52.650	53.160	0.510	Rigid	
85	TCS1A	0.090	TCS1A	53.160	53.250	0.090	Rigid	
86	TCS2	0.260	TCS2	53.250	53.510	0.260	Rigid	
87	TCS2A	0.020	TCS2A	53.51	53.53	0.02	Flexible	
88	TCS4A	0.170	TCS4A	53.53	53.7	0.17	Flexible	
89	TCS1B	0.280	TCS1B	53.7	53.98	0.28	Flexible	
90	TCS1	0.370	TCS1	53.980	54.350	0.370	Rigid	

S. No	Provisions as per Contract Agreement		As per actual/executed at site				Pavement Type	Remarks
	TCS as per CA	Length	TCS - Executed at Site	From	To	Length		
91	TCS1A	0.400	TCS1A	54.350	54.750	0.400	Rigid	
92	TCS1	1.450	TCS1	54.750	56.200	1.450	Rigid	
93	TCS1B	4.210	TCS1B	56.2	60.41	4.21	Flexible	
94	TCS1	1.570	TCS1	60.410	61.980	1.570	Rigid	
95	TCS1A	0.370	TCS1A	61.980	62.350	0.370	Rigid	
96	TCS4	0.120	TCS4	62.350	62.470	0.120	Rigid	
97	TCS4A	0.401	TCS4A	62.47	62.871	0.401	Flexible	
98	Flyover	0.150	Flyover	62.871	63.021	0.15		
99	TCS4A	0.449	TCS4A	63.021	63.47	0.449	Flexible	
100	TCS1B	1.170	TCS1B	63.47	64.64	1.17	Flexible	
101	TCS1	3.240	TCS1	64.640	67.880	3.240	Rigid	
102	TCS1B	0.610	TCS1B	67.88	68.49	0.61	Flexible	
103	TCS1	0.610	TCS1	68.490	69.100	0.610	Rigid	
104	TCS1B	0.255	TCS1B	69.1	69.355	0.255	Flexible	
105	TCS6B	0.385	TCS6B	69.355	69.74	0.385	Flexible	
106	TCS2B	0.225	TCS2B	69.740	69.965	0.225	Rigid	
107	TCS2	0.235	TCS2	69.965	70.200	0.235	Rigid	
Total length						**70.200**		

Figure 4-1: Project start and end location

4.2 Drain

The drain along the project stretch measures around 8.237 km on both sides. RCC-lined drains are provided at super-elevation locations in the median to facilitate surface water drainage. Additionally, V-shaped drains are provided between the MCW, service roads, as well as at ramp toll plaza locations. The available list of drain constructed along the Project stretch are enclosed in **Annexure I**

Figure 4-2: Drain

4.3 Junctions

A total of 04 Major junctions, 29 Minor junctions to be provided along the project stretch as per the Concession Agreement (CA), the same has been executed except at 01 loctaions where the work is in progress at site. The list of major and minor junctions along the project stretch is enclosed in **Annexure II.**

Figure 4-3:- Junctions

4.4 Median & Avenue plantation

As per the Concession Agreement (CA), median and avenue plantation shall be provided along the project stretch. However, as per site visit, it was observed that work is still in progress for balance locations.

Figure 4-4: Median plantation

4.5 Road Furniture

Following are the details of road furniture provided along the Project stretch as per site.

Table 4-2: List of Project furniture's

Type furniture	Unit	Quantity
Metal beam Crash barrier	km	139.79
Pedestrian Guard rail	km	1.060
Streetlights - Conventional	No's	
Single arm	No's	349
Double arm	No's	365
High mast	No's	29
Low mast	No's	Nil

Metal beam crash barrier

Metal beam safety barriers have been installed along the entire Project stretch on the either side of the main carriageway and are being well-maintained. The length of double beam along the project stretches measures 139.79 km. The available list of metal beam crash barrier installed along the Project stretch is enclosed as **Annexure III.**

s

Figure 4-5: Metal beam crash barrier along the Project stretch

Pedestrian Guard Rail

The pedestrian guardrail along the Project stretches measures to be 1.060 km on both sides. The majority of the pedestrian guardrail is located in separator of MCW & Truck lay bye along the Project stretch. The available list of PGR installed along the Project stretch is enclosed as **Annexure IV.**

Figure 4-6: Pedestrian Guard Rail

Street Lighting

Street lighting, including single-arm, double-arm, and high-mast lights, has been provided along the project stretch, covering the main carriageway, service roads, underpasses, and toll plazas etc. As per site visit, the streetlights installed along the project stretch are in good condition.

As per Schedule C, the electrical connection with all its infrastructure shall be done by the Concessionaire. Furthermore, the project must comply with the IRC SP 84:2019 Manual. As per Clause 12.5.1 of the manual, complete street lighting should be provided with DG sets as standby arrangements. However, this provision is not available at the site.

The installation of streetlights along the project stretch are still in progress for some locations. The available list of streetlights installed along the Project stretch is enclosed in **Annexure V.**

Figure 4-7: Street lights

4.6 Project facilities

Following are the details of Project facilities along the Project stretch,

Table 4-3: List of Project facilities

Type facility	Unit	Quantity
Bus shelters	No's	14
Truck lay bye	No's	04
Rest area/Way side amenities	No's	00
Foot Over Bridge (FOB)	No's	Nil
Anti glares	No's	Nil
Drip irrigation pumps	No's	Nil
Solar panel/power planet	No's	Nil
Landscaping and median Plantation	No's	Along with the Project stretch

Bus shelters

There are 14 nos of Bus shelters along with bays have been installed along the Project stretch. As per site visit, the bus shelters were found in good condition. The list of bus shelters along the Project stretch is enclosed as **Annexure VI**.

Figure 4-8: Bus shelters.

Truck lay bye

There are total 4 nos of truck lay bye have been constructed along the project stretch with toilets blocks and are being well maintained. Still few works are balance like (doors, windows, plumbing fixtures, drinking water facilities) are yet be provided. The list of Truck lay byes along the Project stretch is enclosed as **Annexure VII**.

Figure 4-9: Truck lay bye

Rest area/Wayside amenities

As per Concession agreement (CA), Construction of way side amenities/Rest Area is not in the scope of the Concessionaire. Concessionaire shall provide the connectivity of Main Carriageway to Wayside amenities via Entry/Exit Ramp.

Figure 4-10: Rest Area Approach

Diesel generators

DG sets were not observed at the toll plaza locations. The Concessionaire has informed that the DG sets are currently kept in the camp storeroom due to safety concerns and shall be installed upon commencement of full operations

Figure 4-11: Diesel generator room

Rainwater harvesting pits

As per the Concession Agreement, there is a provision for providing rainwater harvesting pits; however, as per the applicable circular, there is no requirement for such pits. Hence, rainwater harvesting pits were not constructed.

4.7 Details of Toll booth Inspection

The details of the plazas are as follows:

Table 4-4: Toll plaza

Toll Lanes	Admin block	Medical aid post	Traffic aid post	High mast	Ambulance	RPV	Crane	Single arm	Double arm	Toilet blocks	Weigh bridge	Highway mini nest	Tunnel	Remarks
8	1	1	1	2	1	1	1	NA	NA	2	2	0	NA	1(Main toll plaza +12 Ramp plaza)

Figure 4-12:- Toll Plaza

4.7.1 Details of toll inspection

The team of CUBE TECH has visited the Project toll plaza on 16th September 2025.

Observations:

Toll Plaza and Toll Collection System

Toll plazas are located at five locations along the project corridor at chainages 18+950, 28+500, 53+470, 62+680, and 69+850. The Toll Collection Systems (TCS) at all toll plazas were supplied and implemented by M/s Qualix Information System LLP in the year 2025.

Toll Plaza Lane Configuration Details are as follows:

- Toll Plaza-1 (Chainage 18+950):

  Toll Plaza-1 consists of a total of 10 lanes. Out of these, 2 lanes are equipped with toll booths, while the remaining 8 lanes are booth less.

- Toll Plaza-2 (Chainage 28+500):

  Toll Plaza-2 comprises four ramp plazas (Entry–2 and Exit–2). Each ramp plaza has 3 lanes, of which 1 lane is provided with a toll booth and the remaining 2 lanes are booth less. This configuration is identical across all four ramp plazas, resulting in a total of 12 lanes at Toll Plaza-2.

- Toll Plaza-3 (Chainage 53+470):

  Toll Plaza-3 consists of two ramp plazas (Entry–1 and Exit–1). Each ramp plaza has 3 lanes, with 1 lane having a toll booth and the remaining 2 lanes being booth less. Accordingly, Toll Plaza-3 has a total of 6 lanes.

- Toll Plaza-4 (Chainage 62+680):

  Toll Plaza-4 comprises four ramp plazas (Entry–2 and Exit–2). Each ramp plaza has 3 lanes, of which 1 lane is provided with a toll booth and the remaining 2 lanes are booth less. This configuration is identical across all four ramp plazas, resulting in a total of 12 lanes at Toll Plaza-4.

- Toll Plaza–5 (Chainage 69+850):

  Toll Plaza–5 consists of two ramp plazas (Entry–1 and Exit–1). Each ramp plaza has 3 lanes, with 1 lane having a toll booth and the remaining 2 lanes being booth less. Accordingly, Toll Plaza-5 has a total of 6 lanes.

Figure 4-13: Plaza-2 Ramp Plaza-3

Figure 4-14: plaza-2 Ramp Plaza-1

Figure 4-15: Toll Plaza-1

Figure 4-16: Plaza-3 Ramp Plaza

Figure 4-17: Plaza-3 Ramp Plaza

Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

- RFID ETC Transceiver
- Lane Controller with Industrial PC
- AVC Sensors
- Automatic Lane Barrier (ALB)
- Incident Capture and license plate capture Cameras
- Overhead Lane Signals
- Traffic Lights
- Toll Booth Equipment

RFID ETC Transceiver

RFID ETC Transceiver reads tags installed on the windshield of vehicles and ETC RFID transceiver near Pay-axis-mounted over gantry. Handheld RFID readers are provided (1 no. in each direction)in case a tag is not detected by the fixed reader.

The ETC system lanes are as follows:

S. No	Equipment	Toll Plaza-1	Toll plaza-2	Toll Plaza-3	Toll Plaza-4	Toll Plaza-5	Remarks
1	No of lanes	8	12	6	12	6	
2	RFID Installed	8	3	3	0	6	Remaining readers are kept in store

- Zebra brand RFID readers have been installed in 22 out of 46 lanes.
- However, due to the non-operational status of the toll plazas, the installed RFID readers are currently not operational.

Figure 4-18: ETC Reader

Lane Controller with Industrial PC

- Toll Lane Controller is located within the Electronic Enclosure placed inside the booth which is connected to the common server.
- Toll Lane Controller are as Follows:

S. No	Equipment	Toll Plaza-1	Toll plaza-2	Toll Plaza-3	Toll Plaza-4	Toll Plaza-5	Remarks
1	No of lanes	8	12	6	12	6	
2	Toll lane controller Installed	8	12	6	0	6	Remaining TLCs are kept in store

- The Toll Lane Controller (TLC) is housed within an electronic enclosure. For booth-equipped lanes, the electronic enclosure is installed inside the respective toll booths, whereas for booth less lanes, the electronic enclosure is installed at the administrative building. All Toll Lane Controllers are connected to the common central server for system integration and data processing.
- TLCs have been installed in 34 out of 46 lanes.
- However, due to the non-operational status of the toll plazas, the installed TLC are currently not operational.

Figure 4-19: ETC Reader

Figure 4-20:Toll collector lane

Figure 4-21:TLC inside Booth

Automatic Vehicle Classification (AVC) Sensors

The Automatic Vehicle Classification (AVC) system is as follows.

S. No	Equipment	Toll Plaza-1	Toll plaza-2	Toll Plaza-3	Toll Plaza-4	Toll Plaza-5	Remarks
1	No of lanes	10	12	6	12	6	
2	AVC Sensor system	10	12	5	0	6	Remaining AVCs are kept in store

- AVC Systems have been installed in 33 out of 46 lanes.
- A Vehicle Profiler–based Automatic Vehicle Classification (AVC) system is deployed for vehicle classification at the toll plazas. The system operates using laser sensor technology to accurately capture the physical profile of vehicles passing through the toll lanes.
- However, due to the non-operational status of the toll plazas, the installed AVC sensor systems are currently not operational.

Automatic Lane Barrier

Boom barriers have been installed in a total of 46 toll lanes; however, they are currently not operational. Additionally, some of the booms for barrier are not installed at site and are presently kept in storage.

Figure 4-22: Boom Barrier

Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. The LTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done, the LTL turns Green to instruct the vehicle to pass through the lane. The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The user fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

LTL and UFD have been installed in a total of 37 lanes out of 46 lanes across the toll plazas. Specifically, these systems are installed in 10 lanes at Toll Plaza–1, 12 lanes at Toll Plaza–2, 6 lanes at Toll Plaza–3, 3 lanes at Toll Plaza–4, and 6 lanes at Toll Plaza–5. However, the LTL and UFD systems are currently non-operational due to the non-availability of power supply.

Figure 4-23:lane equipment's.

Incident Capture Camera (ICS Camera)

- The incident capture camera is installed on a pole to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.
- ICS cameras have not been installed at Toll Plaza–1 and Toll Plaza–2. At Toll Plaza–3, Toll Plaza–4, and Toll Plaza–5,
- All previously installed ICS cameras at toll plaza-3, toll plazas-4 and toll plaza-5 have been reported as stolen.

License Plate Image Capture Camera (LPIC)

- License Plate Image capture camera is installed on a pole facing incoming vehicle to capture the image of the vehicle number plate.
- LPIC Cameras are not installed at Toll plaza-1, Toll plaza-2, Toll plaza-3, Toll plaza-4 and Toll plaza-5.

Over Head Lane Signal (OHLS)

The Overhead Lane Signal (OHLS) for lane "Open" and "Close" sign consists of a pair of "GREEN" (arrow) and "RED" (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed.

OHLS have been installed in a total of 40 lanes out of 46 lanes across the toll plazas. Specifically, these systems are installed in 10 lanes at Toll Plaza–1, 12 lanes at Toll Plaza–2, 6 lanes at Toll Plaza–3, 6 lanes at Toll Plaza–4, and 6 lanes at Toll Plaza–5. However, the LTL and UFD systems are currently non-operational due to the non-availability of power supply.

4.7.1.1 Toll Booth Equipment

Toll Booth Hardware / Equipment provided are:

- Toll Collector Display (Operator Monitor)
- Customized Keyboard
- Receipt Printer
- Intercom slave unit
- Manual Booth Control (MBC)
- Booth Camera
- The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.
- The keyboard on the toll terminal is a customized keyboard for Registration of toll operations.
- Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.
- Booth cameras have been provided only at Toll Plaza–1 for the two booth lanes. The cameras are installed at the inside roof corners of the toll booths to enable effective surveillance, with live video feed monitored through the CCTV screens located in the control room.
- Manual Booth Controller is used to release exempt vehicles.
- Across all toll plazas, a total of 14 booth-equipped lanes is available. Specifically, Toll Plaza–1 has 2 booth lanes, Toll Plaza–2 has 4 booth lanes, Toll Plaza–3 has 2 booth lanes, Toll Plaza–4 has 4 booth lanes, and Toll Plaza–5 has 2 booth lanes. However, toll booth equipment has not been installed in any of the available booth lanes across all toll plazas.

Figure 4-24: Booth equipment's not present.

Medium Speed Weigh in Motion (MSWIM) and Static Weigh Bridge (SWB)

Medium Speed Weigh in Motion (MSWIM) is used bending plate strain gauge technology is used with hardware and software support to calculate the weight of vehicles running through it up to a speed of 50 km/hr. MSWIM have been installed in a total of 38 lanes out of 46 lanes across the toll plazas. Specifically, these systems are installed in 10 lanes at Toll Plaza–1, 12 lanes at Toll Plaza–2, 6 lanes at Toll Plaza–3, 4 lanes at Toll Plaza–4, and 6 lanes at Toll Plaza–5. However, MSWIM systems are currently non-operational due to the non-availability of power supply.

- SWB (Static Weighbridge) is installed on both sides of the plaza at toll plaza-1.
- Toll Plaza–2 consists of four ramp plazas. Each ramp plaza is equipped with one Static Weigh Bridge (SWB). Accordingly, a total of four Static Weigh Bridges are available at Toll Plaza–2.
- Toll Plaza–3 consists of two ramp plazas. Each ramp plaza is equipped with one Static Weigh Bridge (SWB). Accordingly, a total of two Static Weigh Bridges are available at Toll Plaza–3.
- Toll Plaza–4 consists of four ramp plazas. Each ramp plaza is equipped with one Static Weigh Bridge (SWB). Accordingly, a total of four Static Weigh Bridges are available at Toll Plaza–4.

- Toll Plaza–5 consists of two ramp plazas. Each ramp plaza is equipped with one Static Weigh Bridge (SWB). Accordingly, a total of two Static Weigh Bridges are available at Toll Plaza–5.

- No equipment is available in the Static Weigh Bridge (SWB) rooms across all toll plazas.

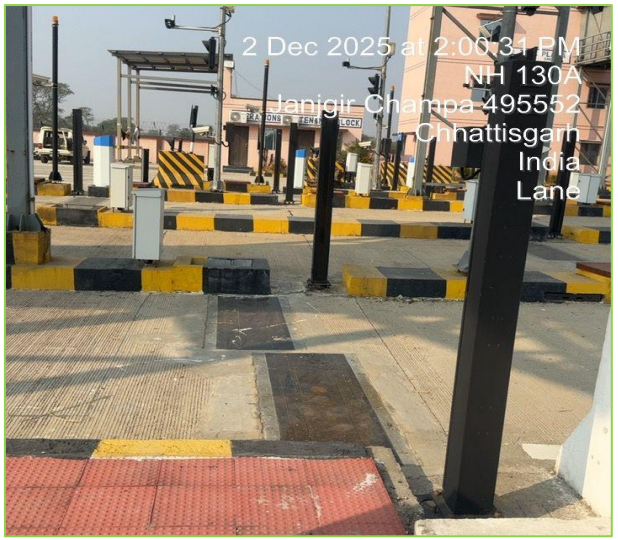


Figure 4-25: MSWIM

Figure 4-26: Ramp Plaza WIM

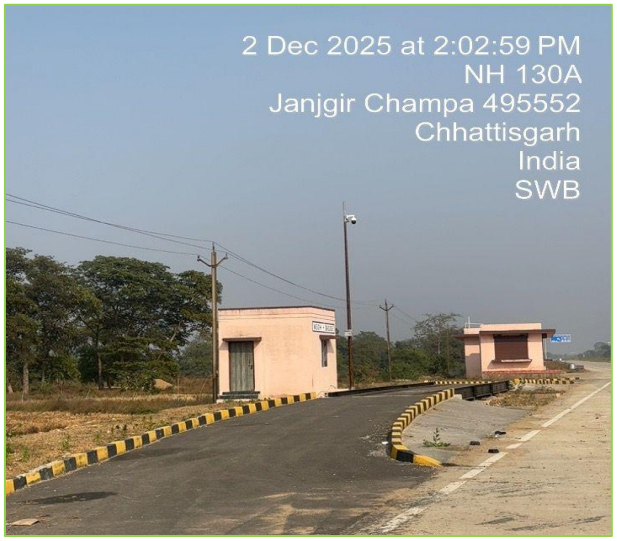


Figure 4-27: SWB

TMS Server

- Two servers (one primary server and one backup server) along with server rack have been provided at Toll Plaza–1 and Toll Plaza–2; however, both servers are currently not operational.
- At Toll Plaza–3 and Toll Plaza–5, one server along with server rack has been provided at each location, but these servers are also not operational.
- No server has been installed at Toll Plaza–4; however, two servers intended for this plaza are available and presently kept in storeroom.
- Server is of HP ProLiant DL380 Gen10 model.

Figure 4-28: Server

55-inch LED screen for CCTV monitoring

One 52-inch LED display screen for CCTV monitoring has been installed at each toll plaza, except Toll Plaza–4. However, the installed LED screens are currently not operational.

Workstations in Control Room, PoS and Cash up room

- Workstations have been provided in the control rooms for lane monitoring, administrative activities, and audit functions. Toll Plaza–1 is equipped with three workstations, Toll Plaza–2 with two workstations, Toll Plaza–3 with two workstations, and Toll Plaza–5 with three workstations.
- No workstations have been installed at Toll Plaza–4.

Figure 4-29: control room

UPS

Following observations were made at toll plaza.

Uninterruptible Power Supply (UPS) systems have been arranged for various components, including 6 kVA UPS units for control rooms, 3 kVA UPS units for each toll lane, 650 VA UPS units for each workstation, and 2 kVA UPS units for Static Weigh Bridges (SWB). However, these UPS units have not been installed at some toll plazas and lanes, and the uninstalled units are currently kept in the storerooms.

Figure 4-30 UPS

Figure 4-31: Ramp Plaza UPS

Adequacy of Toll Collection System

- During the site visit, it was observed that none of the toll plazas were operational. As a result, the stability and functional performance of the installed equipment could not be verified.
- Additionally, it was observed that all ramp plazas are currently not provided with power supply facilities, which requires immediate rectification.
- ETC RFID readers have been installed in 22 lanes out of 46 lanes.
- All previously installed ICS cameras at toll plaza-3, toll plaza-4 and toll plaza-5 have been reported as stolen.

Figure 4-32: control room installation

4.8 Advanced Traffic Management System (ATMS)

The Advanced Traffic Management System (ATMS) was installed by M/s Qualix Information System LLP during the year 2025. BILASPUR - URGA Section of NH 130A from Design CH.0+000 TO CH.70+200 for the project road which is controlled by the ATMS Centre. It comprises of the following:

- Emergency Call Back System (ECB)
- Variable Message Signboards (VMS)

- Portable Variable Message Signboards (PVMS)
- CCTV and Surveillance Cameras.
- **V**ideo Incident Detection System (VIDS)
- Metrological Data Station (MDS)
- Automatic Traffic Count and Classifier (ATCC)
- Radio Frequency (RF) Towers.
- Mobile Radio Communication system (MRCS)

Emergency Call Back System (ECB)

- 68 sets of Emergency Call Booths (ECBs) are installed but due to theft incident, ECB accessories have been removed from the site only ECB box, Protection barrier and pole are installed.

Figure 4-33: ECB

Figure 4-34: No equipment

Variable Message Signboards (VMS)

- Variable Message Sign (VMS) boards are installed at six locations.
- Variable Message Sign Board Full Matrix of size 3000mm x 1800m are installed at six locations.
- Currently, the VMS boards are non-operational at all locations due to the unavailability of power supply.
- UPS units are not installed at any of the VMS locations.

Figure 4-35: VMS

Portable Variable Message Signboards (PVMS)

Portable Variable Message Sign (PVMS) board is not installed at site.

CCTV and Surveillance Cameras

- Surveillance cameras have been installed at 12 out of 15 locations; however, they are not operational due to the unavailability of power supply.
- PTZ Camera with 12 Meter Pole, 1 KVA UPS, Enclosure, RF Device with network Accessories etc. are installed in 12 locations.
- Two PTZ cameras, 3 UPS and 1 cabinet have been reported as being stolen.

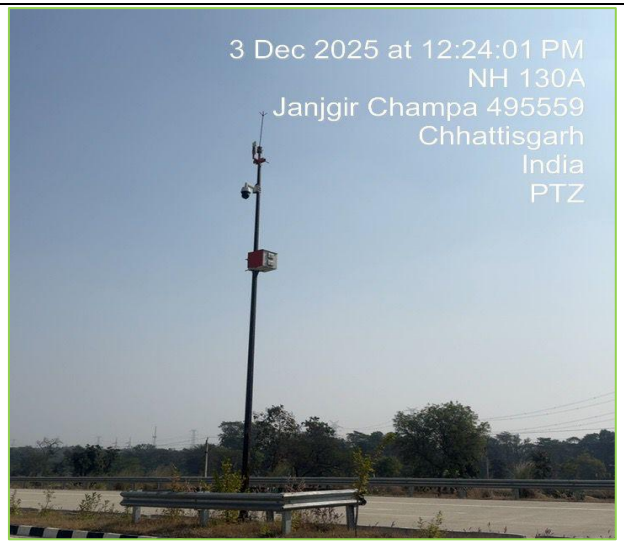


Figure 4-36: PTZ

Video Incident Detection System (VIDS).

- Video Incident Detection System is installed in 5 out of 8 locations but not operational due to unavailability of power.
- VIDS Camera, 1 KVA UPS, Enclosure with network Accessories, Lightning Arrester, Earthing etc are installed in 5 locations.

Figure 4-37: VIDS

Metrological Data Station (MDS)

- Metrological Data Station (MDS) Complete Set with Enclosure, Lightning Arrestor, Earthing & etc. are installed at one location (18+950 chainage).
- The Meteorological Data System (MDS) consists of temperature, wind speed and direction, humidity, and visibility sensors.
- MDS is not operational due to unavailability of power.

Figure 4-38: VIDS

Automatic Traffic Count and Classifier (ATCC)

- Automatic Traffic Count and Classifier (ATCC) is installed at one location (18+950 chainage).
- Loop-Piezo-loop based ATCC architecture has been installed along with a data logger.
- ATCC is not operational due to unavailability of power.
- 1 KVA UPS with cabinet is installed.

Figure 4-39: Loop Piezo Loop based ATCC

Chapter 5
CONDITION ASSESMENT OF EXISTING PAVEMENT AND MAINTAINANCE REQUIREMENT

CHAPTER 5. CONDITION ASSESMENT OF EXISTING PAVEMENT AND MAINTAINANCE REQUIREMENT

To evaluate the existing pavement condition of a Project Highway, investigations are to be carried out on the field to collect data from the field. The collected data is processed and analysed to obtain complete information on the pavement condition.

5.1 Pavement Condition Assessment for Technical Due Diligence

As a part of technical due diligence, the different investigations performed on the Project Highway are listed below.

- Assessment of Pavement Condition based on Visual Condition Survey

Based on the visual condition survey, the type of distress, its quantity, and severity along the Project Highway are obtained. The same is used to evaluate the present condition of pavement, which classifies pavement conditions ranging from 'Good' to 'Fair'.

The pavement investigation studies carried out on the Project Highway from 2nd Dec to 5th Dec 2025 as a part of technical due diligence and their outcomes are detailed in the sections below.

Main Carriageway is comprised of both flexible and rigid pavement.

5.2 Review of Concession Agreement

As perthe Concession Agreement, the Concessionaire shall repair and rectify the defects and deficiencies as specified below

Table 5-1: Major maintenance criteria as per CA

S. No	Nature of Defect or Deficiency	Time limit for Repair/Rectification
1	Roughness value exceeding 2750 mm in a stretch of 1km (as measured by a standardized rough meter/bump integrator)	180 Days
2	Cracking in more than 5% of road surface in a stretch of 1 km	30 days
3	Rutting exceeding 10mm in more than 2% of road surface in a stretch of 1km (measured with 3m straight edge)	30days

5.3 Review of Pavement Design Report

- The design of flexible pavement for has been carried out in accordance with guidelines of IRC-37-2018 IRC SP:59-2019.

- Flexible pavement is proposed for the main carriageway sections where the embankment height exceeds 6.0 m. Rigid pavement is recommended for the main carriageway in the remaining sections as well as for the toll plaza.
- For slip roads, service roads, and cross-roads, flexible pavement has been adopted.
- Effective CBR value of 10% has been considered for the main carriageway and 12% for service/slip/cross-roads for the project highway.
- The thickness of the bituminous layers for the main carriageway has been designed for a service life of 20 years and same for rigid pavement is 30 years.

S. No.	Section	Design Traffic
1	Main Road	125 MSA
2	Slip Road & Cross Road at Major Junction	30 MSA
3	Service Road & Cross Road at Minor Junction	10 MSA

Table 5-2: Base year traffic (AADT)

AADT(FY-22)				
Bus	**LCV**	**2A**	**3A**	**MAV**
155	490	233	345	687

Table 5-3: Growth rates (GR)

Traffic Growth Rates (%)	Bus	LCV	2AT	3AT	MAT
Upto 2053	5%	5%	5%	5%	5%

Table 5-4: Pavement Design Thicknesses for Main carriageway is as per approved Pavement Design Report

Sr. No.	Crust Composition	Crust Thickness
1	Bituminous Concrete (BC) with Modified Bitumen	50 mm
2	Dense Graded Bituminous Macadam (DBM) with VG-40	125 mm
3	Wet Mix Macadam (WMM)	285 mm
4	Granular Sub Base (GSB)	165 mm
5	Sub-Grade Soil of effective CBR-10%	500 mm
	Total	**1125 mm**

Table 5-5: Pavement Design Thicknesses for Rigid Pavement as per Pavement Design Report

Layer	Thickness(mm)
Thickness of Pavement Quality Concrete (PQC)	310
Thickness of Dry Lean Concrete (DLC)	150
Thickness of Granular Sub-base (GSB)	150

5.4 Pavement Distress Survey

A pavement condition survey gives an indication of the serviceability of the road pavement and is vital in deciding the maintenance activities. Some methods to conduct this survey are the Visual Condition Survey method (manual), Network Survey Vehicle (NSV) method, etc. However, Visual Condition Survey was conducted in this Project.

In a visual condition survey, the technical team makes a traverse along the Project Highway, observing the different types of distresses on the pavement surface, and observations are made on each distress type.

Distresses on flexible pavements include

- Approach settlement
- Patches
- Potholes
- Rutting
- Cracks – Longitudinal, Transverse and Alligator cracks
- Ravelling
- Bleeding

Observations made during the visual condition survey for flexible Pavement are detailed below.

5.4.1 Approach Settlement

Approach settlement at flexible pavement refers to the uneven vertical movement or depression at the transition zone between a rigid structure and the flexible approach pavement, often resulting in a "bump". Settlement of approaches were observed on few structure locations and the same are rectified by Concessionaire.

Figure 5-1: Approach Settlement

5.4.2 Patches

The patch is an area of the pavement which have been repaired or replaced by new material to remove a certain defect on the pavement. The patch is considered a defect no matter how well it is performing, and some roughness is associated with this type of distress. Patches have been observed at isolated locations of the project stretch and the concessionaire is addressing the same under routine maintenance works.

Figure 5-2: Patches

5.4.3 Potholes

Potholes are small (or big, based on severity) bowl-shaped depressions on the pavement surface. In general, potholes are formed in later stages of highly ravelled or cracked pavement surface resulting in bowl-shaped depressions. No potholes have been observed along project highway.

5.4.4 Rutting

A rut is a surface depression of pavement in the wheel paths, and pavement uplift may occur along the sides of the rut. Rutting stems from a permanent deformation in any pavement layers or subgrade usually caused by consolidated or lateral movement of the materials due to traffic load. No rutting was observed along the stretch of the project stretch.

5.4.5 Cracks

Cracks in pavement are discontinuities in the bituminous or concrete surface resulting from tensile stresses induced by traffic loads, thermal movements, material shrinkage, aging, or subgrade movement, leading to loss of structural integrity and serviceability. Longitudinal cracks were observed in few isolated locations along the project highway. The same issues were rectifying by the concessionaire under routine maintenance works.

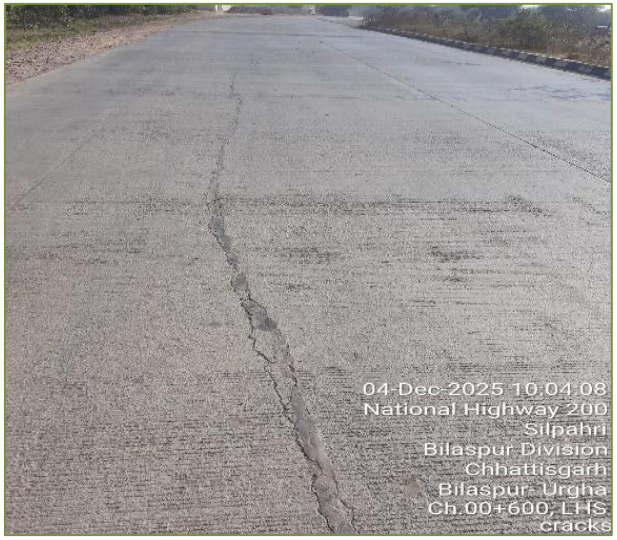


Figure 5-3: Cracks

5.4.6 Ravelling

Ravelling is wearing away of the pavement surface due to loss of bitumen binder and dislodged aggregate particles. This distress indicates that either the bitumen binder has hardened appreciably, or a poor-quality mixture is present. In addition, ravelling may be caused by certain types of traffic, for example, tracked vehicles. Softening of the surface and dislodging of the aggregates due to oil spillage and weathering are also included under ravelling.

No ravelling cracks have been observed along the project stretch.

5.4.7 Bleeding

Bleeding occurs when asphalt binder fills the aggregate voids during hot weather and then expands onto the pavement surface. A film of asphalt binder on the pavement surface. It usually creates a shiny, glass-like reflecting surface that can become sticky when dry and slippery when wet. No Bleeding was observed along the project stretch.

Based on the observations made during the visual condition survey, the pavement condition is categorized into three categories 'Good', 'Fair', and 'Poor'. The summary of the pavement condition of Project Highway is given below.

Table 5-6: Flexible Pavement MCW visual survey results

Condition	LHS	RHS

	Length (km)	Length (%)	Length (km)	Length (km)
Good	17.563	25.01%	Good	17.563
Fair	0	0%	Fair	0
Poor	0	0%	Poor	0
Under Construction	1.185	1.69%	Under Construction	1.185

Table 5-7: Rigid Pavement MCW visual survey results

Condition	LHS		RHS	
	Length (km)	Length (%)	Length (km)	Length (%)
Good	51.452	73.29%	51.452	73.29%
Fair	0	0%	0	0%
Poor	0	0%	0	0%

5.5 Pavement Roughness

Roughness is one of the important parameters for determining the functional characteristics of pavements. According to the American Society for Testing and Materials (ASTM), roughness is defined as "the deviations of a pavement surface from a true planar surface with characteristic dimensions that affect vehicle dynamics, ride quality, dynamic loads, and drainage, for example, longitudinal profile, transverse profile and cross-slope".

The roughness of road surfaces is measured using different equipment/techniques such as rod and level survey, dip stick profiler, profilographs, response type road roughness meters, and profiling devices.

In India, the roughness is measured using the fifth wheel bump integrator (developed by CRRI) and is reported as Unevenness Index (UI) in mm/km. In this report, roughness data is extracted from the NSV report, which measured using a profilometer on June 6, 2024, is incorporated, and a summary of the results is presented below.

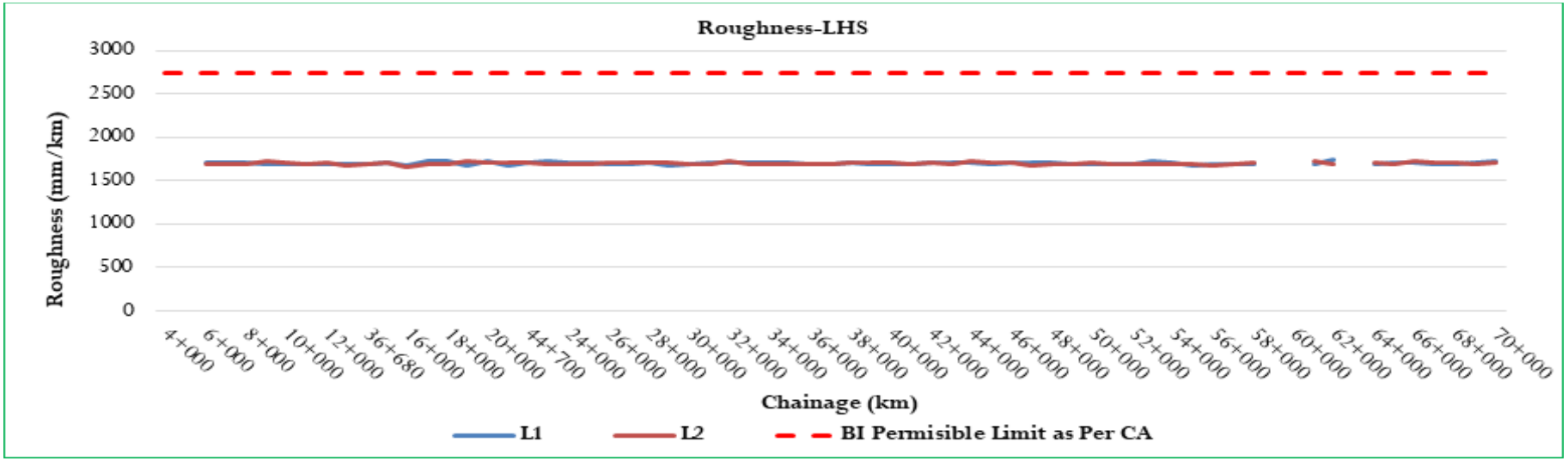


Figure 5-4: Flexible Pavement Roughness in LHS

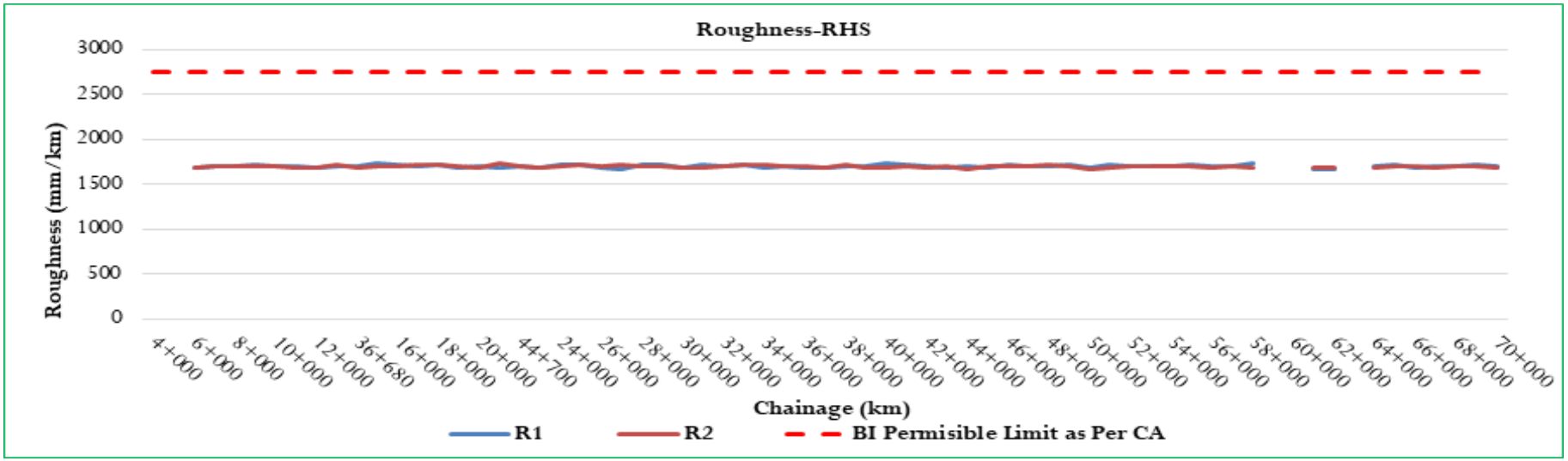


Figure 5-5: Flexible Pavement Roughness in RHS

Table 5-8: Summary of the Roughness values using NSV

Surface Condition	Roughness criteria	LHS				RHS			
		L1 (m)	L2(m)	L1(%)	L2 (%)	R1 (m)	R2(m)	R1(%)	R2 (%)
Good	0-1800	57270	57270	100%	100%	56670	56670	100%	100%
Fair	1800-2750	0	0	0%	0%	0	0	0%	0%
Poor	>2750	0	0	0%	0%	0	0	0%	0%

From the MCW Roughness data, it can be observed that

- Almost 100% of all lanes of the highway are in good condition in both directions.

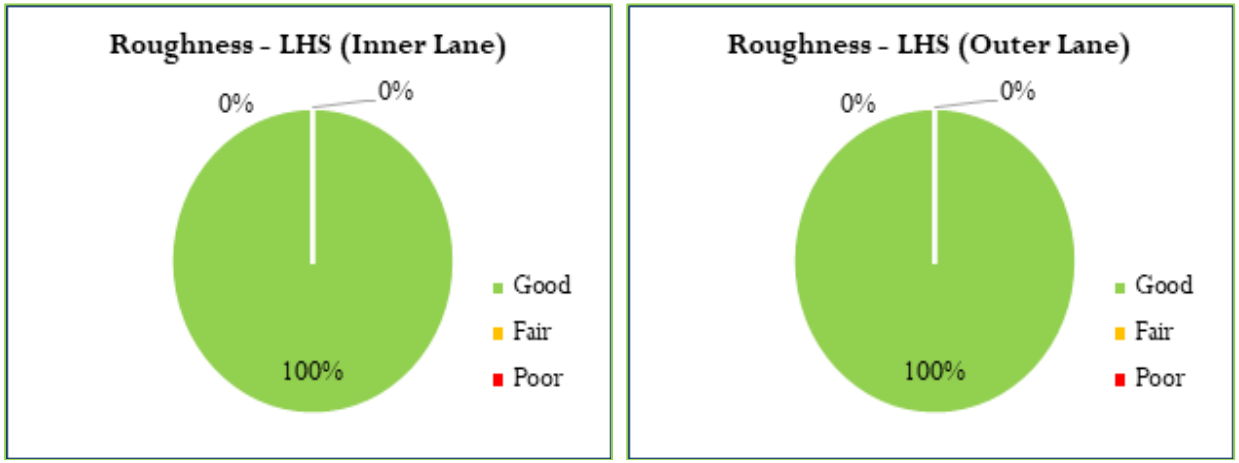


Figure 5-6: Pavement Roughness in LHS MCW

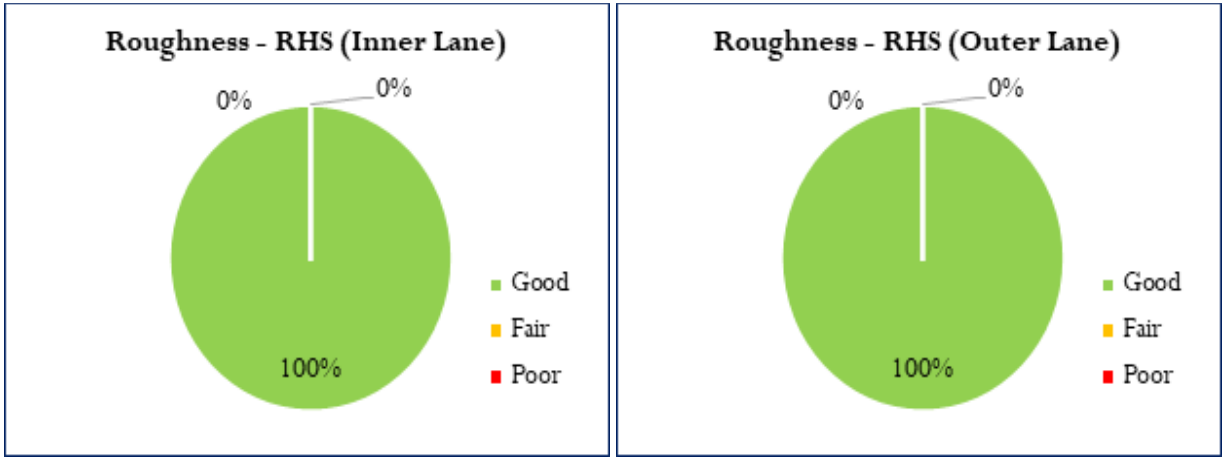


Figure 5-7: Pavement Roughness in RHS MCW

Chapter 6
REVIEW OF STRUCTURES

CHAPTER 6. REVIEW OF STRUCTURES

6.1 Structural investigations

Review of structures inventory and detailed condition survey of structures are the essential requirements for preparation of estimates for Capex and also for O & M cost for Highway Structures. Keeping in view of importance of this task, review of inventory and conducting visual condition survey were carried out as per procedure and guidelines prescribed in IRC: SP:35 bridge engineers. The details of condition survey of structures were furnished below,

6.1.1 Visual Condition Survey

Salient features for which data is collected as part of conditional survey are in accordance with IRC: SP: 35 Proforma. Main features recorded as part of detailed condition survey are listed below.

- Condition of wearing coat on deck slab such as potholes, cracks, and patches.
- Condition of expansion joints such as bump in riding, leakage in expansion joint, damaged elastomer, silt and debris filled in expansion joint gap.
- Condition of RCC railing/ safety barrier/ parapet wall.
- Condition of drainage spouts and down take pipes.
- Condition of super structure and substructure like spalling of concrete, cracks, honeycombing etc., in concrete surfaces.
- Condition of bearings.
- Condition of RE walls (reinforced earth walls).
- Corroded reinforcement exposed anywhere in deck slab and substructure.
- Condition of foundations like scouring, erosion of piles etc., if any at visible locations.

6.2 General

Details of various types of structures as per site inventory survey are furnished below,

Table 6-1: Summary of Structures

S. no	Type of Structure	As per Schedule (no's)	As per site inspection (no's)	Remarks
1	Major bridge	06	06	
2	Minor Bridge	14	13	Construction of Minor bridge at km 0.596 yet to start
3	ROB	02	02	
4	Flyover	03	03	
5	VUP	12	12	
6	LVUP	02	02	
7	SVUP	16	15	Construction of SVUP at km 1.196 yet to start
8	Box Culvert	134	134	
	Total	**189**	**187**	

The condition survey of all structures was conducted by a team of bridge experts through visual inspection as well as with Mobile bridge inspection unit (MBIU) at all the inaccessible locations like bearings, pedestals, girders and soffit of super structure. The detailed condition of all structures with necessary repair and rehabilitation measures is provided in separate report.

6.3 Major Bridges

There are six major bridges on the Project stretch.

Table 6-2: Inventory details of the Major bridges

S. no.	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	1.540	10 x 30.00	300.00	LHS	The construction of spans A1–P1 and P1–P2 yet to start on BHS and remaining spans are completed.
		10 x 30.00	300.00	RHS	
2	7.080	1 x 15.00 + 1 x 45.00 + 1 x 15.00	75.00	LHS	
		1 x 15.00 + 1 x 45.00 + 1 x 15.00	75.00	RHS	
3	16.072	4 x 30.00	120.00	LHS	
		4 x 30.00	120.00	RHS	

S. no.	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
4	57.400	2 x 19 + 1 x 40 + 3 x 27	159.00	LHS	
		1 x 19 + 1 x 40 + 3 x 27 + 1 x 19	159.00	RHS	
5	58.888	26 x 30.00	780	LHS	
		26 x 30.00	780	RHS	
6	59.983	1x 18.00 + 1 x 33.00 + 1 x 25.00	76.00	LHS	
		1x 18.00 + 1 x 33.00 + 1 x 25.00	76.00	RHS	

Figure 6-1: Major bridges

6.4 Minor Bridges

There are fourteen minor bridges on the Project stretch.

Table 6-3: Inventory details of the Minor bridges

S. no.	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks

S. no.	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	0.596	1 x 12.00	12.00	BHS	Yet to start
2	1.026	1 x 12.00	12.00	BHS	Under construction
3	8.632	1 x 15.00	15.00	BHS	
4	12.994	1 x 15.00	15.00	BHS	
5	26.820	1 x 10.00	10.00	BHS	
6	37.708	1 x 12.00	12.00	BHS	
7	37.903	1 x 12.00	12.00	BHS	
8	38.920	1 x 15.00	15.00	BHS	
9	45.710	1 x 10.00	10.00	BHS	
10	47.293	1 x 40.00	40.00	BHS	
11	53.832	1 x 20.00	20.00	BHS	
12	56.349	1 x 40.00	40.00	BHS	
13	63.548	4 x 3.00	12.00	BHS	
14	69.147	2 x 10.00	20.00	BHS	

Figure 6-2: Minor bridges

6.5 ROB

There are two ROBs on the Project stretch.

Table 6-4: Inventory details of the ROB

S. no.	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	5.825	1 x 14.17 + 1 x 76.08 + 1 x 24.20	114.450	LHS	
				RHS	
2	63.850	1 x 19.06 + 1 x 37.28 + 1 x 19.08 + 2 x 37.28 + 1 x 37.26	187.240	LHS	
				RHS	

Figure 6-3: ROBs

6.6 Flyover

There are three Flyovers on the Project stretch.

Table 6-5: Inventory details of the Flyovers

S. no.	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	0.933	1 x 15.00 + 5 x 30.00	165.00	BHS	Approaches are under construction
2	28.721	1 x 45.00	45.00	BHS	
3	62.946	1 x 15.00 + 4 x 30.00 + 1 x 15.00	150.00	BHS	

Figure 6-4: Flyovers

6.7 VUP

There are twelve VUPs on the Project Stretch.

Table 6-6: Inventory details of the VUPs

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks

S. no.	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	7.798	1 x 12.00	12.00	BHS	
2	12.913	1 x 12.00	12.00	BHS	
3	15.727	1 x 12.00	12.00	BHS	
4	18.150	1 x 12.00	12.00	BHS	
5	30.622	1 x 12.00	12.00	BHS	
6	32.036	1 x 12.00	12.00	BHS	
7	35.762	1 x 12.00	12.00	BHS	
8	42.165	1 x 12.00	12.00	BHS	
9	51.194	1 x 12.00	12.00	BHS	
10	53.707	1 x 12.00	12.00	BHS	
11	68.078	1 x 12.00	12.00	BHS	
12	69.349	1 x 12.00	12.00	BHS	

Figure 6-5: VUPs

6.8 LVUP

There are two LVUPs on the Project stretch.

Table 6-7: Inventory details of the LVUPs

S. no.	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	60.243	1 x 12.00	12.00	BHS	
2	64.518	1 x 12.00	12.00	BHS	

Figure 6-6: LVUPs

6.9 SVUP

There are sixteen SVUPs on the project stretch.

Table 6-8: Inventory details of the SVUPs

S. no.	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	1.196	1 x 7.00	7.00	BHS	Yet to start
2	1.800	1 x 7.00	7.00	BHS	
3	4.105	1 x 7.00	7.00	BHS	
4	9.468	1 x 7.00	7.00	BHS	
5	21.045	1 x 7.00	7.00	BHS	
6	24.571	1 x 7.00	7.00	BHS	
7	25.314	1 x 7.00	7.00	BHS	
8	27.315	1 x 7.00	7.00	BHS	
9	30.410	1 x 7.00	7.00	BHS	
10	34.598	1 x 7.00	7.00	BHS	
11	37.941	1 x 7.00	7.00	BHS	
12	40.046	1 x 7.00	7.00	BHS	
13	48.040	1 x 7.00	7.00	BHS	
14	52.960	1 x 7.00	7.00	BHS	
15	56.626	1 x 7.00	7.00	BHS	
16	66.112	1 x 7.00	7.00	BHS	

Figure 6-7: SVUPs

6.10 Culverts

There are one hundred and thirty-four box culverts on the Project stretch.

Table 6-9: Inventory details of the Box culverts

S. no.	Type of culverts	No. of. culverts	Remarks
1	Box Culverts	134	

Figure 6-8: Box culverts

6.11 Key Observations on Strutcures

The overall condition of most of the newly constructed structures were in good condition with few defects. Following are the common observations,

- Bearing sleeves were not grouted and exposed in the bearing pedestals in some of the spans. This rectification can be addressed as part of routine maintenance works.
- Spherical bearings were in locked condition in some of the spans. This rectification can be addressed before allowing the traffic.
- Wooden packings were present between the girder soffit and bearing pedestal top due to which concrete edges were damaged. This rectification can be addressed as part of routine maintenance works.
- Honeycombing was observed on structural elements in some of the spans.
- Strip seal elastomers were damaged /punctured in some of the expansion joints. This rectification can be addressed as part of routine maintenance works.
- PVC longitudinal and vertical down take pipes were not installed at grade structures like Flyovers and underpasses, also on RE wall approaches.

Chapter 7
GENERAL SAFETY CONCERNS ALONG THE PROJECT STRETCH AND SUGGESTED IMPROVEMENTS

CHAPTER 7. GENERAL SAFETY CONCERNS ALONG THE PROJECT STRETCH AND SUGGESTED IMPROVEMENTS

7.1 General

This chapter presents general road safety concerns observed along the Project Stretch (Bilaspur-Urga section of NH-130A) and improvements suggested to address the same.

7.2 Site visit

Road Safety along the highway depends on the condition of various components, including coordination between horizontal and vertical alignment, provision and placement of road furniture, intersection geometry, and the availability of adequate sight distance, as well as nighttime visibility along the highway. It is essential to understand all these aspects of the highway from the point of view of the safety of each type of road user. The purpose of this assignment is to understand the road safety worthiness of the Project Stretch and quantify road furniture items that are required as per the provisions of the Concession Agreement (CA). The report also summarises high-risk safety concerns that persist for a reasonable length along the Project Stretch, which helps improve the safety of road users upon implementation. It may be noted that a few minor observations that are part of regular O&M activities have not been quantified in this report, and geometrical improvements along with blackspots are not reviewed as part of this assignment. The scope has been constrained keeping in view the operational status of the Project Stretch, and the focus is largely on the major safety concerns and deviations from CA provisions in road furniture, if any.

The Safety Team of CUBE Highways Technologies Pvt Ltd. visited the Project Stretch from 3rd to 5th December 2025.

It may be noted that the findings and suggestions in this chapter are based on a review of available information/documents. This chapter mainly focuses on general safety concern-related issues along the Project Stretch, and any major geometrical improvements or location-specific improvements are not covered. The chainages mentioned in the report may vary from the ground by approximately 50 to 100 m within acceptable tolerances.

Along with manual observations, the entire Project Stretch is video graphed using Vehicle Video Recorder Driver's (VVR) Eye Level Video. A snapshot of output obtained from the app view is shown below: VVR records the following details along with the video:

- Video recording (front view – Driver's Eye Level View)
- Location of Video on the Google Map (along with coordinates of the location)
- Speed of the Recording Vehicle, in km/hour

7.3 Summary of safety related documentation

The following table provides the summary of safety related documents

Table 7-1: Summary of pre-bid documents related to road safety aspects

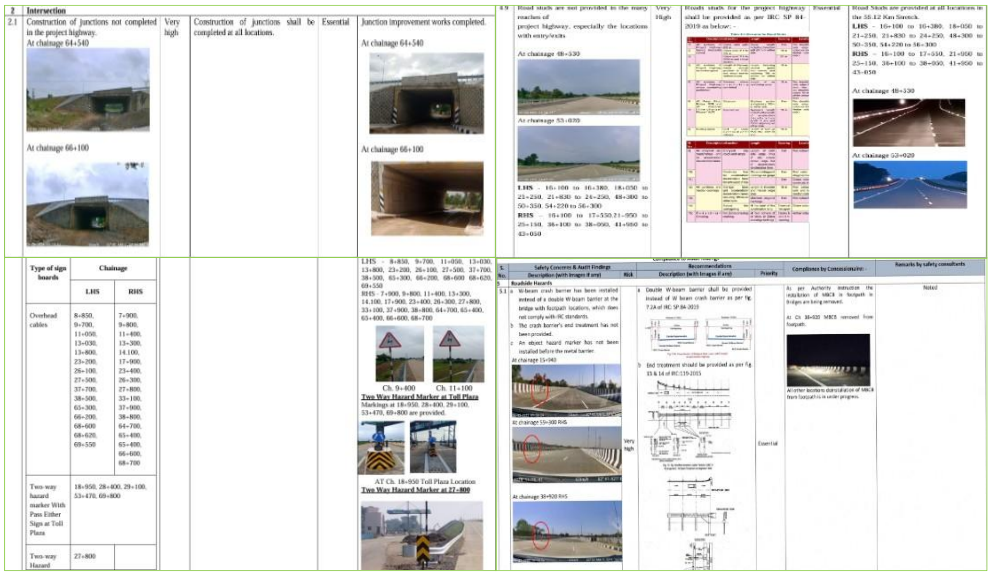
S. No.	Particular	Remarks
1	Concession Agreement (CA) - *M/S GR Bilaspur Urga Highway Private Limited*	• All relevant clauses and safety warrants have been reviewed for traffic control and road safety devices, including signs, markings, crash barriers, delineators, pedestrian facilities, and roadside amenities. • Reference has been made to the Manual of Specifications and Standards for Four-Laning of Highways (IRC: SP: 84–2019).
2	Approved Drawings	• Plan & Profile, Road signage and Road marking and Typical cross-section drawings, etc, have been received and reviewed. • Provision of MELT and TT end treatments for the Metal Beam Crash Barrier (MBCB) is recommended as indicated in the drawing
3	IE MPR, November 2025 *M/s L. N. Malviya Infra Project Private Limited*	• Road safety–related observations were not covered in the IE MPR.
4	Concessionaire MPR, November 2025 *M/S GR Bilaspur Urga Highway Private Limited*	• The report highlights the overall summary of the project in terms of permissions & clearances, utility shifting details, COS, physical progress, etc.
5	Retro-Reflectivity Test for Road Signages and Road Marking (Feb *2025)*	• The report presents the retro-reflectivity tests conducted on thermoplastic road markings and signage, and the results confirm that both the markings and signboards meet the required criteria as per the applicable IRC specifications.
6	Illumination Test for Highway Lighting *(Feb 2025)*	• The report presents the illumination tests conducted for highway lighting intensity, and the results confirm that the lighting levels meet the required criteria as per the applicable IRC specifications
7	Draft Pre-Opening Stage Road Safety Audit Report by IE (*TechMoDec Consultants Pvt Ltd*) Aug, 2024	• The report summarises the key safety issues related to signboards, road markings, junction development, and incomplete safety installations such as safety barriers (refer to the following section 1.4 for more details).
8	Compliance to Draft Pre-Opening Stage Road Safety Audit Report by	• This report outlines the compliance status against the safety issues identified in the pre-opening stage audit,

S. No.	Particular	Remarks
	Concessionaire (*M/S GR Bilaspur Urga Highway Pvt Ltd*), Sept 2024	covering traffic signboards, road markings, junction development, and pending safety installations such as safety barriers, road studs, etc. (refer to the following section **Error! Reference source not found.** for more details).

7.4 Summary of compliance of final pre-opening road safety audit report

The Pre-Completion RSA report broadly covers the key provisions, rectifications, and improvements related to the following aspects. A quick summary of these points, along with a sample image from the RSA report, is provided below along with sample picture.

1. Necessary measures for road closure are provided at required locations.
2. Junction improvement works completed.
3. Missing road markings (longitudinal, transverse, hazard) were addressed.
4. Missing signposts were installed.
5. Road Studs are provided at all locations
6. Gaps in the MBCB at the mentioned locations are not completed due to hindrances
7. Incorrect or missing MBCB & rigid crash barrier connections were corrected.
8. Gap has been identified between the rigid crash barrier and PGR
9. Painting works at NJCB, PGR, etc. have been completed.
10. Retroreflective tape on the metal beam crash barrier has been provided.
11. Installation of MBCB in the footpath at bridges is being removed.



7.5 Identified safety concerns along the project stretch

Keeping in view the scope of the assignment, safety concerns have been recorded on site and reported in the table below. The remarks and recommendation column includes information on road safety concerns related to installation errors of existing road furniture items, Additional requirements of road furniture items, and Junctions/Geometry/location-specific improvements as per pre-bid documents, i.e., *(Schedules, Pre-compliance Road Safety Audit Report, MPR by IE, etc).*

Risk and priority of each safety concern are also included as per the following criteria given in line with IRC: SP:88-2019 (Manual on Road Safety Audit).

- **Risk categories for identified safety concern: Very High, High, and Medium**

Priority level for recommendations: Essential, Highly Desirable, and Desirable

Keeping in view the scope of the assignment, safety concerns have been recorded on site and reported in the table below. The remarks and recommendation column includes information on road safety concerns related to installation errors of existing road furniture items, Additional requirements of road furniture items, and Junctions/Geometry/location-specific improvements as per pre-bid documents, i.e., *(Schedules, Pre-compliance Road Safety Audit Report, MPR by IE, etc).*

Risk and priority of each safety concern are also included as per the following criteria given in line with IRC: SP:88-2019 (Manual on Road Safety Audit).

- Risk categories for identified safety concern: Very High, High, and Medium
- Priority level for recommendations: Essential, Highly Desirable, and Desirable

Table 7-2: Identified safety concerns along the Project Road

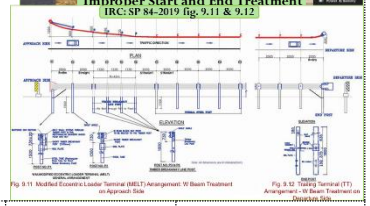
<table>
<tr><th rowspan="2">SI. No.</th><th colspan="2">Safety concern</th><th colspan="2">Recommendation</th><th rowspan="2">Type of concern</th></tr>
<tr><th>Current site condition</th><th>Risk</th><th>Recommendation and Remarks</th><th>Priority</th></tr>
<tr><td>1</td><td colspan="5">Safety Barrier</td></tr>
<tr><td>A</td><td>Inadequate transition arrangements between MBCB & Rigid barrier</td><td>Medium</td><td>Recommendation</td><td>Essential</td><td>O&M Issue</td></tr>
<tr><td></td><td colspan="5">Safety observation: During the site visit, the transition arrangements between MBCB & Rigid barrier were found to be inadequate at a few places.

Safety concern: The unprotected gap between W-Beam and rigid barrier connection locations poses a significant hazard to fast-moving traffic, potentially leading to severe vehicle damage or the vehicle falling from the height.

Recommendation:
• As per IRC: SP:84-2019, Clause 9.7.2, “…The W-beam to concrete transition shall be carried out by decreasing the post spacing, nesting one rail behind another and using steel section behind the W-beam. The transition between W-beam and concrete barrier is detailed in fig. 9.14…”.
• In view of road-user safety and in accordance with IRC requirements, the transition arrangement between MBCBs and rigid barriers requires improvement. This concern was also highlighted in the Pre-opening stage road safety audit report dated August 2024.

</td></tr>
<tr><td>B</td><td>Gap in MBCB</td><td>Medium</td><td>Recommendation</td><td>Essential</td><td>O&M Issue</td></tr>
</table>

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	Safety observation: During the site visit, a gap in the MBCB was observed at a few locations. The following sample photographs present the gap in MBCB along the Project Stretch. **Safety concern:** The gap in MBCB is highly unsafe for fast-moving traffic. Such discontinuity in the crash barrier can cause vehicles to penetrate through the opening, leading to severe accidents, rollovers, or falling off the embankment. **Recommendation:** As per the Compliance of Pre-Opening RSA report dated Sept 2024, the Gap in MBCB has been closed, but the residents have reopened the crash barrier to get access to their properties. Authority is requested to provide administrative support for closing such gaps.				
C	**Damaged Metal Beam Crash Barrier - MBCB**	**Medium**	**Recommendation**	**Essential**	**O&M Issue**
	Safety observation: Upon visual inspection, at a few locations, damaged MBCB has been observed along the Project Stretch. The image illustrates a sample of the damaged MBCB along the Project Stretch. **Safety concern:** The damaged barriers do not offer the requisite strength or ability to control errant vehicles effectively. **Recommendation:** Damaged MBCB shall be rectified, and the missing plates shall be provided at such locations as a part of routine maintainance.				
D	**Improper start and end treatment of MBCB**	**High**	**Recommendation**	**Essential**	**O&M Issue**

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	Safety observation: As shown in the photograph, the start and end treatments of the MBCB are improper. In a few locations, there is an abrupt start or end to the barrier. **Safety concern:** The MBCB is installed without proper end treatments (*Sharpe knife-type end portion),* which poses a significant hazard to approaching vehicles. In the event of an errant vehicle colliding with the beginning of the barrier, the impact could cause fatal/grievous injury. **Recommendation:** Provide appropriate end treatments for the MBCB in accordance with IRC: SP: 84–2019, Clause 9.7.2, with Modified Eccentric Loader Terminal (MELT) on the approach side and Trailing Terminal (TT) on the departure side, as applicable.				 
E	**Improper start and end treatment of MBCB at footpath locations on bridges**	**High**	**Recommendation**	**Essential**	**O&M Issue**
	Safety observation: W-beam crash barrier has been installed at the bridge location with a footpath, which is non-compliant with IRC standards. Additionally, the end treatment of the crash barrier has not been provided. **Safety concern:** The MBCB is installed without proper end treatments (*Sharpe knife-type end portion),* which poses a significant hazard to approaching vehicles. In the event of an errant vehicle colliding with the beginning of the barrier, the impact could cause fatal/grievous injury. **Recommendation:** In the interest of road user safety and in compliance with IRC requirements, the end treatment of the crash barrier shall be suitably improved at bridge locations. This issue was also highlighted in the Pre-Opening Stage Road Safety Audit Report (August 2024). Although the Concessionaire has reported that removal of MBCB at footpath locations is going on, it is observed that MBCB is still present at several such locations. The Concessionaire is therefore advised to review all bridge locations with footpaths and ensure uniform compliance, including provision of appropriate barrier type and approved end treatments, as per IRC guidelines.				
F	**Improper MBCB arrangement at the base of the Overhead Sign Board and ATMS**	**Very high**	**Recommendation**	**Essential**	**O&M Issue**

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	component				
	Safety observation: Improper arrangement of MBCB has been observed at the base of the overhead signboard structure and ATMS component. The alignment and termination of the crash barrier do not adequately shield the rigid roadside object, and proper end treatment/object hazard protection has not been provided. Additionally, the exposed edges of the MBCB are directly facing traffic, posing an increased risk to errant vehicles. **Safety Concern:** The exposed MBCB edges and lack of proper end treatment may cause direct impact with roadside objects, increasing the risk of severe injuries or fatalities to errant vehicles. Improper MBCB arrangement at the base of Overhead Sign Board and ATMS component **Recommendation:** Remove the existing MBCB arrangement and provide a properly aligned MBCB along the base of the overhead signboard support and ATMS components. Further, provide MELT (approach side) and TT (departure side) end treatments for the MBCB as per IRC: SP: 84–2019, Clause 9.7.2, and avoid abrupt or open ends to mitigate safety risks				
G	**Height of existing Metal Beam Crash Barrier -MBCB**	**-**		**-**	**No Issue**
	No Issue Observed.				
H	**Wrong overlapping of MBCB plates**	**-**		**-**	**No Issue**
	No Issue Observed.				
I	**MBCB Setback distance**	**-**		**-**	**No Issue**
	MBCB setback distance is adequate.				
J	**Missing MBCB at hazardous locations**	**Very high**	**Recommendation**	**Essential**	**New Installation**
	Safety Concern: During the site visit, it was observed that MBCB was missing at multiple hazardous locations along the Project Stretch, such as 1. At the base of the Overhead sign Board support 2. At the approach of the Rigid Barrier Missing MBCB at the base of the Overhead sign Board Missing MBCB at the approach of Rigid Barrier				

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	Unprotected and inadequately shielded sections near roadside objects and rigid barriers are dangerous. In the event of a vehicle runoff or out of control, the vehicle could directly hit, potentially resulting in fatalities **Recommendation:** As per clause 9.7.1.4 IRC: 84: 2019, "…Roadside obstacles such as bridge piers, abutments and railing ends, roadside rock mass, culverts, pipes and headwalls, cut slopes, retaining walls, lighting supports, traffic signs and signal supports, trees and utility poles shall be protected with a safety barrier…"				
K	**Welded connection of MBCB Plates**	**-**		**-**	**No Issue**
	No issue was observed.				
L	**Wire Rope Barrier Setback Distance**	**-**		**-**	**NA**
	NA		NA		
M	**Wire Rope Barriers Distance from the face of the kerb**	**-**		**-**	**NA**
	NA		NA		
N	**Inadequate height of Rigid Crash Barrier (RCB)**	**-**		**-**	**No Issue**
	No Issue Observed				
2	**Pedestrian Guard Rail (PGR)**				
A	**New installation of PGR**	**-**		**-**	**No Issue**
	No Issue Observed				
B	**Damaged PGR**	**-**		**-**	**No Issue**
	No Issue Observed				
C	**Improper connection between PGR and Steel railing**	**Medium**	**Recommendation**	**Desirable**	**O&M issue**
	Safety observation: Improper connection between PGR and railing at various locations is highly hazardous for fast-moving traffic: It might lead to severe damage to vehicles. The picture below shows the current scenario of the issue on the site. **Recommendation:** As per standard industrial practices, providing a proper connection between the PGR and the railing is important for the safe and smooth transition of an errant vehicle.				Installation error

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
3	**Missing/Damaged Median walls in b/w structures**	-		-	**No Issue**
	No Issue Observed				
4	**Issue with existing solar blinkers and additional requirements**	-		-	**No Issue**
	No Issue Observed				
5	**Highway Lighting**	**Medium**	**Recommendation**	**Desirable**	**O&M issue**
	The highway lighting design layout, including configuration and specifications, has been received and reviewed. However, during the site visit, it was observed that highway lighting along the project road is non-functional due to the road being non-operational, except for the high-mast lighting at the toll plaza. Noticeable low intensity was observed, raising concerns regarding the adequacy of the existing highway lighting, bulb specifications, etc. Therefore, a detailed highway lighting illumination assessment is recommended to ensure compliance with required standards and uniform lighting.		Highway Lighting at Toll Plaza		
6	**Issue with an existing and additional signboard**	-		-	**No Issue**

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	Safety observation: During the site visit, following issues have been identified along the Project Stretch. • ***Damaged and faded Sign Poles:*** *Few of the existing sign boards are observed to be damaged and faded* • *Damaged Sign Boards* • *Missing Sign boards* • *Faded Sign boards* Following figures present a few issues in existing and missing signboards along the Project Stretch **Safety concern:** Inadequate maintenance of signboards can create confusion among road users regarding the road environment, increasing the likelihood of incidents or accidents **Recommendation:** Signboards are provided to inform road users about various road features or facilities along the road. Hence, the existing signboards shall be maintained to fulfil the purpose of guiding road users, and missing sign boards shall be provided.				
7	**Delineators/Guard Post**	-		-	**No Issue**
	No Issue Observed.				
8	**Maintenance Issues of Existing Pavement Marking**	-		-	**No Issue**
	No Issue Observed.				
9	**Gore Area Improvement**	**Very High**	**Recommendation**		

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	Safety observation: Upon visual inspection, it has been observed that gore areas—such as service road exit points and toll lane bullnose locations—are exposed and pose potential hazards to road users. **Safety Concern:** In the event of a collision involving an errant vehicle at these gore areas, especially where the geometry is compromised, there is a high likelihood of severe injuries. Additionally, such incidents could lead to a chain reaction of accidents involving both service road and main carriageway users. **Recommendation:** As per IRC: SP: 84–2019 (Clauses 9.6 and 10.4.3), provision of Traffic Impact Attenuators (TIA) is recommended at identified hazardous locations, including gore areas and toll lane bullnose locations, to enhance road user safety and mitigate crash severity.				
10	**Safety Measures at critical locations, i.e., Transverse Bar Marking**	-		-	**No Issue**
	No Issue Observed.				
11	**Road Studs**	-		-	**No Issue**
	No Issue Observed.				
12	**Road Geometry**				
A	**Absence of a storage lane at median opening/U-turn locations**	-		-	**NA**
	NA				
B	**Un-Authorized Median Openings (UMO)**	-		-	**No Issue**
	No Issue Observed.				
C	**Improper Entry and Exit Arrangement**	-		-	**No Issue**
	No Issue Observed.				
D	**Improper connections of Minor Roads**	-		-	**No Issue**
	No Issue Observed.				
13	**Night-time visibility -Retroreflective**	-		-	**No Issue**

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	stickers on MBCB				
	No Issue Observed.				
14	**Improper maintenance of the Earthen Shoulder**	-		-	**No Issue**
	No Issue Observed.				
15	**Landscaping and Tree Plantation**				
A	**Issue with Median plantation**	-		-	**No Issue**
	No Issue Observed.				
B	**Median Plantation in No Plantation Zone**	-		-	**NA**
	No issue was observed.				
16	**Truck Lay Bays/Bus Bays/Wayside Amenities**				
A	**Truck Lay Bay Layout**	-		-	**NA**
	No Issue Observed				
B	**Bus Bays and Bus Shelters**	-		-	**NA**
	No Issue Observed.				
C	**Rest Areas / Wayside Amenities**	-		-	**No Issue**
	No Issue Observed.				
18	**Other General Issues**				
A	**Water Stagnation**	-		-	**No Issue**
	No Issue Observed.				
B	**Encroachment by Temporary Shops**	-		-	**No Issue**
	No Issue Observed.				
C	**High Transmission Line Vertical Clearance**	-		-	**No Issue**
	No issue was observed.				
D	**Ongoing Construction-Related Issues**	-		-	**No Issue**

SI. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	No issue was observed.				
E	**Parking on Paved Shoulder**	**-**		**-**	**No Issue**
	No Issue Observed.				
F	**Sudden Edge Drop at the Shoulder**	**-**		**-**	**No Issue**
	No Issue Observed.				
G	**Rigid Electrical Poles on shoulders**	**-**		**-**	**No Issue**
	No Issue Observed.				
19	**Improper access arrangement to Fuel stations**	**-**		**-**	**NA**
	NA				

7.6 Summary of compliance of final pre-opening road safety audit report

The following table represent the identified safery observations along the project stretch.

Table 7-3: Summary of identified road safety concerns and corresponding quantities along the Project Road

S. No.	Safety observations	Identified Locations	Remarks
1	Missing MBCB at the Hazardous locations	**At the base of the overhead sign board, ATMS component and the Electrical Poles** LHS: at Km (0.000, 2.100, 2.500, 4.200, 9.450, 18.800, 38.500, 39.800, 59.550, 61.200, 61.550, 63.000, 64.000) RHS: At Km (0.000, 2.100, 2.500, 4.200, 9.450, 18.800, 38.500, 39.800, 59.550, 61.200, 61.550, 63.000, 64.000) **Total Length = 1300 m** **At the approach side of the Headwall** LHS: At Km (2.200, 7.050, 8.600, 13.020, 16.000, 26.800, 28.650, 37.650, 37.850, 47.300, 53.800, 56.300, 58.500, 59.900, 62.900, 63.800, 69.100) RHS: At Km (2.200, 7.050, 8.600, 13.020, 16.000, 26.800,	

S. No.	Safety observations	Identified Locations	Remarks
		28.650, 37.650, 37.850, 47.300, 53.800, 56.300, 58.500, 59.900, 62.900, 63.800, 69.100) **Total Length = 1700 m**	
3	Improper start/end treatment of MBCB	at Km 63.350, 66.900 and 69.750 = **3 Nos.**	
4	Improper connection between MBCB and RCC Crash Barrier Improper connection between MBCB and Steel Railing	**Improper connection between MBCB and RCC Crash Barrier = 14 Nos.** LHS: At Km (1.700, 57.300, 59.200, 59.900) = 8 Nos. RHS: At Km (59.300, 59.900, 60.200) = 6 Nos. **Improper connection between MBCB and Steel Railing = 6 Nos.** LHS: At Km (5.850) = 2 Nos. RHS: At Km (5.850 and 63.700) = 4 Nos.	
5	Improper start and end treatment of MBCB installed along the footpath	**LHS:** At Km (7.050, 8.600, 13.020, 16.000, 26.800, 37.650, 37.850, 53.800, 56.300, 58.500, 59.300, 69.100) **RHS:** At Km (7.050, 8.600, 13.020, 16.000, 26.800, 37.650, 37.850, 53.800, 56.300, 58.500, 59.300, 69.100)	
6	Improper MBCB arrangement at the base of the Overhead Sign Board and ATMS component	**At the base of the Overhead Sign Board** **BHS:** At Km (24.800, 26.900, 30.200, 32.400, 50.200, 57.400, 62.050, 64.300, 66.200, 68.600, 70.200) (11 Nos.) **At the base of ATMS Component** **BHS: At Km (**16.400, 21.100, 24.900, 26.500, 27.700, 28.600, 29.500, 31.200, 32.050, 38.300, 43.850, 47.950, 52.000, 53.100, 53.600, 64.850, 69.300, 70.050) (18 Nos.)	
7	Issue with existing and missing sign boards	**Missing Sign Board Plates:** Emergency Call Box Sign Board: LHS: At Km (6.150, 12.200, 14.100, 18.300, 22.250, 24.200, 26.300, 30.150, 34.200, 40.000, 44.150, 52.300, 56.000, 60.300, 66.200, 68.200) = 16 Nos. RHS: At Km (2.300, 4.200, 8.200, 24.200, 26.300, 30.150, 34.200, 40.000, 52.300, 54.800, 56.000, 60.300, 66.200,	

S. No.	Safety observations	Identified Locations	Remarks
		68.200) = 14 Nos. **HT Line Ahead Sign Board:** LHS: At Km (26.000, 35.800, 55.500, 62.000) = 4 Nos. RHS: At Km (62.000) = 1 Nos. **OHM Sign Board** LHS: At Km (5.850 & 59.900) = 2 Nos. RHS: At Km (57.500 & 61.500) = 2 Nos. **Pass Either Side Sign Board** LHS: At Km (29.900 & 62.300) = 2 Nos. RHS: At Km (61.500) = 1 No. **Damaged overhead sign board** Cantilever and Gantry Sign Board LHS: At Km (64.900 & 70.200) = 2 Nos. RHS: At Km (66.300 & 70.200) = 2 Nos. **Damaged toll information sign board** RHS: At Km 63.300 = 1 Nos.	

Chapter 8
CHANGE OF SCOPE

CHAPTER 8. CHANGE OF SCOPE

8.1 Change of Scope (COS) details

Table 8-1: List of change of scope details

S. No	Description	Submitted value	Recommended value by IE/TL/AE	Recommended value by PD	Recommended value by RO	COS Value agreed by GRIL	Final approved/accepted value	Status of work
1	COS-01: Providing the Drone Video Recording	1,66,93,022.00	8,61,494.00	8,61,494.00	8,61,494.00	1,66,93,022.00	8,61,494.00	(GR included 16 months construction period + 15 years O&M period whereas IE recommended for 16 months only) - Not approved for O&M
2	COS-02 1). Additional Pipe Vents at Canal Crossing at Ch.6+350, 23+300, Ch.23+500, 24+850, Ch. 53+495, Ch.54+164 for New Canal by Irrigation Dept 2). Additional Crossing at Forest Land from Ch. 42+900 to 47+110 (9 no's Box Vents & 6 no's Pipe Vents) 3). RCC Portal at	12,50,53,626.00	6,64,97,988.00	6,55,03,810.00	6,55,03,810.00	6,55,03,810.00	6,55,03,810.00	

S. No	Description	Submitted value	Recommended value by IE/TL/AE	Recommended value by PD	Recommended value by RO	COS Value agreed by GRIL	Final approved/accepted value	Status of work
	Chainage 65+528 over IOCL Pipeline 4). 2 Nos. Additional Box Vents at Ch. 67+900, 21+680 and 1 No. Pipe Vent at Ch.70+100							
3	COS-03 Reduction in toll lanes (-ve) – 8 lane toll plazas instead of 16 lane toll plazas		-143238475				-143238475	Approved by Authority
4	COS-04 Descoping of WSA (-ve) at km 14.050 (RHS), 20.050(LHS), 60.946(RHS), 65.527(LHS)	-	-168567636				-168567636	
	Total amount						24,54,40,807	

Note – The works related to change of scope is completed at site. The data furnished in above table is based on the data provided by concessionaire at site.

The negative change of scope/ Reduction in scope is approved by Authority through letter no 27011/3/PD-Korba/BSP-URGA/COS-RIS/2025/6935 Dated 28-11-2025 for an amount of 31.18 crores, which the Bid Project cost may be revised accordingly.

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Chapter 9
OPERATION & MAINTAINANCE COST

CHAPTER 9. OPERATION AND MAINTAINANCE COST

9.1 General

This Chapter presents details on the O&M expenditure to be incurred. The expenses are divided into four heads.

- Routine Maintenance Expenses to maintain the asset to the standards set forth in the Concession Agreement.
- Major/ Periodic Maintenance Expenses
- Operating Expenses

Table 9-1: Project stretch

Project stretch	Chainage From	Chainage To	Length (km)
	0.000	70.200	70.200

9.2 Cost of Various Components.

The estimation of quantities is based on Schedules. The estimation of quantities and costs worked out separately for each item. The quantities are estimated under the following heads:

- Overlay on MCW and SR
- TMS & ATMS
- Other miscellaneous works (i.e., Road Marking, Shoulder repair, Kerb raising, Kerb painting etc.)

9.3 Estimation of Operation & Maintainance cost

Following table illustrates the initial cost to be incurred for routine maintenance and major maintenance,

Table 9-2: Routine maintenance cost of the Project

S No	Particulars	Frequency	Cost excluding GST (Cr)	Remarks
1	**Routine Maintenance Cost**	**Annual**		

S No	Particulars	Frequency	Cost excluding GST (Cr)	Remarks
	Pavement Maintenance		**1.15**	
	Highway and Road Furniture		**1.55**	
	Structures Maintenance		**1.07**	
	Street Lighting and Misc. works		**0.23**	
	Total RM cost		**4.02**	

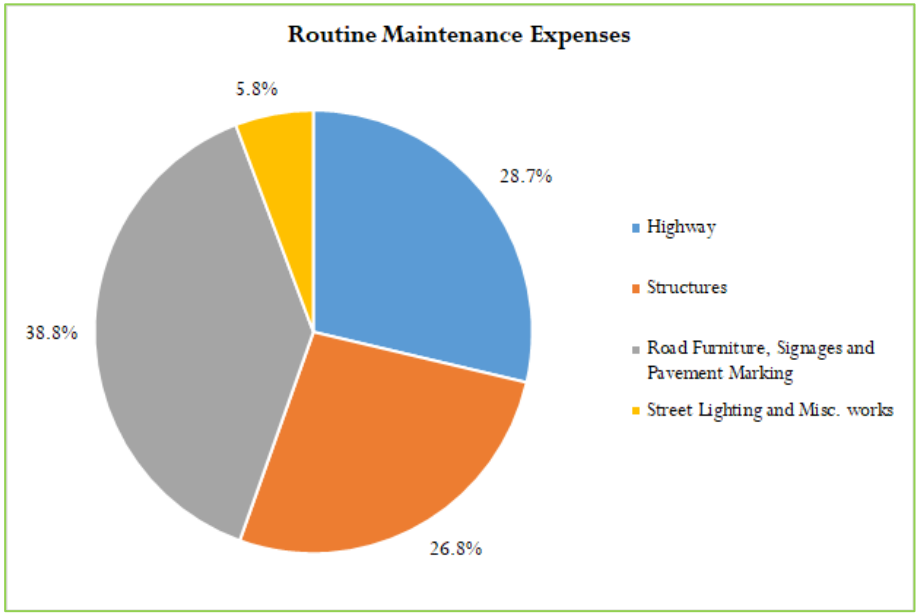


Figure 9-1: Breakup of routine maintenance expenses

Table 9-3: Operational Expenditure of the Project for the FY 2026

S. No	Description	Manpower	Annual Exp. (in lacs)
A.1	SPV staff and salaries	10	67.14
A.2	Tolling Operations Services Outsourced		0.00
A.3	Security services Outsourced	4	0.00

S. No	Description	Manpower	Annual Exp. (in lacs)
A.4	Incident Management Services	24	99.93
A.5	RoW and Horticulture Works_ Manpower Outsourced	37	126.76
A.6	Electricity and Diesel Charges		104.92
A.7	TMS/HTMS System Expenses		73.39
A.8	Office Operating Expenses		11.42
A.9	Vehicle Running Expenses		27.25
A.10	Professional Fee		28.56
A.11	Community Development		6.36
A.12	Communication Expenses		1.53
A.13	Conveyance Expenses		10.68
A.14	Insurance Expenses		71.19
A.15	IE Fees		35.59
A.16	Contingency	1.0%	7.72
	OPEX		672.44

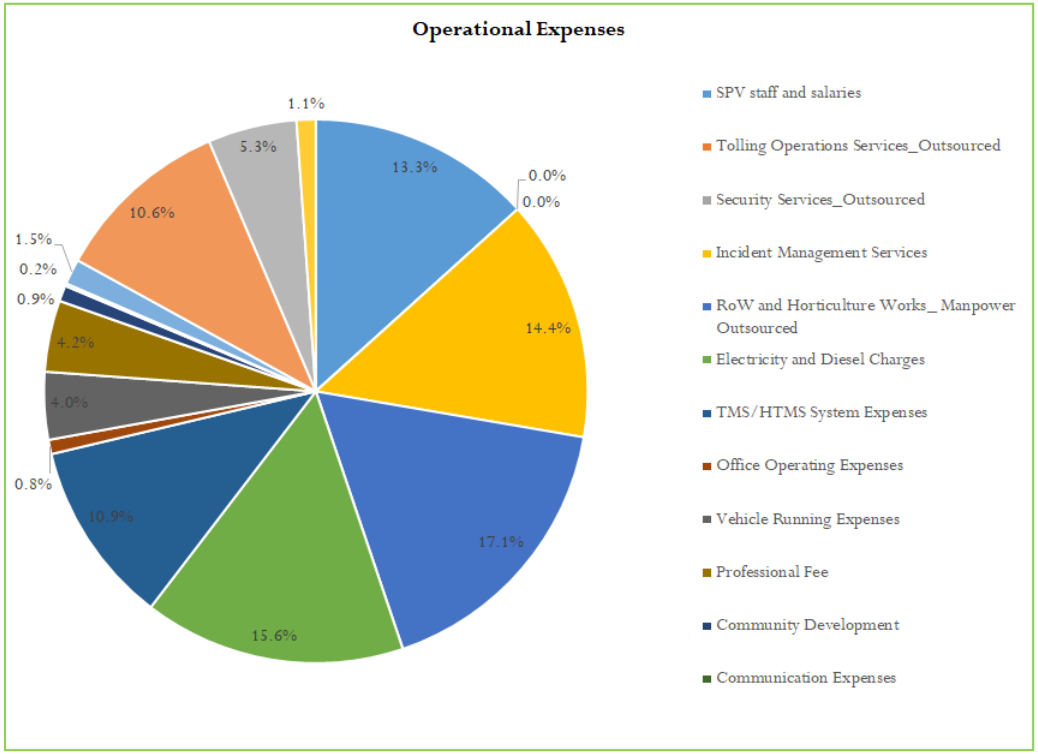


Figure 9-2: Breakup of Operational expenses

9.4 Estimation of Periodic Maintenance Cost

Bitumen plays a vital role in overall cost estimation. Considering the performance and availability of bitumen from a nearby source, to estimate cost analysis Bitumen VG-40 is considered for BC & DBM in all cases.

The abstract of resultant estimated costs for the Project Stretch is given below. All costs are estimated based on FY 2025-26 prices.

Table 9-4: Estimated Periodic Maintenance cost (FY 33) MM-1

S.no	Description	Unit	Qty	Rate	Amount	Remarks
	MCW-Rigid					
1	Route and Seal (Rmt)-10% (Per lane km)	Rmt	19982	180	3596760	

S.no	Description	Unit	Qty	Rate	Amount	Remarks
2	Seal and Cross stitch or staple (Rmt)- 5% (per lane km)	Rmt	9991	1150	11489650	
3	Concrete works (Cubic m)-2%	Cum	5022.41	7946	3,99,08,058.74	
4	Joint sealant-100% (2 Times in Longitudinal Direction)	Rmt	100200.00	120	12024000	
5	Joint sealant-100% (Transverse joints)	Rmt	219617.78	120	26354133.33	
6	**MCW-Flexible**					
7	Bituminous Concrete Overlay (VG 40))	Cum	12792.6	11751	150326318.5	
8	Tack coat	Sqm	426421.35	16	6822741.6	
9	DBM Inlay (VG 40)	Cum		10077	0	
10	Tack coat	Sqm		16	0	
11	Milling	Sqm		90	0	
12	Kerb raising	Rmt	54418	320	17413760	
13	Kerb painting	Sqm	56762	100	5676225	
14	Median Filling	Cum	27964	450	12583800	
15	Earthen shoulder - Granular	Cum	23506.5	460	10812990	
16	Pavement marking (Flexible) MCW & SR	Sqm	39319	430	16906955	
17	Pavement marking (Rigid) MCW & SR	Sqm	74596	485	36179011.5	
18	Road Studs	Nos	25000	200	5000000	
19	**SR**					
20	Bituminous Concrete Overlay (VG-40)	cum	2366.61	11751	27810034.11	
21	Tack coat	Sqm	75731.52	15	1135972.8	
22	DBM Inlay (VG 40)	Cum		10077	0	
23	Tack coat	Sqm		16	0	
24	Milling	Sqm	75731.52	190	0	
25	Miscellaneous and Contingencies (5%)	Ls			7680808.212	
				Total	391721218.8	
				GST (18%)	70509819.39	
				Grand total	462231038.2	
				Total (In Cr)	**46.2**	

Table 9-5: Estimated Periodic Maintenance cost (FY 40) MM-II

S.no	Description	Unit	Qty	Rate	Amount	Remarks
	MCW-Rigid					
1	Route and Seal (Rmt)-10% (Per lane km)	Rmt	19982	180	3596760	
2	Seal and Cross stitch or staple (Rmt)- 5% (per lane km)	Rmt	19562.378	1150	22496734.7	
3	Concrete works (Cubic m)-2%	Cum	6087.77	7946	48373404.53	
4	Joint sealant-100% (2 Times in Longitudinal Direction)	Rmt	90180.00	120	10821600	
5	Joint sealant-100%(Transverse joints)	Rmt	215511.11	120	25861333.33	
6	**MCW-Flexible**					
7	Bituminous Concrete Overlay (VG 40))	Cum	12792.6405	11751	150326318.5	
8	Tack coat	Sqm	426421.35	16	6822741.6	
9	DBM Inlay (VG 40)	Cum	0	10077	0	
10	Tack coat	Sqm	0	16	0	
11	Milling	Sqm	0	90	0	
12	Kerb raising	Rm	0	320	0	
13	Kerb painting	Sqm	56762	100	5676225	
14	Median Filling	Cum	0	450	0	
15	Earthen shoulder - Granular	Cum	23506.5	460	10812990	
16	Pavement marking (Flexible) MCW & SR	Sqm	39319	430	16906955	
17	Pavement marking (Rigid) MCW & SR	Sqm	74596	485	36179011.5	
18	Road Studs	Nos	35000	200	7000000	
19	**SR**					
20	Bituminous Concrete Overlay (VG-40)	cum	2366.61	11751	27810034.11	
21	Tack coat	Sqm	78887.00	16	1262192	
22	DBM Inlay (VG 40)	Cum	0	10077	0	
23	Tack coat	Sqm	0	16	0	
24	Milling	Sqm	78887	190	14988530	
25	Miscellaneous and Contingencies (5%)	Ls			18635871.28	

S.no	Description	Unit	Qty	Rate	Amount	Remarks
				Total	408381571.8	
				GST (18%)	73508682.92	
				Grand total	481890254.7	
				Total (In Cr)	**48.2**	

9.4.1 Major Maintenance expenses during O&M period

As per the Cube Tech estimate, the total Major Maintenance expense including the escalation is Rs.119.09 cr.

9.4.2 Projections of O&M Expenses

The O&M expenses for the entire Concession Period is presented in this section. The following escalations are considered:

Table 9-6: Escalation Factors

Item	Escalation
Operating expenses	4.5%
Routine maintenance	4.5%
Major maintenance	4.5%

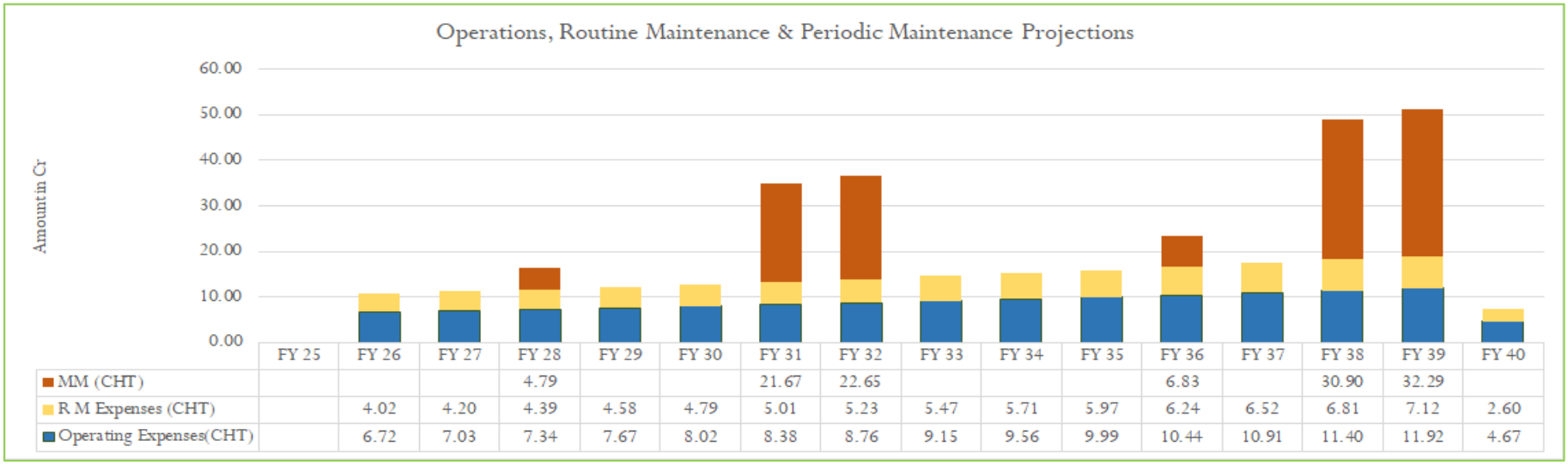
The Projections of total O& M expenses including Major Maintenance for 2 Cycles of the Project Company and CHT is given in the table below

Table 9-7: Projections of total O&M expenses of the Project during O&M period

Particulars	Total Expense (In Cr.)	Base FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
Operating Expenses (CHT)	**131.96**	6.72	7.03	7.34	7.67	8.02	8.38	8.76	9.15	9.56	9.99	10.44	10.91	11.40	11.92	4.67
R M Expenses (CHT)	**78.64**	4.02	4.20	4.39	4.58	4.79	5.01	5.23	5.47	5.71	5.97	6.24	6.52	6.81	7.12	2.60
MM (CHT)	**119.09**			4.79			21.67	22.65				6.83		30.90	32.29	
O&M and MM (CHT)	**329.70**	**10.74**	**11.22**	**16.52**	**12.26**	**12.81**	**35.06**	**36.63**	**14.62**	**15.27**	**15.96**	**23.51**	**17.43**	**49.11**	**51.32**	**7.28**

All amounts are in crores and excluding of GST.

The graph for the total cost Projections of expenses during O&M period given by Cube Highways Technologies is shown in the figure below.



	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
MM (CHT)				4.79			21.67	22.65				6.83		30.90	32.29	
R M Expenses (CHT)		4.02	4.20	4.39	4.58	4.79	5.01	5.23	5.47	5.71	5.97	6.24	6.52	6.81	7.12	2.60
Operating Expenses(CHT)		6.72	7.03	7.34	7.67	8.02	8.38	8.76	9.15	9.56	9.99	10.44	10.91	11.40	11.92	4.67

Figure 9-3: O&M, RM and MM Expenses Projections

Chapter 10
OVERALL REVIEW

CHAPTER 10. OVERALL REVIEW

10.1 Observations

- All the Project facilities provided by the concessionaire are in line with the inventory with few variations.
- National Highways Authority of India (Authority) and M/s G R Bilaspur Urga Highway Private Limited (the Concessionaire) entered into a Concession Agreement on 21st June 2021 for execution of the Project on Hybrid Annuity Mode. Subsequently, the Appointed Date was declared on 25th March 2022.
- The Scheduled Completion Date is (SCD) on 23rd March 2024 i.e., 730th day from the Appointed Date.
- The Project has been completed, and the Project is hereby declared fit for entry into commercial operation from 12th August 2024 for a length of 55.120km (PCC-01)
- PCC-02 has been declared for a length of 13.895km (covering a total length of 69.015km out of 70.200km) effective from 30th June 2025.
- As per IRC Manual 84:2019, standby arrangements such as DG sets shall be provided to ensure uninterrupted street lighting. As per the Schedule C comparison statement with the site, it is mentioned as provided, but the same is not available at site.
- At present, the stone pitching provided along the project stretch is in good condition.
- The pavement conditions along both sides of the Project Highway were generally observed to be in good condition.
- TMS & ATMS equipment's are not in working condition, still few more equipment's are to be installed along the project stretch.
- Some of the equipment is currently under installation, while the remaining equipment is kept at the project office. These will be installed at the time of opening the road to traffic due to theft concerns.

ANNEXURES

Service road

S. No	Design Chainage in Km		Length	Width (m)	Sqm	Side	Remarks
	From	To					
1	400	1280	880	7	6160	BHS	Slip Road - Balance
2	27820	29420	1600	7	11200	BHS	Slip Road
3	53010	53710	700	7	4900	BHS	Slip Road
4	62350	63550	1200	7	8400	BHS	Slip Road
5	43150	49000	5850	7	40950	RHS	BC
6	69300	70200	900	7	6300	RHS	BC
7	1800	2280	480	7			Balance
8	69300	70200	900	7	6300	LHS	BC
		Total length	25020		143220		

Annexure I: Drain

S No.	Chainage		Length (m)	Side	Remarks
	From	To			
1	28370	28560	190	LHS	Covered drain
2	28560	28680	120	LHS	Covered drain
3	28753	28800	47	LHS	Covered drain
4	28910	28990	80	LHS	Covered drain
5	53630	53670	40	LHS	V shape drains
6	53670	53700	30	LHS	V shape drains
7	69397	69740	343	LHS	Covered drain
8	53195	53230	35	LHS	Covered drain
9	53230	53300	70	LHS	Covered drain
10	69880	69900	20	LHS	Covered drain
11	53300	53360	60	LHS	Covered drain

S No.	Chainage		Length (m)	Side	Remarks
	From	To			
12	53380	53440	60	LHS	Covered drain
13	53485	53560	75	LHS	Covered drain
14	53360	53370	10	LHS	Covered drain
15	69740	69880	140	LHS	Covered drain
16	69900	69910	10	LHS	Covered drain
17	70100	70200	100	LHS	V shape drain
18	70071	70100	29	LHS	V shape drain
19	53440	53485	45	LHS	V shape drain
20	53370	53380	10	LHS	V shape drain
21	43291	43320	29	RHS	V shape drain
22	43320	43450	130	RHS	V shape drain
23	43450	43450	0	RHS	V shape drain
24	43450	43459	9	RHS	V shape drain
25	43461	43540	79	RHS	V shape drain
26	43540	43669	129	RHS	V shape drain
27	43671	43710	39	RHS	V shape drain
28	43710	43830	120	RHS	V shape drain
29	43830	43940	110	RHS	V shape drain
30	44120	44258	138	RHS	V shape drain
31	44261	44350	89	RHS	V shape drain
32	44350	44440	90	RHS	V shape drain
33	44450	44550	100	RHS	V shape drain
34	44683	44770	87	RHS	V shape drain
35	44770	44870	100	RHS	V shape drain
36	44870	44970	100	RHS	V shape drain
37	44970	45050	80	RHS	V shape drain

S No.	Chainage		Length (m)	Side	Remarks
	From	To			
38	45050	45090	40	RHS	V shape drain
39	45090	45190	100	RHS	V shape drain
40	45190	45280	90	RHS	V shape drain
41	45280	45310	30	RHS	V shape drain
42	45310	45390	80	RHS	V shape drain
43	45390	45459	69	RHS	V shape drain
44	45462	45480	18	RHS	V shape drain
45	45480	45600	120	RHS	V shape drain
46	45600	45690	90	RHS	V shape drain
47	45715	45740	25	RHS	V shape drain
48	45740	45804	64	RHS	V shape drain
49	45804	45880	76	RHS	V shape drain
50	45955	46040	85	RHS	V shape drain
51	46040	46120	80	RHS	V shape drain
52	46120	46140	20	RHS	V shape drain
53	46140	46200	60	RHS	V shape drain
54	46200	46220	20	RHS	V shape drain
55	46220	46259	39	RHS	V shape drain
56	46261	46275	14	RHS	V shape drain
57	46275	46335	60	RHS	V shape drain
58	46335	46415	80	RHS	V shape drain
59	46415	46460	45	RHS	V shape drain
60	46460	46520	60	RHS	V shape drain
61	46530	46559	29	RHS	V shape drain
62	46561	46590	29	RHS	V shape drain
63	46590	46640	50	RHS	V shape drain

S No.	Chainage		Length (m)	Side	Remarks
	From	To			
64	46640	46690	50	RHS	V shape drain
65	46690	46758	68	RHS	V shape drain
66	46760	46800	40	RHS	V shape drain
67	46800	46865	65	RHS	V shape drain
68	46865	46910	45	RHS	V shape drain
69	46910	46935	25	RHS	V shape drain
70	47752	47770	18	RHS	V shape drain
71	47770	47810	40	RHS	V shape drain
72	47810	47860	50	RHS	V shape drain
73	47860	47900	40	RHS	V shape drain
74	47900	47950	50	RHS	V shape drain
75	47950	47990	40	RHS	V shape drain
76	47990	48030	40	RHS	V shape drain
77	48030	48050	20	RHS	V shape drain
78	48050	48300	250	RHS	V shape drain
79	48300	48410	110	RHS	V shape drain
80	48410	48452	42	RHS	V shape drain
81	48452	48458	6	RHS	V shape drain
82	48458	48478	20	RHS	V shape drain
83	53680	53700	20	RHS	Covered drain
84	69397	69432	35	RHS	Covered drain
85	69739	69750	11	RHS	Covered drain
86	44550	44660	110	RHS	V shape drain
87	44440	44450	10	RHS	V shape drain
88	53539	53590	51	RHS	Covered drain
89	53470	53480	10	RHS	Covered drain

S No.	Chainage		Length (m)	Side	Remarks
	From	To			
90	53435	53470	35	RHS	Covered drain
91	53370	53380	10	RHS	Covered drain
92	53240	53340	100	RHS	Covered drain
93	53340	53370	30	RHS	Covered drain
94	53380	53420	40	RHS	Covered drain
95	53180	53240	60	RHS	Covered drain
96	53420	53435	15	RHS	Covered drain
97	48480	48550	70	RHS	V shape drain
98	48550	48620	70	RHS	V shape drain
99	48700	48900	200	RHS	V shape drain
100	48620	48700	80	RHS	V shape drain
101	44029	44120	91	RHS	V shape drain
102	43940	44021	81	RHS	V shape drain
103	47480	47500	20	RHS	V shape drain
104	47500	47555	55	RHS	V shape drain
105	47555	47640	85	RHS	V shape drain
106	47640	47720	80	RHS	V shape drain
107	48900	48940	40	RHS	V shape drain
108	70100	70200	100	RHS	V shape drain
109	69995	70100	105	RHS	V shape drain
110	53480	53500	20	RHS	V shape drain
111	53500	53520	20	RHS	V shape drain
112	53520	53539	19	RHS	V shape drain
113	69368	69407	39	RHS	V shape drain
114	69432	69739	307	RHS	V shape drain
115	28300	28460	160	RHS	Covered drain

S No.	Chainage		Length (m)	Side	Remarks
	From	To			
116	28460	28708	248	RHS	Covered drain
117	28765	28950	185	RHS	Covered drain
118	28950	29060	110	RHS	Covered drain
119	29060	29140	80	RHS	Covered drain
Total length			8237		

Annexure II: Major and Minor intersections

S. No.	Design Chainage (Km)	Type of Minor intersection	Remarks
1	1 + 195	+	LHS - Dheka, RHS - Dheka
2	1+800	+	LHS - Karra, RHS - Darrighat
3	4+108	+	LHS - Karra, RHS - Limtara
4	7+798	+	LHS -Gatoura, RHS - Jairamnagar
5	9+467	+	LHS - Ralia, RHS - Jairmnagar
6	12+910	+	LHS - Sipat, RHS - Jairamnagar
7	15+725		LHS - Mudpara; RHS - Tenduwa
8	18+160	+	LHS - Son ad u la, RHS - Sankar
9	21+040	+	LHS - Changori, RHS - Pondi Dalha
10	24+567	+	LHS - Chandniya, RHS - Fields
11	25+310	+	LHS - Chandniya, RHS - Pandariya
12	27+324	+	LHS - Bachhaud, RHS - Dhorla
13	30+406	+	LHS -Nawapara, RHS - Baloda
14	30+625	+	LHS -Nawapara, RHS - Baloda
15	32+035	+	LHS - Mahuda, RHS - Baloda
16	34+598	+	LHS - Birgahani, RHS -Bhilai
17	35+712	+	LHS - Korbi, RHS - Dongri

S. No.	Design Chainage (Km)	Type of Minor intersection	Remarks
18	37+945	+	LHS - Kathapali, RHS - Dongri
19	40+036	+	LHS -Bagdabri, RHS - Hardibisal
20	42+157	+	LHS -Dholpur, RHS - Khisora
21	48+150	T	LHS - Murabhatha
22	51+197	+	LHS - Baksara, RHS - Pantora
23	52+960	+	LHS - Bhatikuda, RHS - Pantora
24	53+710	+	LHS - Birda, RHS - Pantora
25	56+600	+	LHS - Saraisingar, RHS - Gonrbhata
26	60+226	+	LHS - Deurmal, RHS - Akhrapali
27	64+555	+	LHS - Urga, RHS - Masan
28	66+115	+	LHS - Kurudih, RHS - Bagbuda
29	68+085	+	LHS - Bhaisma, RHS - Tilkeja

S. No.	Design Chainage	Type of Crossing Road	Type of Major Structure Proposed	Name of Crossing Road/Features/Remarks
1	0+925	NH-49 - Roundabout	Flyover	LHS-Bilaspur, RHS - Sarangarh
2	28+714	MDR - +	Flyover	LHS - Bilaspur, RHS - Baloda
3	62+950	NH-149 B - Roundabout	Flyover	LHS - Urga/Korba, RHS - Champa
4	69+310	SH-04 - T	VUP	LHS - Urga/Korba

Annexure III: Metal beam crash barrier

S. No	From	To	Length	Side	Remarks	S.No	From	To	Length	Side	Remarks
1	0.000	0.650	0.650	LHS		1	0.000	0.650	0.650	RHS	
2	0.650	0.852	0.202	LHS	Balance	2	0.650	0.852	0.202	RHS	Balance
3	0.852	1.017	0.165	LHS	0.74	3	0.852	1.017	0.165	RHS	0.74
4	1.017	1.193	0.176	LHS		4	1.017	1.193	0.176	RHS	

S. No	From	To	Length	Side	Remarks	S.No	From	To	Length	Side	Remarks
5	1.193	1.200	0.007	LHS		5	1.193	1.200	0.007	RHS	
6	1.200	1.390	0.191	LHS		6	1.200	1.390	0.191	RHS	
7	1.390	1.690	0.300	LHS		7	1.390	1.690	0.300	RHS	
8	1.690	1.797	0.107	LHS		8	1.690	1.797	0.107	RHS	
9	1.797	1.804	0.007	LHS		9	1.797	1.804	0.007	RHS	
10	1.804	1.940	0.137	LHS		10	1.804	1.940	0.137	RHS	
11	1.940	4.102	2.162	LHS		11	1.940	4.102	2.162	RHS	
12	4.102	4.109	0.007	LHS		12	4.102	4.109	0.007	RHS	
13	4.109	4.480	0.372	LHS		13	4.109	4.480	0.372	RHS	
14	4.480	5.010	0.530	LHS		14	4.480	5.010	0.530	RHS	
15	5.010	5.280	0.270	LHS		15	5.010	5.280	0.270	RHS	
16	5.280	5.768	0.488	LHS		16	5.280	5.768	0.488	RHS	
17	5.768	5.882	0.114	LHS		17	5.768	5.882	0.114	RHS	
18	5.882	6.200	0.318	LHS		18	5.882	6.200	0.318	RHS	
19	6.200	6.900	0.700	LHS		19	6.200	6.900	0.700	RHS	
20	6.900	7.043	0.143	LHS		20	6.900	7.043	0.143	RHS	
21	7.043	7.118	0.075	LHS		21	7.043	7.118	0.075	RHS	
22	7.118	7.792	0.674	LHS		22	7.118	7.792	0.674	RHS	
23	7.792	7.804	0.012	LHS		23	7.792	7.804	0.012	RHS	
24	7.804	8.010	0.206	LHS		24	7.804	8.010	0.206	RHS	
25	8.010	8.625	0.615	LHS		25	8.010	8.625	0.615	RHS	
26	8.625	8.640	0.015	LHS		26	8.625	8.640	0.015	RHS	
27	8.640	9.465	0.825	LHS		27	8.640	9.465	0.825	RHS	
28	9.465	9.472	0.007	LHS		28	9.465	9.472	0.007	RHS	
29	9.472	12.750	3.279	LHS		29	9.472	12.750	3.279	RHS	
30	12.750	12.907	0.157	LHS		30	12.750	12.907	0.157	RHS	
31	12.907	12.919	0.012	LHS		31	12.907	12.919	0.012	RHS	

S. No	From	To	Length	Side	Remarks	S.No	From	To	Length	Side	Remarks
32	12.919	12.987	0.067	LHS		32	12.919	12.987	0.067	RHS	
33	12.987	13.002	0.015	LHS		33	12.987	13.002	0.015	RHS	
34	13.002	13.150	0.149	LHS		34	13.002	13.150	0.149	RHS	
35	13.150	15.500	2.350	LHS		35	13.150	15.500	2.350	RHS	
36	15.500	15.721	0.221	LHS		36	15.500	15.721	0.221	RHS	
37	15.721	15.733	0.012	LHS		37	15.721	15.733	0.012	RHS	
38	15.733	16.012	0.279	LHS		38	15.733	16.012	0.279	RHS	
39	16.012	16.132	0.120	LHS		39	16.012	16.132	0.120	RHS	
40	16.132	16.350	0.218	LHS		40	16.132	16.350	0.218	RHS	
41	16.350	17.930	1.580	LHS		41	16.350	17.930	1.580	RHS	
42	17.930	18.144	0.214	LHS		42	17.930	18.144	0.214	RHS	
43	18.144	18.156	0.012	LHS		43	18.144	18.156	0.012	RHS	
44	18.156	18.350	0.194	LHS		44	18.156	18.350	0.194	RHS	
45	18.350	18.810	0.460	LHS		45	18.350	18.810	0.460	RHS	
46	18.810	19.100	0.290	LHS	Toll Plaza	46	18.810	19.100	0.290	RHS	Toll plaza
47	19.100	21.042	1.942	LHS		47	19.100	21.042	1.942	RHS	
48	21.042	21.049	0.007	LHS		48	21.042	21.049	0.007	RHS	
49	21.049	24.350	3.302	LHS		49	21.049	24.350	3.302	RHS	
50	24.350	24.568	0.218	LHS		50	24.350	24.568	0.218	RHS	
51	24.568	24.575	0.007	LHS		51	24.568	24.575	0.007	RHS	
52	24.575	24.600	0.025	LHS		52	24.575	24.600	0.025	RHS	
53	24.600	24.650	0.050	LHS		53	24.600	24.650	0.050	RHS	
54	24.650	25.311	0.661	LHS		54	24.650	25.311	0.661	RHS	
55	25.311	25.318	0.007	LHS		55	25.311	25.318	0.007	RHS	
56	25.318	26.815	1.498	LHS		56	25.318	26.815	1.498	RHS	
57	26.815	26.825	0.010	LHS		57	26.815	26.825	0.010	RHS	
58	26.825	27.120	0.295	LHS		58	26.825	27.120	0.295	RHS	

S. No	From	To	Length	Side	Remarks	S.No	From	To	Length	Side	Remarks
59	27.120	27.312	0.192	LHS		59	27.120	27.312	0.192	RHS	
60	27.312	27.319	0.007	LHS		60	27.312	27.319	0.007	RHS	
61	27.319	27.450	0.131	LHS		61	27.319	27.450	0.131	RHS	
62	27.450	28.290	0.840	LHS		62	27.450	28.290	0.840	RHS	
63	28.290	28.699	0.409	LHS		63	28.290	28.699	0.409	RHS	
64	28.699	28.744	0.045	LHS		64	28.699	28.744	0.045	RHS	
65	28.744	29.050	0.307	LHS		65	28.744	29.050	0.307	RHS	
66	29.050	30.340	1.290	LHS		66	29.050	30.340	1.290	RHS	
67	30.340	30.407	0.067	LHS		67	30.340	30.407	0.067	RHS	
68	30.407	30.414	0.007	LHS		68	30.407	30.414	0.007	RHS	
69	30.414	30.616	0.202	LHS		69	30.414	30.616	0.202	RHS	
70	30.616	30.628	0.012	LHS		70	30.616	30.628	0.012	RHS	
71	30.628	30.800	0.172	LHS		71	30.628	30.800	0.172	RHS	
72	30.800	31.900	1.100	LHS		72	30.800	31.900	1.100	RHS	
73	31.900	32.030	0.130	LHS		73	31.900	32.030	0.130	RHS	
74	32.030	32.042	0.012	LHS		74	32.030	32.042	0.012	RHS	
75	32.042	32.290	0.248	LHS		75	32.042	32.290	0.248	RHS	
76	32.290	34.595	2.305	LHS		76	32.290	34.595	2.305	RHS	
77	34.595	34.602	0.007	LHS		77	34.595	34.602	0.007	RHS	
78	34.602	35.500	0.899	LHS		78	34.602	35.500	0.899	RHS	
79	35.500	35.756	0.256	LHS		79	35.500	35.756	0.256	RHS	
80	35.756	35.768	0.012	LHS		80	35.756	35.768	0.012	RHS	
81	35.768	36.100	0.332	LHS		81	35.768	36.100	0.332	RHS	
82	36.100	37.702	1.602	LHS		82	36.100	37.702	1.602	RHS	
83	37.702	37.714	0.012	LHS		83	37.702	37.714	0.012	RHS	
84	37.714	37.897	0.183	LHS		84	37.714	37.897	0.183	RHS	
85	37.897	37.909	0.012	LHS		85	37.897	37.909	0.012	RHS	

S. No	From	To	Length	Side	Remarks	S.No	From	To	Length	Side	Remarks
86	37.909	37.938	0.029	LHS		86	37.909	37.938	0.029	RHS	
87	37.938	37.945	0.007	LHS		87	37.938	37.945	0.007	RHS	
88	37.945	38.913	0.968	LHS		88	37.945	38.913	0.968	RHS	
89	38.913	38.928	0.015	LHS		89	38.913	38.928	0.015	RHS	
90	38.928	40.043	1.115	LHS		90	38.928	40.043	1.115	RHS	
91	40.043	40.050	0.007	LHS		91	40.043	40.050	0.007	RHS	
92	40.050	41.910	1.861	LHS		92	40.050	41.910	1.861	RHS	
93	41.910	42.159	0.249	LHS		93	41.910	42.159	0.249	RHS	
94	42.159	42.171	0.012	LHS		94	42.159	42.171	0.012	RHS	
95	42.171	42.300	0.129	LHS		95	42.171	42.300	0.129	RHS	
96	42.300	45.705	3.405	LHS		96	42.300	45.705	3.405	RHS	
97	45.705	45.715	0.010	LHS		97	45.705	45.715	0.010	RHS	
98	45.715	47.070	1.355	LHS		98	45.715	47.070	1.355	RHS	
99	47.070	47.273	0.203	LHS		99	47.070	47.273	0.203	RHS	
100	47.273	47.313	0.040	LHS		100	47.273	47.313	0.040	RHS	
101	47.313	47.400	0.087	LHS		101	47.313	47.400	0.087	RHS	
102	47.400	47.830	0.430	LHS		102	47.400	47.830	0.430	RHS	
103	47.830	48.037	0.206	LHS		103	47.830	48.037	0.206	RHS	
104	48.037	48.044	0.007	LHS		104	48.037	48.044	0.007	RHS	
105	48.044	48.350	0.307	LHS		105	48.044	48.350	0.307	RHS	
106	48.350	51.000	2.650	LHS		106	48.350	51.000	2.650	RHS	
107	51.000	51.188	0.188	LHS		107	51.000	51.188	0.188	RHS	
108	51.188	51.200	0.012	LHS		108	51.188	51.200	0.012	RHS	
109	51.200	51.610	0.410	LHS		109	51.200	51.610	0.410	RHS	
110	51.610	52.957	1.347	LHS		110	51.610	52.957	1.347	RHS	
111	52.957	52.964	0.007	LHS		111	52.957	52.964	0.007	RHS	
112	52.964	53.510	0.547	LHS		112	52.964	53.510	0.547	RHS	

S. No	From	To	Length	Side	Remarks	S.No	From	To	Length	Side	Remarks
113	53.510	53.701	0.191	LHS		113	53.510	53.701	0.191	RHS	
114	53.701	53.713	0.012	LHS		114	53.701	53.713	0.012	RHS	
115	53.713	53.822	0.109	LHS		115	53.713	53.822	0.109	RHS	
116	53.822	53.842	0.020	LHS		116	53.822	53.842	0.020	RHS	
117	53.842	53.980	0.138	LHS		117	53.842	53.980	0.138	RHS	
118	53.980	56.200	2.220	LHS		118	53.980	56.200	2.220	RHS	
119	56.200	56.329	0.129	LHS		119	56.200	56.329	0.129	RHS	
120	56.329	56.369	0.040	LHS		120	56.329	56.369	0.040	RHS	
121	56.369	56.623	0.254	LHS		121	56.369	56.623	0.254	RHS	
122	56.623	56.630	0.007	LHS		122	56.623	56.630	0.007	RHS	
123	56.630	57.320	0.690	LHS		123	56.630	57.320	0.690	RHS	
124	57.320	57.479	0.159	LHS		124	57.320	57.479	0.159	RHS	
125	57.479	58.498	1.020	LHS		125	57.479	58.498	1.020	RHS	
126	58.498	59.278	0.780	LHS		126	58.498	59.278	0.780	RHS	
127	59.278	59.945	0.667	LHS		127	59.278	59.945	0.667	RHS	
128	59.945	60.021	0.076	LHS		128	59.945	60.021	0.076	RHS	
129	60.021	60.237	0.216	LHS		129	60.021	60.237	0.216	RHS	
130	60.237	60.249	0.012	LHS		130	60.237	60.249	0.012	RHS	
131	60.249	60.410	0.161	LHS		131	60.249	60.410	0.161	RHS	
132	60.410	62.450	2.040	LHS		132	60.410	62.450	2.040	RHS	
133	62.450	62.470	0.020	LHS		133	62.450	62.470	0.020	RHS	
134	62.470	62.869	0.399	LHS		134	62.470	62.869	0.399	RHS	
135	62.869	63.019	0.150	LHS		135	62.869	63.019	0.150	RHS	
136	63.019	63.542	0.523	LHS		136	63.019	63.542	0.523	RHS	
137	63.542	63.554	0.012	LHS		137	63.542	63.554	0.012	RHS	HT Line
138	63.554	63.756	0.202	LHS	0.214	138	63.554	63.756	0.202	RHS	0.214
139	63.756	63.944	0.187	LHS		139	63.756	63.944	0.187	RHS	

S. No	From	To	Length	Side	Remarks	S.No	From	To	Length	Side	Remarks
140	63.944	64.512	0.568	LHS		140	63.944	64.512	0.568	RHS	
141	64.512	64.524	0.012	LHS		141	64.512	64.524	0.012	RHS	
142	64.524	64.640	0.116	LHS		142	64.524	64.640	0.116	RHS	
143	64.640	66.109	1.468	LHS		143	64.640	66.109	1.468	RHS	
144	66.109	66.116	0.007	LHS		144	66.109	66.116	0.007	RHS	
145	66.116	67.880	1.765	LHS		145	66.116	67.880	1.765	RHS	
146	67.880	68.072	0.192	LHS		146	67.880	68.072	0.192	RHS	
147	68.072	68.084	0.012	LHS		147	68.072	68.084	0.012	RHS	
148	68.084	68.490	0.406	LHS		148	68.084	68.490	0.406	RHS	
149	68.490	69.070	0.580	LHS		149	68.490	69.070	0.580	RHS	
150	69.070	69.100	0.030	LHS		150	69.070	69.100	0.030	RHS	
151	69.100	69.137	0.037	LHS		151	69.100	69.137	0.037	RHS	
152	69.137	69.157	0.020	LHS		152	69.137	69.157	0.020	RHS	
153	69.157	69.343	0.186	LHS		153	69.157	69.343	0.186	RHS	
154	69.343	69.355	0.012	LHS		154	69.343	69.355	0.012	RHS	
155	69.355	69.590	0.235	LHS		155	69.355	69.590	0.235	RHS	
156	69.590	69.740	0.150	LHS		156	69.590	69.740	0.150	RHS	
157	69.740	70.200	0.460	LHS		157	69.740	70.200	0.460	RHS	
Length			70.2			Length			70.2		
Total length					138.793						

Annexure IV: Pedestrian guard rail

S No.	Chainage		Length	Side	S No.	Chainage		Length	Side	Remarks
	From	To				From	To			
1	13.360	13.560	0.200	LHS	1	31.420	31.620	0.200	RHS	
2	65.050	65.250	0.200	LHS	2	61.260	61.460	0.200	RHS	
3	62.900	63.030	0.130	LHS	3	62.900	63.030	0.130	RHS	Underpass

Total Length	0.530		Total Length	0.530			

Annexure V: Street lighting

S. No.	Chainage (km)		Type of Road	Location	Median Double Arm	Median Single Arm		High mast		Total	Non-Functional	Remarks
	From	To				LHS	RHS	LHS	RHS			
1	83	90	MCW	Bus Bay		1	1			2		
2	974	1110	SR	RHS SR MNB Approach						0		Balance
3	907	1307	Cross Road	RHS Cross Road MNB Approach						0		Balance
4	440	997	MCW	Flyover Approach						0		Balance
5	1037	1365	MCW	MJB Approach						0		Balance
6	1405	1675	MCW	MJB		9	9			18		On bridge top median SA LHS and RHS
7	1715	1995	MCW	MJB Approach	8					0		Median
8	1196	12000	MCW	Shoulder SVUP Cross Road		1	1			2		
9	2198	2238	MCW	SVUP	2					0		
10	4085	4125	MCW	SVUP	2					0		
11	5749	5827	MCW	ROB		3	3			6		
12	6779	7378	MCW	MJB & Approach	14	2	2			4		
13	7779	7819	MCW	VUP	2					0		
14	8412	8972	MCW	MNB Approach	15					0		
15	9448	9488	MCW	SVUP	2					0		
16	12614	13214	MCW	MNB Approach	15					0		Total 16 Nos Inatalled 15 Nos.
17	13236	13665	MCW	Truck Lay Byes		11				11		Total 12 Nos Installed 11 Nos.
18	13700	14435	MCW	Way Side Amenities			10			10		WSA Descope

S. No.	Chainage (km)		Type of Road	Location	Median Double Arm	Median Single Arm		High mast		Total	Non-Functional	Remarks
	From	To				LHS	RHS	LHS	RHS			
19	15707	15747	MCW	VUP						0		Not Provide 2 Nos
20	15793	16351	MCW	MJB & Approach	14	3	3			6		Scope 12 nos DA and 6 Nos SA
21	18130	18170	MCW	VUP	2					0		
22	18830		MCW	Toll Plaza Parking				1	1	0		Parking lights not provided
23	19700	20400	MCW	Way Side Amenities						0		LHS WSA Descope Not Provided
24	21025	21065	MCW	SVUP	2					0		
25	24549	24589	MCW	SVUP	2					0		
26	25294	25334	MCW	SVUP	2					0		
27	26795	26915	MCW	MNB	4					0		
28	27295	27335	MCW	SVUP	2					0		
29	27485	27500	MCW	Bus Bay		1	1			2		
30	27762	29440	MCW	FO & Approach	42	1	1	3	3	2		
31	29910	29965	MCW	Bus Bay		1	1			2		
32	30390	30430	MCW	SVUP	2					0		
33	30602	30642	MCW	VUP	2					0		
34	31267	31774	MCW	Truck Lay Byes			14			14		39m span
35	32016	32056	MCW	VUP	2					0		
36	34578	34618	MCW	SVUP	2					0		
37	35743	35783	MCW	VUP	2					0		
38	37488	38980	MCW	MNB & Approach	26					0		Total 23 scope
39	40026	40066	MCW	SVUP	1					0		Total 2 Nos 1Installed and 1 Damaged
40	42145	42185	MCW	VUP	2					0		
41	45570	45770	MCW	MNB & Approach	1					0		Total 6 Nos found 1 Nos at

S. No.	Chainage (km)		Type of Road	Location	Median Double Arm	Median Single Arm		High mast		Total	Non-Functional	Remarks
	From	To				LHS	RHS	LHS	RHS			
												site
42	45535	45808		MNB & Approach			8			8		SR RHS Shoulder
43	47133	47373	MCW	MNB & Approach	6	1	1			2		
44	47098	47371	MCW	MNB Approach			8			8		RHS SR Shoulder
45	48020	48060	MCW	SVUP	2					0		
46	48600	49221	MCW	Bus bay		1	1			2		
47	51174	51214	MCW	VUP	2					0		
48	52500	52500	MCW	Bus Bay		1	1			2		Dhomes missing
49	52940	52980	MCW	SVUP	2					0		
50	53513	54193	MCW	MNB & Approach	17	1	1	1	1	2		1 Dhoomes Damaged in DA and 1 Dhomes damaged in SA
51	56270	56430	MCW	MNB & Approach	4	1	1			2		1 pole damaged DA
52	56600	56646	MCW	SVUP	2					0		
53	57055	58492	MCW	MJB & Approach	33	4	4			8		1 Dhoome damaged
54	58531	60793	MCW	MJB & Approach	35	12	12			24		1 Pole mising at the site and 2 nos Dhomes damaged at site
55	60676	61061	MCW	Way Side Amenities			12			12		12 Nos Dhomes missing at the site - Descope
56	61097	61604	MCW	Truck Lay Byes			14			14		14 Nos Dhomes missing at the site
57	61735	61792	MCW	Bus Bay		1	1			2		2 Nos Dhomes missing
58	62880	62909	MCW	Rotary Shoulder		1	2	1	1	3		Rotary SR Shoulder
59	62295	63492	MCW	FO & Approach	25	4	4	2	2	8		Total 27 Nos DA installed at site 25 Nos available
60	63526	63724	MCW	ROB Approach						0		DA 6 Nos and SA 16 Nos missing at the site

S. No.	Chainage (km)		Type of Road	Location	Median Double Arm	Median Single Arm		High mast		Total	Non-Functional	Remarks
	From	To				LHS	RHS	LHS	RHS			
61	63757	64106	MCW	ROB & Approach A2	4	8	8			16		
62	64498	6453	MCW	LVUP	2					0		
63	61400		MCW	Truck Lay Byes			12			12		Shifted to km. 61+400 RHS from km.65+500 RHS total 14 nos installed 12 nos at site and 6 nos Dhome missing
64	65400	65715		Way Side Amenities						0		Not installed De-scope
65	66092	66132	MCW	SVUP	2					0		
66	68058	68098	MCW	VUP	2					0		
67	68650	68800	MCW	Bus Bay		1	1			2		2 nos Dhomes missing at site
68	69350	69428	MCW	RHS SR shoulder			3	1		3		
69	68748	69747	MCW	MNB & Approach	25	1	1			2		DA 7 Nos Dhomes and SA 2 Nos mising at the site
70	69845			Ramp Toll Plaza				1	1	0		
					333	70	141	10	9	211		

Annexure VI: Bus shelters

Bus bay and Bus Shelters					
S.no	Chainage	Side	Description	Street Lighting Single arm	Remarks
1	0+200	BHS	Bus bay with bus shelter	2	
2	27+650	BHS	Bus bay with bus shelter	2	
3	29+650	BHS	Bus bay with bus shelter	2	
4	52+500	BHS	Bus bay with bus shelter	2	
5	48+700	LHS	Bus bay with bus shelter	1	

6	49+030	RHS	Bus bay with bus shelter	1	
7	61+900	BHS	Bus bay with bus shelter	2	
8	69+850	BHS	Bus bay with bus shelter	2	
	Grand Total			14	

Annexure VII: Truck lay bye

S. No.	Chainage	Side	Length (m)	Width (m)	Toilet block	Street Lighting SA	Shelter	Remarks
1	13+450	LHS	400	11	1	11	Rest Room	Nawagaon/Sipat
2	31+520	RHS	400	11	1	14	Rest Room	Baloda
3	65+200	LHS	400	11	1	14	Rest Room	Masan
4	61+500	RHS	400	11	1	12	Rest Room	Bagbuda
Total								

Technical Due Diligence for Construction of Eight Lane Access Controlled Expressway from Km 217.500 to Km.254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) in the state of Gujarat on Hybrid Annuity Mode under Bharatmala Pariyojana (Phase I – Package VI).

Technical Due Diligence Report (Private and Confidential)

February 2026

Submitted to:

M/s Indus Infra Trust.

Submitted by:

Cube Highways Technologies Private Limited

Technical Due Diligence for Construction of Eight Lane Access Controlled Expressway from Km 217.500 to Km.254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) in the state of Gujarat on Hybrid Annuity Mode under Bharatmala Pariyojana (Phase I – Package VI).

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S. No.	Revision	Description	Date	Sign
1	R0	Technical Due Diligence Report	February 2026	

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ABBREVIATIONS

Abbreviation	Description
ASTM	American Society for testing and Materials
AVC	Automatic Vehicle Classifier
BBD	Benkelman Beam Deflection
BC	Bituminous Concrete
BOT	Built, Operate and Transfer
CA	Concession Agreement
CC Drain	Cement Concrete Drains
COD	Commercial Operation Date
CRRI	Central Road Research Institute
CBR	California Bearing Ratio test
DBFOT	Design, Build, Finance, Operate and Transfer
ETC	Electronic Toll Collection
FWD	Falling Weight Deflectometer
GOI	Government of India
GREKEPL	GR Ena Kim Expressway Private limited
HPC	Hume Pipe Culvert
IE	Independent Engineer
IRC	Indian Roads Congress
LA	Land Acquisition
LHS	Left Hand Side
LOA	Letter of Acceptance
MBCB	Metal Beam Crash Barrier
MJB	Major Bridge
MNB	Minor Bridge
MOST	Ministry of Surface Transport

Abbreviation	Description
MPR	Monthly Progress Report
NH	National Highway
NHAI	National Highway Authority of India
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
OHLS	Overhead Lane Signal
OHM	Object Hazard Marker
PCOD	Provisional Commercial Operation Date
POS	Point of Sale
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road/Rail Over Bridge
ROW	Right of Way
RPV	Route Petrol Vehicle
RUB	Road/Rail Under Bridge
SH	State Highway
SPV	Special Purpose Vehicle
SR	Service Road
SSWIM	Slow Speed Weigh in Motion
SWB	Static Weigh Bridge
TOT	Toll Operate Transfer
TC	Toll Collector
Team	Team of Cube Highways Technologies Pvt Ltd.
TMS	Toll Management System
WIM	Weigh in Motion
WMM	Wet Mix Macadam

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. Introduction

The National Highways Authority of India, New Delhi (the "Authority") is engaged in the development of National Highways and as part of this endeavour, the Authority has decided to undertake development and operation/maintenance of the Construction of Eight Lane Access Controlled Expressway from Km 217.500 to Km.254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) in the state of Gujarat on Hybrid Annuity Mode under Bharatmala Pariyojna (Phase I – Package VI).

National Highways Authority of India (Authority) and GR Ena Kim Expressway Private Limited (the Concessionaire) entered into a Concession Agreement on 07th Oct 2020 for execution of the Project on Hybrid Annuity Mode. Subsequently, the Appointed Date was declared on 11th December 2021 vide Authority's letter no. NHAI/BM/VME/Phase-1B/2018/Pkg VI dated 10th December 2021 and the Scheduled Completion Date is [SCD] 730th days from Appointed Date i.e., 10th December 2023.

The scope of work broadly includes construction of eight lane access-controlled expressway from Km 217.500 to Km 254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) include construction of new pavement, construction of major and minor bridges, culverts, road intersections, flyover, drains, underpasses etc. as per Schedule B of the Concession Agreement.

2. Objective of Study

The main objective of this assignment is to assess the physical condition of all existing features of the selected National Highway and review of Concession agreement, technical and maintenance schedules for the major maintenance strategy. Physical condition survey of Project Stretch includes data collection and parameters, pavement condition. Based on physical condition of Project Stretch, options are worked out for Major maintenance, Routine Maintenance & Operational cost

MAIN VOLUME

(Technical Due Diligence for Construction of Eight Lane Access Controlled Expressway from Km 217.500 to Km.254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) in the state of Gujarat on Hybrid Annuity Mode under Bharatmala Pariyojana (Phase I – Package VI).)

Chapter 1
INTRODUCTION

CHAPTER 1. INTRODUCTION

1.1 Background

Infrastructure Sector is a key driver for the Indian economy. In 2014, the Government of India have introduced a new investment vehicle which allows investors to participate in the growth story of infrastructure sector, named Infrastructure Investment Trusts (hereinafter referred to as 'InvITs'). InvITs are instruments on pattern of mutual funds and are designed to pool in money from a number of investors to invest in assets that give cash flow over a period of time. The InvITs are regulated by the SEBI (Infrastructure Investment Trusts) Regulations Act, 2014.

In highway sector, InvIT as an instrument provide greater flexibility to investors and is expected to attract patient capitals (for say, 20-30 years) to the market, as these investors are averse to construction risks and are interested in investment in assets which provide long-term stable returns.

InvIT shall have a (i) Trustee, (ii) Sponsor(s) (iii) Investment Manager and (iv) Project Manager, Sponsor and the Project Manager are the same entity i.e. Aadharshila Infratech Private Limited. Indus Infra Trust has appointed M/s Cube Highways Technologies Private Limited as Technical Consultant for carrying out technical study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, Cube Highways Technologies undertook the site visits to carry out site inspection. The report is based on findings during this period.

Indus Infra Trust ("Trust") was settled in Gurugram, India pursuant to the Trust Deed as a contributory irrevocable trust in accordance with the Indian Trusts Act, 1882. The Trust is an Infrastructure Investment Trust (InvIT) established for making investments in special purpose vehicles as defined under Regulation 2(1) (zy) of the InvIT Regulations, or infrastructure projects or securities of Indian companies engaged in the infrastructure sector, as may be permitted in terms of Regulation 18(5) of the InvIT Regulations. IDBI Trusteeship Services Limited is the Trustee to the Trust.

1.2 Asset Background

The Government of India has envisaged creating an excellent infrastructure facility, to boost the economic development in the country, for which National Highways Authority of India (NHAI) plays a key role. NHAI has been entrusted to implement the development of some of the stretches of National Highways under National Highway Development Program on HAM (Hybrid Annuity Mode) basis.

As part of this endeavour Authority has taken up the development and operation/maintenance of the Construction of Eight Lane Access Controlled Expressway from Km 217.500 to Km.254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) in the state of Gujarat on Hybrid Annuity Mode under Bharatmala Pariyojana (Phase I – Package VI).

The Hybrid Annuity Model (HAM) is a mix of BOT Annuity and EPC models. As per the design, the Government will contribute up-to 40% of the Project cost in ten equal instalments of 4% each during the construction period of 730 days with the provisions of Clause 23.4 of CA. The remaining payment will be made based on the assets created and the performance of the developer. Here, Hybrid Annuity means the first 40% payment is made as fixed amount in five equal instalments whereas the remaining 60% is paid as variable annuity amount after the completion of the Project. As the Government pays only 40%, during the construction stage, the developer has to raise the remaining 60% in the form of equity or loans.

NHAI had invited proposals from bidders for qualification and prescribed the commercial terms and conditions for selection of a successful bidder under its Request for Proposal (RFP) for Design, Engineering, Finance, Construction, Improvement, Operation and Maintenance of the above referred section of NE.
After evaluation of the bids received, M/s GR Infraprojects limited has emerged as successful bidder; the Authority had accepted the bid of the selected bidder and issued its Letter of Award (LOA), NHAI, New Delhi Letter no NHAI/BM/VME/Phase-IB/2018/Pkg-VI dated 30.07.2020.for the Project.

M/s GR Infra projects Limited has formed an SPV, namely, M/s GR Ena Kim Expressway private limited (GEKEPL- the "Concessionaire"). The Concession Agreement (CA) for the Project was signed between GUBHPL and NHAI on 07th October 2020.

As the Concessionaire of this Project, GEKEPL will develop the Project and maintain the facilities after completion of construction. GEKEPL will recover its costs through Annuity Payments made during Concession Period of 15 years (annuity payments during construction as well as in operations period), including construction period of 730 days from the appointed date.

Cube Highways Technologies Pvt Ltd (Cube Tech) has been appointed as Technical Due Diligence consultant for the Project stretch. Apropos the above, Cube Tech has carried out a series of investigations as a part of Technical Due Diligence.

The main objective of the consultancy service is to carry out Technical Due Diligence Study for the Project covering review of; contractual documents and reports, condition of existing pavement and structures, evaluating material properties, toll management system, estimating O&M requirements, formulating maintenance strategy for the remaining Concession period.

1.3 Report Structure

The report contains ten chapters, including this Chapter on Introduction.

Chapter 2 Project Overview

Chapter 3 Technical studies

Chapter 4 Asset Status

Chapter 5 Condition Assessment of Existing Pavement and Maintenance Requirement

Chapter 6 Review of Structures

Chapter 7 General Safety Concerns along the Project stretch and Improvements

Chapter 8 Change of scope

Chapter 9 Operation and Maintenance Cost

Chapter 10 Overall Review

Chapter 2
PROJECT OVERVIEW

CHAPTER 2. PROJECT OVERVIEW

2.1 Location

The Project stretch starts at km 217.500 and ends at km 254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) in the State of Gujarat on "HAM" under Bharatmala Pariyojna (Phase I – Package VI).

As per the Concession Agreement, the project stretch starts at chainage km 217.500 and ends at chainage km 254.430. However, during construction, the chainage system was revised, with the start chainage changed from km 217.500 to km 1006.000 and the end chainage changed from km 254.430 to km 969.500. Accordingly, the project stretch now starts at km 1006.000 and ends at km 969.500.

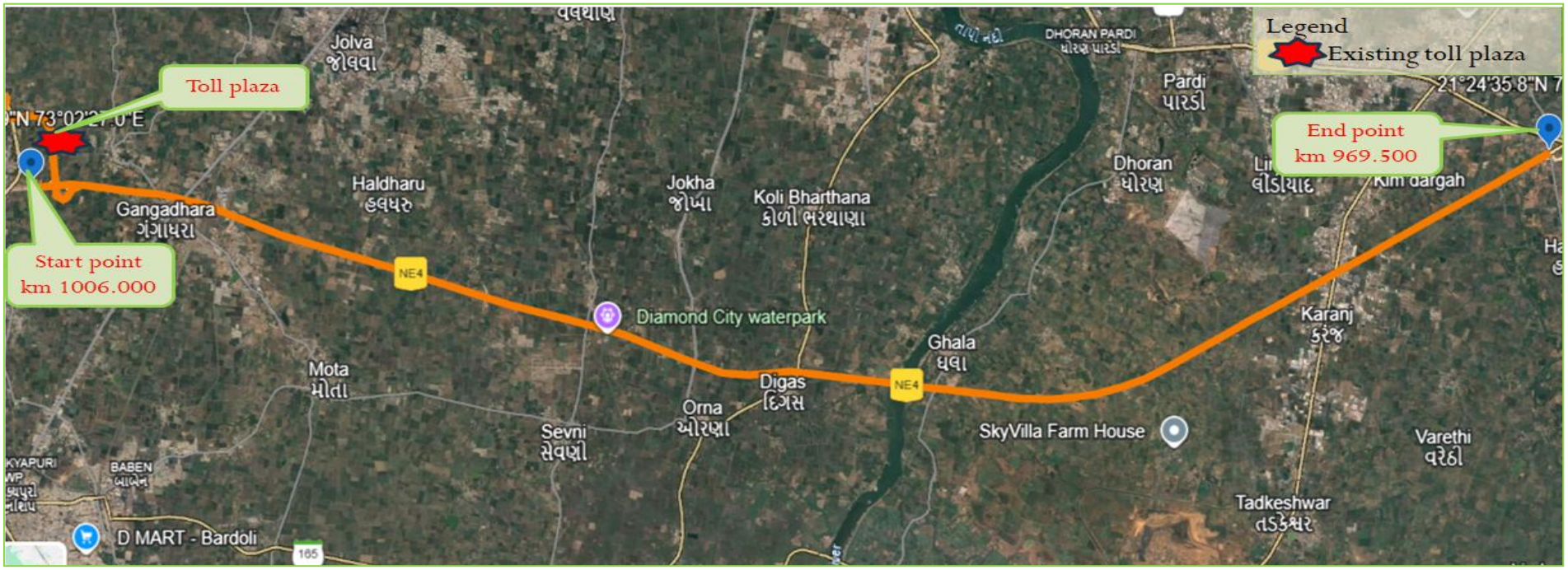


Figure 2-1: Project Alignment

2.2 Salient features

The salient features of the Project are summarised in the table below:

Table 2-1 Project Salient Features

Contract data	
Project Name	Construction of Eight Lane Access Controlled Expressway from Km 217.500 to Km.254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) in the state of Gujarat on Hybrid Annuity Mode under Bharatmala Pariyojna (Phase I – Package VI).
Concessionaire	M/s G R Ena Kim Expressway Private Limited.
Letter of Award	30th July 2020
Date of Concession agreement	07th October 2020
Appointed Date	11th December 2021
Mode of the Execution	HAM Model
No. of Lanes/Configuration	8 Lane
Length of the Project (in Km)	36.93 km + 6.38 km (Interchange)
Bid Project Cost (in Cr)	2187.00 Crore
No. of Toll Plazas	1 No. (km. 218.100 IC)
Operation Period	15 Years from the Completion date
Construction Period	2 years from Appointed date
Scheduled date of completion - Actual	10th December 2023
Revised scheduled date of completion - EOT	30th August 2024 (Except Tapi MJB & COS work) 15th November 2024 (For Tapi MJB & COS work)
Date of provisional completion date	30th November 2024
Date of final completion certificate	Yet to achieve
Independent Engineer	M/s LN Malviya Infra Projects Pvt. Ltd. In association with Highway Engineering Consultant

2.3 Physical features of the Projectss

The Concessionaire shall operate, manage and maintain the Project stretch for entire Concession Period, subject to and in accordance with the provisions of this.

Agreement.

The Project includes the following physical features.

Table 2-2: Project Physical Features

S. No	Project Physical Features	Units	As per CA	As per Site	Remarks
1	Total Length of Project stretch	km	36.93	36.93	
2	Total Length of Service Road	km	3.975	3.975	
3	Loops & Ramps		8.889	8.889	
4	Connecting Road		3.895	3.895	
5	Connecting Road COS			10.059	
6	Major bridge	No's	04	04	
7	Minor bridge	No's	16	16	
8	Flyover	No's	03	03	
9	VUP	No's	10	10	
10	VOP	No's	01	01	
11	ROB	No's	01	01	
12	Interchange	No's	02	02	
13	LVUP	No's	15	15	
14	SVUP	No's	18	18	
15	Box Culvert	No's	124	124	
16	Hume Pipe Culvert	No's	50	50	

Table 2-3: Inventory of the Project stretch

S. No	Description	Side	Units	Qty as per site	Remarks
1	Total Length of the Project	LHS	km	36.93	
		RHS	km	36.93	
2	Total Length of Service Road	LHS	km	3.975	
		RHS	km	3.975	
5	At-grade intersections				
	a) Major junctions	BHS	No's	Nil	Interchanges
	b) Minor junctions	BHS	No's	Nil	
11	Lined Open Drain - median	BHS	km	1.898	Median open drain
	Lined Open Drain – Shoulder	BHS	km	67.84	
	Lined Open Drain - Toe	BHS	km	67.85	
13	Metal beam crash barrier	BHS	km		
14	Thire beam crash barrier	BHS	km	149.670	Thrie beam provided on shoulder LHS and RHS side, Median, and loops and interchanges.
15	Pedestrian guard rail	BHS	km		
16	Boundary wall	BHS	km	68.02	Boundary wall provided along the project stretch on ROW 97.986 BHS and 8.1 BHS interchange and loops.
20	Drip Irrigation Pump Shed	Median	No's	9	
21a)	Median Plantation	Median	No's	21,884	
21b)	Avenue plantation	Median	No's	60,535	
22	**Streetlights**				
a)	Single arm	BHS	No's	231	
b)	Double arm	BHS	No's	83	
23	**Toll Plaza**				
a)	Admin block	BHS	No's	1	
b)	Traffic aid post	BHS	No's	1	

S. No	Description	Side	Units	Qty as per site	Remarks
c)	Medical aid post	BHS	No's	1	
d)	Highmast	BHS	No's	2	
g)	Toilet blocks	BHS	No's	2	
h)	Weigh bridge	BHS	No's	2	.
i)	Mini nest	BHS	No's	0	
j)	RPV	BHS	No's	1	
k)	Crane	BHS	No's	1	
l)	Ambulance	BHS	No's	1	

Chapter 4
TECHNICAL STUDIES

CHAPTER 3. TECHNICAL STUDIES

3.1 Review of Concession Agreement

Table 3-1: Review of Concession Agreement

Article (CA)	Subject	Description in brief	Remarks
Clause 2.1	**Scope of the Project**	The Project shall be executed as in Schedule B and C on the site and in conformity with Specifications and standards outlined in Schedule-D	
		Operation and Maintenance of the Project Stretch as per Concession Agreement	
		Performance and fulfilment of all other obligations of the Concession Agreement	
Article 3	**Concession Period**	The concession period includes a construction period of 730 days and an operational period of 15 years from COD.	
Article 4	**Condition precedent**	Authority shall have procured for the Concessionaire the Right of Way to the Site in accordance with the provisions of Clauses 10.3.1 and 10.3.2;	
Clause 4.1.2		The authority shall have procured forest clearance for and in respect land forming part of the ROW, save and except permission for cutting trees;	
		The authority shall have procured all Applicable Permits relating to environmental protection and conservation of the Site;	
Clause 4.2	**Damages for delay by the Authority**	In the event that (i) the Authority does not procure fulfilment of any or all of the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.2 % (zero point one per cent) of the Performance Security for each day's delay until the fulfilment of such Conditions Precedent, subject to the maximum limit equal to the amount of Bid security and upon reaching such limit.	
Article 5	**Obligations of Concessionaire**	The Concessionaire makes reasonable efforts to facilitate the acquisition of land and procuring of environmental and forest clearances required at his own cost and expenses.	
		Obtain all the necessary Applicable permits, appropriate proprietary rights, licenses, agreements, and permissions for material, methods, processes, and systems used or incorporated into the Project.	

Article (CA)	Subject	Description in brief	Remarks
Clause 6.1	**Obligations of Authority**	The Authority provides necessary support and assistance to the Concessionaire in	
		a) providing Applicable permits required from any Govt. instrumentality for implementation and operation of the project.	
		b) obtaining access to all necessary infrastructure facilities and utilities, including water and electricity at rates and on terms no less favorable to the Concessionaire than those generally available.	
Clause 6.2	**Maintenance obligations prior to Appointed Date**	The Concessionaire shall be reimbursed for the cost of maintenance during the Development Period by the Authority after due certification by the Authorized Representative of the Authority. For the purpose of such reimbursement, the lump sum per kilometer rate of reimbursement for a period of 1 (one) year would be Rs. 0 (Rupees Zero) and shall be paid on a pro-rata basis for the period concerned.	
Clause 8.1.5	**Disclaimer**	all risks relating to the Project shall be borne by the Concessionaire and Authority shall not be liable in the manner for such risks or the consequences.	
Article 9	**Performance Security**	Bank guarantee for Rs.109.35 Cr. to be furnished to Authority within 30 days from the date of signing of the CA, which would be released on spending not less than 30% of Bid Project Cost or one year from the Appointed Date whichever is later.	
Article 10	**Right of Way**	Protection from Encroachments	
Clause 10.5		Throughout the Concession Period, the Concessionaire shall protect the site from all occupations, encumbrances, or encroachments.	
Article 12	**Construction of the Project**	The 730th day of the Appointed Date shall be the scheduled date for completion of the project and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	
Clause 12.3.1			
Article 15	**Commercial Operation Date (COD)**	The Project Stretch shall enter into commercial service on COD where upon the Concessionaire shall be entitled to demand and collect fee in accordance with the provision of Article 14.	
Clause 15.1			
Article 16	**Change of Scope**	As per Clause 16.3, Within 7 (seven) days of issuing a Change of Scope Order, the Authority shall make an advance payment to the Concessionaire in a sum equal to 20% (twenty per cent) of the cost of Change of Scope as agreed hereunder, and in the event of a Dispute, 20% (twenty per cent) of the cost assessed by the Independent Engineer.	
		As per Clause 16.4.2, Notwithstanding anything to the contrary contained in this Article 16, the Concessionaire shall be entitled to nullify any Change of Scope Order if it causes the cumulative costs relating to all the Change of Scope Orders to exceed 10%	

Article (CA)	Subject	Description in brief	Remarks
		(ten per cent) of the Bid Project Cost in any continuous period of 3 (three) years immediately preceding the date of such Change of Scope Order or if such cumulative costs exceed 25% (twenty five per cent) of the Bid Project Cost at any time during the Concession Period.	
		As per Clause 16.5.1, Notwithstanding anything to the contrary contained in Clauses 16.1.1 and 16.3, the Authority may, after giving notice to the Concessionaire and considering its reply thereto, award any works or services, contemplated under Clause 16.1.1, to any person on the basis of open competitive bidding; provided that the Concessionaire shall have the option of matching the first ranked bid in terms of the selection criteria, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services.	
Clause 16.6.1	**Reduction in Scope of Project**	The Authority shall follow the following process for calculation of total cost of reduced Scope	
		I. On direction by the Authority, the Independent Engineer to assess the civil cost of the reduced Scope, as per the schedule of rates applicable on the Bid Due Date.	
		II. The civil cost of the reduced Scope shall be multiplied by 1.05 to arrive at the estimated cost of the reduced Scope.	
		III. The estimated cost of the reduced Scope shall then be multiplied by the ratio of Bid Project Cost to Estimated Project Cost to arrive at the Total Cost of Reduced Scope.	
Article 17	**O&M**	As per Article 17, Concessionaire shall maintain Project Stretch in conformity with Maintenance Requirement, the Maintenance Manual or Maintenance Program as the case may be	
Clause 17.7.3	**Lane Closure**	Upon receiving the permission pursuant to Clause 17.7.1, the Concessionaire shall be entitled to close the designated part of the Project for the period specified therein, and in the event of any delay in re-opening such part, the Concessionaire shall pay Damages to the Authority calculated at the rate of 0.5 % (zero point Five per cent) of the Performance Security, for each day of delay until that part of the Project has been re-opened for use.	
Clause 17.8	**Damages for breach of maintenance obligations**	In the event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of,	Concessionaire is responsible for maintaining the asset as per Level of service as per Schedule K at all times

Article (CA)	Subject	Description in brief	Remarks
		(a) 2% of Performance Security, and	
		(b) 0.1% of the cost of such repair or rectification as estimated by the Independent Engineer.	
Article 19 Clause 19.2	**Monitoring of Operation and Maintenance**	As per Article 19.2, IE shall inspect the Project Stretch at least once a month and IE shall make a report of such inspection (the "O & M Inspection Report") stating in reasonable detail of defects or deficiencies, if any, with particular reference to the Maintenance Requirements, Maintenance Manual, the Maintenance Program and Safety Requirements, and send a copy thereof to the Authority and the Concessionaire within 7 days of such inspection.	
Article 21	**Remuneration of IE**	The remuneration, cost and expenses of the Independent Engineer shall be paid by the Authority and subject to the limits set forth in Schedule-M, one-half of such remuneration, cost and expenses shall be reimbursed by the Concessionaire to the Authority within 15 days of receiving a statement of expenditure from the Authority.	
Clause 21.3			
Article 23	**Payment of Bid Project Cost**	As per Clause 23.3.1, 40% of the Bid Project Cost, adjusted for Price Index Multiple, shall be paid in 5 equal instalments of 8% each during the Construction Period in accordance with Clause 23.4.	
Clause 23.3		As per Clause 23.3.2, the remaining 60% of the Bid Project Cost, adjusted for Price Index Multiple, shall be paid in 30 biannual instalments commencing 180 days after COD in accordance with Clause 23.6.	
Clause 23.4	**Payment during construction period**	As per 23.4 During construction, the Concessionaire gets 8% of Bid Project Cost each time an Independent Engineer certifies a payment milestone. Payments are linked to 5 milestones (from 10% to 90% physical progress). If in case of Change of Scope, the progress milestones are recalculated accordingly.	
Clause 23.5	**Bonus on early completion**	In the event the Concessionaire achieves COD at least 30 days prior to the Scheduled Completion Date, a bonus equivalent to 0.5% of 60% of the Bid Project Cost shall be payable. For each additional day beyond this period, the bonus shall be computed on a pro-rata basis and disbursed along with the first annuity payment.	
Clause 23.6	**Annuity payments during Operation period**	Annuity shall be collected biannually. As per 23.6.4 Interest shall be due and payable in the reducing balance of completion cost at an interest rate equal to applicable bank rate* plus 3%.	
Clause 23.7	**O&M Payments**	23.7.1 The Concessionaire shall bear all O&M Expenses and, in lieu thereof, the Authority shall make O&M Payments at the rate of Rs. 3.87 crore per year, exclusive of GST, it being clarified that no reimbursement shall be made for any excess of the said	

Article (CA)	Subject	Description in brief	Remarks
		amount, save and except where a Change in Scope is affected under this Agreement. 23.7.2 The O&M Payments shall be disbursed into two equal biannual instalments and shall be released by the Authority concurrently with the corresponding instalments of Annuity Payments. 23.7.3 Each instalment of O&M Payment shall be determined as one-half of the annual O&M Payment, duly adjusted by the applicable Price Index Multiple with reference to the Reference Index Date immediately preceding the due date of payment.	
Clause 23.8	**Mobilization Advance**	The Authority shall, upon request, provide the Concessionaire an advance not exceeding 10% of the Bid Project Cost, disbursed in two equal instalments against submission of satisfactory Bank Guarantees. The first instalment may be sought any time after the Appointed Date, and the second after 60 days from the Appointed Date. Payments shall be released within 30 days of such requests. The advance shall carry interest at the Bank Rate, compounded annually, and shall be recovered in four equal instalments from payments due to the Concessionaire, with a fifth and final recovery made 120 days after the fourth instalment.	
Article 29	**Compensation for default by the Concessionaire**	in the event of the Concessionaire being in material breach or default of this Agreement, it shall pay to the Authority by way of compensation, all direct costs suffered or incurred by the Authority as a consequence of such material breach or default.	
Clause 29.1			
Article 31	**Termination payment**	As per Clause 31.3.1, of the CA, Upon Termination on account of a Concessionaire Default during the Operation Period, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to 65% (sixty five per cent) of the sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.	
		Clause 31.3.3, of the CA, upon Termination on account of an Authority Default, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to:	
		(a) Debt Due; and	
		(b) 150% of the Adjusted Equity.	
		Cl 31.3.4, of the CA Termination Payment shall become due and payable to the Concessionaire within 15 (fifteen) days of a demand being made by the Concessionaire to the Authority with the necessary particulars, and in the event of any delay, the Authority shall pay interest at a rate equal to 3% (three per cent) above the daily average Bank Rate on the amount of Termination Payment remaining unpaid; provided	

Article (CA)	Subject	Description in brief	Remarks
		that such delay shall not exceed 90 (ninety) days. For the avoidance of doubt, it is expressly agreed that Termination Payment shall constitute full discharge by the Authority of its payment obligations in respect thereof hereunder	
Article 35	**Change in Law**	If as a result of Change in Law, the Concessionaire suffers an increase in costs or reduction in net after-tax return or other financial burden, the aggregate financial effect of which exceeds the higher of Rs. 3.05 crore or 2% of the total Annuity Payments in any Accounting Year, the Concessionaire may notify the Authority and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in increased costs, reduction in return or other financial burden as aforesaid.	
	Increase in cost		
	Reduction in cost	If as a result of Change in Law, the Concessionaire benefits from a reduction in costs or increase in net after-tax return or other financial gains, the aggregate financial effect of which exceeds the higher of 3.05 crore or 2% of the total Annuity Payments in any Accounting Year, the Authority may so notify the Concessionaire and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in decreased costs, increase in return or other financial gains as aforesaid.	
Article 38	**Dispute Resolution**	Any dispute, difference or controversy of whatever nature howsoever arising can be resolved in three stages	
		Conciliation	
		Arbitration	
		Adjudication by a tribunal	
Article 42	**Total Project Cost**	"Total Project Cost" means 60 % (sixty percent) of the Bid Project Cost specified in Clause 23.1 i.e. Rs. 2187 Cr.	

3.2 Settlement Agreement

The Settlement agreement was signed on 27th August 2024 between National Highways Authority of India and M/s GR Ena Kim Expressway Pvt Ltd.

Concessionaire agreed to complete the project as under:

36.9 km. length of the Project (except for works of Tapi Bridge @ km 237.769 and works in affected stretches due to COS) shall be completed by Concessionaire on or before 30th August 2024 plus 90 days grace period. The work of Tapi Bridge and COS works shall be completed by the Concessionaire on or before 15th November 2024.

Authority has the right to impose Damages and/ or terminate the Concession Agreement as per clause 15.2 of Concession Agreement, if works are delayed beyond the dates mentioned above (plus grace period of 90 days as per Concession Agreement) in case delays are attributable to the Concessionaire. While working out the damages to be levied on the Concessionaire, the delays attributable to the Authority and/or Force Majeure Events after the date of this Agreement will be excluded from total delays. The Damages will be levied only for the delays attributable to the Concessionaire's Defaults.

No bonus shall be payable to the Concessionaire for completion of Works before the dates given above.

In reciprocation of above considerations shown by the Authority, the Concessionaire came forward and agreed not to claim any additional cost such as prolongation cost, bonus, idling of plant & machinery, overhead cost, loss of profit, IDC, loss of interest or any other cost.

Each party hereby confirms that it does not have any residual, pending or any other claims, demands, disputes or differences against each other in respect of Concession Agreement and all claims, demands, disputes etc. of the Concessionaire including that arising out of in relation to the Concession Agreement against the other party namely Authority stands settled without any further recourse whatsoever as on date.

The terms and conditions of the Concession Agreement dated 07.10.2020 are modified to the above extent only. It is clarified that all other terms and conditions of the Concession Agreement dated 07.10.2020, save and except the terms and conditions expressed and agreed upon between the parties in this Settlement Agreement shall remain unaltered/ unchanged and remain binding on the parties.

Chapter 4
ASSET STATUS

CHAPTER 4. ASSET STATUS

4.1 Review of Highway Current Status

The Project stretch starts at km 1006.000 and ends at km 969.500 of NE in the State of Gujarat under "HAM" basis.

The project stretch starts at chainage km 217.500 and ends at chainage km 254.430. However, during construction, the chainage system was revised, with the start chainage changed from km 217.500 to km 1006.000 and the end chainage changed from km 254.430 to km 969.500. Accordingly, the project stretch now starts at km 1006.000 and ends at km 969.500.

The Project is fit for entry in to commercial operation on date 30th November 2024 for total length i.e., 36.930 km (Except Tapi bridge @237.769 & COS works) through IE letter no IE Letter No. LNMI0PPL/GR/NHAI/Ena-Kim-Exp./2024-25/9810, dated 10.01.2025.

Schedule I tests like comparison of schedule B, C with site execution, visual test, NSV survey, cross section test, ultra sonic pulse velocity test, load test, rebound hammer test, retro reflectivity test on signboards, environmental test, safety audit, test drive has been conducted during the PCOD tests and found the documents are in line with very few deviations.

The Concessionaire is addressing the defects/deficiencies as and when arises and pointed out by the Independent Engineers regularly.

Figure 4-1: Project start and end location

4.2 Drain

The drain along the Project stretch measures 137.588 km on median and both sides of shoulder. Out of which 67.819 km of open lined drain on shoulder side and 67.84 km of unlined drain and 1.898km of longitudinal drain on median side. The construction waste has been left in the open lined drain which creates choking of water and leads to erosion of embankment soil. The available list of drain constructed along the Project stretch are enclosed in **Annexure I**.

Figure 4-2: Drain

4.3 Junctions

As per the Concession Agreement (CA), there is provision of two major insterchanges along the project stretch and has been executed at site.

4.4 Median & Avenue plantation

As per the Concession Agreement (CA), median and avenue plantation shall be provided along the project stretch. However, during the site visit, it was observed that the median and avenue have been provided. The list of median and avenue plantations has been enclosed in **Annexure II**

Figure 4-3: Median plantation

4.5 Road Furniture

Following are the details of road furniture provided along the Project stretch as per site.

Table 4-1: List of Project furniture's

Type furniture	Unit	Quantity
Thrie Metal beam Crash barrier	m	149700
Pedestrian Guard rail	km	Nil
Noise barrier	km	3.950
Streetlights - Conventional	No's	
Single arm	No's	231
Double arm	No's	83
High mast	No's	04
Low mast	No's	0
Boundary wall	km	68.02

Metal beam crash barrier

Thrie Metal beam safety barriers have been installed along the entire Project stretch on the toe side and on median side of the main carriageway and are being well-maintained. The length of thrie beam along the project stretches measures 149.618 km. In loops and ramps the thrie beam is installed only on shoulder side. The available list of thrie beam installed along the Project stretch are enclosed in **Annexure III.**

Figure 4-4: Thrie beam crash barrier along the Project stretch

Pedestrian Guard Rail

Nil

Noise barrier

As per Concession agreement (CA), there is provision of Noise barrier at urban areas, interchanges and flyovers along the project stretch and are being well maintained. The detailed list of Noise barrier is enclosed in **Annexure - IV**

Figure 4-5: Noise barrier

Street Lighting

Street lighting, including single-arm, double-arm, and high-mast lights, has been provided along the project stretch, covering the main carriageway, service roads, underpasses, and toll plazas etc. As per site observations, the streetlights installed along the project stretch are in good condition

As per Schedule C, there is provision for solar system for entire highway, the solar panel at interchange, toll plaza and bridges shall be grid connected whereas the other places shall be battery backup. The electrical connection with all its infrastructure shall be done by the contractor. Additional battery backup shall be provided.

An uninterrupted power backup has been provided at toll plazas and VUP locations by providing solar panels. The detailed list of streetlights is enclosed in **Annexure - V**

Figure 4-6: Street lights

4.6 Project facilities

Following are the details of Project facilities along the Project stretch,

Table 4-2: List of Project facilities

Type facility	Unit	Quantity
Emergency call box (ECB)	No's	37
Foot Over Bridge (FOB)	No's	Nil
Diesel generator	No's	1
Boundary wall	km	68.02
Drip irrigation pumps	No's	9
Solar panel/power planet	No's	Available at site, but not shared the details
Boundary wall	km	68.020
Rainwater harvesting pits	No's	20
Landscaping and median Plantation	No's	Along with the Project stretch

Bus shelters

Nil

Truck lay bye

Nil

Rest area/Wayside amenities/Service area/Smaller parking places

As per Concession agreement (CA), there is a provision of Wayside amenities/Service area/Smaller parking places, but as per site is proposed for descoping and the same is in review

Emergency call box

As per Concession agreement (CA), the execution of ATMS policy is as per Expressway policy IRC SP 99-2013 with all amendments and additions till date, but the Authority requested to execute the policy as per latest circular dated 10-10-2023 under change of scope proposal. Accordingly, the review is pending at IE and as on date the total number of emergency call box installed as per site is 37 No's. The detailed list of Emergency call box is enclosed in **Annexure - VL**

Figure 4-7: Emergency call box

Boundarywall

As per the Concession Agreement (CA), there is a provision for a boundary wall along both sides of the project stretch. However, at site, the boundary wall has been constructed with a few gaps at certain locations, covering a total length of 68.02 km along project stretch. The detailed list of boundary wall is enclosed in Annexure - VII

Figure 4-8: Boundary wall

Drip Irrigation Pumps

As per the Concession Agreement (CA), there is a provision for a drip irrigation system for median plantation by gravity/pressure sources with all necessary systems, However, at site, the drip irrigation pipe along with pumps has been installed throughout median. The detailed list of drip irrigation pumps is enclosed in **Annexure – VIII**

Figure 4-9: Drip irrigation pump

Rainwater harvesting pits

As per the Concession Agreement (CA), there is a provision for a rainwater harvesting pit system. However, during the site visit, no rainwater harvesting pits were observed along the project stretch. The list as per concessionaire is enclosed in **Annexure -IX**

Figure 4-10: Rainwater harwesting pits actual loctaion

Diesel generators

DG sets were provided at all toll plaza location with a capacity of 125 KVA.

Figure 4-11: Diesel generator

4.7 Details of Toll booth Inspection

The details of the plazas are as follows:

Based on site observations, there is one toll plaza locations along the project stretch. The condition of the administrative building at Toll Plaza is good.

Table 4-3: Toll plaza

S.no	Chainage (km)	Toll Lanes	Admin block	M.A.P	T.A.P	High mast	Ambulance	RPV	Crane	SA	DA	Toilet blocks	Weigh bridge	Highway mini nest	Tunnel	Remarks
1	218.100	13	1	1	1	2	1	1	1	0	0	2	2	0	0	
Total		8	1			2	**1**	**1**	**1**	0	0	2	2	0	0	

Figure 4-12:- Toll Plaza

4.7.1 Details of toll inspection

The team of CUBE TECH, comprising two technical members, has visited the Project toll plaza on 3rd September 2025.

Observations:

Toll Management System installed at the Project, and all the information collected during the site visit have been reviewed by the team. Details of components of TMS and observations on the same are as follows:

System:

- The TMS system software, hardware and ETC systems are installed by Qualix information system in the year 2024.
- The Toll Collection Systems at Toll Plaza was provided by Qualix Information System LLP in 2025.
- Toll plaza has 13 lanes (5 Entry lanes and 8 Exit lanes). All 13 lanes are equipped with ETC (Electronic Toll Collection) systems.

Figure 4-13: Admin building

Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

- RFID ETC Transceiver
- Lane Controller with Industrial PC
- AVC Sensors

- Automatic Lane Barrier (ALB)
- Incident Capture and license plate capture Cameras
- Overhead Lane Signals
- Traffic Lights
- Toll Booth Equipment

RFID ETC Transceiver

- RFID ETC Transceiver reads tags installed on the windshield of vehicles and ETC RFID transceiver near Pay-axis-mounted over gantry. Handheld RFID readers are provided (1 no. in each direction)in case a tag is not detected by the fixed reader.
- The ETC system lanes are present and operational in 13 Lanes.
- Zebra Brand RFID Readers are installed in all lanes at the Toll Plaza.
- ETC System is Running on ICD 2.5.

Figure 4-14: Zebra RFID reader

Lane Controller with Industrial PC

- Toll Lane Controller is located within the Electronic Enclosure placed inside the booth which is connected to the common server.
- TLCs are installed and operational in 13 lanes.

Figure 4-15: TLC

Automatic Vehicle Classification (AVC) Sensors

- The Automatic Vehicle Classification (AVC) system is installed and working in 13 lanes.
- The Automatic Vehicle Classification (AVC) system at the toll plaza utilizes IR-based height sensors and axle sensors for accurate vehicle detection and classification. The IR height sensor emits an infrared beam across the lane, and interruption of this beam by a passing vehicle is used to determine the vehicle's height and profile. Axle sensors detect the number and spacing of axles as the vehicle moves through the lane.
- Data from both sensors is processed together to classify vehicles as per defined categories.
- The AVC system is operating with an accuracy level of 60%, which is below the expected benchmark.

Figure 4-16: AVC Sensors

Automatic Lane Barrier

Boom barriers are installed and operational in 13 lanes at the plaza. Automatic Lane Barrier is used to allow only authorized vehicles to pass throughthe lane. Torque motor powers the barrier for raising and lowering the boom. The boom weight is exactly balanced by built-in springs.

Figure 4-17: Barrier

Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. TheLTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done, the LTL turns Green to instruct the vehicle to pass through the lane. The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). Theuser fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

LTL and UFD are installed and operational in 13 lanes.

Figure 4-18: Traffic light & UFD

Incident Capture Camera (ICS Camera)

- The incident capture camera is installed on a pole to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.
- ICS cameras are installed and operational in 13 lanes.
- Royal Shield–brand cameras with a 2-megapixel image sensor are deployed for incident detection.

License Plate Image Capture Camera (LPIC)

- License Plate Image capture camera is installed on a pole facing incoming vehicle to capture the image of the vehicle number plate.
- LPIC Cameras are installed and operational in 13 lanes.
- Royal Shield–brand cameras with a 2-megapixel image sensor are deployed for License plate detection.

Figure 4-19: ICS and LPIC cameras.

Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane "Open" and "Close" sign consists of a pair of"GREEN" (arrow) and "RED" (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed.

OHLS is installed and operational in 13 lanes.

Figure 4-20:OHLS

Toll Booth Equipment

Toll Booth Hardware / Equipment provided are:

- Toll Collector Display (Operator Monitor)
- Customized Keyboard
- Receipt Printer
- Intercom slave unit
- Manual Booth Control (MBC)
- Booth Camera

The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a customized keyboard for Registration of toll operations.

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room. Booth cameras have voice recording functionality.

- Manual Booth Controller is used to release exempt vehicles.
- Violation lights, sirens and fog lights are also installed and working outside the booth in 13 lanes.
- Toll booth equipment is installed and working in 13 lanes.

Figure 4-21 : Booth Equipment's

Medium Speed Weigh in Motion (MSWIM)

- Medium Speed Weigh in Motion (MSWIM) is installed on entry lanes. Bending plate strain gauge technology is used with hardware and software support to calculate the weight of vehicles running through it up to a speed of 50 km/hr. MSWIM is installed in 5 Entry lanes but is not operational, as no overload charges are collected.
- SWB (Static Weighbridge) is installed only on one side of the Toll Plaza but is not in use.
- SWB Room consists of monitor, CPU with keyboard and mouse, thermal printer, Weight indicator, 2KVA UPS and booth camera etc.

Figure 4-22: MSWIM

Figure 4-23: Statis weigh bridge

TMS Server

- One server is provided including OS and database licenses, along with a switch rack and a 24-port switch.
- A firewall and broadband internet connectivity are available.
- Server is of HP ProLiant DL380 Gen10 model.
- 32 channel NVR with 4TB storage is available at toll plaza.

Figure 4-24: TMS Server with rack

LED screen for CCTV monitoring

one number of 52" inch LED screen for CCTV monitoring installed at the toll plaza admin block provides a viewof all the toll booths, important zones within the plaza where cash transactions take place(server room, control room, cash up).

The toll plaza manager can observe the activities at the toll lanes and toll booth. When the toll collector calls up on the intercom, the manager can comprehend the situation at the lane by a zoomed view of the lane.

UPS

- Following observations were made at toll plaza.

- Two units of 10 KVA UPS is present in the UPS room along with 20 Number of batteries for each UPS.
- A 3 KVA UPS is installed in each lane.
- Four units of 600 VA UPS are installed in the control room and are connected to the workstations.

Figure 4-25: UPS Room

4.7.2 Advanced Traffic Management System (ATMS)

The Advanced Traffic Management System (ATMS) was installed by M/s Qualix Information System LLP during the year 2023 and has been operational from the year 2025,

Eight lane access-controlled Expressway from Km 217.500 to Km 254.430 of Vadodara Mumbai Expressway (Ena to Kim Section) in the State of Gujarat for the project road which is controlled by the ATMS Centre. It comprises of the following:

- Emergency Call Back System (ECB)
- Variable Message Signboards (VMS)
- Portable Variable Message Signboards (PVMS)
- CCTV and Surveillance Cameras.

- **V**ideo Incident Detection System (VIDS)
- **Vehicle Speed Detection System Equipment (VSDS).**

Emergency Call Back System (ECB)

- 37 No of Emergency Call Booths (ECBs) are installed, out of which 4 Nos are not working due to power issues.
- OFC based ECB are installed with IP 65 certified with 4mtr pole, protection barrier, solar panel and battery.
- The users can access these ECBs and communicate to the ATMS control centre in case of emergency such as vehicle breakdown.
- ECB are powered with solar power.

Figure 4-26: ECB

Variable Message Signboards (VMS)

- **Variable Message Sign (VMS) boards are installed and operational at two locations**, namely at Chainage 219+900 (LHS) and Chainage 220+200 (RHS).
- The VMS display predefined and real-time messages to road users based on prevailing traffic and highway conditions.
- Full-matrix VMS with dimensions of **5000 mm × 2000 mm** are installed at both locations.

- In addition, **Median Detection and Surveillance Cameras (MDSC)**, **all-in-one solar lights**, and **hooter alarm systems** are installed on the VMS gantry.

Figure 4-27: VMS

Portable Variable Message Signboards (PVMS)

- One Portable Variable Message Sign (PVMS) board is available but is currently non-operational due to the absence of the solar panel.
- Portable VMS with Trolley (2000mm x 1000mm) is present at the site.

Figure 4-28: PVMS

CCTV and Surveillance Cameras

- Surveillance cameras are installed at 37 locations and operational at 35 locations.
- The installation includes a TMCS camera with a 128 GB SD card mounted on a 12-meter-high TMCS pole. A Median Detection and Surveillance Camera (MDSC) with SD card, hooter alarm with beacon, and an all-in-one solar light are also installed.
- The system is powered through a solar panel with mounting structure, battery backup, solar charge controller, and a 3-in-1 Surge Protection Device (SPD).
- Power and networking requirements are supported through a Power Distribution Unit (PDU), a 6-port optical switch, SFP modules with two sets of fiber patch cords, an 8-port LIU, and a 24-core OFC joint enclosure.
- Additionally, an outdoor cabinet, lightning arrester, and proper earthing arrangements have been provided to ensure safe and reliable operation of the system

Figure 4-29: CCTV

Video Incident Detection System (VIDS).

- Video Incident Detection System is installed and operational in 4 locations.
- VIDS are installed and operational at 4 locations. Each location consists of three VIDS cameras.
- Motion Detection Surveillance Cameras with beacon, hooter alarm are provided for traffic monitoring and safety.
- The scope also covers equipment cabinets, 12-meter poles with outreach arms, chambers/manholes, and pole foundations.
- Power requirements are met through solar systems with UPS/PCU, battery backup, surge protection, and lightning protection. Additionally, standalone solar-powered amber flasher lights and industrial 8-port managed Gigabit Ethernet switches are included.

Figure 4-30: VIDS

Vehicle Speed Detection System Equipment (VSDS).

- Vehicle Speed Detection System (VSDS) equipment, mounted on gantries with associated cabinets, is installed at eight locations and operational in six locations.
- Each VSDS system comprises five ANPR cameras, five speed display units, and a single radar unit.
- Motion Detection Surveillance Cameras with beacon, hooter alarm is provided for monitoring and safety.
- Power requirements are met through solar systems with UPS and battery backup,

Figure 4-31: VSDS

ATMS Control Room.

Server:

- Two ATMS Servers and one ECB servers are provided with a server rack, 24port switch, NVR 32 channel, media converter etc.
- Two ATMS servers are HP ProLiant DL380 Gen10 model.
- One ECB server is of Enjay synapse mini server.

Figure 4-32: ATMS Server with Rack

Control room equipment.

The following equipment is present in the ATMS control room.

- The control room is equipped with multiple desktop touch screen monitors integrated with workstations, including Intel i5 and Intel i7–based systems, each provided with a keyboard and mouse for operational use.
- Six workstations are provided for ATMS operations.
- Printing facilities comprise a multifunction colour LaserJet printer as well as a mono laser printer.
- Network and IT infrastructure includes a 9U switch rack with fan and cable manager, a 24-port non-PoE network switch, a 16-port network switch, and a 24-port managed optical switch along with a fully loaded 8-port LIU.
- The control room is further supported by a 3x3 Samsung video wall screen with mounting stand for centralized monitoring.
- intercom system for internal communication.

- a joystick for camera and surveillance control.
- 32 channel NVR with 8TB HDD.
- VOIP based landlines for GSM based ECBs.
- A 24-core single-mode armored optical fiber cable (OFC) has been laid along the project stretch to provide high-speed and reliable connectivity. This OFC network establishes communication between all ATMS devices and the control center, enabling real-time monitoring and data transfer.

Figure 4-33: ATMS Control room

UPS

- Following observations were made at ATMS.
- 20 KVA UPS is present in the UPS Room for ATMS servers and control room.
- VIDS and CCTV are powered with solar and raw power
- VMS is powered by Raw power.
- ECB and PVMS are powered with solar power.

- VSDS are powered by Solar and RAW power.

Chapter 5
CONDITION ASSESMENT OF EXISTING PAVEMENT AND MAINTAINANCE REQUIREMENT

CHAPTER 5. CONDITION ASSESMENT OF EXISTING PAVEMENT AND MAINTAINANCE REQUIREMENT

To evaluate the existing pavement condition of a Project Highway, investigations are to be carried out on the field to collect data from the field. The collected data is processed and analysed to obtain complete information on the pavement condition.

5.1 Pavement Condition Assessment for Technical Due Diligence

As a part of technical due diligence, the different investigations performed on the Project Highway are listed below.

- Assessment of Pavement Condition based on Visual Condition Survey

Based on the visual condition survey, the type of distress, its quantity, and severity along the Project Highway are obtained. The same is used to evaluate the present condition of pavement, which classifies pavement conditions ranging from 'Good' to 'Fair'.

The pavement investigation studies carried out on the Project Highway from 3rd Sept 2025 and 4th Sept 2025 as a part of technical due diligence and their outcomes are detailed in the sections below.

Main Carriageway is comprised of rigid pavement.

5.2 Review of Concession Agreement

As per Schedule K of the Concession Agreement, the Concessionaire shall repair and rectify the defects and deficiencies as specified below

Table 5-1: Major maintenance criteria as per CA

S. No	Nature of Defect or Deficiency	Time limit for Repair/Rectification
1	Roughness value exceeding 2750 mm in a stretch of 1km (as measured by a standardized rough meter/bump integrator)	180 Days
2	Cracking in more than 5% of road surface in a stretch of 1 km	30 days
3	Rutting exceeding 10mm in more than 2% of road surface in a stretch of 1km (measured with 3m straight edge)	30days

5.3 Review of Pavement Design Report

- As per sub clause 4.15.1 (Type of Pavement), 4.15.2 (Design Period & Strategy) and 4.15.3 (Design Traffic) of the Schedule B of the CA: The rigid pavement shall be constructed for the main carriageway including loop/ramps at interchange locations. Flexible pavement shall be designed for Slip roads, cross roads, connecting roads and inter connecting roads of VUP / LVUP / SVUP.
- The design of flexible pavement and rigid pavement has been carried out in accordance with guidelines of IRC-58-2015 and IRC-37-2018 respectively.
- As per the concession agreement (refer to the figure below), the minimum permissible CBR was 8%. According to PDR, effective CBR value of 10% has been considered for the entire stretch.

Notwithstanding anything to the contrary contained in this agreement or the Manual, the design of the pavement shall be carried out in accordance with Section 5 of the Manual considering future traffic projections for design life or as per the actual traffic, whichever is higher subject to minimum design requirement detailed below:

Sl. No.	Section	Minimum Design Requirements		
		Traffic	CBR (%)	Design period
1	Main Carriageway	27000 CVPD (Opening Year 2022)	8	30
2	Connecting Road, Overpass Cross-roads	10 MSA	8	15

Figure 5-1: Design CBR as per concession agreement

6. 3. Effective Subgrade CBR

Reference is drawn to the method of determination of effective CBR indicated in Clause 5.7.3.5 of IRC: 58-2015. The effective CBR is computed by considering the CBR of the embankment material (CBR below 500 mm of compacted subgrade) and 500 mm thick subgrade of compacted borrow material 500 mm thick. For the pavement construction of the main carriageway, it is considered that the 500 mm of subgrade and the top 500 mm of the embankment underlying the subgrade shall constitute of borrow materials qualifying 10% minimum CBR.

Thus, for pavement design purposes, an effective CBR of 10% is adopted for the entire project expressway.

Figure 5-2: Design CBR as per pavement design report

- The thickness of the concrete layers for the main carriageway has been designed for a service life of 30 years.
- The pavement for the slip roads, crossroads, connecting roads and interconnecting roads of VUP / LVUP / SVUP has been designed in accordance with IRC:37-2018, considering a design traffic of 10 MSA.
- Since the project road is a green field project, the axle load spectrum is not available. In the absence of the axle load spectrum. Design traffic of 27000 CVPD has been considered.

Table 5-2: Design Traffic for Project Highway

Chainage (km)		Construction Period	Design Life (30 years)	Adopted Traffic as per CA (CVPD)
From	To			
217.500	254.530	2021-2024	2022-2052	27000

Table 5-3: Pavement Design Thicknesses of Flexible Pavement for Main carriageway as per Pavement Design Report

Layer	**Thickness(mm)**
Pavement Quality Concrete (PQC)	300
Dry Lean Concrete (DLC)	150
Granular Sub-base (GSB)	300

Table 5-4: Pavement Design Thicknesses for Slip Roads, Crossroads, Connecting Roads and Interconnecting roads of VUP / LVUP / SVUP as per Pavement Design Report

Layer	**Thickness(mm)**
Bituminous Concrete (BC)	30
Dense Bituminous Macadam (DBM)	50
Wet Mix Macadam (WMM)	200
Granular Sub-base (GSB)	200

5.4 Pavement Distress Survey

A pavement condition survey gives an indication of the serviceability of the road pavement and is vital in deciding the maintenance activities. Some methods to conduct this survey are the Visual Condition Survey method (manual), Network Survey Vehicle (NSV) method, etc. However, Visual Condition Survey was conducted in this Project.

In a visual condition survey, the technical team makes a traverse along the Project Highway, observing the different types of distresses on the pavement surface, and observations are made on each distress type.

Distresses on rigid pavement section include

- Cracks – Longitudinal, Transverse, and Multiple cracks
- Joint Spalling
- Profile undulations
- Corner Break
- Popout
- Joint Widening
- Punchout

Distresses on flexible pavement section include

- Segregated surface
- Mix design failure

Observations made during the visual condition survey for entire pavement stretch are detailed below.

5.4.1 Longitudinal Cracks

Longitudinal cracks in concrete pavements are cracks that run parallel to the pavement's centreline or direction of travel. They can be caused by factors such as inadequate subgrade support, thermal contraction, or stress from traffic loading, particularly at construction joints.

High severity longitudinal cracks have been observed at a number of locations throughout the project stretch. However crack sealing is in progress at these locations as a part of routine maintenance.

Figure 5-3: Longitudinal Cracking

Figure 5-4: Longitudinal cracking has been arrested with the help of stapling

5.4.2 Transverse Cracks

Transverse cracks in concrete pavements are defined as cracks that run generally perpendicular to the pavement's centreline or direction of laydown. These cracks are typically not load-related and are often caused by thermal movements due to temperature changes, shrinkage of the concrete, or reflection from underlying layers such as joints in a rigid pavement or cracks in a cement-treated base. Low severity transverse cracking has been observed from km 224.126 to km 221.176 in LHS and from km 221.476 to km 221.526 in RHS of the project stretch. However crack sealing is in progress at these locations as a part of routine maintenance.

Figure 5-5: Transverse Cracking

5.4.3 Multiple Cracks

Multiple cracks in a concrete pavement refer to a condition where several cracks are present, often interconnected, and can significantly affect the structural integrity and functionality of the pavement. Low severity multiple cracks has been observed at isolated locations of the project stretch. Concessionaire is rectifying the issues as a part of routine maintenance and the photographs for the same is attached.

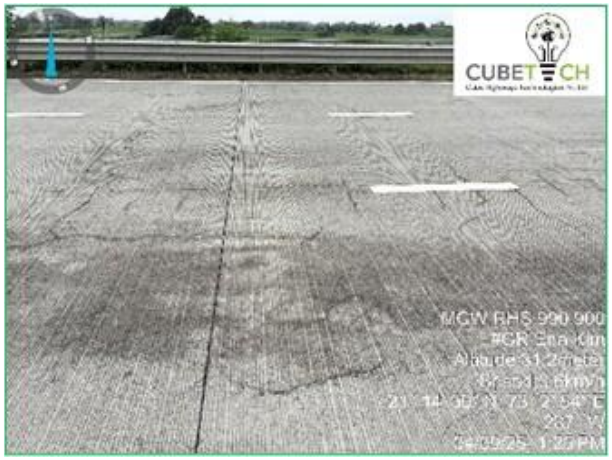


Figure -5-6: Multiple Cracks

Figure 5-7: Rectified crack loctaions

5.4.4 Profile Issue (Undulations)

Profile undulations in a concrete pavement refer to the cumulative vertical irregularities or deviations along the surface of the road.Low severity profile undulations have been observed at isolated locations of the project stretch. Concessionaire is rectifying the issues as a part of routine maintenance.

Figure 5-8: Profile Issues

Figure 5-9: Profile issues has been rectified

5.4.5 Corner Break

A corner break in a concrete pavement refers to a crack that intersects the Portland Cement Concrete (PCC) slab joints near the corner. Low severity corner break has been observed at km 236.576 to 236.596 of LHS of the project stretch.

Figure 5-10: Corner Break

Figure 5-11: Rectified at corner break locations

5.4.6 Punchout

A punchout in a concrete pavement refers to a structural distress where a section of the pavement slab breaks down and punches downward into the subbase and subgrade, typically under repeated heavy loads. Medium severity punchout has been observed at km 228.526 on the LHS of the project stretch. Concessionaire is rectifying the issues as a part of routine maintenance and the photographs has been attached for the same.

Figure 5-12: Punchout

Figure 5-13: Rectified at punchout locations

5.4.7 Popout

A popout in concrete pavement is a small, shallow depression or hole that forms on the surface when a piece of concrete breaks loose, typically due to internal pressure from freezing water within porous or expansive aggregates.

Popout has been observed at one location, i.e. km 225.126 on RHS of the project stretch. Concessionaire is rectifying the issues as a part of routine maintenance.

Figure 5-14: Popout

Figure 5-15: Pop out locations has been rectified

5.4.8 Joint Widening

During our site visit, it was observed that longitudinal joint widening has been developed with a width of 30mm between lane 2 and lane 3 in LHS from km 218.526 to km 228.526. In addition, joint sealant was not observed at many locations. Concessionaire is rectifying the issues, and the photographs has been attached.

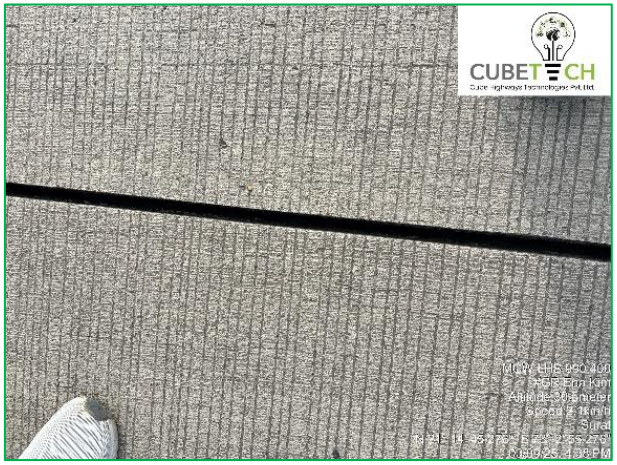


Figure 5-16: Joint Widening

Figure 5-17: Joint widening has been rectified.

5.4.9 Segregated Surface

A segregated surface occurs when the filler-to-binder ratio (F/B) deviates from the optimal range of 0.6-1.2. This imbalance leads to uneven distribution of aggregates and binder, resulting in weak spots, poor surface texture, and reduced pavement durability.Medium severity segregated surface on flexible pavement at majority structure locations have been observed. Concessionaire is rectified the same by relaying the flexible pavement.

Figure 5-18: Segregated Surface

Figure 5-19: Segregation locations has been rectified

5.4.10 Mix Design Failure

Mix design failure in bituminous pavement refers to the inability of the asphalt mixture to perform as intended under traffic and environmental conditions due to improper proportions or properties of its components. Mix design failure has occurred at one location in RHS of the Project Highway from km 981.150 to km 981.100 and the same has been rectified by the concessionaire.

Figure 5-20: Mix design Failure

Figure 5-21: Rectified at failure occurred locations

Based on the observations made during the visual condition survey, the pavement condition is categorized into three categories 'Good', 'Fair', and 'Poor'. The summary of the pavement condition of Project Highway is given below.

Table 5-5: Flexible Pavement visual survey results

Condition	LHS		RHS	
	Length (km)	Length (%)	Length (km)	Length (%)
Good	36.930	100%	36.930	100%
Fair	0	0%	0	0%
Poor	0	0%	0	0%

5.5 Pavement Roughness

Roughness is one of the important parameters for determining the functional characteristics of pavements. According to the American Society for Testing and Materials (ASTM), roughness is defined as "the deviations of a pavement surface from a true planar surface with characteristic dimensions that affect vehicle dynamics, ride quality, dynamic loads, and drainage, for example, longitudinal profile, transverse profile and cross-slope".

The roughness of road surfaces is measured using different equipment/techniques such as rod and level survey, dip stick profiler, profilographs, response type road roughness meters, and profiling devices.

In India, the roughness is measured using the fifth wheel bump integrator (developed by CRRI) and is reported as Unevenness Index (UI) in mm/km. In this report, roughness data is extracted from the NSV report, which was measured using a profilometer in the month of Nov 2024, is incorporated, and a summary of the results is presented below.

Table 5-6: Summary of the Roughness values using NSV for LHS MCW

Surface Condition	Roughness limit as per Concession Agreement	LHS MCW							
		Lane 1(m)	Lane 1(%)	Lane 2(m)	Lane 2(%)	Lane 3(m)	Lane 3(%)	Lane 4(m)	Lane 4(%)
Good	<1800	36.930	100%	36.930	100%	36.930	100%	36.930	100%
Fair	1800-2750	0	0%	0	0%	0	0%	0	0%
Poor	>2750	0	0%	0	0%	0	0%	0	0%

Table 5-7: Summary of the Roughness values using NSV for RHS MCW

Surface Condition	Roughness limit as per Concession Agreement	RHS MCW							
		Lane 1(m)	Lane 1(%)	Lane 2(m)	Lane 2(%)	Lane 3(m)	Lane 3(%)	Lane 4(m)	Lane 4(%)
Good	<1800	36.930	100%	36.930	100%	36.930	100%	36.930	100%
Fair	1800-2750	0	0%	0	0%	0	0%	0	0%
Poor	>2750	0	0%	0	0%	0	0%	0	0%

From the MCW Roughness data, it can be observed that

- Around 100% of all lanes of the highway are in good condition in both directions.
- As per the NSV report, the complete stretch exhibits a roughness value ranging between 1500 mm/km to 1700 mm/km. However, there are some sections which have high undulations and thus, the roughness values should have gone above 2000 mm/km for at least some sections. Therefore, the latest roughness reports are required for verification.

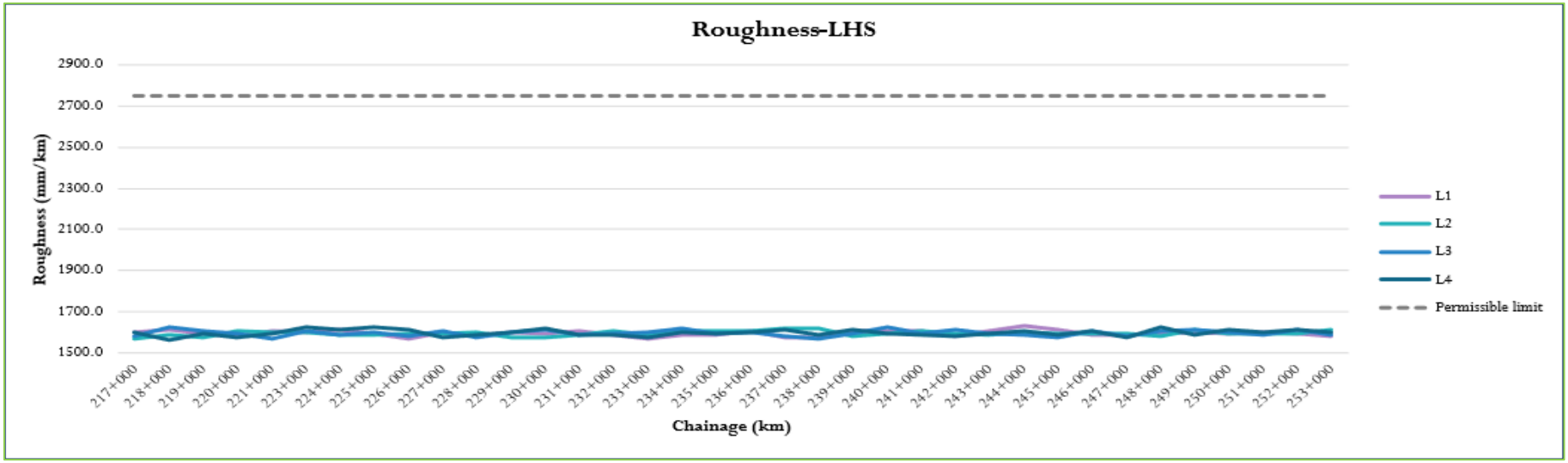


Figure 5-22: Flexible Pavement Roughness in LHS

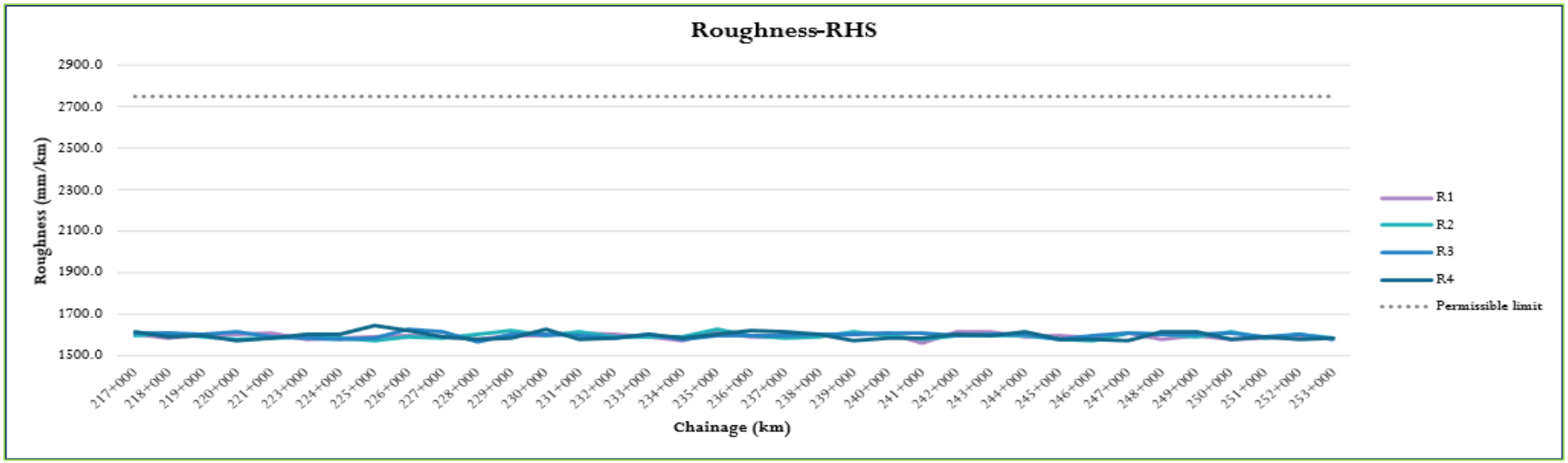


Figure 5-23: Flexible Pavement Roughness in RHS

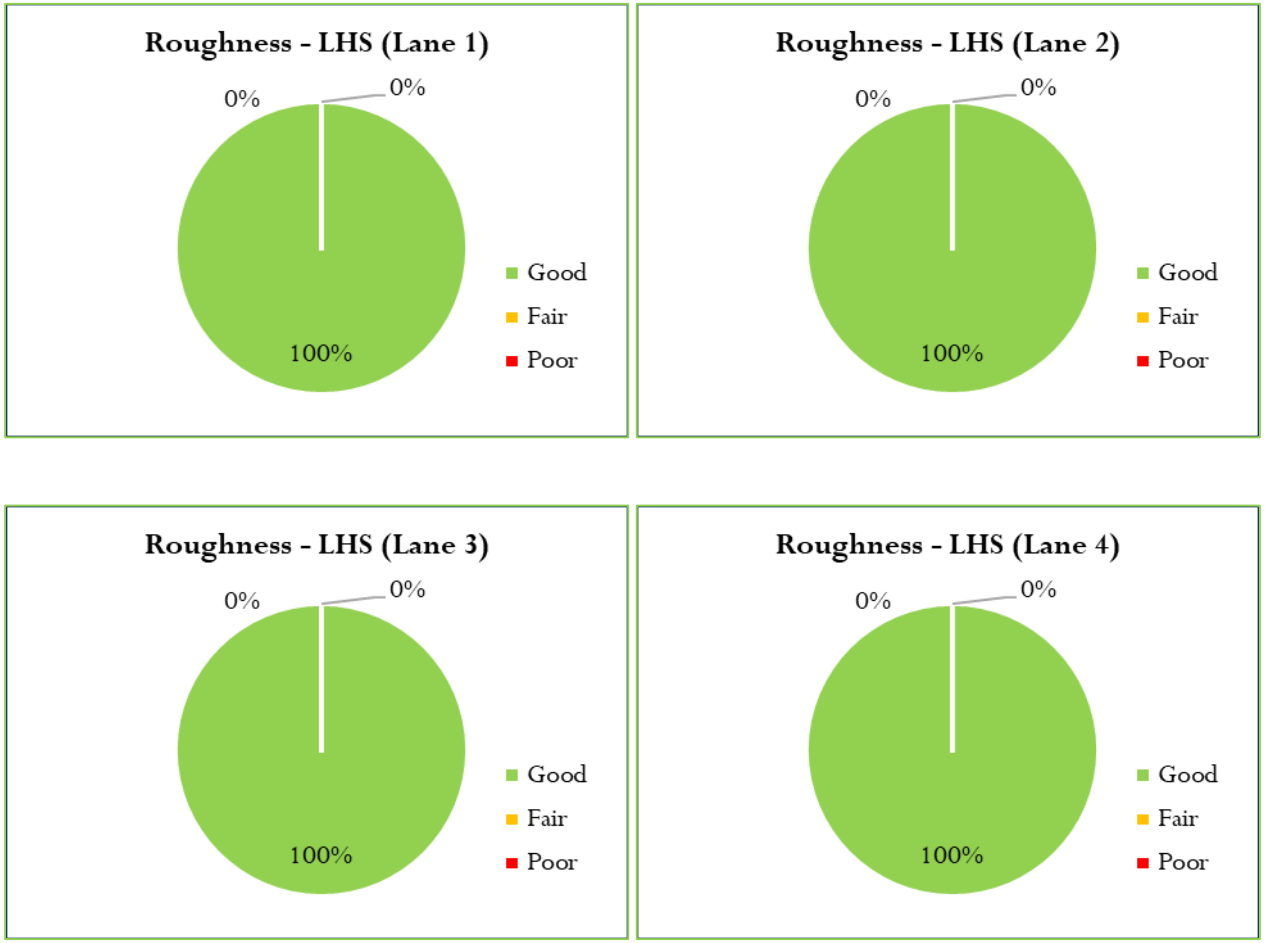


Figure 5-24: Pavement Roughness in LHS MCW

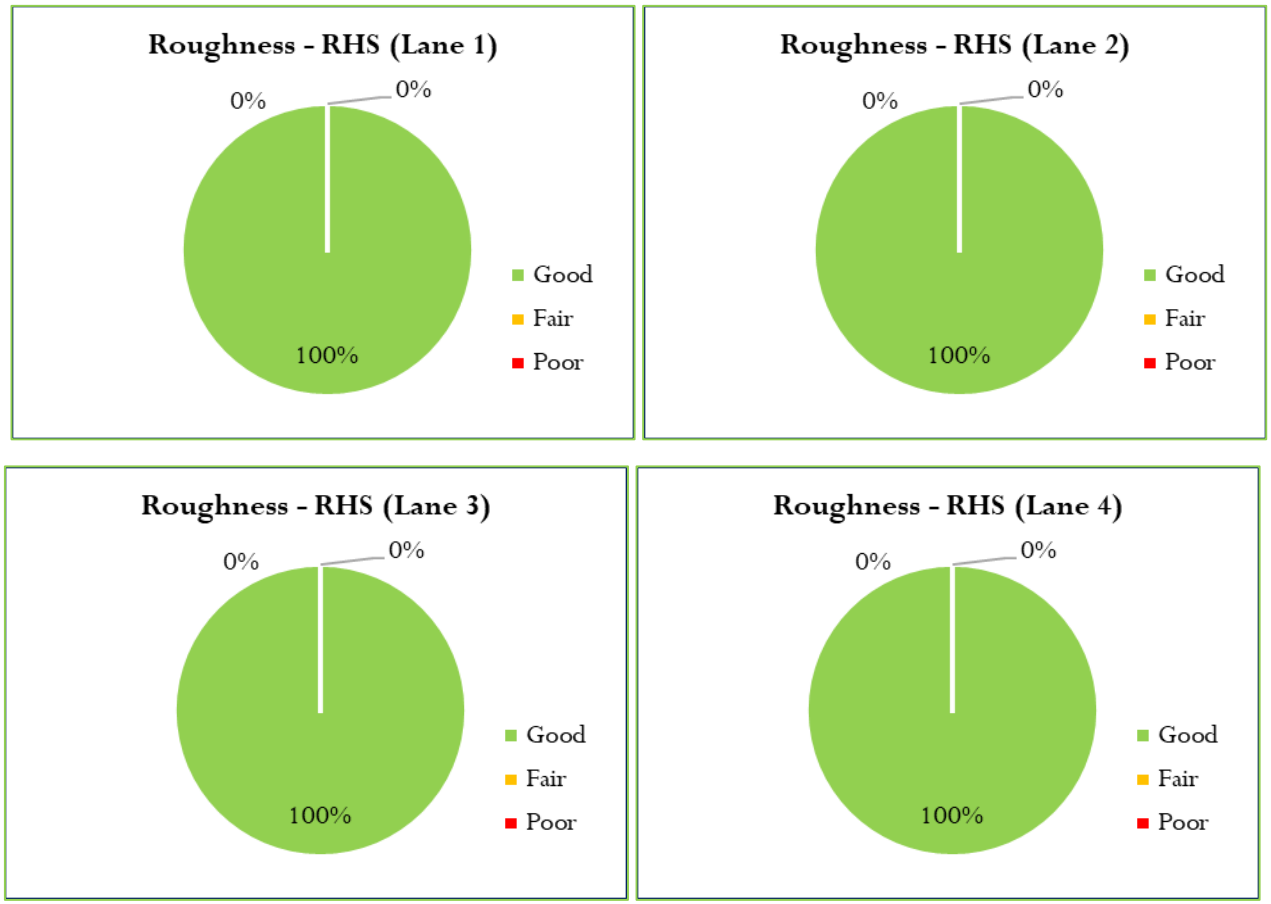


Figure 5-25: Pavement Roughness in RHS MCW

Chapter 5
REVIEW OF STRUCTURES

CHAPTER 6. Review of Structures

6.1 Structural investigations

Review of structures inventory and detailed condition survey of structures are the essential requirements for preparation of estimates for Capex and also for O & M cost for highway structures. Keeping in view of importance of this task, review of inventory and conducting visual condition survey were carried out as per procedure and guidelines prescribed in IRC: SP:35 bridge engineers. The details of condition survey of structures were furnished below.

6.1.1 Visual Condition Survey

Salient features for which data is collected as part of conditional survey are in accordance with IRC: SP: 35 Proforma. Main features recorded as part of detailed condition survey are listed below.

- Condition of wearing coat on deck slab such as potholes, cracks, and patches.
- Condition of expansion joints such as bump in riding, leakage in expansion joint, damaged elastomer, silt and debris filled in expansion joint gap.
- Condition of RCC railing/ safety barrier/ parapet wall.
- Condition of drainage spouts and down take pipes.
- Condition of super structure and substructure like spalling of concrete, cracks, honeycombing etc., in concrete surfaces.
- Condition of bearings.
- Condition of RE walls (reinforced earth walls).
- Corroded reinforcement exposed anywhere in deck slab and substructure.
- Condition of foundations like scouring, erosion of piles etc., if any at visible locations.

6.2 General

Details of various types of structures as per site inventory survey are furnished below,

Table 6-1: Summary of Structures

S. no	Type of Structure	As per Schedule-B	As per Site Inspection	Remarks
1	Major bridge	04	04	
2	Minor bridge	16	16	
3	Flyover	03	03	
4	VUP	10	10	
5	VOP	01	01	
6	ROB	01	01	
7	Interchange	02	02	
8	LVUP	15	15	
9	SVUP	18	18	
10	Box Culvert	124	124	
11	Hume Pipe Culvert	50	50	
Total		**244**	**244**	

The condition survey of all structures was conducted by a team of bridge experts through visual inspection as well as with Mobile bridge inspection unit (MBIU) at all the inaccessible locations like bearings, pedestals, girders and soffit of super structure. The detailed condition of all structures with necessary repair and rehabilitation measures is provided in separate report.

6.3 Major Bridges

There are four major bridges on the Project stretch.

Table 6-2: Inventory details of the major bridges

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	237.768	13 x 61.10	794.30	LHS	
		13 x 61.10	794.30	RHS	
2	246.625	4 x 35.00	140.00	LHS	

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
		4 x 35.00	140.00	RHS	
3	251.915	4 x 25.00	100.00	LHS	
		5 x 25.00	125.00	RHS	
4	252.880	4 x 35.00	140.00	LHS	
		4 x 35.00	140.00	RHS	

Figure 6-1: Major bridges

6.4 Minor Bridges

There are sixteen minor bridges on the Project stretch.

Table 6-3: Inventory of the minor bridges

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	217.527	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
2	218.100	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
3	220.110	1 x 25.00	25.00	LHS	
		1 x 25.00	25.00	RHS	
4	222.364	2 x 30.00	60.00	LHS	
		2 x 30.00	60.00	RHS	
5	223.273	1 x 40.00	40.00	LHS	
		1 x 40.00	40.00	RHS	
6	224.348	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
7	225.323	1 x 42.00	42.00	LHS	
		1 x 42.00	42.00	RHS	
8	228.446	2 x 25.00	50.00	LHS	
		2 x 25.00	50.00	RHS	
9	229.652	1 x 25.00	25.00	LHS	
		1 x 25.00	25.00	RHS	
10	230.945	1 x 35.00	35.00	LHS	
		1 x 35.00	35.00	RHS	
11	232.149	1 x 35.00	35.00	LHS	
		1 x 35.00	35.00	RHS	
12	232.940	2 x 25.00	50.00	LHS	
		2 x 25.00	50.00	RHS	
13	234.437	1 x 40.00	40.00	LHS	
		1 x 40.00	40.00	RHS	
14	235.264	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
15	240.080	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
16	243.982	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	

Figure 6-2: Minor bridges

6.5 Rail Over Bridge (ROB)

There is one ROB on the Project stretch.

Table 6-4: Inventory of the ROB

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	221.550	1 x 15.85 + 1 x 37.5 + 1 x 15.85	69.20	LHS	
		1 x 15.85 + 1 x 37.5 + 1 x 15.85	69.20	RHS	

Figure 6-3: ROB

6.6 Vehicular Overpass (VOP)

There is one VOP on the Project stretch.

Table 6-5: Inventory of the VOP

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	228.220	2 x 41.35	82.70	Single bridge	

Figure 6-4: VOP

6.7 Flyover

There are three flyovers on the Project stretch.

Table 6-6: Inventory of the Flyovers

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	221.002	1 x 20.0 +1 x 40.0 + 1 x 20.0	80.00	LHS	
		1 x 20.0 +1 x 40.0 + 1 x 20.0	80.00	RHS	
2	235.552	1 x 20.0 +1 x 35.0 + 1 x 20.0	75.00	LHS	
		1 x 20.0 +1 x 35.0 + 1 x 20.0	75.00	RHS	
3	248.403	1 x 25.0 + 1 x 42.065 + 1 x 25.0	92.065	LHS	
		1 x 25.0 + 1 x 42.065 + 1 x 25.0	92.065	RHS	

Figure 6-5: Condition of Flyover

6.8 Interchange

There are two interchanges on the Project stretch.

Table 6-7: Invenotry of the Interchanges

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	218.100	3 x 30.00 + 2 x 40.00 + 3 x 30.00	260.00	LHS	VME
		3 x 30.00 + 2 x 40.00 + 3 x 30.00	260.00	RHS	VME
2	218.100	3 x 30.00 + 1 x 40.00 + 3 x 30.00	220.00	LHS	
		3 x 30.00 + 1 x 40.00 + 3 x 30.00	220.00	RHS	

Figure 6-6: Interchanges

6.9 Vehicular Underpass (VUP)

There are ten VUP's on the Project stretch.

Table 6-8: Inventory of the VUP

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	218.100	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
2	220.056	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
3	220.451	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
4	225.448	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
5	230.595	1 x 20.00	20.00	LHS	

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
		1 x 20.00	20.00	RHS	
6	233.183	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
7	238.704	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
8	242.953	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
9	253.975	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
10	0+974 (254.000)	1 x 25.87	25.870	Unidirectional VUP	VUP (0.974) on Ramp 2

Figure 6-7: VUPs

6.10 Light Vehicular Underpass (LVUP)

There are fifteen LVUP's on the Project stretch.

Table 6-9: Inventory of the LVUPs

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	219.132	1 x 12.00	12.00	BHS	
2	222.162	1 x 12.00	12.00	BHS	
3	226.014	1 x 12.00	12.00	BHS	
4	227.011	1 x 12.00	12.00	BHS	
5	231.389	1 x 12.00	12.00	BHS	
6	231.806	1 x 12.00	12.00	BHS	
7	233.595	1 x 12.00	12.00	BHS	
8	236.507	1 x 12.00	12.00	BHS	
9	239.399	1 x 12.00	12.00	BHS	
10	241.346	1 x 12.00	12.00	BHS	
11	243.752	1 x 12.00	12.00	BHS	
12	245.470	1 x 12.00	12.00	BHS	
13	249.508	1 x 12.00	12.00	BHS	
14	250.012	1 x 12.00	12.00	BHS	
15	252.697	1 x 12.00	12.00	BHS	

Figure 6-8: LVUPs

6.11 Small Vehicular Underpass (SVUP)

There are eighteen SVUP's on the Project stretch.

Table 6-10: Inventory of the SVUPs

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	218.100	1 x 7.00	7.00	BHS	
2	222.829	1 x 7.00	7.00	BHS	
3	223.555	1 x 7.00	7.00	BHS	
4	224.990	1 x 7.00	7.00	BHS	
5	227.880	1 x 7.00	7.00	BHS	
6	230.330	1 x 7.00	7.00	BHS	
7	232.576	1 x 7.00	7.00	BHS	
8	234.090	1 x 7.00	7.00	BHS	

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
9	234.703	1 x 7.00	7.00	BHS	
10	235.084	1 x 7.00	7.00	BHS	
11	236.152	1 x 7.00	7.00	BHS	
12	240.412	1 x 7.00	7.00	BHS	
13	242.470	1 x 7.00	7.00	BHS	
14	244.855	1 x 7.00	7.00	BHS	
15	247.206	1 x 7.00	7.00	BHS	
16	247.671	1 x 7.00	7.00	BHS	
17	250.920	1 x 7.00	7.00	BHS	
18	252.150	1 x 7.00	7.00	BHS	

Figure 6-9: SVUPs

6.12 Culverts

There are one hundred and seventy-four culverts in the Project stretch, out of which one hundred and twenty-four are Box culverts and fifty are Hume pipe culverts

Table 6-11: Inventory of the Culverts

S. No	Type of culvert	No. of. culverts	Remarks
1	Box culvert	124	
2	Pipe culvert	50	

Figure 6-10: Condition of Culverts.

6.13 Key Obeservations on Structures

The overall condition of most of the newly constructed structures were in good condition with few minor defects.

- Considerable cracks were noticed on crash barrier in most of the bridges. This rectification can be addressed as part of routine maintenance works.
- Extrusion of pad/sheet was observed in few of guided spherical bearings, B5 bearing in A1-P1 and P9-P10 spans on LHS and on RHS B5 bearing in P1-P2 and P12-A2 spans. Considered bearing replacement in these four spans.

- At major bridge (Tapi) km 237.768, bearing pedestals / bedding concrete below the bearing cast over height of the bearings due to which the side guides of the bearing are touching the bearing pedestal top and have very less gap, limiting the spherical bearing functionality in most of the bearings. This rectification can be addressed as part of routine maintenance works.
- Leaching and cracks were observed on soffit of deck slab in some spans of the major structures.
- Prestressing strands were uncut and projected beyond the girders end face were observed in most of the girders. This rectification can be addressed as part of routine maintenance works.
- In some of the bridges, improper casting of seismic arrestors resulting in wider gaps observed between seismic arrestors and girders side face. This rectification can be addressed as part of routine maintenance works.
- Water leakage was observed on abutment/pier surfaces due to either improper fixing or strip seal elastomer damage in most of the expansion joints. This rectification can be addressed as part of routine maintenance works.
- In some of the structures, water leakage was observed from the deck slab near the end diaphragms through gaps in the RCC precast planks, from the expansion gap between the dirt wall and the gap/approach slab, and at underpass locations where leakage from the deck slab was seen on the abutment walls. This rectification can be addressed as part of routine maintenance works.
- Drainpipes extension was missing for the drainage holes provided at bottom of crash barrier in most of the structures. This rectification can be addressed as part of routine maintenance works.

Chapter 7
GENERAL SAFETY CONCERNS ALONG THE PROJECT STRETCH AND SUGGESTED IMPROVEMENTS

CHAPTER 7. General safety concerns along the project stretch and suggested improvements

7.1 General

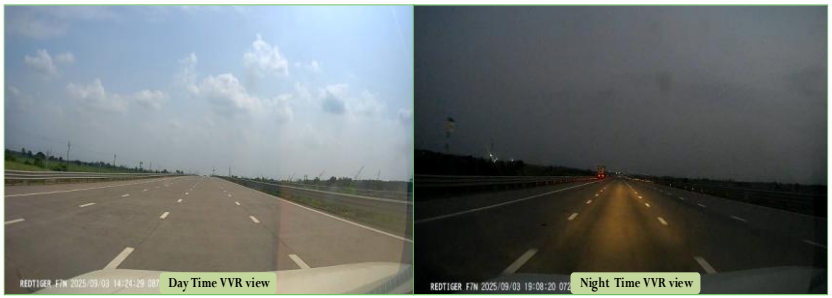
This chapter presents general road safety concerns observed along the project stretch (Ena-Kim section of Vadodara Mumbai) and improvements suggested to address the same.

7.2 Site visit

Road Safety along the highway depends upon the condition of various components of the highway, such as coordination between horizontal and vertical alignment, provision and placement of road furniture, intersection geometry, availability of adequate sight distance, night-time visibility along the highway, etc. It is essential to understand all these aspects of the highway from a point of view of safety of each type of road user. The purpose of this assignment is to understand the road safety worthiness of project stretch and quantify road furniture items that are required as per the provisions of the Concession Agreement (CA). The report also summarizes high-risk safety concerns that persist for a reasonable length along the project stretch that helps improve the safety of road user upon implemented. It may be noted that, few minor observations that are part of regular O&M activities have not been quantified in this report and geometrical improvements along with blackspots are not reviewed as part of this assignment. The scope has been constrained keeping in view the operational status of the project stretch and the focus is largely on the major safety concerns and deviations from CA provisions in road furniture, if any.

The Safety Team of CUBE Highways Technologies Pvt Ltd. visited the project stretch from 3rd to 5th Sep 2025.

It may be noted that the findings and suggestions in this chapter are based on a review of available information/documents. This chapter mainly focuses on general safety concern-related issues along the project stretch, and any major geometrical improvements, or location-specific improvements are not covered. The chainages mentioned in the report may vary from the ground by approximately 50 to 100 m within acceptable tolerances.



Along with manual observations, the entire project stretch is video graphed using Vehicle Video Recorder Driver's (VVR) Eye Level Video. A snapshot of output obtained from the app view is shown below: VVR records the following details along with the video:

- Video recording (front view – driver's eye level view)
- Location of video on the google map (along with coordinates of the location)

- Speed of the recording vehicle, in km/hour

7.3 Review of project documents related to road safety aspects

The table below gives an overview of the documents provided on road safety

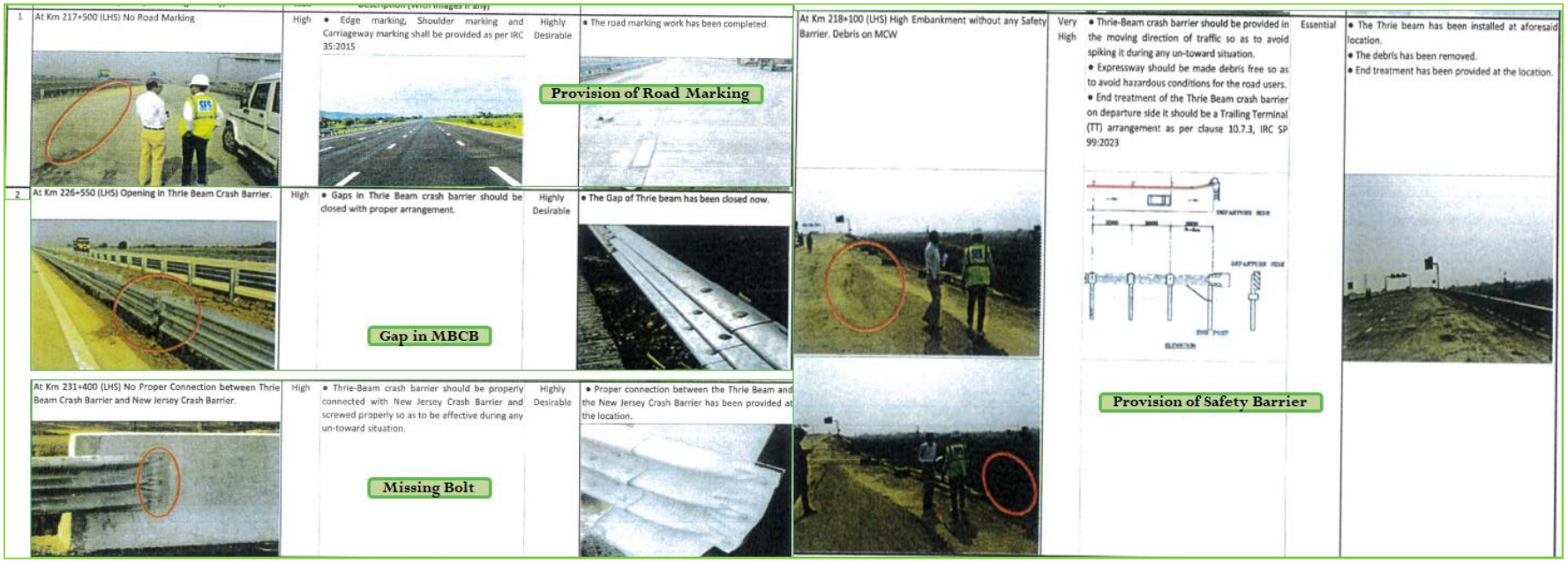
S. No.	Particular	Summary related to road safety
1	Concession Agreement (CA) - GR ENA KIM Expressway Private limited	• All clauses and safety-related warrants have been reviewed.
2	Safety Furniture Plan	• As Build Drawings *(Plan &Profile, Road Signage and Marking, Road studs Plan, Highway Lighting Plan, Toll Plaza Plan, Plan for Tree Plantation, Emergency Crossover Plan, and TCS)* have been received and reviewed.
3	IE MPR	• Road Marking works at Toll Plaza and arrow marking at interchange loops & ramps are completed. • Avenue plantation is ongoing to enhance roadside safety and visibility. • A Traffic Impact Attenuator has been installed at the Toll Plaza to reduce collision severity.
4	Concessionaire MPR, June 2025	• Road safety–related observations were not addressed in the Concessionaire MPR.
5	Pre-Opening Stage Safety Compliance Report by Concessionaire- Dec 2024	• The report summarises the key safety issues related to sign boards, overhead clearance, high embankments, and incomplete safety installations such as safety barriers, markings, and road studs (refer to the following section 7.4 for more details).

7.4 Summary of pre-compliance road safety audit report

The Pre-Completion RSA report broadly covers the key provisions, rectifications, and improvements related to the following aspects. A quick summary of these points, along with a sample image from the RSA report, is provided below.

- Missing road markings (longitudinal, transverse, hazard) were addressed.
- Safety barriers at high embankments have been completed.
- Height limit signs were installed at previously missing locations.
- Spillage of undesirable materials was cleared from the project stretch.

- Incorrect or missing Thrie beams & MBCB connections were corrected.
- Wrongly placed and redundant signposts were removed.
- Painting works at NJCB have been completed.
- Traffic Impact Attenuator (TIA) installation has started and is on the punch list.
- Chevron signs on curves have been installed where missing.
- Choked weep holes in structures were cleared.
- Emergency cross-over treatments were improved with temporary safety measures.
- Improper spacing of signposts has been corrected.
- Missing gantry signage at Km 254+000 is planned as per IRC SP 99:2023.



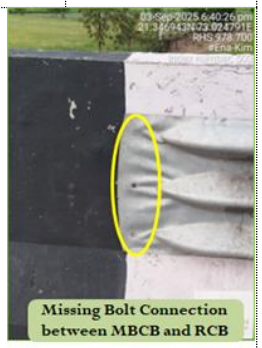
7.5 Identified safety concerns along the project stretch

Keeping in view the scope of the assignment, safety concerns have been recorded on site and reported in the table below. The remarks and recommendation column includes information on road safety concerns related to installation errors of existing road furniture items, Additional requirements of road furniture items, and Junctions/Geometry/location-specific improvements as per provided documents, i.e., *(Schedules, Pre-compliance Road Safety Audit Report, MPR by IE, etc).*

Risk and priority of each safety concern are also included as per the following criteria given in line with IRC: SP:88-2019 (Manual on Road Safety Audit).

- **Risk categories for identified safety concern: Very High, High, and Medium**
- **Priority level for recommendations: Essential, Highly Desirable, and Desirable**

Table 7-1: Summary of pre-bid documents related to road safety aspects

S. No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
1	**Safety Barrier**				
A	**Inadequate transition arrangements between MBCB & Rigid barrier**	**-**		**-**	**No Issue**
	During the site visit, the transition arrangements between MBCB & Rigid barrier was found to be adequate.		No Issue Observed.		
B	**Missing Bolt Connection Between MBCB and RCB**	**High**		**Essential**	**O&M Issue**
	Safety observation: During the site visit, a missing bolt connection between the MBCB and RCB was observed at several locations. The following sample photographs present a missing bolt connection between the MBCB and RCB along the Project stretch. **Safety concern:** The missing bolt connection between the MBCB and RCB compromises barrier integrity, reducing its ability to contain and redirect vehicles during impacts. This poses a serious risk to road users and should be repaired immediately to restore full safety functionality. **Recommendation:** It is suggested to repair and maintain the missing bolt connection between the MBCB and RCB immediately to ensure structural integrity and restore the barrier's full safety performance along the project stretch.				
C	**Gap in MBCB**	**Low**		**Essential**	**O&M Issue**

S. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	Safety observation: During the site visit, gap in the MBCB was observed at a few locations. The following sample photographs present the gap in MBCB along the Project stretch. **Safety concern:** The gap in MBCB is highly unsafe for fast-moving traffic. Such discontinuity in the crash barrier can cause vehicles to penetrate through the opening, leading to severe accidents, rollovers, or falling off the embankment.				
D	**Damaged Metal Beam Crash Barrier - MBCB**	-		-	**No Issue**
	During the site visit, the MBCB was found to be adequate.		No Issue Observed.		
E	**Improper start and end treatment of MBCB**	-		-	**No Issue**
	No Issue Observed.				
F	**Height of existing Metal Beam Crash Barrier -MBCB**	-		-	**No Issue**
	During the site visit, the height of MBCB was found to be adequate.		No Issue Observed.		
G	**Wrong overlapping of MBCB plates**	-		-	**No Issue**
	No Issue Observed.				
H	**MBCB Setback distance**	-		-	**No Issue**
	MBCB setback distance is adequate.				
I	**Missing MBCB at hazardous locations**	-		-	**No Issue**
	No Issue Observed.				
J	**Welded connection of MBCB Plates**	-		-	**No Issue**

S. No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
	No issue was observed.				
K	**Wire Rope Barrier Setback Distance**	**-**		**-**	**NA**
	NA		NA		
L	**Wire Rope Barriers Distance from the face of the kerb**	**-**		**-**	**NA**
	NA		NA		
M	**Inadequate height of Rigid Crash Barrier (RCB)**	**-**		**-**	**No Issue**
	No Issue Observed				
2	**New installation of Pedestrian Guard Rail (PGR)**				**NA**
	As the project road is an access-controlled expressway, pedestrian access is prohibited. Hence, no PGR required.				
3	**Missing/Damaged Median walls in b/w structures**	**High**		**Essential**	**Installation Issue**
	Safety observation: During the site visit, it has been observed that the median walls b/w the LHS and RHS structures are missing/damaged. The following sample photographs present the missing median walls of the structures along the Project stretch. **Safety concern:** Median wall is a non-load-bearing concrete wall provided to conceal the gap between two sides of bridges/structures (gap between LHS & RHS structures), which protects and serves the purpose of controlling vehicles from falling off the carriageway through this gap on the median side. **Recommendation:** It is suggested to review construction of median walls at the required locations on BHS, matching the height with the rigid barriers of the structures. The list of such locations is mentioned in Annexure I				
4	**Issue with existing solar blinkers and additional requirements**	**-**		**-**	**O&M Issue**

S. No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	Safety observation: During the site visit, it was observed that Solar blinkers were non-functional at the Toll Plaza location (At km 218.100) (on loop/ ramp road -5 Nos.). The following sample photographs present the non-functional solar blinker. **Safety concern:** Non-functional solar blinkers reduce night-time visibility and fail to alert drivers about approaching hazards or critical road features, this increases the risk of accidents. **Recommendation:** It is suggested to repair and maintain installed solar blinkers in working conditions as per standards. Non-Functional Solar Blinker				
5	**Highway Lighting at Grade-separated structures and built-up areas**	-		-	**No Issue**
	No Issue Observed.				
6	**Issue with an existing and additional signboard**	**High**		**Essential**	**Installation Issue**
	Safety observation: During the site visit, there is a deficiency of signboards along the Project stretch, Such as the Emergency SOS Facility signboard. The following figures present missing Emergency SOS Facility signboards along the Project stretch. **Safety concern:** In the absence of proper signage, road users may not be aware of the availability or proximity of SOS facilities, which could lead to delays in seeking timely help during breakdowns or emergencies. **Recommendation:** • As per IRC 67 (Clause 17.9), this sign shall be used at regular intervals in rural highways where emergency phones are installed. • It is suggested to install Emergency SOS Facility Sign Boards at the designated locations. • The list of locations of additional signboards has been attached in Annexure-I Missing Emergency SOS facility Signboard				
7	**Delineators/Guard Post**	-		-	**No Issue**
	No Issue Observed.				
8	**Maintenance Issues of Existing Pavement Marking**	-		-	**No Issue**

S. No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
	No Issue Observed.				
9	**Gore Area Improvement**				
	Safety observation: During the site visit, the traffic impact attenuator was found to be damaged at a few locations (At km 999.200 and km 1004.800). **Safety concern: A** Damaged traffic impact attenuator compromises its functionality to absorb collision energy. In its current state, it cannot effectively reduce crash severity, thereby increasing the risk of severe injuries or fatalities in the case of vehicle impact. **Recommendation:** • As per IRC SP 99 (Clause 10.6), attenuators should be placed at gore areas. Also, the RSA Report (December 2024) suggests installing them. • It suggested rectifying the damaged traffic impact attenuator along the project stretch.				
10	**Safety Measures at critical locations, i.e., Transverse Bar Marking**	**-**		**-**	**No Issue**
	No Issue Observed.				
11	**Road Studs**	**-**		**-**	**No Issue**
	No Issue Observed.				
12	**Road Geometry**				
A	**Absence of a storage lane at median opening/U-turn locations**	**-**		**-**	**NA**
	No Issue Observed.				
B	**Un-Authorised Median Openings (UMO)**	**-**		**-**	**No Issue**
	No Issue Observed.				
C	**Improper Entry and Exit Arrangement**	**-**		**-**	**No Issue**
	No Issue Observed.				
D	**Improper connections of Minor Roads**	**-**		**-**	**No Issue**
	No Issue Observed.				

S. No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
13	**Night-time visibility -Retroreflective stickers on MBCB**	**-**		**-**	**No Issue**
	No Issue Observed.				
14	**Improper maintenance of the Earthen Shoulder**	**-**		**-**	**No Issue**
	No Issue Observed.				
15	**Landscaping and Tree Plantation**				
A	**Issue with Median plantation**	**High**		**Essential**	**O&M Issue**
	Safety observation: During the site visit, it was observed an overgrown median plantation was observed. **Safety concern:** Overgrown Vegetation in the median obstructs the visibility of the MBCB and its reflective stickers, which are essential for proper delineation, especially during nighttime or low-visibility conditions. This compromises driver awareness and increases the risk of accidents. **Recommendation:** It is suggested to trim and regularly maintain the median vegetation to ensure clear visibility of the MBCB and its reflective stickers, thereby enhancing road safety.				
B	**Median Plantation in No Plantation Zone**	**-**		**-**	**NA**
	No issue was observed.				
16	**Truck Lay Bays/Bus Bays/Wayside Amenities**				
A	**Truck Lay Bay Layout**	**-**		**-**	**NA**
	No Issue Observed				
B	**Bus Bays and Bus Shelters**	**-**		**-**	**NA**
	No Issue Observed.				
C	**Rest Areas / Wayside Amenities**	**-**		**-**	**No Issue**
	No Issue Observed.				
18	**Other General Issues**				

S. No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
A	**Water Stagnation**	**High**		**Essential**	**General**
	Safety observation: During the site visit, the water stagnation issue was observed at a few locations along the project stretch. **Safety concern:** Water stagnation on the road surface can lead to skidding and loss of vehicle control, especially at higher speeds. It reduces tyre grip and increases braking distance, posing a serious hazard to road users. **Recommendation:** It is suggested to remove stagnated water on the high-speed corridor by constructing median chutes to ensure safe passage for road users. Water Stagnation				
B	**Encroachment by Temporary Shops**	**-**		**-**	**No Issue**
	No Issue Observed.				
C	**High Transmission Line Vertical Clearance**	**-**		**-**	**No Issue**
	No issue was observed.				
D	**Ongoing Construction-Related Issues**	**-**		**-**	**No Issue**
	No issue was observed.				
E	**Parking on Paved Shoulder**	**-**		**-**	**No Issue**
	No Issue Observed.				
F	**Sudden Edge Drop at the Shoulder**	**-**		**-**	**No Issue**
	No Issue Observed.				
G	**Rigid Electrical Poles on shoulders**	**-**		**-**	**No Issue**
	No Issue Observed.				
19	**Improper access arrangement to Fuel stations**	**-**		**-**	**NA**
	No Issue Observed.				

7.6 Summary of identified road safety observations

The following table represents the identified road safety observations along the project stretch.

Table 7-2: Summary of identified road safety observations along the project stretch

SI. No.	Safety observations	Identified locations	Remarks
1	Missing Median walls in the b/w structures	At km 225.400, km 223.200, km 221.500, km 220.900, km 220.400, km 220.100, km 220.000, km 220.000, km 220.000, km 220.500, km 221.000, km 221.500, km 223.200, km 284.800, km 231.000, km 234.500, km 235.200, km 233.700, km 242.900, km 246.700, km 248.400, km 251.900, km 252.800, km 254.000	
2	Traffic Impact Attenuators	At km 999.200 and km 1004.800	
3	Missing Emergency SOS facility Sign Board	At km (218.000, 220.000, 222.050, 224.050, 226.050, 228.060, 230.050, 232.050, 234.050, 236.050, 238.200, 240.200, 242.200, 244.200, 246.200, 248.100, 250.100, 252.010, 254.010) LHS & RHS.	
4	Gap in MBCB	At km 994.500, km 984.100, km 980.700, km 970.500	
5	Issue with existing solar blinkers	At Toll Plaza (At km 218.100) (on loop/ramp road) (5 Nos.)	

Chapter 8
CHANGE OF SCOPE

CHAPTER 8. Change of scope

8.1 Change of Scope (COS) details

As per IE letter no LNMIPPL/PD/NHAI/ENA-KIM/2024-25/1972 dated 29-05-2024, The consolidated COS is as mentioned below,

Table 8-1: Details of Change of Scope -1

S.No.	Description	No. of Locations	Total Length (m)	+ve cost	-ve cost	Cost (₹)
A	**Public Demand COS**					
1	3.5 m Granular Connecting Road	12	3437	2,40,92,692		2,40,92,692
2	3.5 m Bituminous Connecting Road	13	5952	7,34,26,439		7,34,26,439
3	7.0 m Bituminous Connecting Road	1	716	1,21,62,308		1,21,62,308
4	Bituminous Road Ramp on Canal Inspection Road	1	123	12,15,106		12,15,106
5	KRBC Chamber	1	–	5,93,535		5,93,535
6	1200 mm Pipe Culvert	55	1510	3,31,88,788		3,31,88,788
7	600 mm Pipe Culvert	6	450	25,00,878		25,00,878
8	6-inch dia PVC Pipeline	2	400	2,43,920		2,43,920
9	2×2 Box Culvert	1	7.5	8,21,166		8,21,166
10	2 Cell 3×3 Box Culvert	1	5.5	10,86,200		10,86,200
11	250 mm RCC Pipeline incl. Chambers	4	4910	35,94,467		35,94,467
12	Earthen Canal / Nalla Re-alignment	6	2010	24,49,600		24,49,600
13	Fencing (Welded Steel Wire Fabric)	17	10105	1,12,59,061		1,12,59,061
14	Shifting of Shed for EHT Line	1	–	4,99,916		4,99,916
15	Drinking Water Facility (Village Shifting)	1	–	25,72,666		25,72,666
16	Toe Wall	1	220	31,26,441		31,26,441
	Total (i)			17,28,33,183		17,28,33,183
	GST @18% (ii)			3,11,09,973		3,11,09,973

S.No.	Description	No. of Locations	Total Length (m)	+ve cost	-ve cost	Cost (₹)
	Total (i)+(ii)			20,39,43,156		20,39,43,156
B	**ATMS**					
	ATMS as per revised specification			10,41,47,028		10,41,47,028
	GST @18%			1,87,46,465		1,87,46,465
	Total			12,28,93,493		12,28,93,493
C	**Negative COS – WSA / Parking**					
	Smaller Parking with toilet facilities				-67,75,564	-67,75,564
	Truck Parking WSA				-5,56,15,900	-5,56,15,900
	Subtotal (i)				-6,23,91,463	-6,23,91,463
	Article 16.6.1 (II) @5%				-31,19,573	-31,19,573
	Article 16.6.1 (III)				-2,12,29,918	-2,12,29,918
	Total C				-8,67,40,954	-8,67,40,954
D	**Deletion of Tunnel at Toll Plaza (Ch. 218+100)**					
	Civil works for deletion of tunnel				-25,49,434	-25,49,434
	Article 16.6.1 (II) @5%				-1,27,472	-1,27,472
	Article 16.6.1 (III)				-8,67,495	-8,67,495
	Total D				-35,44,400	-35,44,400
Grand Total E = A+B+C+D				32,68,36,649	-9,02,85,354	23,65,51,295

- The cost of COS works calculated by the concessionaire is Rs. 23,96,08,004.00, which has been corrected based on actual quantity of various works, relevant SOR, 2022–23 NH division Bharuch Gujarat/standard data book rates for (+) COS. For (–) COS the rates are taken as per the applicable rates as on the bid due date as per Article 16.6.
- The corrected amount is Rs. 23,65,51,295. However, the payments to the concessionaire shall be made of actual work executed at site.
- Discount premium shall be finalized by authority.

Chapter 9
OPERATION & MAINTAINACE COST

CHAPTER 9. OPERATION AND MAINTENANCE COST

9.1 General

This Chapter presents details on the O&M expenditure to be incurred. The expenses are divided into four heads.

- Routine Maintenance Expenses to maintain the asset to the standards set forth in the Concession Agreement.
- Major/ Periodic Maintenance Expenses
- Operating Expenses

Table 9-1: Project stretch

Project stretch	Chainage From	Chainage To	Length (km)
	217.500	254.530	36.930

9.2 Cost of Various Components.

The estimation of quantities is based on Schedules. The estimation of quantities and costs worked out separately for each item. The quantities are estimated under the following heads:

- Overlay on MCW and SR
- TMS & ATMS
- Other miscellaneous works (i.e., Road Marking, Shoulder repair, Kerb raising, Kerb painting etc.)

9.3 Estimation of Operation & Maintainance cost

Following table illustrates the initial cost to be incurred for routine maintenance and major maintenance,

Table 9-2: Routine maintenance cost of the Project

S No	Particulars	Frequency	Cost excluding GST (Cr)	Remarks
1	**Routine Maintenance Cost**	**Annual**		
	Pavement Maintenance		**1.29**	
	Highway and Road Furniture		**1.34**	
	Structures Maintenance		**1.23**	
	Street Lighting and Misc. works		**0.15**	
	Total RM cost		**4.01**	

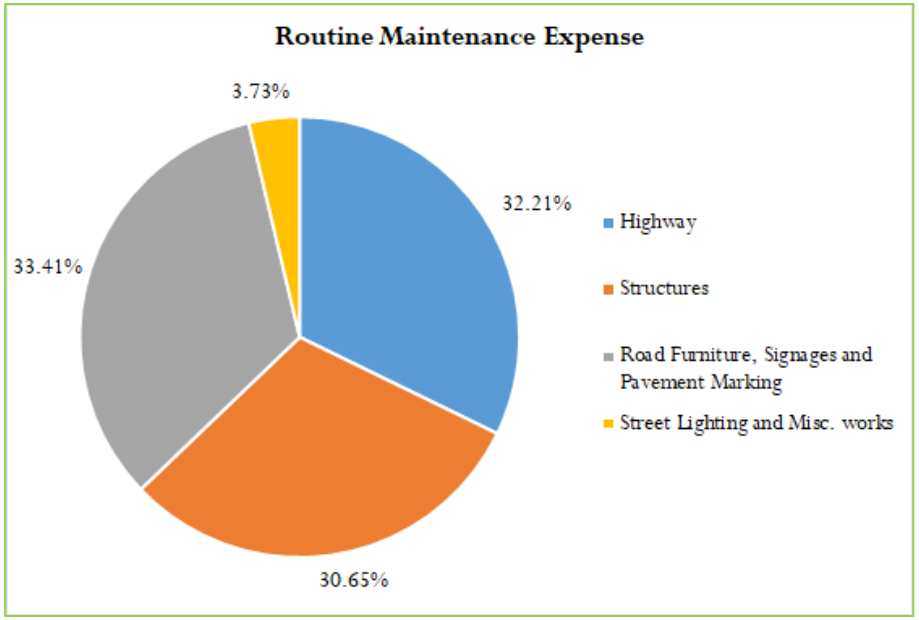


Figure 9-1: Breakup of routine maintenance

Table 9-3: Operational Expenditure of the Project for the FY 2026

S.no	Description	Manpower	Annual Exp. (in Lakhs)
A.1	SPV staff and salaries	11	70.98

S.no	Description	Manpower	Annual Exp. (in Lakhs)
A.2	Tolling Operations Services Outsourced		0.00
A.3	Security Services Outsourced	0	0.00
A.4	Incident Management Services	24	85.14
A.5	RoW and Horticulture Works_ Manpower Outsourced	16	64.62
A.6	Electricity and Diesel Charges		58.89
A.7	TMS/HTMS System Expenses		34.39
A.8	Office Operating Expenses		3.78
A.9	Vehicle Running Expenses		19.77
A.10	Professional Fee		22.92
A.11	Community Development		10.17
A.12	Communication Expenses		1.02
A.13	Conveyance Expenses		10.17
A.14	Insurance Expenses		121.19
A.15	IE Fees		35.59
A.16	Contingency	1.0%	6.23
	OPEX		544.86

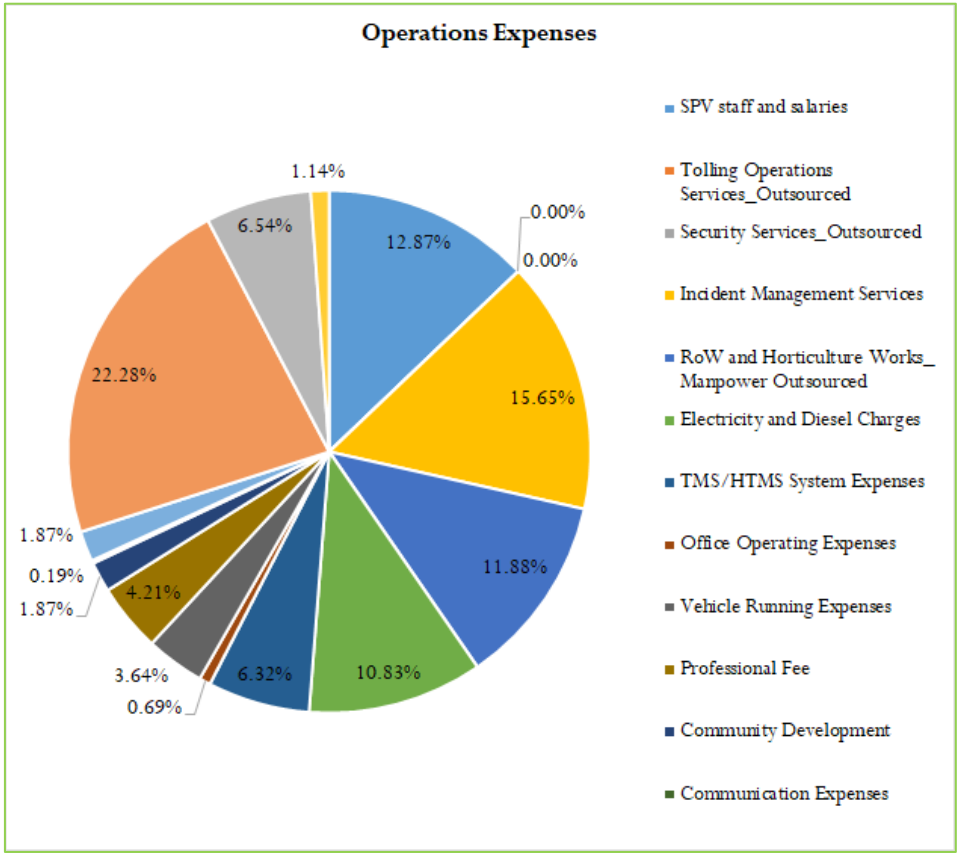


Figure 9-2: Breakup of Operational expenses

9.4 Estimation of Periodic Maintenance Cost

Bitumen plays a vital role in overall cost estimation. Considering the performance and availability of bitumen from a nearby source, to estimate cost analysis Bitumen VG-40 is considered for service roads.

The abstract of resultant estimated costs for the Project Stretch is given below. All costs are estimated based on FY 2025-26 prices.

Table 9-4: Estimated Periodic Maintenance cost (FY 33) MM-1

S.no	Description	Unit	Quantity	Rate	Amount (Lakhs)
	MCW - Rigid				
1	Route & Seal	Rm	36,655	150	54,98,280
2	Seal and Cross stitch or staple	Rm	18,328	1,000	1,83,27,600
3	Concrete works	Cum	4,981	8,288	4,12,82,499
4	Joint sealant	Rm	5,02,360	120	6,02,83,200
7	Kerb raising	Rm	0		0
8	Kerb painting	Sqm	25112	100	25,11,240
9	Earthen shoulder	Cum		450	0
10	Pavement marking (Flexible) MCW & SR	Sqm	6873	430	29,55,297
	Pavement marking (Rigid) MCW & SR	Sqm	45719	560	2,56,02,606
	MCW - Flexible				
1	Bituminous Concrete (VG-40)	cum	1414	11,441	1,61,72,998
2	Tack coat	Sqm	47120	16	7,53,920
3	Milling	Sqm	47120	90	42,40,800
	SR & Connecting roads				
	Bituminous Concrete (VG-40)	Cum	1883	11,441	2,15,38,197
	Tack coat	Sqm	62752	16	10,04,024
	DBM (VG-40)	Cum		9,823	0
	Milling	Sqm	62752	190	1,19,22,785
	Misc (2%)				21,20,934
				Total	**21,42,14,381**
				GST (18%)	**3,85,58,589**
				Grand total	**25,27,72,969**

Table 9-5: Estimated Periodic Maintenance cost (FY 40) MM-II

S.no	Description	Unit	Quantity	Rate	Amount (Lakhs)
	MCW - Rigid				

S.no	Description	Unit	Quantity	Rate	Amount (Lakhs)
1	Route & Seal	Rm	36,655	150	54,98,280
2	Seal and Cross stitch or staple	Rm	18,328	1,000	1,83,27,600
3	Concrete works	Cum	8,772	8,288	7,27,01,038
4	Joint sealant	Rm	5,02,360	120	6,02,83,200
7	Kerb raising	Rm	0		0
8	Kerb painting	Sqm	25,112	100	25,11,240
9	Earthen shoulder	Cum	0	450	0
10	Pavement marking (Flexible) MCW & SR	Sqm	6,873	430	29,55,297
	Pavement marking (Rigid) MCW & SR	Sqm	45,719	560	2,56,02,606
	MCW - Flexible				
1	Bituminous Concrete (VG-40)	cum	1414	11,441	1,61,72,998
2	Tack coat	Sqm	47120	16	7,53,920
3	Milling	Sqm	47120	90	42,40,800
	SR & Connecting roads		0		
	Bituminous Concrete (VG-40)	Cum	1883	11,441	2,15,38,197
	Tack coat	Sqm	62752	16	10,04,024
	DBM (VG-40)	Cum			0
	Milling	Sqm	62752	190	1,19,22,785
	Misc (2%)				24,35,120
				Total	**24,59,47,105**
				GST (18%)	**4,42,70,479**
				Grand total	**29,02,17,584**

9.4.1 Major Maintenance expenses during O&M period

As per the Cube Tech estimate, the total Major Maintenance expense including the escalation is Rs.67.81 cr.

9.4.2 Projections of O&M Expenses

The O&M expenses for the entire Concession Period is presented in this section.

The following escalations are considered:

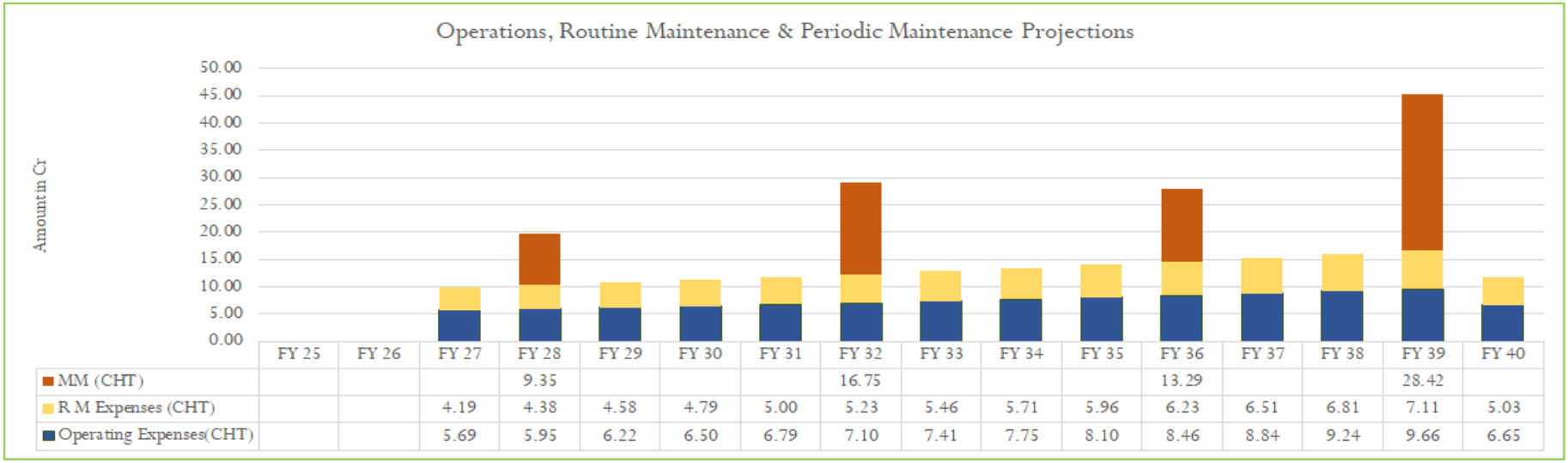
Table 9-6: Escalation Factors

Items	Escalation
Operating expenses	4.50%
Routine maintenance	4.50%
Major maintenance	4.50%

The Projections of total O& M expenses including Major Maintenance for 2 Cycles of the Project Company and CHT is given in the table below

Table 9-7: Projections of total O&M expenses of the Project during O&M period

Particulars	**Total Expense (In Cr.)**	**Base-FY 27**	**FY 27**	**FY 28**	**FY 29**	**FY 30**	**FY 31**	**FY 32**	**FY 33**	**FY 34**	**FY 35**	**FY 36**	**FY 37**	**FY 38**	**FY 39**	**FY 40**
Operating Expenses (CHT)	**104.35**		5.69	5.95	6.22	6.50	6.79	7.10	7.41	7.75	8.10	8.46	8.84	9.24	9.66	6.65
R M Expenses (CHT)	**77.00**		4.19	4.38	4.58	4.79	5.00	5.23	5.46	5.71	5.96	6.23	6.51	6.81	7.11	5.03
MM (CHT)	**67.81**	**21.42**		9.35				16.75				13.29			28.42	
O&M and MM (CHT)	**249.16**		**9.89**	**19.68**	**10.80**	**11.28**	**11.79**	**29.07**	**12.88**	**13.46**	**14.06**	**27.99**	**15.36**	**16.05**	**45.19**	**11.68**



	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
MM (CHT)				9.35				16.75				13.29			28.42	
R M Expenses (CHT)			4.19	4.38	4.58	4.79	5.00	5.23	5.46	5.71	5.96	6.23	6.51	6.81	7.11	5.03
Operating Expenses(CHT)			5.69	5.95	6.22	6.50	6.79	7.10	7.41	7.75	8.10	8.46	8.84	9.24	9.66	6.65

Figure 9-3: O&M, RM and MM Expenses Projections

Chapter 10
OVERALL REVIEW

CHAPTER 10. OVERALL REVIEW

10.1 Observations

- All the Project facilities provided by the concessionaire are in line with the inventory with few variations.
- The Project is fit for entry in to commercial operation on date 30th November 2024 for total length i.e., 36.930 km (Except Tapi bridge @237.769 & COS works) through IE letter no IE Letter No. LNMI0PPL/GR/NHAI/Ena-Kim-Exp./2024-25/9810, dated 10.01.2025.
- During our site visit, Tapi bridge at km 237.769 is completed and the traffic is plying on BHS of the main carriageway.
- It was observed that the 200 mm dia PVC pipe duct has been installed between the paved shoulder and the MBCB. However, as per the as-built drawing No. GR/EN-KI/PKG-VI/HWY/ABT/TCS-06, it should be located after the MBCB post. The shared as-built drawing is not matching with the site execution.
- Rainwater harvesting pits is not in visible condition due to water logging in drain locations.
- Solar panel erection has been completed at toll plaza and VUP locations but still the generation of power through solar is not yet started.
- The pavement condition along both sides of the Project Highway was generally observed to be in fair to good condition.
- Low severity transverse cracking has been observed from km 224.126 to km 221.176 in LHS and from km 221.476 to km 221.526 in RHS of the project stretch and rectification work is being undertaken by Concessionaire as part of routine maintenance.
- Low severity cracks has been observed at isolated locations along the project stretch and the same is addressing by GR team as part of the Routine maintenance.
- During our site visit, it was observed that longitudinal joint widening has been developed with a width of 30mm between lane 2 and lane 3 in LHS from km 218.526 to km 228.526. In addition, joint sealant was observed at many locations, and the concessionaire is addressing the defects as part of the Routine maintenance.
- Patching was done using fosroc material at a few locations of the Project Highway.
- Cross stitching was carried out by concessionaire at few locations of the Project Highway.
- Multiple cracks were repaired using epoxy resin formulations at a few locations of the Project Highway.

- There are few cracks found on project road, rectification cost has been considered under routine Maintenance. As per the concessionaire they have commenced the rectification work at site under routine O&M of project.
- It was observed that the WIM installed in the entry lanes was not operational at the time of the visit.
- It was observed that water stagnation on loops and axle sensors may impact performance or lead to failures.
- It was observed that the solar plant is installed near the toll plaza but is not in operational.
- The canopy width is insufficient; as a result, the AVC profiler is exposed to rain and sunlight, leading to rusting.
- Four units of Emergency Call Booth (ECB) equipment, two CCTV units, and two VSDS systems are currently non-operational due to power issues
- The Portable Variable Message Sign (PVMS) is not operational due to the absence of a solar panel. The solar panel shall be installed to make the PVMS operational
- VMS messages cannot be set through the ATMS application from the control room. The Concessionaire shall rectify the same as part of routine maintenance
- The VMS is currently powered by raw power, and no UPS is connected. The Concessionaire shall rectify the same as part of routine maintenance
- The data furnished in the above chapters are based on the data provided by the concessionaire.

ANNEXURES

Annexure I: Drain

S. No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
1	217+500	217+508	8	LHS	Toe Drain
2	217+540	219+125	1585	LHS	Toe Drain
3	219+139	220+042	903	LHS	Toe Drain
4	220+050	220+096	46	LHS	Toe Drain
5	220+124	220+452	328	LHS	Toe Drain
6	220+480	220+948	468	LHS	Toe Drain
7	221+030	221+515	485	LHS	Toe Drain
8	221+588	222+155	567	LHS	Toe Drain
9	222+169	222+334	165	LHS	Toe Drain
10	222+394	222+825	431	LHS	Toe Drain
11	222+833	223+278	445	LHS	Toe Drain
12	223+322	223+551	229	LHS	Toe Drain
13	223+559	224+341	782	LHS	Toe Drain
14	224+355	224+716	361	LHS	Toe Drain
15	224+724	225+318	594	LHS	Toe Drain
16	225+363	225+436	73	LHS	Toe Drain
17	225+460	226+007	547	LHS	Toe Drain
18	226+020	227+004	984	LHS	Toe Drain
19	227+018	227+876	858	LHS	Toe Drain
20	227+884	229+638	1754	LHS	Toe Drain
21	229+666	230+326	660	LHS	Toe Drain
22	230+334	230+583	249	LHS	Toe Drain

S. No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
23	230+607	230+933	326	LHS	Toe Drain
24	230+972	231+382	410	LHS	Toe Drain
25	231+396	231+799	403	LHS	Toe Drain
26	231+813	232+125	312	LHS	Toe Drain
27	232+160	232+572	412	LHS	Toe Drain
28	232+580	232+915	335	LHS	Toe Drain
29	232+965	233+169	204	LHS	Toe Drain
30	233+197	233+588	391	LHS	Toe Drain
31	233+602	234+086	484	LHS	Toe Drain
32	234+094	234+430	336	LHS	Toe Drain
33	234+473	234+699	226	LHS	Toe Drain
34	234+707	235+080	373	LHS	Toe Drain
35	235+088	235+247	159	LHS	Toe Drain
36	235+281	235+513	232	LHS	Toe Drain
37	235+591	236+148	557	LHS	Toe Drain
38	236+156	236+500	344	LHS	Toe Drain
39	236+514	237+371	857	LHS	Toe Drain
40	238+165	238+690	525	LHS	Toe Drain
41	238+718	239+392	674	LHS	Toe Drain
42	239+406	240+065	659	LHS	Toe Drain
43	240+095	240+408	313	LHS	Toe Drain
44	240+416	241+339	923	LHS	Toe Drain
45	241+353	242+466	1113	LHS	Toe Drain
46	242+474	242+957	483	LHS	Toe Drain
47	242+989	243+748	759	LHS	Toe Drain

S. No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
48	243+759	243+998	239	LHS	Toe Drain
49	244+018	244+851	833	LHS	Toe Drain
50	244+859	245+463	604	LHS	Toe Drain
51	245+477	246+511	1034	LHS	Toe Drain
52	246+659	247+202	543	LHS	Toe Drain
53	247+210	247+651	441	LHS	Toe Drain
54	247+659	248+335	676	LHS	Toe Drain
55	248+432	249+501	1069	LHS	Toe Drain
56	249+515	250+005	490	LHS	Toe Drain
57	250+019	250+916	897	LHS	Toe Drain
58	250+924	251+878	954	LHS	Toe Drain
59	251+978	252+146	168	LHS	Toe Drain
60	252+154	252+690	536	LHS	Toe Drain
61	252+704	252+810	106	LHS	Toe Drain
62	252+950	253+964	1014	LHS	Toe Drain
63	253+986	254+000	14	LHS	Toe Drain
		Total Length =	33950		

S No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
1	217+500	217+508	8	RHS	Toe Drain
2	217+546	219+125	1579	RHS	Toe Drain
3	219+139	220+044	905	RHS	Toe Drain
4	220+070	220+096	26	RHS	Toe Drain

S No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
5	220+124	220+452	328	RHS	Toe Drain
6	220+490	220+948	458	RHS	Toe Drain
7	221+031	221+515	484	RHS	Toe Drain
8	221+588	222+155	567	RHS	Toe Drain
9	222+169	222+334	165	RHS	Toe Drain
10	222+394	222+825	431	RHS	Toe Drain
11	222+833	223+278	445	RHS	Toe Drain
12	223+322	223+551	229	RHS	Toe Drain
13	223+559	224+341	782	RHS	Toe Drain
14	224355	224+716	361	RHS	Toe Drain
15	224+724	225+318	594	RHS	Toe Drain
16	225+363	225+436	73	RHS	Toe Drain
17	225+460	226+007	547	RHS	Toe Drain
18	226+021	227+004	983	RHS	Toe Drain
19	227+018	227+876	858	RHS	Toe Drain
20	227+884	229+638	1754	RHS	Toe Drain
21	229+666	230+326	660	RHS	Toe Drain
22	230+334	230+583	249	RHS	Toe Drain
23	230+607	230+933	326	RHS	Toe Drain
24	230+972	231+382	410	RHS	Toe Drain
25	231+396	231+799	403	RHS	Toe Drain
26	231+813	232+138	325	RHS	Toe Drain
27	232+173	232+572	399	RHS	Toe Drain
28	232+580	232+915	335	RHS	Toe Drain

S No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
29	232+970	233+169	199	RHS	Toe Drain
30	233+197	233+588	391	RHS	Toe Drain
31	233+602	234+086	484	RHS	Toe Drain
32	234+094	234+430	336	RHS	Toe Drain
33	234+473	234+699	226	RHS	Toe Drain
34	234+707	235+080	373	RHS	Toe Drain
35	235+088	235+247	159	RHS	Toe Drain
36	235+281	235+513	232	RHS	Toe Drain
37	235+591	236+148	557	RHS	Toe Drain
38	236+156	236+500	344	RHS	Toe Drain
39	236+514	237+371	857	RHS	Toe Drain
40	238+165	238+690	525	RHS	Toe Drain
41	238+718	239+392	674	RHS	Toe Drain
42	239+406	240+065	659	RHS	Toe Drain
43	240+095	240+408	313	RHS	Toe Drain
44	240+416	241+339	923	RHS	Toe Drain
45	241+353	242+466	1113	RHS	Toe Drain
46	242+474	242+957	483	RHS	Toe Drain
47	242+989	243+745	756	RHS	Toe Drain
48	243+759	243+970	211	RHS	Toe Drain
49	243+990	244+851	861	RHS	Toe Drain
50	244+859	245+463	604	RHS	Toe Drain
51	245+477	246+511	1034	RHS	Toe Drain
52	246+659	247+202	543	RHS	Toe Drain

S No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
53	247+210	247+649	439	RHS	Toe Drain
54	247+659	248+335	676	RHS	Toe Drain
55	248+432	249+501	1069	RHS	Toe Drain
56	249+515	250+005	490	RHS	Toe Drain
57	250+019	250+916	897	RHS	Toe Drain
58	250+924	251+853	929	RHS	Toe Drain
59	251+978	252+146	168	RHS	Toe Drain
60	252+154	252+690	536	RHS	Toe Drain
61	252+704	252+800	96	RHS	Toe Drain
62	252+950	253+964	1014	RHS	Toe Drain
63	253+986	254+000	14	RHS	Toe Drain
		Total Length =	33869		

Median Drain

S.No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
1	233+375	233+585	210	BHS	Median Drain
2	233+585	233+660	75	BHS	Median Drain
3	233+660	233+740	80	BHS	Median Drain
4	233+740	233+812	72	BHS	Median Drain
5	233+812	234+020	208	BHS	Median Drain
6	234+020	234+110	90	BHS	Median Drain
7	234+110	234+251	141	BHS	Median Drain

S.No.	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)			
Main Carriageway					
8	234+251	234+370	119	BHS	Median Drain
9	234+370	234+416	46	BHS	Median Drain
10	234+416	234+465	49	BHS	Median Drain
11	234+465	234+495	30	BHS	Median Drain
12	234+495	234+678	183	BHS	Median Drain
13	234+678	234+708	30	BHS	Median Drain
14	234+708	234+730	22	BHS	Median Drain
15	235+157	235+165	8	BHS	Median Drain
16	235+165	235+228	63	BHS	Median Drain
17	235+228	235+300	72	BHS	Median Drain
18	235+300	235+485	185	BHS	Median Drain
19	235+485	235+617	132	BHS	Median Drain
20	235+617	235+700	83	BHS	Median Drain
		Total Length =	1898		

Annexure II: Median Plantation

Median Plantation				
Chainage		LHS (Nos)	RHS (Nos)	Total
From (km)	To (km)			
217+500	218+000	154	156	310
218+000	219+000	319	317	636
219+000	220+000	324	325	649
220+000	221+000	295	292	587
221+000	222+000	286	287	573
222+000	223+000	306	306	612
223+000	224+000	314	312	626
224+000	225+000	323	325	648
225+000	226+000	310	310	620
226+000	227+000	321	323	644
227+000	228+000	324	321	645
228+000	229+000	310	313	623
>29+000	230+000	322	322	644
230+000	231+000	307	311	618
231+000	232+000	320	323	643
232+000	233+000	295	297	592
233+000	234+000	319	118	437
234+000	235+000	316	93	409
235+000	236+000	185	295	480
236+000	237+000	326	327	653
237+000	238+000	126	122	248
238+000	239+000	271	270	541

Median Plantation				
Chainage		LHS (Nos)	RHS (Nos)	Total
From (km)	To (km)			
239+000	240+000	326	329	655
240+000	241+000	322	321	643
241+000	242+000	326	325	651
242+000	243+000	314	314	628
243+000	244+000	322	323	645
244+000	245+000	328	328	656
245+000	246+000	327	324	651
246+000	247+000	288	285	573
247+000	248+000	326	324	650
248+000	249+000	299	300	599
249+000	250+000	332	330	662
250+000	251+000	323	324	647
251+000	252+000	298	291	589
252+000	253+000	277	275	552
253+000	254+000	324	321	645
Total		**11,105**	**10,779**	**21,884**

Avenue plantation

Chainage		Avenue Plantation (LHS)				Avenue Plantation (RHS)					Total (Nos)
From	To	1st Row (Nos)	2nd Row (Nos)	3rd Row (Nos)	Last Row (Nos)	1st Row (Nos)	2nd Row (Nos)	3rd Row (Nos)	4th Row (Nos)	Last Row (Nos)	
217+500	218+000	94	89	-	60	112	110	78		111	654
218+000	219+000	115	116	116	113	127	126	124	91	126	1,054
219+000	220+000	269	269	144	234	169	168	37	-	166	1,456

Chainage		Avenue Plantation (LHS)				Avenue Plantation (RHS)					Total (Nos)
From	To	1st Row (Nos)	2nd Row (Nos)	3rd Row (Nos)	Last Row (Nos)	1st Row (Nos)	2nd Row (Nos)	3rd Row (Nos)	4th Row (Nos)	Last Row (Nos)	
220+000	221+000	198	126	79	119	123	108	47	-	32	832
221+000	222+000	141	138	100	130	137	138	100	7	107	998
222+000	223+000	251	250	75	248	286	287	241	98	277	2,013
223+000	224+000	265	301	141	182	114	51	-	-	48	1,102
224+000	225+000	299	297	213	299	123	82	49	-	81	1,443
225+000	226+000	278	268	126	181	266	262	47	48	134	1,610
226+000	227+000	306	310	306	302	306	307	306	-	300	2,443
227+000	228+000	303	304	302	304	277	277	275	-	275	2,317
228+000	229+000	307	309	307	307	306	305	210	-	261	2,312
229+000	230+000	195	185	-	168	143	145	116	-	143	1,095
230+000	231+000	174	174	168	163	109	110	108	108	106	1,220
231+000	232+000	176	182	123	181	150	152	32	32	90	1,118
232+000	233+000	179	183	-	175	237	236	-	-	234	1,244
233+000	234+000	290	288	121	178	284	281	-	-	132	1,574
234+000	235+000	280	270	24	171	286	282	76	-	120	1,509
235+000	236+000	215	146	-	50	199	94	6	-	36	746
236+000	237+000	304	302	159	250	302	291	-	-	281	1,889
237+000	238+000	37	36	5	21	109	110	103	-	106	527
238+000	239+000	257	256	167	245	256	256	166	136	256	1,995
239+000	240+000	305	305	170	306	297	296	176	74	294	2,223
240+000	241+000	307	306	183	305	310	310	211	-	312	2,244
241+000	242+000	305	303	275	305	301	285	137	-	268	2,179
242+000	243+000	211	211	-	77	280	274	-	-	208	1,261
243+000	244+000	283	280	-	132	295	296	-	-	163	1,449

Chainage		Avenue Plantation (LHS)				Avenue Plantation (RHS)					Total (Nos)
From	To	1st Row (Nos)	2nd Row (Nos)	3rd Row (Nos)	Last Row (Nos)	1st Row (Nos)	2nd Row (Nos)	3rd Row (Nos)	4th Row (Nos)	Last Row (Nos)	
244+000	245+000	314	314	160	240	234	107	-	-	-	1,369
245+000	246+000	309	303	145	225	225	164	188	-	190	1,749
246+000	247+000	192	111	-	59	162	93	-	-	55	672
247+000	248+000	299	302	145	250	191	190	110	-	158	1,645
248+000	249+000	148	107	64	78	-	-	-	-	-	397
249+000	250+000	305	305	304	306	145	144	143	-	144	1,796
250+000	251+000	175	174	171	170	250	252	249	-	251	1,692
251+000	252+000	204	204	205	202	267	265	265	263	247	2,122
252+000	253+000	252	255	254	213	171	172	173	173	173	1,836
253+000	254+000	314	314	314	276	316	319	243	210	249	2,555
		8,856	**8,593**	**5,066**	**7,225**	**7,865**	7,345	**4,016**	**1,240**	**6,134**	**56,340**

Loop-1 Avenue Plantation						
Design Chainage		LHS (Nos)				Total
From (km)	To (km)	1st Row	2nd Row	3rd Row	Last Row	
0+000	1+000	69				69
1+000	2+000	145				145
2+000	3+000	139	132		122	393
Total		353	132		122	607

Loop-2 Avenue Plantation						
Design Chainage		LHS (Nos)				Total
From	To	1st Row	2nd Row	3rd Row	Last Row	
0+000	1+000	275	276	61	173	785

Loop-2 Avenue Plantation						
Design Chainage		LHS (Nos)				Total
From	To	1st Row	2nd Row	3rd Row	Last Row	
1+000	2+000	80	79		73	232
2+000	3+000	129				129
3+000	4+000	8				8
Total		492	355	61	246	1154

Ramp-1 Avenue Plantation						
Design Chainage		LHS				Total
From	To	1st Row	2nd Row	3rd Row	Last Row	
0+000	1+000	128	120	53	89	390

Ramp-2 Avenue Plantation						
Design Chainage		LHS				Total
From	To	1st Row	2nd Row	3rd Row	Last Row	
0+000	1+000	124	123		42	289

Ramp-3 Avenue Plantation						
Design Chainage		LHS				Total
From	To	1st Row	2nd Row	3rd Row	Last Row	
0+000	1+000	91				91

Ramp-4 Avenue Plantation		
Design Chainage	LHS	Total

		1st Row	2nd Row	3rd Row	Last Row	
From	To					
0+000	1+000	79				79

Annexure III: Thrie beam crash barrier

S. No.	From (km)	To (km)	Side-Shoulder	Length (m)	From (km)	To (km)	Side-Shoulder	Length (m)
1	217+500	217+508	LHS	8	217+500	217+508	RHS	8
2	217+540	219+125	LHS	1585	217+546	219+125	RHS	1579
3	219+139	220+042	LHS	903	219+139	220+044	RHS	905
4	220+050	220+096	LHS	46	220+070	220+096	RHS	26
5	220+124	220+452	LHS	328	220+124	220+452	RHS	328
6	220+480	220+948	LHS	468	220+490	220+948	RHS	458
7	221+030	221+515	LHS	485	221+031	221+515	RHS	484
8	221+588	222+155	LHS	567	221+588	222+155	RHS	567
9	222+169	222+334	LHS	165	222+169	222+334	RHS	165
10	222+394	222+825	LHS	431	222+394	222+825	RHS	431
11	222+833	223+278	LHS	445	222+833	223+278	RHS	445
12	223+322	223+551	LHS	229	223+322	223+551	RHS	229
13	223+559	224+341	LHS	782	223+559	224+341	RHS	782
14	224+355	224+716	LHS	361	224+355	224+716	RHS	361
15	224+724	225+318	LHS	594	224+724	225+318	RHS	594
16	225+363	225+436	LHS	73	225+363	225+436	RHS	73
17	225+460	226+007	LHS	547	225+460	226+007	RHS	547
18	226+020	227+004	LHS	984	226+021	227+004	RHS	983
19	227+018	227+876	LHS	858	227+018	227+876	RHS	858
20	227+884	229+638	LHS	1754	227+884	229+638	RHS	1754
21	229+666	230+326	LHS	660	229+666	230+326	RHS	660

S. No.	From (km)	To (km)	Side-Shoulder	Length (m)	From (km)	To (km)	Side-Shoulder	Length (m)
22	230+334	230+583	LHS	249	230+334	230+583	RHS	249
'3	230+607	230+933	LHS	326	230+607	230+933	RHS	326
24	230+972	231+382	LHS	410	230+972	231+382	RHS	410
25	231+396	231+799	LHS	403	231+396	231+799	RHS	403
26	231+813	232+125	LHS	312	231+813	232+138	RHS	325
27	232+160	232+572	LHS	412	232+173	232+572	RHS	399
28	232+580	232+915	LHS	335	232+580	232+915	RHS	335
29	232+965	233+169	LHS	204	232+970	233+169	RHS	199
30	233+197	233+588	LHS	391	233+197	233+588	RHS	391
31	233+602	234+086	LHS	484	233+602	234+086	RHS	484
32	234+094	234+430	LHS	336	234+094	234+430	RHS	336
33	234+473	234+699	LHS	226	234+473	234+699	RHS	226
34	234+707	235+080	LHS	373	234+707	235+080	RHS	373
35	235+088	235+247	LHS	159	235+088	235+247	RHS	159
36	235+281	235+513	LHS	232	235+281	235+513	RHS	232
37	235+591	236+148	LHS	557	235+591	236+148	RHS	557
38	236+156	236+500	LHS	344	236+156	236+500	RHS	344
39	236+514	237+371	LHS	857	236+514	237+371	RHS	857
40	238+165	238+690	LHS	525	238+165	238+690	RHS	525
41	238+718	239+392	LHS	674	238+718	239+392	RHS	674
42	239+406	240+065	LHS	659	239+406	240+065	RHS	659
43	240+095	240+408	LHS	313	240+095	240+408	RHS	313
44	240+416	241+339	LHS	923	240+416	241+339	RHS	923
45	241+353	242+466	LHS	1113	241+353	242+466	RHS	1113
46	242+474	242+957	LHS	483	242+474	242+957	RHS	483
47	242+989	243+748	LHS	759	242+989	243+745	RHS	756

S. No.	From (km)	To (km)	Side-Shoulder	Length (m)	From (km)	To (km)	Side-Shoulder	Length (m)
48	243+759	243+998	LHS	239	243+759	243+970	RHS	211
49	244+018	244+851	LHS	833	243+990	244+851	RHS	861
50	244+859	245+463	LHS	604	244+859	245+463	RHS	604
51	245+477	246+511	LHS	1034	245+477	246+511	RHS	1034
52	246+659	247+202	LHS	543	246+659	247+202	RHS	543
53	247+210	247+651	LHS	441	247+210	247+649	RHS	439
54	247+659	248+335	LHS	676	247+659	248+335	RHS	676
55	248+432	249+501	LHS	1069	248+432	249+501	RHS	1069
56	249+515	250+005	LHS	490	249+515	250+005	RHS	490
57	250+019	250+916	LHS	897	250+019	250+916	RHS	897
58	250+924	251+878	LHS	954	250+924	251+853	RHS	929
59	251+978	252+146	LHS	168	251+978	252+146	RHS	168
60	252+154	252+690	LHS	536	252+154	252+690	RHS	536
61	252+704	252+810	LHS	106	252+704	252+800	RHS	96
62	252+950	253+964	LHS	1014	252+950	253+964	RHS	1014
63	253+986	254+000	LHS	14	253+986	254+000	RHS	14
			Total Length =	33950			Total Length =	33869

From (km)	To (km)	Side-Median	Length (m)
217+500	217+508	Median	8
217+540	219+125	Median	1585
219+139	220+042	Median	903
220+050	220+096	Median	46
220+124	220+452	Median	328
220+480	220+948	Median	468
221+030	221+515	Median	485

From (km)	To (km)	Side-Median	Length (m)
221+588	222+155	Median	567
222+169	222+334	Median	165
222+394	222+825	Median	431
222+833	223+278	Median	445
223+322	223+551	Median	229
223+559	224+341	Median	782
224+355	224+716	Median	361
224+724	225+318	Median	594
225+363	225+436	Median	73
225+460	226+007	Median	547
226+020	227+004	Median	984
227+018	227+876	Median	858
227+884	229+638	Median	1754
229+666	230+311	Median	645
230+334	230+583	Median	249
230+607	230+933	Median	326
230+972	231+382	Median	410
231+396	231+799	Median	403
231+813	232+125	Median	312
232+160	232+572	Median	412
232+580	232+915	Median	335
232+965	233+169	Median	204
233+197	233+588	Median	391
233+602	234+086	Median	484
234+094	234+430	Median	336
234+466	234+699	Median	233

From (km)	To (km)	Side-Median	Length (m)
234+707	235+080	Median	373
235+088	235+247	Median	159
235+281	235+513	Median	232
235+591	236+148	Median	557
236+156	236+500	Median	344
236+514	237+371	Median	857
238+165	238+690	Median	525
238+718	239+392	Median	674
239+406	240+065	Median	659
240+095	240+408	Median	313
240+416	241+339	Median	923
241+353	242+466	Median	1113
242+474	242+957	Median	483
242+989	243+745	Median	756
243+759	243+998	Median	239
244+018	244+851	Median	833
244+859	245+463	Median	604
245+477	246+511	Median	1034
246+659	247+202	Median	543
247+210	247+651	Median	441
247+659	248+335	Median	676
248+432	249+501	Median	1069
249+515	250+005	Median	490
250+019	250+916	Median	897
250+924	251+878	Median	954
251+978	252+146	Median	168

From (km)	To (km)	Side-Median	Length (m)
252+154	252+690	Median	536
252+704	252+810	Median	106
252+950	253+964	Median	1014
253+986	254+000	Median	14
		Total Length	67878

MBCB in Interchange

S. No.	From	To	MBCB/RCC Crash Barrier	Length(m)	From	To	MBCB/RCC Crash Barrier	Length(m)	Remarks
	Shoulder (LHS)				Shoulder (RHS)				
Interchange 218+100 Loop-01									
1	0	442	MBCB	442	0	442	MBCB	442	Interchange218+100Loop-01
2	676	769	MBCB	93	676	769	MBCB	93	Interchange218+100Loop-01
3	814	1077	MBCB	263	814	1077	MBCB	263	Interchange218+100Loop-01
4	1091	1600	MBCB	509	1091	1580	MBCB	489	Interchange218+100Loop-01
5	1600	2151		551	1580	2151		571	Interchange218+100Loop-01
6	2170	2583	MBCB	413	2170	2704	MBCB	534	Interchange218+100Loop-01
7	2583	2628		45	2980	3714	MBCB	734	Interchange218+100Loop-01
8	2628	2704	MBCB	76				0	Interchange218+100Loop-01
9	2980	3714	MBCB	734				0	Interchange218+100Loop-01
Interchange 218+100 Loop-02									
1	0	790	MBCB	790	0	790	MBCB	790	Interchange218+100Loop-02
2	1066	1179	MBCB	113	1066	1601	MBCB	535	Interchange218+100Loop-02
3	1179	1216	-	37	1620	2164		544	Interchange218+100Loop-02
4	1216	1601	MBCB	385	2164	2672	MBCB	508	Interchange218+100Loop-02
5	1620	2164		544	2686	2945	MBCB	259	Interchange218+100Loop-02
6	2164	2672	MBCB	508	2991	3086	MBCB	95	Interchange218+100Loop-02

S. No.	From	To	MBCB/RCC Crash Barrier	Length(m)	From	To	MBCB/RCC Crash Barrier	Length(m)	Remarks
	Shoulder (LHS)				Shoulder (RHS)				
7	2686	2945	MBCB	259	3320	3896	MBCB	576	Interchange218+100Loop-02
8	2991	3086	MBCB	95				0	Interchange218+100Loop-02
9	3320	3896	MBCB	576				0	Interchange218+100Loop-02
Interchange 218+100 RAMP1									
1	0	421	MBCB	421	0	45		45	Interchange218+100Ramp-01
				0	45	369	MBCB	324	Interchange218+100Ramp-01
				0	369	421		52	Interchange218+100Ramp-01
Interchange 218+100 Ramp-02									
1	0	417	MBCB	417	0	45		45	Interchange218+100Ramp-02
				0	45	380	MBCB	335	Interchange218+100Ramp-02
				0	380	417		37	Interchange218+100Ramp-02
Interchange 218+100 Ramp-03									
1	0	275	MBCB	275	0	28		28	Interchange218+100Ramp-03
				0	28	236	MBCB	208	Interchange218+100Ramp-03
				0	236	275		39	Interchange218+100Ramp-03
Interchange 218+100 Ramp-04									
1	0	246	MBCB	246	0	28		28	Interchange218+100Ramp-04
				0	28	221	MBCB	193	Interchange218+100Ramp-04
				0	221	246		25	Interchange218+100Ramp-04
Interchange 254+000 Ramp-02									
2	983	1728	MBCB	745	983	1166	MBCB	183	Interchange254+000Ramp-02
					1166	1728		562	Interchange254+000Ramp-02
Total Length				8537	Total Length			8537	
MBCB				7360	MBCB			6561	

RCC Crash Barrier

	Shoulder				Shoulder				Median			
S.No.	From (km)	To (km)	Side	Length (m)	From (km)	To (km)	Side	Length (m)	From (km)	To (km)	Side	Length (m)
1	217+508	217+540	LHS	32	217+508	217+546	RHS	38	217+508	217+540	Median	32
2	219+125	219+139	LHS	14	219+125	219+139	RHS	14	219+125	219+139	Median	14
3	220+042	220+050	LHS	8	220+044	220+070	RHS	26	220+042	220+050	Median	8
4	220+096	220+124	LHS	28	220+096	220+124	RHS	28	220+096	220+124	Median	28
5	220+452	220+480	LHS	28	220+452	220+490	RHS	38	220+452	220+480	Median	28
6	220+948	221+030	LHS	82	220+948	221+031	RHS	83	220+948	221+030	Median	82
7	221+515	221+588	LHS	73	221+515	221+588	RHS	73	221+515	221+588	Median	73
8	222+155	222+169	LHS	14	222+155	222+169	RHS	14	222+155	222+169	Median	14
9	222+334	222+394	LHS	60	222+334	222+394	RHS	60	222+334	222+394	Median	60
10	222+825	222+833	LHS	8	222+825	222+833	RHS	8	222+825	222+833	Median	8
11	223+278	223+322	LHS	44	223+278	223+322	RHS	44	223+278	223+322	Median	44
12	223+551	223+559	LHS	8	223+551	223+559	RHS	8	223+551	223+559	Median	8
13	224+341	224+355	LHS	14	224+341	224+355	RHS	14	224+341	224+355	Median	14
14	224+716	224+724	LHS	8	224+716	224+724	RHS	8	224+716	224+724	Median	8
15	225+318	225+363	LHS	45	225+318	225+363	RHS	45	225+318	225+363	Median	45
16	225+436	225+460	LHS	24	225+436	225+460	RHS	24	225+436	225+460	Median	24
17	226+007	226+020	LHS	13	226+007	226+021	RHS	14	226+007	226+020	Median	13
18	227+004	227+018	LHS	14	227+004	227+018	RHS	14	227+004	227+018	Median	14
19	227+876	227+884	LHS	8	227+876	227+884	RHS	8	227+876	227+884	Median	8
20	229+638	229+666	LHS	28	229+638	229+666	RHS	28	229+638	229+666	Median	28
21	230+326	230+334	LHS	8	230+326	230+334	RHS	8	230+311	230+334	Median	23
22	230+583	230+607	LHS	24	230+583	230+607	RHS	24	230+583	230+607	Median	24
23	230+933	230+972	LHS	39	230+933	230+972	RHS	39	230+933	230+972	Median	39

	Shoulder				Shoulder				Median			
S.No.	From (km)	To (km)	Side	Length (m)	From (km)	To (km)	Side	Length (m)	From (km)	To (km)	Side	Length (m)
24	231+382	231+396	LHS	14	231+382	231+396	RHS	14	231+382	231+396	Median	14
25	231+799	231+813	LHS	14	231+799	231+813	RHS	14	231+799	231+813	Median	14
26	232+125	232+160	LHS	35	232+138	232+173	RHS	35	232+125	232+160	Median	35
27	232+572	232+580	LHS	8	232+572	232+580	RHS	8	232+572	232+580	Median	8
28	232+915	232+965	LHS	50	232+915	232+970	RHS	55	232+915	232+965	Median	50
29	233+169	233+197	LHS	28	233+169	233+197	RHS	28	233+169	233+197	Median	28
30	233+588	233+602	LHS	14	233+588	233+602	RHS	14	233+588	233+602	Median	14
31	234+086	234+094	LHS	8	234+086	234+094	RHS	8	234+086	234+094	Median	8
32	234+430	234+473	LHS	43	234+430	234+473	RHS	43	234+430	234+466	Median	36
33	234+699	234+707	LHS	8	234+699	234+707	RHS	8	234+699	234+707	Median	8
34	235+080	235+088	LHS	8	235+080	235+088	RHS	8	235+080	235+088	Median	8
35	235+247	235+281	LHS	34	235+247	235+281	RHS	34	235+247	235+281	Median	34
36	235+513	235+591	LHS	78	235+513	235+591	RHS	78	235+513	235+591	Median	78
37	236+148	236+156	LHS	8	236+148	236+156	RHS	8	236+148	236+156	Median	8
38	236+500	236+514	LHS	14	236+500	236+514	RHS	14	236+500	236+514	Median	14
39	237+371	238+165	LHS	794	237+371	238+165	RHS	794	237+371	238+165	Median	794
40	238+690	238+718	LHS	28	238+690	238+718	RHS	28	238+690	238+718	Median	28
41	239+392	239+406	LHS	14	239+392	239+406	RHS	14	239+392	239+406	Median	14
42	240+065	240+095	LHS	30	240+065	240+095	RHS	30	240+065	240+095	Median	30
43	240+408	240+416	LHS	8	240+408	240+416	RHS	8	240+408	240+416	Median	8
44	241+339	241+353	LHS	14	241+339	241+353	RHS	14	241+339	241+353	Median	14
45	242+466	242+474	LHS	8	242+466	242+474	RHS	8	242+466	242+474	Median	8
46	242+957	242+989	LHS	32	242+957	242+989	RHS	32	242+957	242+989	Median	32
47	243+748	243+759	LHS	11	243+745	243+759	RHS	14	243+745	243+759	Median	14
48	243+998	244+018	LHS	20	243+970	243+990	RHS	20	243+998	244+018	Median	20

	Shoulder				Shoulder				Median			
S.No.	From (km)	To (km)	Side	Length (m)	From (km)	To (km)	Side	Length (m)	From (km)	To (km)	Side	Length (m)
49	244+851	244+859	LHS	8	244+851	244+859	RHS	8	244+851	244+859	Median	8
50	245+463	245+477	LHS	14	245+463	245+477	RHS	14	245+463	245+477	Median	14
51	246+511	246+659	LHS	148	246+511	246+659	RHS	148	246+511	246+659	Median	148
52	247+202	247+210	LHS	8	247+202	247+210	RHS	8	247+202	247+210	Median	8
53	247+651	247+659	LHS	8	247+649	247+659	RHS	10	247+651	247+659	Median	8
54	248+335	248+432	LHS	97	248+335	248+432	RHS	97	248+335	248+432	Median	97
55	249+501	249+515	LHS	14	249+501	249+515	RHS	14	249+501	249+515	Median	14
56	250+005	250+019	LHS	14	250+005	250+019	RHS	14	250+005	250+019	Median	14
57	250+916	250+924	LHS	8	250+916	250+924	RHS	8	250+916	250+924	Median	8
58	251+878	251+978	LHS	100	251+853	251+978	RHS	125	251+878	251+978	Median	100
59	252+146	252+154	LHS	8	252+146	252+154	RHS	8	252+146	252+154	Median	8
60	252+690	252+704	LHS	14	252+690	252+704	RHS	14	252+690	252+704	Median	14
61	252+810	252+950	LHS	140	252+800	252+950	RHS	150	252+810	252+950	Median	140
62	253+964	253+986	LHS	22	253+964	253+986	RHS	22	253+964	253+986	Median	22
			Total	2550			Total	2631			Total	5122

S. No.	From (km)	To (km)	Length (m)	RCC Crash Barrier	From (km)	To (km)	RCC Crash Barrier	Length (m)	Remarks
Shoulder (LHS)					Shoulder (RHS)				
Interchange 218+100 Loop-01					Interchange 218+100 Loop-01				
1	442	676	234	RCC Crash Barrier	442	676	RCC Crash Barrier	234	Interchange 218+100 Loop-01
2	769	814	45	RCC Crash Barrier	769	814	RCC Crash Barrier	45	Interchange 218+100 Loop-01
3	1077	1091	14	RCC Crash Barrier	1077	1091	RCC Crash Barrier	14	Interchange 218+100 Loop-01
4	2151	2170	19	RCC Crash Barrier	2151	2170	RCC Crash Barrier	19	Interchange 218+100 Loop-01
5	2704	2980	276	RCC Crash Barrier	2704	2980	RCC Crash Barrier	276	Interchange 218+100 Loop-01

S. No.	From (km)	To (km)	Length (m)	RCC Crash Barrier	From (km)	To (km)	RCC Crash Barrier	Length (m)	Remarks
Shoulder (LHS)					**Shoulder (RHS)**				
Interchange 218+100 Loop-02					**Interchange 218+100 Loop-02**				
1	790	1066	276	RCC Crash Barrier	790	1066	RCC Crash Barrier	276	Interchange 218+100 Loop-02
2	1601	1620	19	RCC Crash Barrier	1601	1620	RCC Crash Barrier	19	Interchange 218+100 Loop-02
3	2672	2686	14	RCC Crash Barrier	2672	2686	RCC Crash Barrier	14	Interchange 218+100 Loop-02
4	2945	2991	46	RCC Crash Barrier	2945	2991	RCC Crash Barrier	46	Interchange 218+100 Loop-02
5	3086	3320	234	RCC Crash Barrier	3086	3320	RCC Crash Barrier	234	Interchange 218+100 Loop-02
Interchange 254+000 Ramp-02					**Interchange 254+100 Ramp-02**				
1	959	983	24	RCC Crash Barrier	959	983	RCC Crash Barrier	24	Interchange 254+000 Ramp-02
		Total	1201				Total	1201	

Annexure IV: Noise Barrier

Noise Barrier								
S.No.	Location	Structure	Chainage		Side	Nos	Length(m)	Total Length
			From (km)	To (km)				
1	221+002	Flyover	220902	221102	Outer side of LHS&RHS	2	200	400
2	235+552	Flyover	235452	235652	Outer side of LHS&RHS	2	200	400
3	248+403	Flyover & Urban area	248153	248653	Outer side of LHS&RHS	2	500	1000
4	219+815	WSA	219740	219890	RHS on Shoulder	1	150	150
5	223+915	WSA	223665	224165	RHS on Shoulder	1	500	500
6	242+215	WSA	242140	242290	LHS on Shoulder	1	150	150
7	244+715	WSA	244640	244790	RHS on Shoulder	1	150	150
8	3+203 L2	Inter Change-NH	3053	3353	Outer side of LHS&RHS	2	300	600
9	0+928 L2	Inter Change- VME	778	1078	Outer side of LHS&RHS	2	300	600
							Total	3950

Annexure V: Lightings

S. No.	Structure Type	Location/Description		Side	Total Pole Street Light			Remarks
		From(km)	To(km)		Single Arm	Double Arm	High Mast	
1	SVUP	001+080	001+080	BHS				35WLED
2	VUP	002+160	002+160	LHS				35WLED
3	VUP	002+160	002+160	RHS				35WLED
4	ICLoop-1	218+100	218+100	BHS		23		DAP
5	ICVME	218+100	218+100	BHS	12			SAP
6	ICRamp-1	218+100	218+100		11			SAP
7	ICRamp-2	218+100	218+100		16			SAP
8	ICRamp-3	218+100	218+100		18			SAP
9	ICRamp-4	218+100	218+100		11			SAP
10	ICLoop-2	218+100	218+100	BHS		29		DAP
11	ICNH-6	218+100	218+100	BHS	6			SAP
12	ICRamp-5	218+100	218+100		10			SAP
13	ICRamp-6	218+100	218+100		8			SAP
14	ICRamp-7	218+100	218+100		7			SAP
15	ICRamp-8	218+100	218+100		12			SAP
16	LVUP	219+125	219+137	BHS				35WLED
17	WSA	219+315	220+190	RHS	21			SAP
18	VUP	220+050	220+070	LHS				35WLED
19	VUP	220+050	220+070	RHS				35WLED
20	VUP	220+438	220+464	BHS				35WLED
21	LVUP	222+155	222+167	BHS				35WLED
22	SVUP	222+825	222+832	BHS				35WLED
23	WSA	223+370	224+540	RHS	32			SAP

S. No.	Structure Type	Location/Description		Side	Total Pole Street Light			Remarks
		From(km)	To(km)		Single Arm	Double Arm	High Mast	
24	SVUP	223+551	223+558	LHS				35WLED
25	ZSVUP	223+551	223+558	RHS				35WLED
26	SVUP	224+716	224+723	BHS				35WLED
27	VUP	225+445	225+465	BHS				35WLED
28	LVUP	226+007	226+019	BHS				35WLED
29	LVUP	227+004	227+016	BHS				35WLED
30	SVUP	227+877	227+884	BHS				35WLED
31	VOP	228+220	228+220		3			SAP
32	SVUP	230+180	230+187	BHS				35WLED
33	VUP	230+590	230+610	BHS				35WLED
34	LVUP	231+382	231+394	BHS				35WLED
35	LVUP	231+799	231+811	BHS				35WLED
36	SVUP	232+572	232+579	BHS				35WLED
37	VUP	233+180	233+200	BHS				35WLED
38	LVUP	233+588	233+601	BHS				35WLED
39	SVUP	234+085	234+092	BHS				35WLED
40	SVUP	234+700	234+707	BHS				35WLED
41	SVUP	235+080	235+087	BHS				35WLED
42	SVUP	236+148	236+155	BHS				35WLED
43	LVUP	236+500	236+512	BHS				35WLED
44	VUP	238+700	238+720	BHS				35WLED
45	LVUP	239+392	239+404	BHS				35WLED
46	SVUP	240+408	240+415	BHS				35WLED
47	LVUP	241+339	241+351	BHS				35WLED
48	WSA	241+840	242+735	LHS	21			SAP
49	SVUP	242+465	242+472	LHS				35WLED

S. No.	Structure Type	Location/Description		Side	Total Pole Street Light			Remarks
		From(km)	To(km)		Single Arm	Double Arm	High Mast	
50	SVUP	242+465	242+472	RHS				35WLED
51	VUP	242+940	242+966	BHS				35WLED
52	LVUP	243+745	243+757	BHS				35WLED
53	WSA	244+200	245+095	RHS	21			SAP
54	SVUP	244+850	244+857	LHS				35WLED
55	SVUP	244+850	244+857	RHS				35WLED
56	LVUP	245+463	245+475	BHS				35WLED
57	SVUP	247+204	247+211	BHS				35WLED
58	SVUP	247+666	247+673	BHS				35WLED
59	FLYOVER	248+000	249+000	BHS		31		DAP
60	FLYOVER	248+000	248+000	BHS	8			SAP
61	LVUP	249+501	249+513	BHS				35WLED
62	LVUP	250+005	250+017	BHS				35WLED
63	SVUP	250+917	250+924	BHS				35WLED
64	SVUP	252+145	252+152	BHS				35WLED
65	LVUP	252+690	252+702	BHS				35WLED
66	VUP	253+965	253+985	BHS				35WLED
67	FLYOVER	220+970	221+050	BHS				80WLED
68	VOP	228+210	228+251	BHS				80WLED
69	FLYOVER	235+515	235+590	BHS				80WLED
70	FLYOVER	248+360	248+452	BHS				80WLED
71	Toll Canopy	001+800	001+900	BHS				80WLED
72	Toll Plaza	001+085					4	HM
73	Expressway	Entry	Exit		14			SAP
				Total	231	83	4	

Annexure VI: Emergency Communication box

S.No.	Chainage	Side	Unit	Nos	Remarks / Make & Model
1	218+000	LHS/RHS	Nos.	2	QualiX/ERS Xpert
2	220+000	LHS/RHS	Nos.	2	QualiX/ERS Xpert
3	222+050	LHS/RHS	Nos.	2	QualiX/ERS Xpert
4	224+050	LHS/RHS	Nos.	2	QualiX/ERS Xpert
5	226+050	LHS/RHS	Nos.	2	QualiX/ERS Xpert
6	228+030	LHS/RHS	Nos.	2	QualiX/ERS Xpert
7	230+050	LHS/RHS	Nos.	2	QualiX/ERS Xpert
8	232+050	LHS/RHS	Nos.	2	QualiX/ERS Xpert
9	234+050	LHS/RHS	Nos.	2	QualiX/ERS Xpert
10	236+050	LHS/RHS	Nos.	2	QualiX/ERS Xpert
11	238+200	LHS/RHS	Nos.	2	QualiX/ERS Xpert
12	240+200	LHS/RHS	Nos.	2	QualiX/ERS Xpert
13	242+200	LHS/RHS	Nos.	2	QualiX/ERS Xpert
14	244+200	LHS/RHS	Nos.	2	QualiX/ERS Xpert
15	246+200	LHS/RHS	Nos.	2	QualiX/ERS Xpert
16	248+100	LHS/RHS	Nos.	2	QualiX/ERS Xpert
17	250+100	LHS/RHS	Nos.	2	QualiX/ERS Xpert
18	252+100	LHS/RHS	Nos.	2	QualiX/ERS Xpert
19	254+100	LHS	Nos.	1	QualiX/ERS Xpert
			Total	37	

Annexure VII: Boundary Wall

Main Carriageway										
S. No.	Chainage		Length	Side	Remarks	Chainage		Length	Side	Remarks

	From (km)	To (km)	(m)			From (km)	To (km)	(m)		
1	217+500	217+508	8	LHS	Boundary Wall	217+500	217+508	8	RHS	Boundary Wall
2	217+540	219+125	1585	LHS	Boundary Wall	217+540	219+125	1585	RHS	Boundary Wall
3	219+139	220+042	903	LHS	Boundary Wall	219+139	220+042	903	RHS	Boundary Wall
4	220+050	220+096	46	LHS	Boundary Wall	220+050	220+096	46	RHS	Boundary Wall
5	220+124	220+452	328	LHS	Boundary Wall	220+124	220+452	328	RHS	Boundary Wall
6	220+480	220+948	468	LHS	Boundary Wall	220+480	220+948	468	RHS	Boundary Wall
7	220+915	220+948	33	LHS	Boundary Wall	220+915	220+948	33	RHS	Boundary Wall
8	221+030	221+515	485	LHS	Boundary Wall	221+030	221+515	485	RHS	Boundary Wall
9	221+588	222+155	567	LHS	Boundary Wall	221+588	222+155	567	RHS	Boundary Wall
10	222+169	222+334	165	LHS	Boundary Wall	222+169	222+334	165	RHS	Boundary Wall
11	222+394	222+825	431	LHS	Boundary Wall	222+394	222+825	431	RHS	Boundary Wall
12	222+833	223+278	445	LHS	Boundary Wall	222+833	223+278	445	RHS	Boundary Wall
13	223+322	223+551	229	LHS	Boundary Wall	223+322	223+551	229	RHS	Boundary Wall
14	223+559	224+341	782	LHS	Boundary Wall	223+559	224+341	782	RHS	Boundary Wall
15	224+355	224+716	361	LHS	Boundary Wall	224+355	224+716	361	RHS	Boundary Wall
16	224+724	225+318	594	LHS	Boundary Wall	224+724	225+318	594	RHS	Boundary Wall
17	225+363	225+436	73	LHS	Boundary Wall	225+363	225+436	73	RHS	Boundary Wall
18	225+460	226+007	547	LHS	Boundary Wall	225+460	226+007	547	RHS	Boundary Wall
19	226+020	227+004	984	LHS	Boundary Wall	226+020	227+004	984	RHS	Boundary Wall
20	227+018	227+876	858	LHS	Boundary Wall	227+018	227+876	858	RHS	Boundary Wall
21	227+884	229+638	1754	LHS	Boundary Wall	227+884	229+638	1754	RHS	Boundary Wall
22	229+666	230+326	660	LHS	Boundary Wall	229+666	230+326	660	RHS	Boundary Wall
23	230+334	230+583	249	LHS	Boundary Wall	230+334	230+583	249	RHS	Boundary Wall
24	230+607	230+933	326	LHS	Boundary Wall	230+607	230+933	326	RHS	Boundary Wall
25	230+972	231+382	410	LHS	Boundary Wall	230+972	231+382	410	RHS	Boundary Wall
26	231+396	231+799	403	LHS	Boundary Wall	231+396	231+799	403	RHS	Boundary Wall
27	231+813	232+125	312	LHS	Boundary Wall	231+813	232+125	312	RHS	Boundary Wall

Main Carriageway										
S. No.	Chainage		Length (m)	Side	Remarks	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)				From (km)	To (km)			
28	232+160	232+572	412	LHS	Boundary Wall	232+160	232+572	412	RHS	Boundary Wall
29	232+580	232+915	335	LHS	Boundary Wall	232+580	232+915	335	RHS	Boundary Wall
30	232+965	233+169	204	LHS	Boundary Wall	232+965	233+169	204	RHS	Boundary Wall
31	233+197	233+588	391	LHS	Boundary Wall	233+197	233+588	391	RHS	Boundary Wall
32	233+602	234+086	484	LHS	Boundary Wall	233+602	234+086	484	RHS	Boundary Wall
33	234+094	234+430	336	LHS	Boundary Wall	234+094	234+430	336	RHS	Boundary Wall
34	234+473	234+699	226	LHS	Boundary Wall	234+473	234+699	226	RHS	Boundary Wall
35	234+707	235+080	373	LHS	Boundary Wall	234+707	235+080	373	RHS	Boundary Wall
36	235+088	235+247	159	LHS	Boundary Wall	235+088	235+247	159	RHS	Boundary Wall
37	235+281	235+513	232	LHS	Boundary Wall	235+281	235+513	232	RHS	Boundary Wall
38	235+591	236+148	557	LHS	Boundary Wall	235+591	236+148	557	RHS	Boundary Wall
39	236+156	236+500	344	LHS	Boundary Wall	236+156	236+500	344	RHS	Boundary Wall
40	236+514	237+371	857	LHS	Boundary Wall	236+514	237+371	857	RHS	Boundary Wall
41	238+165	238+700	535	LHS	Boundary Wall	238+165	238+700	535	RHS	Boundary Wall
42	238+718	239+392	674	LHS	Boundary Wall	238+718	239+392	674	RHS	Boundary Wall
43	239+406	240+065	659	LHS	Boundary Wall	239+406	240+065	659	RHS	Boundary Wall
44	240+095	240+408	313	LHS	Boundary Wall	240+095	240+408	313	RHS	Boundary Wall
45	240+416	241+339	923	LHS	Boundary Wall	240+416	241+339	923	RHS	Boundary Wall
46	241+353	242+466	1113	LHS	Boundary Wall	241+353	242+466	1113	RHS	Boundary Wall
47	242+474	242+957	483	LHS	Boundary Wall	242+474	242+957	483	RHS	Boundary Wall
48	242+989	243+748	759	LHS	Boundary Wall	242+989	243+748	759	RHS	Boundary Wall
49	243+759	243+998	239	LHS	Boundary Wall	243+759	243+998	239	RHS	Boundary Wall
50	244+018	244+851	833	LHS	Boundary Wall	244+018	244+851	833	RHS	Boundary Wall
51	244+859	245+463	604	LHS	Boundary Wall	244+859	245+463	604	RHS	Boundary Wall
52	245+477	246+511	1034	LHS	Boundary Wall	245+477	246+511	1034	RHS	Boundary Wall

Main Carriageway										
S. No.	Chainage		Length (m)	Side	Remarks	Chainage		Length (m)	Side	Remarks
	From (km)	To (km)				From (km)	To (km)			
53	246+659	247+202	543	LHS	Boundary Wall	246+659	247+202	543	RHS	Boundary Wall
54	247+210	247+651	441	LHS	Boundary Wall	247+210	247+651	441	RHS	Boundary Wall
55	247+659	248+335	676	LHS	Boundary Wall	247+659	248+335	676	RHS	Boundary Wall
56	248+432	249+501	1069	LHS	Boundary Wall	248+432	249+501	1069	RHS	Boundary Wall
57	249+515	250+005	490	LHS	Boundary Wall	249+515	250+005	490	RHS	Boundary Wall
58	250+019	250+916	897	LHS	Boundary Wall	250+019	250+916	897	RHS	Boundary Wall
59	250+924	251+878	954	LHS	Boundary Wall	250+924	251+878	954	RHS	Boundary Wall
60	251+978	252+146	168	LHS	Boundary Wall	251+978	252+146	168	RHS	Boundary Wall
61	252+154	252+690	536	LHS	Boundary Wall	252+154	252+690	536	RHS	Boundary Wall
62	252+704	252+810	106	LHS	Boundary Wall	252+704	252+810	106	RHS	Boundary Wall
63	252+950	253+964	1014	LHS	Boundary Wall	252+950	253+964	1014	RHS	Boundary Wall
64	253+986	254+000	14	LHS	Boundary Wall	253+986	254+000	14	RHS	Boundary Wall
	Total		33993			Total		33993		

Closing Wall

S. No.	Chainage	Length (Km)	Remarks
Main Carriageway			
1	221+587	0.028	ClosingWall
2	221+600	0.033	Closing Wall
3	222+150	0.025	ClosingWall
4	222+829	0.016	Closing Wall
5	222+829	0.01	ClosingWall
6	223+293	0.023	ClosingWall
7	224+348	0.015	ClosingWall

S. No.	Chainage	Length (Km)	Remarks
Main Carriageway			
8	224+348	0.015	ClosingWall
9	224+700	0.02	ClosingWall
10	224+700	0.025	ClosingWall
11	224+700	0.02	ClosingWall
12	225+820	0.01	ClosingWall
13	225+820	0.013	ClosingWall
14	226+750	0.02	ClosingWall
15	226+750	0.025	ClosingWall
16	227+330	0.015	ClosingWall
17	228+445	0.036	ClosingWall
18	230+942	0.028	ClosingWall
19	231+806	0.041	ClosingWall
20	231+806	0.01	ClosingWall
21	232+149	0.015	ClosingWall
22	232+576	0.023	ClosingWall
23	232+576	0.026	ClosingWall
24	233+183	0.032	ClosingWall
	Total	**0.524**	

Annexure VIII: Drip Irrigation

Drip Irrigation & Pump Location							
S.No.	Description	Chainage		Borewell & Pump Location	Section Length	Side	Remark
		From (km)	To (km)				
1	Borewell-1	217+500	221+500	219500	4	Median	

Drip Irrigation & Pump Location							
S.No.	Description	Chainage		Borewell & Pump Location	Section Length	Side	Remark
		From (km)	To (km)				
2	Borewell-2	221+600	225+300	223500	3.7	Median	
3	Borewell-3	225+350	229+630	227500	4.28	Median	
4	Borewell-4	229+670	233+580	231500	3.91	Median	
5	Borewell-5	233+600	237+360	235400	3.76	Median	
6	Borewell-6	238+180	242+200	240200	4.02	Median	
7	Borewell-7	242+200	246+200	244200	4	Median	
8	Borewell-8	246+200	250+000	248200	3.8	Median	
9	Borewell-9	250+030	254+000	252300	3.97	Median	
	Total Pump legation & Length =			9	35.44		

Annexure IX: Rainwater harvesting

Rainwater Harvesting					
S. No.	Chainage	Side	Proposed	Quantity	Remarks
1	236+500	RHS	RWH Pit	1	
2	234+900	LHS	RWH Pit	1	
3	234+870	RHS	RWH Pit	1	
4	234+090	RHS	RWH Pit	1	
5	234+090	LHS	RWH Pit	1	
6	233+183	RHS	RWH Pit	1	
7	233+183	LHS	RWH Pit	1	
8	232+576	LHS	RWH Pit	1	
9	232+576	RHS	RWH Pit	1	
10	230+552	RHS	RWH Pit	1	

Rainwater Harvesting					
S. No.	**Chainage**	**Side**	**Proposed**	**Quantity**	**Remarks**
11	242+510	RHS	RWH Pit	1	
12	242+920	RHS	RWH Pit	1	
13	244+920	LHS	RWH Pit	1	
14	245+580	RHS	RWH Pit	1	
15	245+750	LHS	RWH Pit	1	
16	247+210	LHS	RWH Pit	1	SVUP location
17	247+650	LHS	RWH Pit	1	SVUP location
18	249+970	LHS	RWH Pit	1	
19	250+920	RHS	RWH Pit	1	SVUP location
20	252+670	RHS	RWH Pit	1	
		Total Nos =		20	

Technical Due Diligence for 4-Laning of Ujjain-Badnawar Section of NH-752D from km 26.900 to km 96.000 (Length 69.1 Km) in the State of Madhya Pradesh on Hybrid Annuity Mode.

Technical Due Diligence Report (Private and Confidential)

February 2026

Submitted to:

M/s Indus Infra Trust

Submitted by:

Cube Highways Technologies Private Limited

CUBETECH
Cube Highways Technologies Pvt. Ltd.

Technical Due Diligence for 4-Laning of Ujjain-Badnawar Section of NH-752D from km 26.900 to km 96.000 (Length 69.1 Km) in the State of Madhya Pradesh on Hybrid Annuity Mode.

Documents Submittal and Contents Amendment Record

S. No.	Revision	Description	Date	Sign
1	R0	Technical Due Diligence Report	February 2026	

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ABBREVIATIONS

Abbreviation	Description
ASTM	American Society for testing and Materials
AVC	Automatic Vehicle Classifier
BBD	Benkelman Beam Deflection
BC	Bituminous Concrete
BOT	Built, Operate and Transfer
CA	Concession Agreement
CC Drain	Cement Concrete Drains
COD	Commercial Operation Date
CRRI	Central Road Research Institute
CBR	California Bearing Ratio test
DBFOT	Design, Build, Finance, Operate and Transfer
ETC	Electronic Toll Collection
FWD	Falling Weight Deflectometer
GOI	Government of India
HPC	Hume Pipe Culvert
IE	Independent Engineer
IRC	Indian Roads Congress
LA	Land Acquisition
LHS	Left Hand Side
LOA	Letter of Acceptance
MBCB	Metal Beam Crash Barrier
MJB	Major Bridge
MNB	Minor Bridge
MOST	Ministry of Surface Transport
MPR	Monthly Progress Report

Abbreviation	Description
NH	National Highway
NHAI	National Highway Authority of India
NSV	Network Survey Vehicle
O&M	Operation and Maintenance
OHLS	Overhead Lane Signal
OHM	Object Hazard Marker
PCOD	Provisional Commercial Operation Date
POS	Point of Sale
RCC	Reinforced Cement Concrete
RHS	Right Hand Side
ROB	Road/Rail Over Bridge
ROW	Right of Way
RPV	Route Petrol Vehicle
RUB	Road/Rail Under Bridge
SH	State Highway
SPV	Special Purpose Vehicle
SR	Service Road
SSWIM	Slow Speed Weigh in Motion
SWB	Static Weigh Bridge
TC	Toll Collector
Team	Team of Cube Highways Technologies Pvt Ltd.
TMS	Toll Management System
WIM	Weigh in Motion
WMM	Wet Mix Macadam

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1. Introduction

The National Highway Authority of India, New Delhi (the "Authority") is engaged in the development of National Highways and as part of this endeavour, the Authority has decided to undertake development and operation/maintenance of the construction of 4-Laning of Ujjain-Badnawar Section of NH-752D from km 26.900 to km 96.000 (Length 69.1 Km) in the State of Madhya Pradesh on Hybrid Annuity Mode.

National Highways Authority of India (Authority) and M/s M/s G R Ujjain Badnawar Highway Private Limited (the Concessionaire) entered into a Concession Agreement on 10th May 2022 for execution of the Project on Hybrid Annuity Mode. Subsequently, the Appointed Date was declared on 10th October 2022 the Authority, vide letter dated 10.05.2022, declared the Appointed Date (AD) as 10th Oct 2022. Accordingly, the Scheduled Completion Date is (SCD) becomes due on 08th Oct 2024 i.e., 730th days from the Appointed Date.

The Scope of the Project during the Concession Period includes construction of the Project on the Site set forth in Schedule-A and as specified in Schedule-B together with provision of Project Facilities as specified in Schedule-C, and in conformity with the Specifications and Standards set forth in Schedule-D, together with the operation and maintenance of the Project in accordance with the provision of Concession Agreement.

The Scope of Works is a section of National Highway NH-752D (Ujjain-Badnawar)commencing at junction of NH-42 with NH-71 near Thativaripalle and ending at near Bandakindapalle village, passing through existing NH-71 and greenfield area (in stretches of realignment and bypasses) with Four-lane highway and construction of new flexible pavement for carriageway with entry & exit ramps, new construction and reconstruction of major and minor bridges, culverts, drains, underpasses etc. as per Schedule B of the Concession Agreement.

A memorandum (the “Appendix”) containing an inventory of Site including the vacant and unencumbered land, building, structures, road works, trees and other immovable property on or attached to the Site, was prepared by the Concessionaire, specifying in reasonable detail those parts of the Site to which vacant access and Right of Way (RoW) has not been granted to the Concessionaire, which was submitted to the Authority, vide Concessionaire’s letter no. GUBHBL/UJBA/SITE/107 dated 04.10.2022. The memorandum was duly signed on 04.10.2022 by the authorized representative of both the Parties, where, out of a total Project length of 69.10 km, the vacant access and encumbrance free RoW of only 63.425 km was made available to the Concessionaire by the Authority, which constitute only 91.78 % of the total Project length.

2. Objective of Study

The main objective of this assignment is to assess the physical condition of all existing features of the selected National Highway and review of Concession agreement, technical and maintenance schedules for the major maintenance strategy. Physical condition survey of Project Stretch includes data collection and pavement condition.

MAIN VOLUME

(Technical Due Diligence for 4-Laning of Ujjain-Badnawar Section of NH-752D from km 26.900 to km 96.000 (Length 69.1 Km) in the State of Madhya Pradesh on Hybrid Annuity Mode.)

Chapter 1
INTRODUCTION

CHAPTER 1. INTRODUCTION

1.1 Background

Infrastructure Sector is a key driver for the Indian economy. In 2014, the Government of India have introduced a new investment vehicle which allows investors to participate in the growth story of infrastructure sector, named Infrastructure Investment Trusts (hereinafter referred to as 'InvITs'). InvITs are instruments on pattern of mutual funds and are designed to pool in money from a number of investors to invest in assets that give cash flow over a period of time. The InvITs are regulated by the SEBI (Infrastructure Investment Trusts) Regulations Act, 2014.

In highway sector, InvIT as an instrument provide greater flexibility to investors and is expected to attract patient capitals (for say, 20-30 years) to the market, as these investors are averse to construction risks and are interested in investment in assets which provide long-term stable returns.

InvIT shall have a (i) Trustee, (ii) Sponsor(s) (iii) Investment Manager and (iv) Project Manager, Sponsor and the Project Manager are the same entity i.e. Aadharshila Infratech Private Limited. Indus Infra Trust has appointed M/s Cube Highways Technologies Private Limited as Technical consultant for carrying out technical study and assessment of Opex and Major Maintenance requirement (MMR) for balance concession period. The scope includes review of operation and maintenance system and to prepare maintenance schedule for entire duration of concession period based on a technical analysis. In turn, Cube Highways Technologies undertook the site visits to carry out site inspection. The report is based on findings during this period.

Indus Infra Trust ("Trust") was settled in Gurugram, India pursuant to the Trust Deed as a contributory irrevocable trust in accordance with the Indian Trusts Act, 1882. The Trust is an Infrastructure Investment Trust (InvIT) established for making investments in special purpose vehicles as defined under Regulation 2(1) (zy) of the InvIT Regulations, or infrastructure projects or securities of Indian companies engaged in the infrastructure sector, as may be permitted in terms of Regulation 18(5) of the InvIT Regulations. IDBI Trusteeship Services Limited is the Trustee to the Trust.

1.2 Asset Background

The Government of India has envisaged creating an excellent infrastructure facility, to boost the economic development in the country, for which National Highways Authority of India (NHAI) plays a key role. NHAI has been entrusted to implement the development of some of the stretches of National Highways under National Highway Development Program on HAM (Hybrid Annuity Mode) basis.

As part of this endeavour Authority has taken up the development and operation/maintenance of the construction of 4-Laning of Ujjain-Badnawar Section of NH-752D from km 26.900 to km 96.000 (Length 69.1 Km) in the State of Madhya Pradesh on Hybrid Annuity Mode.

The Hybrid Annuity Model (HAM) is a mix of BOT Annuity and EPC models. As per the design, the Government will contribute up-to 40% of the Project cost in ten equal instalments of 4% each during the construction period of 730 days with the provisions of Clause 23.4 of CA. The remaining payment will be made based on the assets created and the performance of the developer. Here, Hybrid Annuity means the first 40% payment is made as fixed amount in five equal instalments whereas the remaining 60% is paid as variable annuity amount after the completion of the Project. As the Government pays only 40%, during the construction stage, the developer has to raise the remaining 60% in the form of equity or loans.

NHAI had invited proposals from bidders for qualification and prescribed the commercial terms and conditions for selection of a successful bidder under its Request for Proposal (RFP) for Design, Engineering, Finance, Construction, Improvement, Operation and Maintenance of the above referred section of NH- 752D.

After evaluation of the bids received, M/s GR Infraprojects limited has emerged as successful bidder; the Authority had accepted the bid of the selected bidder and issued its Letter of Award (LOA), NHAI, New Delhi Letter no NHAI/Tech/MP/NH-71/Ujjain-Badnawar/2021(65547)/132 dated 30th March 2022.for the Project

M/s GR Infra projects Limited has formed an SPV, namely, M/s GR Ujjain-Badnawar highway private limited (GUBHPL- the "Concessionaire"). The Concession Agreement (CA) for the Project was signed between GUBHPL and NHAI on 10nh May 2022.

As the Concessionaire of this Project, GUBHPL will develop the Project and maintain the facilities after completion of construction. GUBHPL will recover its costs through Annuity Payments made during Concession Period of 15 years (annuity payments during construction as well as in operations period), including construction period of 730 days from the appointed date.

Cube Highways Technologies Pvt Ltd (Cube Tech) has been appointed as Technical Due Diligence consultant for the Project stretch. Apropos the above, Cube Tech has carried out a series of investigations as a part of Technical Due Diligence.

The main objective of the consultancy service is to carry out Technical Due Diligence Study for the Project covering review of; contractual documents and reports, condition of existing pavement and structures, evaluating material properties, toll management system, estimating O&M requirements, formulating maintenance strategy for the remaining Concession period.

1.3 Report Structure

The report contains ten chapters, including this Chapter on Introduction.

Chapter 2 Project Overview

Chapter 3 Technical studies

Chapter 4 Asset Status

Chapter 5 Condition Assessment of Existing Pavement and Maintenance Requirement

Chapter 6 Review of Structures

Chapter 7 General Safety Concerns along the Project stretch and Improvements

Chapter 8 Change of scope

Chapter 9 Operation and Maintenance Cost

Chapter 10 Overall Review

Chapter 2
PROJECT OVERVIEW

CHAPTER 2. PROJECT OVERVIEW

2.1 Location

The Project stretch starts at km 26.900 and ends at km 96.000 of NH-752D in the State of Madhya Pradesh under "HAM" basis.

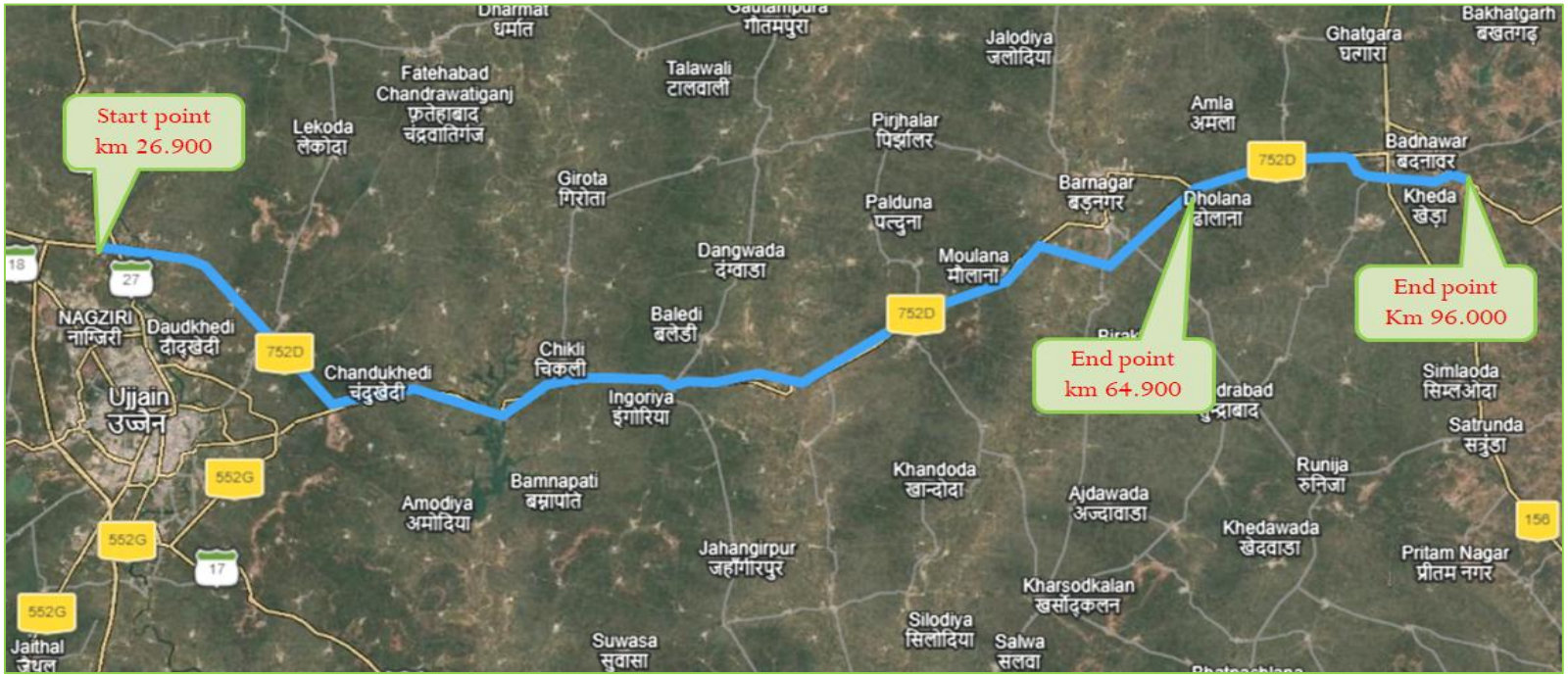


Figure 2-1: Project Alignment

2.2 Salient features

The salient features of the Project are summarised in the table below:

Table 2-1 Project Salient Features

Contract data	
Project Name	4-Laning of Ujjain-Badnawar Section of NH-752D from km 26.90 to km 96.00 (Length 69.1 Km) in the State of Madhya Pradesh on Hybrid Annuity Mode
Concessionaire	M/s G R Ujjain Badnawar Highway Pvt. Ltd.
Letter of Award	24th March 2022
Date of Concession agreement	10th May 2022
Appointed Date	10th Oct 2022
Mode of the Execution	HAM Model
No. of Lanes/Configuration	4 Lane
Length of the Project (in Km)	69.10 Km
Bid Project Cost (in Cr)	907
No. of Toll Plazas	1 No. (km. 64.900)
Concession Period	15 Years from the Completion date
Construction Period	2 years from Appointed date
Scheduled date of completion	08th October 2024
Date of provisional completion date	21st January 2025, Independent Engineer vide its letter no. 10180 issued Provisional Certificate w.e.f. 03rd January 2025 to the Concessionaire.
Date of final completion date	17th February 2025, Independent Engineer vide its letter no. 11134 declared commercial operation of the Project w.e.f. 01st February 2025
Independent Engineer	M/s. L.N. Malviya infra projects private limited.

2.3 Physical features of the Projectss

The Concessionaire shall operate, manage and maintain the Project stretch for entire Concession Period, subject to and in accordance with the provisions of this.

Agreement.

The Project includes the following physical features.

Table 2-2: Project Physical Features

S. No	Project Physical Features	Units	As per CA	As per Site	Remarks
1	Total Length of Project stretch	km	69.10	69.10	
2	Major bridge		04	04	
3	Minor Bridge		07	07	
4	ROB		02	02	
5	Flyover		02	02	
6	VUP		13	13	
7	LVUP		12	12	
8	SVUP		06	06	
9	Box Culvert		140	140	
10	Pipe culverts		69	69	

Table 2-3: Inventory of the Project stretch

S. No	Description	Side	Units	Qty as per site	Remarks
1	Total Length of the Project	LHS	km	69.1	
		RHS	km	69.1	
2	Total Length of Service Road Including ramps	LHS	km	30.690	Including COS loctaions
		RHS	km	30.010	
5	At-grade intersections				
	a) Major junctions	BHS	No's	07	
	b) Minor junctions	BHS	No's	45	
6	Grade Separated Intersections				
	a) Major junctions	BHS	No's	07	
	b) Minor junctions	BHS	No's	45	
7	Bus bay without shelters	BHS	No's	18	
8	Bus bay with shelters	BHS	No's	24	
9	Truck lay byes	BHS	No's	05	

S. No	Description	Side	Units	Qty as per site	Remarks
10	Toilet blocks at Truck Lay Bye	BHS	No's	Nil	
11	Lined Open Drain	BHS	km	13.20	Median BHS open drain
12	RCC Covered drain cum footpath	BHS	km	Nil	
13	Metal beam crash barrier	BHS & Median	m	129998	Shoulder side MBCB provided 8.883 km on LHS and 11.114 km on RHS. in median entire length where MBCB provided
14	Thire beam crash barrier	BHS	km	Nil	
15	Pedestrian guard rail	BHS	km	4.970	
16	Boundary wall	BHS	km	N. A	Boundary pillars are missing at most of the locations on the site.
17	Rainwater harvesting structures	BHS	No's	128	
22	**Streetlights**				
a)	Single arm	BHS	No's	253	
b)	Double arm	BHS	No's	1190	
c)	High mast	BHS	No's	27	
23	**Toll Plaza**				
a)	Admin block	BHS	No's	1	
b)	Traffic aid post	BHS	No's	1	
c)	Medical aid post	BHS	No's	1	
d)	High mast	BHS	No's	2	
e)	Single arm	BHS	No's	Nil	
f)	Double arm	BHS	No's	Nil	
g)	Toilet blocks	BHS	No's	2	
h)	Weigh bridge	BHS	No's	2	
i)	Mini nest	BHS	No's	2	
j)	RPV	BHS	No's	1	
k)	Crane	BHS	No's	1	

S. No	Description	Side	Units	Qty as per site	Remarks
l)	Ambulance	BHS	No's	1	

Chapter 4
TECHNICAL STUDIES

CHAPTER 3. TECHNICAL STUDIES

3.1 Review of Concession Agreement

Table 3-1: Review of Concession Agreement

Article (CA)	Subject	Description in brief	Remarks
Clause 2.1	**Scope of the Project**	The Project shall be executed as in Schedule B and C on the site and in conformity with Specifications and standards outlined in Schedule-D	
		Operation and Maintenance of the Project Stretch as per Concession Agreement	
		Performance and fulfilment of all other obligations of the Concession Agreement	
Article 3	**Concession Period**	The concession period includes a construction period of 730 days and an operational period of 15 years from COD.	
Article 4	**Condition precedent**	Authority shall have procured for the Concessionaire the Right of Way to the Site in accordance with the provisions of Clauses 10.3.1 and 10.3.2;	
Clause 4.1.2		The authority shall have procured forest clearance for and in respect land forming part of the ROW, save and except permission for cutting trees;	
		The authority shall have procured all Applicable Permits relating to environmental protection and conservation of the Site;	
Clause 4.2	**Damages for delay by the Authority**	In the event that (i) the Authority does not procure fulfilment of any or all of the Conditions Precedent set forth in Clause 4.1.2 within the period specified in respect thereof and (ii) the delay has not occurred as a result of breach of this Agreement by the Concessionaire or due to Force Majeure, the Authority shall pay to the Concessionaire Damages in an amount calculated at the rate of 0.2 % (zero point one per cent) of the Performance Security for each day's delay until the	

Article (CA)	Subject	Description in brief	Remarks
		fulfilment of such Conditions Precedent, subject to the maximum limit equal to the amount of Bid security and upon reaching such limit.	
Article 5	**Obligations of Concessionaire**	The Concessionaire makes reasonable efforts to facilitate the acquisition of land and procuring of environmental and forest clearances required at his own cost and expenses.	
		Obtain all the necessary Applicable permits, appropriate proprietary rights, licenses, agreements, and permissions for material, methods, processes, and systems used or incorporated into the Project.	
Clause 6.1	**Obligations of Authority**	The Authority provides necessary support and assistance to the Concessionaire in	
		a) providing Applicable permits required from any Govt. instrumentality for implementation and operation of the project.	
		b) obtaining access to all necessary infrastructure facilities and utilities, including water and electricity at rates and on terms no less favourable to the Concessionaire than those generally available.	
Clause 6.2	**Maintenance obligations prior to Appointed Date**	The Concessionaire shall be reimbursed for the cost of maintenance during the Development Period by the Authority after due certification by the Authorized Representative of the Authority. For the purpose of such reimbursement, the lump sum per kilometre rate of reimbursement for a period of 1 (one) year would be Rs.3,42,000 (Rupees three lakh forty two thousand) and shall be paid on a pro-rata basis for the period concerned.	
Clause 8.1.5	**Disclaimer**	all risks relating to the Project shall be borne by the Concessionaire and Authority shall not be liable in the manner for such risks or the consequences.	
Article 9	**Performance Security**	Bank guarantee for Rs.27.21 Cr. to be furnished to Authority within 30 days from the date of signing of the CA, which would be released on spending not less than 30% of Bid Project Cost or one year from the Appointed	

Article (CA)	Subject	Description in brief	Remarks
		Date whichever is later.	
Article 10	**Right of Way**	Protection from Encroachments	
Clause 10.5		Throughout the Concession Period, the Concessionaire shall protect the site from all occupations, encumbrances, or encroachments.	
Article 12	**Construction of the Project**	The 730th day of the Appointed Date shall be the scheduled date for completion of the project, and the Concessionaire agrees and undertakes that the Project shall be completed on or before the Scheduled Completion Date.	
Clause 12.3.1			
Article 15	**Commercial Operation Date (COD)**	The Project Stretch shall enter commercial service on COD where upon the Concessionaire shall be entitled to demand and collect fee in accordance with the provision of Article 14.	
Clause 15.1			
Article 16	**Change of Scope**	As per Clause 16.3, Within 7 (seven) days of issuing a Change of Scope Order, the Authority shall make an advance payment to the Concessionaire in a sum equal to 20% (twenty per cent) of the cost of Change of Scope as agreed hereunder, and in the event of a Dispute, 20% (twenty per cent) of the cost assessed by the Independent Engineer.	
		As per Clause 16.4.2, Notwithstanding anything to the contrary contained in this Article 16, the Concessionaire shall be entitled to nullify any Change of Scope Order if it causes the cumulative costs relating to all the Change of Scope Orders to exceed 10% (ten per cent) of the Bid Project Cost in any continuous period of 3 (three) years immediately preceding the date of such Change of Scope Order or if such cumulative costs exceed 25% (twenty five per cent) of the Bid Project Cost at any time during the Concession Period.	
		As per Clause 16.5.1, Notwithstanding anything to the contrary contained in Clauses 16.1.1 and 16.3, the Authority may, after giving notice to the Concessionaire	

Article (CA)	Subject	Description in brief	Remarks
		and considering its reply thereto, award any works or services, contemplated under Clause 16.1.1, to any person on the basis of open competitive bidding; provided that the Concessionaire shall have the option of matching the first ranked bid in terms of the selection criteria, subject to payment of 2% (two per cent) of the bid amount to the Authority, and thereupon securing the award of such works or services.	
Clause 16.6.1	**Reduction in Scope of Project**	The Authority shall follow the following process for calculation of total cost of reduced Scope	
		I. On direction by the Authority, the Independent Engineer to assess the civil cost of the reduced Scope, as per the schedule of rates applicable on the Bid Due Date.	
		II. The civil cost of the reduced Scope shall be multiplied by 1.053 to arrive at the estimated cost of the reduced Scope.	
		III. The estimated cost of the reduced Scope shall then be multiplied by the ratio of Bid Project Cost to Estimated Project Cost to arrive at the Total Cost of Reduced Scope.	
Article 17	**O&M**	As per Article 17, Concessionaire shall maintain Project Stretch in conformity with Maintenance Requirement, the Maintenance Manual or Maintenance Program as the case may be	
Clause 17.7.3	**Lane Closure**	Upon receiving the permission pursuant to Clause 17.7.1, the Concessionaire shall be entitled to close the designated part of the Project for the period specified therein, and in the event of any delay in re-opening such part, the Concessionaire shall pay Damages to the Authority calculated at the rate of 0.5 % (zero point Five per cent) of the Performance Security, for each day of delay until that part of the Project has been re-opened for use.	
Clause 17.8	**Damages for breach of maintenance obligations**	In the event that the Concessionaire fails to repair or rectify any defect or deficiency set forth in the Maintenance Requirements within the period specified	Concessionaire is responsible for always maintaining the asset as per Level of service as per Schedule K

Article (CA)	Subject	Description in brief	Remarks
		therein, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages, to be calculated and paid for each day of delay until the breach is cured, at the higher of, (a) 2% of Performance Security, and (b) 0.1% of the cost of such repair or rectification as estimated by the Independent Engineer.	
Article 19 Clause 19.2	**Monitoring of Operation and Maintenance**	As per Article 19.2, IE shall inspect the Project Stretch at least once a month and IE shall make a report of such inspection (the "O & M Inspection Report") stating in reasonable detail of defects or deficiencies, if any, with particular reference to the Maintenance Requirements, Maintenance Manual, the Maintenance Program and Safety Requirements, and send a copy thereof to the Authority and the Concessionaire within 7 days of such inspection.	
Article 21 **Clause 21.3**	**Remuneration of IE**	The remuneration, cost and expenses of the Independent Engineer shall be paid by the Authority and subject to the limits set forth in Schedule-M, one-half of such remuneration, cost and expenses shall be reimbursed by the Concessionaire to the Authority within 15 days of receiving a statement of expenditure from the Authority.	
Article 23	**Payment of Bid Project Cost**	As per Clause 23.3.1, 40% of the Bid Project Cost, adjusted for Price Index Multiple, shall be paid in 10 equal instalments of 4% each during the Construction Period in accordance with Clause 23.4.	
Clause 23.3		As per Clause 23.3.2, the remaining 60% of the Bid Project Cost, adjusted for Price Index Multiple, shall be paid in 30 biannual instalments commencing 180 days after COD in accordance with Clause 23.6.	
Clause 23.4	**Payment during construction period**	As per 23.4 During construction, the Concessionaire gets 8% of Bid Project Cost each time an Independent Engineer certifies a payment milestone. Payments are linked to 10 milestones (from 5% to 90% physical progress). If in case of Change of Scope, the progress	

Article (CA)	Subject	Description in brief	Remarks
		milestones are recalculated accordingly.	
Clause 23.5	**Bonus on early completion**	In the event the Concessionaire achieves COD at least 30 days prior to the Scheduled Completion Date, a bonus equivalent to 0.5% of 60% of the Bid Project Cost shall be payable. For each additional day beyond this period, the bonus shall be computed on a pro-rata basis and disbursed along with the first annuity payment.	
Clause 23.6	**Annuity payments during Operation period**	Annuity shall be collected biannually. As per 23.6.4 Interest shall be due and payable in the reducing balance of completion cost at an interest rate equal to average of one-year MCLR of top 5 scheduled Commercial Banks* plus 1.25%	
Clause 23.7	**O&M Payments**	23.7.1 The Concessionaire shall bear all O&M Expenses and, in lieu thereof, the Authority shall make O&M Payments at the rate of Rs. 3.47 crore per year, exclusive of GST, it being clarified that no reimbursement shall be made for any excess of the said amount, save and except where a Change in Scope is affected under this Agreement. 23.7.2 The O&M Payments shall be disbursed into two equal biannual instalments and shall be released by the Authority concurrently with the corresponding instalments of Annuity Payments. 23.7.3 Each instalment of O&M Payment shall be determined as one-half of the annual O&M Payment, duly adjusted by the applicable Price Index Multiple with reference to the Reference Index Date immediately preceding the due date of payment.	
Clause 23.8	**Mobilization Advance**	The Authority may provide up to 10% of the Bid Project Cost as advance, released in two equal instalments against Bank Guarantees—first after the Appointed Date and second after 60 days. Each instalment shall be released within 30 days of request. The advance shall bear interest (Bank Rate or MCLR+1.25%, as applicable) compounded annually, and be recovered in instalments from payments due, with interest recovered in subsequent instalments.	

Article (CA)	Subject	Description in brief	Remarks
Article 29	**Compensation for default by the Concessionaire**	in the event of the Concessionaire being in material breach or default of this Agreement, it shall pay to the Authority by way of compensation, all direct costs suffered or incurred by the Authority because of such material breach or default.	
Clause 29.1			
Article 31	**Termination payment**	As per Clause 31.3.1, of the CA, Upon Termination on account of a Concessionaire Default during the Operation Period, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to 65% (sixty five per cent) of the sum of Annuity Payments remaining unpaid for and in respect of the Concession Period, including interest thereon up to the Transfer Date.	
		Clause 31.3.3, of the CA, upon Termination on account of an Authority Default, the Authority shall pay to the Concessionaire, by way of Termination Payment, an amount equal to:	
		(a) Debt Due; and	
		(b) 150% of the Adjusted Equity.	
		Cl 31.3.4, of the CA Termination Payment shall become due and payable to the Concessionaire within 15 (fifteen) days of a demand being made by the Concessionaire to the Authority with the necessary particulars, and in the event of any delay, the Authority shall pay interest at a rate equal to 3% (three per cent) above the daily average Bank Rate on the amount of Termination Payment remaining unpaid; provided that such delay shall not exceed 90 (ninety) days. For the avoidance of doubt, it is expressly agreed that Termination Payment shall constitute full discharge by the Authority of its payment obligations in respect thereof hereunder	
Article 35	**Change in Law**	If as a result of Change in Law, the Concessionaire suffers an increase in costs or reduction in net after-tax return or other financial burden, the aggregate financial effect of	
	Increase in cost		

Article (CA)	Subject	Description in brief	Remarks
		which exceeds the higher of Rs.1.76 crore or 2% of the total Annuity Payments in any Accounting Year, the Concessionaire may notify the Authority and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in increased costs, reduction in return or other financial burden as aforesaid.	
	Reduction in cost	If as a result of Change in Law, the Concessionaire benefits from a reduction in costs or increase in net after-tax return or other financial gains, the aggregate financial effect of which exceeds the higher of 1.76 crore or 2% of the total Annuity Payments in any Accounting Year, the Authority may so notify the Concessionaire and propose amendments to this Agreement so as to place the Concessionaire in the same financial position as it would have enjoyed had there been no such Change in Law resulting in decreased costs, increase in return or other financial gains as aforesaid.	
Article 38	**Dispute Resolution**	Any dispute, difference or controversy of whatever nature howsoever arising can be resolved in three stages	
		· Conciliation	
		· Arbitration	
		· Adjudication by a tribunal	
Article 42	**Total Project Cost**	"Total Project Cost" means 60 % (sixty percent) of the Bid Project Cost specified in Clause 23.1 i.e. Rs. 907 Cr.	

Chapter 4
ASSET STATUS

CHAPTER 4. ASSET STATUS

4.1 Review of Highway Current Status

The Project stretch starts at km 26.900 and ends at km 96.000 of NH-752D in the State of Madhya Pradesh under "HAM" basis.

Schedule I tests like comparison of schedule B, C with site execution, visual test, NSV survey, cross section test, ultra sonic pulse velocity test, load test, rebound hammer test, retro reflectivity test on signboards, environmental test, safety audit, test drive has been conducted during the PCOD tests and found the documents are in line with very few deviations.

The cross sections as per Schedule B and during construction have deviated, and the revised cross sections have been approved by the Independent Engineer. The detailed comparison of cross sections is provided below.

The Concessionaire is addressing the defects/deficiencies as and when arises and pointed out by the Independent Engineers regularly.

Figure 4-1: Project start and end location

Table 4-1: TCS statement

S. No.	Chainage		Length (M)	As per CA	Chainage		Length (m)	As per site	
	From	To		TCS Type	From	To		TCS Type	Remarks
1	26.400	26.900	500	I	26.413	26.900	487	I	4 lane Flyover Approaches Without Slip Road
2	26.900	27.580	680	II	26.900	27.580	680	II	4 lane Flyover Approaches with Slip Road
3	27.580	28.440	860	III	27.580	28.350	770	III	4 Lane new Construction Without Service Road
4	28.440	28.900	460	IV	28.350	28.440	90	V-A	4 Lane new Construction with Service Road Left Side
5	28.900	30.260	1360	III	28.440	28.810	370	IV	4 Lane new Construction with Service Both side
6	30.260	31.040	780	II	28.810	28.900	90	V	4 Lane new Construction with Service Right Side
7	31.040	32.500	1460	III	28.900	30.260	1360	III	4 Lane new Construction Without Service Road
8	32.500	32.870	370	IV	30.260	31.040	780	II	4 lane Flyover Approaches with Slip Road
9	32.870	33.660	790	II	31.040	32.500	1460	III	4 Lane new Construction Without Service Road
10	33.660	33.800	140	IV	32.500	32.870	370	IV	4 Lane new Construction with Service Both side
11	33.800	34.470	670	III	32.870	33.660	790	II	4 lane Flyover Approaches with Slip Road
12	34.470	35.200	730	I	33.660	33.800	140	IV	4 Lane new Construction with Service Both side
13	35.200	35.760	560	II	33.800	34.470	670	III	4 Lane new Construction Without Service Road
14	35.760	36.420	660	IV	34.470	35.260	790	I A	4 Lane ROB Approach Without Slip Road
15	36.420	37.540	1120	II	35.260	35.760	500	II	4 lane Flyover Approaches with Slip Road
16	37.540	40.020	2480	III	35.760	36.420	660	IV	4 Lane new Construction with Service Both side
17	40.020	40.960	940	II	36.420	37.540	1120	II	4 lane Flyover Approaches with Slip Road
18	40.960	41.700	740	III	37.540	39.920	2380	III	4 Lane new Construction Without Service Road
19	41.700	42.500	800	II	39.920	40.780	860	II	4 lane Flyover Approaches with Slip Road
20	42.500	43.100	600	V	40.780	41.700	920	III	4 Lane new Construction Without Service Road
21	43.100	44.000	900	II	41.700	42.500	800	II	4 lane Flyover Approaches with Slip Road
22	44.000	44.720	720	III	42.500	43.100	600	IV	4 Lane new Construction with Service Both side
23	44.720	45.420	700	II	43.100	44.000	900	II	4 lane Flyover Approaches with Slip Road
24	45.420	48.930	3510	III	44.000	44.720	720	III	4 Lane new Construction Without Service Road

S. No.	Chainage		Length (M)	As per CA	Chainage		Length (m)	As per site	
	From	To		TCS Type	From	To		TCS Type	Remarks
25	48.930	49.780	850	II	44.720	45.420	700	II	4 lane Flyover Approaches with Slip Road
26	49.780	50.000	220	VI	45.420	48.930	3510	III	4 Lane new Construction Without Service Road
27	50.000	50.440	440	III	48.930	49.780	850	II	4 lane Flyover Approaches with Slip Road
28	50.440	51.340	900	II	49.780	50.000	220	VI	4 lane eccentrics Right widening without service road
29	51.340	51.550	210	IV	50.000	50.490	490	III	4 Lane new Construction Without Service Road
30	51.550	52.100	550	III	50.490	51.600	1110	II	4 lane Flyover Approaches with Slip Road
31	52.100	55.300	3200	VI	51.600	52.100	500	III	4 Lane new Construction Without Service Road
32	55.300	55.660	360	III	52.100	55.300	3200	VI	4 lane eccentrics Right widening without service road
33	55.660	56.560	900	II	55.300	55.680	380	III	4 Lane new Construction Without Service Road
34	56.560	56.860	300	III	55.680	56.580	900	II	4 lane Flyover Approaches with Slip Road
35	56.860	58.300	1440	VI	56.580	56.860	280	III	4 Lane new Construction Without Service Road
36	58.300	61.140	2840	III	56.860	58.300	1440	VI	4 lane eccentrics Right widening without service road
37	61.140	62.060	920	II	58.300	60.930	2630	III	4 Lane new Construction Without Service Road
38	62.060	63.000	940	VI	60.930	61.850	920	II	4 lane Flyover Approaches with Slip Road
39	63.000	64.600	1600	VII	61.850	63.000	1150	VI	4 lane eccentrics Right widening without service road
40	64.600	65.100	500	Toll plaza	63.000	64.710	1710	VII	4 lane eccentrics Left widening without service road
41	65.100	67.100	2000	VI	64.710	65.000	290	Toll Plaza	Toll Plaza
42	67.100	67.460	360	VII	65.000	67.100	2100	VI	4 lane eccentrics Right widening without service road
43	67.460	68.320	860	II	67.100	67.460	360	VII	4 lane eccentrics Left widening without service road
44	68.320	68.800	480	VI	67.460	68.320	860	II	4 lane Flyover Approaches with Slip Road
45	68.800	69.980	1180	VII	68.320	68.800	480	VI	4 lane eccentrics Right widening without service road
46	69.980	70.760	780	II	68.800	69.980	1180	VII	4 lane eccentrics Left widening without service road

S. No.	Chainage		Length (M)	As per CA	Chainage		Length (m)	As per site	
	From	To		TCS Type	From	To		TCS Type	Remarks
47	70.760	71.400	640	VII	69.980	70.760	780	II	4 lane Flyover Approaches with Slip Road
48	71.400	71.920	520	III	70.760	71.400	640	VII	4 lane eccentrics Left widening without service road
49	71.920	72.840	920	II	71.400	71.920	520	III	4 Lane new Construction Without Service Road
50	72.840	73.600	760	III	71.920	72.840	920	II	4 lane Flyover Approaches with Slip Road
51	73.600	74.040	440	VII	72.840	73.600	760	III	4 Lane new Construction Without Service Road
52	74.040	74.880	840	II	73.600	74.135	535	VII	4 lane eccentrics Left widening without service road
53	74.880	75.240	360	III	74.135	74.975	840	II	4 lane Flyover Approaches with Slip Road
54	75.240	75.420	180	IV	74.975	75.240	265	III	4 Lane new Construction Without Service Road
55	75.420	76.220	800	II	75.240	75.420	180	IV	4 Lane new Construction with Service Both side
56	76.220	77.380	1160	III	75.420	76.220	800	II	4 lane Flyover Approaches with Slip Road
57	77.380	77.600	220	IV	76.220	77.410	1190	III	4 Lane new Construction Without Service Road
58	77.600	78.000	400	III	77.410	77.820	410	IV-A	4 Lane new construction bypass with service road Both Side
59	78.000	78.800	800	I	77.820	78.045	225	III	4 Lane new Construction Without Service Road
60	78.800	79.840	1040	II	78.045	78.720	675	I A	4 Lane ROB Approach Without Slip Road
61	79.840	82.640	2800	III	78.720	79.820	1100	II	4 lane Flyover Approaches with Slip Road
62	82.640	83.630	990	II	79.820	82.640	2820	III	4 Lane new Construction Without Service Road
63	83.630	84.280	650	VII	82.640	83.630	990	II	4 lane Flyover Approaches with Slip Road
64	84.280	85.240	960	II	83.630	84.280	650	VII	4 lane eccentrics Left widening without service road
65	85.240	85.760	520	VII	84.280	85.240	960	II	4 lane Flyover Approaches with Slip Road
66	85.760	86.820	1060	VI	85.240	85.760	520	VII	4 lane eccentrics Left widening without service road
67	86.820	87.680	860	II	85.760	86.910	1150	VI	4 lane eccentrics Right widening without service road
68	87.680	89.840	2160	VII	86.910	87.770	860	II	4 lane Flyover Approaches with Slip Road
69	89.840	90.880	1040	II	87.770	89.750	1980	VII	4 lane eccentrics Left widening without service road
70	90.880	92.100	1220	II	89.750	90.790	1040	II	4 lane Flyover Approaches with Slip Road
71	92.100	92.200	100	II	90.790	92.040	1250	III	4 Lane new Construction Without Service Road

S. No.	Chainage		Length (M)	As per CA	Chainage		Length (m)	As per site	
	From	To		TCS Type	From	To		TCS Type	Remarks
72	92.200	93.020	820	I	92.040	92.140	100	II A	4 Lane new construction with slip road on both side
73	93.020	93.180	160	II	92.140	92.602	462	IC	4 Lane Flyover Approach without Slip Road
74	93.180	95.530	2350	VIII	92.602	93.070	468	I B	4 Lane Flyover Approach without Slip Road
75	95.530	95.630	100	X	93.070	93.230	160	II	4 lane Flyover Approaches with Slip Road
76	95.630	96.000	370	IX	93.230	95.670	2440	VIII	2 Lane New Construction Bypass
77					95.670	96.000	330	VIII	2 Lane New Construction Bypass with Slip Road
78					96.000	96.320	320	VIII	COS
	Total length		**69600**				**69907**		

4.2 Drain

The drain along the Project stretch measures 13.20 km on both sides, RCC open lined drain is provided at super elevation locations in the median to drain out the surface water. The available list of drain constructed along the Project stretch are enclosed in **Annexure I**

Figure 4-2: Drain

4.3 Junctions

A total of 07 Major junctions, 45 Minor junctions to be provided along the project stretch as per the Concession Agreement (CA). The list of major and minor junctions along the project stretch is enclosed in **Annexure II.**

sss

Figure 4-3: Junctions

4.4 Median & Avenue plantation

As per the Concession Agreement (CA), median and avenue plantation shall be provided along the project stretch. However, as per site visit, the same has been provided.

Figure 4-4: Median plantation

4.5 Road Furniture

Following are the details of road furniture provided along the Project stretch as per site.

Table 4-2: List of Project furniture's

Type furniture	Unit	Quantity
Metal beam Crash barrier	m	129998
Pedestrian Guard rail	m	4970
Streetlights - Conventional	No's	
Single arm	No's	253
Double arm	No's	1190
High mast	No's	27
Low mast	No's	0
Streetlights - Solar		
Single arm	No's	Nil
Double arm	No's	Nil

Metal beam crash barrier

Metal beam safety barriers have been installed along the entire Project stretch on the toe side and median side of the main carriageway and are being well-maintained. The length of double beam along the project stretches measures 129.998 km. available list of metal beam installed along the Project stretch are enclosed in **Annexure III.**

Figure 4-5: Metal beam crash barrier along the Project stretch

Pedestrian Guard Rail

The pedestrian guardrail along the Project stretches measures 4.970 km on both sides. The majority of the pedestrian guardrail is located in separator of MCW & SR and at some locations in the median along the Project stretch wherever it is required. The available list of PGR installed along the Project stretch are enclosed in **Annexure IV.**

Figure 4-6: Pedestrian Guard Rail

Street Lighting

Street lighting, including single-arm, double-arm, and high-mast lights, has been provided along the project stretch, covering the main carriageway, service roads, underpasses, and toll plazas etc. As per site observations, the streetlights installed along the project stretch are in good condition.

As per Schedule C, the electrical connection with all its infrastructure shall be done by the Concessionaire. Furthermore, the project must comply with the IRC SP 84:2019 Manual. As per Clause 12.5.1 of the manual, complete street lighting should be provided with DG sets as standby arrangements. However, this provision is not available at the site.

The installation of streetlights along the project stretch are still in progress and the available list of streetlights installed along the Project stretch are enclosed in **Annexure VII.**

Figure 4-7: Street lights

4.6 Project facilities

Following are the details of Project facilities along the Project stretch,

Table 4-3: List of Project facilities

Type facility	Unit	Quantity
Bus bays with Bus shelters	No's	24
Bus shelters	No's	18
Truck lay bye	No's	05
Rest area	No's	04
Emergency call box (ECB)	No's	00
Foot Over Bridge (FOB)	No's	Nil
Diesel generator	No's	1
Anti glares	No's	Nil
Drip irrigation pumps	No's	Nil

Type facility	Unit	Quantity
Solar panel/power planet	No's	A solar panel has been installed on the admin building, for toll operations.
Boundary wall	km	Nil
Landscaping and median Plantation	No's	Along with the Project stretch
Rainwater harvesting Pits	No's	128

Bus shelters

Bus shelters along with bays have been installed along the Project stretch. As per site observations, it is noted that, the condition of the bus shelters is in good. The list of bus shelters along the Project stretch is enclosed in **Annexure VI**.

Figure 4-8: Bus shelters.

Truck lay bye

The truck lay bye has been constructed along the project stretch. As per site observations, it is noted that, there is no provision of toilet blocks, drinking water etc at the truck lay bye location. The list of truck lay byes along the Project stretch is enclosed in **Annexure VII**

Figure 4-9: Truck lay bye

Rest area/Wayside amenities

As per Concession agreement (CA). The way side amenities at mentioned location has to provide with features like, Paver block pavement, RCC Boundary wall, toilet facility, and dormitory of 20 persons capacity, but during our site visit, It was observed that the Way Side Amenities (WSA) has been provided with flexible pavement instead of paver block pavement and precast boundary wall instead of RCC boundary wall and also no furniture has been provided at dormitory.

As per schedule C comparison statement signed by IE, it is mentioned as per the pavement is with paver block.

	Rest Area/Wayside Amenities	Rest Area/1Wayside Amenities is attached as Appedix-C3				Rest Area/1Wayside Amenities is as follows:				
	Sr No.	Design Chainage	Length (m)	Side/ Location Name	Remarks	Design Chainage	Length (m)	Side/ Location Name	Remarks	
९	1	27+400	As per Plan & Profile	RHS	to be constructed as per P&P and as per clause 12.9 of Schedule D	27+400	As per Plan & Profile	RHS	Nil	Descoped from Concession Scope by the Authority (COS order issued on 21.06.2024)
	2	29+050	100m straight length & 240m including Tapering	RHS	The pavement with paver block & RCC boundary of height 2.4m and toilet facility @dormitry for 20 nos. persons at each locations	29+050	100m straight length & 240m including Tapering	RHS	The pavement with paver block & RCC boundary of height 2.4m and toilet facility @dormitry for 20 nos. persons at each locations has been provided as per reviewed drawing by IE	
	3	29+050	100m straight length & 240m including Tapering	LHS		29+050	100m straight length & 240m including Tapering	LHS		
	4	88+390	100m straight length & 240m including Tapering	RHS		88+390	100m straight length & 240m including Tapering	RHS		
	5	88+500	100m straight length & 240m including Tapering	LHS		88+500	100m straight length & 240m including Tapering	LHS		

Figure 4-10: Truck lay bye

Diesel generators

DG sets were provided at all toll plaza location with a capacity of 125 KVA.

Figure 4-11: Diesel generator

Rainwater harvesting structures

The (Rainwater harvesting pits) RWH pits along the Project stretch is 128 No's on both sides, but as per site condition there is no proper inlet of surface water in to the pits and few damaged were also observed. The available list of RWH pits constructed along the Project stretch are enclosed in **Annexure VIII**

4.7 Details of Toll booth Inspection

The details of the plazas are as follows:

Table 4-4: Toll plaza

S.no	Chainage (km)	Toll Lanes	Admin block	M.A.P	T.A.P	High mast	Ambulance	RPV	Crane	SA	DA	Toilet blocks	Weigh bridge	Highway mini nest	Tunnel	Remarks
1	64.900	8	1	1	1	2	1	1	1	0	0	2	2	0	0	
Total		8	1	**1**	**1**	2	**1**	**1**	**1**	0	0	2	2	0	0	

Figure 4-12: Toll Plaza

4.7.1 Details of toll inspection

The team of CUBE TECH has visited the Project toll plaza on 16th September 2025.

Observations:

Toll Plaza and Toll Collection System

One toll plaza is located along the stretch: Kharsodkhurd Toll Plaza at km 64.850 chainage. The Toll Collection Systems at Toll Plaza was provided by Qualix Information System LLP in 2025.

Toll plaza has 10 lanes (8 physical lanes and 2 reversible lanes). All 10 lanes are equipped with ETC (Electronic Toll Collection) systems.

Lane Equipment

Lane hardware and equipment installed at each toll plaza are the following:

- RFID ETC Transceiver
- Lane Controller with Industrial PC

- AVC Sensors
- Automatic Lane Barrier (ALB)
- Incident Capture and license plate capture Cameras
- Overhead Lane Signals
- Traffic Lights
- Toll Booth Equipment

RFID ETC Transceiver

- RFID ETC Transceiver reads tags installed on the windshield of vehicles and ETC RFID transceiver near Pay-axis-mounted over gantry. Handheld RFID readers are provided (1 no. in each direction)in case a tag is not detected by the fixed reader.
- The ETC system lanes are present and operational in 10 Lanes.
- Zebra Brand RFID Readers are installed in all lanes.
- ETC System is Running on ICD 2.5.

Lane Controller with Industrial PC

- Toll Lane Controller is located within the Electronic Enclosure placed inside the plaza building which is connected to the common server. Two electronic enclosures are placed inside the booth.
- TLCs are installed and operational in 10 lanes. Each TLC has the specification of 8 GB RAM and 256GB SSD, intel core i5 processor with OS License.

Automatic Vehicle Classification (AVC) Sensors

- The AVC (Automatic Vehicle Classification) equipment is installed and operational in all 10 lanes. The AVC system installed is a laser profiler-based system, which includes a laser sensor. This AVC laser sensor has a high sensing resolution and can detect the profile of a vehicle when an object blocks the path.

Automatic Lane Barrier

Boom barriers are installed and operational in 10 lanes. Automatic Lane Barrier is used to allow only authorized vehicles to pass through the lane. Torque motor powers the barrier for raising and lowering the boom. The boom weight is exactly balanced by built-in springs.

Lane Traffic Light (LTL) and User Fare Display (UFD)

Lane Traffic Light (LTL) is used to instruct vehicles to stop or pass through the lane. TheLTL is RED when the toll collector is expecting the vehicle at the booth. After the transaction is done, the LTL turns Green to instruct the vehicle to pass through the lane. The User Fare Display is a part of electronic toll collection equipment located at the toll booth. It is a mini variable message sign (VMS) made of Light Emitting Diodes (LED). The User fare display is used to display the toll fare that is due and that must be paid by the motorist and the classification of vehicle selected by the collector.

LTL and UFD are installed and operational in 10 lanes.

Incident Capture Camera (ICS Camera)

- The incident capture camera is installed on a pole to capture the image of the vehicle from the back side. The AVC triggers the Image capture system.
- ICS cameras are installed and operational in 10 lanes.
- Royal Shield–brand cameras with a 2-megapixel image sensor are deployed for incident detection.

License Plate Image Capture Camera (LPIC)

- License Plate Image capture camera is installed on a pole facing incoming vehicle to capture the image of the vehicle number plate.
- LPIC Cameras are installed and operational in 10 lanes.
- Royal Shield–brand cameras with a 2-megapixel image sensor are deployed for License plate detection.

Over Head Lane Signal (OHLS)

The **Overhead Lane Signal (OHLS)** for lane "Open" and "Close" sign consists of a pair of"GREEN" (arrow) and "RED" (cross) lights. The OHLS is located at the vehicle approaching side of the canopy to show the drivers whether the lane is open or closed.

OHLS is installed and operational in 10 lanes.

4.7.2 Toll Booth Equipment

- Toll Collector Display (Operator Monitor)
- Customized Keyboard
- Receipt Printer

- Intercom slave unit
- Manual Booth Control (MBC)
- Booth Camera

The operator monitor termed as Toll Collector Display (TCD) is located on the toll collector's desk. It is the system's interface to the toll collector, to display the status of transactions and status of the lane peripherals.

The keyboard on the toll terminal is a customized keyboard for Registration of toll operations.

Thermal Printers are installed at the toll booths to print tickets. Intercom slave unit facilitates communication with the master unit located in the control room.

Booth Cameras are provided on the inside roof corner of the booth to provide surveillance through CCTV screen located in the control room. Booth cameras have voice recording functionality.

Toll booth equipment is installed and operational in 2 lanes. The remaining 8 lanes have no booth installed at the toll plaza.

Medium Speed Weigh in Motion (MSWIM)

- Medium Speed Weigh in Motion (MSWIM) is installed on entry lanes. Bending plate strain gauge technology is used with hardware and software support to calculate the weight of vehicles running through it up to a speed of 50 km/hr. MSWIM is installed in all 10 lanes but is not operational, as no overload charges are collected.
- SWB (Static Weighbridge) are installed on both sides of the Toll Plaza but is not in use.
- Each SWB Room consists of monitor, CPU with keyboard and mouse, thermal printer,2KVA UPS and booth camera etc.

TMS Server

- Two servers (a primary server and a backup server) are provided, along with a switch rack and a 24-port switch.
- A firewall and broadband internet connectivity are available.
- Both servers are HP ProLiant DL380 Gen10 models with the specification of 32GB RAM, 3x2TB HD including OS and database licenses.

55-inch LED screen for CCTV monitoring

one number of 52" inch LED screen for CCTV monitoring installed at the toll plaza admin block provides a viewof all the toll booths, important zones within the plaza where cash transactions take place(server room, control room, cash up).

Workstations in Control Room, PoS and Cash up room

Four Workstations are available in the control room for lane monitoring, administration, and audit with 8 GB RAM and 1 TB HDD.

.**UPS**

Following observations were made at toll plaza.

- A 6 KVA UPS is present in the UPS Room.
- A 3 KVA UPS is connected to each lane and is in the UPS room.
- Four 600 VA UPS units are connected to four workstations.
- Two 2KVA UPS is used for 2 Static Weigh Bridge operations.

Chapter 5
CONDITION ASSESMENT OF EXISTING PAVEMENT AND MAINTAINACE REQUIREMENT

CHAPTER 5. CONDITION ASSESMENT OF EXISTING PAVEMENT AND MAINTAINANCE REQUIREMENT

To evaluate the existing pavement condition of a Project Highway, investigations are to be carried out on the field to collect data from the field. The collected data is processed and analysed to obtain complete information on the pavement condition.

5.1 Pavement Condition Assessment for Technical Due Diligence

As a part of technical due diligence, the different investigations performed on the Project Highway are listed below.

- Assessment of Pavement Condition based on Visual Condition Survey

Based on the visual condition survey, the type of distress, its quantity, and severity along the Project Highway are obtained. The same is used to evaluate the present condition of pavement, which classifies pavement conditions ranging from 'Good' to 'Fair'.

The pavement investigation studies carried out on the Project Highway from 15th Sept to 17th Sept 2025 as a part of technical due diligence and their outcomes are detailed in the sections below.

Main Carriageway is comprised of flexible pavement except toll plaza (rigid pavement).

5.2 Review of Concession Agreement

As per Schedule K of the Concession Agreement, the Concessionaire shall repair and rectify the defects and deficiencies as specified below

Table 5-1: Major maintenance criteria as per CA

S. No	Nature of Defect or Deficiency	Time limit for Repair/Rectification
1	Roughness value exceeding 2750 mm in a stretch of 1km (as measured by a standardized rough meter/bump integrator)	180 Days
2	Cracking in more than 5% of road surface in a stretch of 1 km	30 days
3	Rutting exceeding 10mm in more than 2% of road surface in a stretch of 1km (measured with 3m straight edge)	30days

5.3 Review of Pavement Design Report

- The design of flexible pavement for has been carried out in accordance with guidelines of IRC-37-2018.
- Effective CBR value of 10% has been considered for the main carriageway.

Flexible Pavement shall be provided in entire project length, including Bus bays, truck lay bye, junctions, Slip Road and Way side amenities as per IRC 37:2018 except at plaza where rigid pavement shall be designed as per IRC 58:2015.

Flexible Pavement shall be designed for a minimum design period of 20 years or operation period, whichever is more. The thickness of sub base and base pavement section is designed for a minimum design period 20 year of the operation period, whichever is more and stage construction shall not be allowed.
The pavement shall be strengthened by bituminous overlay as and when required to extend the pavement life to full operation period. The thicknesses of bituminous overlay shall be determined on the basis of respective IRC codes.

Rigid Pavement shall be designed for a minimum design period of 30 years. Stage construction shall not be permitted.

Table 5-2: Pavement Design as per concession agreement

7. 4. Effective Subgrade CBR

Reference is drawn to the method of determination of effective CBR indicated in Clause 6.4 of IRC:37-2018. The effective CBR is computed by considering the CBR of the embankment material (CBR of 500mm embankment below subgrade) and top 500mm subgrade of compacted borrow material. Considering the CBR values of borrow area soil and embankment for pavement design purposes, the calculation for effective CBR is presented in *Annexure-4* and summarized below:

Table 1- Summary of Effective CBR

S. No.	Subgrade		Embankment		Effective CBR (%)
	Thickness	CBR	Thickness	CBR	
A	250	17	750	5	10.3
B	250	15	750	6	10.4
C	250	14	750	7	10.7
D	500	13	500	5	10.6
E	500	12	500	6	10.4
F	500	12	500	7	10.7
G	750	12	250	5	10.6
H	750	11	250	6	10.1
I	750	11	250	7	10.4

Based on the above, the effective CBR of 10% is adopted for the entire project highway.

Table 5-3: Design CBR as per pavement design report

- The thickness of the bituminous layers for the main carriageway has been designed for a service life of 20 years, considering a design traffic of 75 MSA.
- The pavement for the service road has been designed in accordance with IRC:37-2018, considering a design traffic of 10 MSA.
- The base year traffic Annual Average Daily Traffic (AADT), Growth Rate (GR), Vehicle Damage Factor (VDF), and the pavement thicknesses for both the main carriageway and the service road are provided below:

Table 5-4: Base year traffic (AADT)

AADT(FY-22)				
Bus	**LCV**	**2A**	**3A**	**MAV**
323	407	109	479	254

Table 5-5: Growth rates (GR)

Traffic Growth Rates (%)	Bus	LCV	2AT	3AT	MAT
Upto 2046	**5%**	**5%**	**5%**	**5%**	**5%**

Table 5-6: Vehicle damage factor (VDF)

Vehicle type	Estimated VDF
Bus	**1.58**
LCV	**2.23**
2A Truck	**2.55**
3A Truck	**4.60**
MAV	**6.70**

Table 5-7: Design Traffic for Project Highway (MCW)

Chainage (km)		Construction Period	Design Life (20 years)	Design traffic as per survey (MSA)	Min design traffic as per CA (MSA)	Adopted design traffic (MSA)
From	To					
26.900	96.000	2022-2024	2025-2044	31.99	75	75

Table 5-8: Design Traffic for service roads and slip roads

Construction Period	Design Life (20 years)	Adopted design traffic (MSA)
2022-2024	2025-2044	10

Table 5-9: Pavement Design Thicknesses of Flexible Pavement for Main carriageway as per Pavement Design Report

Layer	Thickness(mm)
Bituminous Concrete (BC)	40
Dense Bituminous Macadam (DBM)	75
Wet Mix Macadam (WMM)	150
Cemented Treated Sub-base (CTSB)	200

Table 5-10: Pavement Design Thicknesses for Service roads as per Pavement Design Report

Layer	Thickness(mm)
Bituminous Concrete (BC)	40
Wet Mix Macadam (WMM)	150
Cement Treated Sub-base (CTSB)	200

5.4 Pavement Distress Survey

A pavement condition survey gives an indication of the serviceability of the road pavement and is vital in deciding the maintenance activities. Some methods to conduct this survey are the Visual Condition Survey method (manual), Network Survey Vehicle (NSV) method, etc. However, Visual Condition Survey was conducted in this Project.

In a visual condition survey, the technical team makes a traverse along the Project Highway, observing the different types of distresses on the pavement surface, and observations are made on each distress type.

Distresses on flexible pavements include

- Approach settlement
- Patches
- Potholes
- Rutting
- Alligator Cracks
- Ravelling
- Road Damage
- Bleeding
- Profile undulations
- Mix design failure

Observations made during the visual condition survey for flexible Pavement are detailed below.

5.4.1 Approach Settlement

Approach settlement at flexible pavement refers to the uneven vertical movement or depression at the transition zone between a rigid structure and the flexible approach pavement, often resulting in a "bump" at one location at km 95.100 LHS and the same is rectified by concessionaire. The approach settlement rectification has been done at attached for reference.

Figure 5-1: Approach Settlement

Figure 5-2: Rectification done at approach settlement locations

5.4.2 Patches

The patch is an area of the pavement which have been repaired or replaced by new material to remove a certain defect on the pavement. The patch work has been rectified without any undulations and the photographs has been attached.

Figure 5-3: Patches

Figure 5-4: Rectification at patch work

5.4.3 Potholes

Potholes are small (or big, based on severity) bowl-shaped depressions on the pavement surface. In general, potholes are formed in later stages of highly ravelled or cracked pavement surface resulting in bowl-shaped depressions. The developed potholes is rectified and photographs has been attached for reference.

Figure 5-5: Patch work rectification

5.4.4 Rutting

A rut is a surface depression of pavement in the wheel paths, and pavement uplift may occur along the sides of the rut. Rutting stems from a permanent deformation in any pavement layers or subgrade usually caused by consolidated or lateral movement of the materials due to traffic load. The concessionaire has been rectified the rutting locations and is attached below.

Figure 5-6: Rutting

Figure 5-7: Rutting has been rectified by concessionaire

5.4.5 Alligator cracks

Alligator cracking also referred to as fatigue cracking or crocodile cracking, refers to a pattern of asphalt damage that resembles the scales on an alligator's skin. The cracks form co-joined, irregular "blocks' that are often four-sided, such as rectangles, but they can also have more sides and, on occasion, as few as three sides. The alligator crack has been rectified and rectification photographs has been attached.

Figure 5-8: Alligator Cracks

Figure 5-9: Alligator crack rectified.

5.4.6 Ravelling

Ravelling is wearing away of the pavement surface due to loss of bitumen binder and dislodged aggregate particles. This distress indicates that either the bitumen binder has hardened appreciably, or a poor-quality mixture is present. In addition, ravelling may be caused by certain types of traffic, for example, tracked vehicles. Softening of the surface and dislodging of the aggregates due to oil spillage and weathering are also included under ravelling. The rectification of ravelling photographs has been attached.

Figure 5-10: Ravelling

Figure 5-11: Rectification of ravelling

5.4.7 Bleeding

Bleeding occurs when asphalt binder fills the aggregate voids during hot weather and then expands onto the pavement surface. A film of asphalt binder on the pavement surface. It usually creates a shiny, glass-like reflecting surface that can become sticky when dry and slippery when wet. The bleeding locations has been addressed by Concessionaire.

Figure 5-12: Bleeding

Figure 5-13: Rectified at bleeding issue loctaions.

5.4.8 Profile Undulations

Profile undulation in a flexible pavement refers to irregular surface deformations such as corrugations or waves, typically caused by unstable surface course material due to stop-and-go traffic. The same is rectified by Concessionaire by doing inlay

Figure 5-14: Profile undulations

Figure 5-15: Rectified profile issue loctaions.

Table 5-11: Flexible Pavement MCW visual survey results

Condition	LHS		RHS	
	Length (km)	Length (%)	Length (km)	Length (%)
Good	66570	96%	62550	91%
Fair	2530	4%	6550	9%
Poor	0	0	0	0

5.4.9 Service road visual summary

The service road is damaged at few of the locations along the project stretch. Approach settlement and potholes has been observed.

Approach settlement has been observed from; km 27.4 to km 27.45, km 41.4 to km 41.42, km 49.2 to km 49.21, km 51.6 to km 51.61, alligator cracks have been observed from chainage km 61.15 to km 61.170, and potholes have been observed in km 55.65 to km 56.2 and km 90.15 to km 90.25.The same has been rectified by concessionaire.

5.5 Pavement Roughness

Roughness is one of the important parameters for determining the functional characteristics of pavements. According to the American Society for Testing and Materials (ASTM), roughness is defined as "the deviations of a pavement surface from a true planar surface with characteristic dimensions that affect vehicle dynamics, ride quality, dynamic loads, and drainage, for example, longitudinal profile, transverse profile and cross-slope".

The roughness of road surfaces is measured using different equipment/techniques such as rod and level survey, dip stick profiler, profilographs, response type road roughness meters, and profiling devices.

In India, the roughness is measured using the fifth wheel bump integrator (developed by CRRI) and is reported as Unevenness Index (UI) in mm/km.

In this report, roughness data is extracted from the NSV report, which measured using a profilometer on December 10, 2024, is incorporated,

Summary of the results as per shared NSV report is presented below.

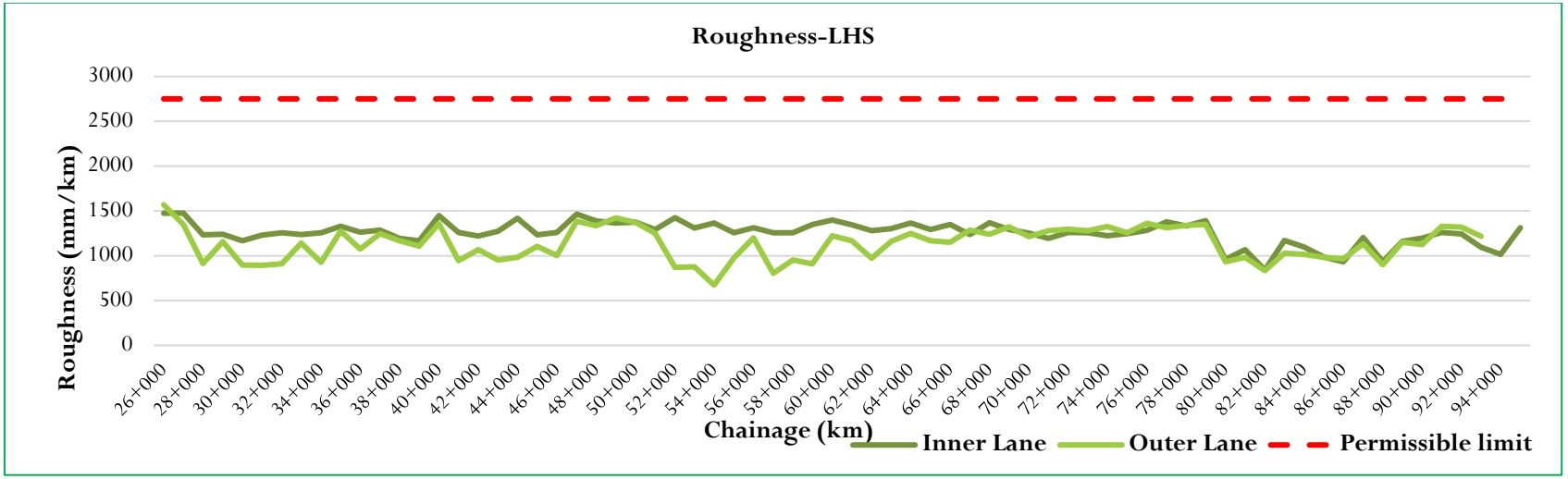


Figure 5-16: Flexible Pavement Roughness in LHS

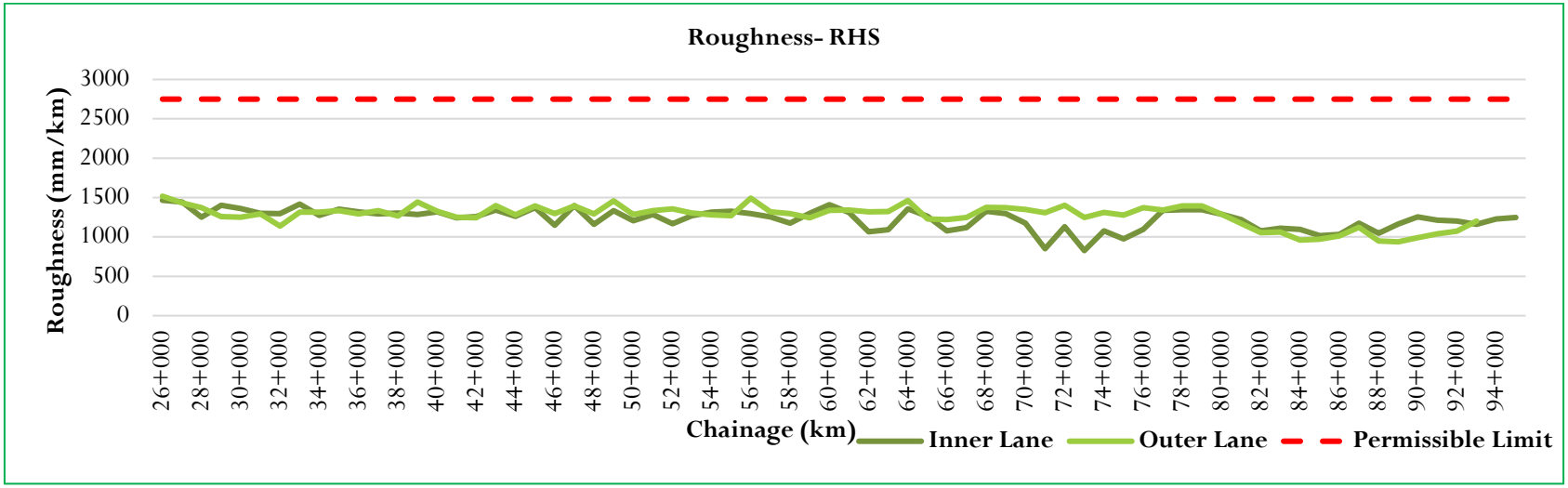


Figure 5-17: Flexible Pavement Roughness in RHS

Table 5-12: Summary of the Roughness values using NSV

Surface Condition	Roughness limit as per Concession Agreement	LHS MCW				RHS MCW			
		Inner (m)	Inner (%)	Outer (m)	Outer (%)	Inner (m)	Inner (%)	Outer (m)	Outer (%)
Good	<1800	69500	100%	67500	100%	69500	100%	67500	100%
Fair	1800-2750	0	0%	0	0%	0	0%	0	0%
Poor	>2750	0	0%	0	0%	0	0%	0	0%

From the MCW Roughness data, it can be observed that

- Around 100% of all lanes of the highway are in good condition in both directions.
- From the NSV data it is observed that the roughness values of most of the sections lies between 1000-1500 mm/km. However, based on the visual inspection such low values of roughness are not possible. Therefore, the latest roughness reports are required for verification.

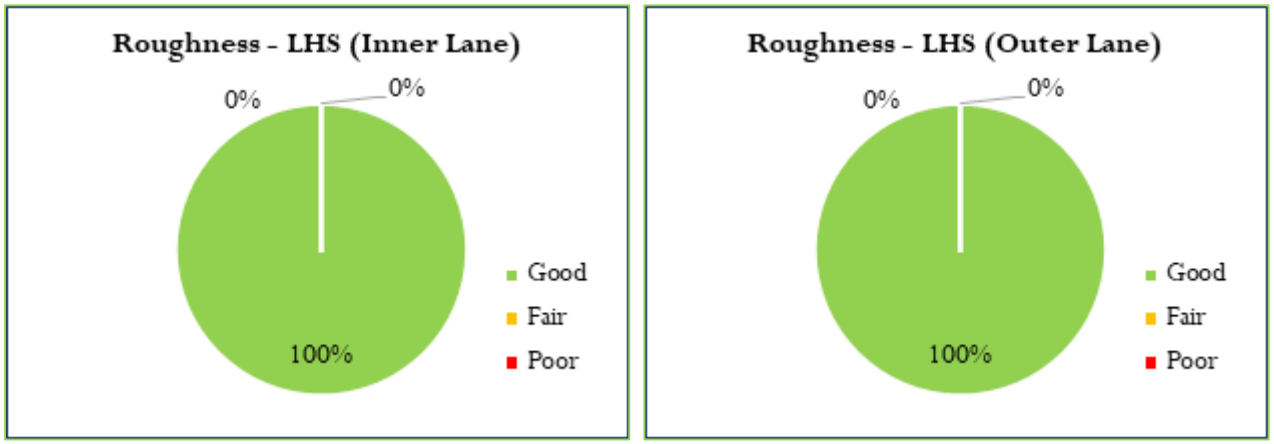


Figure 5-18: Pavement Roughness in LHS MCW

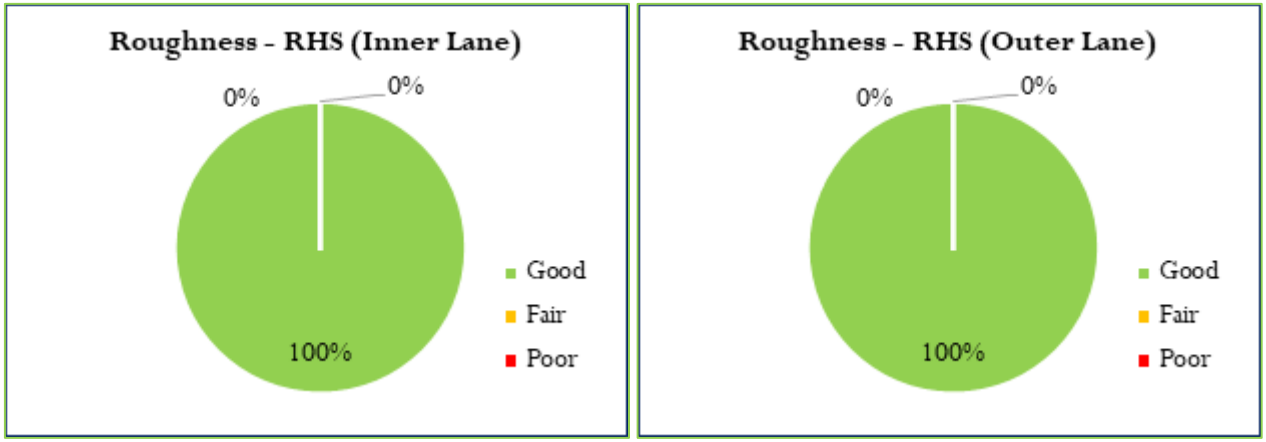


Figure 5-19: Pavement Roughness in RHS MCW

5.6 Pavement Rutting

Rutting is longitudinal depression or groove in the pavement along the wheel path. Rutting is categorized into three types and defined by the cause and layers in which rutting occurs. It can be characterized by two components of the original (initial) pavement profile change, which are direct consequences of permanent deformation such as uplift and downward deformation.

Rutting data is not available in the given NSV report.

Chapter 6
REVIEW OF STRUCTURES

CHAPTER 6. REVIEW OF STRUCTURES

Review of structures inventory and detailed condition survey of structures are the essential requirements for preparation of estimates for Capex and also for O & M cost for Highway Structures. Keeping in view of importance of this task, review of inventory and conducting visual condition survey were carried out as per procedure and guidelines prescribed in IRC: SP:35 bridge engineers. The details of condition survey of structures were furnished below,

6.1 Visual Condition Survey

Salient features for which data is collected as part of conditional survey are in accordance with IRC: SP: 35 Proforma. Main features recorded as part of detailed condition survey are listed below.

- Condition of wearing coat on deck slab such as potholes, cracks, and patches.
- Condition of expansion joints such as bump in riding, leakage in expansion joint, damaged elastomer, silt and debris filled in expansion joint gap.
- Condition of RCC railing/ safety barrier/ parapet wall.
- Condition of drainage spouts and down take pipes.
- Condition of super structure and substructure like spalling of concrete, cracks, honeycombing etc., in concrete surfaces.
- Condition of bearings.
- Condition of RE walls (reinforced earth walls).
- Corroded reinforcement exposed anywhere in deck slab and substructure.
- Condition of foundations like scouring, erosion of piles etc., if any at visible locations.

6.2 General

Details of various types of structures as per site inventory survey are furnished below,

S. no	Type of Structure	As per Schedule (no's)	As per site inspection (no's)	Remarks
1	Major bridge	04	04	

S. no	Type of Structure	As per Schedule (no's)	As per site inspection (no's)	Remarks
2	Minor Bridge	07	07	
3	ROB	02	02	
4	Flyover	02	02	
5	VUP	13	13	
6	LVUP	12	12	
7	SVUP	06	06	
8	Box Culvert	140	140	
	Total	**186**	**186**	

The condition survey of all structures was conducted by a team of bridge experts by visual inspection. However, it should be noted that due to inaccessibility (MBIU was not engaged), the soffit of the superstructure, pedestals, and bearings could not be thoroughly inspected. Nevertheless, all defects visible to the naked eye from the ground level/riverbed level were identified and taken into consideration.

6.3 Major Bridges:

There are four major bridges on the Project stretch.

Table 6-1: Inventory details of the Major bridges

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	27.850	2 x 30.00 + 1 x 35.00	95.00	LHS	
		2 x 30.00 + 1 x 35.00	95.00	RHS	
2	47.360	1 x 7.00 + 4 x 30.00 + 1 x 7.00	134.00	LHS	
		1 x 7.00 + 4 x 30.00 + 1 x 7.00	134.00	RHS	
3	60.440	5 x 30.00	150.00	LHS	
		5 x 30.00	150.00	RHS	
4	76.990	4 x 30.00	120.00	LHS	
		4 x 30.00	120.00	RHS	

Figure 6-1: Major Bridges

6.4 Minor Bridges:

There are seven minor bridges on the Project stretch.

Table 6-2: Inventory details of the Minor bridges

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	29.375	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
2	29.515	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
3	29.720	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
4	33.174	1 x 12.00	20.00	LHS MCW	

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
		1 x 12.00	20.00	LHS SR	
		1 x 12.00	20.00	RHS MCW	
		1 x 12.00	20.00	RHS SR	
5	34.710	1 x 12.00	12.00	LHS	
				RHS	
6	47.820	2 x 25.00	50.00	LHS	
		2 x 25.00	50.00	RHS	
7	95.194	2 x 25.00	50.00	BHS (Bidirectional)	

Figure 6-2: Minor Bridges

6.5 Rail Over Bridges:

There is two ROB on the Project stretch.

Table 6-3: Inventory details of the ROB

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	35.246	2 x 18.00 + 1 x 36.00	72.00	LHS	
				RHS	
2	78.694	2 x 30.00 + 1 x 36.00	96.00	LHS	
				RHS	

Figure 6-3: ROBs

6.6 Flyover:

There are two Flyovers on the Project stretch.

Table 6-4: Inventory details of the Flyovers

S. no	Chainage, km	Span arrangement, m	Total length, m	Side	Remarks
1	26.909	2 x 30.00	60.00	LHS	
				RHS	
2	92.613	2 x 30.00	60.00	LHS	
				RHS	

Figure 6-4: Flyovers

6.7 VUP:

There are thirteen Vehicular underpasses (VUPs) on the Project Stretch.

Table 6-5: Inventory details of the VUP

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	27.220	1 x 20.00	20.00	LHS	
				RHS	

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
2	35.495	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
3	40.481	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
4	43.639	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
5	45.428	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
6	50.974	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
7	56.099	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
8	61.335	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
9	74.507	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
10	79.383	1 x 30.00	30.00	LHS	
		1 x 30.00	30.00	RHS	
11	83.177	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
12	90.240	1 x 20.00	20.00	LHS	
		1 x 20.00	20.00	RHS	
13	95.630	1 x 20.00	20.00	BHS	

Figure 6-5: VUPs

6.8 LVUP:

There are twelve Light vehicular underpasses (LVUPs) on the Project stretch.

Table 6-6: Inventory details for the LVUPs

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	30.719	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
2	33.266	1 x 12.00	12.00	LHS	
				RHS	
3	36.839	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
4	42.079	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
5	45.082	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
6	49.338	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
7	67.986	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
8	70.367	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
9	72.292	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
10	75.817	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
11	84.835	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	
12	87.369	1 x 12.00	12.00	LHS	
		1 x 12.00	12.00	RHS	

Figure 6-6: LVUPs

6.9 SVUP:

There are six small vehicular underpasses (SVUPs) on the project stretch.

Table 6-7: Inventory details of the SVUPs

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
1	37.257	1 x 7.00	7.00	LHS	
		1 x 7.00	7.00	RHS	
2	40.336	1 x 7.00	7.00	LHS	
		1 x 7.00	7.00	RHS	
3	47.710	1 x 7.00	7.00	LHS	
		1 x 7.00	7.00	RHS	
4	48.509	1 x 7.00	7.00	LHS	
		1 x 7.00	7.00	RHS	

S. no	Chainage, km	Span Arrangement, m	Total Length, m	Side	Remarks
5	77.612	1 x 7.00	7.00	LHS	
		1 x 7.00	7.00	RHS	
6	91.330	1 x 7.00	7.00	LHS	
		1 x 7.00	7.00	RHS	

Figure 6-7: SVUP

6.10 Culverts:

There are one hundred forty box culverts on the Project stretch.

Table 6-8: Inventory details of the Box culverts

S. no.	Type of culverts	No. of. culverts	Remarks
1	Box Culverts	140	

Figure 6-8: Box culverts

6.11 Key Observations on Structures:

The overall condition of newly constructed structures was good with few minor defects. It is to be noted that as per the discussions with GR team, they have shared the latest MBIU report. After reviewing the report, there were a few additional observations from the MBIU report that were not covered during our visual inspection were considered. Following are the major observations on the project,

- Leaching was observed on soffit of deck slab in some of the spans of major bridges, minor bridges and ROB.
- Strip seal elastomers were damaged /punctured in some of the expansion joints. This can be rectified in routine maintenance.
- Misalignment / bulging of RE wall was observed at some of the locations. Periodic monitoring required to ascertain the RE wall bulging the cost for the same is considered in capex.
- Hairline cracks were observed on soffit of deck slab in few on the bridges as mentioned in the MBIU report.
- At both the flyovers, pier cap cantilever portion edges were projected beyond the median width of the crossroad carriageway which is an obstruction to the crossroad users and safety barication was observed under the crossroad carriageway at the pier location.

- Water leakage from RE wall observed at ROB km 35.246 and VUP km 95.630.
- PVC down take pipes were missing on approaches of RE wall along the stretch and at grade structure crossroad locations.
- Approaches settlements were observed at the some of the structure. This can be rectified in routine maintenance.

Chapter 7
GENERAL SAFETY CONCERNS ALONG THE PROJECT STRETCH AND SUGGESTED IMPROVEMENTS

CHAPTER 7. GENERAL SAFETY CONCERNS ALONG THE PROJECT STRETCH AND SUGGESTED IMPROVEMENTS

7.1 General

This chapter presents general road safety concerns observed along the project stretch and improvements suggested to address the same.

7.2 Site visit

Road Safety along the highway depends upon the condition of various components of the highway, such as coordination between horizontal and vertical alignment, provision and placement of road furniture, intersection geometry, availability of adequate sight distance, night-time visibility along the highway, etc. It is essential to understand all these aspects of the highway from a point of view of safety of each type of road user. The purpose of this assignment is to understand the road safety worthiness of project stretch and quantify road furniture items that are required as per the provisions of the Concession Agreement (CA). The report also summarizes high-risk safety concerns that persist for a reasonable length along the project stretch that helps improve the safety of road user upon implemented. It may be noted that, few minor observations that are part of regular O&M activities have not been quantified in this report and geometrical improvements along with blackspots are not reviewed as part of this assignment. The scope has been constrained keeping in view the operational status of the project stretches, and the focus is largely on the major safety concerns and deviations from CA provisions in road furniture, if any.

The Safety Team of CUBE Highways Technologies Pvt Ltd. visited the project stretch from 15th to 17th September 2025.

It may be noted that the findings and suggestions in this chapter are based on a review of available information/documents. This chapter mainly focuses on general safety concern-related issues along the project stretch, and any major geometrical improvements, or location-specific improvements are not covered. The chainages mentioned in the report may vary from the ground by approximately 50 to 100 m within acceptable tolerances.

Along with manual observations, the entire project stretch is video graphed using Vehicle Video Recorder Driver's (VVR) Eye Level Video. A snapshot of output obtained from the app view is shown below: VVR records the following details along with the video:

- Video recording (front view – Driver's Eye Level View)
- Location of Video on the Google Map (along with coordinates of the location)
- Speed of the Recording Vehicle, in km/hour

7.3 Summary of safety related documentation

The following table provides the summary of safety related documents

Table 7-1: Summary of pre-bid documents related to road safety aspects

S. No.	Particular	Remarks
1	Concession Agreement (CA) -*M/S GR Ujjain Badnawar Highway Private Limited*	• All clauses and safety-related warrants have been reviewed.
2	Approved Drawings	• Plan & Profile, Road signage and Road marking and Typical cross-section drawings, etc, have been received and reviewed.
3	IE MPR, April 2025	• Road safety–related observations were not covered in the IE MPR.
4	Concessionaire MPR, August 2025	• The report highlights the overall summary of the project in terms of permissions & clearances, utility shifting details, COS, physical progress, etc.
5	Retro-Reflectivity Test for Road Signages and Road Marking *(Nov 2024)*	• The report presents the retro-reflectivity tests conducted on thermoplastic road markings and signage, and the results confirm that both the markings and signboards meet the required criteria as per the applicable IRC specifications.
	Illumination Test for Highway Lighting *(Sept 2024)*	• The report presents the illumination tests conducted for highway lighting intensity, and the results confirm that the lighting levels meet the required criteria as per the applicable IRC specifications
5	Compliance of Final Pre-Opening Stage Road Safety Audit Report by IE (*TechMoDec Consultants Pvt Ltd*) Dec, 2024	• The report summarises the key safety issues related to signboards, road markings, junction development, and incomplete safety installations such as safety barriers, along with the corresponding compliance status (refer to the following section 1.4 for more details).

7.4 Summary of compliance of final pre-opening road safety audit report

: The Pre-Completion RSA report broadly covers the key provisions, rectifications, and improvements related to the following aspects. A quick summary of these points, along with a sample image from the RSA report, is provided below.

- Missing road markings (longitudinal, transverse, hazard) were addressed.
- Missing signposts were installed.
- Safety barriers at high embankments have been completed.

- Incorrect or missing MBCB & rigid crash barrier connections were corrected.
- Gaps in MBCB were closed.
- Gap has been identified between the rigid crash barrier and PGR
- Painting works at NJCB, PGR, etc. have been completed.
- Retroreflective tape on the metal beam crash barrier has been provided.
- Spillage of undesirable materials was cleared from the project stretch.

The following sample pictures indicate rectification of hazardous objects represented in pre-opening road safety audit report.

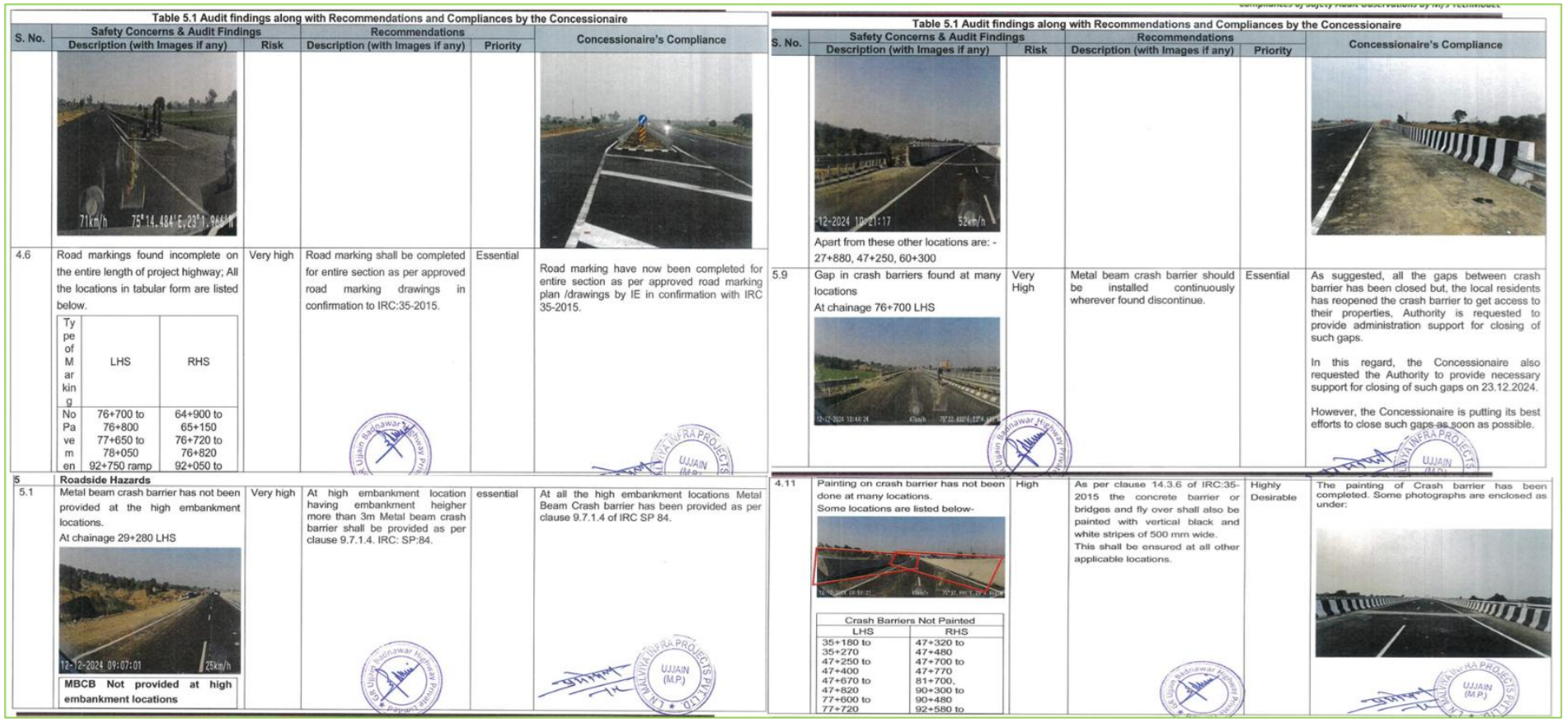


Table 5.1 Audit findings along with Recommendations and Compliances by the Concessionaire

S. No.	Safety Concerns & Audit Findings: Description (with Images if any)	Risk	Recommendations: Description (with Images if any)	Priority	Concessionaire's Compliance
4.6	Road markings found incomplete on the entire length of project highway; All the locations in tabular form are listed below. Type of Marking: LHS: No Pavement: 76+700 to 76+800, 77+650 to 78+050, 92+750 ramp; RHS: 64+900 to 65+150, 76+720 to 76+820, 92+050 to	Very high	Road marking shall be completed for entire section as per approved road marking drawings in confirmation to IRC:35-2015.	Essential	Road marking have now been completed for entire section as per approved road marking plan /drawings by IE in confirmation with IRC 35-2015.
5	**Roadside Hazards**				
5.1	Metal beam crash barrier has not been provided at the high embankment locations. At chainage 29+280 LHS **MBCB Not provided at high embankment locations**	Very high	At high embankment location having embankment heigher more than 3m Metal beam crash barrier shall be provided as per clause 9.7.1.4. IRC: SP:84.	essential	At all the high embankment locations Metal Beam Crash barrier has been provided as per clause 9.7.1.4 of IRC SP 84.

Table 5.1 Audit findings along with Recommendations and Compliances by the Concessionaire

S. No.	Safety Concerns & Audit Findings: Description (with Images if any)	Risk	Recommendations: Description (with Images if any)	Priority	Concessionaire's Compliance
	Apart from these other locations are: - 27+880, 47+250, 60+300				
5.9	Gap in crash barriers found at many locations At chainage 76+700 LHS	Very High	Metal beam crash barrier should be installed continuously wherever found discontinue.	Essential	As suggested, all the gaps between crash barrier has been closed but, the local residents has reopened the crash barrier to get access to their properties, Authority is requested to provide administration support for closing of such gaps. In this regard, the Concessionaire also requested the Authority to provide necessary support for closing of such gaps on 23.12.2024. However, the Concessionaire is putting its best efforts to close such gaps as soon as possible.
4.11	Painting on crash barrier has not been done at many locations. Some locations are listed below- Crash Barriers Not Painted: LHS: 35+180 to 35+270, 47+250 to 47+400, 47+670 to 47+820, 77+600 to 77+720; RHS: 47+320 to 47+480, 47+700 to 47+770, 81+700, 90+300 to 90+480, 92+580 to	High	As per clause 14.3.6 of IRC:35-2015 the concrete barrier or bridges and fly over shall also be painted with vertical black and white stripes of 500 mm wide. This shall be ensured at all other applicable locations.	Highly Desirable	The painting of Crash barrier has been completed. Some photographs are enclosed as under:

7.5 Identified safety concerns along the project stretch

Keeping in view the scope of the assignment, safety concerns have been recorded on site and reported in the table below. The remarks and recommendation column includes information on road safety concerns related to installation errors of existing road furniture items, Additional requirements of road furniture items, and Junctions/Geometry/location-specific improvements as per pre-bid documents, i.e., *(Schedules, Pre-compliance Road Safety Audit Report, MPR by IE, etc).*

Risk and priority of each safety concern are also included as per the following criteria given in line with IRC: SP:88-2019 (Manual on Road Safety Audit).

- Risk categories for identified safety concern: Very High, High, and Medium
- Priority level for recommendations: Essential, Highly Desirable, and Desirable

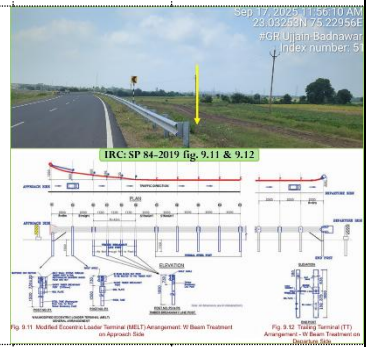
Table 7-2: Identified safety concerns along the Project Road

<table>
<tr><th rowspan="2">S No.</th><th colspan="2">Safety concern</th><th colspan="2">Recommendation</th><th rowspan="2">Type of concern</th></tr>
<tr><th>Current site condition</th><th>Risk</th><th>Recommendation and Remarks</th><th>Priority</th></tr>
<tr><td>1</td><td colspan="5">Safety Barrier</td></tr>
<tr><td>A</td><td>Inadequate transition arrangements between MBCB & Rigid barrier</td><td>High</td><td>Recommendation</td><td>Essential</td><td>O&M Issue</td></tr>
<tr><td></td><td colspan="4">Safety observation: During the site visit, the transition arrangements between MBCB & Rigid barrier were found to be inadequate at a few places.

Safety concern: Unprotected gap between W-Beam and rigid barrier connection locations is highly hazardous for fast-moving traffic: It might lead to severe damage to the vehicle or of vehicle falling from the height, respectively.

Recommendation:
• As per IRC: SP:84-2019, Clause 9.7.2, "…The W-beam to concrete transition shall be carried out by decreasing the post spacing, nesting one rail behind another and using steel section behind the W-beam. The transition between W-beam and concrete barrier is detailed in fig. 9.14…".
• In the interest of road-user safety and in accordance with IRC requirements, the transition arrangement between MBCBs and rigid barriers requires improvement. This concern was also highlighted in the Final Pre-Opening Stage Road Safety Audit Report dated December 2024.</td><td>
Improper MBCB & Rigid crash barrier transition arrangement

Details at A - Connection Details of W beam to Concrete barrier</td></tr>
<tr><td>B</td><td>Gap in MBCB</td><td>High</td><td>Recommendation</td><td>Essential</td><td>O&M Issue</td></tr>
<tr><td></td><td colspan="4">Safety observation: During the site visit, a gap in the MBCB was observed at a few locations. The following sample photographs present the gap in MBCB along the Project stretch.</td><td></td></tr>
</table>

S No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
	Safety concern: The gap in MBCB is highly unsafe for fast-moving traffic. Such discontinuity in the crash barrier can cause vehicles to penetrate through the opening, leading to severe accidents, rollovers, or falling off the embankment. **Recommendation:** As per the Compliance of Pre-Opening RSA report dated Dec 2024, the Gap in MBCB has been closed, but the residents have reopened the crash barrier to get access to their properties. Authority is requested to provide administrative support for closing of such gaps.				
C	**Damaged Metal Beam Crash Barrier - MBCB**	**Low**	**Recommendation**	**Essential**	**O&M Issue**
	Safety observation: Upon visual inspection, at a few locations, damaged MBCB has been observed along the Project stretch. The image illustrates a sample of the damaged MBCB along the Project stretch. **Recommendation:** Damaged MBCB shall be rectified, and the missing plates shall be provided at such locations.				
D	**Improper start and end treatment of MBCB**	**High**	**Recommendation**	**Essential**	**O&M Issue**
	Safety observation: As shown in the photograph, the start and end treatments of the MBCB are improper. In several locations, there is an abrupt start or end to the barrier. In some instances, a half bullnose arrangement has been provided at the start and end sections of the MBCB. **Recommendation:** Modified Eccentric Loader Terminal (MELT) or P4 and Tailing Terminal (TT) arrangement works better than the abrupt end (turned down) type arrangement, as the latter tends to launch the high-speed errant vehicle in the air, leading to grievous or even fatal accidents. Hence, in view of road user safety, it is suggested to review the rectification of end treatments as per IRC: SP: 84 -2019, Clause 9.7.2.				
E	**Height of existing Metal Beam Crash Barrier -MBCB**	**High**	**Recommendation**	**Essential**	**O&M Issue**

S No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
	Safety Observation: During the site visit, about 1km length of existing MBCB height along Project Road is observed to be inadequate, i.e. around 0.6 to 0.65 m from the road surface, as shown in photographs below. Additionally, with each overlay cycle, the height of the existing MBCB is progressively reduced. **Safety Concern:** In case of vehicle runoff or loss of control, the car bumper should be restrained by the W-beam shape, and parallelly through W-beam deflection, which would push the vehicle back toward the carriageway. However, the current reduced height may be insufficient to prevent errant vehicles from toppling over the barrier, leading to severe accidents. **Recommendation**: As per clause figure no. 9.9, IRC: 84: 2019, The height of w-beam crash barrier needs to be "730+-25". In view of road user safety, the W-beam with standard height needs to be replaced to prevent errant vehicles from toppling over the barrier, leading to severe accidents **Remarks:** Low height MBCB at Km 57.400 to 57.600 (Total length = 200m)				
F	**Wrong overlapping of MBCB plates**	**-**		**-**	**No Issue**
	No Issue Observed.				
G	**MBCB Setback distance**	**-**		**-**	**No Issue**
	MBCB setback distance is adequate.				
H	**Missing MBCB at hazardous locations**	**Very high**	**Recommendation**	**Essential**	**New Installation**
	Safety Concern: During the site visit, it was observed that MBCB was missing at multiple hazardous locations along the Project stretch, such as 1. At High Embankment (>3m) with curve locations 2. Along the Water Bodies **Recommendation:** As per clause 9.7.1.4 IRC: 84: 2019, "Embankment height 3 m or more shall have a safety barrier at the edge of formation". In view of road user safety, W-beam needs to be provided at high embankments with curve locations and along the water bodies. **Remarks:** Installation of MBCB along the High Embankment with curve section and Water Bodies MCW on LHS Km (26.300 to 26.350, 29.400 to 29.450, 29.600 to 29.650, 48.350 to 48.400, 52.000 to 52.150, 56.750 to 56.900, 75.400 to 75.450,				

S No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
	and 75.950 to 76.000) (Length = 650m) MCW on RHS Km (89.900 to 89.750, 51.750 to 51.650, 48.620 to 48.560, 40.200 to 39.500, and 28.800 to 28.700) (Length = 1110m)				
I	**Welded connection of MBCB Plates**	**-**		**-**	**No Issue**
	No issue was observed.				
J	**Wire Rope Barrier Setback Distance**	**-**		**-**	**NA**
	NA		NA		
K	**Wire Rope Barriers Distance from the face of the kerb**	**-**		**-**	**NA**
	NA		NA		
L	**Inadequate height of Rigid Crash Barrier (RCB)**	**-**		**-**	**No Issue**
	No Issue Observed				
2	**Pedestrian Guard Rail (PGR)**				
A	**New installation of PGR**	**-**		**-**	**No Issue**
	No Issue Observed				
B	**Damaged PGR**	**-**		**-**	**No Issue**
	No Issue Observed				
C	**Improper connection between Barrier and PGR**	**Medium**	**Recommendation**	**Desirable**	**O&M issue**
	Safety observation: Gap between PGR and rigid barrier at various locations is highly hazardous for fast-moving traffic: It might lead to severe damage to vehicles or falling of vehicles from that gap/height and might collide/hit to other road users. The picture below shows the current scenario of the issue on site. **Recommendation:** • As per standard industrial practices, providing a proper connection between the PGR and the rigid barrier is important for the safe and smooth transition of an errant vehicle. • **Transition arrangement between PGR and RCB:** Provide an MBCB about 10m in between RCB and PGR, ensuring a proper transition arrangement between the MBCB and the rigid crash barrier as per Fig. 16 of IRC: 119-2015.				Installation error

S No.	Safety concern		Recommendation		Type of concern
	Current site condition	**Risk**	**Recommendation and Remarks**	**Priority**	
3	**Missing/Damaged Median walls in b/w structures**	**-**		**-**	**No Issue**
	No Issue Observed				
4	**Issue with existing solar blinkers and additional requirements**	**High**	**Recommendation**	**Essential**	**O&M issue**
	Safety Concern: It was also observed that solar blinkers are missing at the critical locations, such as the exit from the SR to the side road at junction locations. This poses a safety concern, especially during nighttime or low-visibility conditions, as it may lead to confusion or accidents due to the lack of proper visual guidance **Recommendation:** As per CA, Schedule C, clause 2, b) Road Side Furniture V) Traffic Beacons: "These shall be provided on the entire project highway near pedestrian crossings, public gathering places (Educational Institutions, Hospitals, Worship places etc.), cross roads at Major and Minor Junctions and wherever required as per Manual". It is recommended to install solar blinkers at all such locations.				 Missing Solar Blinkers	
5	**Highway Lighting**	**Medium**	**Recommendation**	**Desirable**	**O&M issue**
	The streetlight design layout, including configuration and specifications, has been received and reviewed. However, noticeable shadow patterns were observed between poles, raising concerns regarding the adequacy of the existing streetlight arm lengths, bulb specifications, etc. Therefore, a detailed streetlight illumination assessment is recommended to ensure compliance with required standards and uniform lighting.				 Highway Lighting	
6	**Issue with an existing and additional signboard**	**-**		**-**	**No Issue**
	No Issue Observed.				
7	**Delineators/Guard Post**	**-**		**-**	**No Issue**
	Safety Concern: During the site visit, delineators were not observed at the high embankment and curve locations (<3m) along the Project stretch. Delineators are designed - mark the edges of the roadway and provide guidance - drivers about the upcoming alignment. **Recommendation:** As per CA, Schedule C, clause 2, b) Roadside Furniture VII) Delineators: "Delineators for nighttime visibility shall be provided for the entire project Highway as per Manual". Road delineators shall be provided at high embankment and curve sections along the Project stretch.					
8	**Maintenance Issues of Existing Pavement**	**-**		**-**	**No Issue**

S No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	Marking				
	No Issue Observed.				
9	**Safety Measures at critical locations, i.e., Transverse Bar Marking**	**-**		**-**	**No Issue**
	No Issue Observed.				
10	**Road Studs**	**-**		**-**	**No Issue**
	No Issue Observed.				
11	**Road Geometry**				
A	**Absence of storage lane at median opening/U-turn locations**	**-**		**-**	**NA**
	No Issue Observed.				
B	**Un-Authorized Median Openings (UMO)**	**-**		**-**	**No Issue**
	No Issue Observed.				
C	**Improper Entry and Exit Arrangement**	**-**		**-**	**No Issue**
	No Issue Observed.				
D	**Improper connections of Minor Roads**	**-**		**-**	**No Issue**
	No Issue Observed.				
12	**Night-time visibility -Retroreflective stickers on MBCB**	**-**		**-**	**No Issue**
	No Issue Observed.				
13	**Improper maintenance of the Earthen Shoulder**	**-**		**-**	**No Issue**
	No Issue Observed.				
14	**Landscaping and Tree Plantation**				
A	**Issue with Median plantation**	**-**		**-**	**No Issue**
	No Issue Observed.				
B	**Median Plantation in No Plantation Zone**	**-**		**-**	**NA**

S No.	Safety concern		Recommendation		Type of concern
	Current site condition	Risk	Recommendation and Remarks	Priority	
	No issue was observed.				
15	**Truck Lay Bays/Bus Bays/Wayside Amenities**				
A	**Truck Lay Bay Layout**	**-**		**-**	**NA**
	No Issue Observed				
B	**Bus Bays and Bus Shelters**	**-**		**-**	**NA**
	No Issue Observed.				
C	**Rest Areas / Wayside Amenities**	**-**		**-**	**No Issue**
	No Issue Observed.				
16	**Other General Issues**				
A	**Water Stagnation**	**-**		**-**	**No Issue**
	No Issue Observed.				
B	**Encroachment by Temporary Shops**	**-**		**-**	**No Issue**
	No Issue Observed.				
C	**High Transmission Line Vertical Clearance**	**-**		**-**	**No Issue**
	No issue was observed.				
D	**Ongoing Construction-Related Issues**	**-**		**-**	**No Issue**
	No issue was observed.				
E	**Parking on Paved Shoulder**	**-**		**-**	**No Issue**
	No Issue Observed.				
F	**Sudden Edge Drop at the Shoulder**	**-**		**-**	**No Issue**
	No Issue Observed.				
G	**Rigid Electrical Poles on shoulders**	**-**		**-**	**No Issue**
	No Issue Observed.				
17	**Improper access arrangement to Fuel stations**	**-**		**-**	**NA**
	No Issue Observed.				

7.6 Summary of compliance of final pre-opening road safety audit report

The following table represent the identified safery observations along the project stretch.

Table 7-3: Summary of identified road safety concerns and corresponding quantities along the Project Road

S. No.	Safety observations	Identified Locations	Remarks
1	Missing MBCB along high embankment and critical locations	**Priority I: Along the High Embankment with curve section and Water Bodies** For MCW on LHS Km (26.300 to 26.350, 29.400 to 29.450, 29.600 to 29.650, 48.350 to 48.400, 52.000 to 52.150, 56.750 to 56.900, 75.400 to 75.450, and 75.950 to 76.000) (Length = 650m) For MCW on RHS Km (89.900 to 89.750, 51.750 to 51.650, 48.620 to 48.560, 40.200 to 39.500, and 28.800 to 28.700) (Length = 1110m) **Total Length = 1760 m** **Priority II: Along the High Embankment** For MCW on LHS Km (28.050 to 28.150, 51.850 to 51.900, 53.100 to 53.600, 58.400 to 58.740, 59.250 to 59.300, 59.400 to 59.970, 69.400 to 69.500, 76.600 to 76.650, 79.900 to 80.300, 80.100 to 80.350, 80.400 to 80.600, 81.350 to 81.650, and 88.550 to 88.650) (Length = 3010m) For MCW on RHS Km (89.300 to 88.900, 80.600 to 80.250, 76.650 to 76.550, 69.900 to 69.650, 60.100 to 59.650, 59.600 to 58.650, 53.400 to 53.250, 52.200 to 52.000, 45.900 to 45.650, and 34.650 to 34.450) (Length = 3300m) **Total Length = 6310 m**	As per clause 9.7.1.4 IRC: 84: 2019, "*Embankment height 3 m or more shall have a safety barrier at the edge of formation*". *In view of road user safety, W-beam needs to be provided at high embankments with curve locations and along the water bodies.* It is suggested to review the provision of MBCB at priority II locations.
2	Low height MBCB	Low height MBCB at Km 57.400 to 57.600	As per clause figure no. 9.9, IRC: 84: 2019, The height of w-beam

S. No.	Safety observations	Identified Locations	Remarks
	(<700mm)	**Total Length = 200 m**	crash barrier needs to be "730+-25".
3	Improper start and end treatment of MBCB	at Km 75.400, 76.300, 91.100, and 94.620	It is suggested to review the rectification of end treatments as per IRC: SP: 84 -2019, Clause 9.7.2.
4	Improper connection between RCC Crash Barrier and PGR	At Km (75.250, 91.900, 42.500, 35.800, 33.700, 32.600, and 28.500) on BHS of the MCW (140 m)	Transition arrangement between PGR and RCB: Provide an MBCB about 10m in between RCB and PGR, ensuring a proper transition arrangement between the MBCB and the rigid crash barrier as per Fig. 16 of IRC: 119-2015
5	Missing delineators along embankment and curve locations	**LHS:** Km (37.900 – 38.500, 39.150 – 39.900, 41.000 – 41.400, 45.500 – 45.800, 50.150 – 50.400, 52.900 – 53.500, 62.900 – 63.400, 64.200 – 64.400, 69.950 – 70.050, 73.200 – 73.700, 82.100 – 82.300, 88.100 – 88.400, and 94.200 – 94.500) (125 Nos.) **RHS:** Km (59.600 – 59.300, 53.750 – 53.300, 76.650 – 76.550, 69.900 – 69.650, 59.900 – 59.650, 59.600 – 58.650, 53.400 – 53.250, 48.800 – 48.700, 46.000 – 45.900, and 39.900 – 39.400) (79 Nos.)	As per CA, Schedule C, clause 2, b) Roadside Furniture VII) Delineators: "Delineators for nighttime visibility shall be provided for the entire project Highway as per Manual".
6	Missing Solar Blinkers	**LHS:** At Km (33.220, 35.505, 36.850, 37.280, 40.348, 40.495, 42.100, 43.650, 45.095, 49.354, 49.460, 50.990, 55.430, 57.395, 61.440, 66.210, 68.010, 72.345, 73.437, 74.205, 74.550, 75.835, 77.625, 78.840, 79.400, 83.177, 84.360, 84.845, 85.875, 87.380, 90.270, 92.760, 95.640) (34 Nos.) **RHS:** At Km (33.260, 40.332, 40.470, 42.055, 43.635, 45.070, 45.410, 56.985, 57.885, 58.535, 61.320, 61.700, 63.255, 66.206, 67.940, 72.280, 74.165, 77.605, 78.760, 79.370, 84.830, 85.126, 87.365, 87.685, 88.955, 92.150, 92.470) (27 Nos.)	As per CA, Schedule C, clause 2, b) Roadside Furniture V) Traffic Beacons: "*These shall be provided on the entire project highway near pedestrian crossings, public gathering places (Educational Institutions, Hospitals, Worship places etc.) crossroads Major and Minor Junctions and wherever required as per Manual*".

Chapter 8
CHANGE OF SCOPE

CHAPTER 8. CHANGE OF SCOPE

8.1 Change of Scope (COS) details

Table 8-1: List of change of scope

S. No.	Description	Approval In Principle Approval Amount (Rs.)	Net Financial impact as per PIU	Difference
1 (A)	Cost of Box Culvert due to increase of height at Ch 93+905 (1x6x3 to 1x6x4)	6,45,407.00	6,45,407.00	
1 (B)	Cost of Box Culvert due to increase of height at Ch 94+820 (1x6x3 to 1x6x4)	6,49,844.00	6,49,844.00	
2	Cost of Box Culvert due to increase of Size at Ch 81+690 (1x2x3 to 1x6x4)	43,24,796.00	39,86,560.00	3,38,236.00
3	Cost of Approaches A2 side at SVUP 77+612 Including Service Road due to Local Public Demand and as per instruction Authority	2,01,48,941.00	2,01,48,941.00	
4	Cost of additional Utility Shifting work (Narmada Pipeline)	44,68,223.00	44,68,223.00	
5	Cost of Additional work for Approaches at VUP 95+630 (Km 96+000 to 96+360)	4,60,80,663.00	5,01,56,509.00	40,75,846.00
G	Total Cost of Civil Work Amount	7,63,17,874.00	8,00,55,484.00	37,37,610.00
J	GST 18 %	1,37,37,217.32	1,44,09,987.12	6,72,769.80
I	Sub total	9,00,55,091.32	9,44,65,471.12	44,10,379.80
H	Tender discount (-25.88%)	-2,33,06,257.63	-2,44,47,663.93	-11,41,406.29
	Grand total	**6,67,48,833.69**		
1	**Descoping of WSA**	**2,86,08,027.00**	**2,86,08,027.00**	

Note – The works related to change of scope is completed at site. The data furnished in above table is based on the data provided by concessionaire at site.

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Chapter 9
OPERATION & MAINTAINANCE COST

CHAPTER 9. OPERATION AND MAINTAINANCE COST

9.1 General

This Chapter presents details on the O&M expenditure to be incurred. The expenses are divided into four heads.

- Routine Maintenance Expenses to maintain the asset to the standards set forth in the Concession Agreement.
- Major/ Periodic Maintenance Expenses
- Operating Expenses

Table 9-1: Project stretch

Project stretch	Chainage From	Chainage To	Length (km)
	26.900	96.000	69.100

9.2 Cost of Various Components.

The estimation of quantities is based on Schedules. The estimation of quantities and costs worked out separately for each item. The quantities are estimated under the following heads:

- Overlay on MCW and SR
- TMS & ATMS
- Other miscellaneous works (i.e., Road Marking, Shoulder repair, Kerb raising, Kerb painting etc.)

9.3 Estimation of Operation & Maintainance cost

Following table illustrates the initial cost to be incurred for routine maintenance and major maintenance,

Table 9-2: Routine maintenance cost of the Project

S No	Particulars	Frequency	Cost excluding GST (Cr)	Remarks
1	**Routine Maintenance Cost**	**Annual**		

S No	Particulars	Frequency	Cost excluding GST (Cr)	Remarks
	Pavement Maintenance		**1.03**	
	Highway and Road Furniture		**0.50**	
	Structures Maintenance		**0.73**	
	Street lighting and maintenance		**0.14**	
	Total RM cost		**2.43**	

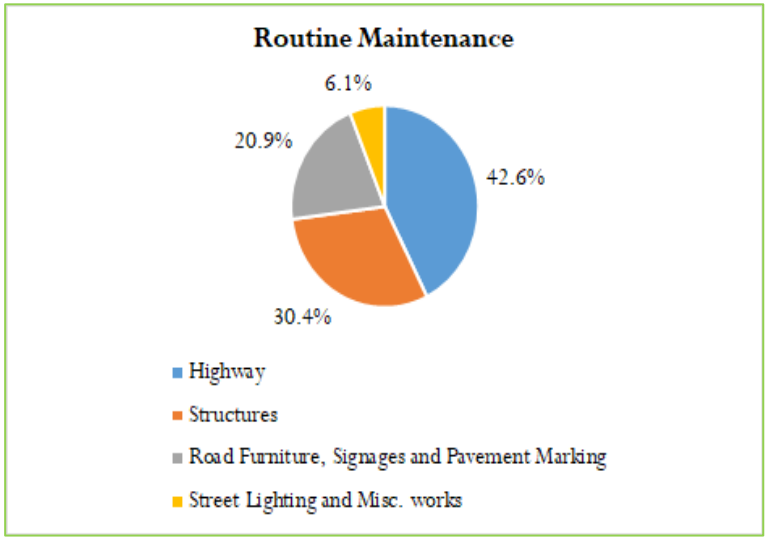


Figure 9-1: Breakup of routine maintenance.

Table 9-3: Operational Expenditure of the Project for the FY 2026

S. No	Description	Manpower	Annual Exp. (in lacs)
A.1	SPV staff and salaries	11	64.36
A.2	Tolling Operations Services Outsourced		0.00
A.3	Security Services Outsourced	0	0.00
A.4	Incident Management Services	24	95.03

S. No	Description	Manpower	Annual Exp. (in lacs)
A.5	RoW and Horticulture Works_ Manpower Outsourced	17	74.32
A.6	Electricity and Diesel Charges		74.77
A.7	TMS/HTMS System Expenses		26.97
A.8	Office Operating Expenses		3.53
A.9	Vehicle Running Expenses		19.89
A.10	Professional Fee		28.51
A.11	Community Development		10.17
A.12	Communication Expenses		1.02
A.13	Conveyance Expenses		10.17
A.14	Insurance Expenses		57.04
A.15	IE Fees		35.59
A.16	Contingency	1.0%	5.80
	OPEX		507.18

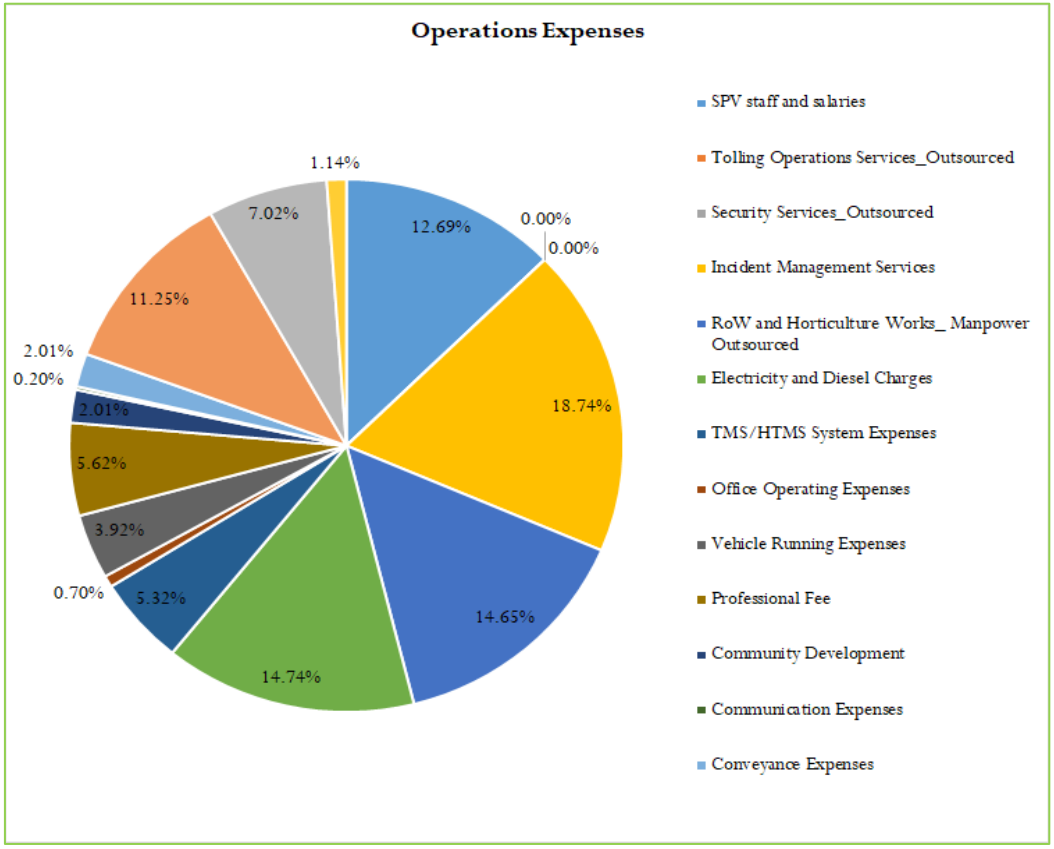


Figure 9-2: Breakup of operational cost

9.4 Estimation of Periodic Maintenance Cost

Bitumen plays a vital role in overall cost estimation. Considering the performance and availability of bitumen from a nearby source, to estimate cost analysis Bitumen VG-40 is considered for BC & DBM in all cases.

The abstract of resultant estimated costs for the Project Stretch is given below. All costs are estimated based on FY 2025-26 prices.

Table 9-4: Estimated Periodic Maintenance cost (FY 33) MM-I

S.no	Description	Unit	Qty	Rate	Amount
Existing features					
	MCW				
1	Bituminous Concrete (VG 40)	Cum	41,940	11,170	46,84,66,952
2	Tack coat	Sqm	13,97,992	15	2,02,70,877
3	Micro surfacing	Sqm	0	190	0
4	DBM (VG 40)	Cum	0	9,926	0
5	Tack coat	Sqm	0	15	0
6	Milling	Sqm	0	90	0
7	Kerb raising	Rm	0	320	0
8	Kerb painting	Sqm	47340	100	47,33,956
9	Earthen shoulder	Cum	11981	450	53,91,630
10	Pavement marking (Flexible) MCW & SR	Sqm	70902	400	2,83,60,787
	SR				
11	Bituminous Concrete (VG-40)	cum	5663	11,170	6,32,58,503
12	Tack coat	Sqm	188775	15	27,95,758
13	Micro surfacing	Sqm	188775	190	3,58,67,250
14	DBM (VG 40)	Cum	0	9,926	0
15	Tack coat	Sqm	0	15	0
16	Milling	Sqm	0	90	0
17	Misc (2%)	Ls	0	0	62,91,457
				Total	**63,54,37,168**
				GST (18%)	**11,43,78,690**
				Grand total	**74,98,15,859**
				Total (In Cr)	**75.0**

Table 9-5: Estimated Periodic Maintenance cost (FY 40) MM-II

S.no	Description	Unit	Qty	Rate	Amount
Existing features					
	MCW				
1	Bituminous Concrete (VG 40)	Cum	41,940	11,170	46,84,66,952
2	Tack coat	Sqm	13,97,992	15	2,02,70,877
3	Micro surfacing	Sqm	0	190	0
4	DBM (VG 40)	Cum	0	9,926	0
5	Tack coat	Sqm	0	15	0
6	Milling	Sqm	0	90	0
7	Kerb raising	Rm	0	320	0
8	Kerb painting	Sqm	47340	100	47,33,956
9	Earthen shoulder	Cum	11981	450	53,91,630
10	Pavement marking (Flexible) MCW & SR	Sqm	70902	400	2,83,60,787
	SR				
11	Bituminous Concrete (VG-40)	cum	5663	11,170	6,32,58,503
12	Tack coat	Sqm	188775	15	27,95,758
13	Micro surfacing	Sqm	188775	190	3,58,67,250
14	Misc (2%)	Ls	0	0	62,91,457
				Total	**63,54,37,168**
				GST (18%)	**11,43,78,690**
				Grand total	**74,98,15,859**
				Total (In Cr)	**75.0**

9.4.1 Major Maintenance expenses during O&M period

As per the Cube Tech estimate, the total Major Maintenance expense including the escalation is Rs.191.03 cr.

9.4.2 Projections of O&M Expenses

The O&M expenses for the entire Concession Period is presented in this section.

The following escalations are considered:

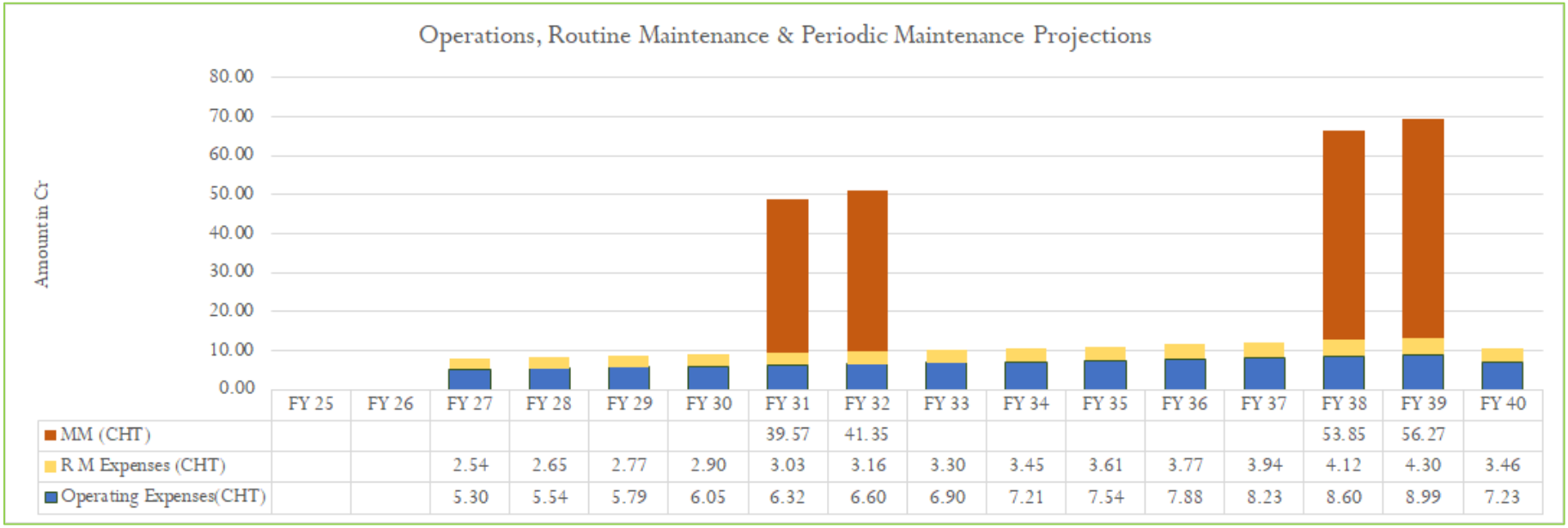
Table 9-6:Escalation Factors

Items	Escalation
Operating expenses	4.5%
Routine maintenance	4.5%
Major maintenance	4.5%

The Projections of total O& M expenses including Major Maintenance for 2 Cycles of the Project Company and CHT is given in the table below

Table 9-7: Projections of total O&M expenses of the Project during O&M period

Particulars	Total Expense (In Cr.)	Base-FY 26	FY27	FY28	FY29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
Operating Expenses (CHT)	**98.18**	**5.07**	5.30	5.54	5.79	6.05	6.32	6.60	6.90	7.21	7.54	7.88	8.23	8.60	8.99	7.23
R M Expenses (CHT)	**47.01**	**2.43**	2.54	2.65	2.77	2.90	3.03	3.16	3.30	3.45	3.61	3.77	3.94	4.12	4.30	3.30
MM (CHT)	**191.03**	63.50					39.57	41.35						53.85	56.27	
O&M and MM (CHT)	**336.06**		**7.84**	**8.19**	**8.56**	**8.94**	**48.91**	**51.11**	**10.21**	**10.67**	**11.15**	**11.65**	**12.17**	**66.56**	**69.56**	**10.53**



	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30	FY 31	FY 32	FY 33	FY 34	FY 35	FY 36	FY 37	FY 38	FY 39	FY 40
MM (CHT)							39.57	41.35						53.85	56.27	
R M Expenses (CHT)			2.54	2.65	2.77	2.90	3.03	3.16	3.30	3.45	3.61	3.77	3.94	4.12	4.30	3.46
Operating Expenses(CHT)			5.30	5.54	5.79	6.05	6.32	6.60	6.90	7.21	7.54	7.88	8.23	8.60	8.99	7.23

Figure 9-3: O&M, RM and MM Expenses Projections

Chapter 10
OVERALL REVIEW

CHAPTER 10. OVERALL REVIEW

10.1 Observations

- All the Project facilities provided by the concessionaire are in line with the inventory with few variations.
- National Highways Authority of India (Authority) and M/s G R Ujjain Badnawar Highway Private Limited (the Concessionaire) entered into a Concession Agreement on 10th May 2022 for execution of the Project on Hybrid Annuity Mode. Subsequently, the Appointed Date was declared on 10th October 2022.
- The Scheduled Completion Date is (SCD) on 08th October 2024 i.e., 730th day from the Appointed Date.
- The Project has been completed, and the Project is hereby declared fit for entry into commercial operation from 1st February 2025.
- As per IRC Manual 84:2019, standby arrangements such as DG sets shall be provided to ensure uninterrupted street lighting. As per the Schedule C comparison statement with the site, it is mentioned as provided, but the same is not available at site.
- Low severity ravelling has been observed from km 49.000 to km 50.500 of LHS and from km 47.200 to km 47.100 of RHS of the project stretch. The Concessionaire is addressing the same as part of routine maintenance.
- Low severity bleeding has been observed from km 50.400 to km 50.200 and from km 83.630 to km 79.500 of the RHS of project stretch.
- Rutting has been observed from km 26.900 to km 26.700, km 30.800 to km 30.750, and from km 56.200 to km 55.600. The Concessionaire is addressing the same as part of routine maintenance.
- Damage of pavement was observed at isolated locations on main carriageway and service road and shall be rectified as part of routine maintenance.
- At the time of the visit, dynamic UPI functionality was not available; however, as per the latest NHAI guidelines, dynamic UPI must be implemented on national highways to eliminate cash transactions, which need to be verified.
- Web cameras need to be installed at two booths for exempt vehicle ID verification.
- The data furnished in the above chapters are based on the data provided by the concessionaire.

ANNEXURES

Annexure I: Open Drain

S No	Chainage		Length	Side	Remarks
	From	To			
1	39330	39461	131	Median	
2	39464	39514	51	Median	
3	39514	39564	50	Median	
4	39564	39761	197	Median	
5	39761	39801	40	Median	
6	39801	39851	50	Median	
7	39854	39911	58	Median	
8	39911	40274	363	Median	
9	40274	40320	46	Median	
10	40320	40335	15	Median	
11	40500	40540	40	Median	
12	40540	40580	40	Median	
13	40580	40620	40	Median	
14	40620	40660	40	Median	
15	40660	40700	40	Median	
16	40700	40740	40	Median	
17	40740	40780	40	Median	
18	40780	40820	40	Median	
19	40820	40860	40	Median	
20	40860	40900	40	Median	
21	40900	40940	40	Median	
22	40940	40980	40	Median	
23	40980	41020	40	Median	
24	41020	41060	40	Median	
25	41060	41102	42	Median	

S No	Chainage		Length	Side	Remarks
	From	To			
26	41100	41140	40	Median	
27	41140	41180	40	Median	
28	41180	41239	59	Median	
29	45439	45480	41	Median	
30	45480	45520	40	Median	
31	45520	45560	40	Median	
32	45560	45582	22	Median	
33	45582	45831	249	Median	
34	47420	47630	210	Median	
35	47630	47670	40	Median	
36	47670	47705	35	Median	
37	47715	47795	80	Median	
38	47845	47930	85	Median	
39	47930	47980	50	Median	
40	47980	48040	60	Median	
41	48040	48080	40	Median	
42	48080	48120	40	Median	
43	48120	48150	30	Median	
44	48150	48188	38	Median	
45	49846	50109	263	Median	
46	50111	50375	264	Median	
47	50375	50415	40	Median	
48	50415	50455	40	Median	
49	50455	50495	40	Median	
50	50512	50535	23	Median	
51	50535	50575	40	Median	
52	50575	50615	40	Median	

S No	Chainage		Length	Side	Remarks
	From	To			
53	50615	50655	40	Median	
54	50655	50695	40	Median	
55	50695	50735	40	Median	
56	50735	50750	15	Median	
57	51390	51430	40	Median	
58	51430	51470	40	Median	
59	51470	51510	40	Median	
60	51510	51539	29	Median	
61	51542	51580	38	Median	
62	51580	51610	30	Median	
63	51610	51995	385	Median	
64	51995	52029	34	Median	
65	52031	52071	40	Median	
66	52071	52111	40	Median	
67	52111	52151	40	Median	
68	52151	52191	40	Median	
69	52191	52239	48	Median	
70	55212	55250	38	Median	
71	55250	55290	40	Median	
72	55290	55349	59	Median	
73	55352	55650	299	Median	
74	55650	55675	25	Median	
75	55675	55720	45	Median	
76	55720	55770	50	Median	
77	55770	55810	40	Median	
78	55810	55850	40	Median	
79	55850	55890	40	Median	

S No	Chainage		Length	Side	Remarks
	From	To			
80	55890	55930	40	Median	
81	55930	55970	40	Median	
82	55970	56020	50	Median	
83	56020	56084	64	Median	
84	56114	56154	40	Median	
85	56154	56194	40	Median	
86	56194	56234	40	Median	
87	56234	56274	40	Median	
88	56274	56314	40	Median	
89	56314	56354	40	Median	
90	56354	56394	40	Median	
91	56394	56434	40	Median	
92	56434	56474	40	Median	
93	56474	56514	40	Median	
94	56514	56560	46	Median	
95	56560	56579	19	Median	
96	56581	57016	435	Median	
97	58202	58240	38	Median	
98	58240	58280	40	Median	
99	58280	58320	40	Median	
100	58320	58360	40	Median	
101	58360	58400	40	Median	
102	58400	58440	40	Median	
103	58440	58460	20	Median	
104	58460	58500	40	Median	
105	58500	58540	40	Median	
106	58540	58600	60	Median	

S No	Chainage		Length	Side	Remarks
	From	To			
107	58600	58766	166	Median	
108	60676	60925	249	Median	
109	60925	60950	25	Median	
110	60950	60980	30	Median	
111	60980	61020	40	Median	
112	61020	61060	40	Median	
113	61060	61085	25	Median	
114	61455	61505	50	Median	
115	61505	61545	40	Median	
116	61545	61585	40	Median	
117	61585	61625	40	Median	
118	61625	61665	40	Median	
119	61665	61705	40	Median	
120	61705	61745	40	Median	
121	61745	61785	40	Median	
122	61785	61825	40	Median	
123	61825	61855	30	Median	
124	61855	61865	10	Median	
125	61865	61905	40	Median	
126	61905	61945	40	Median	
127	61945	61985	40	Median	
128	61985	62025	40	Median	
129	62025	62075	50	Median	
130	62075	62115	40	Median	
131	62115	62155	40	Median	
132	62155	62195	40	Median	
133	62195	62235	40	Median	

S No	Chainage		Length	Side	Remarks
	From	To			
134	62235	62275	40	Median	
135	62275	62315	40	Median	
136	62315	62355	40	Median	
137	62355	62410	55	Median	
138	62410	62429	19	Median	
139	71915	71950	35	Median	
140	71950	71992	42	Median	
141	71992	72032	40	Median	
142	72032	72072	40	Median	
143	72072	72112	40	Median	
144	72112	72170	58	Median	
145	72170	72220	50	Median	
146	72292	72332	40	Median	
147	72332	72372	40	Median	
148	72372	72412	40	Median	
149	72412	72452	40	Median	
150	72452	72492	40	Median	
151	72492	72532	40	Median	
152	72532	72572	40	Median	
153	72572	72612	40	Median	
154	72612	72652	40	Median	
155	72652	72692	40	Median	
156	72692	72722	30	Median	
157	72722	72760	38	Median	
158	72760	72780	20	Median	
159	72780	72874	94	Median	
160	72874	72914	40	Median	

S No	Chainage		Length	Side	Remarks
	From	To			
161	73110	73150	40	Median	
162	73150	73200	50	Median	
163	73200	73300	100	Median	
164	73487	73761	274	Median	
165	74130	74170	40	Median	
166	74170	74210	40	Median	
167	74210	74250	40	Median	
168	74250	74290	40	Median	
169	74290	74330	40	Median	
170	74330	74370	40	Median	
171	74370	74400	30	Median	
172	74400	74430	30	Median	
173	74430	74495	65	Median	
174	74515	74555	40	Median	
175	74555	74595	40	Median	
176	74595	74635	40	Median	
177	74635	74675	40	Median	
178	74675	74715	40	Median	
179	74715	74755	40	Median	
180	74755	74795	40	Median	
181	74795	74820	25	Median	
182	74820	74940	120	Median	
183	74940	74985	45	Median	
184	77616	77660	45	Median	
185	77660	77860	200	Median	
186	77860	77915	55	Median	
187	77915	77955	40	Median	

S No	Chainage		Length	Side	Remarks
	From	To			
188	77955	78000	45	Median	
189	78000	78050	50	Median	
190	78050	78108	58	Median	
191	78108	78280	172	Median	
192	78280	78308	28	Median	
193	89780	89820	40	Median	
194	89820	89860	40	Median	
195	89860	89900	40	Median	
196	89900	89940	40	Median	
197	89940	89980	40	Median	
198	89980	90020	40	Median	
199	90020	90060	40	Median	
200	90060	90100	40	Median	
201	90100	90140	40	Median	
202	90140	90180	40	Median	
203	90180	90236	56	Median	
204	90256	90296	40	Median	
205	90296	90336	40	Median	
206	90336	90376	40	Median	
207	90376	90416	40	Median	
208	90416	90456	40	Median	
209	90456	90496	40	Median	
210	90496	90536	40	Median	
211	90536	90581	45	Median	
212	90581	90695	114	Median	
213	90695	90735	40	Median	
214	90735	90775	40	Median	

S No	Chainage		Length	Side	Remarks
	From	To			
215	90775	90929	154	Median	
216	90932	90968	37	Median	
217	90968	91010	42	Median	
218	91010	91050	40	Median	
219	91050	91090	40	Median	
220	91090	91130	40	Median	
221	91130	91170	40	Median	
222	91170	91200	30	Median	
223	91200	91260	60	Median	
224	91334	91370	36	Median	
225	91370	91410	40	Median	
226	91410	91450	40	Median	
227	91450	91490	40	Median	
228	91490	91530	40	Median	
229	91530	91570	40	Median	
230	91570	91610	40	Median	
231	91610	91650	40	Median	
232	91650	91690	40	Median	
233	91690	91710	20	Median	
234	91710	91872	162	Median	
Total Length			13.20		

Annexure II: Major and Minor intersections

S. No.	Design Chainage	Type of Crossing Road	Type of Structure Proposed	Name of Crossing Road/Features/Remarks
1	26.91	X	PSC Girder & Slab	Ujjain Bypass

S. No.	Design Chainage	Type of Crossing Road	Type of Structure Proposed	Name of Crossing Road/Features/Remarks
2	92.612	X	PSC Girder & Slab	Ratlam
3	40.483	T	VUP	Chndukhedi
4	74.505	Y	VUP	Maulana
5	83.177	Y	VUP	Barnagar
6	90.246	Y	VUP	Badnawar
7	95.665	Y	VUP	Kheda

Minor Junction				
S. No.	Design Chainage	Type of Crossing Road	Type of Structure Proposed	Name of Crossing Road/Features
1	30.719	X	LVUP	Village Road Gangedi
2	33.266	X	LVUP	Village Road Panchkoshimarge
3	36.495	X	VUP	ODR Chintamani Road
4	36.842	X	LVUP	Village Road PanchkoshiMarge
5	37.258	X	SVUP	Village Road Ratnakhedi
6	40.338	X	SVUP	Access Road Jain Temple
7	42.079	X	LVUP	Village Road Chandukhedi
8	43.639	X	VUP	Village Road Soya Factory
9	45.082	X	LVUP	Village Road Nalwa
10	45.429	X	LVUP	State Highway Old SH 18
11	48.509	T	SVUP	Village Road Khadotiya
12	49.338	Y	LVUP	State Highway Old SH 18
13	50.974	X	VUP	Village Road Chikli
14	51.57	X	VUP	Village Road Kulawada
15	55.43	Y		State Highway Old SH 18
16	56.099	X	VUP	MDR Nagda Gautampura

Minor Junction				
S. No.	**Design Chainage**	**Type of Crossing Road**	**Type of Structure Proposed**	**Name of Crossing Road/Features**
17	56.775	Y	Grade with MCW	State Highway Old SH 18
18	56.975	T	Grade with MCW	Village Road Substation
19	57.885	T	Grade with MCW	Village Road BhainslaKhurd
20	58.535	Y	Grade with MCW	State Highway Old SH 18
21	61.39	X	VUP	Village Road Suneda
22	61.711	Y	VUP	State Highway Old SH 18
23	63.265	T	Grade with MCW	Village Road Rajota
24	66.19	T	Grade with MCW	Village Road Kiloli
25	67.968	X	LVUP	Village Road UtwasKhasrodkhurd
26	70.369	T	LVUP	Village Road Rasulabad
27	71.76	Y	Grade with MCW	State Highway Old SH 18
28	72.292	X	LVUP	Village Road Maulana
29	72.785	X	LVUP	Village Road Beesaheda
30	73.437	T	Grade with MCW	State Highway Old SH 18
31	74.18	X	VUP	Access Road Central Jail
32	75.817	X	SVUP	Village Road Kajlana
33	77.415	X	LVUP	Village Road Paduniyalodha
34	77.612	X	LVUP	Village Road Paduniyalodha
35	78.8	X	ROB	Village Road
36	79.383	X	VUP	ODR Badnagar -Runija Road
37	83.113	Y	VUP	State Highway Old SH 18
38	84.35	Y	VUP	Village Road Dholana
39	84.835	X	LVUP	Village Road Dholan - Amla
40	85.875	T	Grade with MCW	Village Road Amla
41	87.369	X	LVUP	Village Road

Minor Junction				
S. No.	**Design Chainage**	**Type of Crossing Road**	**Type of Structure Proposed**	**Name of Crossing Road/Features**
42	87.69	T	LVUP	Village Road Panchakwasa
43	88.96	T	Grade with MCW	Village Road Bamansutta
44	91.33	X	SVUP	Village Road
45	92.16	Y	Flyover	Village Road

Annexure III: Metal beam crash barrier at shoulder side

S. No	From	To	Length	Side	Remarks	S. No	From	To	Length	Side	Remarks
1	27182	27254	72	LHS		1	27396	27580	184	RHS	
2	27392	27780	388	LHS		2	27580	27819	239	RHS	
3	27780	27819	39	LHS		3	27901	27956	55	RHS	
4	27901	27960	59	LHS		4	28092	28116	24	RHS	
5	28200	28320	120	LHS		5	28092	28116	24	RHS	
6	28242	28304	62	LHS		6	28200	28320	120	RHS	
7	29330	29354	24	LHS		7	28320	28350	30	RHS	
8	29395	29491	96	LHS		8	29326	29464	138	RHS	
9	29622	29700	78	LHS		9	29464	29510	46	RHS	
10	29740	29944	204	LHS		10	29540	29568	28	RHS	
11	34500	35196	696	LHS		11	29630	29948	318	RHS	
12	35684	35760	76	LHS		12	34500	34650	150	RHS	
13	43100	43200	100	LHS		13	34650	35203	553	RHS	
14	45529	45710	181	LHS		14	35700	35760	60	RHS	
15	46832	47280	448	LHS		15	41292	41316	24	RHS	
16	47438	47484	46	LHS		16	41292	41316	24	RHS	
17	47480	47580	100	LHS		17	43100	43197	97	RHS	
18	47656	47687	31	LHS		18	45457	45626	169	RHS	
19	47857	47904	47	LHS		19	46836	47088	252	RHS	

S. No	From	To	Length	Side	Remarks	S. No	From	To	Length	Side	Remarks
20	48442	48804	362	LHS		20	47438	47688	250	RHS	
21	58742	59254	512	LHS		21	47856	48208	352	RHS	
22	59972	60124	152	LHS		22	48446	48496	50	RHS	
23	60060	60262	202	LHS		23	48524	48558	34	RHS	
24	60262	60362	100	LHS		24	59856	60158	302	RHS	
25	60512	61034	522	LHS		25	60158	60266	108	RHS	100m gap was observed
26	61192	61294	102	LHS		26	60266	60362	96	RHS	
27	63340	63364	24	LHS		27	60512	61280	768	RHS	
28	63840	63864	24	LHS		28	65346	65370	24	RHS	
29	63840	63864	24	LHS		29	65346	65370	24	RHS	
30	64340	64364	24	LHS		30	65846	65870	24	RHS	
31	64710	64720	10	LHS		31	65846	65870	24	RHS	
32	75450	75550	100	LHS		32	76050	76320	270	RHS	
33	76050	76270	220	LHS		33	76656	76820	164	RHS	
34	76270	76550	280	LHS		34	76820	76930	110	RHS	
35	76652	76850	198	LHS		35	77050	77400	350	RHS	
36	76850	76930	80	LHS		36	77740	78634	894	RHS	
37	77050	77410	360	LHS		37	91104	91240	136	RHS	
38	78150	78645	495	LHS		38	91240	91780	540	RHS	
39	90700	90800	100	LHS	Balance at site	39	92340	92580	240	RHS	
40	91136	91180	44	LHS		40	92640	93140	500	RHS	
41	91188	91314	126	LHS		41	94010	94040	30	RHS	
42	91345	91542	197	LHS		42	94592	94616	24	RHS	
43	92300	92500	200	LHS		43	94700	95190	490	RHS	
44	92650	92766	116	LHS		44	95225	95600	375	RHS	
45	92766	93040	274	LHS		45	96000	96240	240	RHS	
46	93040	93140	100	LHS		46	Loop- A		1480	RHS	
47	94010	94040	30	LHS		47	Loop- B		1480	RHS	

S. No	From	To	Length	Side	Remarks	S. No	From	To	Length	Side	Remarks
48	94800	95170	370	LHS							
49	95225	95300	75	LHS							
50	95300	95600	300	LHS							
51	96000	96240	240	LHS							
Length			8830			Length			11914		
Total length					20.744						

Annexure IV: Pedestrian guard rail

S No.	Chainage		Length	Side	S No.	Chainage		Length	Side	Remarks
	From	To				From	To			
1	75.250	75.450	0.200	LHS	1	75.250	75.450	0.200	RHS	
2	91.900	92.000	0.100	LHS	2	91.900	92.000	0.100	RHS	
3	42.500	43.100	0.600	LHS	3	42.500	43.100	0.600	RHS	30 m Gaps
4	35.800	36.400	0.600	LHS	4	35.800	36.400	0.600	RHS	
5	33.700	33.900	0.200	LHS	5	33.700	33.900	0.200	RHS	
6	32.600	32.950	0.350	LHS	6	32.600	32.950	0.350	RHS	
7	28.500	28.950	0.450	LHS	7	28.500	28.950	0.450	RHS	
Total Length			2.500		Total Length			2.500		

Annexure V: Street lighting

S. No.	Chainage (km)		Type of Road	Location	Double Arm		Single Arm		Highmast		Total	Non Finctional	Reamrks
	From	To			LHS	RHS	LHS	RHS	LHS	RHS			
1	26.400	26.900	MCW	Median	12	0	0	0					
2	26.900	27.600	MCW	Shoulder	18	18	2	2					
3	26.900		SR	Shoulder					1	1			Major Junction

S. No.	Chainage (km)		Type of Road	Location	Double Arm		Single Arm		Highmast		Total	Non Finctional	Reamrks
	From	To			LHS	RHS	LHS	RHS	LHS	RHS			
4	28.950		MCW	Shoulder					1	1			Rest Area
5	30.200	30.950	MCW	Shoulder	20	20	2						No Studs on Grade Sperated Structure
6	32.800	33.650	MCW	Shoulder	22	22							
7	35.400	35.650	MCW	Shoulder	14	14							
8	35.900		SR	Shoulder			3						Bus Bay
9	36.400	37.500	MCW	Shoulder	28	28							
10	37.800		MCW	Shoulder			2	2	1				Truck Lay Bye
13	41.700	42.400	MCW	Shoulder	20	20	1					40	
14	43.000	43.900	MCW	Shoulder	23	23						13	No Studs on Grade Sperated Structure
15	44.650	45.400	MCW	Shoulder	18	18						36	
16	45.400	46.150	MCW	Median	17							17	
17	47.400	47.900	MCW	Median	15							15	
18	48.150	48.800	MCW	Median	17							17	
19	48.900	49.700	MCW	Shoulder	23	23	3					2	
20	50.400	51.500	MCW	Shoulder	28	28						2	
21	55.400		Side Road	Shoulder			4						Cross road
22	55.650	56.500	MCW	Shoulder	23	23							
23	55.650		Side Road	Shoulder			4						
24	56.900		Side Road	Shoulder			3						
25	60.500		Side Road	Shoulder			4						
26	61.000	61.650	MCW	Shoulder	23	23							
27	64.800		Side Road	Shoulder					1	1			Toll Plaza
28	66.000		Side Road	Shoulder			3						
29	67.400	68.250	MCW	Shoulder	21	21							No Studs on Grade

S. No.	Chainage (km)		Type of Road	Location	Double Arm		Single Arm		Highmast		Total	Non Finctional	Reamrks
	From	To			LHS	RHS	LHS	RHS	LHS	RHS			
													Sperated Structure
30	69.950	70.650	MCW	Shoulder	20	20							
31	71.400		SR	Shoulder			2	2	1	1			
32	71.900		MCW	Shoulder	22	22							No Studs on Grade Sperated Structure
33	73.400		Side Road	Shoulder			4						
34	74.100	74.900	MCW	Shoulder	22	22	2						
35	75.400	76.100	MCW	Shoulder	20	20							
36	77.000	77.400	MCW	Median	10								
37	77.400		MCW	Shoulder	11	11							
38	78.700	79.700	MCW	Shoulder	29	29	4						
39	80.900		MCW	Shoulder			2	2	2				Truck Lay Bye
40	81.200		MCW	Shoulder			2	2		2			Truck Lay Bye
41	82.550	83.550	MCW	Shoulder	25	25							
42	83.150		Side Road	Shoulder					1	1			
43	84.200	85.100	MCW	Shoulder	23	23							No Studs on Grade Sperated Structure
44	84.800		Side Road	Shoulder			2						
45	85.650		Side Road	Shoulder			3						
46	86.900	87.650	MCW	Shoulder	15	15	6						
47	88.500		MCW	Shoulder					1	1			Rest Area
48	88.900		Side Road	Shoulder			3						
49	89.700	90.700	MCW	Shoulder	26	26							
50	90.900	91.400	MCW	Shoulder	20	20							
51	91.150		Side Road	Shoulder					1	1			
52	91.900	92.900	MCW	Median	31								

S. No.	Chainage (km)		Type of Road	Location	Double Arm		Single Arm		Highmast		Total	Non Finctional	Reamrks
	From	To			LHS	RHS	LHS	RHS	LHS	RHS			
53	95.150	95.650	MCW	Median			16		1	1			
54	95.650	96.000	MCW	Median	12								
55	95.800		SR	Shoulder			15						
56	93.350	92.650	Ramp A	Shoulder			26						
57	92.650	92.150	Ramp B	Shoulder			24						
58	92.150	92.650	Ramp C	Shoulder				26					
59	92.650	93.150	Ramp D	Shoulder				25					
60	92.400		Loop A	Shoulder			23						
61	92.400		Loop B	Shoulder				23					
62	92.650		Side Road	Shoulder					1	1			
					652	538	167	86	13	13			

Annexure VI: Bus shelters

S.no	Chainage	Side	Description	Street Lighting Single arm	Remarks
1	28+500	RHS	Bus Shelter		
2	28+840	LHS	Bus Shelter		
3	30+300	RHS	Bus Shelter		
4	31+010	LHS	Bus Shelter		
5	32+520	RHS	Bus Shelter		
6	33+760	LHS	Bus Shelter		
7	35+680	RHS	Busbay with Bus Shelter		
8	35+370	LHS	Busbay with Bus Shelter		
9	40+210	RHS	Busbay with Bus Shelter		
10	40+690	LHS	Busbay with Bus Shelter		

S.no	Chainage	Side	Description	Street Lighting Single arm	Remarks
11	41+740	RHS	Bus Shelter		
12	42+200	LHS	Bus Shelter		
13	44+760	RHS	Bus Shelter		
14	45+400	LHS	Bus Shelter		
15	48+940	RHS	Bus Shelter		
16	49+740	LHS	Bus Shelter		
17	50+720	RHS	Busbay with Bus Shelter		
18	51+170	LHS	Busbay with Bus Shelter		
19	55+870	RHS	Busbay with Bus Shelter		
20	56+350	LHS	Busbay with Bus Shelter		
21	61+200	RHS	Bus Shelter		
22	62+040	LHS	Bus Shelter		
23	67+290	RHS	Busbay with Bus Shelter		
24	68+730	LHS	Busbay with Bus Shelter		
25	70+140	RHS	Bus Shelter		
26	70+780	LHS	Bus Shelter		
27	71+960	RHS	Bus Shelter		
28	72+800	LHS	Bus Shelter		
29	73+950	RHS	Busbay with Bus Shelter		
30	74+330	LHS	Busbay with Bus Shelter		
31	75+280	RHS	Bus Shelter		
32	76+180	LHS	Bus Shelter		
33	79+550	LHS	Busbay with Bus Shelter		
34	79+550	RHS	Busbay with Bus Shelter		
35	82+990	RHS	Busbay with Bus Shelter		
36	83+350	LHS	Busbay with Bus Shelter		

S.no	Chainage	Side	Description	Street Lighting Single arm	Remarks
37	84+340	RHS	Bus Shelter		
38	85+360	LHS	Bus Shelter		
39	87+440	RHS	Busbay with Bus Shelter		
40	87+870	LHS	Busbay with Bus Shelter		
41	89+900	RHS	Bus Shelter		
42	90+820	LHS	Bus Shelter		

Annexure VII: Truck lay bye

S. No.	Chainage	Side	Length (m)	Toilet block	Shelter	Remarks
1	37+600	RHS	240	NA	NA	Ratnakhedi
2	37+900	LHS	240	NA	NA	Ratnakhedi
3	71+650	LHS	240	NA	NA	Moulana
4	81+100	LHS	240	NA	NA	Bargadi
5	81+400	RHS	240	NA	NA	Bargadi

Annexure VIII: Rainwater harvesting pits

S. No.	Chainage	Side	Remarks
1	27+000	RHS	
2	27+400	LHS	
3	28+080	RHS	
4	28+560	LHS	
5	29+600	LHS	
6	30+580	LHS	

S. No.	Chainage	Side	Remarks
7	30+975	RHS	
8	31+640	LHS	
9	31+980	RHS	
10	32+450	LHS	
11	32+750	RHS	
12	33+750	RHS	
13	34+140	LHS	
14	34+600	RHS	
15	35+530	LHS	
16	35+850	RHS	
17	36+500	LHS	
18	36+975	RHS	
19	37+530	LHS	
20	38+525	LHS	
21	38+980	RHS	
22	39+980	RHS	
23	40+530	LHS	
24	40+960	RHS	
25	41+500	LHS	
26	42+400	LHS	
27	42+800	RHS	
28	43+300	LHS	
29	43+760	RHS	
30	44+100	LHS	
31	44+600	RHS	
32	45+250	RHS	

S. No.	Chainage	Side	Remarks
33	46+200	LHS	
34	46+200	RHS	
35	47+000	LHS	
36	47+070	RHS	
37	48+000	LHS	
38	48+000	RHS	
39	49+000	RHS	
40	49+420	LHS	
41	50+000	RHS	
42	50+120	RHS	
43	50+550	LHS	
44	51+110	RHS	
45	51+750	LHS	
46	52+150	RHS	
47	52+650	LHS	
48	53+160	RHS	
49	53+640	LHS	
50	54+140	RHS	
51	54+620	LHS	
52	55+340	RHS	
53	55+670	LHS	
54	56+340	RHS	
55	56+470	LHS	
56	57+100	RHS	
57	57+660	LHS	
58	58+360	RHS	

S. No.	Chainage	Side	Remarks
59	58+570	LHS	
60	59+120	RHS	
61	59+670	LHS	
62	60+150	RHS	
63	61+425	RHS	
64	61+750	LHS	
65	62+070	RHS	
66	62+600	LHS	
67	63+160	RHS	
68	63+650	LHS	
69	64+100	RHS	
70	64+500	LHS	
71	65+150	RHS	
72	65+550	LHS	
73	66+040	RHS	
74	66+620	LHS	
75	67+030	RHS	
76	67+420	LHS	
77	68+300	RHS	
78	68+550	LHS	
79	69+100	RHS	
80	69+570	LHS	
81	70+500	RHS	
82	70+900	LHS	
83	71+410	RHS	
84	71+710	LHS	

S. No.	Chainage	Side	Remarks
85	72+250	RHS	
86	72+820	LHS	
87	73+000	RHS	
88	73+400	LHS	
89	74+020	RHS	
90	74+440	LHS	
91	75+050	RHS	
92	75+640	LHS	
93	76+040	RHS	
94	77+180	RHS	
95	78+020	RHS	
96	78+680	LHS	
97	79+060	RHS	
98	79+600	LHS	
99	80+100	RHS	
100	80+400	LHS	
101	81+180	RHS	
102	81+820	LHS	
103	82+040	RHS	
104	82+500	LHS	
105	83+000	LHS	
106	83+480	RHS	
107	84+000	RHS	
108	84+600	LHS	
109	85+280	RHS	
110	85+480	LHS	

S. No.	Chainage	Side	Remarks
111	86+140	RHS	
112	86+790	LHS	
113	87+160	RHS	
114	87+600	LHS	
115	88+180	RHS	
116	88+640	LHS	
117	89+040	LHS	
118	89+400	RHS	
119	90+220	LHS	
120	90+600	RHS	
121	91+440	LHS	
122	91+840	RHS	
123	92+120	RHS	
124	92+480	LHS	
125	93+000	RHS	
126	93+570	LHS	
127	94+500	LHS	
128	94+940	LHS	

Annexure IX: Toe wall

S No.	Chainage		Length	Side	Remarks
	From	To			
1	27.58	27.78	0.4	BHS	
2	29.00	29.20	0.2	LHS	RCC
3	43.3	43.5	0.2	LHS	Gabion Wall
4	47.1	47.3	0.2	RHS	Gabion Wall

S No.	Chainage		Length	Side	Remarks
	From	To			
5	47.45	47.55	0.1	RHS	Gabion Wall
6	47.7	47.82	0.12	LHS	RCC
7	61	61.4	0.4	LHS	Gabion Wall
8	61.3	61.4	0.1	RHS	Gabion Wall
9	60.5	61.34	0.84	LHS	Gabion Wall
10	76.8	76.92	0.12	RHS	
11	76.92	77.4	0.48	LHS	
Total length			3.16		

INDUS INFRA TRUST

TECHNICAL DUE DILIGENCE SERVICES

FOR

"FOUR LANING OF ODDANCHATRAM-MADATHUKULAM SECTION OF NH-209 (NEW NH-83) (Design Ch. Km29.000 to Km. 74.380) UNDER BHARATMALA PARIYOJANA PHASE-I UNDER THE CATEGORY OF RESIDUAL WORKS OF NHDP ON HAM IN THE STATE OF TAMIL NADU"

TECHNICAL DUE DILIGENCE REPORT

October - 2025

Submitted By

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LIST OF ABBREVIATIONS USED

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ATMS	Automatic Toll Management System
AVC	Automatic Vehicle Classification
BC	Bituminous Concrete
BOQ	Bill of Quantities
BOT	Build Operate and Transfer
BT	Bituminous
CA	Concession Agreement
CB	Crash Barrier
CBR	California Bearing Ratio
CCH	Central Clearing House
CCTV	Closed-Circuit Television
Ch	Chainage
COD	Commercial Operation Date
COS	Change of Scope
CTVC	Classified Traffic Volume Count
CVPD	Commercial Vehicles Per Day
DBM	Dense Bituminous Macadam,
DLC	Dry Lean Concrete
ECB	Emergency Call Box
EPC	Engineering, Procurement, and Construction
ETC	Electronic Toll Collection
ETMS	Electronic Toll Management System
Fig.	Figure
FOB	Foot Over Bridge
FRL	Finished Road Level
FWD	Falling Weight Deflectometer
GFC	Good for Construction
GOI	Government of India
GSB	Granular Sub Base
GST	Goods and Services Tax
HPC	Hume Pipe Culvert
HQ	Headquarters
HSD	High Speed Diesel
HTMS	Highway Traffic Management System
IC / IE	Independent Consultant / Engineer
IMM Cost	Immediate Rectification Cost

Abbreviations	Meaning
IRC	Indian Road Congress
LCV	Light Commercial Vehicle
LL	Liquid Limit
LVUP	Light Vehicular Underpass
MAV	Multi Axle Vehicle
MBCB	Metal Beam Crash Barrier
MCB	Miniature Circuit Breaker
MCW	Main Carriageway
MDD	Maximum Dry Density
MDR	Major District Road
MIS	Management Information System
MjB/MJB	Major Bridge
MnB/MNB	Minor Bridge
MORTH	Ministry of Road Transport & Highways
MSA	Million Standard Axles
NCR	Non-Conformance Report
NH	National Highway
NHAI	National Highways Authority of India
NJCB	New Jersey Crash Barrier
Nos, No.	Numbers
NPV	Net Present Value
NSV	Network Survey Vehicle
OGL	Original Ground Level
OpEx	Operational Expenditure
O.M.C	Optimum Moisture Content
O&M	Operation & Maintenance
PCS	Prestressed Concrete Segmental
PCOD	Provisional Commercial Operation Date
PGR	Pedestrian Guard Rails
PI	Plasticity Index
PL	Plastic Limit
P&P	Plan & Profile
POS	Point of Sale
PQC	Pavement Quality Concrete
PSC	Prestressed Concrete
PTZ	Pan, Tilt, and Zoom
PUP	Pedestrian Underpass
RCC	Reinforced Cement Concrete
RE	Reinforced Earth

Abbreviations	Meaning
R/f	Reinforcement
RFID	Radio Frequency Identification
RL	Retroreflected Luminance
ROW/PROW	Right of Way/ Public Right of Way
SBC	Safe Bearing Capacity
SOR	Schedule of Rates
SP	Special Publication
SPV	Special Purpose Vehicle
SR	Service Road
SVUP	Small Vehicular Underpass
TFT	Thin Film Transistor
TNEB	Tamil Nadu Electricity Board
UPS	Uninterruptible Power Supply
VSDS	Vehicle Speed Display System
VDF	Vehicle Damage Factor
VIDS	Video Incident Detection System
VOP	Vehicular Overpass
VUP	Vehicular Underpass
WIM	Weigh-in-Motion
WMM	Wet Mix Macadam

CHAPTER 1. INTRODUCTION

1.0 BACKGROUND

The "Four-Laning of the Oddanchatram to Madathukulam Section of NH-209" is a highway infrastructure project aimed at developing a four-lane road from Km 29.000 to Km 74.380, including the realignment/widening of the existing road from Km 63+220 to Km 67+550. This project is part of the Bharatmala Pariyojna Phase-I under the category of Residual Works of the National Highways Development Project (NHDP) and is being executed through the Hybrid Annuity Model (HAM).

This section, a crucial segment of the NH-209 (now renamed NH-83), connects key economic and agricultural centers in Tamil Nadu. It enhances connectivity between major cities and towns such as Coimbatore, Dindigul, and Madurai and is essential for strengthening links between Tamil Nadu and neighboring states like Kerala and Karnataka.

M/s KNR Palani Infra Private Limited (the "Concessionaire") upgraded the existing two-lane section of NH-209 (NH-83) to four lanes from Oddanchatram to Madathukulam in Tamil Nadu, in accordance with the Concession Agreement (CA) signed with the National Highways Authority of India (the "Authority") on December 6, 2019.

1.1 PROJECT ROAD LOCATION

The Project Road is located in the southern part of Tamil Nadu connecting Oddanchatram in Dindigul district to Madathukulam in Tiruppur district. The project road runs near the picturesque Western Ghats and prominent pilgrimage sites like the Palani Murugan Temple, one of South India's most renowned temples. Project road starts at Km.29.000 located near Oddanchatram and ends at Km. 74.380 near Madathukulam on NH-83. Project location map is provided at Figure 1.1.

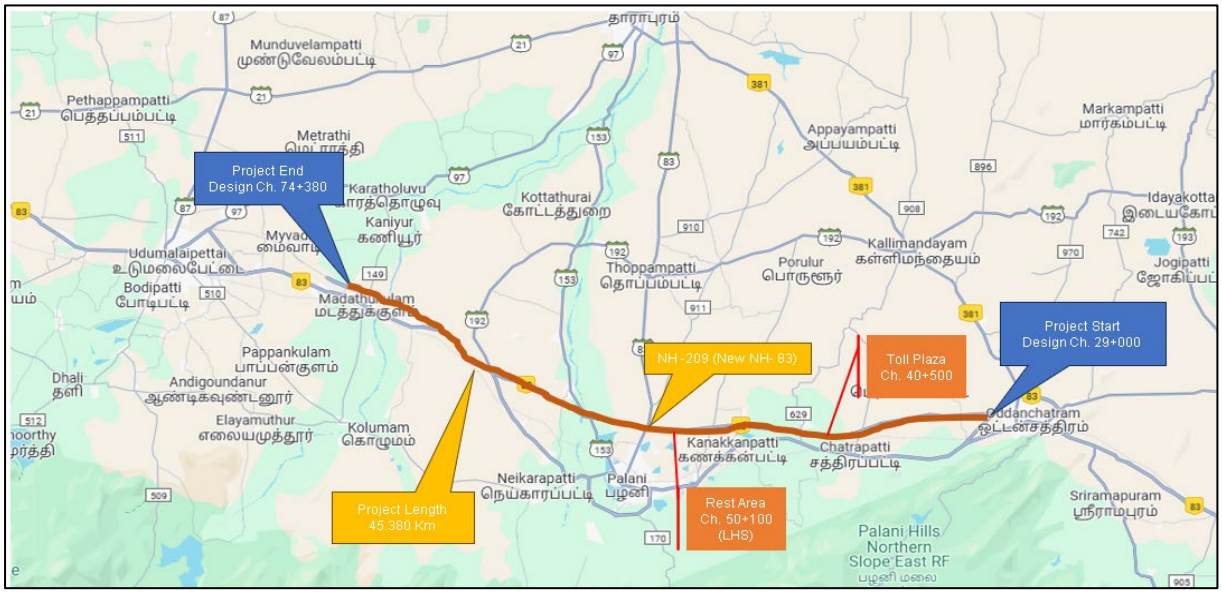

Figure 1.1: Project Locations Map

1.2 PROJECT DETAILS

Table 1.1: Salient Details of Project

SN	Particulars	Details
1.	Name of the project	Four Laning of Oddanchatram - Madathukulam section of NH-209 (New NH-83) (Design Ch. Km 29.000 to Km. 74.380) under Bharatmala Pariyojna Phase-I under the category of Residual Works of NHDP on HAM in the State of Tamil Nadu
2.	Road type	National Highway
3	Design Length	45.380 Km
4	Name of the Authority	National Highways Authority of India
5	Name of the Concessionaire	M/s KNR Palani Infra Private Limited
6	Name of the EPC Contractor	M/s KNR Constructions Limited
8	Independent Engineer	SA Infrastructure Consultants Pvt. Ltd.
9	Financial Close	Achieved on 22.05.2020
10	Senior Lender	Axis Bank Limited
11	Lender's Independent Engineer	Feedback Infra Pvt. Ltd.
12	Date of LOA	07.03.2019
13	Date of Concession Agreement	06.12.2019
14	Bid Project Cost	Rs 920 Crore
15	Annual Maintenance Cost	Rs 3 crore
16	Toll collected by	NHAI
17	Operation & Maintenance Period	15 Years
18	Appointed Date	05.10.2020
19	Construction Period	730 Days
20	Scheduled Completion Date	04.10.2022
21	Issuance of provisional certificate	PC-1(34.850Km) on 02.09.2022

SN	Particulars	Details
		PC-2 (9.97Km) 20.09.2023
22	Date of issuance of Completion Certificate	Under consideration of the Authority. The concessionaire has made a request to issue w.e.f. 31.1.2024.
23	Bonus on early commissioning	Yes, Received by the Concessionaire for the period of 03.09.2022 to 04.10.2022
24	Revised date of Completion (EOT)	The approved Extension of Time (EOT) is 153 days, comprising 60 days for EOT1 due to the COVID-19 pandemic and 93 days for EOT2, attributed to the COVID-19 second wave lockdown, the Tamil Nadu election MCC, and unprecedented rainfall. As per the Settlement Agreement dated March 15, 2023, the scheduled completion date was extended to August 31, 2023. A further extension to January 31, 2024, is under consideration, with an amendment to the Settlement Agreement currently being discussed.
25	Concession End Date	01-09-2037

1.3 SCOPE OF CONSULTANCY SERVICES

M/s Resotech Consultancy Services Pvt. Ltd. has been engaged by M/s Indus Infra Trust to carry out a Technical Due Diligence for the Project Road to assess the present condition of Carriageway and Structures. The scope of work includes: -

1.3.1 GENERAL

i. Review of all documents related to Project including but not limited to concession agreement, supplementary agreements, provisional completion certificates, punch list items, completion certificate, clearances, monthly IE reports, correspondence etc.
ii. Review of Change of Scope/ other Claims submitted and to be submitted to Authority / IE, comment on the veracity of the same and approval status.
iii. Highlight any non-compliance of the terms of the CA or O&M manual and IE inspection reports etc.
iv. Review of any pending issues related to Utility shifting, maintenance etc. in accordance with the Concession Agreement.
v. Comment on issues including any balance work that may have a potential impact on the maintenance costs going forward and which may warrant a one-time expense in future.

vi. In general review the ATMS/ HTMS and the hardware installed therein and comment on the adequacy and level of maintenance of the same to meet the requirements under CA.
vii. Review of as built drawings.
viii. Determine the appropriate level and frequency of routine and major maintenance activities required to keep the road assets in good condition and to meet the performance and O&M standards, specifications and requirements.
ix. Review the major maintenance work undertaken, and prepare projections for future major maintenance expenses (incl. any hand-back requirements), so as to ensure compliance with the terms of CA.
x. Review of the condition of SPV assets including all equipment and vehicles etc.
xi. Report on balance acquisition of land if any and Feasibility of acquisition.
xii. Report on current encroachments on the project stretch and future expected problems due to the same. Verification of project assets as per As Built drawings/GFC drawings, ensuring that development of project is within PROW without encroaching extra land (check footprint)
xiii. Report on the possibility of project highway augmentation.
xiv. Review of all documents related to construction of project including correspondence exchanged between NHAI, IE, Concessionaire, pavement design report, mix design report for all layers, quality control and quality assurance plan, Work Programme, Methodology, O&M manual, design of structures, IC inspection reports etc. for identification of critical or important issues that could have potential implication.
xv. Review of past routine maintenance and its cost (including review of IE fees shared with Authority during Operation period which includes review of deployment of IE staff, Vehicles and annual testing cost etc.) as applicable for the project.
xvi. Status of registration, licenses, approvals, clearances, and permits required during the operation and maintenance phase, if any as per CA

1.3.2 ASSESSMENT OF ASSET CONDITION

i. Assessment of road assets in conformance with specifications, standards and codes stipulated in CA and O&M manual etc.
ii. A detailed inventory survey of road assets including main carriageway, structures, service roads, lightings, drains, slope protection works, retaining walls, bus bays, bus shelters, truck lay byes, O& M center, road furniture including signages, MCB, guard rails etc. other safety measures, toll collection infrastructure, buildings, plantation, etc.
iii. Assessment of condition of the structures including but not limited to visual inspections of bearings, expansion joints, superstructure, substructures, foundations, associated components, review of geotechnical assumptions. In case of major structures on waterbodies that are not accessible from underside, use of drone cameras shall be made to capture the images of bearings etc to the extent possible.
iv. Assessment of the condition of the road pavement including but not limited to visual inspections of the pavement, review as-built design and assess design assumptions.

v. Assessment of physical dimensions/ condition of the infrastructure to determine useful lives of the materials and equipment requiring rehabilitation and/or replacement.
vi. Assessment of variation/ COS orders on the project, if any, and evaluate their impact on expenditure, time to completion, future O&M obligations and tolling revenue.
vii. Comment on the pavement crust composition (Design vs. Actual) for Rigid/ Flexible pavement as the case may be.
viii. Recommendations for any major repair/ rehabilitation and strengthening based on the condition survey and design reports.
ix. To provide a detailed photographic report of the infrastructure assets and its condition to withstand till end of concession period. Suggestion and cost evaluation for any additional repair / rectification / modification required.
x. Review of condition assessment reports like NSV, FWD, retro-reflectivity, etc.
xi. Analysis of reports on Trial pits for pavement layer composition, Axle load survey, etc.
xii. Review of the most recent tests conducted by the IE on project assets (pre-monsoon and post monsoon reports) FWD, NSV & Axle Load Survey
xiii. Review of all Highway Lighting for its sufficiency w.r.t IRC specifications and review of average monthly energy, maintenance cost requirements and Comparative statement for actual bill being paid presently with theoretical calculations

1.3.3 INVESTIGATIONS TO BE CARRIED OUT

i. Assessing maintenance needs and their valuation according to the level of deterioration.
ii. Evaluation of overall condition of rigid/ flexible pavement, by carrying out visual condition survey.
iii. Carry out drainage surveys to assess any potential future problems related to water logging etc.
iv. Following field investigation report shall be provided by the Client:
- NSV survey
- FWD test analysis.
- Retro Reflectivity test
- Trial pits for pavement composition and engineering properties of various pavement layers.
- Bituminous core test results.
- Classified Traffic Volume Count Survey.
- Axle Load Survey.

1.3.4 O&M ASSESSMENT

i. Develop a detailed O&M cost forecast for each year of the concession period and a detailed major maintenance cost forecast along with estimation of costs towards handover requirements.
ii. Providing detailed Due Diligence Report.

CHAPTER 2.0: REVIEW OF DOCUMENTS

2.0 REVIEW OF CONCESSION AGREEMENT

Concession Agreement giving concession right for development ,operation &maintenance to M/s KNR Palani infra private Limited for the project " Four Laning of Oddanchatram - Madathukulam section of NH-209 (New NH-83) (Design Ch. Km 29.000 to Km. 74.380) under Bharatmala Pariyojna Phase-I under the category of Residual Works of NHDP on HAM in the State of Tamil Nadu" was entered into 6th Dec 2019, between NHAI (The "Authority") and KNR Palani Infra Private Limited (The "Concessionaire") . The concession was granted for a construction period of 730 days and operation period of 15 years commencing from COD, as per the terms and conditions set forth in the Agreement.

2.1 SPECIFIC COMMENTS ON ARTICLES OF CONCESSION AGREEMENT

PCOD -I for a length of 34.88 Km was achieved on 02.09.2022, followed by PCOD-II for 9.97 KM on 20.09.2023. Since then, the concessionaire has been performing its O&M obligations and has completed 2 years of the operation period. Relevant clauses of the concession agreement, which will have bearing on the performance of the concessionaire during the balance concession period are reviewed hereunder and our specific comments on the same are indicated clause wise in Table 2.1 below.

Table 2.1: Comments on Concession Agreement

Article & Clause No.	Subject	Information in Brief	Remarks
Article 3, Clause 3.1.1,	Grant of Concession	The Authority granted a concession for a 2-year construction period and a 15-year operational period starting from the COD.	The Appointed Date is October 5, 2020. PCOD-1 and PCOD-II were issued effective September 2, 2022, and September 20, 2023, respectively. The concessionaire received EOTs for construction delays attributable to the Authority. The operation period commenced with effect from 02.09.2022, i.e., on the issuance of PCOD -I.
Article 5, Clause 5.2.5	Selection of O&M Contractor	Selection or replacement of an O&M Contractor requires prior approval from the Authority.	NHAI's approval is limited to considerations of national security and public interest.
Article 6, clause 6.3	Refinancing	Refinancing is allowed but requires prior consent from the	The Authority will aim to convey its decision within 30 days of receiving

Article & Clause No.	Subject	Information in Brief	Remarks
		Authority.	the proposal.
Article 11 Clause 11.2	Shifting of Obstructing Utilities	The Concessionaire, with the Authority's assistance, is responsible for shifting any obstructive utilities like electric lines, water pipes, and telephone cables.	The Authority will bear the cost of shifting. If the delay in shifting is caused by the utility owner, the concessionaire will be excused from responsibility.
Article 15 Clause 15.1	Commercial Operation Date (COD)	Upon COD, Project Highway begins commercial service, entitling the Concessionaire to collect annuity payments.	PCOD 1 for 34.850 Km and PCOD -II for 9.970 Km were achieved by the concessionaire on 2nd Sep 2022 and 20th Sep 2023 respectively.
16.2	Procedure for change of scope	After receiving a change of scope notice, the Concessionaire shall provide the following information supported with preliminary documentation: - (i) Impact on the project completion schedule, (ii) A detailed breakdown by work classification specifying the material and labour costs, calculated in accordance with the applicable SOR.	The concessionaire should also propose a premium/discount on the SOR Rates.
16.6.1	Reduction in Scope of the project	If the Concessionaire cannot complete any construction due to Force Majeure or Authority issues, the total cost for the reduced scope is calculated in specified steps. Total Cost of Reduced Scope shall be calculated as:- IE shall assess the Civil Cost of the Reduced Scope as per the SOR applicable on the bid due date.	With a reduced scope, the revised bid cost is applied to all future calculations. The Authority vide its letter NHAI/PIU/DGL/11014/PKG-II/COS-04/2024/238998/2072 dated 18.10.2024 has communicated its approval for Reduction in Scope proposal for deduction of Boundary wall length 13.6 Km for Rs. 4.57 Crore.

Article & Clause No.	Subject	Information in Brief	Remarks
		Civil Cost of the Reduced Scope shall be multiplied by 1.05 to arrive at the estimated cost of Reduced Scope. The Estimated Cost of Reduced Scope shall then be multiplied by the ratio of Bid Project Cost to Estimated Project Cost to arrive at the Total Cost of Reduced Scope.	
16.7	Effect of Change of Scope on the O&M Costs	If the Change in Scope leads to a reduction or increase in the length of the Project Highway, the O&M Payments shall reduce or increase in the same proportion.	The 0.560 km incomplete section, as on the Settlement Agreement dated 15.03.2023, was physically completed on 27.1.2024. Had the Right of Way (ROW) for the remaining segment not been provided by 31.08.2023, it would have been considered for scope reduction. However, since the work is now finished, there will be no impact on the O&M payment.
Article 17 Clause 17.1	Operation and Maintenance obligation	The Concessionaire must operate and maintain the Project Highway and make necessary improvements to comply with contract provisions.	The O&M requirements are outlined comprehensively in this clause, with maintenance details in Schedule K.
Article 17 Clause 17.3	Maintenance Manual	First submission (prepared in consultation with IE) should be submitted 3 months before the scheduled completion.	The Maintenance Manual will be updated once every three years. The first submission was made on 13.7.2022.
Article 17 Clause 17.4	Maintenance Program	During each year of the operation period, the concessionaire shall provide its proposed annual program of preventive, urgent and other scheduled maintenance to comply with the maintenance	The program should detail schedules, repair procedures, safety measures, and be submitted 45 days before each fiscal year. For FY 24-25, submission was made on 08.02.2024. For FY 25-26, submission is due by February 15, 2025.

Article & Clause No.	Subject	Information in Brief	Remarks
		requirements.	
Article 17 Clause 17.5	Safety, vehicle breakdown and accident	The Concessionaire shall maintain and operate a 24/7 rescue post with equipment to remove obstructions and debris promptly.	2 cranes are deployed by the concessionaire for this purpose.
Article 18 Clause 18.1.2, paragraph 2 of Schedule L	Safety Consultant	The Authority shall appoint an experienced and qualified firm as the "Safety Consultant" for carrying out safety audits of the Project Highway. The remuneration of the Safety Consultant, Safety Audit and cost incidental thereto, shall be met by the Concessionaire.	The Authority engaged M/s Saadhya Infra Solutions LLP for three projects [Package I, II, and III of the four-laning project from Kamalapuram (Design Chainage 0+000) to Pollachi (Design Chainage 116+950 km)] and entered into an agreement on 08.10.2021 with a contract value of ₹50,35,000/-. The remuneration for the Safety Consultant will be shared equally among the three concessionaires.
Article 19 Clause 19.4	Remedial Measures	The Concessionaire shall repair the deficiencies observed in the O&M Inspection Report (issued by IE on a monthly basis) and test results within 15 days on receipt of the same.	Where the rectification is likely to take more than15 days, weekly updates are required until completion.
Article 20 Clause 20.2, 20.3 and 20.7	Traffic Aid Post	The Concessionaire will establish and maintain a Traffic Aid Post at the Toll Plaza with a mobile police squad for round-the-clock patrolling of the project. Traffic Aid Post building of 25 sq mm plinth area to be constructed by the Concessionaire.	The Concessionaire shall provide one jeep or similar vehicles in good working conditions to the State Police along with chauffeurs for round-the-clock patrolling. The Concessionaire shall cover the vehicle operating costs and chauffeur salaries& allowances.
Article 20 Clause 20.4, 20.5 and 20.8	Medical Aid Post	The Concessionaire will support the State in establishing a Medical Aid Post with 2 nos of Ambulance with	(i) The Concessionaire shall meet the following recurring expenses: - (a) operating expense of ambulances including the salaries of chauffeurs,

Article & Clause No.	Subject	Information in Brief	Remarks
2(j) of Schedule C		round-the-clock services at the Toll Plaza. Ambulance shall be provided as per Annexure -I of NHAI/Policy guidelines /strengthening the Incident Management Services /2018	pay& allowance of medical personnels deployed for the project(2 no. with each ambulance) (b) reimbursement of actual expenditure on medical equipment (c) Maintenance cost of medical aid post building.
Article 21 Clause 21.1 and 21.3	Independent Engineer	The Authority shall appoint an IE initially for a period of construction period +6 months. On expiry date, the Authority shall appoint an IE for a further term of 3 years. The same process shall be repeated after the expiry of each appointment.	(a)Agreement Date – 11.09.2020, IE Mobilization Date – 05.10.2020, IE schedule of completion Date – 04.10.2024 (b)During the Development and Construction Periods, the Concessionaire is required to reimburse the Authority for half of the Independent Engineer's (IE) remuneration, costs, and expenses, subject to the cap specified in Schedule M, which is set at 3% of the Bid Project Cost. (c) During the Operation Period, all payments made to the IE for fees and expenses shall be equally shared between the Authority and the Concessionaire. There is no defined cap for the expense to be borne by the concessionaire this period, due consideration must be given to ensuring cost-efficiency in expenditures.
Article 22 Clause 22.1	Financial Close	The Concessionaire must achieve Financial Close within 150 days from the date of the Agreement. If there is a delay in achieving Financial Close, the Concessionaire can be granted an additional period of up to :- (a)120 days, subject to payment of damages calculated at 0.05% of the Performance	The Financial Close was achieved on 22 May 2020, (18 days delay from the scheduled date). The Authority approved the request for extension without penalties under the Force Majeure clause (COVID 19 lockdown). Axis Bank (the Lender Representative), in a letter dated May

Article & Clause No.	Subject	Information in Brief	Remarks
		Security per day of delay. (b) further 95 days, subject to payment of damages at 0.1% of the Performance Security per day of delay, (c) No damages are payable if the delay is due to Force Majeure.	22, 2020, confirmed that all conditions precedent for the initial availability of funds under the Financing Agreements had been fulfilled.
Article 23, Clause 23.1,23.2 &23.3	Bid Project cost and payment	The Bid Project Cost, set at INR 920 Crore, represents the amount payable to the Concessionaire. It will be adjusted by the Price Index Multiple. (i) 40% of the BPC (Bid Project Cost), adjusted for the Price index Multiple shall be paid in 5 equal installments during the construction period. (ii) Remaining 60% of the BPC duly adjusted for the Price Index Multiple shall be paid in 30 biannual installments	The percentage of completion costs remaining to be paid for each annuity has been indicated in the table given in Clause 23.6.3. Each of the biannual installments shall be paid along with interest on the reducing balance of Completion Cost bank rate +3%, calculated on simple interest basis.
23.6.2	Annuity Payments	The completion cost remaining to be paid after the construction period shall be due and payable in biannual installments over a period of 15 years commencing from COD.	The first installment will be due and payable within 15 days after 180 days from the COD. Subsequent installments will be due and payable within 15 days following the end of each successive six-month period. The final annuity payment will be adjusted to ensure it aligns with the end of the Operation Period.
Article 23, Clause 23.7	O&M Payments	(i) First year O&M Cost for the project is INR 3.00 Crore. (ii) Each installment of O&M payment is the product of the First year O&M Cost and the price index multiple.	The O&M payment shall be disbursed in two equal biannual installments alongside the annuity payments.

Article & Clause No.	Subject	Information in Brief	Remarks
Article 23, Clause 23.9	Treatment of incomplete works	If incomplete works are deemed unnecessary, the Authority may adjust the project scope, annuity, and O&M payments accordingly.	For provisional COD, payments will proceed as if the project is complete.
Article 25, Clause 25.3	Withdrawals during Concession Period from Escrow Account	Deposit in the Escrow Account shall be appropriated in the order given in Clause 25.3.1.	For any modification in the order of payment, the Concessionaire has to take prior written approval of the Authority.
Article 26, Clause 26.1	Insurance during concession period	The concessionaire shall effect and maintain at its own cost, during the concession period, insurances required under the Financing Agreements and applicable laws. The Concessionaire shall procure and maintain the following insurances during the Construction & maintenance Period :- a) Loss. damage or destruction of the Project assets handed over by the Authority)' to the Concessionaire. at replacement value: b) Comprehensive third part} liability insurance including injury to or death of personnel or the Authority or other caused by the Project: c) The concessionaire's general liability arising out of the Concession. d) Liability to third parties for goods or property damages: e) Workmen's compensation	The Authority is a co-insured; proceeds go to the Escrow Account. Status of Insurances availed, as per IE letter dt.20.09.2024 is: - Contractor All Risk Policy- valid up to 13.10.2024+ 24 months [covers policy (a) to d)] Standard Fire and Special Perils Policy –valid up to13.04.2025 – additional for fire protection under (f) Employees Compensation Insurance – valid up to 24.5.2025 – covers item (e)

Article & Clause No.	Subject	Information in Brief	Remarks
		insurance f) Any other insurance that may be necessary to protect the Concessionaire and its employees, including all Force Majeure Events that are insurable at commercially reasonable premiums and not otherwise covered in items (a) to (e) above.	
Article 27	Account and Audit	On or before 31st May of each year, the concessionaire shall provide a duly audited statement on revenues derived from the Project by its statutory Auditors.	Statutory Auditors shall be appointed from the mutually agreed list of 5 firms (Panel of Chartered Accountants). The Authority may also appoint another firm from the Panel to act as Additional Auditor.
Article 32	Divestment of Rights and interest	Completion of divestment occurs once requirements in Clause 32.1.1 are met, with the Authority issuing a Vesting Certificate. The requirements are: (a) the location and particulars of the Project Assets be Notified to the Authority (b) Deliver actual or constructive possession of the Project, free of all Encumbrances. (c) Cure all Project Assets of defects and deficiencies to ensure compliance with Maintenance Requirements. (d) Deliver and transfer relevant records, reports, Intellectual Property, licenses, and complete 'as built' Drawings.	The concessionaire shall extend requisite co-operation and assistance to the Authority for smooth transfer of the project. All costs incidental to Divestment except stamp duty, to be borne by the concessionaire.

Article & Clause No.	Subject	Information in Brief	Remarks
		(e) Transfer and/or deliver all Applicable Permits . (f) Execute deeds of conveyance, documents, and other writings as required by the Authority. (g) Comply with all other requirements under Applicable Laws for completing the divestment and assignment of all rights, title, and interest in the Project.	
Article 34, clause 34.3	Substitution Agreement	The lender's representative may replace the Concessionaire under the substitution agreement.	Upon substitution, the new company assumes the role of the Concessionaire in the Concession Agreement.
Article 35	Change in Law	If as a result of Change in Law, the concessionaire suffers an increase/reduction in costs, the aggregate financial effect of which exceeds the higher of Rs. 1.4 Crore or 2% of the total annuity payment in any accounting year, an amendment to the concession Agreement be implemented to bring the concessionaire in the same financial position, as it would have enjoyed had there been no such change in Law.	(i)Net present value of the net cash flow shall be used to ascertain the financial position and for determination of the required adjustment (ii) For determination of NPV, the discount rate to be used shall be equal to the weighted average rate of interest at which the concessionaire has raised the Debt Due under its Financing Agreements.
Article 38	Dispute Resolution	Dispute shall, in the first instance, be resolved with the conciliation procedure, failing which it shall be resolved through Arbitration.	Arbitration shall be held in accordance with the rules of "SAROD "and shall be subject to the provisions of A&C Act ,1996.
Article 41, Clause	Delayed Payments	Payments under the Concession Agreement are due	Interest accrues daily and compounds quarterly. The

Article & Clause No.	Subject	Information in Brief	Remarks
41.4		within specified periods, with late payments incurring 4% interest above the daily average bank rate.	Concessionaire has raised an interest claim on 16.7.2024, amounting to 1,73,81,878/- on account of delay in Annuity payment (First Annuity payment delay -53 days, Second Annuity Payment Delay – 33 days and third Annuity payment delay -54 days).

2.2 REVIEW OF SETTLEMENT AGREEMENT: -

i. The Settlement Agreement Dt 15.03.2023 between the National Highways Authority of India (NHAI) and KNR Palani Infra Pvt. Ltd. was established to resolve disputes related to delays and additional requirements in the project. This agreement outlines the terms for addressing project timelines, financial adjustments, and the obligations of both parties, emphasizing their collaborative efforts to complete the project as planned.

ii. The agreement acknowledges several challenges, including delays caused by the COVID-19 pandemic, heavy rainfall, and state elections, all of which were beyond the control of either party. NHAI's decision to issue a provisional completion certificate for 34.85 km of total 45.38 km was a key milestone, enabling the Concessionaire to secure annuity payments for the completed portion (BPC-1) and lay the groundwork for future annuity payments. The Concessionaire also committed to completing an additional 8.03 km (BPC-2) by March 2023, followed by another 2.5 km (BPC-3) by August 2023, establishing clear stages for revised annuity payments.

iii. A key feature of the agreement is its stance on interest payments. Although the Concessionaire is entitled to payments for the additional completed sections (BPC-2 and BPC-3), no interest will be paid for these sections when calculating annuities.

iv. The agreement allows NHAI to de-scope the remaining 2.5 km if it fails to provide the necessary land by a specified deadline. Both parties have also agreed that unresolved issues, such as disputes over diesel rates and discounts on Change of Scope (COS), may be referred to arbitration if needed.

Conclusions on Observations on Concession Agreement

The Concession Agreement is comprehensive and covers all the issues concerned with the Construction and Operation of the Project. It is seen that the provisions in the Agreement are spelt out clearly without ambiguities.

2.3 REVIEW OF EPC AGREEMENT

The Concession Agreement for this project was executed between the Concessionaire, M/s KNR PALANI INFRA PRIVATE LIMITED, and the Authority, NHAI, on December 6, 2019, with a Bid project cost of Rs. 920 Crores. The Concessionaire appointed M/s KNR Constructions Limited as the EPC Contractor to complete the project scope as outlined in the Concession Agreement, following an EPC model without price escalation. The EPC contract was signed on May 22, 2020.

Key Provisions of the EPC Contract:

i. The EPC Contractor is responsible for constructing and commissioning the Project Highway as per the Concession Agreement's terms and must also rectify defects and provide maintenance until the end of the Defect Notification Period (upto expiry of two years from the date of issuance of the completion certificate).
ii. All risks, rights, and responsibilities of the Concessionaire during construction have been assigned to the EPC Contractor.
iii. The EPC Contractor will assume control of the site from the Authority on behalf of the Concessionaire, as stipulated in the Concession Agreement.
iv. The EPC contract is valued at Rs. 716.80 Crores, which includes a fixed lump sum of Rs. 640 Crores and Rs. 76.80 Crores for GST, with adjustments as per the Concession Agreement. The contract price is fixed and not subject to increase. Monthly progress payments will be made according to the submitted requests in the agreed format.
v. The EPC Contractor is responsible for all applicable taxes, including stamp duties, import fees, and customs duties related to their contractual obligations.
vi. The cost for the Independent Engineer is borne by the Concessionaire/Authority, with no financial obligation on the EPC Contractor.
vii. If the Concessionaire incurs costs due to the EPC Contractor's failure to perform or rectify deficient work, the EPC Contractor must promptly reimburse these costs (including bank charges) upon request. This is in addition to any liquidated damage.
viii. The EPC Contractor is fully accountable for any positive or negative cost impacts arising from design modifications.
ix. For relief due to a Change in Law, the EPC Contractor must provide financial impact details to the Concessionaire, who will forward them to the Authority. Upon receipt of payment, the Concessionaire will transfer the amount to the EPC Contractor.
x. If the EPC Contractor fails to complete punch list items within 90 days, the Concessionaire may do so at the EPC Contractor's risk and cost.
xi. If any obligations during the Defect Notification Period remain unmet, or defects are identified before the period ends, the Defect Notification Period will be extended by the duration of the highway, or its parts are unavailable due to these defects. The defect liability period cannot be extended beyond two years.
xii. The Concessionaire will issue the Performance Certificate within 14 days of the Defect Notification Period's end, provided the EPC Contractor has submitted all required documents. Upon issuing this certificate, the EPC Contractor's obligations will be deemed completed, but any unfulfilled obligations remain enforceable.

xiii. If delays attributable to the EPC Contractor cause milestones to be missed, the EPC Contractor is liable for damages on a back-to-back basis as per the Concession Agreement, with liquidated damages capped at 5% of the EPC Contract price.

xiv. Upon receiving a bonus payment as per the Concession Agreement formula, the Concessionaire will pass on an equivalent bonus to the EPC Contractor, adjusted per the payment priorities outlined in the Escrow Agreement.

xv. Dispute resolution will proceed initially through conciliation, followed by mediation upon notification within the specified period, and, if necessary, arbitration.

2.4 MAINTENANCE PERFORMANCE REQUIREMENT

The Concessionaire completed the Project Highway construction in three phases, in alignment with the phased Right of Way (ROW) handover by the Authority. The phased Commercial Operation Dates (PCODs) for the project are as follows:

- PCOD-I: Issued for a 34.850 km segment out of the total 45.380 km with effect from 02.09.2022
- PCOD-II: Issued for an additional segment of 9.970 km w.e.f. 20.9.2023.
- PCOD-III/COD: Issuance for the remaining 0.560 km is under review and expected to be finalized with Amendment to the Settlement Agreement Dt. 15.3.2023.

Operation and Maintenance (O&M) activities began on September 2, 2022, in line with the PCOD-I issuance. Prior to this, the Concessionaire prepared and submitted a Maintenance Manual detailing the systems, procedures, and methods for fulfilling maintenance obligations during the Concession's Maintenance Period. Since the project is now in the Operation Period, a review of the O&M requirements specified in the Schedule K of the Concession Agreement has been conducted.

2.4.1 Key Provisions: -

- The Concessionaire must operate and maintain the Project as per the Agreement, Applicable Laws, and Permits.
- Defects and deficiencies specified in Annex-I must be repaired/rectified as per the timelines in Annex-I.
- An adequate inventory of spares and consumables must be maintained.
- Defects not specified in Annex-I must be repaired/rectified as per Good Industry Practice and as specified by the Independent Engineer.
- The Independent Engineer may specify permissible limits for deviations and time limits for repairs.
- Extensions of time for repairs may be granted if justified by the nature and extent of defects, as determined by the Independent Engineer.
- Emergency repairs/restoration must be done promptly to eliminate or minimize hazards.
- Daily visual inspections must be conducted by the Concessionaire.
- All defects must be repaired and rectified by the Transfer Date.
- Schedule-K must be displayed at the site along with the complaint register.

Annex-I: Specific Defects and Timelines

Table 2.2: Time limits for repair/rectification as per CA

SI. No	Nature of Defect	Time Limit for Repair/Rectification
1	Breach or blockade	Temporary: 24 hours; Permanent: 15 days
2	Roughness value exceeding 2,750 mm in 1 km	180 days
3	Potholes	48 hours
4	Cracking in more than 5% of road surface in 1 km	30 days
5	Rutting exceeding 10 mm in more than 2% of road surface in 1 km	30 days
6	Bleeding/skidding	7 days
7	Raveling/Stripping of bitumen surface exceeding 10 Sq m	15 days
8	Damage to pavement edges exceeding 100 mm	15 days
9	Removal of debris	6 hours
10	Variation by more than 2% in the prescribed slope of camber/cross fall	30 days
11	Edge drop at shoulders exceeding 40 mm	7 days
12	Variation by more than 15% in the prescribed side (embankment) slopes	30 days
13	Rain cuts/gullies in slope	7 days
14	Damage to or silting of culverts and side drains during rainy season	7 days
15	Desilting of drains in urban/semi-urban areas	48 hours
16	Damage to shape or position; Poor visibility or loss of retro-reflectivity	48 hours
17	Any major failure of the system	24 hours
18	Faults and minor failures	8 hours
19	Obstruction in a minimum headroom of 5 m above carriageway or obstruction in visibility of road signs	24 hours
20	Deterioration in health of trees and bushes	Timely watering and treatment
21	Replacement of trees and bushes	90 days
22	Removal of vegetation affecting sight line and road structures	15 days
23	Cleaning of toilets	Every 4 hours
24	Defects in electrical, water, and sanitary installations	24 hours
25	Damage or deterioration in Approach Roads, pedestrian facilities, truck lay-bys, bus-bays, bus-shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts, and other works	15 days

2.4.2 REVIEW OF O&M MANUAL

According to information gathered from correspondence, the Concessionaire has submitted the Maintenance Manual twice: first at the time of PCOD-1 (vide letter no. 295 dated13.7.2022) and then again when requesting COD (letter no. 454 dated 22.12.2023). The O&M Manual, prepared at the time of the first PCOD, has been provided for review. The manual details guidelines and procedures aimed at fulfilling maintenance requirements effectively. It covers inspection processes, defect identification, and rectification methodologies. During its development, the requirements from the Concession Agreement, IRC Codes, MORTH publications and industry's best practices were considered. The manual's primary objectives are to:

- Ensure the safety of workers and users of the project facilities.
- Safeguard facilities from unnecessary wear and deterioration.

2.4.2.1 Key observations on the manual provision:

- Section I: Introduction – Provides the project background, an overview of salient project features, and notes the commencement of the Operation and Maintenance Period effective from 02.09.2022.
- Section II: Operation and Maintenance Requirements – Lists the requirements that the Concessionaire must comply with, either directly or through O&M contractors.
- Section III: Concessionaire's Team – Details the concessionaire's team responsible for maintenance tasks during the period, with specific responsibilities defined for each key team member.
- Section IV: Operational Procedures and Systems – Describes regular and emergency highway operations. The concessionaire must implement a Highway Traffic Management System for traffic monitoring and control, allowing management of both active and planned events. This includes:
    i. Highway Patrolling: A 24-hour patrolling team for the ROW and project facilities.
    ii. Highway Safety Management Unit (HSMU): To be established on or after COD to ensure safety during operations, with defined safety standards and traffic control zones.
    iii. Rescue and Medical Aid: This includes detailed instructions and procedures. Each ambulance unit is staffed with a nurse, compounder, photographer, and driver.

    It is noted that the presence of a photographer is not explicitly mentioned in the Concession Agreement (CA), but a provision has been included in the Maintenance Manual.
- Section V: Maintenance Activities – Outlines regular and preventive maintenance for road materials and equipment to ensure compliance with specifications and standards. This section includes:
    i. Types of Maintenance: Routine, Preventive, Periodic, and Special Repairs.

ii. Inspection Procedures: Pavement defect identification and comprehensive maintenance measures for both flexible and cement concrete pavements.
iii. Additional Maintenance: Covers toll plaza upkeep, building maintenance, road furniture and facilities, and horticultural activities, with detailed inspection formats.
iv. Some of the important provisions on maintenance activities are :-

Table 2.3: Important provisions of O&M Manual

Clause	Description	Remarks
Clause 5.1, O&M Manual	Routine Maintenance: Routine maintenance covers repair, horticulture, approach road upkeep, cleanliness, encroachment prevention, and road furniture maintenance.	These recurring activities are necessary for preserving the road's condition and ensuring road user safety, adhering to IRC/MORTH Standards.
Clause 5.1.2, O&M Manual	Preventive Maintenance: Ensures adherence to standards throughout the Concession Period to maintain the Project Highway in durable, functional condition.	Preventive maintenance involves regular treatments to slow pavement deterioration and minimize life cycle costs.
Clause 5.1.3	Periodic Maintenance: Renewal is carried out to improve riding quality and maintain specified road roughness levels.	Predictable activities are carried out periodically to protect the pavement structure and improve ride quality.
Clause 5.1.4	Special Repairs: Repairs due to natural events, including landslide clearing, culvert repairs, RE wall repairs, and flood restoration.	Addresses natural calamity-related damage to ensure road usability and safety.
Clause 5.3.1	Minimum Maintenance Requirement: Specifies timeframes for addressing major breaches (within 24 hours) and urgent repairs.	Major breaches must be repaired urgently as per the O&M Manual. Minor damages posing safety risks must also be promptly addressed.
Clause 5.4, Maintenance Manual	Surface Roughness: Surface roughness should not exceed 2750 mm/km during the pavement's service life, with an initial completion measurement of 1800 mm/km.	The Concessionaire must ensure maintenance if roughness exceeds 2750 mm/km, as required by the Concession Agreement.
Clause 5.4.2.4	Pavement Cracking: Specifies treatment methods based on crack width, depth, and extent.	Criteria for crack sealing, slurry sealing, and patching to prevent pavement deterioration.

Clause	Description	Remarks
Clause 5.4.2.5	Pavement Rutting: Limits rut depth to no more than 10 mm within any 50 m section, with treatment as per IRC 82-1982 within 15 days.	Defines performance standards for rutting and mandates timely repairs.
Clause 5.4.2.6	Corrugations and Shoving: Requires full-depth correction for corrugations over 10 mm within 2 days of detection as per IRC 82-1982.	Performance criteria for addressing corrugation and shoving issues.
Clause 5.4.2.7	Settlement and Grade Depressions: Defects larger than 1 sqm with a depth of 10 mm must be treated within 3 days.	Specifies criteria for addressing settlement and grade depressions.
Clause 5.4.2.17	Shoulder Drop: Maximum allowable drop is 25 mm within any 10 m section along the main carriageway edge.	Deformed shoulders should be corrected within 2 days to meet MORT&H specifications.
Clause 5.4.2.19	Drainage and Side Drains: Drainage systems should not exceed 25% silting, and culverts must maintain over 90% of their diameter.	Drainage systems should be cleared within 7 days of detection, and damaged structures should be repaired within 21 days.
Clause 5.2.2	Inspections and Frequency: Specifies types (visual, close, thorough) and frequencies of inspections for various highway elements.	Visual inspections are broad, frequent checks, while close and thorough inspections are more detailed, using instrumental aids where necessary. Inspections during critical weather periods (e.g., rainy season) are essential for accurate assessments.

v. Frequency of Inspection

Table 2.4: Frequency of Inspection for Road Maintenance Activities

Sl. No.	Object	Item	Daily	Monthly	Quarterly	Before and After Rains
1	Riding Surface	Pavement	V		C	C
		Expansion joints	V	V		C
2	Median	Kerb	V	V		V
3	Side Slopes	Shape	V		C	C
		Turfing		V		V
		Pitching & Masonry			V	

Sl. No.	Object	Item	Daily	Monthly	Quarterly	Before and After Rains
		Retaining wall			C	
4	Drainage	Shoulder drain		V		V
		Median Drain		V		V
		Side Slope Drain	R		C	
		Bridge catch basin	R		C	
		Gullies and catch pits	R		C	
5	Bridges	Superstructure			V	C
		Substructure			V	C
		Head wing walls & aprons			V	C
		Painting				V
		Hand rail			C	
6	Culverts/ Underpass	RC Culverts				T
		HP Culverts				T
7	Guard Rails	Shoulders	V		C	T
		Medians	V		C	C
8	Traffic Operation Facilities	Signs	R		T	T
		Marking	R	C	C	T
		Delineators	R	C		
		Lighting	R	C	C	
9	Other Facilities	Vegetation/Landscaping	R	C	T	
		Toll Plaza	R	C	C	T
		Wayside Amenities	R	C	T	
10	Traffic Conditions				T	C
11	Encroachments			R	T	

Symbol Legend
V – Visual Inspection
C – Close Inspection
T – Thorough Inspection

Sl. No.	Object	Item	Daily	Monthly	Quarterly	Before and After Rains
R – Visual Inspection during the rainy season only						

- Section VI: Environmental Management Plan – Details environmental impact, mitigation measures, and a monitoring program for environmental parameters during the operation phase.
- Section VII: Reports and Records – Specifies the reports and records the Concessionaire must furnish during the operation period.
- Annexures: Contains additional resources, including Maintenance standards (desirable and acceptable) – Annexure 2 Maintenance team organization chart – Annexure 3, Emergency procedures – Annexure 4, Inspection formats – Annexure 7, Time limits for repair/rectification of defects and deficiencies – Annexure 11

2.4.2.2 CONCLUSIONS ON OBSERVATIONS OF THE O&M MANUAL

The O&M Manual comprehensively addresses all maintenance requirements for Project Road.

2.4.3 WARRANTIES :- The status is furnished the table below :-

Table 2.5: Summary of Warranties of Products

Sl. No.	Item	Total Qty	Qty under Warranty	Manufacturer	Date of manufacturing /testing/issue	Remarks
1	Elastomeric Bearings (380x250x65mm)	672	196	Hevea Rubber Technologies(P) Ltd	Jan-21	M/s Hevea has given the guarantee for 15 years with regard to its performance except in the case of unnatural events such as cyclones, earthquakes and other such act of God. The warranty is subject to installation procedure followed as per IRC 83 PART 2 :2018 and placement done as advised in the certificate.
2	Elastomeric Bearings (400x250x65mm)		64		Feb-21	
3	Elastomeric Bearings (450x300x65mm)		372		Jan-21	
4	Expansion Joints	1710	200		18-19 Oct 2021	M/s Hevea has given the guarantee for 10 years with regard to its performance except in the case of unnatural events such as cyclones, earthquakes and other such act of God
5	ATMS (list of equipment with qty and make mentioned in the	List of equipment with qty and make mentioned in the certificate.		Metro Infrasys Pvt. Ltd	06.06.2024	The Warranty is valid for the following dates :- Warranty start Dates – 6th June 2024

Sl. No.	Item	Total Qty	Qty under Warranty	Manufacturer	Date of manufacturing /testing/issue	Remarks
	certificate)					Warranty End Date – 5th June 2026
6	TMS (list of equipment with qty and make mentioned in the certificate)	List of equipment with qty and make mentioned in the certificate.			02.12.2023	The Warranty is valid for the following dates :- Warranty start Dates – 2nd Dec 2023 Warranty End Date – 1st Dec 2025. This warranty is subject to the terms & conditions described in the work order (KNRCL/HO/Toll Plaza/2O22/TMS/2242 Work order Dated:03rd March 2022 for Palani TMS) and does not cover any physical damages caused by external conditions.
7	Reinforcing soil structure	60484 sqm	60,484 Sqm comprising of 12 structures	Strata Geosystems (India) Pvt. Ltd	07-05-2024	Design service life of 100 years and Warranty of 20 years commencing from 21st Dec 2023.
8	Road Studs	18772 nos.	10,200	3M India Ltd	22-02-2023	Warranty given about retaining of reflectivity for a period of two years from the date of installation.

2.5 ENCROACHMENT STATUS

i. The Authority vide its letter dated 26.03.2024, taking reference of email from IE dated 24.02.2024, requested the concessionaire to remove all unauthorized access and commercial establishments constructed at site without approval of competent Authority and ensure that no such encroachment or encumbrance, unauthorized access/ approaches, unauthorized commercial establishments shall take place at Site. Details of 14 no. Unauthorized access and commercial establishment in project highway which have been constructed without approval of the competent Authority, as reported by the IE are as follows: -

Table 2.6: Details of Unauthorized Access for commercial Activity

Sl No.	Chainage	Side	Access through	Type of commercial activities
1	33+000	LHS	MCW	M/s RR Bakes
2	33+330	LHS	MCW	M/s hotel Ragavi
3	38+520	LHS	SR	M/s Golden Star Bakery
4	46+480	LHS	SR	M/s MRS Bakery

Sl No.	Chainage	Side	Access through	Type of commercial activities
5	51+920	LHS	MCW	Commercial building under progress
6	59+920	LHS	MCW	Proposed fuel station
7	63 +310	LHS	SR	Commercial building under progress
8	67+000	RHS	SR	M/s Mahalakshmi bakery
9	65+430 to 65+480	RHS	SR	M/s Juice Land
10	65+550	RHS	SR	M/s Noor Chicken center
11	65+080	RHS	SR	Grocery shop
12	65+030	RHS	SR	M/s Sidharth Traders
13	50+400	RHS	MCW	M/s Pandiyan Automotive Private Limited
14	53+100	RHS	MCW	New commercial building under progress

ii. On 22nd Oct 2024, the Authority issued notice for removal of unauthorized occupation to 18 no. (encroachment increased by 04 no.) of unauthorized occupants under Sub Section (2) of Section 26of the control of National Highways (Land and Traffic) Act 2002.

iii. In this letter dated 29.10.2024, referring to the Concessionaire's obligations under Clause 10.5 of the Concession Agreement, the IE provided a list of 32 encroachments (permanent type) identified on the project (tabulated below) and requested the Concessionaire to address the encroachments and provide an update on the status at the earliest.

Table 2.7: Details of Encroachments

S no.	Chainage	Side	Encroachment Length	Name of Encroachment	Remarks
1	33+000	LHS	20	R.R Bakery	Notice Served
2	33+370	BHS	20	Ragavi Tea Stall	Notice Served
3	35+620	RHS	20	Bakery	Notice Served
4	35+755		10		Notice Served
5	38+500	LHS	20	Bakery	Notice Served
6	46+460	LHS	20	Tea Stall	Notice Served
7	51+940	LHS	10	Proposed construction	Notice Served
8	53+070	RHS	20	MDS Bakery	Notice Served
9	59+940	LHS	10	Proposed Construction	
10	63+300	LHS	10	Construction in progress	Notice Served
11	63+430	RHS	10	City union Bank	Notice Served
12	65+530	LHS	10	Proposed construction	Notice Served
13	65+030	RHS	10	Tea Shop	

S no.	Chainage	Side	Encroachment Length	Name of Encroachment	Remarks
14	65+100	RHS	10	Tea Shop	Notice Served
15	65+410	RHS	20	Hotel	Notice Served
16	66+040	LHS	20	Surya Bakery	Notice Served
17	66+990	RHS	20	Mahalaxmi	Notice Served
18	40+500	LHS	10	Iyengar Bakery	Notice Served
19	40+750	LHS	10	Construction	
20	42+470	LHS	10	Construction	
21	42+700	RHS	10	Construction	
22	47+950	LHS	20	Dheeran Bakery	
23	50+710	LHS	20	Murugavilas Hotel	
24	52+440	LHS	20	Saravana Bakery	
25	59+560	RHS	10	Construction	
26	65+600	LHS	20	Karikulamvasam Bakery	
27	62+470	RHS	10	Construction	
28	62+590	LHS	10	Under Construction	
29	57+680	RHS	10	Under Construction	
30	55+250	RHS	10	Under Construction	
31	54+150	RHS	20	KPR High City Venture	
32	35+70	LHS	10	Under Construction Tea stall	

2.6 REVIEW OF SAFETY AUDIT REPORT

The Authority had appointed M/s Saadhya Infra Solutions LLP; Hyderabad for safety consultant services for the construction period of the project. The Contract Agreement for the assignment was signed on 08.10.2021 and the Safety Consultant commenced their service for the project on 20.1.22021. The Safety consultant had submitted three Pre commissioning Safety Audit Report to suit project requirement of phase commissioning.

2.6.1 Pre-Commissioning Safety Audit Report for PCOD I for 34.850 Km –

IE vide letter TL/CLIENT/2022-23/Lr.No. 512 dt. 25-08-2022 forwarded with comments to the Authority the compliance report submitted by the Concessionaire for Pre-Opening Safety audit report given by the safety consultant vide the Safety Consultant letter SIS/Safety/TN/NH-209/2022-23/069 dated 25-08-2022. The Safety Consultant conducted the ''Safety Audit '' and highlighted following observations

during the inspection carried out in the presence of representatives from the Authority, IE and the Concessionaire from 19-08-2022 to 21.08.2022.

Table 2.8: Details of Safety Audit Findings at Pre-COD

SN	Safety Concerns & Audit Finding Description	Concessionaire Response KNRPIPL/NH-209/ PM/ RS/ 2022-23/ 01 dated 25-08-2022
1	At Km 30+970 LHS /RHS, when side road traffic joins the main road ,it has to wait to get a gap. 1.Pavement markings and give way sign should be provided. Remove all objects that fall within the visibility funnel to ensure visibility between main road and side road traffic. VOP is under construction.	Pavement markings and required signboards like speed breakers and give way are provided at mentioned location. Removed all the objects and debris to ensure visibility.
2	Unauthorized median opening shall be closed at 48+150	Unauthorized median opening was closed after allowing traffic through VOP @Km 48+233.
3	At Km 49+840 pedestrian marking is missing.	Pedestrian marking at mentioned location is completed
4	MBCB missing from the following locations (a) 31+620 to 31+800 LHS (b) 31+500 to 31+800 RHS (c) 32+200 to 32 +330 LHS	MBCB at the mentioned location is completed
5	Pedestrian marking missing at Km 49+840	Pedestrian marking at mentioned location is completed.
6	Median plantation missing between 69+200 to 71+820	Median plantations at mentioned locations from Km 69+200 to Km 71 +820 is completed.

Issue of Improper fixing of Metal Beam Crash Barrier with the Rigid Crash Barrier at the structure location. Before issuance of PCOD -I RO Madurai made the following observation :

i. Metal Crash Barrier has been installed on either side of the High Level structures but the end treatment towards the new jersey barrier/ parapet wall of the structure has not been completed. It is also observed that in bridge locations where footpath is provided the crash barrier has been turned towards the bridge railings instead of fixing on the new jersey barriers. The MCB should be fixed in line with the new Jersey barrier as per IRC SP 84. In this regard the recent guidelines issued by NHAI HQ vide Policy circular no. 12.27/2022 dated 22.09.2022 on mandatory completion of safety works for issuance of PCC may be referred for guidance.

ii. In their compliance report the Concessionaire has stated that the above said guidelines have been issued after the date of Safety audit by the Safety consultant and neither the Safety Consultant nor the IE have made any observation in this regard. The end treatment provided by the Concessionaire is as per Fig 9.7 of IRC SP 84 2014 which is the applicable manual for the present contract.

IE, in its letter no 667 dated 10.08.2023, stated that the Metal Beam Crash Barrier has been provided throughout the project Stretch for a length of 47.337 Km and the same has been found in order as per Schedule C of Concession Agreement.
It is noted however that the rectification as required by RO Madurai has not been carried out at site. Since ,the PCOD was given without any rectification, it may be implied that the issue was considered to be closed. The cost for the rectification is required to be considered for any future obligation.

2.6.2 Pre-Commissioning Safety Audit Report for PCOD II for 9.970 Km

IE vide letter TL/CLIENT/2023-24/Lr.No. 696 dt. 16.09.2023 forwarded with comments to the Authority the compliance report submitted by the Concessionaire for Pre-Opening Safety audit report given by the safety consultant vide the Safety Consultant letter SIS/Safety/TN/NH-209/2023-24/069 dated 06.09.2023.The Safety Consultant had conducted the ''Safety Audit '' and highlighted observations (given in table below) during the inspection carried out in the presence of representatives from the Authority ,IE and the Concessionaire on 29.08.2023. The compliance report was verified by the Safety Consultant and after finding that in order, issued the pre-opening safety Audit Report -3 (Final) on 20.09.2023 certifying that "the length of the completed stretches measuring to 9.970 Km of the project can be safely and reliably placed in commercial services of the users thereof".

Table 2.9: Details of Safety Audit findings at PCOD -II

SN	Safety Concerns & Audit Finding Description	Concessionaire Response KNRPIPL/NH-209/ PM/ IE/ 2023-24/ 434 dated 14.09.2023	Remarks by the Safety Consultant
1	At Km 30+940 LHS, when side road traffic joins the main road, it has to wait to get a gap. 1.Pavement markings and relevant sign boards should be provided. Speed breaker and a way sign shall be provided as per standards IRC SP:84 ·2019) Remove all objects that fall within the visibility funnel to ensure visibility between main road and side road traffic.	Road marking and Signboards pending due to COS proposal for service road taper portions are merging with junction.	Compliance noted.
2	Unauthorized median opening shall be closed at 29+185	Unauthorized median opening closed at the mentioned location.	Compliance Noted.
3	At 9 locations, slip/service road markings are missing.	Required pavement markings are provided.	Compliance Noted.
4	Vertical height of support post of signage is not as per standards at the location 39+688	Vertical post provided as per standard size.	Compliance Noted.
5	Pedestrian marking missing at Km 74+101 Gap in MBCB to be closed at 5 locations End terminal connector is not provided at RCC crash barrier at 3 locations (30+688,	Pedestrian markings provided. MBCB gaps closed at given locations.	Compliance Noted.

SN	Safety Concerns & Audit Finding Description	Concessionaire Response KNRPIPL/NH-209/ PM/ IE/ 2023-24/ 434 dated 14.09.2023	Remarks by the Safety Consultant
	30+920,72+470) Hazard Markers missing at three locations (63+880 LHS,67+889 RHS, &1+890 LHS)	In Km 31+920, end terminal connectors provided Hazard Marker Boards provided at mentioned locations	
6	Median plantation missing between 68+900 to 69+200 and 72+470 to 74+380	Median plantations provided at mentioned locations	Compliance Noted.
7	At few locations highway lighting work is in progress (62+730 to 65+290 slip road, 68+900 to 69+200 and 72+420 to 74+380)	Highway lighting provided at mentioned locations.	Compliance Noted.

2.6.3 PRE-COMMISSIONING SAFETY AUDIT REPORT FOR PCOD III FOR 0.560 Km

The Safety Consultant carried out pre-opening stage road safety audit for a length of 0.560 Km &VOP of the Project highway on 09.01.2024. The Consultant also provided a filled checklist as per IRC: SP: 88-2019. Following Audit Findings with recommendations reported: -

- At Km 67+300 to 67+500 LHS service road kerb Painting missing. Kerb shall be painted immediately. Priority -essential
- At Km 48+233 VOP approaches (a) Chevron Boards missing. Chevron signages shall be installed immediately (b) RPMs/Studs are not yet provided. RPMs/Studs shall be fixed as per manual. Priority – highly essential
- From Km. 65+270 to Km 65+330 BHS RPMs (studs) are not yet provided. RPMs/Studs shall be fixed as per manual. Priority – highly essential
- Proper drainage is provided for runoff water.
- Median plantation is provided.
- Nighttime visibility of the signages and road markings is good.

The Concessionaire promptly rectified the deficiencies reported and submitted the location wise compliance along with photographs.

The compliance report was verified by the Safety Consultant and after finding that in order, issued the pre-opening safety Audit Report -3 (Final) certifying that "the length of the completed stretches measuring to 0.560 Kms & 1.285 kms (VOP approaches) of the project can be safely and reliably placed in commercial services of the users thereof".

2.7 REVIEW OF CHANGE OF SCOPE ORDERS

In this project, a total of 4 Change of Scope (COS) proposals and one proposal for a reduction in scope have been initiated. Out of the 4 COS proposals, the first proposal (COS-I) for increasing the height of the RE wall at the grade separator was rejected by the Authority on 30.09.2021. The remaining three COS proposals are as follows:

Table 2.10: Summary of COS Orders

COS NO.	Description of items	COS Amount	Present status /Approval
COS -2	Additional VUP, Height increase of 2 SVUPs, service road & RCC box drain	Rs 12,83,30,809/-	COS recommended by PD, PIU on 23.11.2023., Approved by the Authority on 20.05.2024. Works completed in all respects.
COS -3	COS in toll plaza due to the issuance of the new circular and additional bus bays	Rs 27,77,345/- & Rs (-) 81,87,028/-	COS order approved by the Authority on 28.10.2023. Works completed in all respects.
COS-4	Construction of pedestrian underpass km 67+380	Rs 2,05,04,492/-	COS recommended by PD, PIU on 06.10.2023, In principle Approval received. Works completed in all respects . Revised cost estimate amounting to Rs 2,05,04,492/- submitted by the concessionaire on 24.10.2024 but final approval is pending with Authority.
RIS	Reduction of Scope of Boundary Wall	Rs (-) 4,56,64,852/-	Descoping approved by the Authority on 28.10.2024.

2.7.1 WORKS UNDER COS-II

The Change of Scope (COS-II) includes several modifications to the original project plan, aimed at improving access, safety, and functionality in response to industrial requirements, court directives, and public demands. Below is a breakdown of the key elements within COS-II:

i. **Increase in Height of SVUP**s: This proposal is for an increase of the height of SVUP at Km. 61 +545 & at km 69+380 respectively from 4m to 5.5 m to accommodate uninterrupted movement of heavy machinery & Equipment to the already existing industrial establishments as per the demand of the industrialists adjacent to the Project Highway.

ii. **Addition of a Vehicular Underpass (VUP) at Km 68+407:**
Initially, the project design did not include a dedicated vehicular underpass (VUP) near Km 68+407. A writ petition was filed by the factory owner, M/s LAN Spintex Pvt Ltd, in the Madurai branch of Madras High Court, as the project highway alignment is passing through the factory premises. In response to the writ petition, the Authority committed to providing adequate protection by

constructing structures such as a vehicular underpass to facilitate the smooth operation of the mill during construction. Satisfied with this commitment by NHAI, the Hon'ble Judge issued an order to that effect.

To comply with the Order, the Authority decided to provide a VUP at the said location by providing Reinforced Earth Wall structures for the approach ramps with RE walls to avoid access for road users from MCW on either side between Km 68+400 to Km 69+150. Also, chainages of service roads on either side of the Project highway were altered to avoid disturbance in the vicinity of the factory. The Authority conveyed the approval to the COS proposal vide the letter NHAI/PIU/DGL/11014/Pkg-II/COS/2023/419 dated 17.2.2023. Accordingly, the Concessionaire took up all the approved COS-II work except, construction of VUP 12mX5.5m at Km 68+407 owing to court case, due to the stay obtained by M/s LAN Spintex Pvt Ltd.

Hon'ble Madras High Court, Madurai branch issued a direction on the stay order. In compliance, an amicable settlement was reached between NHAI & M/s LAN Spintex Pvt Ltd, and a MOU was agreed upon. As per the MOU, one SVUP (7m x4m) to be provided in lieu of the earlier proposal of VUP (12mx5.5m). NHAI informed the Concessionaire to commence the work vide letter dt.02.03.2023.

Based on the direction of NHAI, work for SVUP (7mx4m) commenced at site, but it was again stopped by LAN Spintex Pvt Ltd. The Factory owner submitted a modification proposal to NHAI, to construct a 4mx4m Box (Subway) instead of SVUP (7mx4m) and accordingly NHAI directed the concessionaire vide MOU dated 20.03.2023 to construct a 4mx4m Box (subway) at Km 68+388.5, up to 60 m Right of Way under the COS.

Further, approach road beyond 60 m on both sides to subway, drainage and illumination including maintenance will be in the scope of M/s LAN Spintex Pvt Ltd.

iii. **Provision of Service Road with SVUP and Slip Road**: COS-II also included the construction of a Service Road and an SVUP from Km 34+210 to Km 34+430, following the VIP reference from one of the public representatives. This addition aimed at improving access to the local traffic, reducing the risks associated with crossing or merging onto the main carriageway.

iv. **Replacement of Pipe Drains with RCC Box Drains**: This proposal is for replacement of pipe drain with RCC box drain in built-up areas, to improve drainage efficiency, based on the recommendations of a drainage expert. The expert was engaged by the Authority to assess the requirements for an efficient drainage system.

In a letter dated 23.11.2023**,** the Project Director / NHAI forwarded his recommendations (as shown in the table below) on the COS-II proposal to the competent authority

Table 2.11: Summary of works under COS-II

Sl No.	Description of item	Recommendation from PD/NHAI
1	Cost estimate for Km 61+230 to Km 62+150 incl. (height increase of SVUP Km 61+545	1,06,40,619
2	Cost estimate for Km 67+590 to Km 69+790 (FO -Km 67+870, add VUP- Km 68+407 &height increase of SVUP -Km 69+380) Revision:- Cost Estimate for Subway at Km 68+388 including MCW earthwork ,extension of service road (Km 68+400 to 68+500 ,retaining wall for service road (100 m) and Service Road from Km 68+960 to Km 69+360 (RHS)	9,20,70,863
3	Cost estimate for Km 34+210 to Km 34+430 (Addl SVUP 34+210)	75,28,517
4	Cost estimate for RCC Box Drain instead of pipe drain	(-) 10,21,882
Net COS Cost (A)		10,92,18,117
Premium /Discount communicated by NHAI (B)		-1.41%
Discount C =A*B		-15,39,975
Add GST@18% ,and Labour Cess @1%		12,83,30,809/-

2.7.2 WORKS UNDER COS-III

The Change of Scope (COS-3) focused on necessary alterations and additions primarily in toll plaza modifications, bus bays, service roads, and lighting facilities based on new policy guidelines and public demand.

i. **Toll Plaza modifications**: - This COS emerged from the implementation of Electronic Toll Collection (ETC) across all lanes and removal of underground tunnel provision at the toll plaza, which led to design changes in the toll plaza. These modifications were driven by NHAI circulars (18.64 dt. 08.01.2021 and 17.5.82 dated 24.05.2021), leading to reductions in the no. of lanes of toll plaza & toll booths, removal of tunnels system and an addition of Foot Over Bridges (FOBs) with staircase.

ii. **Additional Bus Bays: -** In the schedule -C of the CA, for 8 no. high embankment locations (height > 2 m), bus shelters are proposed without provision of bus bays. In view of substantial difference between the FRL and OGL, the steep gradients posed safety risks for bus passengers alighting directly on the carriageway, prompting the concessionaire to request the construction of full bus bays. IE and the Authority agreed with the concessionaire's contention and advised to propose a COS for the additional bus bays at the locations with high embankments.

iii. **Additional Service Road**: - Based on representations received from VIP and public, the Authority has advised the concessionaire to propose COS for additional service/slip roads from Km 67+250 to Km 67+560 BHS and from Km 30+770 to Km 32+400 BHS.

iv. **Lighting facility for SVUP at Km 34.210 service road**: - Based on public request , the Authority has advised the Concessionaire to propose COS for provision for lighting facility for the SVUP at Km 34.210 service road.

v. **Descoping of Junction @Km 74+380 including Cross Road Culverts:** - According to the Concession Agreement, the Concessionaire is responsible for developing the junction at Km 74+380, including cross road culverts. However, the Concessionaire of Package-3 has already developed this junction, as it was included in both Packages 2 and 3.

Table 2.12: Status of works under COS-3

Sr.No.	Description	Final Cost for COS Order
1	Amendments in the provision of toll plaza	(-) 8,49,61,045
2	Additional Bus Bays in high embankments	2,05,89,277
3	Additional slip road from Km 30+770 to Km 32+400 (BHS) and extension of slip road from Km 67+550 to Km 67+250 (BHS)	6,59,88,475
4	Provision of lighting facility on slip road &SVUP at Km 34+210 to Km 34+420	7,47,000
	Total	23,63,707
	Total after discount @1.41%, GST @18% and labour cess @1%	27,77,345/-
5	Reduction in Scope on account of deletion of junction at Km 74+380	(-) 81,87,028/-

Final approval for COS -III including reduction in scope on account of deletion of junction at Km 74+380 was issued by the Authority vide letter no. 2055 dated 28th Oct 2023.

vi. Issue of water stagnation at SVUP location at Km 34+210

SVUP at Km 34+210 was approved under COS with provision of Service road from km 34+210 to Km 34+430 . The SVUP was completed but construction of service road could not be completed due to land acquisition problem due to which problem of stagnation of water is there . This issue is being raised by the local village Panchayat Reddapatti. For resolution of this issue construction of service with pucca drain is to be carried out after LA takes place.

2.7.3 WORKS UNDER COS-IV

The Change of Scope (COS-4) was initiated to address public safety concerns by constructing a Pedestrian Underpass (PUP) at Km 67+380. The request for this PUP emerged from community demands in the Pushpathur area, where residents, including school children and local pedestrians, faced safety risks while crossing the busy highway. NHAI proposed to provide a Foot Over Bridge (FOB) to reduce construction challenges, but this proposal was rejected by local stakeholders who favoured the underpass. Afterwards, the Authority gave instructions to the

concessionaire to submit COS proposal for provision of PUP of size (1x5x2.5) at Km 67+380.

Table 2.13: Summary of works under COS-IV

S. No.	Item Description	Revised Estimate (₹)	Approval Status
1	Pedestrian Underpass (5m x 2.5m)	54,29,750	Approved by Competent Authority
2	Retaining Wall for MCW	Excluded	Adjusted as per site requirements
3	Modifications in Main Carriageway & SR	99,51,257	Approved
4	RCC Drain along Service Road	43,32,122	Approved
5	Total with GST and Labor Cess	2,31,30,637	In-Principal Approval Granted for 2,29,33,505/-

In compliance with the instructions provided by the Authority while granting in-principle approval for COS-4, the Concessionaire submitted the revised cost estimate of Rs 2,05,04,492/- for final approval by the Authority in its letter dated 24th October 2024.

Please note that in the correspondence document, COS-2 is occasionally referred to as COS-1, and COS-4 is sometimes referred to as COS-5.

2.7.4 DESCOPE ITEMS

As per NHAI/Policy Guidelines/Public Funded/2023 Policy Circular No.9.2.38/2023 dated 10th November 2023, only the Wholesome Withdrawal of works due to non-availability of Row under clause 8.3 will be treated as RIS, whereas substitution/modification of works (e.g. Conversion from PUP to VUP or vice-a-versa) will be treated as COS.

In a letter dt. 18.10.2024, the Authority communicated the approval from the competent Authority for the deduction of Boundary wall length (13.6Km) for the modified amount as detailed in the table below:

Table 2.14: Details of works approved for Reduction in Scope

Sl no.	Description	IE recommendation	Authority recommendation	Authority Remarks
1	Deduction of Boundary wall length (13.62 Km) (A)	(-) 2,50,44,012	(-) 2,93,48,240	Concrete a Excavation quantity as per CA drawing and Steel quantity as er actual BBS
As per Clause (16.6.1) ii, the Total Amount shall be multiplied by 1.05		(-) 2,62,96,213	(-) 3,08,15,652	SOR rates 2018-2019

Sl no.	Description	IE recommendation	Authority recommendation	Authority Remarks
to arrive Estimated cost (B)				
As per Clause (16.6.1) iii the estimated cost shall then be multiplied by the ratio of BPC to Estimated Project Cost to arrive the total cost of Reduced Scope i.e., (920/701.9=1.31 = C		(-) 3,44,48,039	(-) 4,03,68,504	
GST @ 18% (IE) on C (D) GST @ 12% (PIU) on C (D)		(-) 62,00,647	(-) 48,44,220	GST 12% has been considered as the item is reduced from Scope and BPC is included with only 12% GST
Labour Cess@ 1% on (C+D)= E		--	(-) 4,52,127	
Total Amount = C+D+E **Rs.**		(-) 4,06,46,685	(-) 4,56,64,852	

2.8 UTILITY SHIFTING

(i) In its letters dated 24.06.2024 and 20.09.2024 regarding the intention to issue the completion certificate, the Independent Engineer (IE) confirmed that the utility shifting works have been completed, and the Concessionaire has obtained completion certificates from the respective utility owners. The letter dated 20.09.2024 includes the utility shifting status, which is summarized in the table below.

Table 2.15: Status of Utility shifting works

SN	Type of utility	Sanction estimates no. and date	Utility owner	Work description	Shifting Work status
1	Electrical	436/18dt.30.10.2018	TNEB	(Km 45+400 to Km 48+200)	completed
2	Electrical	437/18dt.30.10.2018	TNEB	(Km 30+500 to Km 33+150)	Completed
3.	Electrical	439/18 dt. 30.10.2018	TNEB	(Km 33+150 to Km 35+200)	Completed
4.	Electrical	440/18 dt. 30.10.2018	TNEB	(Km 35+200 to Km 39+400)	Completed
5.	Electrical	441/18 dt. 30.10.2018	TNEB	(Km 39+400 to Km 46+400)	Completed
6.	Electrical	442/18 dt. 30.10.2018	TNEB	(Km 29+600 to Km 30+400)	Completed
7.	Electrical	494/18 dt. 20.11.2018	TNEB	(Km 48+200 to Km 54+100)	Completed

SN	Type of utility	Sanction estimates no. and date	Utility owner	Work description	Shifting Work status
8.	Electrical	495/18 dt. 20.11.2018	TNEB	(Km 54+100 to Km 56+000)	Completed
9.	Electrical	496/18 dt. 20.11.2018	TNEB	(Km 56+000 to Km 60+300)	Completed
10.	Electrical	497/18 dt. 20.11.2018	TNEB	(Km 50+400 to Km 60+150)	Completed
11.	Electrical	498/18 dt. 20.11.2018	TNEB	(Km 57+000 to Km 58+000) &(Km 60+300 to Km 62 +800)	Completed
12.	Electrical	503/18 dt. 20.11.2018	TNEB	(Km 62+800 to Km 63+900)	Completed
13.	Electrical	504/18 dt. 20.11.2018	TNEB	(Km 63+900 to Km 65+400)	Completed
14.	Electrical	505/18 dt. 20.11.2018	TNEB	(Km 65+400 to Km 67+400)	Completed
15.	Electrical	506/18 dt. 20.11.2018	TNEB	(Km 67+400 to Km 69+400)	Completed
16.	Electrical	507/18 dt. 20.11.2018	TNEB	(Km 69+400 to Km 72+900)	Completed
17.	Electrical	616/18 dt. 09.10.2018	TNEB	(Km 73+580 to Km 74+400)	Completed
18.	Electrical	667/18 dt. 02.11.2018	TNEB	(Km 72+900 to Km 74+400)	Completed
19.	Electrical	1433/2023-24 dt. 16.09.2023	TNEB	Km 48+223 VOP approaches (0+800 to 01+300Km)	Completed
20	Electrical	1447/2023-24 dt. 26.09.2023	TNEB	Km 48+233 VOP approaches (0+000 to 0+700 km)	Completed
21	Electrical	T.458 dt. 08.02.2021	TANTRANSCO	Km 52+700	Completed
22	Electrical	T.232 /2020-21 dt. 12.10.2020	TANTRANSCO	Km 53+500	Completed
23	Electrical	T.233/2020-21 dated 12.10.2020	TANTRANSCO	Km 29+480	Completed ,certificate issued on 28/8/2024
24	Water Supply	----------	TWAD	Complete Project length	Completed, certificate issued on 20.6.2024

(ii) However, in its letter no. 2135 dated 24th October 2024, the Authority raised concerns regarding non-compliance in the utility shifting process and highlighted the following:

"It is important to note that there were a total of 18 estimates from TANGEDCO for the shifting of HT/LT lines, along with 3 estimates each from TWAD and TANTRANSCO for the shifting of water pipelines and EHT lines. In the initial submission dated 24th June 2024, the Independent Engineer (IE) reported only 16 locations related to TANGEDCO and 3 locations for TANTRANSCO, mentioning the shifting of the drinking water pipeline. However, the completion certificates submitted by the IE do not cover all locations. The IE is instructed to compile a comprehensive summary of all estimates and certify them, including completion certificates from the respective utility-owning agencies."

A response to this letter is not available in the correspondence documents provided for review. An updated status on this matter be is required to obtained from the Concessionaire.

2.9 ROYALTY

The Concessionaire, through letter no. KNRIPL/NH-209/HO/IE/2023-24/80 dated 30.01.2024, confirmed that the applicable royalty and mining charges for raw materials, as per the scope of the concession agreement, have been paid. Additionally, the Concessionaire has undertaken to pay any future royalty charges or liabilities as notified by the Government of Tamil Nadu. However, correspondence related to the amount of royalty paid/demand raised has not been made available for our review.

2.10 REVIEW OF ENVIRONMENT AUDIT

As per provision of Clause 2.9 and 3 of Schedule I, Environmental Audit was conducted by Third-party agency M/s Enviro Analysts & Engineering Private Limited and the tests sample/ tests conducted on 08.01.2024. Environmental Indicator report for Soil, Noise, Air, etc. were found within the limit. Following permit status furnished:-

Table 2.16: Status of Permits

Sl No.	Description	Remarks
1	Permission of the State Government for extraction of boulders from quarry.	Obtained
2	Permission of Village Panchayat and Pollution Control Board for installation of Crushers.	Obtained
3	License for use of Explosives.	Obtained.
4	Permission of the State Government for drawing Water from river/reservoir	NA
5	License from Inspector of Factories or other competent Authority for setting up Batching Plant.	Obtained
6	Clearance of Pollution Control Board for setting up Batching Plant	Obtained
7	Clearance of Village Panchayats & Pollution Control Board for	Obtained

Sl No.	Description	Remarks
	Asphalt Plant	
8	Permission of Village Panchayat and State Government for borrow earth	obtained
9	Permission of State Government for cutting of trees.	Obtained

2.11 STATUS OF NCR

(i). NCR issued during Construction stage :- IE in its letter dated 24.6.2024 has furnished following statement :- " It is submitted that all lapse ,defects and deficiencies observed by IE during the construction phase are rectified and all NCR have been closed in accordance with the provision of the Concession Agreement". NCRs issued during the Construction stage are as below :-

Table 2.17: Summarized Status of NCRs

Sl no.	Issue Description	Type	Issued vide	Compliance submitted vide	Status	Closure Letter
PCOD-1						
1	Crash barrier on approach slab not in alignment	Site Instruction converted to NCR	STR-01 dated 4 Apr 2022	258 ,29th April 2022	Closed	STR-01 ,29th April 2022
2	Above 75mm stones in embankment layer	Site instruction converted to NCR	HW-01 dated 20 Apr 2022	259 ,29th April 2022	Closed	HW-01,29th April 2022
3	Above 75 mm stone in embankment layer (median portion)	NCR	HW-02 dated 4 May 2022	29 ,14th May 2022	Closed	Hw-02,14th May 2022
PCOD -II						
1	Oversized stones in the embankment layer (68+380 to 68+400 RHS)	Site Instruction	Hw-10 dated -----		closed	24.4.2023
2	Bumping observed in Embankment layers (73+200 to 73+210 RHS)	Site Instruction	HW-11		closed	10.01.2023
3	Vertical layer joints not in true vertical in Box Culvert wall Km 63+788 RHS	Site Instruction	STR -08		closed	11.11.2022
	Vertical layer joints not in true vertical in retaining wall		STR-10		closed	21.7.2023

Sl no.	Issue Description	Type	Issued vide	Compliance submitted vide	Status	Closure Letter
	Km 68+440 to 68+450 LHS					

(ii) NCR issued during Operation Period

In IE MPR for the month of Oct 2024 , the following information provided on NCR but no details of the NCR have been made available:-

Table 2.18: Summary of NCRs during Operation period as per IE MPR

SN	Highway Asset	Total NCR issued till Sep 2024	NCR issued in Oct '2024	NCR closed during Oct 2024	Balance
1	Pavement	12	03	02	13
2	Shoulder	11	02	03	10
3	Drainage				
4	Median	03			03
5	Road Furniture	63	12	01	74
6	Bridges	17	01	03	15
7	Buildings	06			06
8	Horticulture	11	01		12
9	Others	107	05	07	105
	Total	230	24	16	238

2.12 PROJECT CRITICAL ISSUES

1. Challenges in issuance of Completion Certificate

The project completion phase began with the issuance of provisional certificates for partially completed sections. Provisional Certificate I (PCOD-I) was issued for 34.85 km out of 45.38 km in September 2022, after required inspections and tests, followed by Provisional Certificate II (PCOD-II) for an additional 9.97 km in September 2023.

- In late December 2023, the Concessionaire completed the final 0.56 km section and, after conducting tests from January 5 to January 24, 2024, formally requested the Authority to issue the completion certificate.
- On April 18, 2024, the Independent Engineer expressed its intent to issue the Completion Certificate for the remaining 0.56 km, in addition to the 34.85 km from PCOD-I and 9.97 km from PCOD-II, in accordance with NHAI HQ circular No. 9.2.22/2018 dated August 2, 2018, and Clause 14.2 of the Concession Agreement. The Authority was asked to provide observations and consent.
- The Authority responded on May 1, 2024, requesting para-wise compliance remarks and supporting documents for further review. The IE was instructed to double-check the Concessionaire's compliance to ensure all parameters were met. Further action would be taken upon receipt of the comprehensive compliance report.

- On May 24, 2024, the Authority issued a new circular to be followed for the completion certificate issuance. The Concessionaire submitted the required para-wise compliance as per the new circular and requested the Authority's approval on June 4, 2024.
- On June 24, 2024, the IE, after addressing the Authority's observations, submitted a request for the Authority's consent to issue the Completion Certificate to the Concessionaire.
- The Authority provided additional observations on July 19, 2024, to which the IE responded on September 20, 2024.

On October 24, 2024, the Authority returned the proposal, requesting compliance with NHAI's policy circular dated May 24, 2024. The IE was instructed to address the requirements and resubmit the proposal promptly in a complete and properly formatted manner.

2. Annuity Payment not in accordance with the Settlement Agreement

The dispute surrounding the annuity payment amount stems from differing interpretations of the Settlement Agreement. According to the Concession Agreement, the Concessionaire is entitled to annuity payments upon achieving completed project milestones.

The first annuity payment was made based on a partially completed section of 34.85 km, covering Bid Project Cost (BPC-1). For the second annuity, the Concessionaire sought payment for an additional 8.03 km of work completed (BPC-2 and BPC-3) along with the interest accrued during the period. However, the Authority raised concerns about including BPC-2 and BPC-3, as Provisional Completion Certificates (PCC) for these sections had not yet been issued, and the inclusion of interest on BPC-2 was questioned.

I. Concessionaire stand: - As per the Concessionaire's understanding, outlined in their letter dated 05.03.2024, there is no requirement for obtaining further provisional certificates for the completed length. Concessionaire vide its letter dated 21.02.2024 made the following contention - "Procedure & issuance of further Provisional Certificate is not required as per the Settlement Agreement and also as per Concession Agreement and no mention in Settlement Agreement & CA about Provisional Certificate is to be obtained, for the completed length".

The Concessionaire asserts that BPCs for the release of annuity payments should be as follows**:**

Table 2.19: BPCs to be considered for Annuity payments as per Concessionaire

Annuity	Due Date	Annuity Payment	Interest Payment	O&M Payment
1st	02.03.2023	BPC1+BPC2	BPC1	BPC1
2nd	02.09.2023	BPC1+BPC2+BPC-3	BPC1+BPC2	BPC1+BPC2
3rd	02.03.2024	BPC1+BPC2+BPC	BPC1+BPC2+BPC-3	BPC1+BPC2+BPC-3

Annuity	Due Date	Annuity Payment	Interest Payment	O&M Payment
		3+BPC4		
4th	02.09.2024	BPC1+BPC2+BPC 3+BPC4	BPC1+BPC2+BPC3+ BPC4	BPC1+BPC2+BPC3+ BPC4

BPCs have been calculated and considered as below: -

Table 2.20: BPC actually considered for Annuity Payments

Sl No.	Description	Amount	Remarks
1	BPC-1	694,85,36,660	Amount of work executed by the concessionaire, certified by IE & paid by the Authority up to Aug 2022
2	BPC-2	82,36,23,340	Amount of work executed by the concessionaire, certified by IE & paid by the Authority from Sep 2022 to Feb 2023, prior to release date of 1st Annuity.
3	BPC-3	116,74,80,000	Amount of work executed by the concessionaire, certified by IE & paid by the Authority from March 2023 to Aug 2023, prior to release date of 2nd Annuity
4	BPC-4	20,65,08,120	Amount of work executed by the concessionaire, certified by IE & paid by the Authority from Sep2023 to Feb 2024, prior to release date of 3rd Annuity
Total		914,61,48,120	

The Concessionaire vide letter KNRPIPL/NH-209/PM/IE/2023-24/246 dated 06.11.2023 claimed a financial loss of Rs. 20,10,80,087/- (approximate calculation up to 4th Annuity) due to non-compliance with the Settlement Agreement dated 15.03.2023 and as per Article 23, Clause 23.6.2.

II. Authority Stand: -

- The Authority communicated the following direction with reference to the Annuity clarification to the concessionaire vide its letter dt. 03.02.2024: -

"...The Annuity Payments (Clause 23.6.3 of CA), Interest on reducing balance (Clause 23.6.4 of CA), O&M Payments (Clause 23.7 of CA) will be made following the principles as laid down at Para 3.1(iv) of Settlement Agreement dated 15.03.2023 with completed lengths and corresponding BPC as given below: -

Table 2.21: Details BPC and Completed length considered

PCC	Date/Likely Date	Completed Length	BPC corresponding to completed length
PCC-1	02.09.2022	34.85 Km	BPC-1
PCC-2	20.09.2023	9.97 Km	BPC-2
Final Completion	31.01.2024	0.56 Km	BPC-3

Annuity	Due Date	Annuity Payment	Interest Payment	O&M Payment
1st Annuity	02.03.2023	BPC-1	BPC-1	BPC-1
2nd Annuity	02.09.2023	BPC-1	BPC-1	BPC-1
3rd Annuity	02.03.2024	BPC-1+BPC-2+BPC-3	BPC-1	BPC-1
4th Annuity	02.09.2024	BPC-1+BPC-2+BPC-3	BPC-1+BPC-2+BPC-3	BPC-1+BPC-2+BPC-3

- The Authority, in its response dated 23.02.2024, considered the above-mentioned contention made by the concessionaire as inappropriate, giving reference of good industrial practice and Article 14 &15 of CA. Further the Authority is of the opinion that In terms of Settlement Agreement, "After Completion of each portion…" means the Concessionaire shall even after completion of construction, procedures stipulated in Article 14 of CA shall be duly followed and without any tests & confirmation as per standards for completed length of project cannot be considered as completed.

In its response dated 08.11.2024 to the Authority's letter dated 15.10.2024 regarding non-compliance with the Settlement Agreement, the Concessionaire has refuted the allegations made against it and submitted a new request for reimbursement of the losses incurred due to this issue.

3. GST impact payment

A. For Payment Milestone: The Ministry of Finance issued Notification No. 03/2022 on 13th July 2022, which implemented the GST Council's recommendations, changing the GST rate for road construction services from 12% to 18%, effective from 18th July 2022. To calculate the GST impact for reimbursement to the Concessionaire, NHAI issued Policy Circular No. 3.3.27/2022 on 23rd December 2022. According to point 2 (iii) of the circular, if an invoice is raised on or after 18th July 2022, and the Concessionaire faces an increase in GST cost (from 12% to 18%), NHAI will compensate for the GST difference at 5.36%.

Following this policy, the Concessionaire calculated the GST difference on invoices raised for Payment Milestones and requested a reimbursement of Rs 7,26,95,771/- for additional GST paid on construction work up to Payment Milestone-V (final part) in its letter dated 11th December 2023. The Independent Engineer (IE) recommended an amount of Rs 6,84,61,071/- in its letter dated 24th January 2024. The Authority, in its letter dated 13th February 2024, instructed the IE to calculate the GST impact on the gross bill value and deduct the mobilization advance already paid. Subsequently, the IE revised its recommendation to Rs 7,25,48,571/- in its letter dated 28th February 2024, in line with the Authority's instructions.

B. For Annuity Payment: As per the GST impact certificate issued by M.K. Dandekar & Co. (CA engaged by the Authority) on 15th June 2023, the GST impact to be claimed for each annuity is 11.51%. In a letter dated 29th January 2024, the IE confirmed that the Concessionaire is eligible for an additional differential GST amount of Rs 56.57 crore (11.51% of the Bid Project Cost, including escalation) due to the change in GST rates, as per NHAI Policy Circular dated 23rd December 2022. The IE requested the Authority to submit the GST claim to the GST cell at NHAI HQ, as per the policy guidelines.

In its letter dated 11th June 2024, the Concessionaire requested the Authority to release the outstanding GST amounts for the 1st, 2nd, and 3rd annuities, as well as the O&M amounts, totaling Rs 5,29,98,044/-. The IE recommended the same amount for release in its letter dated 16th July 2024. The Authority raised certain observations in its letter dated 19th July 2024, and the IE provided a response in its letter dated 6th August 2024. In its recommendation for the 4th Annuity payment, the IE clarified that GST on annuity payments should be calculated according to Annexure-IV of NHAI Policy Circular No. 3.3.27/2022 and 3.3.28/2023. As the Concessionaire did not provide the required details in Annexure-IV, this was not considered in the recommendation.

The Concessionaire, in its letter dated 8th November 2024, reiterated that the GST issue remains unresolved and requested the Authority to expedite the settlement. From the above, it appears that while the GST impact on milestone payments has been settled, the GST impact on annuity payments remains pending.

4. Applicability of Discount of 1.41% on COS and Excise charges on Diesel Consumption

The Authority has imposed a 1.41% discount on each COS, but the calculation for this discount is not available in the records. In its letter dated 29.07.2022, the Concessionaire issued a notice under Article 35 of the Concession Agreement, highlighting additional costs incurred due to a change in law. This includes an increase in Excise Duty, Additional Duty of Excise, Special Additional Excise Duty, and Agricultural Infrastructure & Development Cess on HSD for the financial years 2020-21 and 2021-22, amounting to ₹8,97,48,860/-. Furthermore, the Concessionaire stated that the Authority/Independent Engineer (IE) had not responded to its notice dated 20.07.2021 under Clause 35.4 of the Concession Agreement, which detailed the consolidated financial impact for the accounting year 2020-21 due to the increase in the Excise Duty rate on HSD.

The updated status in this regard is required to be obtained from the Concessionaire.

The Conciliator has issued the following directive regarding these two issues (reference – para 3.1 (vii) of the Settlement Agreement):- "The issues of additional impact due to Change in Rates of Excise Duty on Diesel (up to Dec 2022) & issue of application of discount on COS ,Concessionaire may go for arbitration if he so desires on. "

CHAPTER 3.0: REVIEW OF AS-BUILT DRAWINGS

3.1 REVIEW OF DESIGNS AND AS-BUILT DRAWINGS

The project was executed and designed by KNR as the EPC contractor for the Project. The details of the as-built drawings for highways and structures provided by the Concessionaire (as per **Table 3.1** below) were studied by us and our observations on the same are presented in the subsequent paragraphs below. Most of the drawings received were approved and signed by IE.

Table 3.1: List of reviewed as-built drawings

Sl. No.	Description	Remark
1	Plan & Profile	Main Carriageway & Service road Plan and Profile from km 29+000 to 73+400 km received.
2	Typical Cross Section	TCS not provided (GFC provided but its Schedules not provided)
3	Pavement Design Report	Received
4	Job Mix Design	Received
5	As-Built Drawings of Structures	Received
6	Design Basis Report for Structures	Not Received. Geotech Reports received.
7	Junction Drawings	Not Received (GFC provided)
8	Furniture Plan	Received
9	Highway Mini Nest	Received
10	Toll Plaza	
11	Truck Lay Bye	
12	Bus Bay	
13	Rest Area	

3.1.1 AS-BUILT DRAWINGS OF HIGHWAYS

We have received the Plan & Profile (P&P) as-built drawings from Ch 29+000 to Ch 74+380. A comparison on the development provisions mentioned in the Technical Schedules of Concession Agreement and as provided in the as-built drawings have been presented in **Table 3.2** below.

Table 3.2: Review of As-Built drawings for Highways

S. No.	Name of Item	As per Agreement Schedule	As per as-built Drawing			Remarks
1	Project Length	Main Carriageway - 45.380 km & Service road/Slip road – 19.35 km / 3.86 km	Main Carriageway - 45.380 km & Service Road – 28.010 km			
2	Design Speed	IRC: 73-1980	100 kmph (except 65 kmph at VOP location)			
3	Proposed ROW	30m – 60m	60m*			*Additional land acquired for Toll Plaza, Rest area, Highway Mini nest and junction improvement.
4	Horizontal Curves	As per Schedule IRC:SP:84-2014	All the curves radii are within the desirable limits and have no sharp curves.			
5	Vertical Curves	As per IRC:SP 84-2014	Under Limits (max. gradient – 2.5%) and are designed for desirable sight distance except at Ch. 56+150 Flyover approaches which is designed for SSD.			
			Most of the curves are within the limiting Gradient except in the stretch Ch. 34+200 to Ch. 34+400 where gradient is 5.00% on the Slip road. The Service /Slip roads are designed for SSD.			
6	Design of pavement (Design MSA and crust details)	Flexible pavement design as per Manual subject to minimum requirements and construction shall be in stages.	Main Carriageway is designed for 20 MSA. Following are the thicknesses:			
			Layer Type	**MCW Crust thickness**	**Service Road Crust thickness**	
			Bituminous	BC – 40mm	BC – 40mm	

S. No.	Name of Item	As per Agreement Schedule	As per as-built Drawing			Remarks
		Minimum design MSA specified for Main Carriageway (Bituminous) - 20 MSA for design period of 10 years and Crust min. 90mm		DBM – 60mm	DBM – 50mm	
		Minimum design MSA specified for Main Carriageway (Base +Sub Base Layer) - 35 MSA for design period of 15 years and Crust min. 450mm	Base +Sub Base Layer	WMM – 250mm	WMM – 250mm	
				GSB – 200mm	GSB – 200mm	
			Sub Grade	500mm	500mm	
		Minimum design 10MSA specified for Service road for design life 15 years. Min. crust of 450mm for Base + Sub base and 90mm for Bituminous		CBR – 13%	CBR – 12%	
				V_a - 3.6% & V_b -11.25%	V_a - 4.0%& V_b - 11%	
		Rigid pavement for Toll Plaza is designed for minimum CVPD 2033. Requirement for minimum crust is PQC – 280mm, DLC – 150mm, GSB – 150mm				
7	Junctions	32 nos. (including Grade separated junctions)	35 nos. (including Grade separated junctions)			As-built drawings of junctions not available. As per P&P drawings of the Main Carriageway 35 nos. minor junctions could be seen
8	Median Opening	07 nos.	02 nos.			
9	Truck Lay-bye	2 nos. at Ch. 35+800 (Both side) near	02 nos. at Ch. 35+700 (Both side)			
10	Bus Bays and Bus Shelters	06 nos. Bus Bays & 32 nos. Bus Shelters	14 nos. Bus Bays & 22 nos. Bus Shelters			
11	Footpath	Footpath of 2.5 – 5.0 m width provided on RHS in a length of 4.330 km.	Footpath provided in 5.0m width on RHS for 2.11 km length as per the P&P			In Revised TCS length is more than 2.11 km. As per site inventory 4.33 km constructed.
12	Rest Area	01 no. at Ch. 50+100 RHS near Mollampatti	01 no. at Ch. 50+100 RHS			

S. No.	Name of Item	As per Agreement Schedule	As per as-built Drawing	Remarks
13	Highway mini-nest	02 nos. near Toll Plaza	02 nos. (Ch. 39+800 & Ch. 41+150)	
14	Toll Plaza	01 no. at Ch. 39+800 (RHS) (7+1 lanes)& Ch. 41+150 (LHS) (7+1 lanes)	1 no. at Ch. 40+500 near Chatrapatti (4+4 lane)	
15	Safety Barrier	Metal Beam Crash Barrier min. 47.00 km length	Not specified in the P&P	
16	Over head Gantry/Cantilever Gantry	Overhead – 10 no. Cantilever – 12 no.	Overhead – 10 nos. Cantilever – 12 nos.	
17	Major Bridge	02 nos.	02 nos.	
18	Flyover	05 nos.	05 nos.	
19	Vehicular Underpass	03 nos.	03 nos.	
20	Light Vehicular under pass	03 nos.	03 nos.	
21	Small Vehicular under pass	06 nos.	08 nos.	
22	Minor Bridges	19 nos.	19 nos.	
23	Vehicular Overpass	01 no.	01 no.	
24	Box Culverts	141 nos. (including 1 no. widening of Slab culvert)	146 nos. (includes 1 no. Pipe culvert)	

3.2 REVIEW OF PAVEMENT DESIGN

3.2.1 PROVISIONS FOR PAVEMENT DESIGN AS PER CONCESSION AGREEMENT

a) As per Clause 4.1 of Schedule B, Flexible pavement shall be provided for the entire project highway including bypasses, Realignment, Bus bays, Truck Lay Bye, Slip roads and Service roads except Toll Plaza location. Rigid Pavement shall be provided on Toll Plaza location. Only VG-40 Grade of Bitumen is allowed for DBM and VG-40 Grade of Bitumen or Modified Bitumen are allowed for BC layers. Stage construction is allowed in this project the details of which are as follows:

Table 3.3 : Pavement Crust details as per CA

Sl. No.	Section	Pavement Layer	Minimum Design Requirements			
			Traffic (MSA)	CBR (in %)	Design Period (in years)	Crust (in mm)
1	Main Carriageway	Base + Sub-base	35	12	15	450
		Bituminous	20	12	10	90
2	Service Road	Base + Sub-base	10	10	15	450
		Bituminous	10	10	15	90

c) Rigid pavement shall be provided at toll plaza location which shall be designed for minimum design traffic of 2033 CVPD in the year of completion of construction. Minimum crust composition are PQC – 280mm, DLC – 150mm and GSB – 150mm with a debonding layer between DLC and PQC of polythene sheet having minimum thickness of 125 micron.

3.2.2 PAVEMENT COMPOSITION AS PER APPROVED PAVEMENT DESIGN REPORT

a) Based on Traffic studies carried out in February 2020 in which two homogeneous sections were considered, the pavement design details are as follows:

Table 3.3 A: Main carriageway crust details

Main Carriageway	
Total Cumulative Number of Standard Axles to be carried during Design Life 20 Years	20 MSA
Effective CBR of Sub Grade Soil	15%
Design life of granular layers	15 years

Main Carriageway		
Design life of bituminous layers adopting stage construction		10 years
Crust Composition	**29+000 To 52+490**	**52+490 To 74+380**
Bituminous Concrete (mm)	40	40
Dense Bituminous Macadam (mm)	50	50
Wet Mix Macadam (mm)	250	250
Granular Sub Base (mm)	200	200
Subgrade (mm)	500	500
Total (mm)	**1040**	**1040**

Table 3.3 B Service Road crust details

Main Carriageway		
Total Cumulative Number of Standard Axles to be carried during Design Life 20 Years		10 MSA
Effective CBR of Sub Grade Soil		12%
Crust Composition	**29+000 To 52+490**	**52+490 To 74+380**
Bituminous Concrete (mm)	40	40
Dense Bituminous Macadam (mm)	50	50
Wet Mix Macadam (mm)	250	250
Granular Sub Base (mm)	200	200
Subgrade (mm)	500	500
Total (mm)	**1040**	**1040**

b) The details of the MSA calculation at the two locations are as follows :

Table 3.4: Traffic number (ADT & AADT) as per Traffic report

Type Of Vehicle	**Km 43+500 Existing Chainage**		**Km 72+000 Existing Chainage**	
	ADT	**AADT**	**ADT**	**AADT**
Car, Jeep & Van Private	4555	4282	4236	3982
Mini Bus	298	280	284	267

Type Of Vehicle	Km 43+500 Existing Chainage		Km 72+000 Existing Chainage	
	ADT	AADT	ADT	AADT
School/Institution Bus	1515	1424	1092	1027
Bus (Govt.)				
Bus (Pvt.)				
3-Axle bus				
LMV	1103	1037	1113	1046
LCV (4 Wheels)				
LCV (6 Wheels)				
2-Axle	1008	948	982	923
3-Axle	368	346	333	313
MAV (4 to 6 Axle)	373	350	347	326
Auto (Passengers)	88	86	49	48
2 Wheeler	3813	3699	3897	3780
Tractor (Without Trailer)	5	5	4	4
Tractor (With Trailer)	42	39	39	37

Table 3.4A: Details of CVPD (AADT) and MSA as per the Traffic report for the Concession Period (Location km 43+000)

YEAR	BUS	LCV	2- AXLE	3- AXLE	MAV	MSA	DESCRIPTION
2020	1424	1037	948	346	350	1.29	Design Period
2021	1518	1186	995	363	385	1.38	Construction Period
2022	1619	1356	1045	381	424	1.47	
2023	1631	1318	1099	401	427	1.51	
2024	1738	1508	1154	421	469	1.62	
2025	1853	1724	1212	442	515	1.73	
2026	1975	1967	1273	464	565	1.85	
2027	2105	2244	1336	487	620	1.98	
2028	2239	2560	1403	521	677	2.12	
2029	2382	2921	1473	537	739	2.27	
2030	2534	3318	1547	564	806	2.43	
2031	2696	3768	1624	592	880	2.60	
Cumulative MSA						**18.10**	

Table 3.4B: Details of CVPD (AADT) and MSA as per the Traffic report for the Concession Period (Location km 75+000)

YEAR	BUS	LCV	2- AXLE	3- AXLE	MAV	MSA	DESCRIPTION
2020	1027	1046	923	313	326	1.13	Design Period
2021	1095	1196	969	329	359	1.21	Construction Period
2022	1168	1368	1018	345	394	1.29	
2023	1176	1330	1071	363	397	1.33	
2024	1254	1522	1125	381	436	1.42	
2025	1336	1740	1181	400	479	1.52	
2026	1425	1985	1240	420	526	1.63	
2027	1518	2265	1302	441	577	1.75	

YEAR	BUS	LCV	2- AXLE	3- AXLE	MAV	MSA	DESCRIPTION
2028	1615	2584	1367	463	630	1.87	
2029	1718	2948	1435	486	687	2.00	
2030	1828	3348	1507	511	750	2.14	
2031	1945	3803	1582	536	819	2.29	
Cumulative MSA						**15.95**	

Table 3.4C: Details of VDF Traffic report (km 42+500) (Feb 2020)

Vehicle Type	VDF		
	Palani To Dindigul	Dindigul To Palani	Both Direction
Two Axle	2.84	1.81	2.26
Three Axle	5.90	4.61	5.2
Multi Axle Truck	8.47	6.99	7.7
Bus	1.85	1.91	1.84
LCV	0.16	0.11	0.13

c) The Concessionaire had considered DBM - 60mm instead of DBM – 50mm for better performance and effective CBR as 15% for Main carriageway. The approved pavement composition for the Main Carriageway and Service road are brought out in **Table 3.3 D** and **Table 3.3 E** respectively.

Table 3.3 D: Main carriageway crust details (design traffic 20 MSA)

S.NO	Description	Thickness (mm)	Remarks
1	Bituminous concrete	40	BC with Modified bitumen or VG40
2	DBM with VG40	60	At Va =3.6%, Vbe =11.25%.
3	WMM	250	Compacted at Field at 98% MDD
4	GSB	200	Gradation V of Table 400-1 of MoRTH Specifications to be adopted
5	Subgrade	500	During execution of work a minimum of 13% Effective CBR is to be ensured.

Table 3.3 E: Service Road crust details (design traffic 10 MSA)

S.NO	Description	Thickness (mm)	Remarks
1	Bituminous concrete	40	BC with VG 40
2	DBM with VG40	50	At Va =4.0%, Vbe =11%.
3	WMM	250	Compacted at Field at 98% MDD
4	GSB	200	Gradation V of Table 400-1 of MoRTH Specifications to be adopted
5	Subgrade	500	Minimum 12% Effective CBR to be ensured during construction

3.3 AS-BUILT DRAWINGS OF STRUCTURES

As-built drawings of structures from km 29+000 to km 74+380 were made available to us for review. Our observations on the development provisions mentioned in the Technical Schedules of Concession Agreement with respect to as-built drawings/site inventory have been presented in **Table 3.5** below.

Table 3.5: Review of As-Built drawings for Structures

S.No.	Chainage	Type of Structure	Span Arrangement	Carriageway Width	Foundation	Sub Structure	Super Structure	Type Of Bearing	Type of Expansion Joint	Remarks
1	29+900	Flyover	1x25.00	2 X 11	Open	Circular Type Abutment	PSC I-Girder	Elastomeric	Strip-seal	Start of Oddanchatram, Chatrapatti & Palani Bypass
2	30+685	MNB	3x15.00	2 X 12.50	Open	Wall Type Abt. & Circular Type Pier	PSC I-Girder	Elastomeric	Strip-seal	Virupatchi Pallam river
3	31 +925	SVUP	1x12.00	2 X 11	Open	Wall Type	Post Tensioned Plank			
4	34+210	SVUP	1x7.00	2 X 11	Box Type	Box Type	Box Type			**COS**
5	36+580	SVUP	1x9.00	2 X 11	Box Raft	Box Side Wall	Post Tensioned Plank			Skew - 37◦
6	38+530	VUP	1x15.00	2 X 11	Open	Circular Type Pier	RCC T-Girder	Elastomeric	Strip-seal	Crossing MDR 971
7	38+611	MNB	1x25.00	2 x 11.0 +2x11.00	Open	Wall Type Abt	PSC I-Girder	Elastomeric	Strip-seal	Nala
8	41+013	MNB	1x30.00	2 X 12.50	Open	Wall Type Abt	PSC I-Girder	Elastomeric	Strip-seal	Nala
9	42+485	VUP	1x15.00	2 X 11	Open	Circular Type Pier	PCS I-Girder	Elastomeric	Strip-seal	Crossing MDR 629
10	42+672	MNB	1x10.00	2 x 11.0 2x11.00	Box Raft	Box Side Wall	Box Top Slab			Canal

S.No.	Chainage	Type of Structure	Span Arrangement	Carriageway Width	Foundation	Sub Structure	Super Structure	Type Of Bearing	Type of Expansion Joint	Remarks
11	43+082	MNB	1x15.00	2X12.5	Open	Wall Type Abt	RCC T-Girder	Elastomeric	Strip-seal	Canal
12	43+145	MNB	3x15.00	2 X 12.50	Open	Wall Type Abt. & Rectangular Pier	RCC T-Girder	Elastomeric	Strip-seal	Nala
13	43+748	MNB	1x30.00	2 X 12.50	Open	Wall Type Abt	PSC I-Girder	Elastomeric	Strip-seal	Canal
14	45+772	MNB	1x20.00	2X12.5	Open	Wall Type Abt	RCC T-Girder	Elastomeric	Strip-seal	Nala Nala
15	46+462	LVUP	1x12.00	2 X 11	Open	Side Wall	Box Top Slab			Crossing MDR/Village Road
16	48+255	VOP	2x32.00	1 X 11	Open	Rectangular Abt. & Pier.	PCS I-Girder	Elastomeric	Strip-seal	Crossing MDR-900 & Skew- 24◦
17	52+480	Flyover	1x25.00	2 X 11	Open	Circular Type Pier (1.2-dia) Total 12nos	PSC I-Girder	Elastomeric	Strip-seal	Crossing SH-83
18	53+600	MNB	1x27.00	2 X 12.50	Open	Wall Type Abt	PSC I-Girder	Elastomeric	Strip-seal	Skew- 45◦
19	54+580	SVUP	1x7.00	2 X 11	Box Raft	Box Side Wall	Post Tensioned Plank			
20	56+042	MNB	1x30.00	2 x 11.0 +2x11.00	Open	(Wall Type Abt In MCW) & (Wall Type Abt. & Rectangular Pier In SR)	MCW=PSC I-Girder SR=RCC T-Girder	Elastomeric	Strip-seal	Canal & Skew- 28◦
21	56+150	Flyover	1x30.00	2 X 11	Open	Circular Type Pier (1.2-dia) Total 12nos	PSC I-Girder	Elastomeric	Strip-seal	Crossing SH-J 53 & Skew-25◦
22	56+730	MJB	5x30.00	2 X 12.50	Open	Wall Type Abt. & Rectangular Pier	PCS I-Girder	Elastomeric	Strip-seal	Shanmuga river
23	58+167	LVUP	1x12.00	2 X 11	Open	Side Wall	Box Top Slab			Crossing MDR/Village Road & Skew- 13◦

S.No.	Chainage	Type of Structure	Span Arrangement	Carriageway Width	Foundation	Sub Structure	Super Structure	Type Of Bearing	Type of Expansion Joint	Remarks
24	58+810	SVUP	I x7.00	2 X 11	Box Raft	Box Side Wall	Post Tensioned Plank			
25	59+241	MNB	5x5.00	2 x 11.0 +2x11.00	Box Raft	Box Side Wall	Box Top Slab			Nala & Skew- 30◦
26	60+606	MNB	1x10.00	2X12.5	Box Raft	Box Side Wall	Post Tensioned Plank			Nala
27	60+635	SVUP	1x12.00	2 X 11	Open	Wall Type	Box Top Slab			Skew- 49◦
28	61+203	MNB	4x5.00	2 X 11.50	Open	Wall Type Abt	PSC I-Girder	Elastomeric	Strip-seal	Nala. Skew- 26◦
29	61+540	SVUP	1x7.00	2 X 11	Box Raft	Box Side Wall	Box Top Slab			
30	62+150	MNB	1x7.00	2 X 12.50	Box Raft	Box Side Wall	Box Top Slab			Nala
31	62+380	MNB	1x6.00	2 X 12.50	Box Raft	Box Side Wall	Box Top Slab			Canal. Skew- 37◦
32	63+290	Flyover	1x25.00	2 X 11	Open	Circular Type Pier	PSC I-Girder	Elastomeric	Strip-seal	Crossing SH-192
33	67+380	PUP	1X5	2X11	Box	Box	Box			COS as locals demanded for the crossing of project road.
34	67+870	Flyover	1x25.00	2 X 11	Open	Circular Type Pier (1.2-dia) Total 12nos	PSC I-Girder	Elastomeric	Strip-seal	At the Start of Madathukulam and Udumalpet Bypass
35	68+388	Box Culvert (Subway)	1x4	2x9.5	Box	Box	Box			COS proposal by Spintex industry for crossing the project road. Box culverts is used as Subway. Skew - 37◦
36	69+390	SVUP	1x7.00	2 X 11	Box Raft	Box Side Wall	Box Top Slab			Skew- 10◦
37	69+900	MNB	1x17.00	2 X 12.50	Open	Wall Type Abt	RCC T-Girder	Elastomeric	Strip-seal	Nala & Skew- 45◦

S.No.	Chainage	Type of Structure	Span Arrangement	Carriageway Width	Foundation	Sub Structure	Super Structure	Type Of Bearing	Type of Expansion Joint	Remarks
38	70+330	MNB	1x21.00	2 X 12.50	Open	Wall Type Abt	RCC T-Girder	Elastomeric	Strip-seal	Nala & Skew- 52◦
39	71+175	MNB	1x17.00	2 X 12.50	Open	Wall Type Abt	RCC T-Girder	Elastomeric	Strip-seal	Nala & Skew- 45◦
40	71+425	LVUP	1x12.00	2 X 12.50	Open	Side Wall	Post Tensioned Plank			
41	71+660	MJB	10x30.00	2 X 12.50	Open	Wall Type Abt. & Circular Type Pier (2.5-dia) Total 18nos	PCS I-Girder	Elastomeric	Strip-seal	Amaravathi river
42	71+871	MNB	1x10.00	2 X 12.50	Box Raft	Box Side Wall	Post Tensioned Plank			Canal
43	73+004	VUP	1x15.00	2 X 11	Open	Circular Type Pier (1.2-dia) Total 12nos	PCS I-Girder	Elastomeric	Strip-seal	Crossing MDR 149

On review of the available drawings it is seen that the drawings are broadly in accordance with the provision of the Concession agreement. It is noted that Minor Bridges at Ch. 38+611 has been modified w.r.t Sch. B (i.e. span 4x5m) as the span arrangement of the Main carriageway is 1X25 while in the service road the span arrangement is same as Sch. B. The approval letter for the same is shared.

3.3.1 REVIEW OF STRUCTURE DESIGN REQUIREMENTS

3.3.1.1 GENERAL DESIGN REQUIREMENTS

As per the Concession Agreement, the design standards and loading to be considered for culverts, bridges, underpasses and retaining walls shall be those laid down in the relevant IRC codes. The structural design report for most of the structures have been provided by the Concessionaire. We have broadly reviewed the same with the objective of confirming compliance to the IRC guidelines. The observations are as under:

i) The load calculation and load combinations have been considered in accordance with the relevant IRC codes.
IRC: 5 –2015 : – General Features of Design.
IRC: 6 – 2017 – Loads and Stresses.
IRC: 112 – 2011:Code of Practice for Concrete Road Bridges.
Though footpath is present, the design is carried out with 3 lane loading with no footpath condition

ii) As per the Drawings notes of individual structures, these are designed for critical loading out off one lane of class 70 R wheeled, Three lanes of class A, one lane of class 70 R wheeled + one lane class A & IRC Special Vehicle Loading. However in the on review of the design notes it is seen that the SV Loading has been mentioned in the case of LVUP and SVUP only. It is not seem to be mentioned or considered in case of other structures.

iii) Seismic zone III has been considered for seismic analysis.

iv) Exposure condition considered for design is "Severe" for foundations and sub structures.

v) The reaction values for dead load from superstructure, SIDL, live load and footpath live load are extracted from the STAAD grillage model created for the design of superstructure for spans under consideration.

vi) Elastomeric bearing have been provided (Longitudinal and transverse Seismic restrainer).

vii) For the flyovers and underpasses the whole horizontal pressure exerted by active earth pressure and live load surcharge is taken by the RE wall behind the Abutment Pier and in cases of Major Bridges the same is taken by the Abutment wall.

viii) Reinforcement steel used is Fe 500D while Grade of Concrete used is M35 to M50.

ix) For PSC girders post tensioning method has been considered in design.

x) The wearing coat is 53mm with 3mm membrane and 50mm Bituminous Course.

3.3.2 HYDROLOGICAL ADEQUACY OF STRUCTURES

The Hydrology calculations of the structures were not available with us for review. Also, there is no data pertaining to hydrological calculations (Discharge, Catchment, Scour Depth, etc.) in the as-built drawings of the Major Structures (Major and Minor Bridges) made available to us. However from our assessment of condition of structures during the site inventory, we are of the view that almost all structures are high level and the design of these structures must have been done by fulfilling the requirements of hydrology.

3.3.3 GEOTECH REPORT REVIEW

The Geotech report have been provided in respect of 40 nos. of structures. The details of the founding level provided in the as built drawing have been compared with the geotech report and summarized position is provided in the **Table 3.6** below:

Table 3.6: Summary of Geotech report

Sl. No.	Chainage	Structure	Bore holes numbers & depths	Safe Bearing Capacities
1	29+900	Flyover	2 bores 10 M	SBC 50 T/sqm at 1.5 to 6 m
2	30+685	MNB	3 bores 13.5 to 10 m	SBC 30 to 55 T/sqm @ 1.5 to 6 on A2 and 50 to 55 on other foundation
3	31 +925	SVUP	3 bores 13.5 to 10 m	SBC 50 T/sqm @ 4- 6 m
4	36+580	SVUP	3 bores 6 to 3 m	SBC 60 T/sqm @ 1-2 m
5	38+530	VUP	3 bores 9 to 7.5 m	SBC 50 to 60 T/sqm @ 1.5 to 9 m on AP1 and 50 to 60 T/sqm on other
6	38+611	MNB	2 bores 9 to 8 m	SBC 50 to 60 T/sqm @1.5 to 8 m on A1 and 60 T/sqm on A2
7	41+013	MNB	2 bores 12 to 11 m	SBC 50 T/sqm @1.5 to 6 m on A1 and 20 to 50 T/sqm @ 1.5 to 6 m on A2
8	42+485	VUP	3 bores 11 to 9 m	SBC 50 to 55 T/sqm @ 1.5 - 6 m
9	42+672	MNB	1 bore 7.5 m	SBC 10 to 60 T/sqm @ 1.5-6 m
10	43+082	MNB	1 bore 12 m	SBC 10 to 50 T/sqm @ 1.5-6 m
11	43+145	MNB	3 bores 13 to 10.5 m	SBC 50 to 55 T/sqm @ 1.5 - 6 m on PCL 20 to 55 T/sqm @ 1.5-6 m on A1 and 10 to 55 T/sqm @ 1.5-6 m on A2
12	43+748	MNB	2 bores 12 to 9 m	SBC 50 to 55 T/sqm @ 3-6 m on A1 and 50 to 70 T/sqm @ 1.5-9 m on A2
13	45+772	MNB	2 bores 9 m	SBC 15 to 70 T/sqm @ 1.5-9 m on A1 and 15 to 70 T/sqm @ 1.5-9 m on A2
14	46+462	LVUP	1 bore 10.5 m	SBC 50 to 60 T/sqm @ 1.5-6 m
15	48+255	VOP	6 bore 11 to 8.4 m	SBC 50 to 60 T/sqm @ 1.5-6 m on Right Abutment A1, Centre Point P1, VUP A1 LHS, A1 Approch and 50 to 65 T/sqm @ 1.5-6 m on A2 VOP and 55 to 60 T/sqm @1.5-6 m on A2 RHS
16	52+480	Flyover	4 bores 10.5 to 3 m	SBC 60 T/sqm @ 3 m on A1 and 60 to 70 T/sqm @ 1.5-6 m on A2 and 70 T/sqm @ 3 m on AP1 and 30 to 70 T/sqm @ 1.5-10.5 m on AP2
17	53+600	MNB	2 bores 7.5 to 7 m	SBC 50 to 60 T/sqm @ 1.5-7 m on A1 and 50 to 60 T/sqm @ 1.5-7.5 m on A2
18	54+580	SVUP	3 bores 10.5 to 8 m	SBC 25 T/sqm @ 0.5 m
19	56+042	MNB	2 bores 14 to 10.5 m	SBC 50 to 55 T/sqm @ 1.5-6 m on A1 and 20 to 50 T/sqm @ 1.5-6 m on A2
20	56+150	Flyover	4 bores 14 to 10 m	SBC 10 to 70 T/sqm @ 1.5-6 m on A1 and 20 to 55 T/sqm @ 1.5-6 m on A2 and 15 to 70 T/sqm @ 3-6 m on AP1 and 20 to 40 T/sqm @ 1.5-6 m on AP2

Sl. No.	Chainage	Structure	Bore holes numbers & depths	Safe Bearing Capacities
21	56+730	MJB	6 bores 9 to 6 m	SBC 70 to 60 T/sqm @ 1-7.5 m on A1 and 60 T/sqm @ 4.5-9 m on P1 and 60 T/sqm @ 1-8 m on P2 and 60 T/sqm @ 3-6 m on P3 and 60 T/sqm @ 1.5-7.5 on P4 and 70 T/sqm @1.5-7.5 m on A2
22	58+167	LVUP	1 bore 9 m	SBC 70 T/sqm @ 6-9 m
23	58+810	SVUP	3 bores 10.5 to 5 m	SBC 25 T/sqm @ 0.5 m
24	59+241	MNB	2 bores 4.5 to 3 m	SBC 70 T/sqm @ 1.5-4.5 m on A1 and 70 T/sqm @ 0-3 m on A2
25	60+606	MNB	1 bore 9.10 m	SBC 50 to 70 T/sqm @ 1.5-9.1 m
26	60+635	SVUP	3 bores 9 to 8 m	SBC 45 to 60 T/sqm @ 1.5-9 m on PCL and 45 to 60 T/sqm @ 1.5-8 m on AP1 and 45 to 60 T/sqm @ 1.5-9 m on AP2
27	61+203	MNB	2 bores 12 m	SBC 50 to 55 T/sqm @ 1.5-6 m
28	61+540	SVUP	3 bores 10.5 to 9 m	SBC 50 T/sqm @ 0.5 m
29	62+150	MNB	1 bore 5 m	SBC 60 to 70 T/sqm @ 1.5-5 m
30	62+380	MNB	1 bore 8.5 m	SBC 50 to 60 T/sqm @ 1.5-8.5 m
31	63+290	Flyover	4 bores 6 to 5 m	SBC 70 T/sqm @ 2-3 m
32	67+870	Flyover	4 bores 10.5 to 5.5 m	SBC 65 to 70 T/sqm @ 1.5-5.5 m on A1 and 55 to 60 T/sqm @ 1.5-6 m on A2 and 60 to 70 T/sqm @ 1.5-8 m on AP1 and 50 to 55 T/sqm @ 1.5-4.5 m on AP2
33	69+390	SVUP	3 bores 14 to 12 m	SBC 35 T/sqm @ 0.5 m
34	69+900	MNB	2 bores 12 to 9 m	SBC 40 to 70 T/sqm @ 1.5-9 m on A1 and 40 to 60 T/sqm @ 1.5-6 m on A2
35	70+330	MNB	2 bores 11 m	SBC 50 T/sqm @ 1.5-6 m
36	71+175	MNB	2 bores 5 to 3.5 m	SBC 65 T/sqm @ 0.5-3 m
37	71+425	LVUP	1 bore 9 m	SBC 20 to 70 T/sqm @ 1.5-9 m
38	71+660	MJB	11 bores 6 to 3 m	SBC 60 T/sqm 0.5-3 m
39	71+871	MNB	1 bore 6 m	SBC 55 to 70 T/sqm @ 2-6 m
40	73+004	VUP	3 bores 12 to 10.5 m	SBC 42 to 50 T/sqm @ 1.5-6 m on AP1 and 50 T/sqm @ 1.5-6 m on others

3.3.4 CONCLUSIONS ON REVIEW OF DRAWINGS

As per the Concession Agreement, the structures have been designed for loading as per IRC: 6-2000. The Concessionaire has taken into account all the IRC Codal specifications based on which the structures have been constructed at site.

CHAPTER 4.0: EXISTING INVENTORY & CONDITION SURVEY

4.1 PROJECT DETAIL

The Project Road is a Section of NH 209 (New NH 83) which starts from existing road Ch 29+000 and ends at Ch 74+380 on the Oddanchatram-Madathukulam section in the State of Tamil Nadu . The effective Length of Project Road is 45.380 km.

The major details of the Project are presented in **Table 4.1** below.

Table 4.1: Summary of Project details as per the site inventory

S. No.	PARAMETER	DESCRIPTION
1	Main Carriageway	45.380 km
2	Service Road	28.850 Km length (both sides)
3	Drain	RCC Drain - 19.760 Km length
4	Junctions	35 nos. (Minor junctions)
5	Bus Bays/ Bus Shelters	37 nos.
6	Truck lay bye	01 nos.
7	Flyover	05 nos.
8	Major Bridge	02 nos.
9	Minor Bridges	19 nos.
10	Underpasses	VUP – 03 nos., LVUP -03 nos., SVUP -08 nos. and PUP – 01 no.
11	Overpasses	VOP – 01 nos.
12	Culverts	146 nos.
13	Toll Plaza	01 no. at Ch. 40+500

4.2 OVERVIEW OF ROAD ASSETS AND APPURTENANCES

Detailed inspection of the site was carried out by our team of Engineers in October 2024 for assessment of status and condition of various Road Assets and Appurtenances. Inventories of various road assets and structures were prepared.

Status of various road furniture items, painting, road markings, safety fixtures, way-side amenities, horticulture and landscaping with respect to the provisions of Concession Agreement and their condition were checked. Certain defect and deficiencies have been observed at site in respect of the condition of the earthen drain, vegetation growth excessive. The summarised details in respect of inventory/condition survey of road assets for the Project are presented in subsequent para below.

4.2.1 HIGHWAY INVENTORY

The basic dimensional parameters like width of the carriageway, earthen shoulder, embankment height, Drain, median etc. for the Project Road were observed and details pertaining to it were noted for every 100m interval. This information has been presented in **Table 4.2** along with the representative photographs of each 5 km stretch of the project road are shown in **Figures** below.

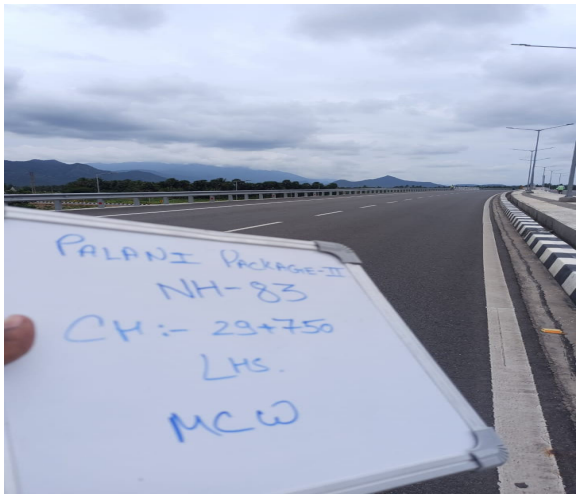

Fig.4.1: Section at Ch 29+750 LHS

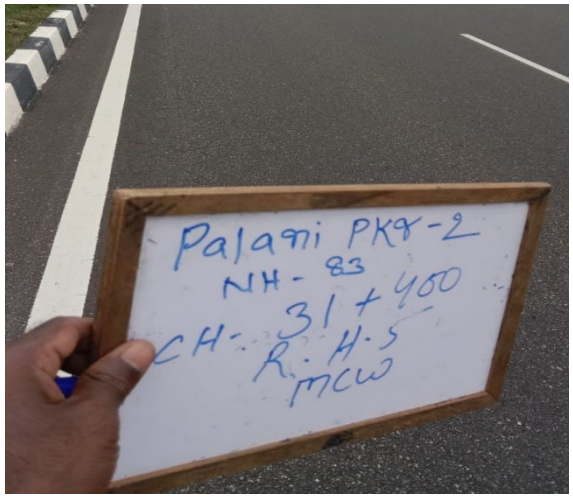

Fig.4.2: Section at Ch 31+400 RHS

Fig.4.3: Section at Ch 34+850 LHS

Fig.4.4: Section at Ch 35+500 RHS

Fig.4.5: Section at Ch 41+300 LHS

Fig.4.6: Section at Ch 41+340 RHS

Fig.4.7: Section at Ch 44+100 LHS

Fig.4.8: Section at Ch 47+400 RHS

Fig.4.9: Section at Ch 49+700 LHS

Fig.4.10: Section at Ch 49+900 RHS

Fig.4.11: Section at Ch 55+000 LHS

Fig.4.12: Section at Ch 57+200 RHS

Fig.4.13: Section at Ch 63+600 LHS

Fig.4.14: Section at Ch 63+900 RHS

Fig.4.15: Section at Ch 66+400 LHS

Fig.4.16: Section at Ch 67+100 RHS

Fig.4.17: Section at Ch 73+700 LHS

Fig.4.18: Section at Ch 74+250 RHS

Table 4.2: Details of Main Carriageway Inventory

Chainage		MCW Width (m)		Median Width (m)	Paved Shoulder Width(m)		Earthen Shoulder Width(m)		Embankment Height (m)		Paver Blocks (m)	Remarks
Start	End	LHS	RHS		LHS	RHS	LHS	RHS	LHS	RHS	RHS	
29.000	30.000	7	7	4.0	1.5-2	1.5-2	-	-	1.0-2.0	1.0		
30.000	31.000	7	7	4.0	1.5-2	1.5-2	-	-	1.0-2.0	1.0		
31.000	32.000	7	7	4.0	1.5	1.5	-	-	1.0-2.0	1.0		
32.000	33.000	7	7	4.0	1.5	1.5	2.5	2.5	1.5-2.5	1.5-2.5		
33.000	34.000	7	7	4.0	1.5	1.5	2.5-3	2.5-3	1.0-1.5	1.5-2.2		
34.000	35.000	7	7	4.0	1.5	1.5	2.5	2.5	2.3-2.5	1.0-2.3		
35.000	36.000	7	7	4.0	1.5	1.5	2.5	2.5	2.3	2.3		
36.000	37.000	7	7	4.0	1.5-2	1.5-2	2-2.5	2-2.5	0.7-2	2.0		
37.000	38.000	7	7	4.0	1.5	1.5	2.0	2.0	1.5-2	2-1.5		
38.000	39.000	7	7	4.0	1.5-2	1.5-2	2.0	2.0	1.5-1.75	1.5-1.75		Under pass approaches
39.000	40.000	7	7	4.0	1.5	1.5	2.0	2.0	0.2-1.75	1.75		
40.000	41.000	7	7	4.0	1.5	1.5	2-3.5	2-3.5	0.2	1.75-1.2		
41.000	42.000	7	7	4.0	1.5-2	1.5-2	2.0	2.0	1.5-2.5	1.5-2.5		
42.000	43.000	7	7	4.0	2.0	2.0	-	-	2.0	1.8		
43.000	44.000	7	7	4.0	1.5-2	1.5-2	1.5-2.5	1.5-2.5	2.0	1.75		
44.000	45.000	7	7	4.0	1.5	1.5	2.0	2.0	1.2	1.25-1.75		
45.000	46.000	7	7	4.0	1.5	1.5	2.0	2.0	1.2	1.5-2		
46.000	47.000	7	7	4.0	1.5-2	1.5-2	2.0	2.0	1.2	1.5-2		
47.000	48.000	7	7	4.0	1.5	1.5	2.0	2.0	2-2.5	0.8-2.5		
48.000	49.000	7	7	4.0	1.5	1.5	2.0	2.0	0.8-2.5	0.7-0.8		
49.000	50.000	7	7	4.0	1.5	1.5	1.5-2	1.5-2	0.7-0.8	0.7-0.8		
50.000	51.000	7	7	4.0	1.5	1.5	1.5	1.5	1.5	1.5		
51.000	52.000	7	7	4.0	1.5	1.5	1.5-2	1.5-2	1.75	1.75		
52.000	53.000	7	7	4.0	1.5	1.5	2.0	2.0	1.5-2.0	1.5-2.0		Under pass approaches
53.000	54.000	7	7	4.0	1.5	1.5	1.5	1.5	1.5-2	1.5-2		

Chainage		MCW Width (m)		Median Width (m)	Paved Shoulder Width(m)		Earthen Shoulder Width(m)		Embankment Height (m)		Paver Blocks (m)	Remarks
Start	End	LHS	RHS		LHS	RHS	LHS	RHS	LHS	RHS	RHS	
54.000	55.000	7	7	4.0	1.5-2	1.5-2	1.5-2	1.5-2	1.0-2.0	1.0-2.0		Under pass approaches
55.000	56.000	7	7	4.0	2.0	2.0	1.5-2	1.5-2	0.6-1.0	0.6-1.0		Under pass approaches
56.000	57.000	7	7	4.0	1.5-2	1.5-2	1.5	1.5	0.6-1.0	0.6-1.0		Under pass approaches
57.000	58.000	7	7	4.0	1.5-2	1.5-2	1.5	1.5	0.6-1.0	0.6-1.0		Under pass approaches
58.000	59.000	7	7	4.0	2.0	2.0	-	-	2.0	2.0		
59.000	60.000	7	7	4.0	1.5	1.5	1.0-2.0	1.0-2.0	1.5-2	1.5-2		
60.000	61.000	7	7	4.0	1.5	1.5	-	-	1.75	1.75		
61.000	62.000	7	7	4.0	1.5	1.5	-	-	0.6-1.75	0.6-1.75		
62.000	63.000	7	7	4.0	2.0	2.0	2.5	2.5	0.6-1.0	0.6-1.0		
63.000	64.000	7	7	1.5-4	1.5-2	1.5-2	3.5-4.2	3.5-4.2	1.0	1.0	200	Paver Blocks provided for pilgrims going towards Palani
64.000	65.000	7	7	1.5	1.5	1.5	3.5-4.2	3.5-4.2	1.0	1.0	1000	
65.000	66.000	7	7	1.5	1.5	1.5	2-4.2	2-4.2	1.0	1.0	1000	
66.000	67.000	7	7	1.5-4	1.5	1.5	1.0-2.0	1.0-2.0	1.0 - 1.5	1.0 - 1.5	1000	
67.000	68.000	7	7	4.0	1.5-2	1.5-2	1.0-2.0	1.0-2.0	1.5	1.5	200	Under pass approaches
68.000	69.000	7	7	4.0	1.5-2	1.5-2	1.0	1.0	2.5-3.5	2-4		Under pass approaches
69.000	70.000	7	7	4.0	1.5	1.5	1.0	1.0	1.5-3.5-5	1.5-3.5-5		
70.000	71.000	7	7	4.0	1.5	1.5	1.0-2.0	1.0-2.0	1.5-2	1.5-2		
71.000	72.000	7	7	4.0	1.5-2	1.5-2	-	-	1.3-1.5	1.3-1.5		
72.000	73.000	7	7	4.0	1.5-2	1.5-2	1.0	1.0	1.3-1.7	1.3-1.7		Under pass approaches
73.000	74.380	7	7	4.0	1.5-2	1.5-2	1.0	1.0	1.3-1.7	1.3-1.7		Under pass approaches

4.2.2 PAVEMENT CONDITION

Based on the visual inspection carried out every 100m interval no pavement distress was visible at site. Representative photographs showing the Pavement Condition are presented in Figures below**.** The details of various damages like cracks, pot holes, settlement, rutting, roughness etc. observed by the Network Survey Vehicle are summarized in Ch. 5.4.

Fig.4.19: Section at Ch. 40+660 LHS

Fig.4.20: Section at Ch 40+600 RHS

Fig.4.21: Section at Ch. 43+200 LHS

Fig.4.22: Section at Ch 43+200 RHS

Fig.4.23: Section at Toll Plaza on LHS

Fig.4.24: Section at Ch 56+000 RHS

4.2.3 SERVICE ROADS/ SLIP ROADS

Total length of Service roads/Slip roads is 28.850 Km. Representative Photographs of some of the Service roads/Slip Roads sections are presented in **Figures** below. The details of the service road are bought out in **Table 4.3** below.

Fig.4.25: Service Road at Ch 29+425 RHS

Fig.4.26: Slip Road at Ch 38+000 RHS

Fig.4.27: Service Road at Ch 42+000 LHS

Fig.4.28: Service Road at Ch 52+640 LHS

Fig.4.29: Slip Road at Ch 62+700 RHS

Fig.4.30: Service Road at Ch 65+450 LHS

Fig.4.31: Service Road at Ch 67+450 LHS

Fig.4.32: Service Road at Ch 72+310 RHS

Fig.4.33: Slip Road at Ch 73+580 LHS

Table 4.3: Details of Service Road/ Slip Road

S.No.	Village Name	Chainage (Km)		Side	Length (m)	Width (m)	Condition	Taper length(entry)			Taper length(exit)			Remarks
		From	To	LHS/RHS				1	2	3	1	2	3	
1	Athappagounenpudur	29+000	30+350	LHS	1350	7	Fair	0	0	80	75	95	55	Taper lengths are non standard at some locations due to site constraints. Service road from 41+700 to 42+100 is not shown in the as built drawing as it is developed by the Petrol Pump.
2		29+000	30+350	RHS	1350	7	Fair	75	80	55	0	0	80	
3	Palani bypass	30+850	32+610	LHS	1760	5	Fair	0	0	90	55	95	75	
4	Kaveriyammapatti	30+850	32+610	RHS	1760	5	Fair	75	80	55	111	95	75	
5	Samiyarpudur	34+220	34+430	LHS	210	5	Fair	0	0	45	0	0	0	
6		34+220	34+430	RHS	210	5	Fair	0	0	0	0	0	45	
7	Velur	38+050	38+920	LHS	870	7	Fair	75	80	55	75	95	55	
8		38+050	38+920	RHS	870	7	Fair	90	80	55	75	95	55	
9	Manjanaichicenpatti	42+100	42+880	LHS	780	7	Fair	0	0	115	0	0	130	
10		42+100	42+880	RHS	780	7	Fair	0	0	115	0	0	130	
11	Palani bypass	46+075	46+760	LHS	685	7	Fair	75	80	55	75	95	55	
12		46+075	46+760	RHS	685	7	Fair	75	80	55	75	95	55	
13		48+130	48+430	LHS	300	7	Fair	75	80	55	75	95	55	
14		48+130	48+430	RHS	300	7	Fair	75	80	55	75	95	55	
15	Karuppana goudan valasu	52+070	53+000	LHS	930	7	Fair	75	80	55	75	95	55	
16		52+070	53+000	RHS	930	7	Fair	75	80	55	75	95	55	
17	Manoor	55+750	56+570	LHS	820	7	Fair	75	80	55	0	0	102	

S.No.	Village Name	Chainage (Km)		Side	Length (m)	Width (m)	Condition	Taper length(entry)			Taper length(exit)			Remarks
		From	To	LHS/RHS				1	2	3	1	2	3	
18		55+750	56+570	RHS	820	7	Fair	0	0	102	75	95	55	
19	Pethanaicenpatti	57+740	59+330	LHS	1590	7	Fair	75	80	55	75	95	55	
20		57+740	59+330	RHS	1590	7	Fair	75	80	55	75	95	55	
21	Thalaiyuthu	62+700	65+850	LHS	3150	7	Fair	75	80	55	75	95	55	
22		62+700	65+430	RHS	2730	7	Fair	75	80	55	75	95	55	
23	Pushpathur	67+230	68+500	LHS	1270	7	Fair	75	80	55	75	95	55	
24		67+230	68+500	RHS	1270	7	Fair	75	80	55	75	95	55	
25	Madathuulam Bypass	72+380	73+400	LHS	1020	7	Fair	75	80	55	75	95	55	
26		72+380	73+400	RHS	1020	7	Fair	75	80	55	75	95	55	

4.2.4 JUNCTIONS

There are 35 nos. of Minor junctions are provided on the Project road which are merging with the Main Carriageway & Service Road. The side roads are having flexible pavement which are in fair condition. Auxiliary lanes for turning traffic are not provided as per the standards. The details of the junctions are furnished in **Table 4.4**. Representative photographs of some of the Junctions are presented in **Figures** below.

Fig.4.34.: Minor Junction at Ch 30+935 LHS

Fig.4.35: Minor Junction at Ch 30+935 RHS

Fig.4.36: Minor Junction at Ch 46+085 LHS

Fig.4.37: Minor Junction at Ch 46+085 RHS

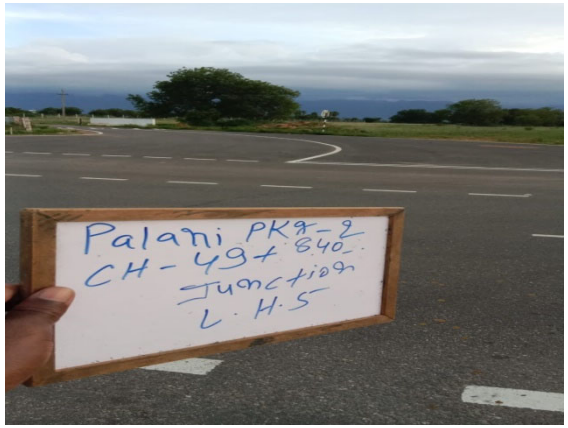

Fig.4.38: Minor Junction at Ch 49+840 LHS

Fig.4.39: Minor Junction at Ch 50+710 RHS

Fig.4.40: Minor Junction at Ch 61+645 LHS

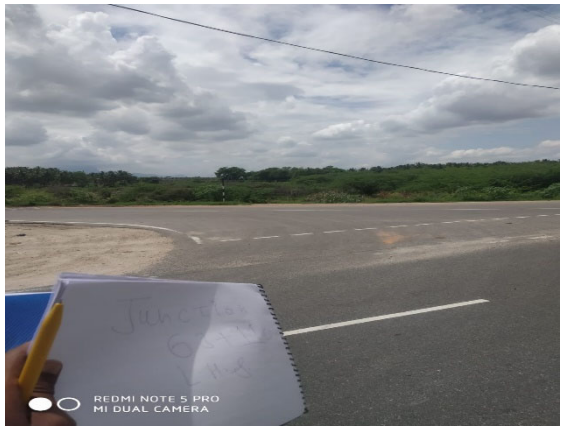

Fig.4.41: Minor Junction at Ch 63+110 LHS

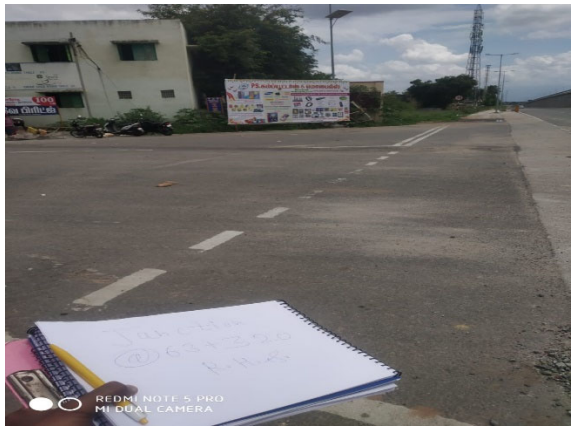

Fig.4.42: Minor Junction at Ch 63+320 RHS

Fig.4.43: Minor Junction at Ch 73+004 RHS

Fig.4.44: Minor Junction at Ch 73+300 LHS

Fig.4.45: Minor Junction at Ch 74+380 RHS

Table 4.4: Details of Minor Junctions

Sl. No.	Chainage	Type (T/X/Y)	Side Road LHS				MCW taper (m)	Side Road RHS				MCW taper (m)	Condition	Remarks
			Pavement Type	Width	Width at mouth	Taper Length		Pavement Type	Width	Width at mouth	Taper Length			
1	29+900	T	BC	22	41	200	Flyover						Good	
2	30+935	X	BC	6	19	25	SR Taper	BC	6	19	25	SR Taper	Good	Taper on the MCW is not provided at site but shown in GFC drawing
3	31+925	X	BC	7.5	17	25	SVUP	BC	7	17.5	25	SVUP	Good	
4	32+975	T						BC	7.5	17	25	140	Good	
5	33+050	T	BC	7.5	17	25	140	BC					Good	not in Sch. B
6	34+430	X	BC	7	14	25	SR Taper	BC	7	14	25	SR Taper	Good	
7	36+580	X	BC	3.75	6	25	SVUP	BC	3.75	6	25	SVUP	Good	Junction development is not done

Sl. No.	Chainage	Type (T/X/Y)	Side Road LHS				MCW taper (m)	Side Road RHS				MCW taper (m)	Condition	Remarks
			Pavement Type	Width	Width at mouth	Taper Length		Pavement Type	Width	Width at mouth	Taper Length			
														as per standard
8	38+530	X	BC	7	27.5	25	VUP	BC	7	23.5	25	VUP	Good	
9	42+485	X	BC	7	27	25	VUP	BC	7	20	25	VUP	Good	
10	46+085	X	BC	3.5	23	25	SR Taper	BC	3.5	24	25	SR Taper	Good	
11	46+482	X	BC	5.5	15	25	LVUP	BC	7	21.5	25	LVUP	Good	
12	49+840	Y	BC	5.5	49	32	140						Good	Median opening is provided infront of the junction
13	50+710	Y						BC	3	148	25	70	Good	Taper of junction is merging with exit taper of Bus bay
14	52+480	X	BC	7.5	28	25	Flyover	BC	7.5	38	25	Flyover	Good	
15	54+580	X	BC	3.5	3.5	25	SVUP	BC	3.5	3.5	25	SVUP	Good	
16	56+150	X	BC	7.5	27	26	Flyover	BC	7.5	26.5	25	Flyover	Good	
17	58+167	X	BC	3	16	25	LVUP	BC	2.5	12	25	LVUP	Good	
18	58+810	X	BC	3	16	25	SVUP	BC	3	18.5	25	SVUP	Good	
19	60+635	X	BC	3.5	3.5	25	SVUP	BC	3.5	3.5	25	SVUP	Good	
20	61+540	T						BC	3	3	25	SVUP	Good	
21	61+650	Y	BC	2.5	16	25	Connecting road					Connecting road	Good	
22	63+110	Y	BC	7	38	25	SR						Good	
23	63+320	T						BC	7	40	25	Flyover	Good	
24	63+540	T	BC	5.5	24	25	SR						Good	
25	64+920	Y	BC	3.5	18	25	SR						Good	
26	66+650	Y						BC	3	82	25	140	Good	
27	67+330	Y	BC	6	33	25	SR						Good	

Sl. No.	Chainage	Type (T / X / Y)	Side Road LHS				MCW taper (m)	Side Road RHS				MCW taper (m)	Condition	Remarks
			Pavement Type	Width	Width at mouth	Taper Length		Pavement Type	Width	Width at mouth	Taper Length			
28	67+350	Y						BC	3.5	19	25	PUP	Good	
29	67+870	Y	BC	7	33	25	Flyover						Good	
30	67+500	Y						BC	3.5	24	25	SR	Good	
31	69+390	X	BC	5.5	5.5	25	SVUP	BC	5.5	5.5	25	SVUP	Good	
32	71+425	X	BC	5	5	25	LVUP	BC	3	3	25	LVUP	Good	
33	73+004	X	BC	5	39	25	VUP	BC	5	30	25	VUP	Good	
34	73+300	X	BC	6.5	30	25	SR Taper	BC	6.5	32	25	SR Taper	Good	
35	74+380	X	BC	7	42	30	70	BC	7	40	30	140	Fair. Pot hole (1mx1m) on LHS & (0.5x0.5) on RHS	Taper of the LHS junction merging with exit taper of Bus Bay

4.2.5 MEDIAN

The Project road consists of raised median having width of the median 3.5m /1.5m. There are two Median Openings provided on the project road which are having storage lane, pedestrian crosswalk and solar blinkers the details of which are furnished in **Table 4.5** below. Raised Kerb is provided on the median edge, service road separators, physical islands for the Bus Bay and Truck lay bye. The height of the Kerb is 240mm along the complete length of the project road which are in good condition. Representative photographs of the median are presented in **Figures** below.

Fig.4.46: Median Opening at Ch 49+840

Fig.4.47: Emergency Opening at Ch 32+955

Fig.4.48: Median at Ch 30+200

Fig.4.49: Median at Ch 38+200

Fig.4.50: Median Kerb at Ch 63+400

Fig.4.51: Median Opening at Ch 74+100

Table 4.5: Details of Kerb

Chainage		Total kerb length (km)	Condition	Chainage		Total kerb length (km)	Condition	Chainage		Total kerb length (km)	Condition
From	to			from	to			from	to		
29.000	30.000	3.800	Good	45.000	46.000	2.000	Good	61.000	62.000	2.000	Good
30.000	31.000	2.850	Good	46.000	47.000	3.370	Good	62.000	63.000	2.600	Good
31.000	32.000	3.000	Good	47.000	48.000	2.000	Good	63.000	64.000	4.000	Good
32.000	33.000	2.520	Good	48.000	49.000	2.000	Good	64.000	65.000	4.000	Good
33.000	34.000	2.000	Good	49.000	50.000	2.000	Good	65.000	66.000	3.280	Good
34.000	35.000	2.510	Good	50.000	51.000	2.000	Good	66.000	67.000	2.000	Good
35.000	36.000	2.000	Good	51.000	52.000	2.000	Good	67.000	68.000	3.540	Good
36.000	37.000	2.000	Good	52.000	53.000	3.860	Good	68.000	69.000	3.000	Good
37.000	38.000	2.000	Good	53.000	54.000	2.000	Good	69.000	70.000	2.000	Good
38.000	39.000	3.640	Good	54.000	55.000	2.000	Good	70.000	71.000	2.000	Good
39.000	40.000	2.000	Good	55.000	56.000	2.500	Good	71.000	72.000	2.000	Good
40.000	41.000	1.400	Good	56.000	57.000	3.140	Good	72.000	73.000	3.240	Good
41.000	42.000	2.000	Good	57.000	58.000	2.520	Good	73.000	74.000	2.800	Good
42.000	43.000	3.660	Good	58.000	59.000	4.000	Good	74.000	74.380	0.760	Good
43.000	44.000	2.000	Good	59.000	60.000	2.660	Good				
44.000	45.000	2.000	Good	60.000	61.000	2.000	Good				

There is an Emergency Median Opening provided at Ch. 32+955 (about 5m) which is closed by W-Beam MBCB. As per the Concessionaire this opening was provided at the request of the villagers and can only be operated by the villager but no such correspondence is seen in this regard.

4.2.6 BUS BAYS/ SHELTER

There are 37 nos. of Bus Bays with Shelters on both sides details of which are presented in **Table 4.6** below. Representative photographs of some of the Bus Bays/Bus Shelters are presented in **Figures** below.

Fig.4.52: Bus Bay at Ch 29+800 LHS

Fig.4.53: Bus Bay at Ch 30+000 RHS

Fig.4.54: Bus Bay at Ch 38+380 RHS

Fig.4.55: Bus Bay at Ch 42+385 LHS

Fig.4.56: Bus Bay at Ch 42+590 RHS

Fig.4.57: Bus Bay at Ch 46+100 LHS

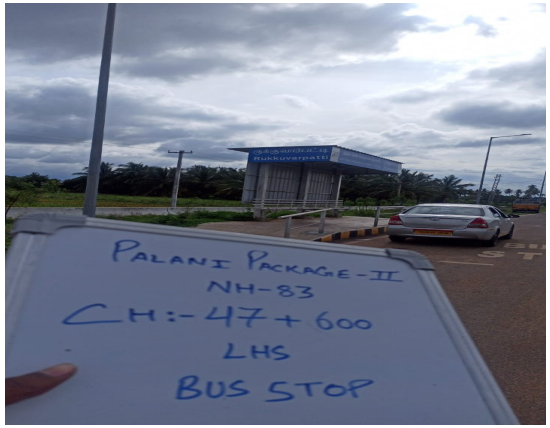

Fig.4.58: Bus Bay at Ch 47+600 LHS

Fig.4.59: Bus Bay at Ch 49+000 RHS

Fig.4.60: Bus Bay at Ch 50+550 LHS

Fig.4.61: Bus Bay at Ch 55+000 RHS

Fig.4.62: Bus Bay at Ch 71+050 LHS

Fig.4.63: Bus Bay at Ch 73+600 RHS

Table 4.6: Details of Bus Bays/ Shelter

Chainage	Side	Bus Bay		Width (m)	Bus Shelter	Place Name	Condition	Remarks
		length(m)	length(m)					
29+800	LHS	0	0	0	Yes	Athappagoundenpudur	Good	
30+000	RHS	0	0	0	Yes		Good	
31+500	LHS	225	20	7.5	Yes	Kaveriyammapatti	Good	
32+290	RHS	189	15	7.5	Yes		Fair.	Painting of the Shelter is required
34+560	LHS	186	19	7.5	Yes	Samiyar pudur	Good	
34+560	RHS	188	19	7	Yes		Good	
38+350	LHS	0	0	0	Yes	Velur	Good	
38+450	RHS	0	0	0	Yes		Good	
42+360	LHS	0	0	0	Yes	Manjanaickenpatti	Good	
42+600	RHS	0	0	0	Yes		Good	
46+150	LHS	0	0	0	Yes	Kanakkanpatti	Good	
46+560	RHS	0	0	0	Yes		Good	
47+600	LHS	242	15	7.5	Yes	Rukkuvarpatti	Good	
49+000	RHS	245	15	8	Yes		Good	
50+550	LHS	247	15	7.5	Yes	MollomPatti	Good	
50+860	RHS	245.5	15.5	7.2	Yes		Good	
52+380	LHS	0	0	0	Yes	Karrupunna	Good	
52+580	RHS	0	0	0	Yes		Good	
54+150	LHS	144	23	7.5	Yes	Kodaimangalam	Good	
55+000	RHS	225.5	20	7.5	Yes		Good	
56+000	LHS	0	0	0	Yes	Manoor	Good	
56+250	RHS	0	0	0	Yes		Good	
58+425	RHS	0	0	0	Yes		Good	
61+640	LHS	0	0	0	Yes	Sappalanai ckenpatti	Good	
63+250	LHS	0	0	0	Yes	Thalaigathu	Good	
63+450	RHS	0	0	0	Yes		Good	

Chainage	Side	Bus Bay		Width (m)	Bus Shelter	Place Name	Condition	Remarks
		length(m)	length(m)					
64+870	LHS	0	0	0	Yes		Good	
65+170	RHS	0	0	0	Yes		Good	
67+770	LHS	0	0	0	Yes	Pushpathur	Good	
67+970	RHS	0	0	0	Yes		Good	
69+070	LHS	225	15	7.5	Yes	Valayur	Good	
69+070	RHS	225	15	7.5	Yes		Good	
71+050	LHS	245	15	7	Yes	VG Nagar	Good	
71+080	RHS	234	15	7	Yes		Good	
72+580	LHS	0	0	0	Yes	Madathukulam	Good	
73+680	RHS	168	15	7.5	Yes		Good	
74+230	LHS	237	15	7.5	Yes	Vedapatti	Good	

4.2.7 TUCK LAY BYE

There are 2 nos. of Truck Lay Bye on the Project road which are provided on either side. The details of which are presented in **Table 4.7** below.

Fig.4.64: Truck Lay Bye at Ch 35+800 LHS

Fig.4.65: Truck Lay Bye at Ch. 35+800 Entry

Fig.4.66: Truck lay Bye at Ch 35+800 LHS Exit

Fig.4.67: Truck Lay Bye at Ch. 35+800 RHS

Fig.4.68: Truck Lay Bye at Ch. 35+800 RHS Entry

Fig.4.69: Truck Lay Bye at Ch. 35+800 RHS Exit

Table 4.7: Details of Truck Lay Bye

Chainage	Side	Truck Lay Bye		Width(m)	Physical island	Toilet Block	Lighting	Condition	Remark
		length(m)	length(m)						
35+800	LHS	256	100	11.4	Yes	Yes	Yes	Good	Near Reddiapatti
35+800	RHS	256	100	11.4	Yes	Yes	Yes	Good	

4.2.8 PLANTATION

The Avenue Plantation & Median Plantation are in fair condition. The details of median plantation and avenue plantation are shown in Table 4.8 and Table 4.9 below:

Fig.4.70: Plantation at 29+100

Fig.4.71: Plantation at 29+300

Fig.4.72: Plantation at 36+950

Fig.4.73: Plantation at 37+870

Fig.4.74: Plantation at 51+800

Fig.4.75: Plantation at 66+400

Fig.4.76: Avenue Plantation at 51+000 LHS

Fig.4.77: Avenue Plantation at 55+550 LHS

Fig.4.78: Avenue Plantation at 74+100 LHS

Table 4.8: Details of Median Plantation

SI.No.	Chainage		Length (in Km)	Sl. No.	Chainage		Length (in Km)
	from	to			from	to	
1	29.000	29.660	0.660	10	52.750	55.900	3.150
2	30.150	32.955	2.805	11	56.390	57.900	1.510
3	33.000	36.100	3.100	12	59.120	62.805	3.685
4	36.100	38.200	2.100	13	63.660	63.800	0.140
5	38.810	40.360	1.550	14	65.430	67.380	1.950
6	40.660	41.000	0.340	15	67.390	67.660	0.270
7	41.000	42.210	1.210	16	68.000	71.500	3.500
8	42.720	46.270	3.550	17	71.820	72.540	0.720
9	46.610	52.210	5.600	18	73.170	74.380	1.210

Table 4.9: Details of Avenue Plantation SH-41

SI. NO.	Chainage		Single Row	
1	from	to	LHS	RHS
2	34.460	34.560	0.100	0.100
3	34.600	35.000		0.400
4	35.600	36.090		0.490
5	35.580	36.100	0.520	
6	36.150	36.600	0.450	
7	41.150	41.420	0.270	0.270
8	42.880	43.400	0.520	
9	43.180	43.400		0.220
10	60.400	60.650	0.250	
11	63.700	65.430	1.730	
12	68.950	70.100	1.150	
13	69.500	70.550		1.050
14	72.000	72.200	0.200	0.200
15	53.040	53.250	0.210	
16	53.040	53.200		0.160
17	54.900	55.400		0.500
Total length			8.790	

SI. NO.	Chainage		Double Row	
1	from	to	LHS	RHS
2	33.130	33.880	0.750	
3	40.740	41.000	0.260	
4	34.600	35.000	0.400	
5	35.200	35.600		0.400
6	36.100	36.150	0.050	
7	36.900	37.150	0.250	
8	36.800	37.300		0.500
9	41.420	41.900	0.480	
10	43.400	44.060	0.660	0.660
11	46.760	47.000	0.240	0.240
12	47.600	48.100	0.500	0.500
13	49.100	49.200		0.100
14	65.850	66.550	0.700	
15	59.330	59.650	0.320	0.320
16	59.650	60.400	0.750	0.750
17	60.100	62.650		2.550
18	60.650	61.400	0.750	
19	62.300	62.700	0.400	
20	70.370	70.950	0.580	
21	70.550	70.970		0.420
22	73.400	74.350	0.950	0.950
23	66.500	67.380	0.880	
24	53.250	53.750	0.500	
25	53.770	54.200		0.430
26	55.500	55.750	0.250	
Total length			17.490	

SI. NO.	chainage		Triple Row	
1	from	to	LHS	RHS
2	33.060	33.090	0.030	
3	37.100	38.000	0.900	
4	37.300	37.950		0.650
5	41.420	41.670		0.250
6	44.060	45.465	1.405	
7	44.060	45.600		1.540
8	47.000	47.600	0.600	0.600
9	48.400	50.800	2.400	
10	48.440	49.000		0.560
11	50.150	50.800		0.650
12	53.750	54.200	0.450	
13	54.900	55.500	0.600	
14	56.900	57.730	0.830	0.830
Total length			12.295	

4.2.9 DRAIN

RCC Covered Drains & unlined Drains are provided along the slip road/service road. Covered drains are provided in the built–up stretches towards the outer side of the service road. The details of drains are mentioned in **Table 4.10**. Representative photographs of some of the Drains are presented in **Figures** below.

Fig.4.79: Drain at Ch 29+100 LHS

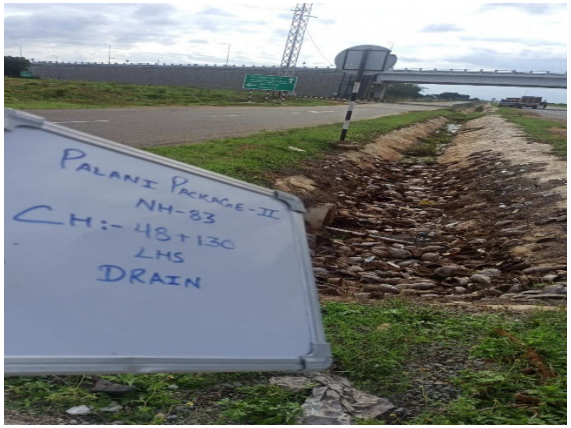

Fig.4.80: Drain at Ch 48+130 LHS

Fig.4.81: Drain at Ch 48+140 RHS

Fig.4.82: Drain at Ch 48+200 LHS

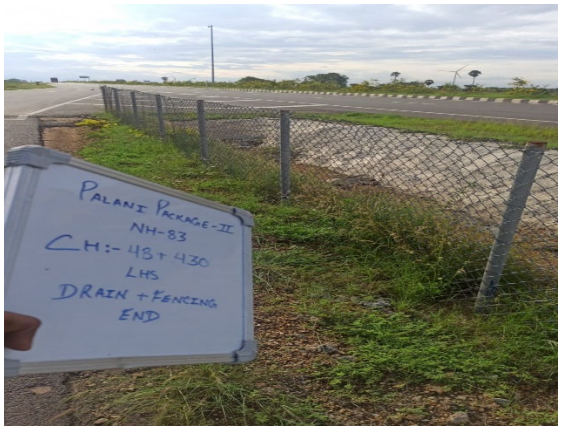

Fig.4.83: Drain at Ch 48+430 LHS

Fig.4.84: Median Drain at Ch 66+180

Table 4.10: Details of the Drain along the Project Road

Chainage		Catch water drain on RE Wall		Open and lined drain on MCW		Open and lined drain on SR		Median drain	Open Drain (Stone Masonry)	Closed RCC drain		Total length
Start	End	LHS	RHS	LHS	RHS	LHS	RHS		RHS	LHS	SR RHS	
29.000	30.000	0.330	0.330				0.28					0.940
30.000	31.000	0.160	0.160									0.320
38.000	39.000	0.870	0.870									1.740
42.000	43.000	0.510	0.510									1.020
46.000	47.000	0.340	0.340									0.680
48.000	49.000			0.3	0.29							0.590
52.000	53.000	0.540	0.540									1.080
55.000	56.000	0.100	0.100									0.200
56.000	57.000	0.390	0.390									0.780
57.000	58.000	0.100	0.100									0.200
58.000	59.000	1.000	1.000									2.000
59.000	60.000	0.120	0.120									0.240
62.000	63.000	0.195	0.195									0.390
63.000	64.000	0.66	0.66							0.2	0.78	2.300
64.000	65.000									1	1	2.000
65.000	66.000									0.43	0.43	0.860
66.000	67.000							0.58				0.580
67.000	68.000	0.34	0.34			0.12	0.21				0.09	1.100
68.000	69.000	0.42	0.42					0.36				1.200
71.000	72.000		0						0.3			0.300
72.000	73.000	0.45	0.45									0.900
73.000	74.000	0.17	0.17									0.340

4.2.10 SLOPE PROTECTION

The details of Slope Protection are mentioned in **Table 4.11**. Representative photographs of some of the Slope Protection are presented in **Figures** below.

Fig.4.85: Slope Protection at Ch 29+560 LHS

Fig.4.86: Slope Protection at Ch 29+620 LHS

Fig.4.87: Slope Protection at Ch 42+750 LHS

Fig.4.88: Slope Protection at Ch 42+720 RHS

Fig.4.89: Slope Protection at Ch 61+300 RHS

Fig.4.90: Slope Protection at Ch 67+300 LHS

Table 4.11: Details of Slope Protection

Chainage		Stone Pitching/ Turfing/Vetiver grass length in km		Retaining /Toe wall Length in km		Retaining /RE wall Length in km	
Start	End	LHS	RHS	LHS	RHS	LHS	RHS
29.000	30.000	0.44	0.67	0.06	0.06	0.33	0.33
30.000	31.000	0.25	0.25			0.18	0.185
34.000	35.000	0.09	0.13				
38.000	39.000	0.69	0.69			0.87	0.87
42.000	43.000	0.57	0.57				
45.000	46.000	0.43	0.43				
52.000	53.000	0.83	0.83				
53.000	54.000	1	1				
54.000	55.000	1	1				
55.000	56.000	1.59	1.59				
56.000	57.000	1	1				
57.000	58.000	1	1				
58.000	59.000	1	1				
59.000	60.000	1	1				0.33
60.000	61.000	1	1				
61.000	62.000	1	1				
62.000	63.000	1.24	1.24				
63.000	64.000	1.7	1.7				
64.000	65.000	1	1		0.84		
65.000	66.000	1	1				
66.000	67.000					0.28	0.39
67.000	68.000	1.7	1.72				
68.000	69.000	1	1	0.14	0.14		
69.000	70.000	1	1	0.28	0.28		
70.000	71.000	1	1	0.1	0.03		
71.000	72.000	1	1	0.25	0.25		
72.000	73.000	0.75	0.75				

4.2.11 SIGN BOARDS

The details in respect of the sign boards installed on the project road are furnished in Table 4.12 & Table 4.13 below. Representative photographs of some of the Sign Boards are presented in **Figures** below.

Fig.4.91: Sign Board at Ch 29+100 LHS

Fig.4.92: Sign Board at Ch 35+850 LHS

Fig.4.93: Sign Board at Ch 49+840 Median

Fig.4.94: Sign Board at Ch 52+800 LHS

Fig.4.95: Sign Board at Ch 53+400 LHS

Fig.4.96: Sign Board at Ch 57+000

Fig.4.97: Sign Board at Ch 57+500

Fig.4.98: Sign Board at Ch 68+900 LHS

Fig.4.99: Sign Board at Ch 71+700 RHS

Fig.4.100.: Sign Board at Ch 73+840 LHS

Fig.4.101: Sign Board at Ch 74+100 Median

Fig.4.102: Sign Board at Ch 74+380 LHS

Table 4.12: Details of Sign Boards

S.No	Chainage from	Chainage To	LHS	RHS	Condition	Warning	Informatory	Mandatory	Remark
1	29+080	30+000	16	13	Good	15	6	6	4 Sign Board in Median (Informatory)
2	30+000	30+500	0	0		0	0	0	
3	30+500	31+000	15	11	Good	7	16	3	
4	31+000	31+500	2	4	Good	2	4	0	
5	31+500	32+000	9	8	Good	8	5	4	
6	32+000	32+500	3	5	Good	1	5	2	
7	32+500	33+500	9	10	Good	6	11	2	
8	33+500	34+700	15	11	Good	8	15	3	
9	34+700	35+000	1	2	Good	1	2	0	
10	35+000	37+000	10	9	Good	0	19	0	
11	37+000	38+000	9	4	Good	0	11	2	
12	38+000	39+000	13	13	Good	9	13	4	
13	39+000	40+000	9	5	Good	3	10	1	
14	40+000	41+000	21	21	Good	6	35	1	
15	41+000	41+800	6	5	Good	1	9	1	
16	41+800	43+000	18	20	Good	12	20	6	
17	43+000	44+000	11	10	Good	0	20	1	
18	44+000	45+000	2	3	Good	0	5	0	
19	45+000	46+000	7	5	Good	0	12	0	
20	46+000	47+000	24	22	Good	16	22	8	
21	47+000	48+000	7	5	Good	0	12	0	
22	48+000	49+000	10	13	Good	9	10	4	
23	49+000	50+000	12	9	Good	6	13	2	
24	50+000	51+000	3	14	Good	4	13	0	
25	51+000	52+000	5	4	Good	0	9	0	
26	52+000	53+000	18	22	Good	12	21	7	
27	53+000	54+000	6	7	Good	2	11	0	

S.No	Chainage from	Chainage To	LHS	RHS	Condition	Warning	Informatory	Mandatory	Remark
28	54+000	55+000	11	11	Good	2	16	4	
29	55+000	57+000	28	32	Good	11	42	7	
30	57+000	59+450	40	36	Good	15	45	16	
31	59+450	62+000	14	13	Good	0	26	1	
32	62+000	65+000	38	25	Good	18	40	5	
33	65+000	66+000	8	7	Good	2	9	4	
34	66+000	67+000	7	12	Good	5	13	1	
35	67+000	69+000	25	15	Good	12	21	7	
36	69+000	72+000	13	15	Good	0	28	0	
37	72+000	73+700	20	24	Good	15	19	10	
38	73+700	74+500	25	15	Good	13	23	4	

Table 4.13: No. of Sign Boards

SIGN BOARD	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	37-38	38-39	39-40	40-41	41-42	42-43	43-44	44-45	45-46	46-47
INFORMATORY/VILLAGE SIGN BOARD	5	5	7	6	2	1	1		6	2	3		2	4	2		3	4
OVERHEAD GANTRY	1	1										1			1			
PETROL PUMP STATION		1									1			1	1	1		
OHM	4	8	8	4	6	4	4	6	1	8	4	21	8	10	12	4	8	12
SLIP/SERVICE ROAD START/END	2	2	1	2	2	2			1	2	1			2	1		1	3
NO ENTRY		4								2				2				2
STOP		2	1	1	1	2												4
SPEED LIMIT	5	1				2			1	4	1		1	4	1			4
T/Y/+/STARREGED JUNCTION	1	2	2	2	2	3												4
BUS STOP	1		1	1		2				2				2				1
GIVE WAY	1			1		1				2				2				2
TRUCK LAY BYE							4	4										

SIGN BOARD	29-30	30-31	31-32	32-33	33-34	34-35	35-36	36-37	37-38	38-39	39-40	40-41	41-42	42-43	43-44	44-45	45-46	46-47
NH 83	2				2	2			1		1				1			
1033 HELP	2					2			2		1		1		1			
CANTILEVER GANTRY GIRDER									1		1		1					
TOLL PLAZA AHEAD											1	1	1					
TOLL SIGN BOARD												15						
FUEL STATION															1			
REST STATION AREA												1						
CHEVRON																		
4M. HIGHT			2															2
SPEED BREAKER	1		1	1	1	1												2
KEEP EIGHTER SIDE										2				2				2
LINE MERGING												2		2				
PEDESTRAIN CROSSING	2									2				2				2
DO NOT CROSS														2				2
MEDIAN OPENING																		
STACK SIGN BOARD	2																	

SIGN BOARD	47-48	48-49	49-50	50-51	51-52	52-53	53-54	54-55	55-56	56-57	57-58	58-59	59-60	60-61	61-62	62-63	63-64	64-65
INFORMATORY/VILLAGE SIGN BOARD	2	6	1	2	2	3	2		3	3	2	8	2			1	2	2
OVERHEAD GANTRY	1				1				1	2						1	1	
PETROL PUMP STATION	1			1	1	1											1	
OHM	4	4	6	8	4	12	8	12	8	18	4	8	10	8	8	10	10	6
SLIP/SERVICE ROAD START/END	1	3			1	2	2		2	2	2		2			2		
NO ENTRY		2				2			1	1	1		1			1		
STOP		1	2	1		2									3		2	1

SIGN BOARD	47-48	48-49	49-50	50-51	51-52	52-53	53-54	54-55	55-56	56-57	57-58	58-59	59-60	60-61	61-62	62-63	63-64	64-65
SPEED LIMIT		2	2			4		2	1	4	2	4	2			2	2	
T/Y/+/STARREGED JUNCTION			2	2		1									3		4	2
BUS STOP	2			1		2			1	1		2			2		1	1
GIVE WAY		2				2				2		4					2	
TRUCK LAY BYE																		
NH 83			2					2			1		1			1		
1033 HELP			2					2			1			1	1			
CANTILEVER GANTRY GIRDER	1	1					1											
TOLL PLAZA AHEAD																		
TOLL SIGN BOARD																		
FUEL STATION																		
REST STATION AREA				1														
CHEVRON																		
4M. HIGHT								2				4		2	2			
SPEED BREAKER				1				2				2		2	2		2	1
KEEP EIGHTER SIDE			2			2			1	1	1		1			1		
LINE MERGING		2	2			2			1	2	1							
PEDESTRAIN CROSSING						3			1	2		3					2	2
DO NOT CROSS						2				2								
MEDIAN OPENING																		
GO SLOW																		

SIGN BOARD	65-66	66-67	67-68	68-69	69-70	70-71	71-72	72-73	73-74	74-75
INFORMATORY/VILLAGE SIGN BOARD	1	5	3	1				3	4	3
OVERHEAD GANTRY	1	1		1						
PETROL PUMP STATION										
OHM	5	5	2	4	8	8	4	8	6	6
SLIP/SERVICE ROAD START/END	2		2	2				3	2	
NO ENTRY	1		1	1				1	1	

SIGN BOARD	65-66	66-67	67-68	68-69	69-70	70-71	71-72	72-73	73-74	74-75
STOP		1	2						2	4
SPEED LIMIT	1		4	2				3	3	
T/Y/+/STARREGED JUNCTION		2	3						4	4
BUS STOP						3		1		1
GIVE WAY	1	1	2						1	1
TRUCK LAY BYE										
NH 83		1	1	1					1	
1033 HELP	1	1	1	1			1		1	
CANTILEVER GANTRY GIRDER								1		1
TOLL PLAZA AHEAD										
TOLL SIGN BOARD										
FUEL STATION										
REST STATION AREA										
CHEVRON										
4M. HIGHT										
SPEED BREAKER		1	2		2		2			1
KEEP EIGHTER SIDE	1		2	1				1	2	2
LINE MERGING	1			1				2	1	1
PEDESTRAIN CROSSING								1	2	
DO NOT CROSS		1						1	2	
MEDIAN OPENING									1	1
GO SLOW									1	

4.2.12 SAFETY BARRIERS

The details of Safety Barrier which includes the Metal Beam Crash Barriers (MBCB), RCC Crash Barriers/New Jersey Crash Barrier (NJCB)/Pedestrian guard rails (PGR)are furnished in **Table 4.14** below. Representative photographs of some of the Safety Barrier are presented in **Figures** below.

Fig.4.103: MBCB at Ch 29+425 RHS

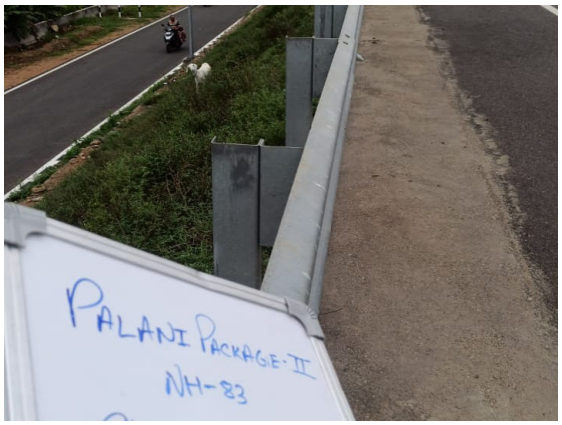

Fig.4.104: MBCB at Ch 31+800 LHS

Fig.4.105: MBCB at Ch 38+870

Fig.4.106: MBCB at Ch 46+100 LHS

Fig.4.107: NJCB at Ch 65+000

Fig.4.108: PGR at Ch 65+000

Fig.4.109: MBCB at Ch 67+660 RHS

Fig.4.110: MBCB at Ch 67+800 RHS

Fig.4.111.: MBCB at Ch 68+000 RHS

Table 4.14: Details of Safety Barriers

S. no	Chainage		MBCB		NJCB	PGR	
	From	To	LHS(m)	RHS(m)	Median(m)	LHS (m)	RHS (m)
1	29	30	0.575	0.575			
2	30	31	0.960	0.960			
5	33	34		0.420			
6	34	35	0.430	0.320			
8	36	37	0.760	0.710			
10	38	39	0.140	0.070			
12	40	41	0.260	0.260			
13	41	42	0.270	0.340			
14	42	43	0.870	0.870			
15	43	44	0.460	0.460			
16	44	45	0.060	0.060			
18	46	47	0.665	0.800			
19	47	48	0.170	0.170			
21	49	50		0.170			
22	50	51	0.130				

S. no	Chainage		MBCB		NJCB	PGR	
	From	To	LHS(m)	RHS(m)	Median(m)	LHS (m)	RHS (m)
23	51	52	0.135	0.135			
24	52	53	0.930	0.930			
25	53	54	0.720	0.580			
26	54	55	0.630	0.590			
27	55	56	0.200	0.050			
28	56	57	0.670	0.720			
29	57	58	0.260	0.470			
30	58	59	1.000	1.280			
31	59	60	0.635	0.685			
32	60	61	0.990	0.990			
33	61	62	1.000	1.000			
34	62	63	0.520	0.520			
35	63	64	0.780	0.780	0.200	0.2	0.2
38	66	67	0.280	0.380	1.000	1	1
39	67	68	0.770	0.770	0.430	0.43	0.43
40	68	69	1.080	1.450			
41	69	70	1.000	1.000			
42	70	71	0.650	0.580			
43	71	72	0.690	0.691			
44	72	73	1.230	1.230			
45	73	74	0.890	0.890			
46	74	75	0.360	0.350			

4.2.13 LIGHTING

Details of Lighting provided on the Project Road are furnished in **Table 4.15** below. Representative photos of same are shown in **Figures** below.

Fig.4.112: Lighting at Ch 40+295 LHS

Fig.4.113: Lighting at Ch 42+720 RHS

Fig.4.114: Lighting at Ch 47+500 LHS

Fig.4.115: Lighting at Ch 48+850 RHS

Fig.4.116: Lighting at Ch 67+800 LHS

Fig.4.117: Lighting at Ch 68+000 RHS

Table 4.15 Details of Lighting

Chainage		Pole Type	Number of Poles			No. of fittings	Remark
From	To		LHS	Median	RHS		
29+450	30+350	Single	27		27	54	SR
29+450	30+350	Double		27		54	MCW
31+000	32+500	Single	32		31	63	SR
31+000	32+500	Double		20		40	MCW
31+000	32+500	Double	8		7	30	MCW Edge
34+100	34+600	Single	6		6	12	SR
34+100	34+600	Double		2		4	MCW
34+100	34+600	Single	7		7	14	Bus Shelter
35+630	35+970	Single	11		11	22	Truck Lay Bye
36+500	36+850	Double		22		44	MCW
38+110	38+950	Single	28		28	56	SR
38+110	38+950	Double		28		56	MCW
40+000	41+000	Single	4		4	8	Toll Plaza
40+500		High Mast	1		1	24	Toll Plaza
40+000	41+000	Double		22		44	Toll Plaza
42+120	42+480	Single	24		24	48	SR
42+120	42+480	Double		24		48	MCW
46+130	46+790	Single	22		22	44	SR
46+130	46+790	Double		22		44	MCW
47+000	48+000	Single	7			7	Bus Shelter
48+225		Double			31	62	VOP
48+225		Single	32			32	VOP
48+890	49+110	Single			7	7	Bus Shelter
50+100		High Mast	3			54	Rest Area
50+440	50+660	Single	7			7	Bus Shelter
50+740	50+960	Single			7	7	Bus Shelter
52+090	52+870	Single	26		26	52	SR

Chainage		Pole Type	Number of Poles			No. of fittings	Remark
From	To		LHS	Median	RHS		
52+090	52+870	Double		26		52	MCW
54+040	54+260	Single	6			6	Bus Shelter
54+000	55+000	Double		20		40	MCW
54+890	55+110	Single			7	7	Bus Shelter
55+000	56+800	Single	32		32	64	SR
55+000	56+800	Double		28		56	MCW
57+920	59+360	Single	48		48	96	SR
57+920	59+360	Double		48		96	MCW
60+220	62+860	Double		44		88	MCW
63+000	65+600	Single	24		24	48	SR
63+000	65+600	Double	56		56	224	MCW Edge
63+000	65+600	Double		81		162	MCW
65+600	67+200	Single			57	57	Footpath
67+270	68+470	Single	40		40	80	SR
67+270	68+470	Double		40		80	MCW
69+140	69+640	Single	7		7	14	Bus Shelter
69+140	69+640	Double		17		34	MCW
71+000	71+200	Single	7		7	14	Bus Shelter
71+400	71+800	Single	10		10	20	Major Bridge
72+580	73+420	Single	28		28	56	SR
72+580	73+420	Double		27		54	MCW
73+600		Single	7			7	Bus Shelter
74+000		Single	10		6	16	Junction

4.2.14 ROAD MARKING

The condition of the Road Marking in general was Good at most of the locations. Representative Photos of the Longitudinal, Horizontal, Arrow Marking are shown in the representative photographs and details are mentioned in Table 4.16 below.

Fig.4.118: Road Marking at Ch 34+350 RHS

Fig.4.119: Road Marking at Ch 34+700 LHS

Fig.4.120: Road Marking at Ch 53+200 RHS

Fig.4.121: Road Marking at Ch 63+320 RHS

Fig.4.122: Road Marking at Ch 65+800 RHS

Fig.4.123: Road Marking at Ch 67+350 RHS

Fig.4.124: Road Marking at Ch 72+800 RHS

Fig.4.125: Road Marking at Ch 73+004 RHS

Fig.4.126: Road Marking at Ch 74+360 RHS

Table 4.16: Details of Road Markings

SI. No.	Chainage		Condition	
	From	To	LHS	RHS
1	29.000	30.000	Good	Good
2	30.000	31.000	Good	Good
3	31.000	32.000	Good	Good
4	32.000	33.000	Good	Good
5	33.000	34.000	Good	Good
6	34.000	35.000	Good	Good
7	35.000	36.000	Good	Good
8	36.000	37.000	Good	Good
10	37.000	38.000	Good	Good
11	38.000	39.000	Good	Good
12	39.000	40.000	Good	Good
13	40.000	41.000	Good	Good
14	41.000	42.000	Good	Good
15	42.000	43.000	Good	Good
16	43.000	44.000	Good	Good
17	44.000	45.000	Good	Good

SI. No.	Chainage		Condition	
	From	To	LHS	RHS
18	45.000	46.000	Good	Good
19	46.000	47.000	Good	Good
20	47.000	48.000	Good	Good
21	48.000	49.000	Good	Good
22	49.000	50.000	Good	Good
23	50.000	51.000	Good	Good
24	51.000	52.000	Good	Good
25	52.000	53.000	Good	Good
26	53.000	54.000	Good	Good
27	54.000	55.000	Good	Good
28	55.000	56.000	Good	Good
29	56.000	57.000	Good	Good
30	57.000	58.000	Good	Good
31	58.000	59.000	Good	Good
32	59.000	60.000	Good	Good
33	60.000	61.000	Good	Good
34	61.000	62.000	Good	Good
35	62.000	63.000	Good	Good
36	63.000	64.000	Good	Good
37	64.000	65.000	Good	Good
38	65.000	66.000	Good	Good
39	66.000	67.000	Good	Good
40	67.000	68.000	Good	Good
41	68.000	69.000	Good	Good
42	69.000	70.000	Good	Good
43	70.000	71.000	Good	Good
44	71.000	72.000	Good	Good
45	72.000	73.000	Good	Good
46	73.000	74.000	Good	Good
47	74.000	74.380	Good	Good

4.2.15 KM STONES

Kilometre stones are generally seen to be available on the project road and are seen to be in good condition. Representative photographs and details are mentioned in Table 4.17 below

Fig.4.127: KM stone at Ch 29+870 Median

Fig.4.128: KM stone at Ch 38+870 Median

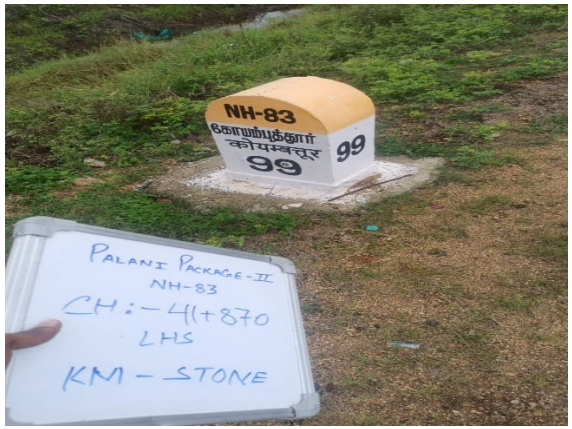

Fig.4.129: KM stone at Ch 41+870 LHS

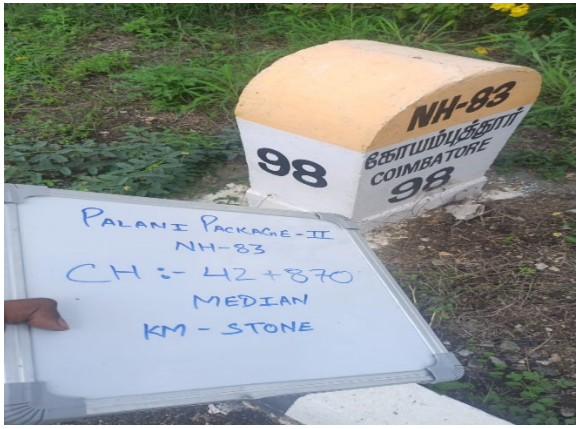

Fig.4.130: KM stone at Ch 42+870 Median

Fig.4.131: KM stone at Ch 53+870 LHS

Fig.4.132: KM stone at Ch 55+000 Median

Fig.4.133: KM stone at Ch 64+870 LHS

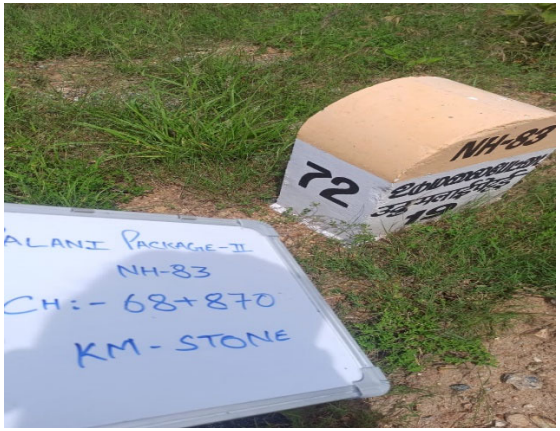

Fig.4.134: KM stone at Ch 68+870

Fig.4.135: KM stone at Ch. 73+870

Table 4.17: Details of Km Stone/Hectometre Stone

Sl. No.	Particulars	Provided Numbers		Missing Numbers		Condition	
		LHS	RHS	LHS	RHS	LHS	RHS
1	Kilometer Stone	36	36	-	-	Good	Good
2	5th Kilometer Stone	9	9	-	-	Good	Good
3	Hectometer Stone	173	173	9	9	Good	Good

4.2.16 BOUNDARY WALL

Boundary wall is provided all along the project length accept at the structure location and Built-up locations. At some locations the boundary wall is discontinued in short length of about 5-10m for giving access to the farmers into there fields and are seen to be in good condition. Representative photographs and details are mentioned in Table 4.18 below

Table 4.18: Details Of Boundary Wall

Sl. No.	Chainage		Length	Sl. No.	Chainage		Length
	from	to			from	to	
1	29.000	30.000	0.859	25	53.000	54.000	1.846
2	30.000	31.000	1.772	26	54.000	55.000	1.6
3	31.000	32.000	1.866	27	55.000	56.000	1.7
4	32.000	33.000	1.9	28	56.000	57.000	0.587
5	33.000	34.000	1.9	29	57.000	58.000	1.9
6	34.000	35.000	1.872	30	58.000	59.000	1.837
7	35.000	36.000	1.9	31	59.000	60.000	1.85
8	36.000	37.000	1.888	32	60.000	61.000	1.87
9	37.000	38.000	1.9	33	61.000	62.000	1.834
10	38.000	39.000	1.799	34	62.000	63.000	1.874
11	39.000	40.000	1.9	35	63.000	64.000	1.798
12	40.000	41.000	1.4	36	64.000	65.000	0.982
13	41.000	42.000	1.79	37	65.000	66.000	1
14	42.000	43.000	1.833	38	66.000	67.000	0.918
15	43.000	44.000	1.72	39	67.000	68.000	0.891
16	44.000	45.000	1.9	40	68.000	69.000	1
17	45.000	46.000	1.86	41	69.000	70.000	1.856
18	46.000	47.000	1.816	42	70.000	71.000	1.858
19	47.000	48.000	1.9	43	71.000	72.000	1.236
20	48.000	49.000	1.9	44	72.000	73.000	1.9
21	49.000	50.000	1.851	45	73.000	74.000	1.769
22	50.000	51.000	1.81	46	74.000	75.000	1.815
23	51.000	52.000	1.894				
24	52.000	53.000	1.834				

4.2.17 ATMS EQUIPMENT

The ATMS equipment's were found to be in working condition. Representative photographs of ATMS Equipment and details are mentioned in Table 4.19 below.

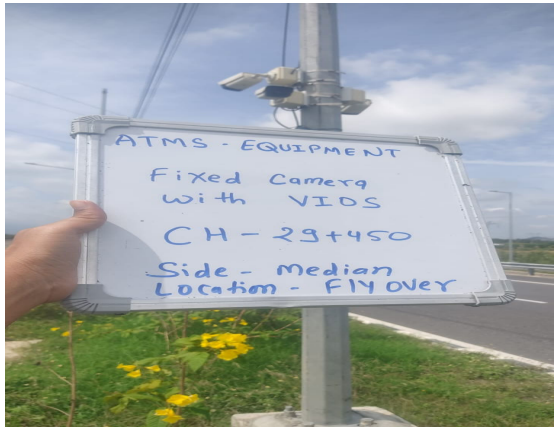

Fig.4.136: Fixed Camera with VIDS at Ch. 29+450 Median

Fig.4.137: PTZ Camera at Ch. 45+500 Median

Fig.4.138: VIDS at Ch. 50+100 Median

Fig.4.139: VSDS at Ch. 55+300 RHS

Fig.4.140: PTZ Camera Ch. 61+500 Median

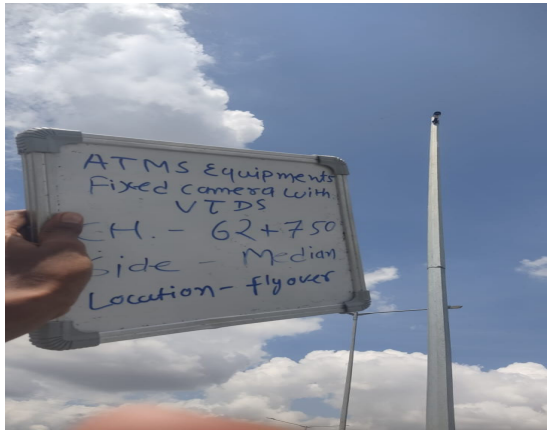

Fig.4.141: VIDS at Ch. 62+750 Median

Fig.4.142: ECB at Ch. 63+820 LHS

Fig.4.143: Fixed Camera with VIDS at 65+440 Median

Fig.4.144: ECB at Ch. 67+000 LHS

Fig.4.145: PTZ Camera at Ch. 69+500 Median

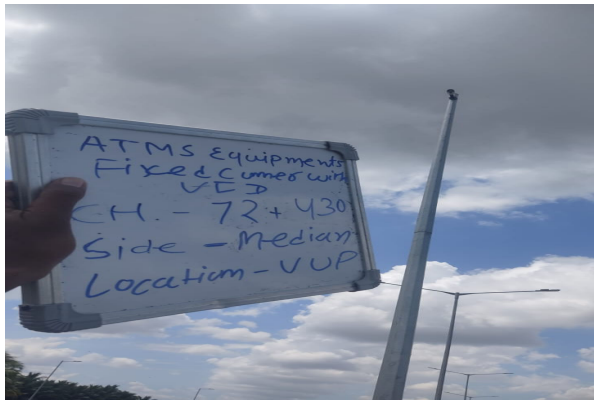

Fig.4.146: Fixed Camera with VIDS 72+430 Median

Fig.4.147: PTZ Camera at Ch. 74+080 Median

Table. 4.19: Details of ATMS Equipments

SI. No.	Equipment	Chainage	Side	Location
1	Fixed Camera with VIDS	29+450	Median	Flyover
2	Fixed Camera with VIDS	30+300	Median	Flyover
3	ECB	30+580	LHS	
4	PTZ Camera	31+500	Median	
5	ECB	31+500	RHS	
6	PTZ Camera	32+500	Median	
7	ECB	33+500	LHS	
8	PTZ Camera	33+500	Median	
9	VMS	33+700	LHS	
10	PTZ Camera	34+500	Median	
11	ECB	35+500	RHS	
12	VIDS	35+800		Truck Lay Bye
13	PTZ Camera	36+500	Median	
14	ECB	37+500	LHS	
15	VSDS	37+800	LHS	
16	Fixed Camera with VIDS	38+100	Median	VUP
17	Fixed Camera with VIDS	38+870	Median	VUP
18	ECB	39+100	RHS	
19	PTZ Camera	39+500	Median	
20	TTES	40+020	LHS	
21	TTES	40+020	RHS	
22	ATCC	40+500	BHS	
23	Portable WIM	40+500		
24	MET	40+500	LHS	
25	Portable VMS	40+500		
26	Control Room (Command Centre)	40+500		Toll Plaza
27	TTES	40+935	LHS	
28	TTES	40+935	RHS	
29	PTZ Camera	41+500	Median	
30	ECB	41+500	LHS	

SI. No.	Equipment	Chainage	Side	Location
31	Fixed Camera with VIDS	42+150	Median	VUP
32	Fixed Camera with VIDS	42+830	Median	VUP
33	ECB	43+100	RHS	
34	PTZ Camera	44+600	Median	
35	ECB	45+230	LHS	
36	PTZ Camera	45+500	Median	
37	PTZ Camera	46+500	Median	
38	ECB	47+300	RHS	
39	PTZ Camera	47+500	Median	
40	PTZ Camera	48+500	Median	
41	PTZ Camera	49+800	Median	
42	VIDS	50+100	Median	Rest Area
43	ECB	51+300	LHS	
44	Fixed Camera with VIDS	52+150	Median	Flyover
45	MRCS	52+500		
46	Fixed Camera with VIDS	52+950	Median	Flyover
47	PTZ Camera	53+500	Median	No Camera
48	ECB	53+800	RHS	
49	PTZ Camera	54+500	Median	
50	VSDS	55+300	RHS	
51	ECB	55+100	LHS	
52	Fixed Camera with VIDS	55+800	Median	Flyover
53	Fixed Camera with VIDS	56+420	Median	Flyover
54	VMS	57+500	RHS	
55	PTZ Camera	57+500	Median	
56	ECB	57+500	RHS	
57	PTZ Camera	58+500	Median	
58	ECB	59+400	LHS	
59	PTZ Camera	59+500	Median	
60	PTZ Camera	60+500	Median	
61	ECB	60+950	RHS	

SI. No.	Equipment	Chainage	Side	Location
62	PTZ Camera	61+500	Median	
63	VMS	62+450	LHS	
64	Fixed Camera with VIDS	62+750	Median	Flyover
65	PTZ Camera	63+390	Median	
66	ECB	63+820	LHS	
67	PTZ Camera	64+900	Median	
68	Fixed Camera with VIDS	65+440	Median	Flyover
69	ECB	65+800	RHS	
70	PTZ Camera	66+500	Median	
71	Fixed Camera with VIDS	67+300	Median	Flyover
72	ECB	67+000	LHS	
73	Fixed Camera with VIDS	68+450	Median	Flyover
74	PTZ Camera	69+500	Median	
75	PTZ Camera	70+500	Median	
76	ECB	70+550	RHS	
77	VMS	70+700	RHS	
78	PTZ Camera	71+500	Median	
79	ECB	72+150	LHS	
80	Fixed Camera with VIDS	72+430	Median	VUP
81	Fixed Camera with VIDS	73+350	Median	VUP
82	ECB	73+800	RHS	
83	PTZ Camera	74+080	Median	

4.2.18 REST AREA

The Rest area is built as per the approved drawings and consists of a restaurant, dormitory, toilet block, truckers dhaba with Toilet block, Trauma center and Fuel station. Hight mast lightings are provided at this location for illumination of the area. Representative photographs of Rest Area are in Figure below.

Fig.4.148: Rest Area at Ch. 50+000 RHS

Fig.4.149: Rest Area

Fig.4.150: Rest Area Building

Fig.4.151: Fuel Station near Rest Area

Fig.4.152: Rest Area

Fig.4.153: Rest Area

4.3 OVERVIEW OF STRUCTURES

Detailed inventory of structures has been carried out. It is found that most of the structures are in fair condition with requirement pertaining mainly to routine maintenance and cleaning. The Inventory & Condition Survey details of the structures are as follows:

4.3.1 MAJOR BRIDGES

There are 2 numbers of Major Bridges on the Project Road. Details for the Major Bridges are furnished in Table 4.20 below. Representative photographs of the Major bridges are shown in Figures below. The Major Bridges are found to be in fair condition. Some of the site observations made in respect of some of structures are summarised in table 4.21 below.

Table 4.20: Details of Major Bridges

Design Chainage	Span Arrangement	Carriageway Width	Foundation	Sub Structure	Super Structure
56+730	5x30.00	2 X 12.50	Open	Wall Type Abt. & Rectangular Pier	PCS I-Girder
71+660	10x30.00	2 X 12.50	Open	Wall Type Abt. & Circular Type Pier	PCS I-Girder

Fig.4.154: MJB at Ch. 56+730 LHS

Fig.4.155: MJB at Ch. 56+730 RHS

Fig.4.156: MJB at Ch. 56+730 RHS

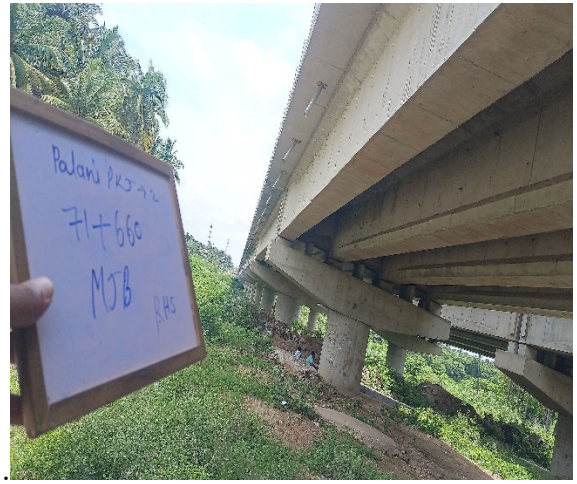

Fig.4.157: MJB at Ch. 71+660 LHS

Fig.4.158: MJB at Ch. 71+660 RHS

Fig.4.159: MJB at Ch. 71+660 LHS

Fig.4.160: MJB at Ch. 71+660 LHS

Fig.4.161: MJB at Ch. 56+730 LHS

Fig.4.162: MJB at Ch. 71+660 RHS

Table 4.21: Condition Assessment of the Major Bridges

Design Chainage	Span Arrangement	Observation		Recommendations	
		LHS	RHS	LHS	RHS
56+730	5x30.00	The A2 side toe wall is damaged.	Fair	The A2 side toe wall needs to be repaired	
71+660	10x30.00	i) Dirt is seen on the expansion joints. ii) Construction debries is seen under the structure and vegetation overgrowth is seen under side of the structure.		i) The expansion joints needs to be cleaned. ii) Cleaning of waterway needs to be carried out.	

4.3.2 FLYOVER

There are 5 nos. of Flyover on the project road and are found to be in good condition. The details of the structures are mentioned in Table 4.22 & observations on the condition of the structure is mentioned in Table 4.23. Representative photographs of Flyovers are given in figure below.

Fig.4.163: Flyover at Ch 29+900 LHS

Fig.4.164: Flyover at Ch 29+900 RHS

Fig.4.165: Flyover at Ch 29+900 RHS

Fig.4.166: Flyover at Ch 67+870 LHS

Fig.4.167: Flyover at Ch 67+870 RHS

Fig.4.168: Flyover at Ch 67+870 RHS

Table 4.22: Details of Flyover

Design Chainage	Span Arrangement	Carriageway Width	Skew	Foundation	Sub Structure	Super Structure
29+900	1x25.00	2 X 11		Open	Circuler Type Pier	PSC I-Girder
52+480	1x25.00	2 X 11		Open	Circuler Type Pier	PSC I-Girder
56+150	1x30.00	2 X 11	25°	Open	Circuler Type Pier	PSC I-Girder
63+290	1x25.00	2 X 11		Open	Circuler Type Pier	PSC I-Girder
67+870	1x25.00	2 X 11		Open	Circuler Type Pier	PSC I-Girder

Table 4.23: Condition Assessment of the Flyover

Design Chainage	Span Arrangement	Observation		Recommendations	
		LHS	RHS	LHS	RHS
29+900	1x25.00	Fair	Fair		
52+480	1x25.00	Fair	Fair		
56+150	1x30.00	Fair	Fair		
63+290	1x25.00	Dirt is seen on the expansion joint.		Cleaning will need to be done on the expansion joint.	
67+870	1x25.00	Fair	Fair		

4.3.3 UNDERPASSES

There are 14 nos. of Underpasses which includes the Light Vehicular Underpasses (LVUP) , Vehicular Underpasses (VUP) and Small Vehicular Underpasses (SVUP) on the project road and are found to be in good condition. The details of the structures are mentioned in Table 4.24 and observations on the condition of the same are mentioned in Table 4.25 below.

Table 4.24: Details of VUP/ SVUP/ LVUP

Design Chainage	Type of Structure	Span Arrangement	Carriageway Width	Skew	Foundation	Sub Structure	Super Structure
31 +925	SVUP	1x12.00	2 X 11		Open	Wall Type	Post Tensioned Plank
34+210	SVUP	1x7.00	2 X 11		Box Raft	Box Side Wall	Box Top Slab
36+580	SVUP	1x9.00	2 X 11	37^0	Box Raft	Box Side Wall	Post Tensioned Plank
38+530	VUP	1x15.00	2 X 11		Open	Circuler Type Pier	RCC T-Girder
42+485	VUP	1x15.00	2 X 11		Open	Circuler Type Pier	PCS I-Girder
46+462	LVUP	1x12.00	2 X 11		Open	Side Wall	Box Top Slab
54+580	SVUP	1x7.00	2 X 11		Box Raft	Box	Post Tensioned Plank
58+167	LVUP	1x12.00	2 X 11	13^0	Open	Side Wall	Box Top Slab
58+810	SVUP	I x7.00	2 X 11		Box Raft	Box Side Wall	Post Tensioned Plank
60+635	SVUP	1x12.00	2 X 11	49^0	Open	Wall Type	Box Top Slab
61+540	SVUP	1x7.00	2 X 11		Box Raft	Box Side Wall	Box Top Slab
67+380	PUP	1X5X2.5	2X11			Box Type	
69+390	SVUP	1x7.00	2 X 11	10^0	Box Raft	Box Side Wall	Box Top Slab
71+425	LVUP	1x12.00	2 X 12.50		Open	Side Wall	Post Tensioned Plank
73+004	VUP	1x15.00	2 X 11		Open	Circuler Type Pier	PCS I-Girder

Fig.4.169: VUP at Ch 38+530 LHS

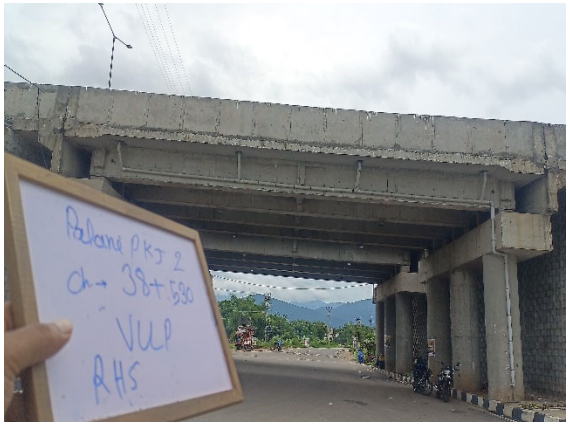

Fig.4.170: VUP at Ch. 38+530 RHS

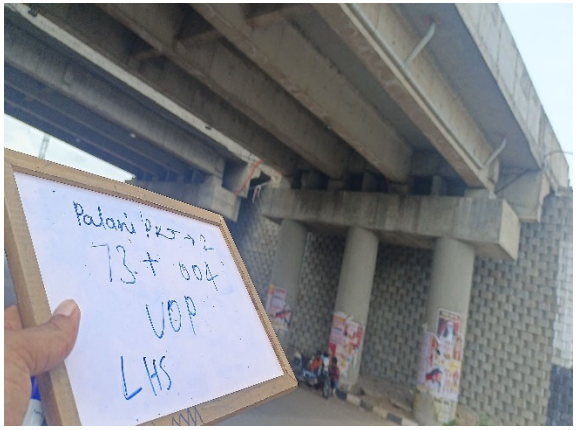

Fig.4.171: VUP at Ch. 73+004 LHS

Fig.4.172: VUP at Ch. 73+004 RHS

Fig.4.173: SVUP at Ch. 31+925 LHS

Fig.4.174: SVUP at Ch. 31+925 RHS

Fig.4.175: SVUP at Ch. 34+210 LHS

Fig.4.176: SVUP at Ch. 34+210 RHS

Fig.4.177: SVUP at Ch. 36+580 LHS

Fig.4.178: SVUP at Ch. 36+580 RHS

Fig.4.179: SVUP at Ch. 69+390 LHS

Fig.4.180: SVUP at Ch. 69+390 RHS

Table 4.25: Condition Assessment of VUP/ SVUP/ LVUP

Design Chainage	Type of Structure	Span Arrangement	Observation		Recommendations	
			LHS	RHS	LHS	RHS
31+925	SVUP	1x12.00	The toe wall is damaged.		The toe wall needs to be repaired	
34+210	SVUP	1x7.00	The toe wall is damaged.	Fair	The toe wall needs to be repaired	
36+580	SVUP	1x9.00	The toe wall is damaged.	Fair	The toe wall needs to be repaired.	
38+530	VUP	1x15.00	There is honeycombing in the dirt wall on A1 side.	Dirt is seen on the expansion joint.	The honeycombing on the dirt wall on A1 side needs to be repaired	Expansion joint needs to be cleaned
42+485	VUP	1x15.00	Dirt is seen on the expansion joint.		Expansion joint needs to be cleaned	
46+462	LVUP	1x12.00	Fair	Fair		
54+580	SVUP	1x7.00	Fair	Fair		
58+167	LVUP	1x12.00	Fair	Fair		
58+810	SVUP	I x7.00	Fair	Fair		
60+635	SVUP	1x12.00	Fair	Fair		
61+540	SVUP	1x7.00	Fair	Fair		
67+340	PUP	1X5X2.5	Fair	Fair		
69+390	SVUP	1x7.00	Fair	Fair		
71+425	LVUP	1x12.00	i. Painting is pending on the post-tensioned plank, and there are gaps in the joints. ii. The Toe wall on the A2 side is	Painting is pending on the post-tensioned plank, and there are gaps in the joints.	Toe wall on A2 side needs to be repaired	

Design Chainage	Type of Structure	Span Arrangement	Observation		Recommendations	
			LHS	RHS	LHS	RHS
			damaged.			
73+004	VUP	1x15.00	Dirt is seen on the expansion joint.		Expansion joint needs to be cleaned	

4.3.4 VEHICULAR OVERPASS

There are 1 no. of Vehicular Overpass (VOP) on the project road and is found to be in good condition. The details of the structure is mentioned in Table 4.26 & condition of the same is mentioned in Table 4.27 below.

Fig.4.181: VOP at Ch 48+255 LHS

Fig.4.182: VOP at Ch. 48+255 LHS

Fig.4.183: VOP at Ch.48+255 SR in LHS

Fig.4.184: VOP at Ch. 48+255 Staircase in LHS

Fig.4.185: VOP at Ch. 48+255

Fig.4.186: VOP at Ch. 48+255 LHS

Table 4.26: Details of VOP

DESIGN CHAINAGE	SPAN ARRANGEMENT	Carriageway Width	Skew	Foundation	Sub Structure	Super Structure
48+255	2x32.00	1 X 11	24	Open	Rectangular Abt. & Pier.	PCS I-Girder

Table 4.27: Condition Assessment of the VOP

Design Chainage	Span Arrangement	Observation		Recommendations	
		LHS	RHS	LHS	RHS
48+255	2x32.00	Dirt is seen on the expansion joint and Drainage spouts are choked		Expansion joint and Drainage spouts needs to be cleaned	

4.3.5 MINOR BRIDGES

There are 19 numbers of Minor Bridges on the Project Road. Details for the Minor Bridges are furnished in Table 4.28 below. The Minor Bridges are found to be in fair condition. Some of the site observations made in respect of some of structures are summarised in table 4.29 below.

Table 4.28: Details of Minor Bridges

Design Chainage	Span Arrangement	Carriageway Width	Skew	Foundation	Sub Structure	Super Structure
30+685	3x15.00	2 X 12.50		Open	Wall Type Abt. & Circuler Type Pier	PSC I-Girder
38+611	1x25.00	2 x 11.0 +2x11.00		Open	Wall Type Abt	PSC I-Girder
41+013	1x30.00	2 X 12.50		Open	Wall Type Abt	PSC I-Girder
42+672	1x10.00	2 x 11.0 2x11.00		-	Box Type	Box Type
43+082	1x15.00	2X12.5		Open	Wall Type Abt	RCC T-Girder
43+145	3x15.00	2 X 12.50		Open	Wall Type Abt. & Rectangular Pier	RCC T-Girder
43+748	1x30.00	2 X 12.50		Open	Wall Type Abt	PSC I-Girder
45+772	1x20.00	2X12.5		Open	Wall Type Abt	RCC T-Girder
53+600	1x27.00	2 X 12.50	45	Open	Wall Type Abt	PSC I-Girder
56+042	1x30.00	2 x 11.0 +2x11.00	28	Open	(Wall Type Abt In MCW) & (Wall Type Abt. & Rectangular Pier In SR)	PSC I-Girder (MCW) & RCC T-Girder (SR)
59+241	5x5.00	2 x 11.0 +2x11.00	30	Box Type		
60+606	1x10.00	2X12.5		Box Type		Post Tensioned Plank
61+203	4x5.00/ Site Span is 1x25	2 X 11.50	26	Open	Wall Type Abt	PSC I-Girder
62+150	1x7.00	2 X 12.50		Box Type		
62+380	1x6.00	2 X 12.50	37	Box Type		

Design Chainage	Span Arrangement	Carriageway Width	Skew	Foundation	Sub Structure	Super Structure
69+900	1x17.00	2 X 12.50	45	Open	Wall Type Abt	RCC T-Girder
70+330	1x21.00	2 X 12.50	52	Open	Wall Type Abt	RCC T-Girder
71+175	1x17.00	2 X 12.50	45	Open	Wall Type Abt	RCC T-Girder
71+871	1x10.00	2 X 12.50		Box Type		Post Tensioned Plank

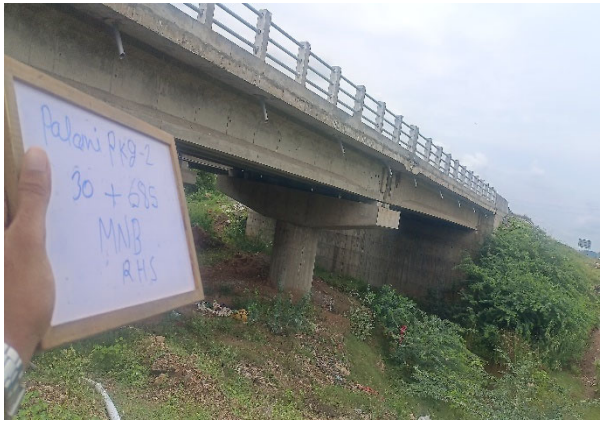

Fig.4.187: MNB at Ch. 30+685 RHS

Fig.4.188: MNB at Ch. 38+611 RHS

Fig.4.189: MNB at Ch. 42+642 RHS

Fig.4.190: MNB at Ch. 43+738 LHS

Fig.4.191: MNB at Ch. 45+772 LHS

Fig.4.192: MNB at Ch. 45+772 RHS

Fig.4.193: MNB at Ch. 53+600 LHS

Fig.4.194: MNB at Ch. 53+600 RHS

Fig.4.195: MNB at Ch. 59+241 LHS

Fig. 4.196: MNB at Ch. 59+241 RHS

Fig.4.197: MNB at Ch. 62+150 LHS

Fig.4.198: MNB at Ch. 62+150 RHS

Table 4.29: Condition Assessment of the Minor Bridges

Design Chainage	Span Arrangement	Observation		Recommendations	
		LHS	RHS	LHS	RHS
30+685	3x15.00	i) Some Vegetation is seen on the quadrant pitching and in the water way. ii) Dirt is seen on expansion joint.		i) Clearing of vegetation is required. ii) Cleaning of expansion joint is required.	
38+611	1x25.00	Dirt is seen on expansion joint.		Cleaning of expansion joint is required.	
41+013	1x30.00	i) Dirt is seen on expansion joint and drainage spouts. ii) Some Vegetation is seen on the quadrant pitching and in the water way		i) Cleaning of expansion joint is required. ii) Clearing of vegetation is required.	
42+672	1x10.00	i) There is soil accumulated near the mouth of the box. ii) The PCC on footpath is not yet completed, and the drainage spout on the footpath is slightly raised, causing water to accumulate on the surface.		i) Clearing of soil from the waterway needs to be carried out. ii) PCC layer needs to be laid on the footpath and level of the drainage spout needs to be adjusted.	
43+082	1x15.00	Fair	The stone pitching on the RHS A1 side is damaged.		Stone pitching needs to be repaired.
43+145	3x15.00	Fair	There is some vegetation in the waterway		Clearing of vegetation needs to be carried out.

Design Chainage	Span Arrangement	Observation		Recommendations	
		LHS	RHS	LHS	RHS
43+748	1x30.00	i) There's soil in the middle span of the opening. ii) Dirt is seen on expansion joint.		i) Clearing of soil debries from the water way needs to be carried out. ii) Cleaning of expansion joint is required.	
45+772	1x20.00	Dirt is seen on expansion joint.		Cleaning of expansion joint is required.	
53+600	1x27.00	Dirt is seen on expansion joint.		Cleaning of expansion joint is required.	
56+042	1x30.00	i) Some Vegetation is seen on the quadrant pitching and in the water way. ii) Dirt is seen on expansion joint and drainage spouts are choked		i) Clearing of vegetation is required. ii) Cleaning of expansion joint and drainage spouts is required.	
59+241	5x5.00	Fair	The toe wall on the RHS A2 side is damaged.		Repair of the toe wall needs to be carried out.
60+606	1x10.00	The toe wall on the A2 side is damaged.	Fair	Repair of the toe wall needs to be carried out.	
61+203	4x5.00/ Site Span is 1x25	Dirt is seen on expansion joint.		Cleaning of expansion joint is required.	
62+150	1x7.00	The PCC on footpath is not yet completed, and the drainage spout on the footpath is slightly raised, causing water to accumulate on the surface..		PCC layer needs to be laid on the footpath and level of the drainage spout needs to be adjusted.	
62+380	1x6.00	Drainage spouts are choked		Cleaning of drainage spouts is required.	
69+900	1x17.00	Dirt is seen on the expansion joint.		Cleaning will need to be done on the expansion joint.	
70+330	1x21.00	i) The Toe wall on the A2 side is damaged. ii) Dirt is seen on the expansion joint.	Dirt is seen on the expansion joint.	i) The toe wall needs to be repaired ii) Cleaning of expansion joint is required	Cleaning of expansion joint is required
71+175	1x17.00	i) Drainage spouts are choked		Cleaning of drainage spouts is required.	
71+871	1x10.00	i) A1 Side Stone pitching & toe wall are damaged ii) The pipe of the drainage spout is choked.	i) A1 Side toe wall damage. ii) The pipe of the drainage spout is choked.	i)Stone pitching and Toe wall on A1 side need to be repaired. ii) The drainage spout needs to be cleaned	i) Toe wall on RHS side needs to be repaired ii)The drainage spout needs to be cleaned

4.3.6 CULVERTS

The total 146 number of culverts are there on the Project Road and the details are brought out in Tables 4.30 & 4.31 below.

4.3.6.1 CULVERTS DETAILS

The total numbers of culverts on the Project Road are summarized in Table 4.30 below.

Table 4.30: Details of Culverts on the Project Road

SL. NO.	TYPE OF STUCTURE	NUMBER
1	Box Culvert	145
2	HPC	01
	TOTAL	**146**

4.3.6.2 OBSERVATIONS IN RESPECT OF BOX CULVERT

Most of the culverts are in good condition some repair/maintenance work are required to be carried out on some culverts. The details of such culverts are summarised in Table 4.31. In most of the culvert it is observed that general cleaning of vegetation and garbage from the water way is required.

Fig.4.199: Box Culvert at Ch 32+422 RHS

Fig.4.200: Box Culvert at Ch 35+160 LHS

Fig.4.201: Box Culvert at Ch 39+975 RHS

Fig.4.202: Box Culvert at Ch 44+800 LHS

Fig.4.203: Box Culvert at Ch 48+255 RHS

Fig.4.204: Box Culvert in Junction at Ch 50+710 LHS

Fig.4.205: Box Culvert at Ch 52+480 LHS

Fig.4.206: Box Culvert in Junction at Ch 54+580 LHS

Fig.4.207: Box Culvert at Ch 56+340 RHS

Fig.4.208: Box Culvert in Junction at Ch 58+167 LHS

Fig.4.209: Box Culvert in Junction at Ch 61+540 RHS

Fig.4.210: Box Culvert in Junction at Ch 63+290 RHS

Fig.4.211: Box Culvert at Ch 64+390 LHS

Fig.4.212: Box Culvert in Junction at Ch 67+870 LHS

Fig.4.213: Box Culvert at Ch 72+587 RHS

Fig.4.214: Box Culvert in Junction at Ch 73+300 LHS

Fig.4.215: Box Culvert at Ch 73+590 RHS

Fig.4.216: Box Culvert at Ch 73+590 LHS

Table 4.31: Observations highlighting repair and maintenance needs for Box/Slab Culverts

Design Chainage	Span Arrangement	Observations		Recommendations	
		LHS	RHS	LHS	RHS
29+154	1x5.00x2.00	Fair	Fair		
29+900	1x2.00x1.50	Waterway is blocked considerably		Water way needs to be cleared by removing the soil deposits.	
30+490	1x2.00x2.00	Fair	Fair		
30+900	1x2.00x2.00	Waterway is blocked considerably		Water way needs to be cleared by removing the soil deposits.	
30+935	1x2.00x1.50	Waterway is blocked considerably		Water way needs to be cleared by removing the soil deposits.	
30+935	1x2.00x1.50	Fair	Fair		
31+120	1x2.00x2.00	Waterway is blocked considerably		Water way needs to be cleared by removing the soil deposits.	
31+610	1x2.00x2.00	Fair	Fair		
31+925	1x2.00x1.50	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits.	
31+925	1x2.00x1.50	Waterway is blocked partially		Water way needs to be cleared by removing	

Design Chainage	Span Arrangement	Observations		Recommendations	
		LHS	RHS	LHS	RHS
				the soil deposits.	
32+000	1x2.00x2.00	Fair	Waterway is blocked considerably		Water way needs to be cleared by removing the soil deposits.
32+422	1x2.00x2.00	Fair	Fair		
32+950	1x2.00x2.00	Fair	Fair		
32+975	1x2.00x1.50	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits.	
33+120	1x2.00x2.00	Fair	Fair		
33+600	1x2.00x2.00	Fair	Fair		
33+875	1x4.00x2.00	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits	
34+120	1x2.00x2.00	Fair	Fair		
34+430	1x2.00x1.50	Fair	Fair		
34+430	1x2.00x1.50	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits	
34+940	1x2.00x2.00	Fair	Fair		
35+160	1x2.00x2.00	Fair	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits
35+551	1x3.00x2.00	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits	
35+860	1x2.00x2.00	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits	
36+529	1x5.00x2.00	water blocked because of earthen cart road leading to water stagnation	Fair	Water way continuity from the culvert to the earthen drain needs to be ensured	
36+580	1x2.00x1.50	Fair	Fair		

Design Chainage	Span Arrangement	Observations		Recommendations	
		LHS	RHS	LHS	RHS
36+580	1x2.00x1.50	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits	
36+810	1x2.00x2.00	Fair	Fair		
37+300	1x2.00x2.00	Fair	Fair		
37+840	1x2.00x2.00	Waterway is blocked partially		Water way needs to be cleared by removing the soil deposits	
38+226	1x3.00x2.00	Clear but little amount of soil is present at mouth	Fair		
38+530	1x2.00x1.50	Waterway is blocked partially by debries	Waterway is blocked partially by garbage	Water way needs to be cleared by removing the debries	Water way needs to be cleared by removing the garbage
38+530	1x2.00x1.50	Fair	Fair		
39+300	1x2.00x2.00	Water logging	Fair	Waterway needs to be cleared	
39+975	1x2.00x2.00	Fair	Water logging		Waterway needs to be cleared
40+670	1x2.00x2.00	Fair	Fair		
41+421	1x2. 00x2. 00	Fair	Fair		
41+700	1x2.00x2.00	Fair	Fair		
41+970	1x2.00x2.00	Water logging	Fair	Waterway needs to be cleared	
42+252	1x2.00x2.00	Fair	Fair		
42+485	1x2.00x1.50	Fair	Fair		
42+485	1x2.00x1.50	Fair	Fair		
42+500	1x3.00x1.50	Fair	Fair		
44+045	1x2.00x2.00	Fair	Fair		
44+320	1x2.00x2.00	Fair	Fair		
44+800	1x2.00x2.00	Fair	Fair		
45+150	1x2.00x2.00	Fair	Fair		
45+570	1x2.00x2.00	Fair	Fair		

Design Chainage	Span Arrangement	Observations		Recommendations	
		LHS	RHS	LHS	RHS
45+980	1x2.00x2.00	Fair	Fair		
46+085	1x2.00x1.50	Fair	Fair		
46+085	1x2.00x1.50	Fair	Fair		
46+210	1x2.00x2.00	Fair	Fair		
46+462	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
46+642	1x2.00x1.50	Fair	Fair		
46+780	1x2.00x2.00	Fair	Fair		
47+000	1x2.00x2.00	Given in Sch. B but not found at site			
47+250	1x2.00x2.00	Fair	Fair		
47+720	1x2.00x2.00	Fair	Fair		
0+430	1x2.00x2.00	Fair	Mouth is completely blocked by a Hume Pipe placed across the opening		The arrangement is not clear. Waterway of the culvert needs to be ensured
48+540	1x2.00x2.00	Fair	Fair		
48+760	1x2.00x2.00	Fair	Fair		
49+200	1x2.00x2.00	Fair	Fair		
49+555	1x2.00x2.00	Fair	Fair		
49+700	1x2.00x2.00	Fair	Fair		
49+840	1x2.00x1.50	Fair	Fair		
50+140	1x2.00x2.00	Fair	Fair		
50+300	1x2.00x2.00	Fair	Fair		
50+710	1x2.00x1.50	Fair	Fair		
51+270	1x2.00x2.00	Fair	Fair		
51+470	1x2.00x2.00	Fair	Waterway is blocked partially	Waterway needs to be cleared	
51+820	1x2.00x2.00	Fair	Filled with soil and vegetation present		Waterway needs to be cleared
52+200	1x2.00x2.00	Fair	Fair		
52+480 (LHS)	1x2.00x1.50	Cutting of the adjoining	Fair	Waterway needs to	

Design Chainage	Span Arrangement	Observations		Recommendations	
		LHS	RHS	LHS	RHS
		ground is not carried out		be ensured	
52+480 (RHS)	1x2.00x1.50	Cutting of the adjoining ground is not carried out	Water pitching damaged. Waterway block by the soil deposit	Waterway needs to be ensured	Waterway needs to be ensured
52+750	1x2.00x2.00	Vegetation overgrowth affecting waterway	Fair	Clearance of vegetation is required	
52+970	1x2.00x2.00	Fair	Filled with garbage.		
53+235	1x2.00x2.00	Fair	Fair		
53+990	1x2.00x2.00	Fair	Fair		
54+280	1x2.00x2.00	Fair	Fair		
54+380	1x2.00x2.00	Fair	Fair		
54+580	1x2.00x1.50	Blocked with soil	waterway blocked		
54+580	1x2.00x1.50	mouth is open but waterway is blocked	mouth is open but waterway is blocked		
54+890	1x2.00x2.00	Fair	Fair		
55+190	1x2.00x2.00	water logging	water logging	Waterway needs to be ensured	
55+500	1x2.00x2.00	Blocked	blocked	Waterway needs to be cleared	
55+850	1x2.00x2.00	Fair	Fair		
56+150	1x2.00x1.50	Fair	Fair		
56+120	1x2.00x2.00	Blocked	Fair		
56+340	1x2.00x2.00	Fair	Fair		
56+540	1x3.00x2.00	Fair	Fair		
56+640	1x5.00x2.00	Fair	Fair		
57+120	1x2.00x2.00	As per Sch. B Box culvert is to be provided but Pipe culvert is observed at this location			
57+500	1x2.00x2.00				
57+540	1x2.00x2.00	Fair	Fair		
57+930	1x2.00x2.00	Fair	Fair		
58+167	1x2.00x1.50	Waterway is blocked considerably		Waterway needs to be cleared	
58+167	1x2.00x1.50	Fair	Fair		

Design Chainage	Span Arrangement	Observations		Recommendations	
		LHS	RHS	LHS	RHS
58+480	1x2.00x2.00	Fair	Fair		
58+730	1x2.00x2.00	Fair	Fair		
58+810	1x2.00x1.50	Waterway is blocked considerably		Waterway needs to be cleared	
58+810	1x2.00x1.50	Waterway is blocked considerably		Waterway needs to be cleared	
59+055	1x4.00x2.00	Fair	Fair		
59+660	1x2.00x2.00	Fair	Fair		
59+962	1x3.00x2.00	Fair	Fair		
60+210	1x2.00x2.00	Fair	Fair		
60+635	1x2.00x1.50	Waterway is blocked considerably		Waterway needs to be cleared	
60+635	1x2.00x1.50	Waterway is blocked considerably		Waterway needs to be cleared	
60+710	1x2.00x2.00	Fair	Fair		
61+540	1x2.00x1.50	Fair	Fair		
61+540	1x2.00x1.50	Waterway is blocked	Fair	Waterway to be cleared	
61+645	1x2.00x1.50	Waterway is blocked considerably		Waterway needs to be cleared	
61+828	1x3.00x2.00	Waterway is blocked considerably		Waterway needs to be cleared	
62+100	1x2.00x2.00	Fair	Fair		
62+520	1x2.00x2.00	Fair	Fair		
62+680	1x2.00x2.00	Fair	Fair		
63+030	1x2.00x2.00	Fair	Fair		
63+190	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
63+290	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
63+540	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
63+788	1x2.00x2.00	Fair	Fair		
64+390	1x2.00x2.00	Fair	Fair		
64+780	1x1.9x1.5	Fair	Fair		
64+920	1x2.00x1.50	Fair	Fair		
66+390	1x2.00x2.00	Fair	Fair		
66+690	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
67+350	1x2.00x1.50	Fair	Fair		
67+500	1x2.00x1.50	Fair	Fair		

Design Chainage	Span Arrangement	Observations		Recommendations	
		LHS	RHS	LHS	RHS
67+870	1x2.00x1.50	Fair	Fair		
68+215	1x2.00x2.00	Fair	Fair		
68+570	1x2.00x2.00	Fair	Fair		
68+980	1x2.00x2.00	Fair	Fair		
69+390	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
69+390	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
69+440	1x2.00x2.00				
70+550	1x2.00x2.00	Waterway is blocked partially		Waterway needs to be cleared	
70+850	1x2.00x2.00	Fair	Fair		
71+425	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
72+150	1x2.00x2.00	As per Sch. B Box culvert is to be provided but Pipe culvert is observed at this location			
72+470	1x2.00x2.00	Fair	Fair		
72+587	1x5.00x2.00	Fair	Fair		
72+890	1x4.00x2.00	Fair	Fair		
73+004	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
73+004	1x2.00x1.50	Waterway is blocked partially	Fair	Waterway needs to be cleared	
73+300	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
73+300	1x2.00x1.50	Waterway is blocked partially		Waterway needs to be cleared	
73+590	1x2.00x2.00	Water Logging	Vegetation	Waterway needs to be ensured	Vegetation needs to be cleared
74+090	1x2.00x2.00	Fair	Fair		
74+380	1x2.00x1.50	Blocked		Waterway needs to be cleared	
74+380	1x2.00x1.50	Water logging		Waterway needs to be ensured	
74+280	1x2.00x2.00	Fair	Vegetation overgrowth near structure		Clearing of vegetation needs to be carried out
75+500	1x2.00x2.00	blocked by soil		Waterway needs to be cleared	

Fig.4.217: HPC at Ch 57+120 LHS

Fig.4.218: HPC at Ch 57+120 RHS

Fig.4.219: HPC at Ch 57+120 RHS

4.4 TOLL PLAZA

There are only 1 toll plaza (Chatrapatti Toll Plaza) on the project road at chainage 40+540. Representative photographs of the Toll Plazas are given in figure below.

Fig.4.220: Toll Plaza at Ch. 40+540

Fig.4.221: Toll Plaza Buildings at Ch. 40+540

Fig.4.222: Toll Nursing Quarter

Fig.4.223: Toll Administration Building

Fig.4.224: Toll Medical AID Post

Fig.4.225: Toll Traffic AID Post

4.4.1 TOLL MANAGEMENT SYSTEM

The project road has 1 Toll Plaza near Chatrapatti and 8 Lane out of which 2 are having toll booths and are provided for the oversized vehicles. All the toll plaza lanes are equipped with Electronical (Fastag) toll collection system and two lanes with both manual and fastag toll collection are provided.

4.4.2 BOOTH OPERATIONAL STEPS IN HYBRID LANE (ETMS)

i) The RFID Reader reads the vehicle Fastag data and deducts the desired amount directly from the bank account linked with fastag and the user receives the transaction message for the same.
ii) In case of any violation or un-readable fastag Hand held RFID reader is used to capture the details from fastag else, cash need to be paid to complete the transaction.
iii) During the transaction process the LPR camera records the License plate details.
iv) The boom barrier opens-up and the vehicle then moves towards the Loop sensor where automatic classification of vehicle is done
v) Once the vehicle crosses over the loop detector the boom barrier closes automatically and vehicle classification is done simultaneously.

The primary focus of the exercise was to check the various equipment installed in the toll plaza and its functioning. Details pertaining to plaza level equipment's and lane level equipment's are furnished in this report in Annexures.

4.4.3 REVIEW ON CHATRAPATTI TOLL PLAZA

4.4.3.1 REVIEW AND CONDITION OF THE EQUIPMENTS AT CHATRAPATTI TOLL PLAZA

The details of status an availability of the equipment at the Toll plaza are brought out in table 4.32 & 4.33 below:

Table 4.32: Toll Booth details

S N	Item/Equipment Description	L1	L2	L3	L4	L5	L6	L7	L8
		Available/ Working	Available/ Working	Available/ Working	Available/ Working	Available/ Working	Available/ Working	Available/ Working	Available/ Working
1	**ETC RFID Transceiver**	Working	Working	Working	Working	Working	Working	Working	Working
2	**Lane controller**	Working	Working	Working	Working	Working	Working	Working	Working
3	**AVC including sensors,**	Working	Working	Working	Working	Working	Working	Working	Working

SN	Item/Equipment Description	L1	L2	L3	L4	L5	L6	L7	L8
		Available/ Working	Available/ Working	Available/ Working	Available/ Working	Available/ Working	Available/ Working	Available/ Working	Available/ Working
	loop and detector								
4	**User Fare Display with mounting pole**	Working	Working	Working	Working	Working	Working	Working	Working
5	**Automatic Barrier Gate**	Working	Working	Working	Working	Working	Working	Working	Working
6	**Overhead Lane Status Light(OHLS)**	Working	Working	Working	Working	Working	Working	Working	Working
7	**Traffic Light with mounting pole**	Working	Working	Working	Working	Working	Working	Working	Working
8	**Loop with detector**	Working	Working	Working	Working	Working	Working	Working	Working
9	**Incident capture camera with mounting pole**	Working	Working	Working	Working	Working	Working	Working	Working
10	**License plate image camera with mounting pole**	Working	Working	Working	Working	Working	Working	Working	Working
11	**TFT monitor**	Working	Not Applicable						
12	**Customized Industrial grade Key Board**	Working							
13	**Thermal receipt printer**	Working							
14	**Bar recorder with stand/ID reader**	Working							
15	**Violation light and Alarm**	Working	Maintenance	Working	Working	Working	Working	Working	Working
16	**Booth CCTV Camera with voice recording**	Working							Working
17	**Cabling/Networking**	Working	Working	Working	Working	Working	Working	Working	Working
18	**Lane UPS**	Working	Working	Working	Working	Working	Working	Working	Working
19	**Working of Software -Lane Level**	Working	Working	Working	Working	Working	Working	Working	Working
20	**Intercom in booth**	Working							Working
21	**WIM**	Working	Working	Working	Working	Working	Working	Working	Working

Table 4.33: Toll Plaza level Equipment

Sno	Item/Equipment Description	Working/Non-working/QTY	Remark
1	Plaza Server in hot standby configuration	Working	
2	Network Printer	Working	
3	Static Weigh Bridge	Working	
4	Broadband Internet connection with minimum 2Mbps	Working	300 Mbps
5	Working of Software-Plaza Level	Working	Metro Software system
6	42"/55" LED Display for CCTV monitoring	Working	
7	Network video Recorder (NVR) for CCTV	Working	
8	CCTV camera for Plaza Building surveillance	Working	
9	Work station for POS	Working	
10	Work station for Auditor	Working	
11	Work Station for MIS	Working	
12	Intercom in Control Room	Working	
13	Hand held REID readers	Working	
14	Outdoor Wifi access point	Working	
15	Plaza surveillances PTZ Camera	Working	LHS RHS
16	Internet router for connection to CCH	Working	
17	Plaza UPS	Working	10 KV
18	24 Port Network switches	Working	

CHAPTER 5.0: FIELD INVESTIGATIONS

5. FIELD INVESTIGATIONS FOR ASSESSMENT OF THE PROJECT ROAD CONDITION

As part of the Technical Due Diligence for the project various field investigations have been carried out in October 2024 and August 2025 for assessment of the pavement quality & condition and loading pattern of the traffic. The analysis and results from the field investigations are brought out in the subsequent sub paras

5.1 AXLE LOAD SURVEY

5.1.1 SUMMARY OF VDF

Axle load survey was carried out at one location near the Chatrapatti toll plaza at Ch. 40+500 for 24 hours.

Table 5.1: Summary of Vehicle Damage Factor for the project road

Sl. No.	Mode	Direction		Final VDF
		Madathukulam to Oddanchatram	Oddanchatram to Madathukulam	
1	Bus	0	1.49	1.49
2	LCV	0.15	0.03	0.07
3	2 Axle Trucks	0.97	0.85	0.92
4	3 Axle Trucks	3.8	4.59	4.11
5	4 Axle Trucks	4.4	7.16	5.9
6	Multi Axle Trucks	5.1	5.7	5.5

5.1.2 CALCULATION OF CUMULATIVE MSA PROJECTION

The 7 days CTVC Count was carried out on the project road at Ch. 64+500 from 17.10.24 to 23.10.24. The Average Dailly Traffic count is shown in table 5.2 below:

Table 5.2: Summary of Average Daily Traffic count

		Direction	Madathukulam to Oddanchatram	Oddanchatram to Madathukulam	Combined
Tollable	Passenger Vehicles	Bus	475	472	947
		Mini Bus	143	198	341
		Car/Jeep/Van/Tata Magic	3369	3488	6857
	Goods Vehicles	Loading Van	25	20	45
		LCV	246	235	481
		Truck 2 Axle	226	231	457
		Truck 3 Axle	136	106	142
		Truck 4-6 Axle	145	154	299
		Oversized Vehicle 7 or More Axle	0	1	1
		HCM/Earth Moving Machinery	3	1	4

		Direction	Madathukulam to Oddanchatram	Oddanchatram to Madathukulam	Combined
Non - Tollable	Goods Vehicles	Tractor with Trailer	**11**	**11**	**22**
		Tractor	**0**	**0**	**0**
	Passenger Vehicles	Two Wheelers	**2092**	**2862**	**4954**
		Auto Rickshaws	**43**	**44**	**87**
	Non Motorized Vehicles	Hand / Animal Drawn	**0**	**0**	**0**
		Cycle	**0**	**0**	**0**
Toll Exempt	Passenger Vehicles	Bus	**0**	**0**	**0**
		Car/Jeep/Van/Tata Magic	**08**	**04**	**08**
	Goods Vehicles	Truck 2 Axle	**0**	**0**	**0**
		Truck 3 Axle	**0**	**0**	**0**
Vehicles			**6918**	**7827**	**14745**
PCUs			**8391**	**8840**	**17231**

Table 5.2A : Cumulative MSA Projection for the remaining Concession Period

	Initial VDF	1.50	1.50	0.07	0.93	4.10	5.95	No. of Standard Axles	Design Standard Axles	Cumulative M.S.A.
	Year	BUS	Mini Bus	LCV	2-Axle Truck	3- Axle	4-6 Axle			
Base Year	2024-25	1.50	1.50	0.07	0.93	4.10	5.95	579497	217311	**0.2**
1	2025-26	947	341	481	457	142	299	1825416	684531	**0.9**
2	2026-27	994	358	505	480	149	314	1916687	718758	**1.6**
3	2027-28	1044	376	530	504	157	330	2012521	754695	**2.4**
4	2028-29	1096	395	557	529	164	346	2113147	792430	**3.2**
5	2029-30	1151	414	585	555	173	363	2218804	832052	**4.0**
6	2030-31	1209	435	614	583	181	382	2329745	873654	**4.9**
7	2031-32	1269	457	645	612	190	401	2446232	917337	**5.8**
8	2032-33	1333	480	677	643	200	421	2568544	963204	**6.8**
9	2033-34	1399	504	711	675	210	442	2696971	1011364	**7.8**
10	2034-35	1469	529	746	709	220	464	2831819	1061932	**8.8**
11	2035-36	1543	555	783	744	231	487	2973410	1115029	**9.9**
12	2036-37	1620	583	823	782	243	511	3122081	1170780	**11.1**
13	2037-38 (till Aug.37)	1701	612	864	821	255	537	1365910	512216	**11.6**

The Pavement has been designed for 35 MSA with stage construction for Bituminous layers which are designed for 20 MSA. From the above table it is seen that cumulative MSA for the remaining concession period as per the current traffic and VDF values is coming to 11.6 MSA only which is quite less than the design MSA. This implies that there should not be any requirement for structural overlay.

5.2 ASSESSMENT OF OVERLAY REQUIREMENTS-FALLING WEIGHT DEFLECTION (FWD) TEST

Falling Weight Deflectometer Test conducted in August 2025 has been reviewed and results are summarized in table 5.3 below.

Table 5.3: Summary of FWD Results- Remaining pavement Life

Chainage (km)		Existing Crust Thickness (mm)		15th Percentile E Value (MPa)			Fatigue Strain (εt)	Fatigue Residual Life (MSA)	Rutting Strain (εv)	Rutting Residual Life (MSA)	Remaining Life (MSA)
From	To	BT (mm)	Granular (mm)	BT	Granular	Subgrade					
LHS											
29.000	31.600	100	450	3000.00	211.48	100.00	0.0002497	12.14	0.000306	120.75	12.14
31.600	36.100	100	450	3000.00	261.67	100.00	0.0002262	17.84	0.000287	162.25	17.84
36.100	38.500	100	450	3000.00	267.02	100.00	0.000224	18.53	0.000285	167.48	18.53
38.500	51.700	100	450	3000.00	248.28	100.00	0.000232	16.17	0.000292	150.25	16.17
51.700	56.100	100	450	3000.00	211.65	100.00	0.0002497	12.14	0.000306	120.93	12.14
56.100	61.200	100	450	3000.00	231.19	100.00	0.0002398	14.21	0.000298	135.75	14.21
61.200	65.000	100	450	3000.00	249.64	100.00	0.0002314	16.33	0.000291	151.42	16.33
65.000	70.200	100	450	3000.00	221.26	100.00	0.0002447	13.14	0.000302	127.99	13.14
70.200	74.380	100	450	3000.00	212.71	100.00	0.0002491	12.26	0.000306	121.65	12.26
RHS											
29.000	33.900	100	450	3000.00	243.18	99.92	0.0002343	15.56	0.000294	145.44	15.56
33.900	41.200	100	450	2945.75	285.77	99.90	0.0002186	20.70	0.000279	183.86	20.70
41.200	44.000	100	450	2829.56	238.50	100.00	0.0002437	14.03	0.000298	136.79	14.03
44.000	47.000	100	450	2739.16	245.52	100.00	0.0002443	14.29	0.000296	139.96	14.29
47.000	52.100	100	450	2632.28	286.35	100.00	0.0002306	18.51	0.000282	173.75	18.51
52.100	56.100	100	450	2730.24	236.53	100.00	0.0002492	13.27	0.0003	132.30	13.27
56.100	61.700	100	450	2885.10	222.10	100.00	0.0002494	12.62	0.000303	125.52	12.62
61.700	67.700	100	450	3000.00	265.38	100.00	0.0002247	18.31	0.000285	165.89	18.31
67.700	74.380	100	450	3000.00	231.51	100.00	0.0002397	14.24	0.000298	136.16	14.24

In August 2025 FWD survey was conducted in the entire length of the Project Road for assessment of the Remaining life of the existing pavement and assessment of overlay requirement.

From the FWD results it is seen that there is no requirement of any structural overlay as the MSA calculated during the concession period is less than 12 MSA. However 40mm function overlay is suggested in 2030-31 on the project road for the remaining concession period.

5.3 SUMMARY OF ROUGHNESS RESULTS FROM NETWORK SURVEY VEHICLE

Detailed survey of the entire project road has been conducted using Network Survey Vehicle (NSV) and the roughness results of the project road are summarised in **Table 5.4** below:

Table 5.4: Roughness Value for the Project road using NSV

Sl. no.	Chainage		LHS MCW (in mm/ Km)			RHS MCW (in mm/Km)		
	From	To	Inner lane	Outer lane	Average	Outer lane	Inner lane	Average
1	29000	30000	1430	1684	1557	1173	1215	1194
2	30000	31000	1200	1189	1195	1210	1251	1231
3	31000	32000	1160	1424	1292	1305	1306	1305
4	32000	33000	1193	1274	1233	1167	1174	1171
5	33000	34000	1024	949	987	1056	981	1018
6	34000	35000	1444	1267	1355	1263	1237	1250
7	35000	36000	1290	1148	1219	977	1412	1194
8	36000	37000	1452	983	1217	1031	1032	1031
9	37000	38000	1354	976	1165	1156	1059	1108
10	38000	39000	1534	1293	1413	1507	1493	1500
11	39000	40000	1245	1285	1265	1317	1302	1309
12	40000	41000	2298	2202	2250	2327	2249	2288
13	41000	42000	1139	1222	1181	1219	1130	1174
14	42000	43000	1271	1349	1310	1285	1191	1238
15	43000	44000	1419	1447	1433	1248	1480	1364
16	44000	45000	1388	1164	1276	1243	1373	1308
17	45000	46000	1164	1321	1243	1211	1322	1267
18	46000	47000	1243	1226	1235	1133	1156	1144
19	47000	48000	1282	1178	1230	1119	1315	1217
20	48000	49000	1148	1151	1149	1150	1252	1201
21	49000	50000	1127	1341	1234	1089	1282	1186
22	50000	51000	1142	1335	1238	1270	1237	1254
23	51000	52000	1090	1098	1094	985	1030	1008
24	52000	53000	1227	1481	1354	1314	1348	1331
25	53000	54000	1323	1112	1217	1131	1132	1132
26	54000	55000	1315	1288	1302	1190	1218	1204
27	55000	56000	1368	1138	1253	1245	1095	1170
28	56000	57000	1448	1456	1452	1364	1372	1368
29	57000	58000	1370	1291	1331	1108	1127	1117
30	58000	59000	1329	1329	1329	1240	1235	1238
31	59000	60000	1145	1142	1143	1067	1084	1076
32	60000	61000	1153	1132	1143	1284	1298	1291
33	61000	62000	1235	1372	1304	1184	1254	1219
34	62000	63000	1245	1194	1219	1285	1210	1247
35	63000	64000	1313	1290	1301	1265	1208	1236
36	64000	65000	1239	991	1115	1005	947	976
37	65000	66000	1447	1464	1455	1264	1071	1168

Sl. no.	Chainage		LHS MCW (in mm/ Km)			RHS MCW (in mm/Km)		
	From	To	Inner lane	Outer lane	Average	Outer lane	Inner lane	Average
38	66000	67000	1301	1241	1271	1131	1171	1151
39	67000	68000	1403	1215	1309	1261	1685	1473
40	68000	69000	1207	1148	1178	1639	1796	1717
41	69000	70000	1252	1143	1198	1255	1352	1304
42	70000	71000	1018	1153	1086	1177	1079	1128
43	71000	72000	1175	1257	1216	1287	1384	1335
44	72000	73000	1486	1657	1571	1156	1096	1126
45	73000	74000	1589	1371	1480	1240	1124	1182
46	74000	74380	1547	1399	1473	1690	1788	1739
	Maximum Value (in mm/km)				**2250**			**2288**
	Average Value (in mm/km)				**1293**			**1258**

As per Schedule-K of the Concession Agreement, wherever the roughness value exceeds 2750mm, functional overlay may be required. From the above Table, it can be seen that the roughness values are well within the acceptable limits along the project road. Thus there is no requirement of any functional overlay as per the Roughness test results.

The average roughness value for LHS MCW - 1293 & for RHS MCW – 1258.

Table 5.5: Summary of Roughness Value for the Project road

S.no	Condition	BI (mm/km)	LHS				RHS			
			Outer		Inner		Outer		Inner	
			L (km)	L (%)	L (km)	L (%)	L (km)	L (%)	L (km)	L (%)
1	Good	<1800	45.010	99.18	45.010	99.18	45.050	99.27	45.050	99.27
2	Fair	1800-2400	0.370	0.82	0.370	0.82	0.330	0.73	0.330	0.73
3	Poor	>2400	0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.00
Total Surveyed length (km)			45.380	100.00	45.380	100.00	45.380	100.00	45.380	100.00

Note:- L = Length

5.3.1 SUMMARY OF RUTTING RESULTS FROM NETWORK SURVEY VEHICLE

Detailed survey of the entire project road has been conducted by the Concessionaire on August 2025 using Network Survey Vehicle (NSV) and the roughness results of the project road are summarised in **Table 5.6** below:

Table 5.6: Rutting Value for the Project road

Rut depth (mm)	Length of the Road Effected with Rutting							
	LHS (in Km)		LHS (in %)		RHS (in Km)		RHS (in %)	
	Outer Lane	Inner Lane	Outer Lane	Inner Lane	Outer Lane	Inner Lane	Outer Lane	Inner Lane
< 5 mm	44.580	45.080	98.24	99.34	45.080	45.380	99.34	100.00
5 to 10 mm	0.800	0.300	1.76	0.66	0.300	0.000	0.66	0.00
> 10 mm	0.000	0.000	0.00	0.00	0.000	0.000	0.00	0.00

5.3.2 SUMMARY OF PAVEMENT DISTRESS RESULTS FROM NETWORK SURVEY VEHICLE

Detailed survey of the entire project road has been conducted by the Concessionaire on August 2025 using Network Survey Vehicle (NSV) and the roughness results of the project road are summarised in **Table 5.7 & 5.8** below:

Table 5.7: Summary of Pavement Condition Data LHS

Distress	Condition	PCI Range	Range of Distress	Length of the Road Affected			
				LHS (length in Km)		LHS (Length in %)	
				OL	IL	OL	IL
Cracking (% of Area)	Excellent to Good	100 to 80	< 5%	45.000	45.010	100.00	100.00
	Satisfactory to Fair	80 to 40	5% to 10%	0.000	0.000	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.00	0.00
Ravelling (% of Area)	Excellent to Good	100 to 80	< 1%	45.000	45.010	100.00	100.00
	Satisfactory to Fair	80 to 40	1% to 10%	0.000	0.000	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.00	0.00
Potholes Numbers (No's)	Excellent to Good	100 to 80	Nil	45.000	45.010	100.00	100.00
	Satisfactory to Fair	80 to 40	1 to 2	0.000	0.000	0.00	0.00
	Poor to Fail	40 to 0	>2	0.000	0.000	0.00	0.00
Patching (% of Area)	Excellent to Good	100 to 80	< 1%	44.900	44.910	99.78	99.78
	Satisfactory to Fair	80 to 40	1% to 10%	0.100	0.100	0.22	0.22

Distress	Condition	PCI Range	Range of Distress	Length of the Road Affected			
				LHS (length in Km)		LHS (Length in %)	
				OL	IL	OL	IL
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.00	0.00
Rut depth (mm)	Excellent to Good	100 to 80	< 5	44.200	44.710	98.22	99.33
	Satisfactory to Fair	80 to 40	5 to 10	0.800	0.300	1.78	0.67
	Poor to Fail	40 to 0	> 10	0.000	0.000	0.00	0.00
IRI (m/km)	Excellent to Good	100 to 80	< 2.55	43.300	42.610	96.22	94.67
	Satisfactory to Fair	80 to 40	2.55 to 3.3	1.700	2.400	3.78	5.33
	Poor to Fail	40 to 0	> 3.3	0.000	0.000	0.00	0.00

Note:- OL= Outer Lane , IL = Inner Lane

Table 5.8: Summary of Pavement Condition Data RHS

Distress	Condition	PCI Range	Range of Distress	Length of the Road Affected			
				RHS (length in Km)		RHS (Length in %)	
				OL	IL	OL	IL
Cracking (% of Area)	Excellent to Good	100 to 80	< 5%	45.050	45.050	100.00	100.00
	Satisfactory to Fair	80 to 40	5% to 10%	0.000	0.000	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.00	0.00
Ravelling (% of Area)	Excellent to Good	100 to 80	< 1%	45.050	45.050	100.00	100.00
	Satisfactory to Fair	80 to 40	1% to 10%	0.000	0.000	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.00	0.00
Potholes Numbers (No's)	Excellent to Good	100 to 80	Nil	45.050	45.050	100.00	100.00
	Satisfactory to Fair	80 to 40	1 to 2	0.000	0.000	0.00	0.00
	Poor to Fail	40 to 0	>2	0.000	0.000	0.00	0.00
Patching (% of Area)	Excellent to Good	100 to 80	< 1%	45.050	45.050	100.00	100.00
	Satisfactory to Fair	80 to 40	1% to 10%	0.000	0.000	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.00	0.00
Rut depth (mm)	Excellent to Good	100 to 80	< 5	44.750	45.050	99.33	100.00

Distress	Condition	PCI Range	Range of Distress	Length of the Road Affected			
				RHS (length in Km)		RHS (Length in %)	
				OL	IL	OL	IL
	Satisfactory to Fair	80 to 40	5 to 10	0.300	0.000	0.67	0.00
	Poor to Fail	40 to 0	> 10	0.000	0.000	0.00	0.00
IRI (m/km)	Excellent to Good	100 to 80	< 2.55	43.550	42.070	96.67	93.39
	Satisfactory to Fair	80 to 40	2.55 to 3.3	1.500	2.780	3.33	6.17
	Poor to Fail	40 to 0	> 3.3	0.000	0.200	0.00	0.44

Note:- OL= Outer Lane , IL = Inner Lane

From the details presented in **Table 5.7 & 5.8** above, following inferences are drawn in respect of the pavement condition.

i) Rutting depth is less than 10mm in the entire length on all traffic lanes.

ii) Cracking, Potholes, Ravelling, Patch work are well within the limits as per Sch. K of the Concession Agreement.

5.4 SUMMARY OF TRIAL PIT RESULTS

The details of the pavement composition of the Existing pavement as obtained from the trial pit are brought out in the **Table 5.9** below and the details of laboratory test results on subgrade samples are brought outlined **Table 5.10** below:

Table 5.9: Pavement Composition from Trial Pit

Sl. No.	Existing Chainage	Side	Thickness of Layer (mm)			
			WMM	GSB	Bitumen	Total Thickness
1	31+170 (GSB)	LHS	260	210	130	600
2	41+320	LHS	250	250	130	630
3	51+310	LHS	250	220	110	580
4	62+220	LHS	260	210	120	590
5	72+150	LHS	250	220	120	590
6	37+450	RHS	250	210	110	570
7	47+450 (GSB)	RHS	250	210	100	560
8	57+460	RHS	270	210	100	580
9	66+950	RHS	250	210	100	560

Table 5.10: Laboratory Test results from Trial Pit samples (sub grade)

S No.	Chainage	Side	Grain Size Analysis				M.D.D (g/cc)	O.M.C (%)	LL-PL			C.B.R (%)
			4.75 mm	2.0 mm	425 micron	75 micron			LL (%)	PL (%)	PI	
1	31+170 (GSB)	LHS	76.48	61.88	38.48	16.28	2.20	7.30	42.10	NP		22.65
2	41+320	LHS	85.66	72.02	40.42	24.68	1.95	11.30	38.40	NP		14.68
3	51+310	LHS	62.48	49.48	24.82	10.48	2.16	6.50	31.20	NP		29.86
4	62+220	LHS	78.28	61.78	35.86	15.06	2.18	6.18	33.80	NP		38.24
5	72+150	LHS	75.34	63.00	37.34	15.38	2.06	7.40	35.60	NP		31.87
6	37+450	RHS	69.58	56.14	37.28	23.38	2.00	8.75	36.20	NP		28.65
7	47+450 (GSB)	RHS	51.02	36.56	20.04	8.66	2.23	7.00	28.90	NP		34.59
8	57+460	RHS	81.38	66.74	40.00	20.86	1.98	10.15	27.50	NP		23.97
9	66+950	RHS	83.96	69.24	42.44	14.06	2.05	8.90	33.80	NP		22.63

5.4.1 CONCLUSION OF TRIAL PIT RESULTS

i. At two locations 31+170 & 47+450 sample was collected for GSB layer.
ii. The CBR results are more than 14% for all the locations.
iii. The pavement layer thicknesses are as per the pavement design for the project.

5.4.2 SUMMARY OF TEST RESULTS OF BITUMINOUS CORE SAMPLES

Table 5.11: Summary - Density of Bituminous Layer of BC from Core cutting

S.No	Chainage (Km)	Side	Location	BC Core Thickness (mm)	BC Bulk Density (gm/cc)
1	39+650	RHS	Shoulder	110	2.380
2	33+470	RHS	Midian	110	2.416
3	30+470	LHS	Divider	110	2.368
4	36+480	LHS	Shoulder	110	2.445
5	42+550	LHS	Midian	100	2.454
6	48+610	LHS	Divider	105	2.423
7	54+490	LHS	Shoulder	95	2.427
8	60+500	LHS	Midian	100	2.414
9	66+480	LHS	Divider	100	2.330
10	72+600	LHS	Midian	105	2.411
11	69+330	RHS	Shoulder	100	2.449
12	63+380	RHS	Midian	100	2.361
13	57+400	RHS	Divider	115	2.381
14	51+470	RHS	Shoulder	100	2.467
15	45+470	RHS	Shoulder	100	2.402

5.5 SUMMARY OF RETRO-REFLECTIVE TEST RESULTS

5.5.1 SIGN BOARDS

The Retro reflective test was carried out on sample bases which covered 154 nos. various types of sign boards on the project road. These sign boards are having type 11 sheeting on which test was carried out as per IRC:67-2012 specifications.

Table 5.12: Summary of Retro reflectivity test results on Sign boards

Sign Boards	LHS		RHS	
	No. of Boards	Percentage	No. of Boards	Percentage
Pass	76	98.7%	72	94.7%
Fail	1	1.3%	4	5.3%
Sign Board Missing	0	0.0%	0	0.0%
Damaged	0	0.0%	0	0.0%
Total	77	100.0%	76	100.0%

Based on the sample tests carried out it is found that about 5% of sign boards sheeting are not able to provide the desired retro-reflectivity and may need to be replaced.

5.5.2 ROAD MARKING

Table 5.13: Summary of Retro reflectivity test results on Road Marking LHS

Chainage	Pavement Type	Shoulder Line		Center Line 1		Kerb Line	
		RL (mcd/m²/lux)	Condition (PASS/FAIL)	RL (mcd/m²/lux)	Condition (PASS/FAIL)	RL (mcd/m²/lux)	Condition (PASS/FAIL)
29+260	Flexible	153	PASS	159	FAIL	163	PASS
32+390	Flexible	193	PASS	176	PASS	154	PASS
37+000	Flexible	77	FAIL	147	PASS	150	PASS
41+000	Flexible	125	PASS	191	PASS	148	PASS
45+000	Flexible	179	PASS	187	PASS	130	PASS
49+000	Flexible	200	PASS	182	PASS	212	PASS
53+000	Flexible	169	PASS	128	PASS	180	PASS
57+720	Flexible	134	PASS	199	PASS	142	FAIL
61+970	Flexible	77	FAIL	215	PASS	208	PASS
65+720	Flexible	147	PASS	205	PASS	155	PASS
69+000	Flexible	129	PASS	195	PASS	232	PASS

Table 5.14: Summary of Retro reflectivity test results on Road Marking RHS

Chainage	Pavement Type	Shoulder Line		Center Line 1		Kerb Line	
		RL (mcd/m²/lux)	Condition (PASS/FAIL)	RL (mcd/m²/lux)	Condition (PASS/FAIL)	RL (mcd/m²/lux)	Condition (PASS/FAIL)
33+500	Flexible	57	Pass	81	Pass	14	Fail
35+000	Flexible	54	Pass	73	Pass	64	Pass
39+000	Flexible	22	Fail	87	Pass	56	Pass
43+000	Flexible	63	Pass	64	Pass	30	Fail
47+000	Flexible	49	Fail	91	Pass	54	Pass
51+000	Flexible	94	Pass	63	Pass	61	Pass
55+000	Flexible	83	Pass	94	Pass	29	Fail

Chainage	Pavement Type	Shoulder Line		Center Line 1		Kerb Line	
		RL (mcd/m²/lux)	Condition (PASS/FAIL)	RL (mcd/m²/lux)	Condition (PASS/FAIL)	RL (mcd/m²/lux)	Condition (PASS/FAIL)
61+200	Flexible	64	Pass	33	Fail	53	Pass
63+000	Flexible	83	Pass	83	Pass	72	Pass
67+000	Flexible	92	Pass	73	Pass	80	Pass
71+000	Flexible	75	Pass	81	Pass	65	Pass

Based on the sample tests carried out it is found that the values of retro reflectivity test results in the above mentioned sections are within limits but at some sections as mentioned table 5.13 & 5.14 the test results have failed and re-painting will be required for achieving the desired standards.

5.7 CONCLUSIONS FROM FIELD INVESTIGATIONS

From the results of FWD and NSV survey it is seen that the present condition of the project road is Good and meeting the performance criteria as given in the Concession Agreement.

Fig 5.1: Retro reflectivity test carried out at site

Fig 5.2: Core cutting and Trial pit test carried out at site

Fig 5.3: CTVC survey, Axle Load survey, NSV vehicle & FWD on Project road

CHAPTER 6.0: OPERATION & MAINTENANCE STRATEGY

6.1 OPERATIONS & MAINTENANCE – REQUIREMENTS OF CONCESSION AGREEMENT

The Scope of Works for O&M stage has been mentioned in the Schedule-M of the Concession Agreement and also the O&M Manual as described earlier. The O&M Manual is a guideline to assist the Concessionaire. Certain forms and procedures are annexed as part of the Manual for facilitating proper supervision and implementation of various O&M activities. The Concessionaire is expected to cover the following two aspects during the entire Operations Period.

a) Operations part

This includes permitting smooth and uninterrupted flow of traffic during normal operating conditions, functioning of Toll system including charging and collecting fees from road user, functioning of patrolling system, functioning of rescue and medical aid services, functioning of the Project Facilities, public toilets and other sanitary facilities and solid waste disposal system.

b) Maintenance part

This includes maintaining the Project Road in traffic worthy conditions and the Project's Ancillary Facilities in usable condition satisfying the performance criteria as provided in the Concession Agreement throughout the Concession Period through regular maintenance and preventive maintenance of the various items and elements of the Project Highway.

6.2 PERFORMANCE PARAMETERS AS PER SCHEDULE K

Table 6.1: Performance Parameter

Sl. No.	Service Factor	Requirement
1	Roughness by Standardized rough meter/ Bump Integrator	Surface roughness shall not exceed 2750mm in a stretch of 1 km
2	Rutting	Not exceeding 10mm in more than 2% of road surface in stretch of 1km (measured with 3m straight edge)
3	Percentage Cracking	more than 5% of road surface in stretch of 1km
4	Ravelling/Stripping of bitumen surface	exceeding 10 sqm
5	Damage to prevent edges	exceeding 100 mm
6	Variation in prescribed side (embankment) slopes	more than 15% in prescribed side (embankment) slopes
7	Edge drop at shoulder	exceeding 40 mm

6.3 MAJOR MAINTENANCE - STATUS & STRATEGY

As per Schedule K of the Concession Agreement the Periodic Renewal will be undertaken so that surface roughness will not exceed 2750 mm/km during entire service life and in the last year of Concession Period**.** Road marking as specified and other roadside features shall also be restored to meet the relevant standards. This Periodic Maintenance shall also include profile corrective course of overlays with the periodic renewal of the wearing course of the road pavement and the wayside amenities.

The PCOD I was achieved on 02th September 2022 for 34.8 km length and PCOD II was achieved on 20th September 2023 for 9.97 km length and the Concession Period ends in September 2037.

6.3.1 STRATEGY OF MAJOR MAINTENANCE FOR CONCESSION PERIOD

From the Roughness Results obtained from NSV survey as brought out in para.5.3 of report, it can be seen that there is no requirement of functional overlay at present.

Further from the results of FWD survey as brought out in para.5.2, it is seen that there is no requirement of any structural overlay on the project road during the remaining concession period. However, in order to meet the performance criteria envisaged in the concession agreement and looking to the condition of the project road, for the major maintenance work to be carried out in the remaining Concession period following strategy is suggested as shown in **Table 6.2** below.

Table 6.2: Major Maintenance Work to be carried out from 2025 to 2037

Sl. no.	Period (year)	Type of Corrective Measures
1	2027-28	On MCW, Micro surfacing in 100% length
2	2030-31	On MCW, functional overlay with BC -40mm in 100% length & On SR, functional overlay with BC -30mm in 100% length
3	2036-37	On MCW, Micro surfacing in 100% length

6.4 ROUTINE MAINTENANCE - STATUS & STRATEGY

In order to cover the requirements of the Concession Agreement and maintain the Asset in accordance with best industry practice the following activities are required to be carried out under routine maintenance in the remain concession period.

i. Maintenance of Potholes & cracks on the pavement surface;
ii. Maintenance of earthen shoulders;
iii. Cleaning of waterways of the structure, ROW & drains;
iv. Removal of vegetation and landscaping like Grass cutting & pruning of shrubs & trees, Watering, Applying manure, pesticide;
v. Maintenance of MBCB & Pedestrian guard rails;
vi. General house keeping of the asset;
vii. Repair of median, kerbs, footpath, Sign Boards, Road Markings etc;

viii. Replacement of damaged /stolen sign boards, fixtures such as cats eyes, delineators;
ix. Electrical Maintenance.

6.5 PRESENT STATUS OF OPERATIONS

6.5.1 CONCESSIONAIRE OBLIGATION STATUS

The status of various obligations are as under**:**

a) The Technical manpower include Project Manager, Senior and Mid-management level Managers, Civil Engineers, Executives for Maintenance, IT, Accounts, HR & Administration.
b) The User Services presently mobilized at site include
   i) Two fully furnished Ambulances and necessary staff including drivers, paramedic and helper.
   ii) Heavy duty tow-away vehicle / crane is available on call.
c) Two Route Patrol Vehicles
d) Tolling System is functional at the Toll Plazas

6.5.2 CONCESSIONAIRE OBLIGATION STRATEGY

One-time replacement of the Toll Management System and Route Patrol Vehicles (2 nos.) and Ambulances (2 nos) is suggested to be considered. The staff deployment for Incident management need to be considered adequately.

CHAPTER 7.0: COSTS

7.0 OPERATION & MAINTENANCE COST ASSESSMENT

7.1 IMMEDIATE REPAIR & RECTIFICATION COSTING

An assessment of immediate repairs/rectifications cost has been made to cover the minor repair and rectification of works found to be deficient w.r.t drawings/standards. Summary of the same is furnished in **Table 7.1** below.

Table 7.1: Details of Immediate Repair & Rectification works to be carried out in 2025-26

Sl.No.	Issues Identified	Recommendations	Financial Implication (in Rs.)
1	Water stagnation issue identified at SVUP Ch. 34+210	Construction of RCC Drain in 200m length (both side)along with Sump well / Soak pit construction cost to be taken	2416000
2	Junction development at Ch. 30+985 & 36+580	Construction of junction area	230000
3	Safety Issues at the junction location at Ch. 36+580, Ch. 46+085, 50+710 & 74+380	Cautionary sign boards to be installed	77000
4	Alignment of the MBCB on the Major bridges & 3 nos. minor bridges with footpath Railing (MCW)	Rectification of the MBCB by aligning the MBCB with the RCC Crash Barrier	2674440
5	Minor repair works at Major bridge 56+730 & cleaning of water ways	Repairs to toe wall and waterway cleaning	52405
6	Minor repair works at few Minor bridges	Repairs to toe wall, quadrant pitching, footpath repair and waterway cleaning	215503
7	Minor repair works at few Underpasses	Repairs to toe wall	69933
8	Floor apron missing at several locations of culverts	Providing floor aprons on culverts	55755
9	Water way affected by the soil deposit and vegetation	Waterway cleaning of culverts	438000
10	Road Marking poor in some sections as per the retro reflectivity test	Road Marking to be redone on the edge and centreline	1631666
	Total (say)		**0.79 Cr.**

7.2 ASSESSMENT OF O&M COSTS

The assessment of the O&M costs has been done by considering works pertaining to Major Maintenance works and repair to the minor damages to the structures and road furniture items. Prevailing market rates & Tamil Nadu SOR rates for the year 2024-25 have been adopted. The details are brought out hereunder.

7.2.1 O & M COST PROJECTION FOR CONCESSION PERIOD UPTO 2037

A summary of the O&M Cost based on 2025-26 rates is furnished in the **Table 7.2 & Table 7.3** below:

Table 7.2: Routine Maintenance & Operation Cost at FY 2026 level is used for future years

Sl. no.	Details	Amount incl. GST (in Cr.)
	Routine Maintenance & Operations Costs (Annual)	
i	Operational Expense	7.59
ii	Routine Maintenance Expense	3.52
	Total	11.11

Table 7.3 Operation & Maintenance Cost Projections (including GST)

Sl. No	Year	Periodic Maintenance Costs (in Cr.)	Routine Operations and Maintenance Cost (in Cr.)
1	2026-27		11.11
2	2027-28	13.50	11.11
3	2028-29		11.11
4	2029-30		11.11
5	2030-31	64.21	11.11
6	2031-32		11.11
7	2032-33		11.11
8	2033-34		11.11
9	2034-35		11.11
10	2035-36		11.11
11	2036-37	24.52	11.11
12	2037-38 *		4.63
	Total	**102.23**	**126.89**

* Till Aug. 2037

7.3 CONCLUSIONS ON O&M REQUIREMENTS

The O&M Costs and the OPEX Projections for the Project Road have been worked out taking into consideration the requirements stipulated in the Concession Agreement the present condition of the road, structure and other assets and the overall maintenance strategy suggested for the remaining Concession Period. The costs cover all the requirements and there does not appear to be any likely-hood of any unforeseen expenditure during the Concession Period.

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INDUS INFRA TRUST

TECHNICAL DUE DILIGENCE SERVICES

FOR

"Development of Six Lane Chittoor-Thatchur Highway from km 61.380 to km 96.040 on Hybrid Annuity Mode in the state of Andhra Pradesh and Tamil Nadu (Package-lll)"

TECHNICAL DUE DILIGENCE REPORT

October - 2025

Submitted By

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LIST OF ABBREVIATIONS USED

Abbreviations	Meaning
AIL	Aggregate Interlayer
AIV	Aggregate Impact Value
ATMS	Automatic Toll Management System
BC	Bituminous Concrete
BOQ	Bill of Quantities
BOT	Build Operate and Transfer
BPC	Bid Project Cost
BT	Bituminous
CA	Concession Agreement
CB	Crash Barrier
CBR	California Bearing Ratio
Ch	Chainage
COD	Commercial Operation Date
COS	Change of Scope
CRMB	Crumb Rubber Modified Bitumen
CTB	Cement-Treated Base
CTSB	Cement Treated Sub-Base
CTVC	Classified Traffic Volume Count
CVPD	Commercial Vehicles Per Day
DBM	Dense Bituminous Macadam,
DLC	Dry Lean Concrete
ECB	Emergency Call Box
EHT	Extra High Tension
EOT	Extension of Time
EPC	Engineering, Procurement, and Construction
Fig.	Figure
FRL	Finished Road Level
FWD	Falling Weight Deflectometer
GFC	Good for Construction
GOI	Government of India
GSB	Granular Sub Base
GST	Goods and Services Tax
HAM	Hybrid Annuity Model
HPC	Hume Pipe Culvert
HPCL	Hindustan Petroleum Corporation Limited
HQ	Headquarters
HSD	High Speed Diesel
HTMS	Highway Traffic Management System

Abbreviations	Meaning
IC / IE	Independent Consultant / Engineer
IMM Cost	Immediate Rectification Cost
IRC	Indian Road Congress
LCV	Light Commercial Vehicle
LL	Liquid Limit
LVUP	Light Vehicular Underpass
MAV	Multi Axle Vehicle
MBCB	Metal Beam Crash Barrier
MCB	Miniature Circuit Breaker
MCW	Main Carriageway
MDD	Maximum Dry Density
MDR	Major District Road
MIS	Management Information System
MjB/MJB	Major Bridge
MnB/MNB	Minor Bridge
MORTH	Ministry of Road Transport & Highways
MPR	Monthly Progress Report
MSA	Million Standard Axles
NCR	Non-Conformance Report
NH	National Highway
NHAI	National Highways Authority of India
Nos, No.	Numbers
NPV	Net Present Value
NSV	Network Survey Vehicle
OGL	Original Ground Level
OpEx	Operational Expenditure
O.M.C	Optimum Moisture Content
O&M	Operation & Maintenance
PCC	Provisional Completion Certificate
PCS	Prestressed Concrete Segmental
PCOD	Provisional Commercial Operation Date
PGR	Pedestrian Guard Rails
PI	Plasticity Index
PL	Plastic Limit
P&P	Plan & Profile
PQC	Pavement Quality Concrete
PSC	Prestressed Concrete
PTZ	Pan, Tilt, and Zoom
RCC	Reinforced Cement Concrete

Abbreviations	Meaning
RE	Reinforced Earth
R/f	Reinforcement
RIS	Reduction in Scope
ROW/PROW	Right of Way/ Public Right of Way
SBC	Safe Bearing Capacity
SG	Site Grading
SOR	Schedule of Rates
SOS	Save Our Souls
SP	Special Publication
SPV	Special Purpose Vehicle
SR	Service Road
TTES	Travel Time Estimation System
VDF	Vehicle Damage Factor
VMS	Variable Message Sign
VUP	Vehicular Underpass
WMM	Wet Mix Macadam

CHAPTER 1: INTRODUCTION

The development of six lane highway project from Km 61.380 (Veera Kaveri Raja Puram) to Km 96.040 (Pondavakkam) is a section (Package III) of a new access-controlled greenfield National Highway No. 716 B, from Chittoor to Thatchur in the states of Andhra Pradesh and Tamil Nadu. This new highway project from Chittoor to Thatchur starts from (CH 0+000) junction of proposed Bangalore -Chennai expressway (CH 152+100) near Chittoor in Andhra Pradesh and ends at NH5 near Thatchur in the proposed Chennai Peripheral Road Project (CH 126+550). The project is managed by M/s KNR Ramagiri Infra Private Limited, following the Concession Agreement signed with NHAI on 10.11.2021, and is getting executed on Hybrid Annuity Model (HAM) under Bharatmala Pariyojana.

1.1 PROJECT ROAD LOCATION

The project road is located in part in southern Andhra Pradesh and in part in northern Tamil Nadu, connecting Chittoor in Andhra Pradesh to Thatchur in Tamil Nadu. By linking the Bangalore–Chennai Expressway with the Chennai Peripheral Ring Road, the project road will facilitate seamless movement of goods and passengers, thereby reducing travel time and decongesting existing road networks. The project location map is provided at Figure 1.1 below:

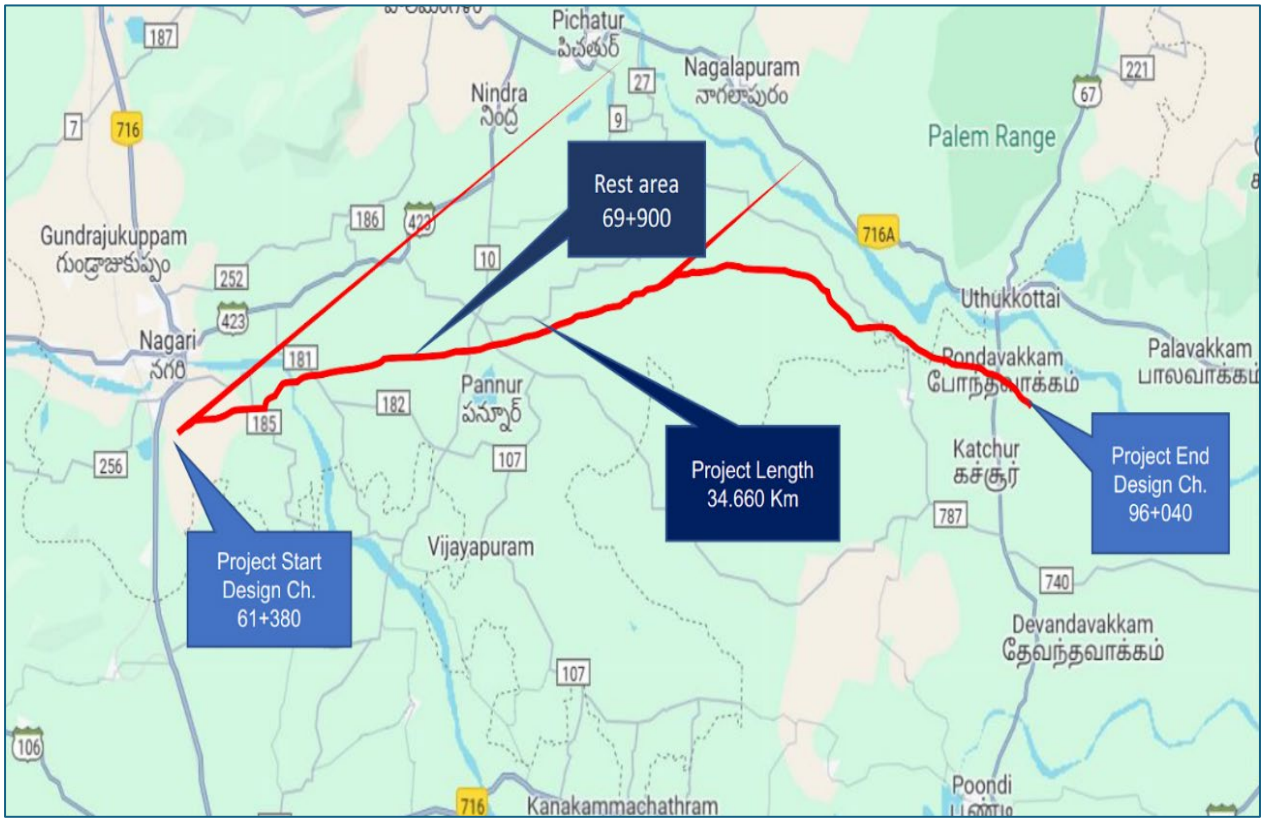

Figure 1.1 Project Location Map

1.2 PROJECT SALIENT DETAILS:-

Table 1.1 Project Salient Details

Sl. No.	Particulars	Details
1.	Name of the project	Green-field six-lane project Chittoor-Thatchur Highway, from Km 61.380 (Veera Kaveri Raja Puram) in the state of Andhra Pradesh to Km 96.040 (Pondavakkam) in the state of Tamil Nadu on Hybrid Annuity Mode under Bharatmala Pariyojana.
2.	Road type	National Highway
3	Design Length	34.660 Km
4	Name of the Authority	National Highways Authority of India
5	Name of the Concessionaire	M/s KNR Ramagiri Infra Private Limited
6	Name of the EPC Contractor	M/s KNR Constructions Limited
8	Independent Engineer (IE)	Dhruv Consultancy Services Limited Joint Venture with Global Infra Solutions Associate with Kaius Consulting Pvt. Ltd.
9	IE Agreement & Mobilization Date	17.01.2022 & 21.02.2022
10	Senior Lender	Axis Bank
11	Date of LOA	24.09.2021
12	Date of Concession Agreement	10.11.2021
13	Bid Project Cost	1041.50 Cr
14	Annual Maintenance Cost	1 Cr
15	Toll Plaza (Ramp Toll Plaza)	01 at (95+444)
16	Safety Consultant	M/s Sri infotech Pvt. Ltd

Sl. No.	Particulars	Details
17	Appointed Date	25.01.2023
18	Concession Period	730 days Construction Period+ 15 Years Operation period commencing from COD
19	Scheduled Completion Date	24.01.2025
20	Issuance of provisional completion certificate	16.12.2024

1.3 SCOPE OF CONSULTANCY SERVICES:-

M/s Resotech Consultancy Services Pvt. Ltd. has been engaged by M/s Indus Infra Trust to carry out a Technical Due Diligence for the Project Road to know-how the present condition of Carriageway and Structures. The scope of work includes: -

1.3.1 GENERAL:-

i. Review of all documents related to Project including but not limited to concession agreement, supplementary agreements, provisional completion certificates, punch list items, completion certificate, clearances, monthly IE reports, correspondence etc.
ii. Review of Change of Scope/ other Claims submitted and to be submitted to Authority / IC, comment on the veracity of the same and approval status.
iii. Highlight any non-compliance of the terms of the CA or O&M manual and IC inspection reports etc.
iv. Review of any pending issues related to Utility shifting, maintenance etc. in accordance with the Concession Agreement.
v. Comment on issues including any balance work that may have a potential impact on the maintenance costs going forward and which may warrant a one-time expense in future.
vi. In general, review the ATMS/ HTMS and the hardware installed therein and comment on the adequacy and level of maintenance of the same to meet the requirements under CA.
vii. Review of as built drawings.
viii. Determine the appropriate level and frequency of routine and major maintenance activities required to keep the road assets in good condition and to meet the performance and O&M standards, specifications and requirements.
ix. Review the major maintenance work undertaken, and prepare projections for future major maintenance expenses (incl. any hand-back requirements), so as to ensure compliance with the terms of CA.
x. Review of the condition of SPV assets including all equipment and vehicles etc.
xi. Report on balance acquisition of land if any and possibility of acquisition.

xii. Report on current encroachments on the project stretch and future expected problems due to the same. Verification of project assets as per As Built drawings/GFC drawings, ensuring that development of project is within PROW without encroaching extra land (check footprint)

xiii. Report on the possibility of project highway augmentation.

xiv. Review of all documents related to construction of project including correspondence exchanged between NHAI, IE, Concessionaire, pavement design report, mix design report for all layers, quality control and quality assurance plan, Work Programme, Methodology, O&M manual, design of structures, IC inspection reports etc. for identification of critical or important issues that could have potential implication.

xv. Review of past routine maintenance and its cost (including review of IE fees shared with Authority during Operation period which includes review of deployment of IE staff, Vehicles and annual testing cost etc.) as applicable for the project.

xvi. Status of registration, licenses, approvals, clearances, and permits required during the operation and maintenance phase, if any as per CA.

1.3.2 ASSESSMENT OF ASSET CONDITION:-

i. Assessment of road assets in conformance with specifications, standards and codes stipulated in CA and O&M manual etc.

ii. A detailed inventory survey of road assets including main carriageway, structures, service roads, lightings, drains, slope protection works, retaining walls, bus bays, bus shelters, truck lay byes, O&M center, road furniture including signages, MCB, guard rails etc. other safety measures, toll collection infrastructure, buildings, plantation, etc.

iii. Assessment of condition of the structures including but not limited to visual inspections of bearings, expansion joints, superstructure, substructures, foundations, associated components, review of geotechnical assumptions. In case of major structures on water bodies that are not accessible from underside, use of drone cameras shall be made to capture the images of bearings etc. to the extent possible.

iv. Assessment of the condition of the road pavement including but not limited to visual inspections of the pavement, review as-built design and assess design assumptions.

v. Assessment of physical dimensions/ condition of the infrastructure to determine useful lives of the materials and equipment requiring rehabilitation and/or replacement.

vi. Assessment of variation/ COS orders on the project, if any, and evaluate their impact on expenditure, time to completion, future O&M obligations and tolling revenue.

vii. Comment on the pavement crust composition (Design vs. Actual) for Rigid/ Flexible pavement as the case may be.

viii. Recommendations for any major repair/ rehabilitation and strengthening based on the condition survey and design reports.

ix. To provide a detailed photographic report of the infrastructure assets and its condition to withstand till end of concession period. Suggestion and cost evaluation for any additional repair / rectification / modification required.

x. Review of condition assessment reports like NSV, FWD, retro-reflectivity, etc.

xi. Analysis of reports on Trial pits for pavement layer composition, Axle load survey, etc.

xii. Review of the most recent tests conducted by the IE on project assets (pre-monsoon and post monsoon reports) FWD, NSV & Axle Load Survey.

xiii. Review of all Highway Lighting for its sufficiency w.r.t IRC specifications and review of average monthly energy, maintenance cost requirements and Comparative statement for actual bill being paid presently with theoretical calculations

1.3.3 INVESTIGATIONS TO BE CARRIED OUT:-

i. Assessing maintenance needs and their valuation according to the level of deterioration.
ii. Evaluation of overall condition of rigid/ flexible pavement, by carrying out visual condition survey.
iii. Carry out drainage surveys to assess any potential future problems related to water logging etc.
iv. Following field investigation report shall be provided by the Client:

- NSV survey
- FWD test analysis.
- Reflectivity test
- Trial pits for pavement composition and engineering properties of various pavement layers.
- Bituminous core test results.
- Classified Traffic Volume Count Survey.
- Axle Load Survey.

1.3.4 O & M ASSESSMENT:-

i. To develop a detailed O&M cost forecast for each year of the concession period and a detailed major maintenance cost forecast along with estimation of costs towards handover requirements.
ii. To provide a detailed Due Diligence Report.

CHAPTER 2: REVIEW OF DOCUMENTS

2.1 REVIEW OF CONCESSION AGREEMENT:-

The Concession Agreement granting the concession right for "Development of Six-lane Chittoor-Thatchur Highway from Km 61.380 to Km 96.040 on Hybrid Annuity Mode under Bharatmala Pariyojana in the states of Andhra Pradesh and Tamil Nadu (**Package -III**)" was executed on 10th November 2021, between NHAI (the "Authority") and KNR Ramagiri Infra Private Limited (the "Concessionaire"). The concession is granted for a construction period of 730 days and operation period of 15 years beginning from the COD, as per the terms and conditions outlined in the Agreement.

2.1.1 SPECIFIC COMMENTS ON ARTICLES OF CONCESSION AGREEMENT:-

The project is currently under construction, with a cumulative physical progress of 82.634 % as of the end of November (2024) according to the IE MPR. The Concessionaire has achieved all three milestones specified in the Concession Agreement, and work is ongoing towards the final commissioning for the issuance of the COD.

The relevant clauses of the concession agreement, which will impact on the Concessionaire's performance during the remaining concession period, have been reviewed and our specific comments on each clause are provided in Table 2.1 below.

Table 2.1 Comments on Concession Agreement

Article & Clause	Subject	Information in Brief	Remarks
Article 3, Clause 3.1.1,	Grant of Concession	Concessionaire received the grant for exclusive rights to construct, operate, and maintain the project for 730 days during construction and 15 years during operation, subject to the agreement's terms.	The Concessionaire is responsible for financing and managing the project while adhering to the agreement, with limited rights to transfer or assign responsibilities.
Article 4, 4.1.2	Condition Precedent for Authority	The Authority was required to fulfill the Condition Precedent within 150 days, extendable by an additional 90 days, from the date of signing the Concession Agreement.	The concessionaire fulfilled the condition precedent within the stipulated period of 150 days, whereas, the Authority did not meet all the condition precedents within the stipulated timeframe; however, the delay damages were waived upon the declaration of the Appointed Date.

Article & Clause	Subject	Information in Brief	Remarks
Article 5 Clause 5.2.2	Obligations relating to Project Agreements: General	Drafts of all Project Agreements and all the replacements and amendments thereto have to be submitted to the Authority for review.	Authority may provide review/comments in 30 days, but a failure to do so on the part of the Authority shall mean a de facto acceptance of the draft.
Article 5, Clause 5.3	Obligations relating to Change in Ownership	Prior approval required from the Authority for any change in ownership or control, particularly for acquisitions amounting to 25% or more of equity of the Concessionaire, or control over its Board of Directors.	This approval is based on, and limited to, national security concerns and public interest, with the Authority's decision being final and binding.
Article 6, clause 6.3	Refinancing	Refinancing is allowed but requires prior consent from the Authority, in conformity with Government/RBI guidelines.	The Authority will aim to convey its decision within 30 days of receiving the proposal.
Article 9, Clause 9.1,9.3	Performance Security and Release of Performance Security	The Concessionaire is required to provide a Performance Security of Rs. 31.25 crore within 30 days of the Concession Agreement signing date.	The security may be released after one year from the Appointed Date or once 30% of the project cost is spent, whichever is earlier. The original Bank guarantee was returned to the Concessionaire on 21.02.2024 (within one year).
Article 10, Clause 10.3	Procurement of the Site	The Authority is required to grant the Concessionaire vacant access and Right of Way to at least 80% of the Site by the Appointed Date, ensuring it is free from encumbrances, and shall be liable for Damages in case of any delay. The Concessionaire, in turn, must safeguard the site against encroachments and complete construction on all lands where the Right of Way has been provided within 146 days or by the scheduled completion date.	(i)The Authority was able to procure ROW to an extent of 80%, for declaration of Appointed Date for the project, after passing of one year from the signing of the Concession Agreement. 25th January 2023 was declared as the Appointed Date and ROW of 27.770 Km out of 34.660 Kms (80.12%) was handed over to the concessionaire.

Article & Clause	Subject	Information in Brief	Remarks
Article 10, Clause 10.9	Land for wayside Amenities	The Concessionaire shall use the additional land specified in Schedule-A for wayside amenities like toilets, rest areas, cafeteria, motels, medical facilities and other facilities or amenities.	It is under the process of descoping.
Article 11, Clause 11.1	Existing utilities and roads	The Concessionaire must ensure that existing road, right of way, or utility owners can maintain their utilities in satisfactory use, providing necessary diversions with the relevant authority's approval.	Upon written request from the Concessionaire, the Authority will initiate legal proceedings for acquiring any necessary right of way at the Concessionaire's cost.
Article 11 Clause 11.2	Shifting of Obstructing Utilities	1. The Concessionaire is responsible for shifting any utilities (electric lines, water pipes, telephone cables) that adversely affects the execution or maintenance of the Project Highway, in accordance with applicable standards and specifications of concerned utility owning entity. 2. The cost of shifting utilities listed in Schedule B is covered in the Bid Project Cost, while costs for shifting utilities not included in Schedule B are treated as a Change of Scope. 3. If there are delays not caused by the utility owner, the Concessionaire remains responsible for performance failures.	The Authority will assist in obtaining estimates from utility owners, and the Concessionaire must execute the work under the supervision of the utility owner and the Independent Engineer. Supervision charges shall be paid by the Authority to the utility owning entity. Utility shifting can commence at any time after the agreement is signed.
Article 12, Clause 12.3	Construction of the Project	(i) The Concessionaire must complete the Project by the Scheduled Completion Date, 730 days from the Appointed Date, in accordance with the	The Concessionaire has achieved Milestones 1 & 2 before the Scheduled date, and Milestone 3 was achieved within the 90-day grace period. The Concessionaire

Article & Clause	Subject	Information in Brief	Remarks
		specifications in Schedule-B, Schedule-C, and Schedule-D. (ii) If any Project Milestone is delayed beyond 90 days, the Concessionaire must pay Damages at a rate of 0.1% of the Performance Security per day, unless the delay is due to Force Majeure or the Authority's actions.	has made a request to the Authority to issue PCOD for the Andhra Pradesh stretch w.e.f. 16th Dec 2024. (Scheduled Completion Date as per CA is 24.01.2025).
Article 14, Clause 14.1	Tests	At least 30 days before the expected completion of the Project, the Concessionaire must notify the Independent Engineer of its intent to subject the Project to Tests which shall be conducted by the IE. Date and time of each test shall be determined by the IE in consultation with the Concessionaire.	All tests shall be conducted in accordance with Schedule I at the cost and expense of the Concessionaire. The Concessionaire in its letter dt. 16.12.2024, informed that all the tests are completed and testing results were handed over to IE.
Article 14, Clause 14.3, 14.4	Provisional Certificate and Punch List	The Independent Engineer may issue a Provisional Certificate for part of the Project subject to: a. The Concessionaire has completed construction on 100% of the available site made available within 146 days from the Appointed Date; and b. Tests are successful and the Project can be safely operated, even if some works are incomplete. The Provisional Certificate will include a Punch List of outstanding items, signed by both the IE and the Concessionaire.	(i) Once Provisional Certificate gets issued, the provisions of Article 15 [Entry into Commercial Service] will apply to the completed part, and the Concessionaire's rights and obligations will be adjusted accordingly. (ii) The Concessionaire must complete all Punch List items within 90 days of the Provisional Certificate's issue, with a penalty for delays, and may be granted an additional 120 days to complete them, subject to applicable Damages, while delays caused by the Authority or Force Majeure will lead to an adjusted

Article & Clause	Subject	Information in Brief	Remarks
			completion date determined by the IE.
Article 15 Clause 15.1	Commercial Operation Date (COD)	(i) The Project is deemed complete when the Completion or Provisional Certificate is issued, marking the Commercial Operation Date (COD), after which the Concessionaire can collect Annuity Payments. (ii) If COD is not achieved within 91 days of the Scheduled Completion Date, unless the delay is on account of reasons attributable to the Authority or FME, the Concessionaire shall pay Damages of 0.2% of the Performance Security for each day of delay until COD is reached.	If the Concessionaire fails to pay the damage, the same shall be recovered from the Annuity payments / any further amount due, with applicable interest.
Article 16 Clause 16.2	Procedure for change of scope	After receiving a change of scope notice, the Concessionaire shall provide the following information supported with preliminary documentation: - (i)Impact on the project completion schedule, (ii) A detailed breakdown by work classification specifying the material and labour costs, calculated in accordance with the applicable SOR.	The concessionaire should also propose a premium/discount on the SOR Rates.
Article 16 Clause 16.6.1	Reduction in Scope of the project	If the Concessionaire cannot complete any construction due to Force Majeure or Authority issues, the total cost for the reduced scope is calculated in specified steps. Total Cost of	With the reduced scope, the revised bid cost will be applied to all future payment calculations.

Article & Clause	Subject	Information in Brief	Remarks
		Reduced Scope shall be calculated as: i. IE shall assess the Civil Cost of the Reduced Scope as per the SOR applicable on the bid due date. ii. Civil Cost of the Reduced Scope shall be multiplied by 1.04 to arrive at the estimated cost of Reduced Scope. iii. The Estimated Cost of Reduced Scope shall then be multiplied by the ratio of Bid Project Cost to Estimated Project Cost to arrive at the Total Cost of Reduced Scope.	
Article 16 Clause 16.7	Effect of Change of Scope on the O&M Costs	If the Change in Scope leads to a reduction or increase in the length of the Project Highway, the O&M Payments shall reduce or increase in the same proportion.	As per the records made available, No Change of Scope for increase /decrease in the length of the Project Highway has been initiated.
Article 17 Clause 17.1	Operation and Maintenance obligation	The Concessionaire shall operate and maintain the Project Highway and make necessary improvements to comply with contract provisions.	The O&M requirements are outlined comprehensively in this clause, with maintenance details in Schedule K.
Article 17 Clause 17.3	Maintenance Manual	First submission (prepared in consultation with IE) should be submitted 3 months before the scheduled completion.	First Submission of the Maintenance Manual was made on 12.11.2024. The Maintenance Manual will be updated once every three years.
Article 17 Clause 17.4	Maintenance Program	On or before COD and for each year of the operation period, the concessionaire shall provide its proposed annual program of preventive, urgent and other scheduled	The program should detail schedules, repair procedures, safety measures, and be submitted 45 days before each fiscal year during the operation period.

Article & Clause	Subject	Information in Brief	Remarks
		maintenance to comply with the maintenance requirements.	
Article 17 Clause 17.5	Safety, vehicular breakdown, and accidents	The Concessionaire shall ensure safe conditions for Users and, in case of unsafe conditions, closures, diversions, breakdowns, or accidents, promptly follow operating procedures, including setting up temporary lights and removing obstructions.	Concessionaire shall maintain and operate a 24/7 rescue post with equipment to remove obstructions and debris promptly.
Article 18 Clause 18.1 &18.2	Safety Consultant	The Authority shall appoint an experienced and qualified firm as the "Safety Consultant" for carrying out safety audits of the Project Highway. The Concessionaire shall bear all costs and expenses related to Safety Requirements to the extent that they are part of the works and services included in the Scope of the Project. Any works and services not included in the Scope shall be carried out and funded as per the provisions of Article 16.	The Authority has engaged M/s Shri Infotech, as the Safety Consultant for the Project vide LOA Dated 18.01.2023.
Article 20 Clause 20.2, 20.3& 20.7	Police Assistance	The Concessionaire shall procure police assistance, including, provision of a jeep with chauffeurs for round-the-clock patrolling and setting up Traffic Aid Posts. The Concessionaire will construct the Traffic Aid Post, following State designs, at its own cost, ensuring the buildings do not exceed 25 square meters and are handed over to the	The Authority will assist in procuring police support. The Traffic Aid Posts will be considered part of the Site and will vest in the Authority. Recurring expenditure (salary and allowances of chauffeurs for round-the-clock patrolling service, operating cost of running the patrolling vehicle) on police assistance shall be borne by the Concessionaire.

Article & Clause	Subject	Information in Brief	Remarks
		Authority 60 days before the Scheduled Completion Date.	
Article 20 Clause 20.4, 20.5&20.8	Medical Aid Post	The Concessionaire will support the State or a substitute thereof in establishing a Medical Aid Post with round-the-clock ambulance services at the Toll Plaza. The Concessionaire shall construct a medical aid post building and two residential quarters, as per State Medical Department designs, at its own cost, and hand them over to the Authority 30 days before the Scheduled Completion Date.	The Medical Aid Posts will be part of the Site and vest in the Authority. Recurring expenditure (salary and allowances of chauffeurs for round-the-clock ambulance service, actual expenditure on the medical equipment, pay & allowance of two medical personnels and maintenance cost of medical aid post) shall be borne by the Concessionaire.
Article 20, Clause 20.6	Computer Systems and network	The Concessionaire shall install, operate, and maintain a computer system with 24/7 connections to the Authority and related entities for data exchange.	The Protocol, as specified by the Authority, shall be followed for Electronic Data Interchange.
Article 21 Clause 21.1and 21.3,21.7	Independent Engineer	The Authority shall appoint an IE initially for a period of construction period +6 months. On expiry date, the Authority shall appoint an IE for a further term of 3 years. The same process shall be repeated after the expiry of each appointment.	(a) Agreement Date – 17.01.2022, IE Mobilization Date – 21.02.2022. (b)The Concessionaire shall reimburse half of the IE's remuneration, cost, and expenses to the Authority, subject to the limit set forth in Schedule M. The limit is 3% of the Bid Project Cost during the development and construction period.
Article 23, Clause 23.1,23.2, 23.3, 23.6.4	Bid Project cost and payment	The Bid Project Cost, set at INR 1041.50 Crore, represents the amount payable to the Concessionaire. It will be adjusted by the Price Index Multiple.	The percentage of completion costs remaining to be paid for each annuity has been indicated in the table given in Clause 23.6.3. Each of the biannual installments shall be paid along with interest on the reducing balance of Completion

Article & Clause	Subject	Information in Brief	Remarks
		(i) 40% of the BPC (Bid Project Cost), adjusted for the Price index Multiple shall be paid in 10 equal installments of 4% each during the construction period. (ii) Remaining 60% of the BPC duly adjusted for the Price Index Multiple shall be paid in 30 biannual installments	Cost – average of one-year MCLR of top 5 scheduled commercial banks plus 1.25% calculated on a simple interest basis.
23.6.2	Annuity Payments	The completion cost remaining to be paid after the construction period shall be due and payable in biannual installments over a period of 15 years commencing from COD.	The first installment will be due and payable within 15 days after 180 days from the COD. Subsequent installments will be due and payable within 15 days following the end of each successive six-month period. The final annuity payment will be adjusted to ensure it aligns with the end of the Operation Period.
Article 23, Clause 23.7	O&M Payments	(i) First year O&M Cost for the project is INR 1.00 Crore. (ii) Each installment of O&M payment is the product of the First year O&M Cost and the price index multiple.	The O&M payment shall be disbursed in two equal biannual installments alongside the annuity payments.
Article 23, Clause 23.9	Treatment of incomplete works	If incomplete work is deemed unnecessary, the Authority may adjust the project scope, annuity, and O&M payments accordingly.	For provisional COD, payments will proceed as if the project is complete.
Article 25, Clause 25.3	Withdrawals during Concession Period from Escrow Account	Deposit in the Escrow Account shall be appropriated in the order given in Clause 25.3.1.	For any modification in the order of payment, the Concessionaire has to take prior written approval of the Authority.

Article & Clause	Subject	Information in Brief	Remarks
Article 26, Clause 26.1	Insurance during concession period	The concessionaire shall affect and maintain at its own cost, during the concession period, insurances required under the Financing Agreements and applicable laws. The Authority is a co-insured party, and the proceeds go to the Escrow Account.	Status of Insurances: (i) Contractor All Risk Policy-valid up to 15-02-2025+ 60 months maintenance period (ii) Employment Compensation Insurance – valid up to 15.02.2025
Article 27	Account and Audit	On or before 31st May of each year, the concessionaire shall provide a duly audited statement on revenues derived from the Project by its statutory Auditors.	Statutory Auditors shall be appointed from the mutually agreed list of 5 firms (Panel of Chartered Accountants). The Authority may also appoint another firm from the Panel to act as Additional Auditor.
Article 28, Clause 28.6	Effect of Force Majeure Event on the Concession	If a Force Majeure Event occurs before the Appointed Date, the deadlines for fulfilling Conditions Precedent and achieving Financial Close will be extended by the duration of the event. After the Appointed Date, Force Majeure may extend the Construction Period or, if after COD, the Concessionaire will be entitled to Annuity Payments plus interest due, subject to deduction of any outstanding dues of the Authority.	Costs arising from Force Majeure before the Appointed Date will be borne by each party individually. Upon occurrence of a Force Majeure Event after the Appointed Date, cost shall be allocated and paid as per Clause 28.7.2
Article 32	Divestment of Rights and interests	Completion of divestment occurs once requirements in Clause 32.1.1 are met, with the Authority issuing a Vesting Certificate. The requirements are: (a) the location and particulars of the Project Assets be Notified to the Authority:	The concessionaire shall extend requisite corporation and assistance to the Authority for smooth transfer of the project. All costs incidental to Divestment except stamp duty, are to be borne by the concessionaire.

Article & Clause	Subject	Information in Brief	Remarks
		(b) Deliver actual or constructive possession of the Project, free of all Encumbrances. (c) Cure all Project Assets of defects and deficiencies to ensure compliance with Maintenance Requirements. (d) Deliver and transfer relevant records, reports, Intellectual Property, licenses, and complete 'as built' Drawings. (e) Transfer and/or deliver all Applicable Permits. (f) Execute deeds of conveyance, documents, and other writings as required by the Authority. (g) Comply with all other requirements under Applicable Laws for completing the divestment and assignment of all rights, title, and interest in the Project.	
Article 34, clause 34.3	Substitution Agreement	The Lenders' Representative may exercise the right to substitute the Concessionaire through a Substitution Agreement, which allows a Nominated Company to take over the Concessionaire's rights and responsibilities	Substitution Agreement to be entered into amongst the Concessionaire, the Authority and the Lenders' Representative, on behalf of Senior Lenders, substantially in the form set forth in Schedule-R.
Article 35	Change in Law	If as a result of Change in Law, the concessionaire suffers an increase/reduction in costs, the aggregate financial effect of which exceeds the higher of Rs. 1.69 Crore or 2% of the total annuity payment in any	The GST Council increased the rate on road work services from 12% to 18%, effective 18th July 2022. The Concessionaire in its letter dated 30-07-2022 had notified a claim of Rs. 68.21 Cr for

Article & Clause	Subject	Information in Brief	Remarks
		accounting year, an amendment to the concession Agreement be implemented to bring the concessionaire in the same financial position, as it would have enjoyed had there been no such change in Law.	the financial impact on the grant amount due to this change in law. The Concessionaire had notified a change in law relating to Royalty rate/Seignorage charges vide a letter dated 03.05.2023. The claim will be submitted after the completion of work.
Article 38	Dispute Resolution	Dispute shall, in the first instance, be resolved with the DRB, followed up with conciliation procedure, failing which it shall be resolved through Arbitration.	Arbitration shall be conducted in accordance with the rules of "SAROD" and shall be subject to the provisions of A&C Act, 1996, and any amendments made thereto.
Article 41, Clause 41.4	Delayed Payments	Payments under the Concession Agreement are due within specified periods, with late payments incurring 4% interest above the daily average bank rate.	Interest accrues daily and compounds quarterly.
Article 41, Clause 41.9	Entire Agreement	This Agreement, along with its Schedules, constitutes the complete and exclusive understanding between the Parties. No amendments are valid unless agreed upon in writing by both Parties	Settlement Agreement is under deliberation by the parties, and shall become a part of the "Entire Agreement" when signed.
Article 42	Definition	"Change in Law" means the occurrence of any of the following after the Bid Date: (a) The enactment of any new Indian law; (b) The repeal, modification or re-enactment of any existing Indian law; (c) The commencement of any Indian law which has not entered into effect until the Bid Date;	As the Bid for the subject Project was submitted on 07.04.2021, and hence the occurrence of any of the events after that date constitutes Change in Law.

Article & Clause	Subject	Information in Brief	Remarks
		(d) a change in the interpretation or application of any Indian law by a judgment of a court of record which has become final, conclusive and binding, as compared to such interpretation or application by a court of record prior to the Bid Date; or (e) Any change in the rates of any of the Taxes that have a direct effect on the Project.	

2.1.2 IMPORTANT PROVISIONS OF SCHEDULES:-

Schedule A

i. The project is a green field project, hence there is no existing structures.

ii. There are 7 tanks/ponds measuring length from 120 to 570 m along the project alignment.

iii. No change of Scope shall be paid for any over ground utilities. However, for any underground utilities not mentioned in schedule B shall form change of Scope.

Schedule B

i. Pavement type - For MCW &Slip Road (Ramp of Interchange 650 m) - the flexible pavement shall be designed for minimum 130 MSA with 7%CBR ,Design period 20 years and phase construction is not permitted . For Connecting Road (4810 m) ,the flexible pavement shall be designed for minimum 5 MSA with 7%CBR ,Design Period 15 years . For toll plaza including tapering zone -Rigid pavement
ii. The ROW has been taken as 60 m for the proposed highway except at interchange location, toll plaza location, junction improvement location and wayside amenities area ,where the ROW varies as per drawings and design requirement.
iii. Shoulders of the Project Highway shall include a 0.5 m wide edge strip flanked by 3.0 m wide treated earthen shoulder on each side.
iv. The Superstructure of all bridges, culverts and structures is to be designed for edge movement of the vehicle considering stitching of new superstructure in future due to widening to 10 lanes.
v. Special vehicle loading is to be considered in Design of structures.
vi. Congestion factor to be considered as per IRC 6-2017.
vii. RCC retaining wall /RE Retaining structures shall be constructed for a minimum length of 11.945 Km (both side inclusive).

viii. The slope protection up to 3m height shall be carried out with turfing and slope protection above 3 m height shall be carried out with geogrid as per IRC: SP:59-2019.
ix. Rainwater harvesting pit shall be provided on either side of road in 500 m interval.
x. RCC boundary wall shall be provided along the entire length on either side (including transverse requirements at structure locations).
xi. Traffic signage plan shall be improved /upgraded based on site /design requirement as per IRC: SP:87-2019 and IRC 67-2012.

Schedule C

i. Close tolling system shall be provided in entire length of the project (116.100Km) and the same is integrated with the adjoining packages /highway.
ii. There is no toll plaza in this section. There is one Interchange /Ramp Plaza at Km 95.444, consisting of two toll booths with 2 no. of toll lanes equipped with ETC.
iii. Traffic Control Devices, Road safety Devices and roadside furniture shall be provided as per section 9 and 10 of IRC: SP:87-2019.
iv. One no. Highway patrol vehicle fitted with GPS having tracking facility shall be provided.
v. Emergency medical service shall be provided with provision of a GPS fitted, "two patient capacity" rescue ambulance with all lifesaving equipment ,trained staff and first aid items on 24x7 basis during the entire concession period.
vi. The Concessionaire shall provide crane service to clear the disabled /accident met vehicles. The crane should be fitted with a GPS-based vehicle tracking system.
vii. Wayside amenities on both sides of project highways at km 69.900 to be developed.
viii. Advance traffic Management system shall be provided for a length of 34.660 km. The concessionaire shall co-ordinate with package IV and other adjoining packages/highways /expressways for effective and efficient work of ATMS. There shall be no central control room in this package. ATMS provisions for this package must be integrated with CCR provided in package I.

2.1.3 REVIEW OF SETTLEMENT AGREEMENT: -

We have received a draft of the Settlement Agreement which has not been signed as of the date of our reciept, and this review hereunder is based on the draft, and should be read with modifications or amendments, if any, made subsequently.

Both parties involved in the Concession Agreement, the National Highways Authority of India (NHAI) and M/s KNR Ramagiri Infra Private Limited, jointly agreed to resolve outstanding issues relating to issuance of PCC-1, due bonus, and the completion of entire project as per the terms of this Agreement, and other matters related to the project through conciliation. Such matter would be referred to a sole conciliator, and following the Conciliation hearing, the Settlement Agreement will be executed under the provisions of Section 73 of the Arbitration and Conciliation Act, 1996, as amended by the Amendment Act, 2015.

2.1.3.1 KEY ASPECTS OF THE SETTLEMENT AGREEMENT:-

A. Background: --

i. The Concession Agreement for the project was executed on November 10, 2021, with the Appointed Date for the Project being January 25, 2023. The construction period for the project was set at 730 days from the Appointed Date, with a Scheduled Completion Date of January 24, 2025. The Concessionaire had requested EOT owing to the delay in handing over the land in the Tamil Nadu stretch. However, no extension of time had been granted by the Authority as of that date.

ii. The Authority has provided ROW for 80.12% of linear length (27.770/34.660 Km) through Joint Memo dt. 31.12.2022.

iii. As of December 16, 2024, the project was 85.467% complete from 61.380 Km to 91.965 Km (30.585 Km) and requested PCC upon compliance to the Safety Audit report, delinking the stretch from 91.965 Km to 96.040 Km (4.075 Km) which was not handed over within 146 days of the Appointed date, and agreeing to complete the de-linked stretches during the O&M period. The remaining work is the delinked stretch on BHS, and was delayed due to taking up of the work in the Tamil Nadu stretch due to protests regarding compensation in LA, which has been subsequently resolved.

iv. Punch List A – to be completed within 90 days from PCOD; and Punch List B – balance work which cannot be completed within 90 days from PCC due to delay in handing over of land after AD+146 days, were prepared, and the Concessionaire agreed to delink the work under Punch List B from PCC and complete the same during O&M period without any additional cost to the Authority.

v. One COS case is under finalization, and the final amount will be clear once this Agreement is signed. The COS includes the construction of 2 box culverts at 92+350 (1x6x3) and 92+100 (1x2x2); paved shoulders in RE wall approaches against treated shoulders in CA; New Utility Ducts size 600mm Día 5Nos; Construction of Wayside Amenities; Provision of ATMS and allied furniture & Sign Boards as per MoRTH New Circular Dt-20-07-2023 & Latest IRC-67-2022 Specifications; and Descoping of Boundary wall due to local farmers demand to have access from one side to other side of the Project alignment. (Appx. Length 14.869 Km LHS+RHS)

vi. Concessionaire has formally requested for amicable settlement of issues in connection to issuance of PCC for a proposed length of 30.585kms, delinking of balance 4.075km to be completed during O&M period

B. Terms of the Settlement Agreement and Obligations of Authority & Concessionaire:-

i. Concessionaire proposed to complete the entire project in Punch List A by 16.12.2024, after which PCC-1 will be issued as per the CA and IE shall finalize BPC-1 corresponding to PCC-1.

ii. There are no pending LA & other clearance issues in Punch List B, and the balance ongoing works shall be completed by the Concessionaire within 06 months from the date of issuance of PCC-1. EOT may be applicable if it is made necessary by force majeure as per site condition. After completion of balance works in Punch List B, PCC-2 will be considered as per the CA, and IE shall finalize BPC-2 corresponding to PCC-2. However, if the balance works in Punch List B are not completed within 06 months

from the date of issuance of PCC-1 for reasons attributable to the Concessionaire, 1st Annuity will be deferred till completion of the balance works. Concessionaire agreed not to claim any interest on the delayed payment of Annuity, if any.

iii. For works in Punch List B, including the interchange, the adjustment of BPC based on Price Index Multiple (PIM) shall be applicable till the balance work is completed.

iv. The Annuity Payments (Clause 23.6.3 of CA), Interest on reducing balance (Clause 23.6.4 of CA), O&M Payments (Clause 23.7 of CA) will be made in accordance with completed lengths and corresponding BPC as given below:

(a) Commissioning Plan (PCC – 1 and PCC – 2).

Table 2.2 BPC for 30.585 Kms.

PCC	Assumed Completion Date	Completed Length	BPC corresponding to completed length
PCC-1	16.12.2024	30.585 Kms.	BPC-1
PCC-2	-	4.075Kms (MCW including interchange)	BPC-2+COD

(b) If PCC-2 is achieved before 14.06.2025.

Table 2.3 Annuity Start Date Case – I.

Annuity	Assumed Due date	Annuity Payment (Cl. 23.6.3)	Interest Payment (Cl. 23.6.4)	O&M Payment (Cl. 23.7)
1st Annuity	14.06.2025	BPC-1+BPC-2	BPC-1	BPC-1
2nd Annuity	14.12.2025	BPC-1+BPC-2	BPC-1+BPC-2	BPC-1+BPC-2

(c) If PCC-2 is achieved between 14.06.2025 & 14.12.2025.

Table 2.4 Annuity Start Date Case – II.

Annuity	Assumed Due date	Annuity Payment (Cl. 23.6.3)	Interest Payment (Cl. 23.6.4)	O&M Payment (Cl. 23.7)
1st Annuity	Date of achievement of PCC-2	BPC-1	BPC-1	BPC-1

Annuity	Assumed Due date	Annuity Payment (Cl. 23.6.3)	Interest Payment (Cl. 23.6.4)	O&M Payment (Cl. 23.7)
2nd Annuity	14.12.2025	BPC-1+BPC-2	BPC-1+BPC-2	BPC-1+BPC-2

v. Concessionaire/IE to finalize the cost of COS/RIS items within 15 days of Settlement Agreement. Authority has agreed to convey its decision on COS/RIS Works within 30 days of Settlement Agreement. IE will provide the net cost of COS/RIS to the Authority to issue COS order, based on the following principles:

   a. Net cost of COS considering Revised Scope and Original Scope using Basic Rate from SOR of AP (2021-22) and using MoRTH Data Book duly applying Tender Discount of 8.83% as quoted by the Bidder based on Assessed Bid Price.

   b. No other cost like escalation, design charges, insurance, etc., shall be considered.

   c. The cost of RIS items shall be determined as per Clause 16.6 of CA having SOR applicable at Bid Due Date and accordingly, BPC shall be reduced by the Total Cost of Reduced Scope.

   d. Concessionaire agreed on the above principles for determining the cost of COS.

   e. All parties to expedite & ensure that COS Order is issued by 31.12.2024.

vi. NHAI agreed that the due bonus amount shall be given as per the CA for completed length of 30.585 Km (Punch List A), excluding punch list A items which could not be completed within 90 days. IE shall finalize BPC-1 corresponding to PCC-1 for calculation of bonus as per Cl.23.5 of CA with due regard to all RIS items that affect BPC-1.

vii. In exchange for these considerations, the Concessionaire agreed not to claim any additional costs, such as prolongation costs, bonuses, overheads, plant & machinery idling costs, loss of profit, or any other related costs.

viii. Both parties confirmed that they have no further claims, demands, disputes, or differences against each other regarding the Concession Agreement, and all claims, including those arising from the Concession Agreement, were considered settled without any further recourse.

This settlement marks the resolution of key issues between the parties, providing clarity on the completion timeline, cost adjustments, and dispute resolution mechanisms.

2.1.4 CONCLUSION ON OBSERVATIONS ON CONCESSION AGREEMENT:-

The Concession Agreement is comprehensive and covers all the issues concerned with the Construction and Operation of the Project. It is seen that the provisions in the Agreement are spelt out clearly, and without material ambiguities.

2.2 REVIEW OF EPC AGREEMENT:-

The Concessionaire appointed M/s KNR Constructions Limited (KNR) as the EPC Contractor for the design, procurement, construction, testing, completion and commissioning of the project as per terms of the Concession Agreement on a fixed time and fixed price basis, with no price escalation whatsoever required. The EPC contract was signed on 30th March ,2022.

2.2.1 KEY PROVISIONS OF THE EPC CONTRACT:-

i. The EPC Contractor is responsible for constructing and commissioning the Project Highway as per requirements and standards prescribed in the Concession Agreement and shall rectify defects and provide maintenance until the end of the Defect Liability Period.
ii. EPC Contractor shall be wholly responsible for the detailed engineering design, drawings and procurement for the entire construction works at its cost. Cost savings resulting from adopting the design modifications/changes, as proposed by the EPC Contractor and accepted by the Authority, shall be to the benefit of the EPC Contractor and similarly any additional costs incurred due to the adoption of the modification /changes, shall be borne by the EPC Contractor.
iii. The EPC Contractor will assume control of the site from the Authority on behalf of the Concessionaire, as stipulated in the Concession Agreement. The Works must be performed according to the Implementation schedule, and any alteration shall require Concessionaire's approval. Monthly updates on performance status shall be provided to the Concessionaire.
iv. If the EPC Contractor fails to address delays, the Concessionaire may take necessary actions (including completing the Works) at the EPC Contractor's expense. Any costs incurred will be deducted from the Contract Price or other amounts payable.
v. The EPC Contractor shall assign to the Concessionaire all the EPC Contractor's rights under the subcontract's warranties within five (5) calendar days from (a) termination of this Agreement; or (b) the date of issuance of the Completion Certificate, whichever is earlier. The EPC Contractor will keep the Concessionaire indemnified from any claims or liabilities arising from subcontractors or supplier.
vi. The EPC Contractor shall be fully responsible for removal of all encumbrances, shifting of utilities, land acquisition and performing all works for making the Site encumbrance free. Payment to the EPC Contractor shall be made only to the extent of back-to-back basis as released by the Authority to the Concessionaire.
vii. The EPC Contractor shall purchase and maintain required insurance at its cost, including third-party liability coverage with a cross-liability clause (the insurance shall apply to the EPC Contractor and the Employer as if both are separately insured), and provide proof to the Concessionaire. The Contractor is responsible for indemnifying the Concessionaire against any damages or compensation claims.
viii. The EPC Contractor shall obtain and maintain all necessary permits for the Project Highway at its cost, ensuring compliance with applicable laws and conditions. The

Contractor is responsible for avoiding legal issues and ensuring smooth project implementation and operation.

ix. The cost for the Independent Engineer is borne by the Concessionaire/Authority, with no financial obligation on the EPC Contractor.

x. The Employer will pay the EPC Contractor a total of Rs. 856.80 Crores. This includes Rs. 765.00 Crores as the fixed EPC basic price and Rs. 91.80 Crores for GST subject to adjustment in accordance with CA, without any escalation on any account. Payments will be made monthly based on work progress, as per the Billing Schedule in Annexure-I. These payments are subject to contractual and statutory tax deductions and certification by the Lender's Engineer. The Contract Price covers all obligations, risks, and costs for completing the Works.

xi. The EPC Contractor shall pay all Taxes, duties and fees payable on the Contract Price. All applicable taxes, duties and levies include but not limited to income tax and all other applicable taxes and duties (including GST, labour cess, works contract tax, duties, royalties /seigniorages, municipality/village taxes, overheads, profits and all other applicable taxes) which are currently in force and/or which may be levied in future. These taxes shall be deemed to be included in the Contract Price. In no event shall the Employer be liable for or responsible for the payment of any taxes. The Contractor shall indemnify the Employer for any losses resulting from the failure to comply with tax obligations.

xii. The Concessionaire shall pay a Mobilization Advance of Rs. 85.68 Crores including GST to the EPC Contractor in two tranches— 50% within 15 days of EPC Agreement and 50% after procurement of land and setting up of camp office. Recovery of Mobilization Advance and interest on it will be made in line with recovery made by the Authority from the Concessionaire as per the terms of the Concession Agreement @ 7.50% p.a. and contractor shall submit an account of utilization of the advance within 6 months, recoverable by the employer on account of non-performance.

xiii. If the Concessionaire incurs costs due to the EPC Contractor's failure to perform or rectify deficient work, the EPC Contractor must promptly reimburse these costs (including bank charges) upon request. This is in addition to any liquidated damage.

xiv. If the Authority requires changes or additional works beyond the original scope of the Project, the Concessionaire has the right to make corresponding changes to the Scope of Works. The EPC Contractor shall follow the procedure defined in the Concession Agreement for Change of Scope. For changes resulting in additional costs, the Employer will reimburse the EPC Contractor to the extent of compensation received from the Concession Authority. Conversely, if the change results in cost reduction, the Employer is entitled to adjust the contract price accordingly.

xv. For relief due to a Change in Law under Article 35 of the Concession Agreement , the EPC Contractor must provide financial impact details to the Concessionaire, who will forward them to the Authority. Upon receipt of payment, the Concessionaire will transfer the amount to the EPC Contractor.

xvi. The EPC Contractor shall carry out all necessary tests to ensure the Works meet the design, construction, and operational requirements. The Independent Engineer will issue the Completion Certificate once the tests are successful, and the Works can be safely opened for commercial operation. If certain parts of the Project Highway are

incomplete, a Provisional Certificate may be issued, listing the outstanding items in a Punch List, which must be completed within 90 days.

xvii. The EPC Contractor is responsible for maintaining the Project Highway and the existing road at its cost during the Implementation Period, ensuring smooth traffic flow and minimal disruption. "Implementation period" means the period beginning from the Appointed Date and ending on the receipt of Completion Certificate as defined in the Concession Agreement.

xviii. The Defects Notification Period is 2 years from the Completion Certificate issuance, during which the EPC Contractor must address defects. It may be extended for any period the Project Highway is unusable but cannot exceed a total of 4 years. [Clause 9.3 r/w 9.5]

xix. The Concessionaire will issue the Performance Certificate within 14 days of the Defect Notification Period's end, provided the EPC Contractor has submitted all required documents. Upon issuing this certificate, the EPC Contractor's obligations will be deemed completed, but any unfulfilled obligations remain enforceable.

xx. If completion of the Works is delayed due to reasons attributable to the EPC Contractor, the EPC Contractor shall become liable to pay the damages levied to the Concessionaire in accordance with the provisions of the Concession Agreement. on a back-to-back basis. If the completion of works is delayed due to reasons attributable to the EPC Contractor, the Contractor shall be liable to pay the damages levied on the Concessionaire, on a back-to-back basis, in accordance with the provisions of the Concession Agreement.

xxi. Dispute resolution will proceed initially through conciliation, followed by mediation upon notification within the specified period, and, if necessary, arbitration.

2.3 PROGRESS OF CONSTRUCTION WORKS:-

i. The Project stretch spans across two states as detailed below:

Table 2.5 Project Stretch Details State wise.

Sl. No.	State	From (Km)	To (Km)	Total (Kms)
1.	Andhra Pradesh	61.380	91.700	30.320
2.	Tamil Nadu	91.700	96.040	4.340
			Total Kms	**34.660**

ii. The Appointed Date for the project was declared as 25.01.2023, following the handover of land for 27.770 Km, accounting for 81.12% of the total project scope.

iii. Project Completion Schedule.

Table 2.6 Milestones Achievements

Sl. No.	Milestone	Milestone completion date as per CA	Progress to be achieved	Achieved Date
1	1st Milestone	23.07.2023	20%	20.7.2023
2	2nd Milestone	25.01.2024	35%	27.11.2023
3	3rd Milestone	28.07.2024	75%	25.09.2024
4	Scheduled Completion	24.01.2025	100%	----------

iv. The concessionaire successfully achieved Milestones I & II ahead of schedule as per the Concession Agreement (CA). However, Milestone III was achieved within the grace period primarily due to delays in land handover in the Tamil Nadu stretch (Km 91+700 to Km 96+040) by the Authority.

v. As of 31.12.2024, the project has achieved a physical progress of 88.052% and Financial progress of 86.198% respectively.

vi. Work Status
   (a) Main Carriageway (MCW): 30.585 Km completed out of 34.660 Km
   (b) Service Road: 4.950 Km completed out of 5.860 Km
   (c) Slip Road: Work yet to commence (Scope: 1.300 Km at interchange location)
   (d) Structure Works: All completed except 02 elevated structures and 01 interchange in Tamil Nadu
   (e) Drainage Works: 16.426 Km completed out of 17.686 Km

vii. Payment Milestone

Table 2.7 Achievements of Payment Milestones.

Payment Milestone	Physical achievement	Date of achievement
1st Milestone	5%	5.89% on 31.03.2023
2nd Milestone	10%	12.209% on 31.05.2023
3rd Milestone	20%	20.133% on 20.07.2023
4th Milestone	30%	30.039% on 30.09.2023
5th Milestone	40%	40.112% on 31.12.2023
6th Milestone	50%	50.666% on 21.03.2024
7th Milestone	60%	6.429% on 29.05.2024
8th Milestone	70%	70.648% on 19.08.2024
9th Milestone	80%	80.106% on 27.11.2024
10th Milestone	90%	

viii. EOT-application for 201 Days

In its letter dated 06.12.2024, responding to the observations made by the IE on the Concessionaire's EOT Application dated 06.07.2024, the Concessionaire requested an Extension of Time (EOT) of 201 days for completing the remaining work as of 30.11.2024, considering the following aspects:

a. Due to land acquisition issues, work on the Tamil Nadu stretch could only commence on 12.06.2024. By then, the rainy season had begun, leading to water accumulation at the three major elevated structure sites across ponds at Km 91+665, Km 93+850, and Km 94+980. These sites were surrounded by paddy fields with no access, necessitating the construction of an embankment for highway access before work could begin.
b. The project includes an interchange with a ramp plaza, featuring a 3x30 meter span flyover along with junction improvements and four service roads connecting the local road to the MCW. The flyover is designed with pile foundations.
c. All major works were in different stages of construction, requiring consideration of the curing period.
d. The Concessionaire submitted a delay statement outlining the number of days delayed in land handover, a delay analysis, and a work program detailing the time required for completing the remaining work.
e. During an inspection on 09.11.2024, RO/Vijayawada observed that the sites were waterlogged and instructed NHAI officials and the IE to monitor progress in the Tamil Nadu stretches and consider EOT proposals if the work remained incomplete due to delays in land handover.
f. In its letter dated 01.01.2025, the Concessionaire referred issues related to the Extension of Time and the issuance of the Provisional Completion Certificate to the Sole Conciliator, Shri S.P.S. Jain.

2.4 MAINTENANCE REQUIREMENTS:-

The Concessionaire has successfully achieved Project Milestone III and is progressing towards project completion. In a letter dated 16.12.2024, the Concessionaire has requested the issuance of a Provisional Completion Certificate for a 30.585 km project stretch from Km -61+380 to Km 91+965 (Andhra Pradesh stretch). The request for the Provisional Certificate is currently under review.

Upon issuance of the Provisional Certificate of Completion (PCOD), the operation period will commence immediately, and the Concessionaire will be contractually obligated to maintain the stretch in accordance with the Concession Agreement. The maintenance requirements for the project are detailed in Schedule "K" of the Concession Agreement, which includes the following key provisions:

2.4.1 KEY PROVISIONS: -

i. The Concessionaire shall operate and maintain the Project in accordance with the Agreement, Applicable Laws, and Permits.
ii. Defects and deficiencies specified in Annex-I shall be repaired/rectified as per the timelines given.
iii. An adequate inventory of spares and consumables shall be maintained at all times.
iv. Defects not specified in Annex-I must be repaired/rectified as per Good Industry Practice and as specified by the Independent Engineer. The Independent Engineer, if required, shall specify permissible limits for deviations and time limits for repairs. Extensions of time for repairs may be granted if justified by the nature and extent of defects, as determined by the Independent Engineer.
v. Emergency repairs/restoration must be done promptly to eliminate or minimize hazards.
vi. Daily visual inspections must be conducted by the Concessionaire through its engineer.
vii. All defects shall be repaired and rectified by the Transfer Date.
viii. Schedule-K should be displayed at the site along with the complaint register.

The specific Defects and time lines specified in the Annexure I of Schedule K have been summarised in Table 2.8 and 2.9 below.

Table 2.8 Defects and Timeline for Road

Sl. No	Nature of Defect	Time Limit for Repair/Rectification
Carriageway and paved shoulders		
1.	Breach or blockade	Temporary:24 hours; Permanent: 15 days
2.	Roughness value exceeding 2,750 mm in 1 km	180 days
3.	Potholes	48 hours
4.	Cracking in more than 5% of road surface in 1 km	30 days
5.	Rutting exceeding 10 mm in more than 2% of road surface in 1 km	30 days
6.	Bleeding/skidding	7 days
7.	Ravelling/Stripping of bitumen surface exceeding 10 sq. m	15 days
8.	Damage to pavement edges exceeding 100 mm	15 days
9.	Removal of debris	6 hours
Hard/Earth shoulders, side slopes, drains and culverts		
1.	Variation by more than 2% in the prescribed slope of camber/cross fall	30 days
2.	Edge drop at shoulders exceeding 40 mm	7 days
3.	Variation by more than 15% in the prescribed side (embankment) slopes	30 days
4.	Rain cuts/gullies in slope	7 days
5.	Damage to or silting of culverts and side drains during rainy season	7 days
6.	Desilting of drains in urban/semi-urban areas	48 hours

Sl. No	Nature of Defect	Time Limit for Repair/Rectification
Roadside furniture including road signs and pavement marking		
1.	Damage to shape or position; Poor visibility or loss of retro-reflectivity	48 hours
Street lighting and telecom (ATMS)		
1.	Any major failure of the system	24 hours
2.	Faults and minor failures	8 hours
Trees and plantation		
1.	Obstruction in a minimum head-room of 5 m above carriageway or obstruction in visibility of road signs	24 hours
2.	Deterioration in health of trees and bushes	Timely watering and treatment
3.	Replacement of trees and bushes	90 days
4.	Removal of vegetation affecting sight line and road structures	15 days
Rest areas		
1.	Cleaning of toilets	Every 4 hours
2.	Defects in electrical, water, and sanitary installations	24 hours
Other Project Facilities and Approach roads		
1.	Damage or deterioration in Approach Roads, pedestrian facilities, truck lay-bys, bus-bays, bus-shelters, cattle crossings, Traffic Aid Posts, Medical Aid Posts, and other works	15 days

Table 2.9 Defects and Timeline for Bridges

S. No.	Nature of Defect	Time Limit for Repair/Rectification
Superstructure of bridges		
1.	Cracks	Temporary measure -within 48 hrs. Permanent measures-within 45 days
2.	Spalling /scaling	15 days
Foundation of bridges		
1.	Scouring and/or cavitation	15 days
Piers, abutments, return walls and wing walls		
1.	Cracks and damages including settlement and tilting	30 days
Bearings (metallic) of bridges		
1.	Deformation	15 days
Joints in bridges		
1.	Loosening and malfunctioning of joints	15 days
Other items relating to bridges		
1.	Deforming of pads in elastomeric bearings	7 days
2.	Gathering of dirt in bearings and joints or clogging of spouts, weep holes and vent holes	3 days

S. No.	Nature of Defect	Time Limit for Repair/Rectification
3.	Damage or deterioration in parapets and handrails	3 days
4.	Rain-cuts or erosion of banks of the side slopes of approaches	15 days
5.	Damage to wearing coat	15 days
6.	Damage or deterioration in approach slabs, pitching, apron, toes, floor or guide bunds	30 days
7.	Growth of vegetation affecting the structure or obstructing the waterway	15 days

2.4.2 REVIEW OF O & MANUAL:-

In its letter dated 12.11.2024, the Concessionaire submitted the Operation and Maintenance Manual for review and approval, in accordance with the provisions of Article 17 of the Concession Agreement. The manual outlines comprehensive guidelines and procedures to effectively fulfill maintenance requirements, including inspection processes, defect identification, and rectification methodologies. Its development was based on the provisions of the Concession Agreement, IRC Codes, MORTH publications, and industry best practices.

Key Objectives of the Manual:

i. Ensure the safety of workers and users of the project facilities.
ii. Protect project facilities from unnecessary wear and deterioration.

2.4.2.1 KEY OBSERVATIONS ON THE MANUAL PROVISION:-

Chapter 1 to 3: Provides information on the background and maintenance organization structure for the Project. Details of the concessionaire's team responsible for maintenance tasks during the period, with specific responsibilities defined for each key team member.

Chapter 4: Maintenance Requirements – Lists the requirements that the Concessionaire must comply with, either directly or through O&M contractors.

Chapter 5: Maintenance methodology and Programme – The road maintenance can be divided in four types namely routine, preventive, periodic and special repairs .This chapter is for guidance of maintenance team to undertake the routine &periodic maintenance of the project facilities .

Chapter 6: Maintenance Procedure – This chapter covers the inspection and routine maintenance requirements for flexible and rigid pavements on the project road. Periodic inspection has been planned at the interval of six months and roughness measurement using NSV shall be carried out twice a year.

Chapter 7: Safety Management – This chapter covers guiding principles, Accident &Victim management and ways to manage traffic safety during different various types of situations encountered in traffic operation.

Chapter 8: Inspection procedures – Degree of inspection for project facilities, carried out at predetermined frequency are categorized into three levels: Visual Inspection, Close Inspection and Thorough Inspection. The type of inspection and tentative frequency of inspection for the project facilities are as given in the table below

Table 2.10: Frequency of Inspection for Road Maintenance Activities as per Maintenance Manual

S. No.	Object	Item	Daily	Weekly	Monthly	Quarterly	Before and After Rains
1.	Riding Surface	Pavement	V	C	C		
		Expansion joints	V	C	C		T
2.	Median	Kerb	V	V	C		T
3.	Side Slopes	Shape	V	V		C	T
		Turfing		V	V		T
		Pitching & Masonry		V	V		T
		Retaining wall		C	C		T
		Side Slope Drain	R	C	C		
		Gullies and catch pits	R	C	C		
4.	Bridges	Superstructure		V		C	T
		Substructure		V		C	T
		Head wing walls & aprons		V		C	T
		Painting		V			T
		Hand rail		V		T	
5.	Culverts/ Underpass			V			T
6.	Safety Barriers		V	V		C	T
7.		Signs		V	C		T

S. No.	Object	Item	Daily	Weekly	Monthly	Quarterly	Before and After Rains
	Traffic Operation Facilities	Marking	V	V	C	T	
		Delineators	V	V	C	T	
		Lighting	V	V	C		
8.	Other Facilities	Vegetation/Landscaping	V	V	C	T	
		Toll Plaza	V	V	C	T	
		Wayside Amenities	V	V	C		
9.	Traffic Conditions		V	V	T	C	
10.	Encroachments		V	V	T		
	Symbol Legend V – Visual Inspection C – Close Inspection T – Thorough Inspection R – Visual Inspection during the rainy season only						

Chapter 9 & 10: Management Information System, Report formats – Describes reporting procedures and formats for the same.

2.4.2.2 CONCLUSIONS ON OBSERVATIONS OF THE O&M MANUAL:-

The O&M Manual comprehensively addresses all maintenance requirements for the Project Road. We have not seen any review comments from the IE in the documents provided for review. The Concessionaire must ensure that any feedback from the IE is incorporated into the Maintenance Manual before its distribution to the maintenance team.

2.4.3 WARRANTIES AND PERFORMANCE GUARANTEES:-

The status is furnished in the table below:

Table 2.11: Summary of Warranty and Performance Guarantees

Sl No	Item	Total Qty.	Qty under Warranty	Manufacturer	Date of manufacturing / testing / issue	Remarks
1.	Strip Seal expansion joint system	1970	821.448 Mtrs.	KANTAFLEX (INDIA) PRIVATE LIMITED	05.11.2024	The Strip Seal Expansion Joint is designed for 10 years functioning. And shall be valid from the dispatched date of the goods.
			475.02 Mtrs.	MAURER SANFIELD INDIA LIMITED	18.11.2024	
2.	POT – PTFE Bearings	784	12		18.11.2024	Life of 15 Years under normal loading, normal traffic and routine maintenance.
3.	MSM Spherical bearings		532		Invoices were issued in between October 2023 to August 2024.	Design life of 50 years, Warranty for a period of 15 years under normal loading, normal traffic and routine maintenance, including free repair and replacement in part or full for any defect in the bearings within 36 months from the supply or 24months from installation (whichever is earlier).

2.5 REVIEW OF SAFETY AUDIT REPORT:-

The Authority has appointed M/s Sri Infotech as the Safety Consultant for the project through LOA No. NHAI/RO-VJA/Safety Consultant (HAM) Pkg-I/Chittoor/2022/223, dated 18.01.2023, for the Chittoor-Thatchur six-lane highway (all packages).

To date, the Safety Consultant has conducted four construction-stage audits and one pre-commissioning audit. The Pre-Commissioning Audit Report for the section from Km 61+380 to Km 91+965 (30.585 Km) was submitted via letter no. Sri Infotech/NHAI/RSC-PKG-11/2024-25/2002, dated 12.12.2024. The recommendations made in the report have been addressed by the Concessionaire, and the compliance report was submitted via letter no. 1267, dated 14.12.2024.

The key observations made during the audit and their corresponding compliance status are summarized in the table below:

Table 2.12: Safety Observations and it's Compliances.

Sl. No.	Issue	Comment	Compliance
1.	New/Existing Road Interface,	During the visit ,it was observed that warning signboards ,including height and speed limit	Necessary warning signboards ,including height

Sl. No.	Issue	Comment	Compliance
		signs ,are yet to be provided at the following crossroad locations EX Ch. 85+550,Ch 81+950	and speed limit signs , provided at the crossroad locations Ex Ch. 85+550,Ch 81+950
3.	Interchanges	It is not applicable since the existing Interchange location is at Km. 95+500. Hower, at present Concessionaire applied PCOD from Ch 61+380 to Ch 91+965	No comment
4.	Signs, Pavement Markings and Delineation	(i) Concessionaire to provide all sign boards as per Approved signage plan drawing (ii) Need to provide a few locations on Road marking on MCW, Crossroads and service roads (iii) Delineators need to be provided as per CA	(i Provided all sign boards as per Approved signage plan drawing ii. Road marking on MCW, Crossroad are provided. Service roads work is not yet taken up (Tamil Nadu stretch) (iii) Thrie beam crash barrier are provided on 4 sides of the carriageway with retro reflective sticker grade XI to have night visibility
5.	Roadside Hazards	Need to connect/overlap the flexible crash barrier with Concrete crash barrier wherever is required as per IRC 119-2015 Thrie beam barrier needs to be attached properly as per IRC 119-2015 Need to provide delineation	Complied with the instructions Thrie beam crash barrier are provided on 4 sides of the carriageway with retro-reflective sticker grade XI to have night visibility

2.6 REVIEW OF CHANGE OF SCOPE ORDERS:-

2.6.1 FOR ADDITIONAL STRUCTURES :-

A comprehensive Change of Scope (COS) order for Rs. 61.12 Cr. (inclusive of 18% GST, less a tender discount of 8.83%) was issued on 22.12.2023, covering the following items:

Table 2.13: Summary of Approved Change of Scope.

Sl. No	COS Provision	Approved COS Amount	No. in Scope	% total competed
1	Additional Box Culverts 16 Nos (67+385,75+300,77+100,78+200, 79+280, 80+430,84+300,85+695, 61+390,68+215, 74+740,75+240,79+350, 89+675, 93+030,94+500)	17,47,90,249	16	100%
2	New Utility Ducts size 600 mm dia	72,99,600	35	85.71%
3	Major Bridge @ Km 65+925	4,17,95,711	1	95% (5% hold for protection work)
4	Additional elevated Structure @ Km 68+875	12,74,30,570	1	-
5	Proposed new VUP Structure @ Km 73+010, shifting of VUP from Km 73+439 to 73 +840 deletion of connecting road from Km 73+010 to 73+840 BHS	17,36,19,755	1	100%
6	Shifting of LVUP from Km 68+938 to Km 76+400 (Span 1x12x4m, width 2X14.50)	3,65,20,247	1	95% (5% hold for protection work)
7	Shifting of LVUP from Km 79+739 to Km 80+140 (Span 1x12, width 2X14.50) deletion of connecting road from Km 79+345 to 80+140 BHS	66,40,879	1	95% (5% hold for protection work)

Sl. No	COS Provision	Approved COS Amount	No. in Scope	% total competed
8	Deletion of Connecting Road @ Km 74+740 to 75+470	-55,93,765		
	Total Amount	**56,25,03,246**		
	Tender Discount@8.83%	- 49669038		
A	Sub Total	51,28,34,227		
B	GST on A @18%	9,23,10,161		
C	Labour cess on A+B	60,51,444		
	Net COS amount	**61,11,95,832**		

2.6.2 COS FOR UTILITY SHIFTING:-

i. During the inspection of Member (P) on 20.04.2024, the following additional works were considered for execution under COS:
   a. Box Culvert at 92+350 for providing access to an ancient temple for the villagers of Ramalingapuram.
   b. Paved Shoulders instead of earthen shoulder at RE wall approaches.

ii. NHAI has informed the Concessionaire to submit the Descope proposal of the wayside amenities vide a letter dt. 10.08.2023 due to Land acquisition issue at the location indicated in the CA.

iii. Height clearance for the 400 KV Powergrid line: The Concessionaire has demanded approval for COS shifting Powergrid 400 Kv transmission line for ensuring 14 m vertical clearance as per latest CEA norms. It is under discussion with the Authority. Formal approval is awaited.

iv. In its letter dated 11.12.2024, the concessionaire has proposed for descoping of boundary wall for a length of 14.869 Kms, citing protest from the farmers.

v. The Concessionaire has demanded approval of COS for provision of ATMS and allied furniture & Sign Boards as per MoRTH New Circular Dt-20-07-2023 & Latest IRC-67-2022 Specifications.

2.7 UTILITY SHIFTING:-

i. In terms of the Concession Agreement, the concessionaire is responsible for shifting obstructing utilities to appropriate locations as per the standards and specifications of the relevant Utility Departments, as outlined in Schedule-B .The shifting will follow the utility department's guidelines, and any changes in the type or overhead-to-underground crossings will not be reimbursed. The contractor must conduct a joint inspection with the utility department and obtain estimate approval. The Authority's role is limited to forwarding letters to the utility, with the utility department's

decisions being binding. After the shifting work is completed, the utilities will be handed over to the utility department, which will assume maintenance liability.

ii. Status of utility shifting according to IE MPR (November 2024)

Table 2.14: Status of Utility shifting

Name	Length affected	Department	Physica Progress (in %)	Estimated Amount	Issue /Comments
Power grid	Ch 72.600	400 KV Line-NLRCNIPGCIL		5.83Cr	Concurrences of the Concessionaire to be Received, pending for approval of COS.
Power grid	Ch 62.200	NLR-TVLM at Km.62.200			
AP TRANSCO, (SC) NAGARI WSPL, AP	Ch 66.250	132 KV at 66.250	100%	2.42 Cr	Completed
APSPDCL	61+380 to 92+000	Nagari, Nindra, Pitchatur	100%	9.09 Cr	Completed
TANGEDCO	92+000 to 96+040		100%	0.90 Cr	Completed

2.8 STATUS OF PERMISSION AND APPROVALS:-

The status is furnished in the table below:

Table 2.15: Status of Utility Shifting

Sl. No.	Description	Consent No.	Date	Remarks
1.	Blasting Permission	MAGL3/371184/2022	16.05.2022	Valid up to the completion of the project
2.	Consent for operation of Road metal , Hot mixing Plant, Wet mixing plant and Concrete Batching plant	CTR - 1859/APPCB/ ZO-KNL/CFO & HWM/2022	29.09.2022	Valid up to 30.06.2025

Sl. No.	Description	Consent No.	Date	Remarks
3.	Labour License	AP-10-45-022-02789720	25.01.2022	Date of commencement -10-11-2021
4.	Environment Clearance	EC22A034AP110261	09.10.2018	Obtained
5.	Land Conversion	D.Dis.B/750 /2022	02.04.2022	Obtained
6	Factory License	B/CTR/1561/2022	10.06.2022	Shall remain valid until get cancelled
7	Quary lease approval	Letter No:3235/Ql/2021	13.04.2023	Obtained.

2.9 NCR STATUS:-

The NCR status as furnished in the IE MPR of Nov 2024 in the table as below:

Table 2.16: NCR Status

NCR	Date	Observation (IE)	Status	Closure date
NCR 1	17.03.2023	Dumping of oversized material in embankment layer	Closed	29.03.2023
NCR 2	26.04.2023	For oversize stone & Boulders in embankment layer	Closed	06.05.2023
NCR 3	02.05.2023	RE wall blocks casting	Closed	24.05.2023
NCR 4	21.06.2023	Embankment layer dumped at site	Closed	26.06.2023
NCR 5	23.10.2023	Friction slab cum crash barrier	Closed	02.11.2023 (typo observed in the IE letter date)
NCR 6	22.11.2023	Coarser material (over size Boulders) found in embankment layer	Closed	16.12.2023
NCR 7	19.12.2023	Coarser material (over size Boulders) found in embankment layer	Closed	03.01.2024 (typo in letter date)
NCR 8	09.01.2024	Irregular shape of shuttering plates	Closed	26.02.2024
NCR 9	28.02.2024	Oversized material observed at site	Closed	14.03.2024
NCR 10	12.03.2024	Embankment layer dumped at site	Closed	19.03.2024
NCR 11	24.05.2024	Irregular shape of shuttering plates	Closed	02.12.2024
NCR 12	28.06.2024	Surface finishing concrete crash barrier	Closed	02.12.2024
NCR 13	01.07.2024	Surface finishing concrete crash barrier	Closed	02.12.2024
NCR 14	23.08.2024	Embankment layer dumped at site	Closed	07.09.2024

2.10 ROYALTY PAYMENT:-

The royalty payment status as furnished in the IE MPR of Nov 2024 in the table as below:

Table 2.17: Status of Utility Shifting

Sl. No.	Item	Qty.	Amount	Remarks
1.	Road Metal	602195	13,30,13,401	Paid to Raghava Construction
2.	Earth Soil	2151320	22,67,90,948	Paid to Raghava Construction
		Total	**35,98,04,349**	

2.11 PENDING ISSUES WITH NHAI:-

i. Finalization of Settlement Agreement Terms

The Concessionaire has raised the issues of Extension of Time (EOT) and the issuance of the Provisional Certificate of Completion (PCOD) for the 30.585 km completed stretch, along with other related matters, for the Authority's consideration. As the settlement process is currently under review, its early finalization will facilitate the commencement of the operation period.

ii. Issuance of Change of Scope (COS) Order for Vertical Clearance of Power Grid Transmission Line

a According to the Existing Utilities & Relocation Plan enclosed in the Concession Agreement, the required minimum vertical clearance for the 400 kV Extra High Tension (EHT) line, as per IRC-32-1969, between the Finished Road Level (FRL) and the lowest wire/conductor, is 8.84 meters.

b At Ch. 72+500, the available vertical clearance is 10.59 meters, which the Concessionaire believes meets the prevailing utility department (PGCIL) standards at the time of bidding. Therefore, the Concessionaire asserts that shifting the 400 kV line is unnecessary. However, the Independent Engineer (IE) has indicated that a vertical clearance of 14 meters is required, as per PGCIL letter no. 12205 dated 02.05.2022.

c In its letter dated 24.07.2023, the Concessionaire stated that achieving a 14-meter vertical clearance is beyond the contract's original scope and asserted that the work would be executed only upon issuance of a Change of Scope (COS) order.

d The IE agreed that this work should be carried out under COS and instructed the Concessionaire to obtain an estimate for shifting the 400 kV transmission line to ensure the required 14-meter vertical clearance.

e During their inspection of the project site, NHAI officials also conveyed their concurrence for shifting the 400 kV EHT line in accordance with the CEA Regulations 2023, ensuring the required 14-meter vertical clearance under COS.

f However, despite six months passing since the Advisor/NHAI's inspection on 26.06.2024, the COS order has yet to be issued, as noted in the Concessionaire's December 2024 Monthly Progress Report (MPR).

CHAPTER 3.0: REVIEW OF GOOD FOR CONSTRUCTION (GFC) DRAWINGS

3.1 REVIEW OF DESIGNS AND GFC DRAWINGS

The project was executed and designed by KNR as the EPC contractor for the Project. The details of the Good For Construction drawings for highways and structures provided by the Concessionaire (as per **Table 3.1** below) were studied by us and our observations on the same are presented in the subsequent paragraphs below. Most of the drawings received were approved and signed by IE.

Table 3.1: List of reviewed GFC drawings

Sl. No.	Description	Remark
1	Plan & Profile	Main Carriageway & Connecting road Plan and Profile from km 61+380 to km 96+040 received.
2	Typical Cross Section	Received
3	Pavement Design Report	Received
4	Job Mix Design	Received
5	Drawings of Structures	Mostly Received
6	Design Basis Report for Structures	Some of the Reports received
7	Junction Drawings	Not Received
8	Furniture Plan	Received
9	Toll Plaza	Not Received
10	Toll Plaza Buildings	
11	Rest Area	

3.1.1 GFC DRAWINGS OF HIGHWAYS

We have received the Plan & Profile (P&P) GFC drawings from Ch 61+380 to Ch 95+040. A comparison on the development provisions mentioned in the Technical Schedules of Concession Agreement and as provided in the GFC drawings have been presented in **Table 3.2** below.

Table 3.2: Review of GFC drawings of the Project Road

S. No.	Name of Item	As per Agreement Schedule	As per GFC Drawing		Remarks
1	Project Length	Main Carriageway – 34.660 km	Main Carriageway – 34.660 km		
2	Connecting Road & Slip Road	LHS – 5.250 km RHS – 4.810 km	LHS – 4.200 km RHS – 3.040 km		Sections de-scoped (Both side): 1. 65+675 to 65+795; 2. 73+020 to 73+840; 3. 74+740 to 75+470; 79+345 to 80.140
3	Design Speed	As per the Manual	100 kmph		
4	Proposed ROW	60-80m	60m*		*Additional land acquired for Toll Plaza, Rest area and junction improvement.
5	Horizontal Curves	As per the Manual	All horizontal curves radii are within the desirable limits and have no sharp curves.		
6	Vertical Curves	As per the Manual	Most of the curves are within the limiting Gradient except at Ch. 87+836 where gradient is 3.00%.		The median opening Ch. 87+100 is at an undesirable location
7	Design of pavement (Design MSA and crust	Flexible pavement design as per Manual subject to minimum requirements and construction shall be in stages.	Main Carriageway & Slip road are designed for 130 MSA & Connecting road is designed for 5 MSA. Following are the thicknesses:		
		Minimum design MSA specified for Main	**MCW & Slip Road Crust**	**Connecting Road Crust**	

S. No.	Name of Item	As per Agreement Schedule	As per GFC Drawing		Remarks
	details)	Carriageway & Slip Road - 130 MSA for design period of 20 years & CBR 7%	BC – 40mm	BC – 40mm	
			DBM – 60mm		
		Minimum design 5MSA specified for Connecting road for design life 15 years & CBR 7%	AIL – 100mm	WMM – 150mm	
			CTB – 170 mm	CTSB – 200 mm	
			GSB – 200mm		
			SG - 500mm	SG - 500mm	
		Rigid pavement for Toll Plaza	Rigid pavement details: PQC – 280mm; DLC – 150mm; GSB – 200mm & SG – 500mm		
9	Junctions	19 nos. (Grade separated junctions)	21 nos. (Grade separated junctions) whose GFC drawings are yet to be provided		
10	Median Opening	07 nos.	02 nos.		
11	Retaining wall/RE Wall/ Toe Wall	11.945 km	Details not provided		
12	Rest Area	01 no. at Ch. 69+900 BHS near Padiri village	De-scoped		
13	Boundary Wall	Entire length of project	Details not provided		
14	Toll Plaza	04 nos. at Ch. 94+444 BHS (1+1 lanes) each	04 nos. at Ch. 94+444 BHS (1+1 lanes) each		
15	Safety Barrier	Metal Beam Crash Barrier min. 47.00 km length	Not specified in the P&P		
16	Overhead Gantry	11 nos.	08 nos.		
17	Major Bridge on river	01 no.	01 no.		
18	Major/Elevated Bridge on pond	07 nos.	07 nos.		Str. At Ch. 68+875 (COS) drawings not received
19	Interchange	01 no.	01 no.		

S. No.	Name of Item	As per Agreement Schedule	As per GFC Drawing	Remarks
20	Vehicular Underpass	03 nos.	04 nos.	Str. at Ch. 73+015 constructed under COS
21	Light Vehicular Under pass	12 nos.	12 nos.	
22	Minor Bridges	06 nos.	06 nos.	
23	Box Culverts	48 nos.	58 nos. (Includes 1 no. Pipe culvert)	

3.2 REVIEW OF PAVEMENT DESIGN

3.2.1 PROVISIONS FOR PAVEMENT DESIGN AS PER CONCESSION AGREEMENT

As per Clause 5 of Schedule B, Flexible pavement shall be provided for the entire project highway including Slip roads and Connecting roads except Toll Plaza location. Rigid Pavement shall be provided on Toll Plaza location. The Main Carriageway shall be designed for 20 years and Connecting Road shall be designed for 15 years with minimum CBR of 7%. Stage construction is not allowed in this project.

3.2.2 PAVEMENT COMPOSITION AS PER APPROVED PAVEMENT DESIGN REPORT

a) Based on Traffic studies carried out in January 2023, the pavement design details are as follows:

Table 3.3: Main carriageway crust details

Sl.No.	Pavement Layer	Main Carriageway crust thickness	Service Road crust thickness
1	BC	40 mm	40 mm
2	DBM	60 mm	-
3	AIL	100 mm	-
4	CTB	170 mm	-
5	WMM	-	150 mm
6	GSB	200 mm	-
7	CTSB	-	200 mm
8	Sub grade	500 mm	500 mm

Table 3.4: Rigid pavement crust details

Toll Plaza crust details which is designed for 3476 CVPD	
Thickness of PQC layer	280 mm
Thickness of Debonding layer	125 micron
Thickness of DLC layer	150 mm
Thickness of GSB layer	200 mm
Dowel Bars Details	
Diameter of Bar	32 mm
Length of Bar	500 mm
Spacing of Bars	270 mm
Tie Bar Details (deformed)	
Diameter of Bar	12 mm
Length of Bar	640 mm
Spacing of Bars	495 mm

b) The details of the MSA calculation at the one location is as follows:

Table 3.5: Traffic number (CVPD) as per Traffic report

Cumulative No. of Commercial Axles during design period (one way) in CVPD	1304
Proportion of Rear single Axles	53.31%
Total expected repetitions	8.75%
Single Axles	695
Tandem Axles	495
Triadem Axles	114
Projected Traffic in CVPD	3476

Table 3.6: Details of CVPD and MSA as per the Traffic report for the Concession Period

YEAR	Mini BUS	BUS	LCV	2- AXLE	3- AXLE	4-6 Axle	CVPD	MSA	Period
2023	244	261	203	118	148	280	1253	0.54	Construction
2024	256	274	213	124	155	294	1316	1.11	Period
2025	269	288	223	130	163	309	1382	1.7	1
2026	282	302	234	137	171	324	1450	2.33	2
2027	296	317	245	144	180	340	1522	2.98	3
2028	311	333	257	151	189	357	1598	3.67	4
2029	327	350	269	159	198	375	1678	4.39	5
2030	343	368	282	167	208	394	1762	5.15	6
2031	360	386	296	175	218	414	1849	5.95	7
2032	378	405	310	184	229	435	1941	6.79	8
2033	397	425	325	193	240	457	2037	7.66	9
2034	417	446	341	203	252	480	2139	8.58	10
2035	437	468	358	213	265	504	2245	9.55	11
2036	459	491	375	224	278	529	2356	10.57	12
2037	482	516	393	235	292	555	2473	11.63	13
2038	506	542	412	247	307	583	2597	12.75	14
2039	532	569	432	259	322	612	2726	13.93	15
2040	558	597	453	272	338	643	2861	15.16	16
2041	586	627	475	286	355	675	3004	16.45	17
2042	615	658	498	300	373	709	3153	17.81	18
2043	646	691	522	315	392	744	3310	19.24	19
2044	678	726	548	331	412	781	3476	20.74	20

Table 3.7: Details of VDF from Traffic report

Vehicle Type	Adopted VDF for Both Directions
Two Axle	3.99
Three Axle	4.94
Four Axle	6.69
Five Axle	2.54
Six Axle	10.2
BUS	0.89
LCV	1.32
Mini Bus	0.89

3.2.3 REVIEW OF DESIGN MIX REPORTS

Design Mix Reports for various items of works have been reviewed and the observations are summarized as under:

i. The aggregate source used is the KNR crusher Ch 61+500 RHS .The Aggregate test results show that aggregates are of very good quality with AIV of the order of 13.5 to 15 %, specific gravity of aggregates is about 2.6, water absorption being less than 1 % and all other parameters being as per the specified specifications.

ii. The cement sources used in the Mix Designs are OPC 43 Grade Ultratech cement, Maha cement and Bharathi cement. The Cement content in the Mix Designs are ranging from 260 kg / cum for M15 to 445 kg/ cum for M50 Grade concrete. The admixture used is MYK Armix Emmecrete PC10.

iii. Mix Designs for DBM show Optimum binder content of the order of 4.73 % , V_a and V_{be} of the order of 3.7% and 10.9 %. The Bitumen used is VG 40.

iv. Mix Design for BC Gr II using CRMB 60 Bitumen of HPCL shows optimum binder content of 5.67 %, V_a and V_{be} are of the order of 4.07% and 11.85 %.

3.3 GFC DRAWINGS OF STRUCTURES

GFC drawings of structures from Ch. 61+380 to Ch. 96+040 were made available to us for review. Our observations on the development provisions mentioned in the Technical Schedules of Concession Agreement with respect to GFC drawings have been presented in **Table 3.8** below.

Table 3.8: Review of GFC drawings for Structures

S.No.	Chainage	Type of Structure	Span Arrangement	Total Width (m)	Super Structure	Sub Structure	Foundation	Type of Bearing	Expansion Joint Type	Remarks
1	95+453	Interchange	3x30	2x14.5	PSC Precast Pretensioned Girder	Rectangular Pier and Wall type Abutment	Pile Foundation	Spherical Bearing	Strip Seal Joint	
2	69+965	Viaduct over Pond	4x30+1x15	2x14.5	PSC Precast Pretensioned Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Spherical Bearing	Strip Seal Joint	
3	71+080	Viaduct over Pond	10x30	2x14.5	PSC Precast Pretensioned Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Spherical Bearing	Strip Seal Joint	
4	71+720	Viaduct over Pond	2X30+3X30+1X15	2x14.5	PSC Precast Pretensioned Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Spherical Bearing	Strip Seal Joint	
5	81+320	Viaduct over Pond	6X30	2x14.5	PSC Precast Pretensioned Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Spherical Bearing	Strip Seal Joint	
6	65+925	MJB	1x25+1x25+1x25+1x25	2x14.5	PSC Precast Pretensioned Girder	Wall type abutment and pier	Open foundation	Spherical Bearing	Strip seal joint	
7	91+665	Viaduct over Pond	19X30+1X15	2x14.5	PSC Precast Pretensioned Girder	Rectangular Pier	Pile Foundation	Spherical Bearing	Strip seal joint	
8	93+850	Viaduct over Pond	2X30+2X3X30+2X30+1X15	2x14.5	PSC Precast Pretensioned Girder	Wall type abutment and rectangular pier	Pile Foundation	Spherical Bearing	Strip seal joint	

S.No.	Chainage	Type of Structure	Span Arrangement	Total Width (m)	Super Structure	Sub Structure	Foundation	Type of Bearing	Expansion Joint Type	Remarks
9	94+980	Viaduct over Pond	14x30	2x14.5	PSC Precast Pretensioned Girder	Rectangular Pier	Pile Foundation	Spherical Bearing	Strip seal joint	
10	66+820	VUP	1 X 20 X 5.5	2x14.5	PSC Precast Pretensioned Girder	Wall type Abutment	Open Foundation	Spherical Bearing	Strip seal joint	Skew- 15◦
11	73+015	VUP	1 X 23.5	2x14.5	PSC Precast Pretensioned Girder	Only Super structure drawing received		Spherical Bearing	Strip seal joint	Skew- 15◦
12	73+835	VUP	1 X 20 X5.5	2x14.5	PSC Precast Pretensioned Girder	Wall type Abutment	Open Foundation	Spherical Bearing	Strip seal joint	Skew- 15◦
13	86+183	VUP	1 X 20 X 5.5	2x14.5	PSC Precast Pretensioned Girder	Wall type Abutment	Open Foundation	Spherical Bearing	Strip seal joint	
14	63+415	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
15	65+810	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
16	66+220	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
17	76+400	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
18	79+739	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
19	90+240	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
20	75+487	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
21	83+180	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
22	85+549	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	

S.No.	Chainage	Type of Structure	Span Arrangement	Total Width (m)	Super Structure	Sub Structure	Foundation	Type of Bearing	Expansion Joint Type	Remarks
23	88+610	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
24	91+050	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
25	68+937	LVUP	1 X 12 X 4	2x14.5	PSC Precast Planks	RCC Wall type Abutment	Open Foundation	Tar Paper Bearing	Filler Joint	
26	77+494	MNB	2X17.5	2x14.5	PSC Precast Pretensioned Girder	Wall type abutment	Open foundation	Spherical Bearing	Single strip seal joint	Skew- 30◦
27	82+340	MNB	1X30	2x14.5	PSC Precast Pretensioned Girder	Wall type abutment	Open foundation	Spherical Bearing	Single strip seal joint	
28	85+768	MNB	1X30	2x14.5	PSC Precast Pretensioned Girder	Wall type abutment	Open foundation	Spherical Bearing	Single strip seal joint	Skew- 15◦
29	87+743	MNB	1X20	2x14.5	PSC Precast Pretensioned Girder	Wall type abutment	Open foundation	Spherical Bearing	Single strip seal joint	Skew- 19◦
30	30+325	MNB	1X25	2x14.5	PSC Precast Pretensioned Girder	Wall type abutment	Open foundation	Spherical Bearing	Single strip seal joint	Skew- 30◦
31	90+770	MNB	1X30	2x14.5	PSC Precast Pretensioned Girder	Wall type abutment	Open foundation	Spherical Bearing	Single strip seal joint	Skew- 30◦

3.3.1 REVIEW OF STRUCTURE DESIGN REQUIREMENTS

As per the Concession Agreement Schedule B, all the bridges, culverts and structures are to be designed for edge movement of vehicles considering the stitching of new super structures in future for widening up to 10 lanes. A special vehicle loading is to be considered in the design of structure and congestion factor is to be considered as per IRC 6 -2017. The design standards and loading to be considered for culverts, bridges, underpasses and retaining walls shall be those laid down in the relevant IRC codes. The structural design reports for some of the structures have been provided by the Concessionaire i.e. Major Bridge at Ch. 65+925, Minor Bridges at 69+965, 68+800, 94+980 and interchange structure at Ch. 95+445. Design of super structure has been provided only for the Major Bridge at 65+925. We have broadly reviewed the Design Notes provided in the Design Basis Report for structures with the objective of confirming compliance to the IRC guidelines. The observations are as under:

i. The load calculation and load combinations have been considered in accordance with the relevant IRC codes.
   IRC: 5 –2015: – General Features of Design
   IRC: 6 – 2017 – Loads and Stresses
   IRC: SP-13-2004- Guidelines for design of small bridges and culverts
   IRC: SP 114-2018 – Guidelines for seismic design for road bridges
   IRC: SP 71-2018 – Guidelines for design and construction of precast pre tensioned girders for bridges
   IRC: 112 – 2020: Code of Practice for Concrete Road Bridges
   IRC: 78-2014- Section VII – Foundations and Substructures
ii. SV loading has been considered in the design note.
iii. There is no mention of Congestion factor in the design note.
iv. Seismic zone III has been considered for seismic analysis.
v. Exposure condition considered in the design notes is seen to be "Moderate" for some bridges while it is seen to be " Severe" for some bridges This needs to be clarified as in the technical notes given in the drawings exposure condition is mentioned as " Severe".
vi. Structural Analysis has been carried out using STAAD pro software.
vii. Spherical /POT - PTFE bearings have been provided.
viii. For the interchange structure the whole horizontal pressure exerted by active.
ix. Earth pressure and live load surcharge is taken by the RE wall behind the Abutment Pier. and in cases of Underpasses the same is taken by the Abutment wall.
x. Reinforcement steel used is Fe 500 D while Grade of Concrete used is M35 to M50.
xi. For PSC girders pre tensioning method has been considered in design.

A clarification is required to be obtained from the Concessionaire whether congestion factor has been considered in the design of the structures and whether the structures have been designed for the edge movement of the vehicles considering stitching of new structure in future.

3.3.2 HYDROLOGICAL ADEQUACY OF STRUCTURES

The Hydrology Report provided for 5 Minor Bridges out of a total of 6 Minor bridges and 8 Major bridges have been reviewed. The observations are summarized as under:

i. The discharge calculation and assessment has been carried out using Ryve method, Rational Formula and Area Velocity Method. It is observed that discharge calculated using one of the methods is much higher as compared to the other two methods.
ii. The Linear waterway provided is more than that obtained from Hydraulic Calculation
iii. Scour depth calculation has not been furnished in the Hydrology reports.

3.3.3 GEOTECH REPORT REVIEW

The Geotech reports have been provided in respect of 34 nos. of structures. The details of the founding level provided in the as built drawing have been compared with the geotech report and summarized position is provided in the **Table 3.9** below:

Table 3.9: Summary of Geotech report

Sl. No.	Chainage	Type of Structure	No. of Bore holes	Depth of Bore holes (max) in m	SBC (T/m^2)	Type of foundation
1	63.415	LVUP	1	10	20-40	Open
2	65.793	LVUP	1	8	25-45	Open
3	65.935	MJB	5	10-20	45-50	Open
4	66.238	LVUP	1	15	25-35	Open
5	66.820	VUP	1	20	30-35	Open
6	68.938	LVUP	1	15	20-27.5	Open
7	69.965	Elevated Structure	6	13.5-25	40	Open
8	71.080	Elevated Structure	11	25	37.5-40	Open
9	71.720	Elevated Structure	6	16-25	40-45	Open
10	73.439	VUP	1	20	32.5	Open
11	75.470	LVUP	1	15	18-30	Open
12	77.490	MNB	1	20	30	Open
13	81.630	Elevated Structure	7	13-18	45	Open
14	81.959	LVUP	1	15	20-30	Open
15	82.340	MNB	1	20	35	Open
16	83.229	LVUP	1	15	25-40	Open
17	85.549	LVUP	1	15	20-35	Open
18	85.770	MNB	1	15	45	Open
19	86.183	VUP	1	15	40	Open
20	90.239	LVUP	1	15	25-40	Open
21	90.323	MNB	1	25	40	Open
22	91.044	LVUP	1	15	20-40	Open
23	91.655	Elevated	21	25-30	Load	Pile

Sl. No.	Chainage	Type of Structure	No. of Bore holes	Depth of Bore holes (max) in m	SBC (T/m^2)	Type of foundation
		Structure			capacity (340-428)	
24	93.850	Elevated Structure	12	25	Load capacity	Pile
25	94.980	Elevated Structure	11	25	(340-428)	Pile
26	68.875	Elevated Structure	6	18.5-25	40	Open
27	73.010	VUP	1	11	30	Open
28	73.840	VUP	1	9.5	45	Open
29	76.400	LVUP	1	15	18-35	Open
30	80.140	LVUP	1	15	18	Open
31	88.609	LVUP	1	12	25-40	Open
32	90.770	MNB	1	15	40	Open
33	87.743	MNB	1	13	40	Open
34	95.444	Interchange	2	21-25	Pile capacity (450-460)	Pile

3.3.4 CONCLUSIONS ON REVIEW OF DRAWINGS

The provisions of the CA and the IRC guidelines have been generally fulfilled. Clarification in respect of few specific requirements as per CA like congestion factor etc. is required to be obtained from the Concessionaire.

CHAPTER 4.0: EXISTING INVENTORY & CONDITION SURVEY

4.1 PROJECT DETAIL

The proposed Greenfield alignment commencing from Veera Kaveri Raja Puram Village at km 61.380 in Nagari Tehsil of Chittoor district in Andhra Pradesh and ends near Pondavakkam Village at km 96.040 in Uthukkottai Tehsil of Thiruvallur District in the State of Tamil Nadu. The effective Length of Project Road is 34.660 km. The site inventory was carried out in December 2024 and work in the Tamil Nadu section (from Ch. 92+000 to Ch. 96+040) is under progress as land was recently provided to the Concessionaire.

The major details of the Project are presented in Table 4.1 below are based on the site inventory conducted in the December 2024.

Table 4.1: Major Details of Project Road

S. No.	PARAMETER	DESCRIPTION
1	Main Carriageway	30.620 km
2	Connecting Roads/Slip Roads	5.430 km (only connecting roads)
3	Drain	6.67 km (LHS) & 6.75 km (RHS)
4	Junctions	18 nos.
5	Interchange	01 no. (work in progress)
6	Major Bridge (on river/pond)	09 nos.
8	Minor Bridges	06 nos.
9	Vehicular Underpasses	04 nos.
10	Light Vehicular Underpasses	12 nos.
11	Culverts	51 nos.
12	Toll Plaza	01 no. (work in progress)
13	Rest Area	De-scoped
14	Median Opening	05 nos. (1 no. additional opening at Ch. 87+100)
15	Boundary Wall	19.62 km (LHS) / 19.26 km (RHS)
16	MBCB	12.815 km (LHS) / 12.440 km (RHS)
17	Slope protection	3.9 km (LHS) / 4.1 km (RHS) work in progress

4.2 OVERVIEW OF ROAD ASSETS AND APPURTENANCES

Detailed inspection of the site was carried out by our team of Engineers in December 2024 for assessment of status and condition of various Road Assets and Appurtenances. Inventories of various road assets and structures were prepared.

Status of various road furniture items, painting, road markings, safety fixtures, way-side amenities, horticulture and landscaping with respect to the provisions of Concession Agreement and their condition were checked. Certain defect and deficiencies have been observed at site in respect of the condition of the earthen drain, vegetation growth excessive. The summarised details in respect of inventory/condition survey of road assets for the Project are presented in subsequent para below.

4.2.1 HIGHWAY INVENTORY

The basic dimensional parameters like width of the carriageway, earthen shoulder, embankment height, Drain, median etc. for the Project Road were observed and details pertaining to it were noted for every 200m interval. This information has been presented in Table 4.2 along with the representative photographs of each 5 km stretch of the project road are shown in Figures below.

Fig.4.1: Section at Ch 63+500 LHS

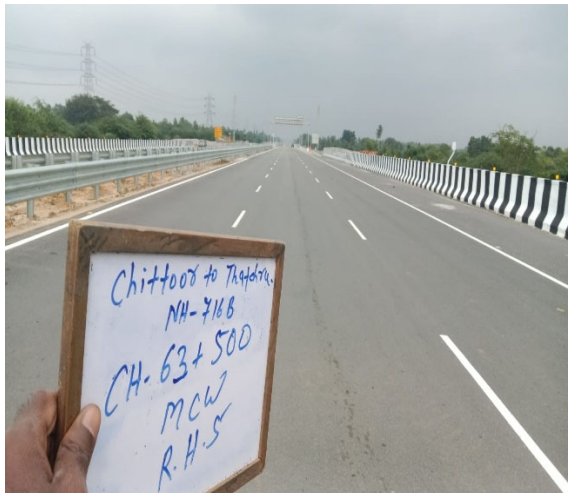

Fig.4.2: Section at Ch 63+500 RHS

Fig.4.3: Section at Ch 66+500 LHS

Fig.4.4: Section at Ch 66+500 RHS

Fig.4.5: Section at Ch 73+020 LHS

Fig.4.6: Section at Ch 73+020 RHS

Fig.4.7: Section at Ch 80+000 LHS

Fig.4.8: Section at Ch 81+220 RHS

Fig.4.9: Section at Ch 82+700 RHS

Fig.4.10: Section at Ch 85+550 LHS

Fig.4.11: Section at Ch 87+000 RHS

Fig.4.12: Section at Ch 88+100 RHS

Fig.4.13: Section at Ch 92+500 RHS

Fig.4.14: Section at Ch 92+800 RHS

Fig.4.15: Section at Ch 95+900 RHS

Table 4.2: Details of Main Carriageway Inventory

Chainage (km)		MCW Width		Median Width (m)	Paved Shoulder Width(m)		Earthen Shoulder Width (m)		Embankment Height (m)		Boundary wall		Remark
From	To	LHS	RHS		LHS	RHS	LHS	RHS	LHS	RHS	LHS	RHS	
61.000	62.000	10.5	10.5	5	----	----	3	3	0.5-1	0.5-2	----	0.160	
62.000	63.000	10.5	10.5	5	----	----	3	3	1-1.5	1.2-2	0.820	1.000	
63.000	64.000	10.5	10.5	5	0 to 3	0 to 3	Varies	Varies	0.5-1.5	0-1.5	0.600	0.700	
64.000	65.000	10.5	10.5	5	----	----	3	3	0.5-1.2	0.5-1.5	1.000	0.800	
65.000	66.000	10.5	10.5	5	----	----	Varies	Varies	1-2	1.2-2	1.000	1.000	
66.000	67.000	10.5	10.5	5	0 to 3	0 to 3	Varies	Varies	3-5	3-5	0.400	0.400	
67.000	68.000	10.5	10.5	5	0 to 3	0 to 3	Varies	Varies	0.5-1.5	3	0.600	0.600	
68.000	69.000	10.5	10.5	5	0 to 2.5	0 to 2.5	----	----	2-5.5	2.5-5.5	0.400	0.400	
69.000	70.000	10.5	10.5	5	0 to 2.5	0 to 2.5	3	3	1.5-4	0-4	0.400	0.200	
70.000	71.000	10.5	10.5	5	0 to 2.5	0 to 2.5	3	3	1.5-4.5	1.5-4.5	0.400	0.400	
71.000	72.000	10.5	10.5	5	0 to 2.5	0 to 2.5	Varies	Varies	0-4.5	0-4.5	0.400	0.400	
72.000	73.000	10.5	10.5	5	----	----	3	3	1-3.5	1.2-3.5	0.800	0.800	

Chainage (km)		MCW Width		Median Width (m)	Paved Shoulder Width(m)		Earthen Shoulder Width (m)		Embankment Height (m)		Boundary wall		Remark
From	To	LHS	RHS		LHS	RHS	LHS	RHS	LHS	RHS	LHS	RHS	
73.000	74.000	10.5	10.5	5	----	----	3	3	3-4	3-4	0.600	0.600	
74.000	75.000	10.5	10.5	5	----	----	3	3	1.2-2.5	1.2-3	1.000	1.000	
75.000	76.000	10.5	10.5	5	----	----	3	3	1-3.5	1-3.5	1.000	1.000	
76.000	77.000	10.5	10.5	5	----	----	3	3	1-3.5	1.5-3.5	1.000	1.000	
77.000	78.000	10.5	10.5	5	----	----	3	3	1-1.5	1-2.5	0.600	0.600	
78.000	79.000	10.5	10.5	5	----	----	3	3	1.2-2	1.2-2	0.400	1.000	
79.000	80.000	10.5	10.5	5	----	----	3	3	2-3.5	2-3.5	1.000	1.000	
80.000	81.000	10.5	10.5	5	----	----	3	3	1.2-4	1--3	1.000	1.000	
81.000	82.000	10.5	10.5	5	----	----	3	3	1.5-2	0-2	0.800	0.800	
82.000	83.000	10.5	10.5	5	----	----	3	3	0-1.5	0-1.5	0.600	----	
83.000	84.000	10.5	10.5	5	----	----	3	3	0-4	0-4	0.600	----	
84.000	85.000	10.5	10.5	5	----	----	3	3	0-3.5	0-3.5	0.200	0.600	
85.000	86.000	10.5	10.5	5	----	----	3	3	0-4	0-4	----	----	
86.000	87.000	10.5	10.5	5	----	----	3	3	2-4	1-4	0.800	0.800	
87.000	88.000	10.5	10.5	5	----	----	3	3	0-3	0-2.5	1.000	1.000	
88.000	89.000	10.5	10.5	5	----	----	3	3	0-2.5	0-2.5	0.400	0.400	
89.000	90.000	10.5	10.5	5	----	----	3	3	0.5-2	0.5-2	1.000	0.800	
90.000	91.000	10.5	10.5	5	----	----	3	3	2-4	2-4	0.800	0.800	
91.000	92.000	10.5	10.5	5	Varies	Varies	Varies	Varies	4	4	----	----	
92.000	93.000	11.5	11.5	5	----	----	Not prepared	Not prepared	3--6	3-6.5	----	----	
93.000	94.000	11.5	11.5	5	----	----	Not prepared	Not prepared	3-4	3-4	----	----	

4.2.2 PAVEMENT CONDITION

Based on the visual inspection carried out every 200m interval no pavement distress was visible at site. Representative photographs showing the Pavement Condition are presented in Figures below**.** The pavement is mostly in good condition and at a few locations where BC works or carriageway construction is under progress like in sections from Ch. 63+780 to Ch. 63+900 & Ch. 92+000 to Ch. 96+040.

Fig.4.16: Section at Ch. 61+450 RHS

Fig.4.17: Section at Ch 63+400 LHS

Fig.4.18: Section at Ch. 69+060 LHS

Fig.4.19: Section at Ch 69+400 RHS

Fig.4.20: Section at Ch 74+800 RHS

Fig.4.21: Section at Ch 75+400 RHS

Fig.4.22: Section at Ch. 78+600 RHS

Fig.4.23: Section at Ch 82+100 RHS

Fig.4.24: Section at Ch. 88+800 LHS

Fig.4.25: Section at Ch 89+000 RHS

Fig.4.26: Section at Ch 90+350 RHS

Fig.4.27: Section at Ch 91+700 RHS

Fig.4.28: Section at Ch 92+200 RHS

Fig.4.29: Section at Ch 93+600 RHS

Fig.4.30: Section at Ch 94+300 RHS

4.2.3 CONNECTING ROADS

Work is in progress and the length of Connecting roads completed is 5.43 Km. Representative Photographs of some of the sections are presented in **Figures** below. The details of the Connecting road are bought out in Table 4.3 below.

Fig.4.31: Connecting Road at Ch 63+000 RHS

Fig.4.32: Connecting Road at Ch 63+100 LHS

Fig.4.33: Connecting Road at Ch 66+830 LHS

Fig.4.34: Connecting Road at Ch 67+200 RHS

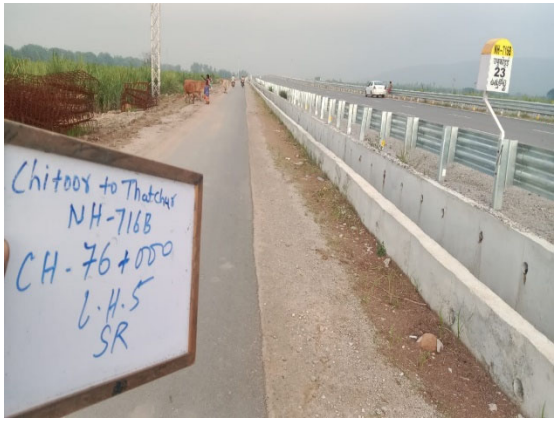

Fig.4.35: Connecting Road at Ch 76+000 LHS

Fig.4.36: Connecting Road at Ch 80+080 LHS

Fig.4.37: Connecting Road at Ch 83+180 RHS

Fig.4.38: Connecting Road at Ch 83+280 RHS

Fig.4.39: Connecting Road at Ch 83+300 LHS

Fig.4.40: Connecting Road at Ch 83+380 RHS

Fig.4.41: Connecting Road at Ch 88+600 RHS

Fig.4.42: Connecting Road at Ch 88+730 RHS

Table 4.3: Details of Connecting Road

Sl. No.	Chainage (Km)		Side	Length (m)	Width (m)	Separator Width(m)	RCC Drain / Pipe Drain / Line Drain		Remark
	From	To	LHS/RHS				LHS	RHS	
1	62.950	64.230	LHS	1.280	3.75	Work in Progress		RCC Drain width - 1.5m	
2	63.000	64.230	RHS	1.230	3.75	-	RCC Drain width - 1.5m		
3	66.760	67.600	LHS	0.840	3.75	Work in Progress		RCC Drain width - 1.5m	
4	66.720	67.600	RHS	0.880	3.75	Work in Progress	RCC Drain width -1.5m		
5	75.480	75.920	LHS	0.440	3.75		RCC Covered Drain (Inner Side) 1.5m		
6	80.060	80.140	LHS	0.080	3.75	No	No	No	Not in Sch. B (COS)
7	83.180	83.380	LHS	0.200	3.75	No		1m	
8	83.180	83.380	RHS	0.200	3.75	No	1m		
9	88.615	88.740	LHS	0.140	3.75		1m RCC CD, 1.5m RCC OD (Ch 88+740 to 89+000)		
10	88.615	88.740	RHS	0.140	3.75		1m RCC CD, 1.5m RCC Open Drain (Ch 88+740 to 89+090)		

4.2.4 JUNCTIONS

There are 18 nos. of Minor junctions on the Connecting Road along the Main carriageway and the side roads are flexible pavement. The details of the junctions are furnished in Table 4.4. Representative photographs of some of the Junctions are presented in **Figures** below.

Fig.4.43.: Junction at Ch 63+410 LHS

Fig.4.44: Junction at Ch 64+230 RHS

Fig.4.45: Junction at Ch 66+830 RHS

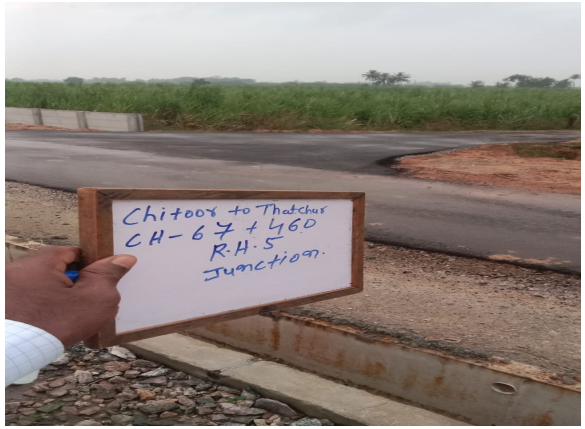

Fig.4.46: Junction at Ch 67+460 RHS

Fig.4.47: Junction at Ch 67+610 LHS

Fig.4.48: Junction at Ch 73+020 LHS

Fig.4.49: Junction at Ch 73+850 RHS

Fig.4.50: Junction at Ch 74+775 RHS

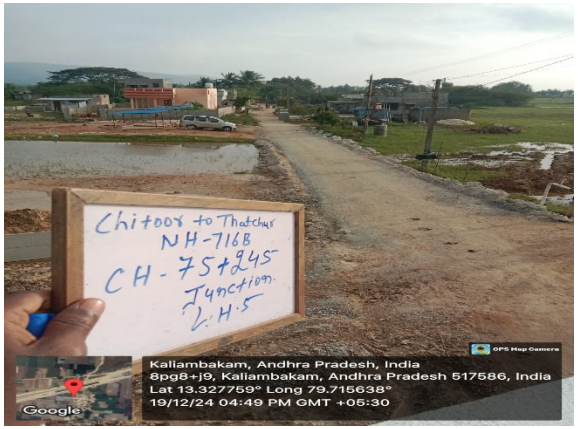

Fig.4.51: Junction at Ch 75+245 LHS

Fig.4.52: Junction at Ch 75+480 RHS

Fig.4.53: Junction at Ch 79+350 LHS

Fig.4.54: Junction at Ch 80+140 LHS

Fig.4.55: Junction at Ch 86+180 RHS

Fig.4.56: Junction at Ch 88+600 RHS

Fig.4.57: Junction at Ch 91+050 RHS

Table 4.4: Details of Minor Junctions

Sl. No.	Chainage (Km)	Type (T / X / Y)	SIDE	Side Road			Width of junction at mouth (m)	Tapper Length (m)
				Type	Road Width (m)	Condition		
1	63+410	X	LHS	BT	3.75	Fair	15	17
			RHS	BT	3.75	Fair	30	17
2	64+230	X	LHS	BT	3	Fair	10	20
			RHS	BT	3	Fair	5	35
3	67+460	T	RHS	BT	3	Fair	15	11
4	66+830	X	LHS	BT	3	Fair	9	18
			RHS	BT	3.75	Fair	15	11
5	67+600	T	LHS	BT	3	No	5	20
6	68+440	X	LHS	Earthen Road	3.5	-	10	30
			RHS	Earthen Road	3.5	-	10	25
7	73+020	X	LHS	BT	5.5	Fair	5.5	-

Sl. No.	Chainage (Km)	Type (T / X / Y)	SIDE	Side Road			Width of junction at mouth (m)	Tapper Length (m)
				Type	Road Width (m)	Condition		
			RHS	BT	5.5	Fair	5.5	-
8	73+850	X	LHS	BT			5.5	
			RHS	BT		-	5.5	
9	74+775	X	LHS	Earthen Road	3.75	GSB work under progress	14	40
			RHS	Earthen Road	3.75		14	40
11	75+245	X	LHS	BT		GSB work under progress	7	40
			RHS	BT			7	40
12	75+480	X	LHS	BT	3.5		12	20
			RHS	BT	3.5		12	
13	76+400	X	LHS	GSB TYPE	3.5		15	20
			RHS	GSB TYPE	3.5		15	20
14	79+350	X	LHS	BT	3		6	20
			RHS	BT	3		6	15
15	80+130	X	LHS	BT	3		8	20
			RHS	BT	3		8	20
16	83+180	X	LHS	BT	3.75	Fair		
			RHS	BT	3.75	Fair		
17	85+550	X	LHS		3.75		7	3.75
			RHS		3.75		7	3.75
18	86+180	X	LHS	BT	3.5		20	50
			RHS	BT	3.5		20	60

4.2.5 MEDIAN OPENINGS

Six Median Openings are provided on the project road and are without any storage lane. Solar blinkers are yet to be installed at these locations. The details of which are furnished in Table 4.5 below and representative photographs of the median are presented in Figures below.

Fig.4.58: Median Opening at Ch 62+500

Fig.4.59: Median Opening at Ch 72+380

Fig.4.60: Median Opening at Ch 77+200

Fig.4.61: Median Opening at Ch 82+200

Fig.4.62: Median Opening at Ch 83+530

Fig.4.63: Median Opening at Ch 87+100

Table 4.5: Details of Median Opening

Sl. No.	Chainage	Length of Opening	Condition
1	62+500	30 m	Road Studs to be provided & Temporary Barrier yet to be provided
2	67+500	30 m	
3	72+380	30 m	
4	77+200	40 m	Road Marking & Temporary Barrier yet to be provided
5	82+200	30 m	Road Marking & Temporary Barrier yet to be provided
6	83+530	Work in progress	Construction is in progress
7	87+100	30 m	Road Marking & Temporary Barrier yet to be provided

4.2.6 DRAIN

RCC Covered/Uncovered Drains are provided along the connecting roads and unlined earthen drain is provided along the project length. The details of drains are mentioned in Table 4.6. Representative photographs of some of the Drains are presented in Figures below.

Fig.4.64: Drain at Ch 61+430 LHS

Fig.4.65: Drain at Ch 67+600 LHS

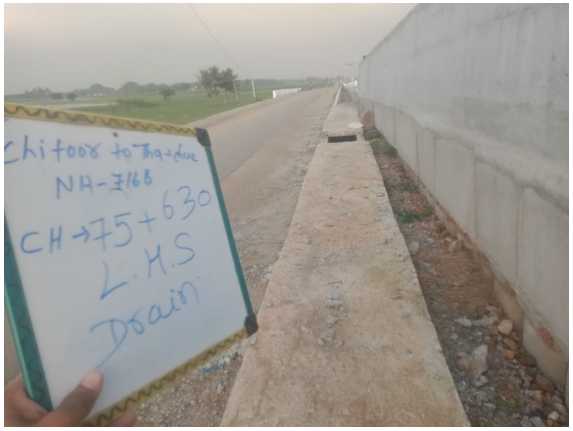

Fig.4.66: Drain at Ch 75+630 LHS

Fig.4.67: Drain at Ch 82+600 RHS

Fig.4.68: Drain at Ch 82+800 RHS

Fig.4.69: MBCB and Drain at Ch 82+980 RHS

Table 4.6: Details of the Drain along the Project Road

Sl. No.	Chainage		RCC Drain (Covered/Uncovered) in Km		Chute Drain length along the Project road (m)	
	From	To	LHS	RHS	LHS	RHS
1	61.000	62.000	0.62	0.62	----	----
2	62.000	63.000	0.100	----	----	----
3	63.000	64.000	1.000	1.000	----	----
4	64.000	65.000	0.200	0.200	----	----
5	65.000	66.000	----	----	----	----
6	66.000	67.000	0.400	0.400	0.390	0.360
7	67.000	68.000	0.400	0.400	----	----
8	68.000	69.000	0.400	0.400	0.240	0.240
9	69.000	70.000	----	----	0.570	0.570
10	70.000	71.000	0.400	0.400	0.270	0.270
11	71.000	72.000	0.200	0.200	0.190	0.190
12	72.000	73.000	----	----	----	----
13	73.000	74.000	----	----	0.680	0.680
15	75.000	76.000	0.200	0.200	----	----

Sl. No.	Chainage		RCC Drain (Covered/Uncovered) in Km		Chute Drain length along the Project road (m)	
	From	To	LHS	RHS	LHS	RHS
16	76.000	77.000	----	----	0.020	0.020
17	77.000	78.000	----	----	0.010	0.010
18	78.000	79.000	----	----	----	----
19	79.000	80.000	----	----	0.020	0.020
21	81.000	82.000	----	----	0.020	0.020
22	82.000	83.000	0.460	0.460	0.020	0.020
23	83.000	84.000	0.420	0.420	0.020	0.120
24	84.000	85.000	0.520	0.520	----	----
25	85.000	86.000	0.300	0.300	0.330	0.330
27	87.000	88.000	0.220	0.310	----	----
28	88.000	89.000	0.830	0.830	----	----
29	89.000	90.000	----	0.090	----	----

4.2.7 SLOPE PROTECTION

The details of Slope Protection are mentioned in Table 4.7. Representative photographs of some of the Slope Protection are presented in Figures below.

Fig.4.70: Slope Protection at Ch 68+600 RHS

Fig.4.71: Slope Protection at Ch 71+860 RHS

Fig.4.72: Slope Protection at Ch 72+000 RHS

Fig.4.73: Slope Protection at Ch 73+520 RHS

Fig.4.74: Slope Protection at Ch 73+900 LHS

Fig.4.75: Slope Protection at Ch 74+700 LHS

Table 4.7: Details of Slope Protection

Chainage		Stone Pitching/ Turfing/Vetiver grass length in km		Retaining /RE wall Length in km	
Start	End	LHS	RHS	LHS	RHS
61.000	62.000	----	----	----	----
62.000	63.000	----	----	----	----
63.000	64.000	----	----	0.53	0.45
64.000	65.000	----	----	----	----
65.000	66.000	----	----	----	----
66.000	67.000	----	----	0.28	0.28
67.000	68.000	----	----	0.2	0.2
68.000	69.000	0.4	0.4	----	----
69.000	70.000	0.4	0.4	----	----
70.000	71.000	0.4	0.4	----	----
71.000	72.000	0.4	0.4	----	----
72.000	73.000	0.1	0.1	----	----
73.000	74.000	0.6	0.6	----	----

Chainage		Stone Pitching/ Turfing/Vetiver grass length in km		Retaining /RE wall Length in km	
Start	End	LHS	RHS	LHS	RHS
74.000	75.000	0.6	0.6	----	----
75.000	76.000	0.4	0.4	----	----
76.000	77.000	0.2	0.2	----	----
84.000	85.000	----	0.2	----	----
85.000	86.000	0.4	0.4	----	----
86.000	87.000	----	----	----	----
87.000	88.000	----	----	----	----
88.000	89.000			0.1	0.1

4.2.8 SIGN BOARDS

The details in respect of the sign boards installed on the project road are furnished in Table 4.8 below. Representative photographs of some of the Sign Boards are presented in Figures below.

Fig.4.76: Sign Board at Ch 61+440 RHS

Fig.4.77: Sign Board at Ch 62+220 RHS

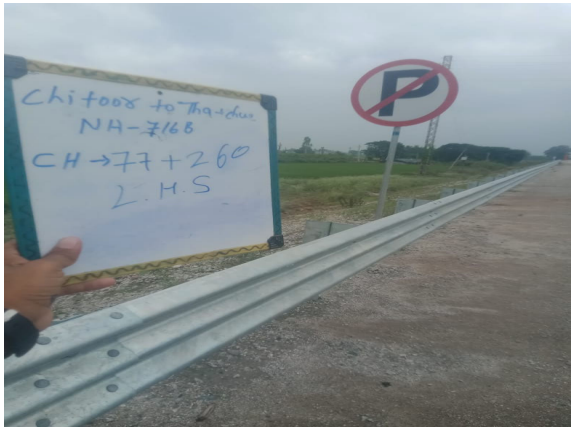

Fig.4.78: Sign Board at Ch 77+260 LHS

Fig.4.79: Sign Board at Ch 77+750 RHS

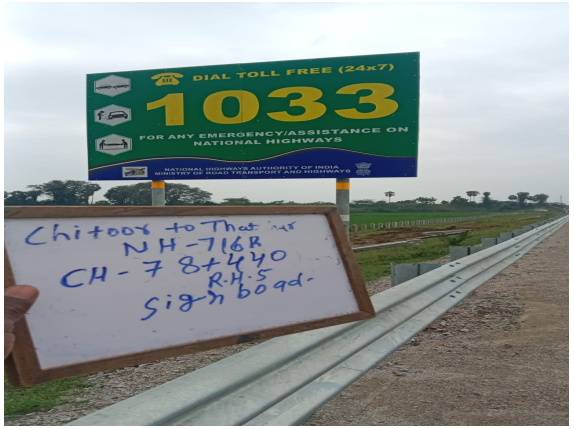

Fig.4.80: Sign Board at Ch 78+440 RHS

Fig.4.81: Sign Board at Ch 78+570 RHS

Fig.4.82: Sign Board at Ch 80+300 RHS

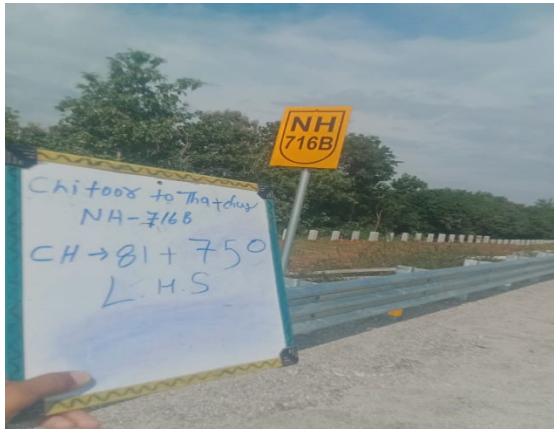

Fig.4.83: Sign Board at Ch 81+750 LHS

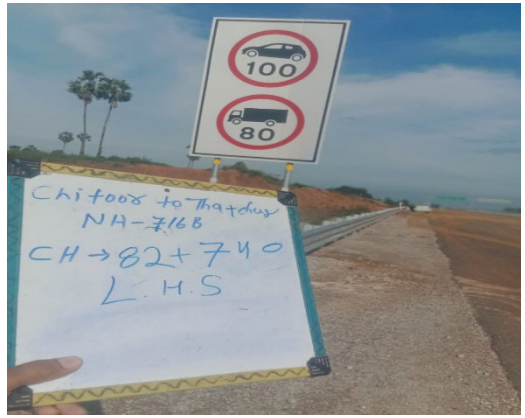

Fig.4.84: Sign Board at Ch 82+740 LHS

Fig.4.85.: Sign Board at Ch 87+250 RHS

Fig.4.86: Sign Board at Ch 88+550 RHS

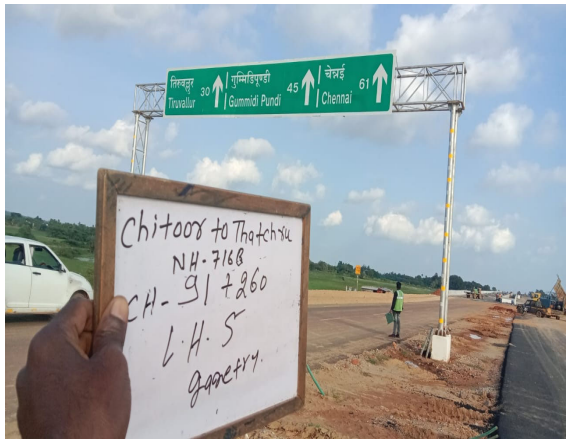

Fig.4.87: Sign Board at Ch 91+260 LHS

Table 4.8: Number of Sign Boards

SIGN BOARD	61-62	62-63	63-64	64-65	65-66	66-67	67-68	68-69	69-70	70-71	71-72	72-73	73-74	74-75	75-76	76-77	77-78
INFORMATORY/VILLAGE SIGN BOARD	2	2	1	4	1	1	1		2	2		3	1	3			1
OVERHEAD GANTRY	1		1	1								2					
OHM		2															
SPEED LIMIT		2					2					2					2
NH 716 B	2					2										2	
1033 HELP		2					2						2				
CANTILEVER GANTRY GIRDER	2	1															
CHEVRON	12	1															
CURVE AHEAD	1						2										
NO PARKING		2					2					2					2
OVERHEAD CABLES		2				2						2					
HEAVY VEHICLE KEEP LEFT			2					2					2				

SIGN BOARD	61-62	62-63	63-64	64-65	65-66	66-67	67-68	68-69	69-70	70-71	71-72	72-73	73-74	74-75	75-76	76-77	77-78
NO STOPPING						1											

SIGN BOARD	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-96
INFORMATORY/VILLAGE SIGN BOARD	1	1		1	4	3	3	1	1	1	1	1	1		
OVERHEAD GANTRY			2		1									1	
PETROL PUMP STATION															
OHM								2		2					
SPEED LIMIT					2					2					
T/Y/+/STARREGED JUNCTION															
BUS STOP															
GIVE WAY															
TRUCK LAY BYE															
NH 716 B				2						2				2	
1033 HELP	2										2				
GO SLOW															
NO PARKING					2					2					
HEAVY VEHICLE KEEP LEFT	2					2					2				

4.2.9 SAFETY BARRIERS

The details of Safety Barrier which includes the Thrie Beam Metal Beam Crash Barriers (MBCB), RCC Crash Barriers are furnished in Table 4.9 below. Representative photographs of some of the Safety Barrier are presented in Figures below.

Fig.4.88: MBCB at Ch 61+500 RHS

Fig.4.89: MBCB at Ch 67+670 RHS

Fig.4.90: MBCB at Ch 75+270 Median

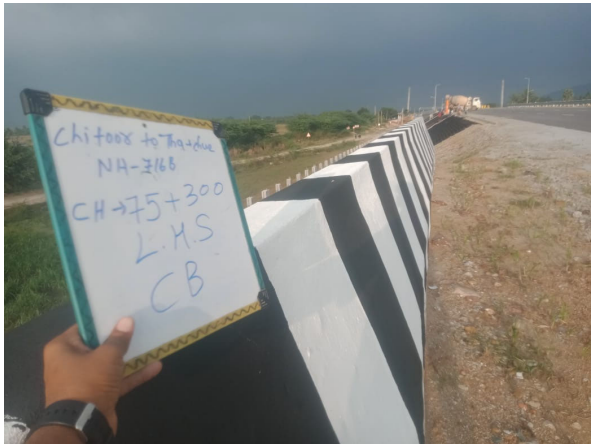

Fig.4.91: CB at Ch 75+300 LHS

Fig.4.92: CB at Ch 81+220 RHS

Fig.4.93: MBCB at Ch 81+550 RHS

Fig.4.94: MBCB at Ch 86+260 RHS

Fig.4.95: CB at Ch 88+600 RHS

Fig.4.96: MBCB at Ch 88+860 RHS

Table 4.9: Details of Safety Barriers.

S. no	Chainage		RCC Crash Barrier		MBCB	
	From	To	LHS (m)	RHS (m)	LHS (m)	RHS (m)
1	61.000	62.000	----	----	0.620	0.620
2	62.000	63.000	----	----	0.750	1.000
3	63.000	64.000	0.100	0.100	0.430	0.220
4	64.000	65.000	----	----	0.970	0.620
5	65.000	66.000	0.050	0.050	0.620	0.800
6	66.000	67.000	0.270	0.300	0.500	0.510
7	67.000	68.000	0.250	0.300	0.330	0.330
8	68.000	69.000	0.170	0.170	0.390	0.370
9	69.000	70.000	0.120	0.120	0.325	----
10	70.000	71.000	0.070	0.070	0.220	0.220
11	71.000	72.000	0.630	0.630	0.100	0.130
12	73.000	74.000	----	----	0.080	0.080
13	74.000	75.000	----	----	0.440	0.290

S. no	Chainage		RCC Crash Barrier		MBCB	
	From	To	LHS (m)	RHS (m)	LHS (m)	RHS (m)
14	75.000	76.000	----	----	0.530	0.460
15	76.000	77.000	----	----	0.580	0.620
16	77.000	78.000	----	----	0.620	0.500
17	78.000	79.000	----	----	0.910	0.900
18	79.000	80.000	----	----	0.610	0.680
19	80.000	81.000	----	----	0.400	0.710
20	81.000	82.000	0.090	0.330	0.300	0.300
21	82.000	83.000	0.030	----	0.650	1.060
22	83.000	84.000	0.110	0.110	----	0.390
23	84.000	85.000	----	----	0.610	----
24	85.000	86.000	----	----	0.400	----
25	86.000	87.000	0.03	0.03	0.580	0.440
26	87.000	88.000	----	----	0.410	0.100
27	88.000	89.000	0.130	0.130	0.440	0.170
28	89.000	90.000	----	----	----	0.870
29	90.000	91.000	0.030	0.030	----	0.050
30	91.000	92.000	0.59	0.59	----	----

4.2.10 LIGHTING

Details of Lighting provided on the Project Road are furnished in Table 4.10 below. Representative photos of same are shown in Figures below.

Fig.4.97: Lighting at Ch 65+800 RHS

Fig.4.98: Lighting at Ch 65+900 LHS

Fig.4.99: Lighting at Ch 66+200 RHS

Table 4.10: Details of Lighting

Chainage From	Pole Type	Number of Poles	No of Lamps	Height of Poles	Remarks
65+810	Double arm	1	2	**7**	
65+880	Double arm	4	4	**7**	
65+980	Double arm	2	2	**7**	
66+220	Double arm	2	4	**7**	VUP
65+810	Double arm	1	2	**1**	
65+880	Double arm	4	4	**7**	
66+220	Double arm	2	2	**7**	
66+810	Double arm	2	4	**7**	VUP
76+400	Double arm	2	4	**7**	VUP
60+130	Double arm	2	4	**7**	VUP

Chainage From	Pole Type	Number of Poles	No of Lamps	Height of Poles	Remarks
81+250	Double arm	2	4	7	
83+180	Double arm	2	4	7	
85+550	Double arm	2	4	7	
86+180	Double arm	2	4	7	
88+600	Double arm	2	4		
90+240	Double arm	2	4		
91+050	Double arm	2	4		

4.2.11 ROAD MARKING

The condition of the Road Marking in general was Good at most of the locations. The centre line marking is mostly provided and Representative Photos of the longitudinal marking are shown in the figures below and details are mentioned in Table 4.11 below.

Fig.4.100: Road Marking at Ch 61+400

Fig.4.101: Road Marking at Ch 61+450 RHS

Fig.4.102: Road Marking at Ch 72+500 RHS

Fig.4.103: Road Marking at Ch 77+200 RHS

Fig.4.104: Road Marking at Ch 80+450 RHS

Fig.4.105: Road Marking at Ch 88+900 RHS

Fig.4.106: Road Marking at Ch 90+000 RHS

Fig.4.107: Road Marking at Ch 91+400 RHS

Fig.4.108: Road Marking at Ch 91+800 RHS

Table 4.11: Details of Road Markings

SI. No.	Chainage		Condition	
	From	To	LHS	RHS
2	62.000	63.000	Good	Good
3	63.000	64.000	Good	Good
4	64.000	65.000	Good	Good
5	65.000	66.000	Good	Good
6	66.000	67.000	Good	Good
7	67.000	68.000	Good	Good
8	68.000	69.000	Good	Good
10	69.000	70.000	Good	Good
11	70.000	71.000	Good	Good
12	71.000	72.000	Good	Good
13	72.000	73.000	Good	Good
14	73.000	74.000	Good	Good
15	74.000	75.000	Good	Good
16	75.000	76.000	Good	Good
17	76.000	77.000	Good	Good
18	77.000	78.000	Good	Good
19	78.000	79.000	Good	Good
20	79.000	80.000	Good	Good
21	80.000	81.000	Good	Good
22	81.000	82.000	Good	Good
23	82.000	83.000	Good	Good
24	83.000	84.000	Good	Good
25	84.000	85.000	Good	Good
26	85.000	86.000	Good	Good
27	86.000	87.000	Good	Good
28	87.000	88.000	Good	Good
29	88.000	89.000	Good	Good
30	89.000	90.000	Good	Good

4.2.12 KILOMETER STONES/HECTOMETER STONES

Kilometre stones/5th Kilometer stones and Hectometer are generally seen to be available on the project road and installation is under progress. Representative photographs and details are mentioned in Table 4.12 below

Fig.4.109: KM stone at Ch 62+000 RHS

Fig.4.110: KM stone at Ch 68+000 RHS

Fig.4.111: KM stone at Ch 70+000 RHS

Fig.4.112: KM stone at Ch 76+000 LHS

Fig.4.113: KM stone at Ch 80+000 RHS

Fig.4.114: KM stone at Ch 84+000 RHS

Fig.4.115: KM stone at Ch 87+000 RHS

Fig.4.116: KM stone at Ch 89+000 RHS

Fig.4.117: KM stone at Ch 90+000 RHS

Table 4.12: Details of Km Stone/Hectometre Stone

SI. No.	Chainage		Kilometer/5th Kilometer Stone (nos.)			Hectometer Stone (nos.)		
	From	To	LHS	RHS	Condition	LHS	RHS	Condition
1	61.000	62.000				4	4	Good
2	62.000	63.000	1	1	Good	7	5	Good
3	63.000	64.000	1	1	Good	3	3	Good
4	64.000	65.000	1	1	Good	6	6	Good
5	65.000	66.000	1	1	Good	10	10	Good
6	66.000	67.000	1	1	Good	5	5	Good
7	67.000	68.000	1	1	Good	10	9	Good
8	68.000	69.000	1	1	Good	2	2	Good
10	69.000	70.000				3	3	Good
11	70.000	71.000	1	1	Good	4	4	Good
12	71.000	72.000	1	1	Good	4	4	Good
13	72.000	73.000						
14	73.000	74.000	1	1	Good	1	2	Good
15	74.000	75.000				4	2	Good

SI. No.	Chainage		Kilometer/5th Kilometer Stone (nos.)			Hectometer Stone (nos.)		
	From	To	LHS	RHS	Condition	LHS	RHS	Condition
16	75.000	76.000	1	1	Good	2	1	Good
17	76.000	77.000	1	1	Good	13	12	Good
18	77.000	78.000	1	1	Good	7	7	Good
19	78.000	79.000	1	1	Good	8	8	Good
20	79.000	80.000	1	1	Good	6	4	Good
21	80.000	81.000		1	Good	5	6	Good
22	81.000	82.000				7	8	Good
23	82.000	83.000	1	1	Good	6	5	Good
24	83.000	84.000		1	Good	1	4	Good
25	84.000	85.000		1	Good	4	6	Good
26	85.000	86.000	1		Good	6	5	Good
27	86.000	87.000				7	7	Good
28	87.000	88.000	1	1	Good	5	9	Good
29	88.000	89.000				6	4	Good
30	89.000	90.000		1	Good	1	9	Good
31	90.000	91.000						

4.2.13 BOUNDARY WALL

Boundary wall is provided all along the project length except at the structure locations and the installation work is in progress and are seen to be in good condition. Representative photographs and details are mentioned in Table 4.13 below.

Table 4.13: Details Of Boundary Wall

Sl. No.	Chainage		Boundary wall length (in m)	
	from	to	LHS	RHS
1	61+000	62+000	----	0.160
2	62+000	63+000	0.820	1.000
3	63+000	64+000	0.600	0.700
4	64+000	65+000	1.000	0.800
5	65+000	66+000	1.000	1.000
6	66+000	67+000	0.400	0.400
7	67+000	68+000	0.600	0.600
8	68+000	69+000	0.400	0.400
9	69+000	70+000	0.400	0.200
10	70+000	71+000	0.400	0.400
11	71+000	72+000	0.400	0.400
12	72+000	73+000	0.800	0.800
13	73+000	74+000	0.600	0.600
14	74+000	75+000	1.000	1.000
15	75+000	76+000	1.000	1.000
16	76+000	77+000	1.000	1.000
17	77+000	78+000	0.600	0.600
18	78+000	79+000	0.400	1.000
19	79+000	80+000	1.000	1.000
20	80+000	81+000	1.000	1.000
21	81+000	82+000	0.800	0.800
22	82+000	83+000	0.600	----
23	83+000	84+000	0.600	----
24	84+000	85+000	0.200	0.600

Sl. No.	Chainage		Boundary wall length (in m)	
	from	to	LHS	RHS
25	85+000	86+000	----	----
26	86+000	87+000	0.800	0.800
27	87+000	88+000	1.000	1.000
28	88+000	89+000	0.400	0.400
29	89+000	90+000	1.000	0.800
30	90+000	91+000	0.800	0.800

4.2.14 ATMS EQUIPMENT

Representative photographs of ATMS Equipment and details are mentioned in Table 4.14 below.

Fig.4.118: SOS at Ch. 61+430 RHS

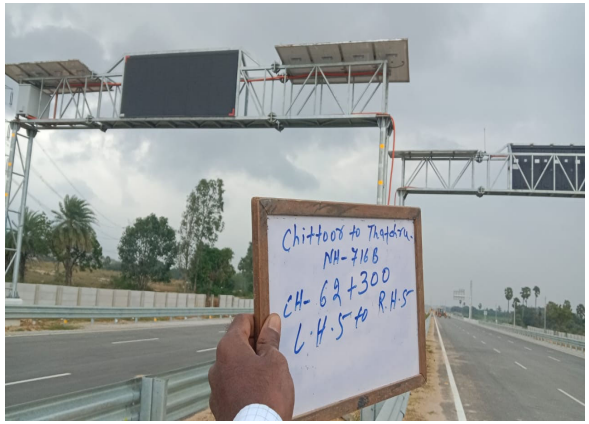

Fig.4.119: VMS at Ch. 62+300 LHS TO RHS

Fig.4.120: PTZ Camera at Ch. 73+700 Median

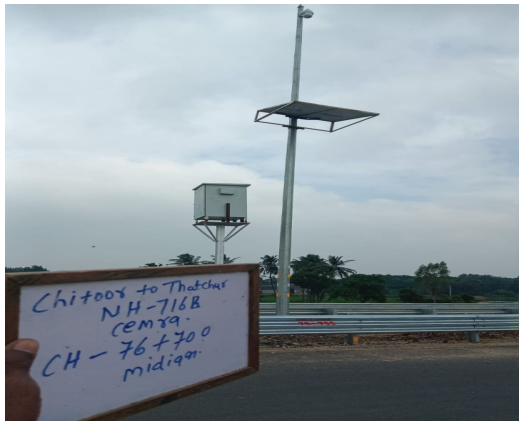

Fig.4.121: PTZ Camera at Ch. 76+700 Median

Fig.4.122: SOS Ch. 83+400 RHS

Fig.4.123: PTZ Camera at Ch. 83+600 Median

Fig.4.124: PTZ Camera at Ch. 87+400 Median

Fig.4.125: PTZ Camera at Ch. 88+600 Median

Fig.4.126: TTES (Speed Cameras) at Ch. 90+500 LHS

Table. 4.14: Details of ATMS

Acc. to ATMS Location Final Joint PDF				
SI. No.	**Equipment**	**Chainage**	**Side**	**Location**
1	ECB	61+430	BHS	MNB
2	PTZ CAMERA	61+700	MEDIAN	-
3	VMS	62+300	BHS	MCW
4	PTZ CAMERA	62+700	MEDIAN	MCW
5	ECB	63+650	BHS	END OF VUP
6	PTZ CAMERA	63+700	MEDIAN	MCW
7	PTZ CAMERA	64+700	MEDIAN	MCW
8	VMS	65+000	BHS	MCW
9	ECB	65+410	BHS	SHOULDER
10	PTZ CAMERA	65+700	MEDIAN	MCW
11	PTZ CAMERA	66+750	MEDIAN	VUP
12	ECB	67+400	BHS	SHOULDER
13	PTZ CAMERA	67+700	MEDIAN	MCW
14	PTZ CAMERA	68+700	MEDIAN	MCW
15	ECB	69+400	BHS	SHOULDER
16	PTZ CAMERA	69+700	MEDIAN	MCW
17	TTES (SPEED CAMERAS)	70+600	BHS	MCW
18	PTZ CAMERA	70+700	MEDIAN	MCW
19	ECB	71+400	BHS	SHOULDER
20	PTZ CAMERA	71+860	MEDIAN	MCW
21	PTZ CAMERA	72+700	MEDIAN	MCW
22	ECB	73+400	BHS	SHOULDER
23	PTZ CAMERA	73+700	MEDIAN	MCW
24	PTZ CAMERA	74+700	MEDIAN	MCW
25	ECB	75+400	BHS	SHOULDER
26	PTZ CAMERA	75+700	MEDIAN	MCW
27	VMS	75+800	BHS	MCW
28	PTZ CAMERA	76+700	MEDIAN	MCW

Acc. to ATMS Location Final Joint PDF				
SI. No.	**Equipment**	**Chainage**	**Side**	**Location**
29	ECB	77+400	BHS	SHOULDER
30	PTZ CAMERA	77+700	MEDIAN	MCW
31	PTZ CAMERA	78+700	MEDIAN	MCW
32	ECB	79+400	BHS	SHOULDER
33	PTZ CAMERA	79+700	MEDIAN	MCW
34	PTZ CAMERA	80+700	MEDIAN	MCW
35	ECB	81+500	BHS	SHOULDER
36	PTZ CAMERA	81+700	MEDIAN	MCW
37	PTZ CAMERA	82+700	MEDIAN	MCW
38	TELECOM TOWER	83+180	MEDIAN	MCW
39	ECB	83+400	BHS	SHOULDER
40	PTZ CAMERA	83+600	MEDIAN	MCW
41	PTZ CAMERA	84+700	MEDIAN	MCW
42	VMS	85+000	BHS	MCW
43	ECB	85+400	BHS	SHOULDER
44	PTZ CAMERA	85+700	MEDIAN	MCW
45	PTZ CAMERA	86+700	MEDIAN	MCW
46	ECB	87+400	BHS	SHOULDER
47	PTZ CAMERA	87+400	MEDIAN	MCW
48	PTZ CAMERA	88+600	MEDIAN	MCW
49	ECB	89+400	BHS	SHOULDER
50	PTZ CAMERA	89+700	MEDIAN	MCW
51	TTES (SPEED CAMERAS)	90+500	BHS	MCW
52	PTZ CAMERA	90+800	MEDIAN	MCW

4.2.15 PLANTATION

The Avenue Plantation & Median Plantation are in fair condition. The details median plantation and avenue plantation are shown in Table 4.15 below:

Fig.4.127: Plantation at 61+450

Fig.4.128: Plantation at 62+400

Fig.4.129: Plantation at 66+200

Fig.4.130: Plantation at 68+600

Fig.4.131: Plantation at 73+900

Fig.4.132: Plantation at 87+900

Table 4.15: Details of Plantation

From	To		Median Plantation	Avenue Plantation	Remarks
61+380	61+460			No	
61+460	62+350			Yes	Spacing of Plants 3 m
62+350	63+600		Yes	Yes	
63+600	64+930		Yes	Yes	
63+650	64+000		Yes	Yes	
64+000	66+000		Yes	Yes	
66+000	70+000		Yes	Yes	
71+240	72+960		Yes	Yes	
73+170	73+770	BHS	Yes	Yes	
73+900	74+720	BHS	Yes	Yes	
76+460	77+170	BHS	Yes	Yes	
87+800	90+200	BHS	Yes	Yes	
90+380	90+740	BHS	Yes	Yes	

4.3 OVERVIEW OF STRUCTURES

Detailed inventory of structures has been carried out. It is found that most of the structures are newly constructed are in Good condition and requires minor catchup works which shall be completed before the PCOD. The summarized details of the Inventory & Condition Survey for various structures are brought out in subsequent paras.

4.3.1 INTERCHANGE

There is only 1 Interchange at Ch. 95+444 on the Project road and construction of the structure is under progress. Construction of Sub structure is mostly completed and photographs of the same are shown in figures below.

Fig.4.133: Interchange at Ch. 95+444 LHS

Fig.4.134: Interchange at Ch. 95+444 LHS

Fig.4.135: Interchange at Ch. 95+444 LHS

Table 4.16: Details of the Interchange

Site chainage	Span as per site	Carriageway Width	Foundation	Sub Structure	Super Structure
95.444	3x30	32 m *	Open Foundation	Circular Pier and Wall Type Abutment	PCS I-Girder

*As per the GFC drawing. Construction work in progress.

4.3.2 MAJOR BRIDGES

There are 9 numbers of Major Bridges Newly Constructed on rivers and ponds crossing the Project Road. Details for the Major Bridges are furnished in Table 4.17 below.

Table 4.17: Details of Major Bridges

Design Chainage	Span Arrangement	Overall Width	Type Of Super Structure	Type Of Substructure	Type Of Foundation	Remarks
65+925	1x25+1x25+1x25+1x25	32	PSC Precast Pretensioned I - Girder	Wall type abutment and pier	Open foundation	On River
68+875	4x30+1x15	32	PSC Precast Pretensioned I - Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Viaduct over Pond
69+965	4x30+1x15	32	PSC Precast Pretensioned I - Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Viaduct over Pond
71+080	10x30	32	PSC Precast Pretensioned I - Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Viaduct over Pond
71+720	2X30+3X30+1X15	32	PSC Precast Pretensioned I - Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Viaduct over Pond
81+320	6X30	32	PSC Precast Pretensioned I - Girder	Rectangular Pier and Wall type Abutment	Open Foundation	Viaduct over Pond
91+665	19X30+1X15	32	PSC Precast Pretensioned I - Girder	Rectangular Pier	Pile Foundation	On River
93+850	2X30+2X3X30+2X30+1X15	32	PSC Precast Pretensioned I - Girder	Rectangular Pier and Wall type Abutment	Pile Foundation	On River
94+980	14x30	50	PSC Precast Pretensioned I - Girder	Rectangular Pier and Wall type Abutment	Pile Foundation	On River

Representative photographs of the Major bridges are shown in Figures below. Some of the site observations made in respect of some of structures are summarised in table 4.18 below.

Fig.4.136: MJB at Ch. 65+995 LHS

Fig.4.137: MJB at Ch. 65+965 LHS

Fig.4.138: MJB at Ch. 68+875 RHS

Fig.4.139: MJB at Ch. 69+965 LHS

Fig.4.140: MJB at Ch. 69+965 LHS

Fig.4.141: MJB at Ch. 71+140 LHS

Fig.4.142: MJB at Ch. 71+720 LHS

Fig.4.143: MJB at Ch. 71+720 RHS

Fig.4.144: MJB at Ch. 91+665 RHS

Fig.4.145: MJB at Ch. 93+850 LHS

Fig.4.146: MJB at Ch. 93+850 LHS

Fig.4.147: MJB at Ch. 93+850 LHS

Fig.4.148: MJB at Ch. 93+850 LHS

Fig.4.149: MJB at Ch. 94+980 RHS

Fig.4.150: MJB at Ch. 94+980 RHS

Fig.4.151: MJB at Ch. 94+980 RHS

Fig.4.152: MJB at Ch. 94+980 RHS

Fig.4.153: MJB at Ch. 94+980 RHS

Table 4.18: Observations & Recommendations on Major Bridges

Sl. No.	Site chainage	Observation		Recommendations	
		LHS	RHS	LHS	RHS
1	65+925	Structure is fair condition			
2	68+875	Honeycombing is seen in diaphragm, back side of Crash barrier and retaining wall.		Honeycombing needs to be repaired	
3	69+965	Honeycombing is seen in diaphragm, back side of Crash barrier and retaining wall.		Honeycombing needs to be repaired	
4	71+080	Expansion joints are yet to be installed		Balance works need to be completed as per the drawings	
5	71+720	1)Expansion Joints are yet to be installed 2) Honeycombing seen on back side of crash barrier		1) Balance works need to be completed as per the drawings 2)Honeycombing needs to be repaired	
6	81+320	Structure is in good condition			
7	91+665	Reinforcement exposed and honeycombing seen on backside of crash barrier		Reinforcement exposure and Honeycombing need to be repaired	
8	93+850	Construction work of slab, dirt wall, crash barrier, RE wall is in progress		Balance works need to be completed as per the drawings	
9	94+980	Construction work of piers is in progress		Balance works need to be completed as per the drawings	

4.3.3 MINOR BRIDGES

There are 6 numbers of Minor Bridges on the Project Road. Details for the Minor Bridges are furnished in Table 4.19 below.

Table 4.19: Details of Minor Bridges

Design Chainage	Span Arrangement	Overall Width	Type Of Super Structure	Type Of Substructure	Type Of Foundation	Remarks
77+494	2X17.5	32	PSC Precast Pretensioned I - Girder	Wall type abutment and pier	Open foundation	
82+340	1X30	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation	
85+768	1X30	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation	
87+743	1X20	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation	
30+325	1X25	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation	
90+770	1X30	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation	

Representative photographs of the Minor bridges are shown in Figures below. The Minor Bridges are found to be in Good condition. Some of the site observations made in respect of some of structures are summarised in table 4.20 below.

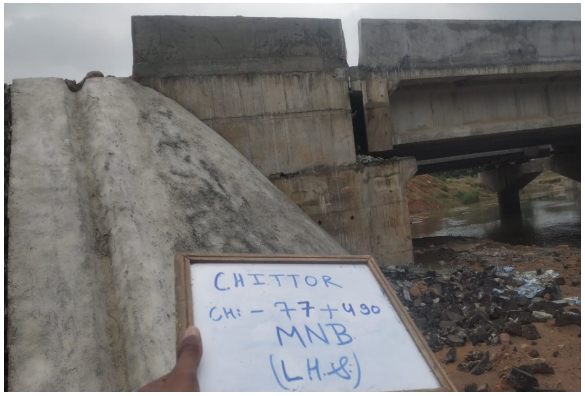

Fig.4.154: MNB at Ch. 77+490 LHS

Fig.4.155: MNB at Ch. 82+340 RHS

Fig.4.156: MNB at Ch. 85+770 LHS

Fig.4.157: MNB at Ch. 87+743 LHS

Fig.4.158: MNB at Ch. 90+323 LHS

Fig.4.159: MNB at Ch. 90+770 LHS

Table 4.20: Observations & Recommendations on Minor Bridges

Site chainage	Observation		Recommendations	
	LHS	RHS	LHS	RHS
77.49	Honeycombing seen on Crash barrier backside		Honeycombing needs to be repaired	
82.340	Honeycombing seen on cross girder and crash barrier.		Honeycombing needs to be repaired	
85.77	Structure is in good condition			
87.743	Waterway blocked due to soil dumping		Waterway needs to be cleared	
90.323	Pitching work on approach embankment is yet to be completed		Pitching work needs to be completed as per the drawings	
90.76	Honeycombing seen on Crash barrier backside		Honeycombing needs to be repaired	

4.3.4 UNDERPASSES

There are 16 nos. of Underpass which includes Vehicular Underpasses (VUP) and Light Vehicular Underpasses (LVUP) on the project road and are found to be in good condition. The details of the structures are mentioned in Table 4.21 below. Some of the site observations made in respect of the underpasses are summarised in table 4.22 below.

Table 4.21: Details of VUP/ LVUP

Sl. No.	Design Chainage	Structure Type	Span Arrangement	Overall Width	Type Of Super Structure	Type Of Substructure	Type Of Foundation
1	66+820	VUP	1 X 20 X 5.5	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
2	73+015	VUP	1 X 23.5	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
3	73+835	VUP	1 X 20 X5.5	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
4	86+183	VUP	1 X 20 X 5.5	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
5	63+415	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation

Sl. No.	Design Chainage	Structure Type	Span Arrangement	Overall Width	Type Of Super Structure	Type Of Substructure	Type Of Foundation
6	65+810	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
7	66+220	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
8	76+400	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
9	79+739	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
10	90+240	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
11	75+487	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
12	83+180	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
13	85+549	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
14	88+610	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation
15	91+050	LVUP	1 X 12 X 4	32	PSC Precast Pretensioned I - Girder	Wall type Abutment	Open Foundation

Fig.4.160: LVUP at Ch 63+415 LHS

Fig.4.161: LVUP at Ch. 65+793 LHS

Fig.4.162: LVUP at Ch. 66+238 LHS

Fig.4.163: VUP at Ch. 66+820 LHS

Fig.4.164: VUP at Ch. 73+439

Fig.4.165: SVUP at Ch. 74+775 LHS

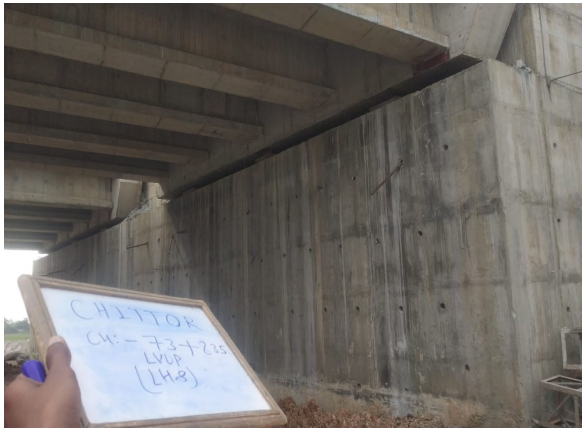

Fig.4.166: LVUP at Ch. 73+835 LHS

Fig.4.167: LVUP at Ch. 75+470 LHS

Fig.4.168: LVUP at Ch. 75+470 RHS

Fig.4.169: LVUP at Ch. 80+140 LHS

Fig.4.170: LVUP at Ch. 85+549 LHS

Fig.4.171: LVUP at Ch. 85+549 RHS

Fig.4.172: LVUP at Ch. 85+549 RHS

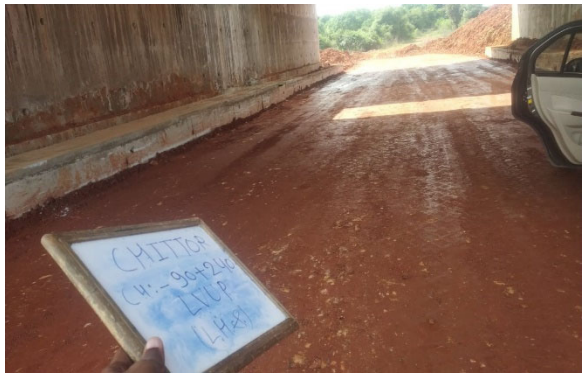

Fig.4.173: LVUP at Ch. 90+240 LHS

Fig.4.174: LVUP at Ch. 91+050 LHS

Table 4.22: Observations & Recommendations on VUP & LVUP

Site chainage	Observation		Recommendations	
	LHS	RHS	LHS	RHS
66+820	Structure is in good condition			
73+015	Structure is in good condition			
73+439	Structure is in good condition			
73+835	Honeycombing seen on Crash barrier backside			
63.415	Honeycombing in Crash barrier backside		Honeycombing needs to be repaired	
65.793	Honeycombing in Crash barrier backside		Honeycombing needs to be repaired	
66.238	Honeycombing seen on Crash barrier backside		Honeycombing needs to be repaired	
75.487	Structure is in good condition			
76.4	Structure is in good condition			
80.14	Structure is in good condition			
81.96	Structure is in good condition			
83.229	Structure is in good condition			
85.549	Structure is in good condition			
88.609	Structure is in good condition			
90.24	Structure is in good condition			
91.05	Structure is in good condition			

4.3.5 CULVERTS

The total 63 number of culverts are there on the Project Road and the details are brought out in Tables 4.23 & 4.24 below.

The total numbers of culverts on the Project Road are summarized in Table 4.23 below.

Table 4.23: Details of Culverts on the Project Road

SL. NO.	TYPE OF STUCTURE	NUMBER
1	Box Culvert	62
2	Pipe Culvert	01

Most of the culverts are in good condition some repair/maintenance work are required to be carried out on some culverts. The Observations of such culverts are summarised in Table 4.24. In most of the culvert it is observed that general cleaning of vegetation and garbage from the water way is required.

Fig.4.175: Box Culvert at Ch 61+390 RHS

Fig.4.176: Box Culvert at Ch 64+937 LHS

Fig.4.177: Box Culvert at Ch 66+320 RHS

Fig.4.178: Box Culvert at Ch 68+175 LHS

Fig.4.179: Box Culvert at Ch 71+490 LHS

Fig.4.180: Box Culvert at Ch 75+180 LHS

Fig.4.181: Box Culvert at Ch 79+280 RHS

Fig.4.182: Box Culvert at Ch 80+060 LHS

Fig.4.183: Box Culvert at Ch 83+070 LHS

Fig.4.184: Box Culvert at Ch 85+695 LHS

Fig.4.185: Box Culvert at Ch 86+040 LHS

Fig.4.186: Box Culvert at Ch 88+580 LHS

Fig.4.187: Box Culvert at Ch 89+190 LHS

Fig.4.188: Box Culvert at Ch 89+540 LHS

Fig.4.189: Box Culvert at Ch 89+620 LHS

Fig.4.190: Box Culvert at Ch 92+940 LHS

Fig.4.191: Box Culvert at Ch 94+380 RHS

Fig.4.192: Box Culvert at Ch 95+740 RHS

Table 4.24: Observations for Box/Slab Culverts

Site Chainage	Span as per site	Observation		Recommendations	
		LHS	RHS	LHS	RHS
61.390	1X6X4	Flexible apron, curtain wall, stone pitching works yet to be completed	1)Flexible apron, curtain wall, stone pitching works yet to be completed 2)Honeycombing in the retaining wall	Balance works need to be completed as per the drawings	1)Balance works need to be completed as per the drawings 2)Necessary repairs to be carried out in the retaining wall
62.176	1x2 x 2.00	Flexible apron, curtain wall yet to be completed		Balance works need to be completed as per the drawings	
62.680	1x2x2	Flexible apron, curtain wall yet to be completed		Balance works need to be completed as per the drawings	
63.228	1x2x2	1) Honeycombing is seen on back side of crash barrier . 2)Flexible apron, curtain wall work yet to be completed		1)Honeycombing needs to be repaired.	

Site Chainage	Span as per site	Observation		Recommendations	
		LHS	RHS	LHS	RHS
				2)Balance works need to be completed as per the drawings	
63+760	1x2x2	1) Honeycombing in wing wall. 2) Flexible apron, curtain wall work yet to be completed. 3) water way is blocked due to soil deposit.		1)Honeycombing needs to be repaired. 2)Balance works need to be completed as per the drawings 3) Waterway needs to be cleared	
64+060	1x2x2	1)Honeycombing in top slab and wing wall 2) Flexible apron, curtain wall yet to be completed		1)Honeycombing needs to be repaired. 2)Balance works need to be completed as per the drawings	
64+949	1x2x2	1)Honeycombing in crash barrier back side		Honeycombing needs to be repaired.	
65.436	1x2x2	1) Water way is blocked due to soil deposition 2) Parapet and wingwall yet to be completed		1)Waterway needs to be cleared 2)Balance works need to be completed as per the drawings	
66.32	1x2x2	Parapet is yet to be completed		Balance works need to be completed as per the drawings	
67.198	1x2x2	1) Crash barrier is yet to be completed 2)Waterway blocked due to soil deposition	1)Honeycombing in retaining wall. 2)Waterway blocked due to soil deposition	1)Balance works need to be completed as per the drawings 2)Waterway needs to be cleared	1)Honeycombing needs to be repaired. 2) Waterway needs to be cleared
67.410	1X6X4	Honeycombing is seen on crash barrier back side.	Reinforcement exposed and Honeycombing seen on crash barrier back side.	Honeycombing needs to be repaired.	
67.637	1x2x2	Structure is in good condition			
67.888	1X6 x 2.50	Stone pitching work is yet to be completed		Balance works need to be completed as per the drawings	
68.175	1X3 x 2.50	1)Bulging is seen in parapet. 2) Waterway blocked due to soil deposit		1)Necessary repairs need to be carried out in the parapet. 2)Waterway needs to be cleared	

Site Chainage	Span as per site	Observation		Recommendations	
		LHS	RHS	LHS	RHS
68.215	1X6 x 2.50	1)Honeycombing is seen in crash barrier back side . 2)Waterway blocked due to soil deposit		1)Honeycombing needs to be repaired 2)Waterway needs to be cleared	
69.077	1X3 x 2.50	1)Honeycombing at retaining wall backside. 2) Flexible apron, curtain wall work yet to be completed.		1)Honeycombing needs to be repaired. 2)Balance works need to be completed as per the drawings	
70.175	1X3 x 2.50	Structure is in good condition			
70.422	1x2x2	1)Honeycombing is seen in parapet back side and return wall . 2)Waterway blocked due to soil deposition		1)Honeycombing needs to be repaired 2)Waterway needs to be cleared	
71.49	1X3 x 2.50	1)Waterway blocked due to soil deposits 2) Parapet is yet to be completed		1)Waterway needs to be cleared 2)Balance works need to be completed as per the drawings	
72.14	1x2x2	1)Honeycombing in back side of crash barrier. 2)Waterway blocked due to soil deposits		1)Honeycombing needs to be repaired 2)Waterway needs to be cleared	
72.54	1X3 x 2.50	Wing wall yet to be completed		Balance works need to be completed as per the drawings	
73.36	1x2x2	1)Reinforcement exposure and Honeycombing is seen in parapet wall. 2)Flexible apron, curtain wall work yet to be completed.		1)Reinforcement exposure and honeycombing need to be repaired 2) Balance works need to be completed as per the drawings	
73.8	1x2x2	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
74.775	1X6x3.5	Structure is in good condition			
75.180	1x2x2	Waterway blocked due to soil deposits		Waterway needs to be cleared	
75+300	1X5X2.5	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
75.245	1X6x3.5	Structure is in good condition			
75.72	1x2x2	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
76.62	1X3 x 2.50	Honeycombing seen on back side of parapet		Honeycombing needs to be repaired.	
77.100	1X3 x 2.50	Structure is in good condition			

Site Chainage	Span as per site	Observation		Recommendations	
		LHS	RHS	LHS	RHS
77.32	1X3 x 2.50	1)Flexible apron, curtain wall work yet to be completed. 2)Honeycombing is seen in side of top slab.	Flexible apron, curtain wall work yet to be completed.	1)Honeycombing needs to be repaired. 2) Balance works need to be completed as per the drawings	
77.82	1x2x2	1)Flexible apron, curtain wall work yet to be completed. 2)Honeycombing in back side of parapet		1)Honeycombing needs to be repaired. 2)Balance works need to be completed as per the drawings	
78.2	1x2x2	Waterway blocked due to soil deposits		Waterway needs to be cleared	
78.51	1X3 x 2.50	Waterway blocked due to soil deposits		Waterway needs to be cleared	
79.08	1x2x2	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
79.28	1x2x2	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
79.350	1X6X3.5	Structure is in good condition			
79.5	1x2x2	1)Waterway blocked due to soil dump around the culvert. 2)Flexible apron, curtain wall ,stone ptiching at side slope work yet to be completed.		1)Waterway needs to be cleared 2)Balance works need to be completed as per the drawings	
80.06	1x2x2	1)Flexible apron, curtain wall work yet to be completed. 2)Waterway blocked due to vegetation growth		1)Waterway needs to be cleared 2)Balance works need to be completed as per the drawings	
80.597	1x2x2	Structure is in good condition			
80.43	1x2x2	1) Waterway blocked due to soil deposits 2)Flexible apron, curtain wall work yet to be completed.		1)Waterway needs to be cleared 2)Balance works need to be completed as per the drawings	
81.5	1x2x2	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
83.07	1X3 x 2.50	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	

Site Chainage	Span as per site	Observation		Recommendations	
		LHS	RHS	LHS	RHS
84.083	1X3 x 2.50	Honeycombing is seen in parapet wall.		Honeycombing needs to be repaired.	
84.3	1X3 x 2.50	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
85.4	1X2X2	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
85.695	1X2X2	Waterway blocked due to soil deposits		Waterway needs to be cleared	
83.83	1X2X2	1)Rain cuts seen in approaches 1)Flexible apron, curtain wall work yet to be completed.	Structure is in good condition	1)Rain cuts need to be repaired 2)Balance works need to be completed as per the drawings	
86	1X2X2	1)Rain cuts seen in approached 2)waterway blocked due to soil dump around the culvert.		1)Rain cuts need to be repaired 2)Waterway needs to be cleared	
88.580	1X3 x 2.50	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
89.14		not found			
89.19	1X2X2	Wing wall is yet to be completed		Balance works need to be completed as per the drawings	
89.54	1X3 x 2.50	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
89.62	1X6x 3.50	Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
90.590	1X3 x 2.50	Structure is in good condition			
90.78		not found			
92.43		not found			
92.940	1X3 x 2.50	1)Parapet wall, wing wall under construction. 2)Flexible apron, curtain wall work yet to be completed.		Balance works need to be completed as per the drawings	
93.050	1X6X4	Structure is in good condition			
94.380	1x2x2	Culvert Opening blocked due to soil deposits	Waterway blocked due to soil deposits	Waterway needs to be cleared	
94.530	1X6X4	Structure is in good condition			

Site Chainage	Span as per site	Observation		Recommendations	
		LHS	RHS	LHS	RHS
95.740	1x2x2	Construction is in progress		Balance works need to be completed as per the drawings	

CHAPTER 5.0: FIELD INVESTIGATIONS

5. FIELD INVESTIGATIONS FOR ASSESSMENT OF THE PROJECT ROAD CONDITION

As part of the Technical Due Diligence, various field investigations have been carried out in December 2024 & August 2025 for assessment of the pavement quality & condition and loading pattern of the traffic. The analysis and results from the field investigations are brought out in the subsequent sub paras.

5.1 AXLE LOAD SURVEY

5.1.1 SUMMARY OF VDF

Since the Project Highway is a greenfield project, Axle load survey was carried out at one location near the Nagari city at Ch. 66+865 on Tiruttani-Renigunta road for 24 hours.

Table 5.1: Summary of Vehicle Damage Factor for the project road

Sl. No.	Mode	Direction		VDF as per survey	Final VDF
		Chennai to Tirupati	Tirupati to Chennai		
1	**Bus**	0	1.20	1.20	1.20
2	**LCV**	0.01	0	0.01	1.32
3	**2 Axle Trucks**	1.21	0.71	1.09	3.99
4	**3 Axle Trucks**	2.89	4.81	3.48	3.48
5	**4-6 Axle Trucks**	2.72	20.21	9.57	9.57

5.1.2 CALCULATION OF CUMULATIVE MSA PROJECTION

The 7 days CTVC Count was carried out on the Tiruttani-Renigunta road at Ch. 66+500 from 24.12.24 to 30.12.24. The Average Dailly Traffic count is shown in table 5.2 below:

Table 5.2: Summary of Average Daily Traffic count

Tollable	Direction	Chennai to Tirupati	Tirupati to Chennai	Combined
Passenger Vehicles	Bus	345	298	643
	Mini Bus	84	68	152
	Car/Jeep/Van/Tata Magic	2960	2806	5766
Goods Vehicles	Loading Van	0	0	0
	LCV	162	171	333
	Truck 2 Axle	142	159	301
	Truck 3 Axle	239	189	428
	Truck 4-6 Axle	222	243	465
	Over sized Vehicle 7 or More Axle	0	0	0
	HCM/Earth Moving Machinery	0	0	0
	Vehicles (nos.)	**6918**	**7827**	**14745**
	Vehicles (PCUs)	**8391**	**8840**	**17231**

Table 5.3: Cumulative MSA Projection for the Design life

	Initial VDF	1.50	1.50	0.07	0.93	4.10	5.95	No. of Standard Axles	Design Standard Axles	Cumulative M.S.A.
	Year	BUS	Mini Bus	LCV	2-Axle Truck	3- Axle	4-6 Axle			
Base Year	2024-25	643	152	333	301	428	465	291142	291142	0.3
1	2025-26	675	160	350	316	449	488	1222797	1513938	1.5
2	2026-27	709	168	367	332	472	513	1283937	2797875	2.8
3	2027-28	744	176	385	348	495	538	1348133	4146008	4.1
4	2028-29	782	185	405	366	520	565	1415540	5561548	5.6
5	2029-30	821	194	425	384	546	593	1486317	7047865	7.0
6	2030-31	862	204	446	403	574	623	1560633	8608498	8.6
7	2031-32	905	214	469	424	602	654	1638665	10247163	10.2
8	2032-33	950	225	492	445	632	687	1720598	11967761	12.0
9	2033-34	998	236	517	467	664	721	1806628	13774388	13.8
10	2034-35	1047	248	542	490	697	757	1896959	15671347	15.7
11	2035-36	1100	260	570	515	732	795	1991807	17663154	17.7
12	2036-37	1155	273	598	541	769	835	2091397	19754552	19.8
13	2037-38	1212	287	628	568	807	877	2195967	21950519	22.0
14	2038-39	1273	301	659	596	847	921	2305766	24256285	24.3
15	2039-40	1337	316	692	626	890	967	2421054	26677338	26.7
16	2040-41	1404	332	727	657	934	1015	6778951	2542107	29.2
17	2041-42	1474	348	763	690	981	1066	7117898	2669212	31.9
18	2042-43	1547	366	801	724	1030	1119	7473793	2802672	34.7
19	2043-44	1625	384	841	761	1082	1175	7847483	2942806	37.6
20	2044-45	1706	403	884	799	1136	1234	8239857	3089946	40.7

The project road is a greenfield corridor connecting Bangalore Chennai expressway with Kolkata – Chennai Highway. For the traffic assessment. Concessionaire had carried out survey on Tiruthani- Renigunta road near Nagri. No assessment of the likely diverted or generated traffic has been made in the traffic report of the Concessionaire. As per the Concessionaire's pavement design report computed MSA comes to about 28 MSA while the design MSA as per the Schedule B of the Concession Agreement is 130 MSA. In order to make a comparative assessment M/s Aadharshila has also carried out the traffic survey at the same location and based on the traffic numbers and VDF values the Design MSA works out to 40.7 MSA (20 years).

It can be seen that the pavement design has been carried out in accordance with 130 MSA which is much above the computed Design MSA and it may be presumed that the adopted design MSA takes into account the likely diverted / generated traffic on the greenfield project road.

5.2 NETWORK SURVEY VEHICLE

5.2.1 SUMMARY OF ROUGHNESS RESULTS FROM NETWORK SURVEY VEHICLE

Detailed survey of the entire project road has been conducted by the Concessionaire on 20.08.2025 using Network Survey Vehicle (NSV) and the roughness results of the project road are summarised in **Table 5.4** below:

Table 5.4: Roughness Value for the Project road

LHS Direction						RHS Direction					
Chainage		Avg. BI (mm/km)				Chainage		Avg. BI (mm/km)			
From	To	Outer	Middle	Inner	Avg.	From	To	Outer	Middle	Inner	Avg.
61.380	62.000	1353.4	1315.9	1145.8	1271.7	96.040	95.000	1173.6	1383.6	1255.0	1270.7
62.000	63.000	1132.0	1201.0	1095.7	1142.9	95.000	94.000	1088.5	1235.9	1301.1	1208.5
63.000	64.000	1260.6	1195.6	1161.6	1206.0	94.000	93.000	1140.0	1195.2	1175.5	1170.2
64.000	65.000	1009.4	1046.5	986.5	1014.1	93.000	92.000	1046.7	1174.0	1067.2	1096.0
65.000	66.000	1102.2	1158.9	1111.9	1124.4	92.000	91.000	1134.1	1201.2	1097.7	1144.3
66.000	67.000	1218.4	1219.8	1187.0	1208.4	91.000	90.000	1390.4	1228.3	1308.3	1309.0
67.000	68.000	1149.5	1163.9	1095.2	1136.2	90.000	89.000	1111.6	1084.6	1229.6	1141.9
68.000	69.000	1196.9	1310.3	1243.4	1250.2	89.000	88.000	1301.8	1343.1	1309.1	1318.0
69.000	70.000	1236.7	1166.8	1197.1	1200.2	88.000	87.000	1172.1	1253.4	1261.7	1229.0
70.000	71.000	1193.2	1254.4	1176.9	1208.2	87.000	86.000	1071.6	1161.8	1210.6	1148.0
71.000	72.000	1243.7	1212.9	1237.1	1231.2	86.000	85.000	1331.5	1416.6	1332.3	1360.1
72.000	73.000	1130.0	1246.3	1102.4	1159.6	85.000	84.000	1198.4	1206.3	1152.7	1185.8
73.000	74.000	1165.6	1159.4	1181.9	1169.0	84.000	83.000	1252.4	1521.6	1358.0	1377.3
74.000	75.000	1128.8	1154.7	1177.4	1153.6	83.000	82.000	1121.4	1259.3	1211.6	1197.4
75.000	76.000	1393.5	1359.5	1358.1	1370.4	82.000	81.000	1279.6	1217.8	1208.9	1235.4
76.000	77.000	1181.8	1179.5	1130.6	1164.0	81.000	80.000	1110.1	1214.8	1152.3	1159.1
77.000	78.000	1137.0	1153.7	1130.5	1140.4	80.000	79.000	1178.8	1312.6	1198.0	1229.8
78.000	79.000	1202.5	1184.0	1126.7	1171.1	79.000	78.000	1004.4	1111.0	1068.9	1061.4
79.000	80.000	1251.0	1254.0	1163.7	1222.9	78.000	77.000	1127.9	1324.1	1158.5	1203.5
80.000	81.000	1131.7	1218.4	1103.0	1151.0	77.000	76.000	1140.2	1281.3	1201.7	1207.7
81.000	82.000	1263.9	1301.9	1210.2	1258.7	76.000	75.000	1421.2	1400.1	1319.9	1380.4
82.000	83.000	1063.6	1162.0	1143.4	1123.0	75.000	74.000	1145.4	1377.8	1256.8	1260.0
83.000	84.000	1058.3	1172.4	1061.0	1097.2	74.000	73.000	1406.6	1479.7	1428.0	1438.1
84.000	85.000	1143.7	1201.6	1150.2	1165.2	73.000	72.000	1115.8	1365.6	1217.6	1233.0
85.000	86.000	1157.4	1226.5	1134.0	1172.6	72.000	71.000	1339.2	1425.3	1347.8	1370.8
86.000	87.000	1204.0	1269.1	1065.9	1179.7	71.000	70.000	1217.4	1356.3	1282.2	1285.3
87.000	88.000	1205.5	1268.7	1112.3	1195.5	70.000	69.000	1280.2	1420.2	1234.8	1311.7
88.000	89.000	1098.8	1217.9	1108.0	1141.6	69.000	68.000	1145.1	1234.7	1209.7	1196.5
89.000	90.000	1192.1	1215.6	1123.1	1176.9	68.000	67.000	1171.7	1205.0	1070.8	1149.2
90.000	91.000	1342.6	1292.7	1158.5	1264.6	67.000	66.000	1255.1	1413.0	1238.8	1302.3

LHS Direction						RHS Direction					
Chainage		Avg. BI (mm/km)				Chainage		Avg. BI (mm/km)			
From	To	Outer	Middle	Inner	Avg.	From	To	Outer	Middle	Inner	Avg.
91.000	92.000	1385.9	1344.3	1287.6	1339.3	66.000	65.000	1446.6	1541.8	1494.8	1494.4
92.000	93.000	1245.2	1232.8	1119.0	1199.0	65.000	64.000	1196.7	1312.6	1311.4	1273.5
93.000	94.000	1376.4	1456.5	1460.1	1431.0	64.000	63.000	1170.8	1339.6	1238.6	1249.7
94.000	95.000	1407.6	1489.4	1434.2	1443.7	63.000	62.000	1305.4	1433.1	1244.9	1327.8
95.000	96.040	1644.2	1631.7	1547.8	1607.9	62.000	61.380	1403.0	1550.1	1531.6	1494.9

As per Schedule-K of the CA, wherever the roughness value exceeds 2750mm/ km, functional overlay may be required. The average roughness value for LHS MCW - 1214 mm/km & RHS MCW – 1256 mm / km. It can be seen from the above table that the roughness values are well within the acceptable limits along the project road. Thus, there is no requirement of any overlay at present as per the Roughness test results.

Table 5.5: Summary of Roughness Value for the Project road

S. No.	Condition	BI (mm/km)	LHS						RHS					
			Outer		Middle		Inner		Outer		Middle		Inner	
			L (km)	L (%)	L (km)	L (%)	L (km)	L (%)	L (km)	L (%)	L (km)	L (%)	L (km)	L (%)
1	Good	<1800	35	100	35	100	35	100	35	100	35	100	35	100
2	Fair	1800-2400	0	0	0	0	0	0	0	0	0	0	0	0
3	Poor	>2400	0	0	0	0	0	0	0	0	0	0	0	0
Total Surveyed length			**35**	**100**	**35**	**100**	**35**	**100**	**35**	**100**	**35**	**100**	**35**	**100**

Note:- L = Length

5.2.2 SUMMARY OF RUTTING RESULTS FROM NETWORK SURVEY VEHICLE

Detailed survey of the entire project road has been conducted by the Concessionaire on August 2025 using Network Survey Vehicle (NSV) and the roughness results of the project road are summarised in **Table 5.6** below:

Table 5.6: Rutting Value for the Project road

Rut depth (mm)	Length of the Road Effected with Rutting											
	LHS (in Km)			LHS (in %)			RHS (in Km)			RHS (in %)		
	OL	ML	IL	OL	ML	IL	OL	ML	IL	OL	ML	IL
< 5 mm	34.7	34.7	34.7	100%	100%	100%	34.7	34.7	34.7	100%	100%	100%
5 to 10 mm	0	0	0	0%	0%	0%	0	0	0	0%	0%	0%
> 10 mm	0	0	0	0%	0%	0%	0	0	0	0%	0%	0%

5.2.3 SUMMARY OF PAVEMENT DISTRESS RESULTS FROM NETWORK SURVEY VEHICLE

Detailed survey of the entire project road has been conducted by the Concessionaire on 20.08.2025 using Network Survey Vehicle (NSV) and the roughness results of the project road are summarised in **Table 5.7 & 5.8** below:

Table 5.7: Pavement Distress for the Project road LHS

Distress	Condition	PCI Range	Range of Distress	Length of the Road Affected					
				LHS (length in Km)			LHS (Length in %)		
				OL	ML	IL	OL	ML	IL
Cracking (% of Area)	Excellent to Good	100 to 80	< 5%	34.660	34.660	34.660	100.00	100.00	100.00
	Satisfactory to Fair	80 to 40	5% to 10%	0.000	0.000	0.000	0.00	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.000	0.00	0.00	0.00
Ravelling (% of Area)	Excellent to Good	100 to 80	< 1%	34.660	34.660	34.660	100.00	100.00	100.00
	Satisfactory to Fair	80 to 40	1% to 10%	0.000	0.000	0.000	0.00	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.000	0.00	0.00	0.00
Potholes Numbers (No's)	Excellent to Good	100 to 80	Nil	34.660	34.660	34.660	100.00	100.00	100.00
	Satisfactory to Fair	80 to 40	1 to 2	0.000	0.000	0.000	0.00	0.00	0.00
	Poor to Fail	40 to 0	>2	0.000	0.000	0.000	0.00	0.00	0.00
Patching (% of Area)	Excellent to Good	100 to 80	< 1%	34.560	34.460	34.560	99.71	99.42	99.71
	Satisfactory to Fair	80 to 40	1% to 10%	0.100	0.200	0.100	0.29	0.58	0.29
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.000	0.00	0.00	0.00
Rut depth (mm)	Excellent to Good	100 to 80	< 5	34.660	34.660	34.660	100.00	100.00	100.00
	Satisfactory to Fair	80 to 40	5 to 10	0.000	0.000	0.000	0.00	0.00	0.00
	Poor to Fail	40 to 0	> 10	0.000	0.000	0.000	0.00	0.00	0.00
IRI (m/km)	Excellent to Good	100 to 80	< 2.55	33.020	33.020	33.420	95.27	95.27	96.42
	Satisfactory to Fair	80 to 40	2.55 to 3.3	1.640	1.640	1.240	4.73	4.73	3.58
	Poor to Fail	40 to 0	> 3.3	0.000	0.000	0.000	0.00	0.00	0.00

Note:- OL= Outer Lane , ML= Middle Lane , IL = Inner Lane

Table 5.8: Pavement Distress for the Project road RHS

Distress	Condition	PCI Range	Range of Distress	Length of the Road Affected					
				LHS (length in Km)			LHS (Length in %)		
				OL	ML	IL	OL	ML	IL
Cracking (% of Area)	Excellent to Good	100 to 80	< 5%	34.660	34.660	34.660	100.00	100.00	100.00
	Satisfactory to Fair	80 to 40	5% to 10%	0.000	0.000	0.000	0.00	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.000	0.00	0.00	0.00
Ravelling (% of Area)	Excellent to Good	100 to 80	< 1%	34.660	34.660	34.660	100.00	100.00	100.00
	Satisfactory to Fair	80 to 40	1% to 10%	0.000	0.000	0.000	0.00	0.00	0.00
	Poor to Fail	40 to 0	> 10%	0.000	0.000	0.000	0.00	0.00	0.00
Potholes Numbers (No's)	Excellent to Good	100 to 80	Nil	34.660	34.660	34.660	100.00	100.00	100.00
	Satisfactory to Fair	80 to 40	1 to 2	0.000	0.000	0.000	0.00	0.00	0.00
	Poor to Fail	40 to 0	>2	0.000	0.000	0.000	0.00	0.00	0.00
Patching (% of Area)	Excellent to Good	100 to 80	< 1%	34.260	34.560	34.460	98.85	99.71	99.42
	Satisfactory to Fair	80 to 40	1% to 10%	0.300	0.100	0.200	0.87	0.29	0.58
	Poor to Fail	40 to 0	> 10%	0.100	0.000	0.000	0.29	0.00	0.00
Rut depth (mm)	Excellent to Good	100 to 80	< 5	34.660	34.660	34.660	100.00	100.00	100.00
	Satisfactory to Fair	80 to 40	5 to 10	0.000	0.000	0.000	0.00	0.00	0.00
	Poor to Fail	40 to 0	> 10	0.000	0.000	0.000	0.00	0.00	0.00
IRI (m/km)	Excellent to Good	100 to 80	< 2.55	33.300	33.460	33.660	96.08	96.54	97.11
	Satisfactory to Fair	80 to 40	2.55 to 3.3	1.360	1.200	1.000	3.92	3.46	2.89
	Poor to Fail	40 to 0	> 3.3	0.000	0.000	0.000	0.00	0.00	0.00

Note:- OL= Outer Lane , ML= Middle Lane , IL = Inner Lane

5.3 FIELD INVETIGATION USING FALLING WEIGHT DEFLECTIONS

5.3.1 FALLING WEIGHT DEFLECTION (FWD) TEST

Falling Weight Deflectometer Test conducted in August 2025 has been reviewed. As per the assessed residual life of the pavement there is no requirement for overlay.

5.3.2 MCW - ESTIMATED REMAINING LIFE OF PAVEMENT

Table 5.9: MCW - Estimated Remaining Life of Pavement

Chainage (km)		Existing Crust Thickness (mm)		15th Percentile E Value (MPa)			Fatigue Strain (εt)	Fatigue Residual Life (MSA)	Rutting Strain (εv)	Rutting Residual Life (MSA)	Remaining Life (MSA)
From	To	BT (mm)	Granular (mm)	BT	Granular	Subgrade					
LHS											
61.380	63.400	100	470	2661.31	1092.75	99.90	0.00009614	357.55	0.00014	4196.87	357.55
63.400	70.800	100	470	2695.88	1077.25	99.90	0.0000969	342.97	0.000141	4076.61	342.97
70.800	80.400	100	470	2648.04	1056.84	99.90	0.00009883	322.53	0.000143	3848.46	322.53
80.400	90.400	100	470	2555.12	1038.83	99.90	0.0001011	304.41	0.000144	3635.71	304.41
90.400	96.040	100	470	2518.34	1131.70	99.90	0.00009477	396.34	0.000138	4479.99	396.34
RHS											
61.380	66.600	100	470	2836.96	1117.51	99.90	0.00009291	386.70	0.000137	4569.43	386.70
66.600	70.600	100	470	2889.62	1045.86	99.90	0.00009732	317.84	0.000142	3885.38	317.84
70.600	77.300	100	470	2926.98	1082.10	99.90	0.00009448	352.76	0.000139	4265.55	352.76
77.300	81.700	100	470	2914.65	1105.08	99.90	0.00009306	375.51	0.000138	4494.74	375.51
81.700	91.000	100	470	2804.67	1080.30	99.90	0.00009569	348.18	0.00014	4169.77	348.18
91.000	96.040	100	470	2699.08	1019.24	99.90	0.0001011	290.49	0.000145	3545.77	290.49

From the FWD results it is seen that there is no requirement of any structural overlay as design MSA 130 is less than the Remaining life of the Concession period. However 40mm function overlay is suggested in 2029-30 and 2036-37 on the project road during the Concession period.

5.4 SUMMARY OF TRIAL PIT RESULTS

The details of the pavement composition of the Existing pavement as obtained from the trial pit are brought out in the **Table 5.10** below and the details of laboratory test results on subgrade samples are brought outlined **Table 5.11** below:

Table 5.10: Pavement Composition from Trial Pit

Sl. No.	Chainage	Side	Thickness of Layer (mm)				
			Bitumen	WMM	CTB	GSB	Total Thickness
1	Ch-61+540	LHS	105	100	170	200	575
2	Ch-66+500	LHS	103	100	170	200	573
3	Ch-71+450	RHS	100	100	170	200	570
4	Ch-76+500	LHS	100	100	170	200	570
5	Ch-71+550	RHS	100	100	170	210	580
6	Ch-86+500	LHS	100	100	170	200	570

Table 5.11: Laboratory Test results from Trial Pit samples (sub grade)

S No.	Chainage	Side	Grain Size Analysis				M.D.D (g/cc)	O.M.C (%)	LL-PL			C.B.R (%)
			4.75 mm	2.0 mm	425 micron	75 micron			LL (%)	PL (%)	PI	
1	61+540	LHS	75.22	55.88	26.70	11.78	2.18	6.40	34.30	NP		37.5
2	66+500	LHS	91.30	76.06	31.42	11.60	2.06	6.90	29.70	NP		38.3
3	71+450	RHS	87.02	76.76	52.64	31.74	2.00	8.10	40.20	NP		40.0
4	76+500	LHS	84.74	66.84	31.80	16.18	2.14	7.40	31.40	NP		40.3
5	71+550	RHS	88.56	71.32	33.44	15.82	2.12	7.42	30.00	NP		39.7
6	86+500	LHS	87.24	69.10	31.70	14.84	2.02	7.90	29.00	NP		41.7

5.4.1 CONCLUSION OF TRIAL PIT RESULTS

i. The MDD and Grain size analysis results indicate that the material for the subgrade is non-plastic type with MDD more than 2 gm/cc which is very good.
ii. The CBR results are more than 37% for all the locations which is exceptionally good.
iii. The pavement layer thicknesses are as per the pavement design for the project.

5.4.2 SUMMARY OF TEST RESULTS OF BITUMINOUS CORE SAMPLES

Table 5.12: Summary of Bituminous Layer of BC from Core cutting

S.No	Chainage (Km)	Side	Location	BC Core Thickness (mm)	BC Bulk Density (gm/cc)		Binder Content %	
					DBM	BC	DBM	BC
1	67+350	LHS	Median	100	2.249	2.306	4.39	4.96
2	73+400	RHS	Median	120	2.270	2.248	4.45	4.97
3	79+500	LHS	Median	104	2.260	2.247	4.17	5.24
4	85+280	RHS	Shoulder	100	2.336	2.227	4.27	4.84
5	91+260	LHS	Median	105	2.173	2.244	4.32	4.96
6	91+220	RHS	Center	100	2.242	2.243	4.89	5.57

5.5 SUMMARY OF RETRO-REFLECTIVE TEST RESULTS

5.5.1 SIGN BOARDS

The Retro reflective test was carried out on sample bases which covered 148 nos. sign boards of all types, color and gantry sign boards on the project road. These sign boards are having type 11 sheeting on which test was carried out as per IRC:67-2012 specifications.

Table 5.13: Summary of Retro reflectivity test results on LHS Sign boards

Sign Boards	No. of Boards	Percentage
Pass	72	100.0%
Fail	0	0.0%
Damaged	0	0.0%
Total	72	100.0%

Table 5.14: Summary of Retro reflectivity test results on RHS Sign boards

Sign Boards	No. of Boards	Percentage
Pass	75	100.0%
Fail	0	0.0%
Damaged	0	0.0%
Total	75	100.0%

Based on the sample tests carried out it is seen that 100% of total number of sign boards on the project road are safe and do not require any replacement of sheeting.

5.5.2 ROAD MARKING

The Retro reflective test was carried out on sample bases on the shoulder line, center line 1, center line 2 and kerb line.

Table 5.15: Summary of Retro reflectivity test results on LHS Road Marking

From	Shoulder Line		Center Line 1		Center Line 2		kerb Line	
	Rw (mcd/m²/lux)	Condition	Rw (mcd/m²/lux)	Condition	Rw (mcd/m²/lux)	Condition	Rw (mcd/m²/lux)	Condition
61.500	147	Pass	150	Pass	162	Pass	179	Pass
64.460	166	Pass	98	Pass	57	Pass	56	Pass
67.350	129	Pass	161	Pass	114	Pass	59	Pass
70.900	87	Pass	101	Pass	67	Pass	56	Pass
74.000	59	Pass	189	Pass	90	Pass	88	Pass
77.000	51	Pass	197	Pass	123	Pass	98	Pass
80.000	58	Pass	59	Pass	66	Pass	93	Pass
83.000	53	Pass	52	Pass	81	Pass	56	Pass
87.000	72	Pass	125	Pass	93	Pass	66	Pass
94.000	106	Pass	109	Pass	56	Pass	55	Pass
95.000	55	Pass	60	Pass	63	Pass	51	Pass

Table 5.16: Summary of Retro reflectivity test results on RHS Road Marking

From	Shoulder Line		Center Line 1		Center Line 2		kerb Line	
	Rw (mcd/m²/lux)	Condition	Rw (mcd/m²/lux)	Condition	Rw (mcd/m²/lux)	Condition	Rw (mcd/m²/lux)	Condition
95.858	53	Pass	51	Pass	53	Pass	75	Pass
93.000	60	Pass	58	Pass	70	Pass	62	Pass
89.000	73	Pass	87	Pass	109	Pass	76	Pass
85.000	85	Pass	58	Pass	68	Pass	66	Pass
83.000	57	Pass	54	Pass	58	Pass	57	Pass
81.000	88	Pass	56	Pass	66	Pass	101	Pass
77.000	57	Pass	67	Pass	55	Pass	63	Pass
75.000	82	Pass	65	Pass	53	Pass	83	Pass
72.000	60	Pass	74	Pass	58	Pass	59	Pass
68.000	75	Pass	72	Pass	81	Pass	52	Pass
63.000	75	Pass	81	Pass	59	Pass	65	Pass

Based on the sample tests carried out it is found that 100% length is having desired retro-reflectivity.

5.7 CONCULSIONS FROM FIELD INVESTIGATIONS

From the results of field tests, it is seen that the present condition of the project road is Good and meeting the performance criteria as given in the Concession Agreement.

Fig 5.1: Trial pit test carried out at site

Fig 5.2: Core cutting test carried out at site

Fig 5.3: Retro reflectivity test carried out at site

Fig 5.4: Field Testing NSV Photographs

Fig 5.5: Photographs showing FWD Test Under Progress

CHAPTER 6.0: OPERATION & MAINTENANCE STRATEGY

6.1 OPERATIONS & MAINTENANCE – REQUIREMENTS OF CONCESSION AGREEMENT

The Scope of Works for O&M stage has been mentioned in the Schedule-M of the Concession Agreement and also the O&M Manual as described earlier. The O&M Manual is a guideline to assist the Concessionaire. Certain forms and procedures are annexed as part of the Manual for facilitating proper supervision and implementation of various O&M activities. The Concessionaire is expected to cover the following two aspects during the entire Operations Period.

a) Operations part

This includes permitting smooth and uninterrupted flow of traffic during normal operating conditions, functioning of Toll system including charging and collecting fees from road user, functioning of patrolling system, functioning of rescue and medical aid services, functioning of the Project Facilities, public toilets and other sanitary facilities and solid waste disposal system.

b) Maintenance part

This includes maintaining the Project Road in traffic worthy conditions and the Project's Ancillary Facilities in usable condition satisfying the performance criteria as provided in the Concession Agreement throughout the Concession Period through regular maintenance and preventive maintenance of the various items and elements of the Project Highway.

6.2 PERFORMANCE PARAMETERS AS PER SCHEDULE K

Table 6.1: Performance Parameters

Sl. No.	Service Factor	Requirement
1	Roughness by Standardized rough meter/ Bump Integrator	Surface roughness shall not exceed 2750mm in a stretch of 1 km
2	Rutting	Not exceeding 10mm in more than 2% of road surface in stretch of 1km (measured with 3m straight edge)
3	Percentage Cracking	more than 5% of road surface in stretch of 1km
4	Ravelling/Stripping of bitumen surface	exceeding 10 sqm
5	Damage to prevent edges	exceeding 100 mm
6	Variation in prescribed side (embankment) slopes	more than 15% in prescribed side (embankment) slopes
7	Edge drop at shoulder	exceeding 40 mm

6.3 MAJOR MAINTENANCE - STATUS & STRATEGY

As per Schedule K of the Concession Agreement the Periodic Renewal will be undertaken so that surface roughness will not exceed 2750 mm/km during entire service life and in the last year of Concession Period**.** Road marking as specified and other roadside features shall also be restored to meet the relevant standards. This Periodic Maintenance shall also include profile corrective course of overlays with the periodic renewal of the wearing course of the road pavement and the wayside amenities.

The PCOD of the Andhra Pradesh section of the project road is likely to be obtained shortly. For the purpose of analysis PCOD is assumed as 1st April 2025. For the Tamil Nadu portion land has been made available recently and work is in progress.

6.3.1 STRATEGY OF MAJOR MAINTENANCE FOR CONCESSION PERIOD

From the Roughness Results obtained from NSV survey as brought out in para.5.3 of report, it can be seen that there is no requirement of functional overlay at present.

However, in order to meet the performance criteria envisaged in the concession agreement and looking to the condition of the project road following major maintenance works need to be carried out in the Concession period, the strategy is suggested as shown in **Table 6.2** below.

Table 6.2: Major Maintenance Work to be carried out from 2025 to 2040

Sl. no.	Period (year)	Type of Corrective Measures
1	2029-30	1st cycle renewal: Main Carriageway (BC -40mm) in 100% length
2	2036-37	2nd cycle renewal: Main Carriageway (BC -40mm) in 100% length

6.4 ROUTINE MAINTENANCE - STATUS & STRATEGY

In order to cover the requirements of the Concession Agreement and maintain the Asset in accordance with best industry practice the following activities are required to be carried out under routine maintenance in the remain concession period.

i. Maintenance of Potholes & cracks on the pavement surface;
ii. Maintenance of earthen shoulders;
iii. Cleaning of waterways of the structure, ROW & drains;
iv. Removal of vegetation and landscaping like Grass cutting & pruning of shrubs & trees, Watering, Applying manure, pesticide;
v. Maintenance of MBCB & RCC Crash Barrier;
vi. General housekeeping of the asset;
vii. Repair of median, kerbs, Sign Boards, Road Markings etc;
viii. Replacement of damaged /stolen sign boards, fixtures such as cats eyes, delineators;
ix. Electrical Maintenance.

6.5 PRESENT STATUS OF OPERATIONS

6.5.1 CONCESSIONAIRE OBLIGATION STATUS

The status of various obligations is as under**:**

i. The Technical manpower include Project Manager, Senior and Mid-management level Managers, Civil Engineers, Executives for Maintenance, IT, Accounts, HR & Administration.
ii. The User Services presently mobilized at site include;
    a. One fully furnished Ambulance and necessary staff including driver, paramedic and helper.
    b. Heavy duty tow-away vehicle / crane is available on call.
iii. Two Route Patrol Vehicles;
iv. Tolling System is functional at the Toll Plazas.

6.5.2 CONCESSIONAIRE OBLIGATION STRATEGY

One-time replacement of the Toll Management System and Two times replacement of Route Patrol Vehicles (2 nos.) and One-time Replacement of Ambulances (1 no.) & Crane (1 no.) is suggested to be considered. The staff deployment for Incident management needs to be considered adequately.

CHAPTER 7.0: OPERATION & MAINTENANCE COSTING

7.1 ASSESSMENT OF O&M COSTS

The assessment of the O&M costs has been done by considering works pertaining to Major Maintenance works and repair to the minor damages to the structures and road furniture items. Prevailing market rates & Andhra Pradesh SOR rates for the year 2024-25 have been adopted. The details are brought out hereunder.

7.1.1 O & M COST PROJECTION FOR CONCESSION PERIOD UPTO 2040

A summary of the O&M Cost based on 2025-26 rates is furnished in the **Table 7.1 & Table 7.2** below:

Table 7.1: Routine Maintenance & Operation Cost at FY 2026 level is used for future years

Sl. no.	Details	Amount incl. GST (in Cr.)
	Routine Maintenance & Operations Costs (Annual)	
i	Operational Expense	6.11
ii	Routine Maintenance Expense	2.08
	Total	**8.19**

Table 7.2: Operation & Maintenance Cost Projections (including GST)

Sl. No	Year	Periodic Maintenance Costs (in Cr.)	Routine Operations and Maintenance Cost (in Cr.)
1	2026-27		8.19
2	2027-28		8.19
3	2028-29		8.19
4	2029-30	51.47	8.19
5	2030-31		8.19
6	2031-32		8.19
7	2032-33		8.19
8	2033-34		8.19
9	2034-35		8.19
10	2035-36		8.19
11	2036-37	51.47	8.19
12	2037-38		8.19
13	2038-39		8.19
14	2039-40		8.19
	Total	**102.94**	**114.60**

7.2 CONCLUSIONS ON O&M REQUIREMENTS

The O&M Costs and the OPEX Projections for the Project Road have been worked out taking into consideration the requirements stipulated in the Concession Agreement the present condition of the road, structure and other assets and the overall maintenance strategy suggested for the entire Concession Period. The costs cover all the requirements and there does not appear to be any likely-hood of any unforeseen expenditure during the Concession Period.

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