

Date: February 28, 2022

To

Virescent Infrastructure Investment Manager Private Limited

10th Floor, Parinee Crescenzo

C- 30 'G' Block

Bandra Kurla Complex

Bandra (East),

Mumbai 400051, Maharashtra, India

Dear Sir,

Re: Submission of Final Report of Technical due diligence study for the project "Ulundurpet Expressways Pvt. Ltd (UEPL)".

With reference to the captioned matter, we are here with submitting the Final Report of "Technical Due Diligence for Tindivanam to Ulundurpet section of NH-45 from km 121.000 to km 193.900 of Length 72.900 kms in the State of Tamil Nadu".

Yours faithfully,

For **Samarth Infraengg Technocrats Pvt. Ltd.**

Authorized Signatory

Kalva Kiran Kumar



**Technical Due Diligence for Tindivanam
to Ulundurpet section of NH-45 from km
121.000 to km 193.900 of Length
72.900 kms in the State of Tamil Nadu.**

**For Virescent Infrastructure Investment
Manager Private Limited (For the purpose of
Highways Infrastructure Trust)**

Final Report

SAMARTH INFRAENGG Technocrats Private Limited



FEBRUARY 2022

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I. INTRODUCTION

The Govt. of India (GOI) through Ministry of Road transport & Highways (MoRT&H) has authorized National Highways Authority of India (NHAI) for widening the existing 2-lane to 4 lane from **km 121.000 (Tindivanam) to km 193.900 (Ulundurpet)** covering 72.900 kms of NH-45 in the state of Tamil Nadu, through Build, Operate and Transfer (BOT) basis. The project has been awarded to the Consortium lead by **M/s. GMR Infrastructure Ltd.**,

Consequent to this, M/s. GMR Infrastructure Ltd., formed a Special Purpose Vehicle (SPV) in the name of **Ulundurpet Expressways Pvt. Ltd.**, for implementation/execution of the project, registered under the companies act 1956.

The Concessionaire completed the project and obtained PCOD on 23.07.2009 with a punch list of items to be completed within 120 days. Final completion certificate received on 04.08.2016 with final completion date as 15.01.2010.

On 17.02.2014, **India Infrastructure Fund (IIF)** acquired control of 74% stakes of M/s Ulundurpet Expressways Pvt. Ltd. and balance 26% was acquired on 17.10.2016. Further, on 17.12.2021, Galaxy Investments II Pte. Ltd. acquired control of 100% stakes of M/s Ulundurpet Expressways Pvt. Ltd. from India Infrastructure Fund.

The project is presently under operation and maintenance by the Concessionaire Ulundurpet Expressways Pvt. Ltd. (UEPL”). Samarth Infraengg Technocrats Pvt. Ltd. has been engaged as Technical/ Engineering Due Diligence Advisor for Highways Infrastructure Trust purpose.

This report highlights the findings of due diligence study undertaken by consultants on the project.

II. PROJECT AT A GLANCE

The National Highway 45 (NH-45) begins in southern Chennai at the Kathipara Junction. Connecting many cities and towns in various districts in the State of Tamil Nadu and ends at Dindigul. The Total Length of the NH-45 is 417kms.

The Project Corridor start chainage is Km 121.000 and end Chainage is 193.900, the Total length of the Project Corridor is 72.900 Kms

The project corridor has flexible pavement in the entire length except at Toll Plaza Location where it is Rigid Pavement for a length of 50m, along the Project Corridor. The Project Road has 4-lane divided Carriageway with 7.0m wide carriageway and shyness of 0.25m flanked by 1.5m wide paved shoulder plus 1.0m earthen shoulder, except at approaches to underpasses where it is 6lane configuration

- The agreement was signed on 19.04.2006 and the Appointed date was taken on 16.10.2006.
- The project achieved Provisional Completion Certificates on 23.07.2009 for entire project length with condition to complete the punch list items within 120 days of PCOD. The Commercial Operations started from 23.07.2009

- The Effective date of Final Completion is 15.01.2010 for entire project length but the FCC was issued on 04.08.2016.
- The Concession Period for the project is 20 years and as per the CA original Concession Period end date is 15.10.2026. Subsequently the Project got extension of 98 days during construction and 38 days during operation; With this the revised end of Concession is due on 28.02.2027. The Remaining Concession Period is about 5 Years 1 month.

III. SALIENT FEATURES

Sl. No.	Description	Length/ Nos.	Details
1	Start Chainage (Km)	Km	121.000
2	End chainage (Km)	Km	193.900
3	Length of the Project Corridor	Kms	72.900
4	Service Road / Slip Road	Kms	36.443
5	Toll Plaza	Nos.	1
6	No. of Toll Lanes (Both side)	Nos.	12
7	ROBs	Nos.	3
8	Interchange /Grade Separators	Nos.	1
9	VUPs	Nos.	2+(1COS)
10	PUP's/CUP's	Nos.	6
11	Major Bridges	Nos.	6
12	Minor Bridges	Nos.	14
13	Culverts (Pipe)	Nos.	56
14	Culvert (Slab/Box)	Nos.	66
15	Major Junctions	Nos.	4
16	Minor junctions	Nos.	97
17	High Embankments with Stone Pitching	Kms	25.781
18	RCC Wall	Kms	2.66
19	RE Wall	Kms	8.180
20	Bus Bays with Shelter	Nos.	34
21	Bus Bays	Nos.	34
22	Truck Lay bye	Nos.	3
23	High Mast Lights	Nos.	28
24	Highway Lighting (length only)	Kms	8.850
25	Single Arm Lightnings	Nos.	29
26	Double Arm Lightnings	Nos.	215
27	Solar Blinkers	Nos.	102
28	Traffic Blinker (installed by Traffic police)	Nos.	138
29	Solar Lights	Nos.	23
30	RCC Cover Drain	ms	27662
31	Median drain	Kms	7.025
32	Median Plantation	Kms	53.115
33	W-Beam Safety Barriers	Kms	64.377

IV. IMPORTANT FINDINGS AND CONCLUSION

1. The project road in general has good pavement condition except for minor surface related distresses such as minor surface cracking at isolated locations.
2. Patching is observed at few locations and the condition of the patch is good and importantly No Pot holes are seen along the project road.
3. There are no major undulations or depressions are observed along the corridor indicating good Subgrade quality.
4. For this project, a Project specific Manual is provided in Schedule-D. the allowable threshold value of roughness is 3000 mm/km as per Schedule-L.
5. Roughness surveys along corridor indicate that the maximum Roughness in LHS Carriageway is 1586 mm/Km and the maximum Roughness in RHS Carriageway is 1632 mm/Km whilst the allowable roughness as per CA is 3000 mm/Km. It can be concluded that, no immediate overlay is required for entire length of the Project Road from Roughness consideration.
6. Benkelman Beam Survey Data indicates that the maximum characteristic deflection in LHS carriageway is 0.693 mm and the maximum characteristic deflection in RHS carriageway is 0.657 mm whilst the maximum allowable characteristic deflection as per CA is 1.2mm. it can be concluded that the, no immediate overlay is required for entire length from Pavement Deflection consideration.
7. As per CA, mandatory overlay shall be done every 5 years after Initial Construction and There is no mention regarding the minimum Overlay thickness. There is no mandatory overlay specified in the last year of Concession Period
8. Maintenance requirements stipulates that, the Surface shall not exceed 3000mm/Km during the service life of pavement at any time. A renewal coat of Bituminous concrete shall be laid every 5year after initial Construction or where the Roughness values reaches 3000mm/Km whichever is earlier to bring it to the initial value of 2000mm/Km. There is no mention regarding the minimum Overlay thickness.
9. Amendment was issues to IRC:81-1997 “Guidelines for Strengthening of Flexible Road Pavements, Using Benkelman Beam Deflection Technique” As per this Amendment (No. 1/IRC:81-1997/August, 2014 to IRC:81-1997), from structural considerations, the recommended minimum bituminous overlay thickness is 40 mm, however Clause 7.6 of IRC:81-1997stipulates that, where structural deficiency is not indicated from deflection values, thin surfacing may be provided to improve the riding quality as required.
10. As per Clause 507.1 of MoRTH, Specifications for Roads and Bridge Works (Fifth Revision), Single layer of 30mm thick Bituminous Concrete (BC) can be laid on previously prepared bituminous bound surface
11. Considering the above, For the next Major maintenance which is due in Year 2024-25, overlay thickness of 30mm BC for Main Carriageway and Service Road is consider in Costing as this is the Renewal Coat.

12. Concessionaire installed Solar System of capacity 1x60 KW in the recent past.
13. The Project road has One Toll plazas along the project road with rigid pavement. The Condition of the Rigid Pavement is Good
14. The concessionaire is maintaining the project facilities like truck lay byes, Toilets, Water supply, drinking water and power supply as per the agreement clauses and specifications which have been reviewed
15. Construction of Toilet Block under Swatch Bharat Mission is functional at Vikravandi Toll Plaza RHS. Due to local problem, the construction of toilet block in LHS at vikravandi Toll Plaza has been not started
16. Construction of Highway Nest (Mini) is completed and functioning at Vikravandi Toll Plaza RHS. Due to local problem, the construction of Nest (Mini) in LHS at vikravandi Toll Plaza has been not started.
17. Construction of VUP at Black Spot ID TN-98/TN-093-03 (Gingee Junction): Construction of VUP and approaches completed and open to traffic during December 2021.

V. COST ABSTRACT

S. No	FY	Immediate Repair's Cost + Routine and Operational Cost (Rs. Cr.)	Periodic Maintenance Cost (Rs. Cr.)	Total Cost (Rs. Cr)
1	2023	18.21	-	18.21
2	2024	18.21	37.47	55.69
3	2025	18.21	28.48	46.69
4	2026	18.21	-	18.21
5	2027	14.75	1.74	16.49
	Total:	87.59	67.69	155.29

Note:

1. Above costs are absolute numbers based on FY23 rates.
2. All the material rates are Feb 2022 Rates
3. All labour rates are taken from Central minimum wages (October'2021 cycle) and 2.5% escalation applied on the same to arrive FY2023 Rates
4. All numbers are without any Escalation.
5. Overlay thickness of 30mm BC considered in next MM (part length in FY24 and part length in FY 25)
6. All the Cost presented in the above table are excluding Head Office (HQ) Expenses

DUE DILIGENCE REPORT

1.1 INTRODUCTION

The Govt. of India (GOI) through Ministry of Road transport & Highways (MoRT&H) has authorized National Highways Authority of India (NHA) for widening the existing 2-lane to 4-lane from **km 121.000 (Tindivanam) to km 193.900 (Ulundurpet)** covering 72.900 kms of NH-45 in the state of Tamil Nadu, through Build, Operate and Transfer (BOT) basis. The project has been awarded to the Consortium lead by **M/s. GMR Infrastructure Ltd.,**

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This report highlights the findings of due diligence study undertaken by consultants on the project.

1.2 PROJECT AT A GLANCE

The National Highway 45 (NH-45) begins in southern Chennai at the Kathipara Junction. Connecting many cities and towns in various districts in the State of Tamil Nadu and ends at Dindigul. The Total Length of the NH-45 is 417kms.



Table 1: Project Corridor Chainage System

Referencing system	Project Corridor Start Point (km)	Project Corridor End Point (km)	Length (km)
Existing Chainage	121.000	193.900	72.900
Design Chainage	0.000	72.900	72.900

The Project Corridor starts from Tindivanam and runs towards Vikravandi, Villupuram, Madapatu and ends at Ulundurpet in Tamil Nadu. Photographs showing the start and end of the project road are presented below:



Start Point km 121.000

End Point km 193.900

Following Table highlights the total project at a glance:

Sl. No.	Description	Date
1.	Date of Signing the Concession Agreement	19.04.2006
2.	Appointment Date	16.10.2006
3.	Scheduled End of Concession	28.02.2027 (extension with 98 days during construction and 38 days during operation)
4.	Date of issue of Provisional Completion Certificate (COD)	23.07.2009
5.	Date of Commencement of Commercial Operation	23.07.2009
6.	Final Completion Date	15.01.2010 but letter issued on 04.08.2016

Table 2: Salient Features of Project Corridor

Sl. No.	Particulars	Length/ Nos.	As per Site
1	Start Chainage (Km)	Km	121.000
2	End chainage (Km)	Km	193.900
3	Length of the Project Corridor	Kms	72.900
4	Service Road / Slip Road	Kms	36.443
5	Toll Plaza	Nos.	1
6	No. of Toll Lanes (Both side)	Nos.	12
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8	Interchange /Grade Separators	Nos.	1
9	VUPs	Nos.	2+(1COS)
10	PUP's/CUP's	Nos.	6
11	Major Bridges	Nos.	6
12	Minor Bridges	Nos.	14
13	Culverts (Pipe)	Nos.	56
14	Culvert (Slab/Box)	Nos.	65
15	Major Junctions	Nos.	4
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18	Stone Pitching	Kms	25.781
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21	Bus Bays with Shelter	Nos.	34
22	Bus Bays	Nos.	34
23	Truck Lay bye	Nos.	3
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25	Highway Lighting (length only)	Kms	8.850
26	Single Arm Lightnings	Nos.	29
27	Double Arm Lightnings	Nos.	215
28	Solar Blinkers	Nos.	102
29	Traffic Blinker (installed by Traffic police)	Nos.	138
30	Solar Lights	Nos.	23
31	RCC Cover Drain	ms	27662
32	Median drain	Kms	7.025
33	Median Drainage chutes	Nos.	634
34	Embankment Chute drains	Nos.	992
35	Median Opening	Nos.	74
36	Median Damages	ms	105
37	Separator Damages	ms	4
38	Median Plantation	Kms	53.115
39	W-Beam Safety Barriers	Kms	64.377
40	Pedestrian Guard Rails	ms	560
41	Delineators	Nos.	138
42	Guard Posts	Nos.	103
43	Kilometer Stones	Nos.	144
44	Hectometer Stones	Nos.	558
45	Road Signs	Nos.	1842
46	Gantry Sign Boards	Nos.	9
47	Cantilever Sign Boards	Nos.	4
48	Varying Message Signs(VMS)	Nos.	12
49	Emergency Call Box	Nos.	65
50	Advanced Traffic Management System (ATMS)	Nos.	Nil

1.3 OBJECTIVE AND SCOPE OF SERVICES - FOR DUE DILIGENCE

The main objective of the study is to review the current status of project corridor including details pertaining to its construction and maintenance and to provide requisite technical information for processing the acquisition of said project by client. Objective of the study can be broadly defined with following tasks:

1.3.1 General

- Review of all documents related to Project including but not limited to provisional completion certificates, punch list items completion certificate, clearances, monthly IE reports, important correspondence if any.
- 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.
- Highlight any non-compliance of the terms of the CA or O&M manual and IC inspection reports etc.
- Review of any pending issues related to Utility shifting, maintenance etc. in accordance with the Concession Agreement.
- 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.
- In general review the toll plaza systems (incl. AVCC, weigh bridge, sensors, ETC etc.) and the hardware installed therein and comment on the adequacy and level of maintenance of the same to meet the requirements under CA.
- Review of as built drawings.
- 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.
- 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.
- Review of condition of SPV assets including all equipment and vehicles etc.
- Report on balance acquisition of land if any and possibility of acquisition.
- Report on current encroachments on the project stretch and future expected problems due to the same.

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, vehicles and other objects.
- iii. Assessment of condition of the structures including but not limited to visual inspections of bearings, expansion joints, superstructure, substructures, foundations, associated components, pre-stress anchorages (if any), review of geotechnical assumptions, perform geotechnical due diligence, review as-built design and assess design assumptions and provide a detailed report thereon.

- iv. Assessment of condition of the road pavement including but not limited to visual inspections of the pavement, review as-built design and assess design assumptions and provide a detailed report thereon.
- v. Assessment of physical dimensions/ condition of the infrastructure to determine useful lives of the materials and equipment requiring rehabilitation and/or replacement.
- vi. Recommendations for any major repair/ rehabilitation and strengthening based on the condition survey and design reports.
- vii. To provide a detail 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.

1.3.3 Investigations to be carried out

- 1.1. Assessing maintenance needs and its valuation according to the level of deterioration.
- 1.2. Carry out visual condition survey for rigid (toll plaza) and flexible pavement
- 1.3. Carry out drainage survey to assess any potential future problems which will cause by moisture and runoff.
- 1.4. 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.

1.3.4 O&M Assessment and Submission of Report

- 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.
- Provide comprehensive report by covering all scope of work mentioned herein this Engagement Letter.

1.4 SURVEYS AND INVESTIGATIONS

The main objective of undertaking Surveys and Investigations is to appreciate the existing engineering features along the project corridor and to understand the present condition of the various elements of the project road and to prepare inputs required for various rehabilitation and maintenance strategies.

Following Survey and Investigations have been undertaken as a part of study with an objective to understand the present condition of the road and there by access the quality of construction and as well to prepare requisite rehabilitation/corrective designs where necessary.

- Road Inventory Surveys
- Visual Pavement Condition
- BBD Surveys (data will be provided by Client)
- Roughness Surveys (data will be provided by Client)
- Test Pits& Subgrade Investigations

- Structure Inventory and Condition Surveys

1.4.1 Road Inventory

The project corridor has flexible pavement in the entire length except at Toll Plaza Location where it is Rigid Pavement for a length of 50m, along the Project Corridor. The Project Road has 4-lane divided Carriageway with 7.0m wide carriageway and shyness of 0.25m flanked by 1.5m wide paved shoulder plus 1.0m earthen shoulder, except at approaches to underpasses where it is 6lane configuration.

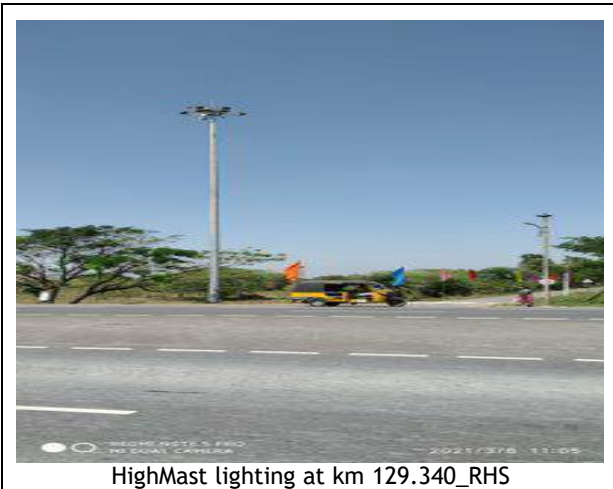
The project corridor generally runs in plain terrain for most of length except in few locations where it is rolling. The land use along the project road is mostly Agriculture. It passes through settlements like Vikravandi, Villupuram, Madapatu and ends at Ulundurpet in Tamil Nadu.

In general, road embankments are in the range of 0.3m-1.0m height. Embankments higher than 3.0m are observed mainly in the approaches of CD structures and Underpass locations. Maximum embankment height is observed near Major Bridge & ROB locations.

The Project Road has 4 major junctions and about 97 minor junctions along the project road. Photographs showing the Four major junctions are presented below:



About 28 numbers of High mast lighting is observed along the project road. Few photos showing High mast lighting are presented below:



HighMast lighting at km 129.340_RHS



HighMast lighting at km 158+880_RHS

Altogether, the Project road has about 34 Bus Bay with shelters. Few photos taken at the bus shelters and bus bays are presented below:



Bus Bay With Shelter @ km 152+000, RHS-SR



Bus Bay with Shelter @ km 131.830, RHS MCW



Bus Bay With Shelter @ km 150+600, RHS MCW



Bus Bay with Bus shelter @ km 168+100, RHS MCW

The Project Road has 3 Truck lay Bye at km 134.900 on LHS side & at km 184.600 on Both Sides. It has been provided with Flexible Pavement and the condition appears to be good. Toilet blocks and 6 High Mast Lighting have been provided at truck lay byes which are in good condition.

Few photos depicting the truck lay bye portion are presented below:



Table 3: Toll Plaza Details

Sl. No.	Chainage	Toll Plaza	Pavement Type	Length (m)	Width (m)	No. of Lanes in each direction	Office	Toilets
1	150+250	Vikravandi	Rigid	275	70	5+1	Yes	Yes

Few photos taken at toll plaza locations are presented below:



Service road/slip roads have been observed along the Project Corridor at Urban locations. The Condition of these Roads are Good. Few photos depicting the service road pavement surface type, condition and the other associated features like drain, pedestrian guard railing are presented below.



Service Road @ km 121+830-LHS_5.5m wide



Service Road @ km 123+180-LHS_5.5m wide



Service Road @ km 128+530-LHS_5.5m wide



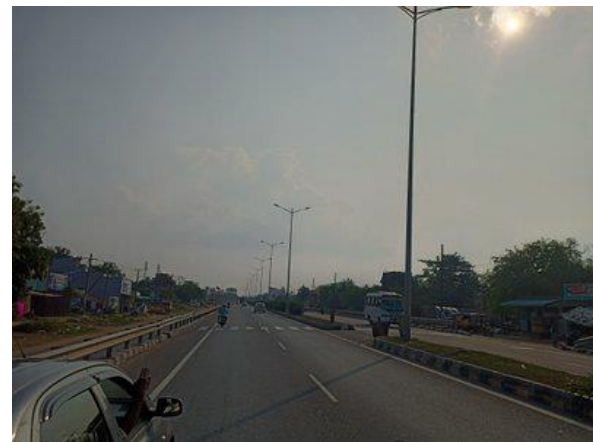
Service Road @ km 131+630-LHS_5.5m wide

1.4.2 Visual Pavement Condition Surveys

The present condition of pavement appears to be good. However, minor cracking is observed along the project road and Patching at few Locations. No potholes and no undulations are observed along the project. Few photos are presented below showing existing pavement condition:



Good Condition km 128+870



Good Condition km 131+540



Good Condition @ km 142+450



Good Condition km 133+770



Good Condition km 144+860



Good Condition @ km 149+880



Good Condition km 161+000



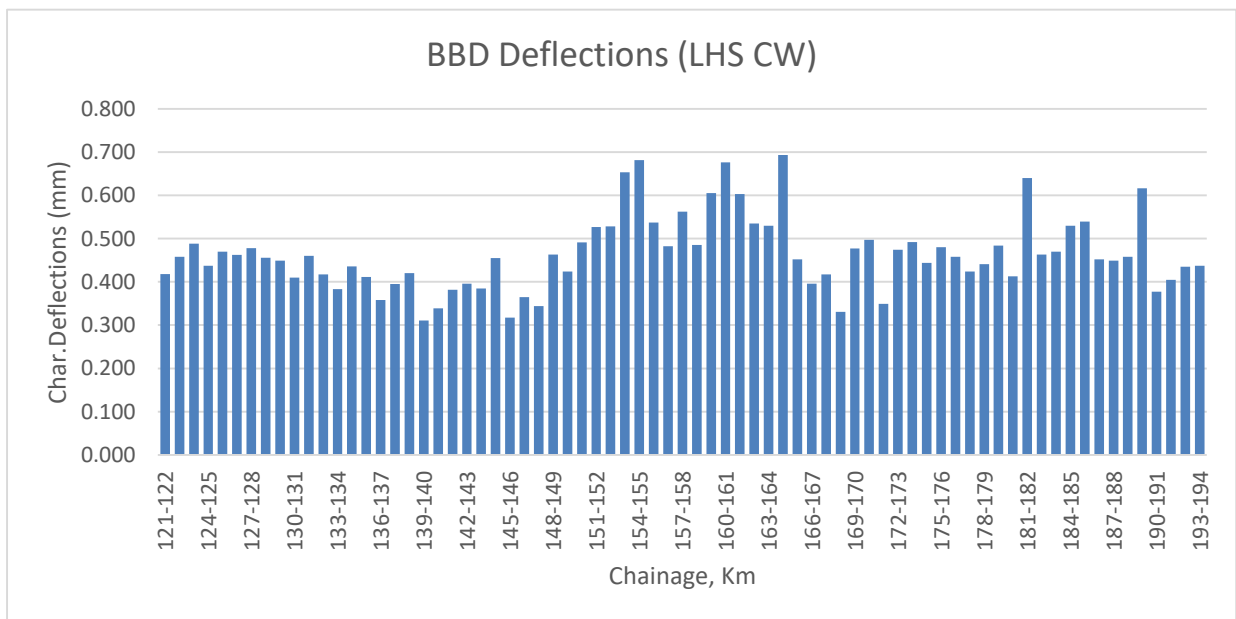
Good Condition km 165+030

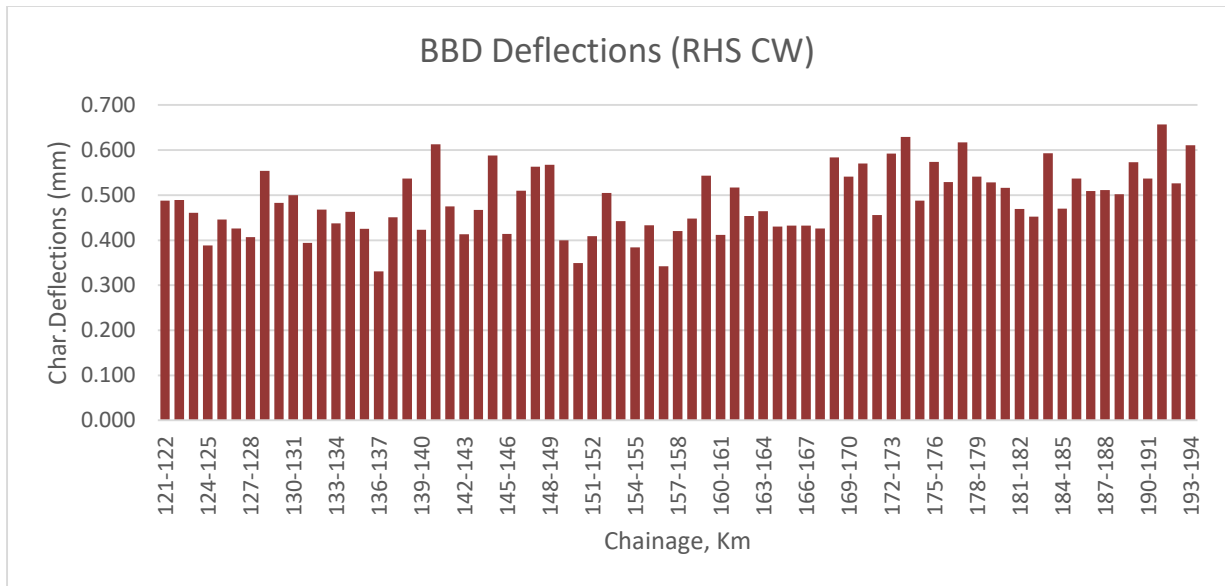


1.4.3 Latest Deflection Data

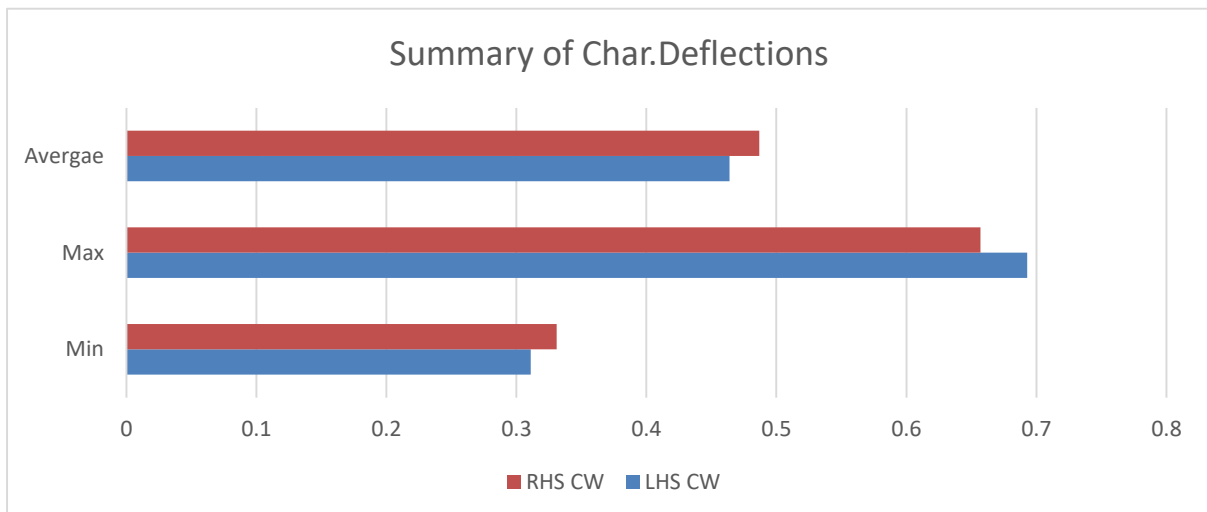
1.4.3.1 Benkelmen Beam Deflection Survey

Report on Benkelman Beam Deflection Survey provided by the Concessionaire indicates that the BBD surveys was carried in the month of September 2021. The Report Reveals that the Survey has been carried out by using instrument manufactured by STECO, New Delhi. Bar diagrams showing the kilometer wise characteristic Deflection values along the project road are presented below





Summary of the BBD Data analyzed is presented in the following chart:



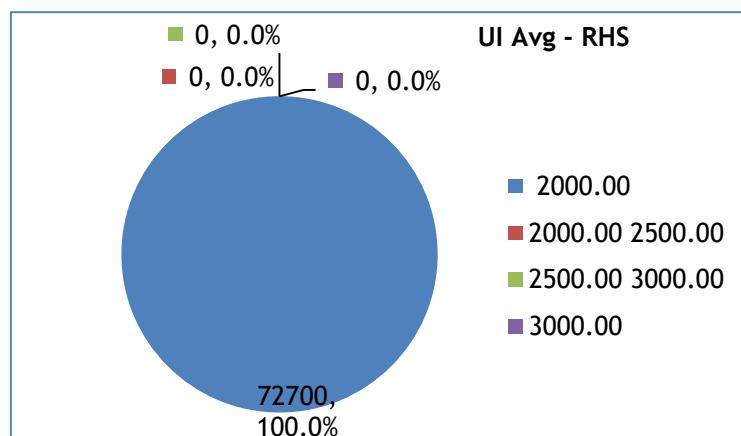
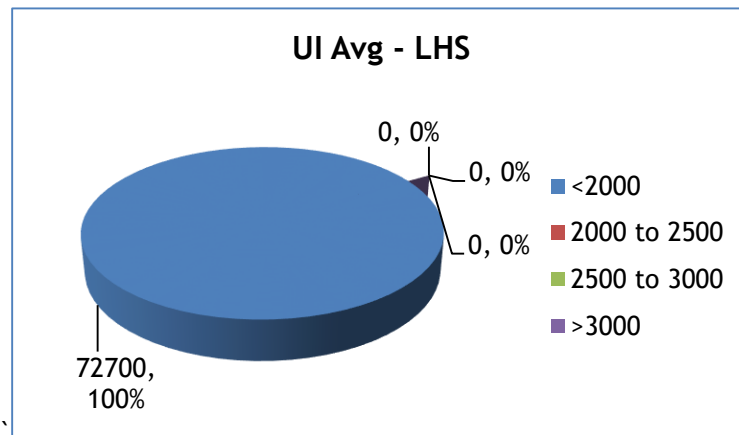
From the above it can be noticed that the Average characteristic values along the project road are 0.464 mm and 0.487 mm in LHS and RHS Carriageways respectively. The maximum Characteristic Deflection Values are 0.693 mm and 0.657 mm in LHS and RHS Carriageways respectively. From the above it can be concluded that none of the section of the project road requires strengthening overlay as the maximum Characteristic Deflection value is less 1.20 mm (Maximum allowed as per Schedule-L) in all sections.

1.4.4 Roughness surveys

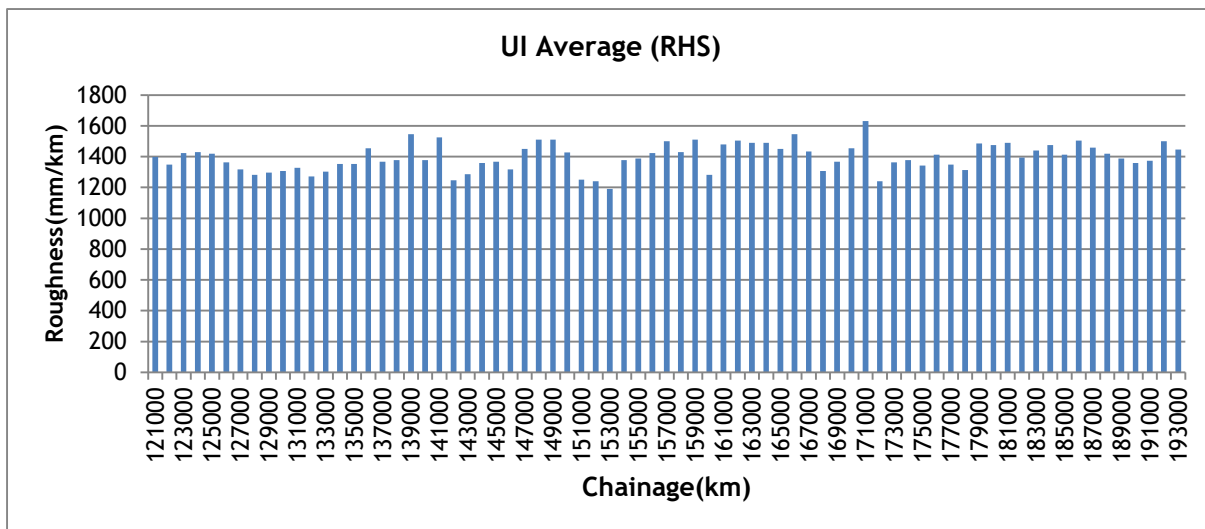
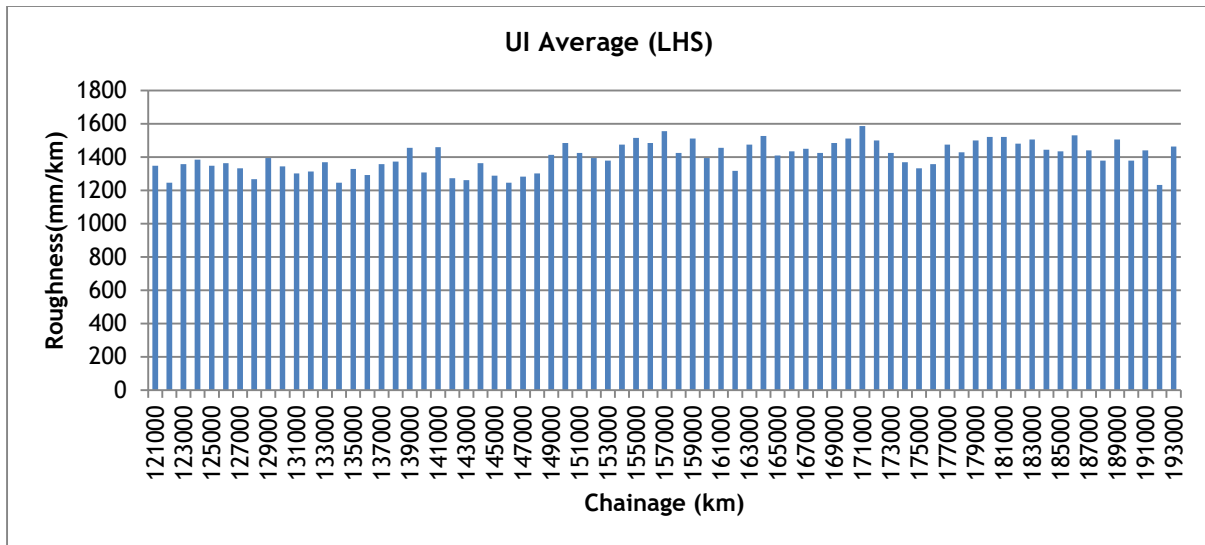
Report on Roughness Survey provided by the Concessionaire indicates that the Roughness surveys was carried in the month of August 2021. The Report Reveals that the Survey has been carried out by using 5th wheel Bump Integrator manufactured by STECO, New Delhi.

As per IRCSP:16-2004, Bituminous Concrete pavement surface is considered to be good when its UI value is less than 2000 mm/Km and the same is considered to be average for UI values between 2000 and 3000 mm/Km whilst the surface is treated as Poor for UI values greater than 3000 mm/Km.

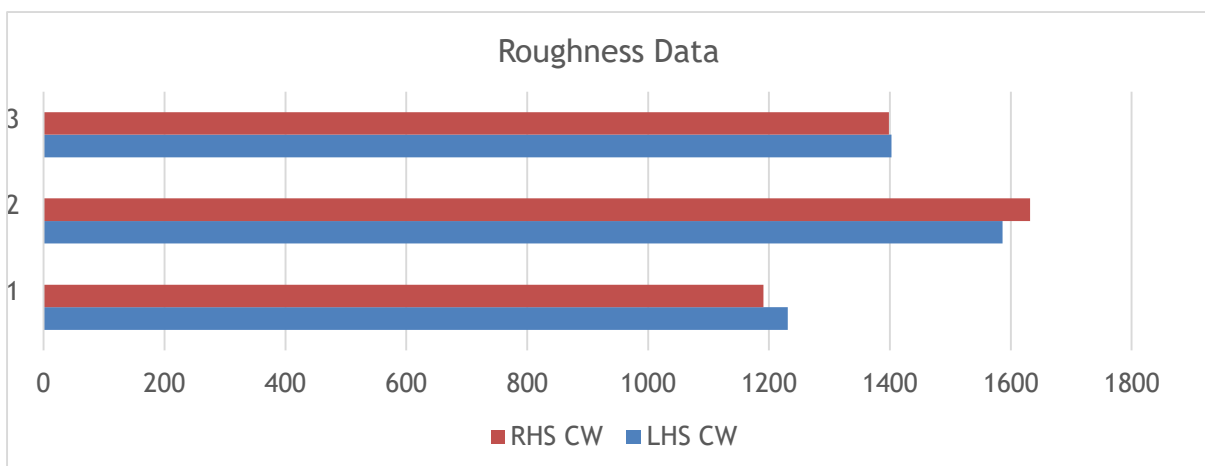
Average UI values along the corridor have been grouped in to four categories, Pie chart showing the range of UI values in each carriageway of the project road have been presented below:



It can be seen from the above pie charts, that about total length of the both carriageways having good riding quality (UI<2000 mm/km) along the project road. Bar diagrams showing the Kilometer wise roughness along the project road are presented below:



Summary of the Roughness Values analyzed is presented in the following chart



From the above it can be noticed that the Average Roughness values along the project road are 1402mm/Km and 1398 mm/Km in LHS and RHS Carriageways respectively. The maximum Roughness Values are around 1586 mm/Km and 1632 mm/Km in LHS and RHS Carriageways

respectively. From the above it can be concluded that none of the section of the project road requires functional overlay as unevenness Index (UI) is less than 3000 mm/km.

1.4.5 Pavement Composition Data

Test Pit Data provided by Client indicates that initial Construction was done with the following Pavement Crust 50mm BC+175mm DBM+250mm WMM+200mm GSB+100mm Drainage layer and subsequently two overlays done with 40mm BC in the year 2014-15 and in the year 2019-20.

1.4.6 Aggerate Sources

Good quality of aggregate material required for overlay work and concrete work is available along the project road at Km 124.5 (LHS) and Km 137.800 (LHS) within a reasonable lead of about 8 to 15 Km.

1.5 VALIDATION OF EXECUTED WORKS

The project road has been closely inspected to verify the executed works on ground vis-à-vis the scope envisaged in CA. Each and every structure has been inspected to note down its structural configuration and condition. The following works highlight the findings on executed works on ground.

1.5.1 Road Works

The Project Road has 4-lane divided Carriageway and is provided with width of 7.0 m carriageway plus paved shoulders of 1.5m and a shyness of 0.25m and Earthen shoulders of 1.0m has been provided on each side of median over the entire length except at flyover locations where the road has 6-lane configuration.

Location of service roads and slip roads as constructed are as below:

Table 4: Service Road/Slip Road Locations -LHS

Sl. No.	Chainage		Length (m)	Side	Pavement Type	Width (m)	Remarks
	from (Km)	To (Km)					
1	121180	121670	490	LHS	Flexible	5.5	
2	123300	124300	1000	LHS	Flexible	7.0	
3	126200	127000	800	LHS	Flexible	5.5	
4	128600	128950	350	LHS	Flexible	3.5	
5	131900	132180	280	LHS	Flexible	3.5	
6	132600	133900	1300	LHS	Flexible	5.5	
7	134750	134950	200	LHS	Flexible	3.5	
8	135600	136450	850	LHS	Flexible	5.5	
9	137200	138150	950	LHS	Flexible	5.5	
10	142500	143000	500	LHS	Flexible	3.5	
11	146630	148600	1970	LHS	Flexible	5.5	

Sl. No.	Chainage		Length (m)	Side	Pavement Type	Width (m)	Remarks
	from (Km)	To (Km)					
12	149400	150000	600	LHS	Flexible	5.5	
13	150600	152100	1500	LHS	Flexible	7.0	
14	152500	156200	3700	LHS	Flexible	5.5	
15	159240	160440	1.200	LHS	Flexible	5.5	VUP_SR_COS
16	163800	164110	310	LHS	Flexible	5.5	
17	166890	168380	1490	LHS	Flexible	5.5/7.0	
18	169580	170220	640	LHS	Flexible	5.5	
19	172230	172580	350	LHS	Flexible	5.5	
20	172750	173500	750	LHS	Flexible	5.5	
21	180180	183700	3520	LHS	Flexible	5.5/7.0	
22	185400	186200	800	LHS	Flexible	5.5	
23	190770	191300	530	LHS	Flexible	5.5	
As per Site Total Length (m)			24080				

Table 5: Service Road/Slip Road Locations-RHS

Sl. No.	Chainage		Length (m)	Side	Pavement Type	Width(m)	Remarks
	From (Km)	To (Km)					
1	124250	123250	1000	RHS	Flexible	5.5	
2	127000	126000	1000	RHS	Flexible	5.5	
3	133900	132750	1150	RHS	Flexible	3.5/5.5	
4	136450	135600	850	RHS	Flexible	5.5	
5	138200	137400	800	RHS	Flexible	3.5/5.5	
6	148600	146980	1620	RHS	Flexible	7.0	
7	156200	152380	3820	RHS	Flexible	7.0/5.5	
8	157800	156960	840	RHS	Flexible	3.5/5.5	
9	159240	160440	1.200	RHS	Flexible	5.5	VUP_SR_COS
10	164650	162120	2530	RHS	Flexible	5.5	
11	167260	166900	360	RHS	Flexible	5.5	
12	170200	169580	620	RHS	Flexible	5.5	
13	176320	177420	1100	RHS	Flexible	5.5	
14	176900	175500	1400	RHS	Flexible	5.5	
15	180250	179900	350	RHS	Flexible	5.5	
16	182100	181000	1100	RHS	Flexible	7.0	
17	186200	185400	800	RHS	Flexible	5.5	
As per Site Total Length(m)			19640				

Lined Covered drains exist at Service Road locations in entire length of the project road and these sections are presented in the Table below:

Table 6: Lined Covered Drain Locations - As per Site

Sl. No.	Chainage		Length (m)	Side	Drain Dimenions		Remarks
	from	To			Width (m)	Depth (m)	
1	126200	127000	800	LHS	1.5	1.2	
2	132600	133900	1300	LHS	1.5	1.2	
3	135600	136450	850	LHS	1.5	1.2	
4	137200	138150	950	LHS	1.5	1.2	
5	146630	148600	1970	LHS	1.5	1.2	
6	151300	152100	800	LHS	1.5	1.2	
7	152500	156200	3700	LHS	1.5	1.2	
8	159.280	160.400	1.120	1.5	1.2	LHS	VUP_SR_COS
9	159.280	160.400	1.120	1.5	1.2	RHS	VUP_SR_COS
10	169580	170200	620	RHS	1.5	1.2	
11	169580	170220	640	LHS	1.5	1.2	
12	172750	173500	750	LHS	1.5	1.2	
13	176320	177420	1100	LHS	1.5	1.2	
14	180990	183600	2610	LHS	1.5	1.2	
15	190770	191300	530	LHS	1.5	1.2	
16	152380	156200	3820	RHS	1.5	1.2	
17	146980	148600	1620	RHS	1.5	1.2	
18	137400	138200	800	RHS	1.5	1.2	
19	135600	136450	850	RHS	1.5	1.2	
20	132750	133900	1150	RHS	1.5	1.2	
21	126000	127000	1000	RHS	1.5	1.2	
22	123250	124250	1000	RHS	1.5	1.2	
23	185400	186200	800	RHS	1.5	1.2	
Total Length			27660				

On curved sections with super-elevation, chutes in median were provided and are presented in table below:

Table 7: Median Chutes

Sl. No.	Chainage		Length	No of Chutes	Damage	Condition
	From (km)	To (km)				
1	121.080	121.250	0.170	3	-	Good
2	121.530	121.650	0.120	13	-	Good
3	121.990	122.500	0.510	54	-	Good
4	124.000	124.500	0.500	29	-	Good
5	125.570	125.605	0.035	5	-	Good
6	125.780	126.000	0.220	9	-	Good
7	126.100	126.120	0.020	2	-	Good
8	126.900	127.970	1.070	10	-	Good

Sl. No.	Chainage		Length	No of Chutes	Damage	Condition
	From (km)	To (km)				
9	128.570	128.630	0.060	6	-	Good
10	129.360	129.550	0.190	28	-	Good
11	137.400	137.550	0.150	9	-	Good
12	138.600	139.000	0.400	15	-	Good
13	140.970	141.200	0.230	22	-	Good
14	141.500	141.600	0.100	7	-	Good
15	141.980	142.150	0.170	11	-	Good
16	148.100	148.230	0.130	30	-	Good
17	149.430	149.580	0.150	13	-	Good
18	151.400	151.500	0.100	10	-	Good
19	154.000	154.300	0.300	28	-	Good
20	157.970	158.185	0.215	18	-	Good
21	158.550	158.750	0.200	18	-	Good
22	158.800	158.950	0.150	17	-	Good
23	164.080	164.200	0.120	9	-	Good
24	164.230	164.400	0.170	13	-	Good
25	166.730	166.870	0.140	15	-	Good
26	166.900	167.100	0.200	14	-	Good
27	174.950	175.170	0.220	19	-	Good
28	177.550	177.750	0.200	17	-	Good
29	187.100	187.280	0.180	9	-	Good
30	187.420	187.900	0.480	31	-	Good
31	187.980	188.270	0.290	27	-	Good
32	189.200	189.440	0.240	37	-	Good
33	189.750	189.900	0.150	15	-	Good
34	190.300	190.650	0.350	29	-	Good
35	191.200	191.410	0.210	42	-	Good
Total Length			8.140	634		

RE/RCC walls and Pitching are found in approaches of some of the Grade-Separators/ROB/Major Bridges along the Project Corridor and are listed in the table below.

Table 8: Slope Protection Details

Sl. No.	Chainage (km)		Length (m)	Side	Embankment	Stone Pitching	Chutes	RE Wall	RCC Wall	Grouting	Remarks
	From (km)	To (km)									
1	121.250	121.650	0.400	LHS	Yes	Yes	25	-	-	-	
2	121.700	121.710	0.010	LHS	Yes	Yes	-	-	-	-	
3	121.720	122.570	0.850	LHS	Yes	Yes	-	-	-	-	
4	122.570	121.710	0.860	RHS	Yes	Yes	22				
5	122.590	122.800	0.210	LHS	Yes	Yes	12	-	-	-	

Sl. No.	Chainage (km)		Length (m)	Side	Embankment	Stone Pitching	Chutes	RE Wall	RCC Wall	Grouting	Remarks
	From (km)	To (km)									
6	122.690	121.670	1.020	RHS	Yes	Yes	-				
7	122.800	122.600	0.200	RHS	Yes	Yes	8				
8	122.820	123.250	0.430	LHS	Yes	Yes	-	-	-	-	
9	123.180	122.830	0.350	RHS	Yes	Yes	-				
10	123.300	123.200	0.100	RHS	Yes	Yes	-				
11	124.300	124.380	0.080	LHS	Yes	Yes	-	-	-	-	
12	124.390	124.780	0.390	LHS	Yes	Yes	-	-	-	-	
13	124.770	124.400	0.370	RHS	Yes	Yes	-				
14	124.830	125.100	0.270	LHS	Yes	Yes	-	-	-	-	
15	125.080	124.830	0.250	RHS	Yes	Yes	-				
16	125.120	125.600	0.480	LHS	Yes	Yes	10	-	-	-	
17	125.150	125.100	0.050	RHS	Yes	Yes	-				
18	125.700	125.740	0.040	LHS	Yes	Yes	-	-	-	-	
19	125.750	125.600	0.150	RHS	Yes	Yes	-				
20	125.760	125.800	0.040	LHS	Yes	Yes	-	-	-	-	
21	125.970	125.800	0.170	RHS	Yes	Yes	-				
22	130.700	130.410	0.290	RHS	Yes	Yes	-				
23	134.930	134.790	0.140	RHS	Yes	Yes	-				
24	135.070	134.950	0.120	RHS	Yes	Yes	-				
25	139.000	139.120	0.120	LHS	Yes	Yes	3	-	-	-	
26	139.200	139.450	0.250	LHS	Yes	Yes	4	-	-	-	
27	141.250	141.150	0.100	RHS	Yes	Yes	1				
28	141.600	141.500	0.100	RHS	Yes	Yes	-				
29	141.650	141.620	0.030	RHS	Yes	Yes	-				
30	148.780	149.200	0.420	LHS	Yes	Yes	-	-	-	-	
31	149.100	148.600	0.500	RHS	Yes	Yes	-				
32	149.960	149.610	0.350	RHS	Yes	Yes	8				
33	150.080	150.000	0.080	RHS	Yes	Yes	3				
34	157.400	157.100	0.300	RHS	Yes	Yes	-				
35	157.600	157.420	0.180	RHS	Yes	Yes	-				
36	157.900	158.200	0.300	LHS	Yes	Yes	6	-	-	-	
37	157.950	157.700	0.250	RHS	Yes	Yes	15				
38	158.150	158.120	0.030	RHS	Yes	Yes	-				
39	158.240	158.200	0.040	RHS	Yes	Yes	-				
40	158.760	158.900	0.140	LHS	Yes	Yes	-	-	-	-	
41	158.995	159.600	0.605	LHS	Yes	Yes	-	-	-	-	
42	159.440	158.970	0.470	RHS	Yes	Yes	47				
43	159.570	159.480	0.090	RHS	Yes	Yes	10				
44	159.630	159.600	0.030	RHS	Yes	Yes	-				
45	159.850	160.560	0.710	LHS	Yes	Yes	28	-	-	-	

Sl. No.	Chainage (km)		Length (m)	Side	Embankment	Stone Pitching	Chutes	RE Wall	RCC Wall	Grouting	Remarks
	From (km)	To (km)									
46	160.570	160.200	0.370	RHS	Yes	Yes	28				
47	161.200	161.650	0.450	LHS	Yes	Yes	45	-	-	-	
48	161.600	160.650	0.950	RHS	Yes	Yes	76				30 Damage
49	161.700	161.970	0.270	LHS	Yes	Yes	19	-	-	-	
50	162.150	161.650	0.500	RHS	Yes	Yes	16				
51	162.650	163.130	0.480	LHS	Yes	Yes	38	-	-	-	
52	163.150	162.570	0.580	RHS	Yes	Yes	45				
53	163.200	163.750	0.550	LHS	Yes	Yes	40	-	-	-	
54	163.760	163.200	0.560	RHS	Yes	Yes	42				
55	163.830	164.050	0.220	LHS	Yes	Yes	-	-	-	-	
56	164.190	164.210	0.020	LHS	Yes	Yes	-	-	-	-	
57	164.200	164.180	0.020	RHS	Yes	Yes	-				
58	164.230	164.370	0.140	LHS	Yes	Yes	-	-	-	-	
59	164.240	164.220	0.020	RHS	Yes	Yes	-				
60	164.430	164.560	0.130	LHS	Yes	Yes	-	-	-	-	
61	165.400	165.600	0.200	LHS	Yes	Yes	16	-	-	-	3 Damage
62	165.550	165.250	0.300	RHS	Yes	Yes	25				
63	165.900	165.700	0.200	RHS	Yes	Yes	6				
64	166.100	166.300	0.200	LHS	Yes	Yes	-	-	-	-	
65	166.320	166.500	0.180	LHS	Yes	Yes	11	-	-	-	
66	166.320	165.970	0.350	RHS	Yes	Yes	-				
67	166.630	166.350	0.280	RHS	Yes	Yes	15				
68	166.700	166.840	0.140	LHS	Yes	Yes	-	-	-	-	
69	167.180	167.250	0.070	LHS	Yes	Yes	1	-	-	-	
70	167.220	167.050	0.170	RHS	Yes	Yes	9				
71	168.250	168.450	0.200	LHS	Yes	Yes	6	-	-	-	
72	168.330	168.280	0.050	RHS	Yes	Yes	5				
73	168.470	168.350	0.120	RHS	Yes	Yes	19				
74	168.480	168.660	0.180	LHS	Yes	Yes	9	-	-	-	
75	168.650	168.500	0.150	RHS	Yes	Yes	12				
76	168.680	168.800	0.120	LHS	Yes	Yes	10	-	-	-	
77	168.900	168.800	0.100	RHS	Yes	Yes	8				
78	170.540	170.500	0.040	RHS	Yes	Yes	-				
79	170.550	170.900	0.350	LHS	Yes	Yes	26	-	-	-	
80	170.570	170.480	0.090	RHS	Yes	Yes	-				
81	170.900	170.570	0.330	RHS	Yes	Yes	-				
82	170.960	171.400	0.440	LHS	Yes	Yes	42	-	-	-	
83	171.440	171.003	0.437	RHS	Yes	Yes	27				
84	172.000	172.160	0.160	LHS	Yes	Yes	13	-	-	-	
85	172.300	172.050	0.250	RHS	Yes	Yes	20				

Sl. No.	Chainage (km)		Length (m)	Side	Embankment	Stone Pitching	Chutes	RE Wall	RCC Wall	Grouting	Remarks
	From (km)	To (km)									
86	172.370	172.360	0.010	RHS	Yes	Yes	-				
87	172.550	172.400	0.150	RHS	Yes	Yes	-				
88	176.020	176.040	0.020	LHS	Yes	Yes	-	-	-	-	
89	176.191	176.210	0.019	LHS	Yes	Yes	-	-	-	-	
90	181.150	181.300	0.150	LHS	Yes	Yes	17	-	-	-	
91	181.360	181.200	0.160	RHS	Yes	Yes	15				
92	181.400	181.670	0.270	LHS	Yes	Yes	19	-	-	-	
93	181.800	181.400	0.400	RHS	Yes	Yes	19				
94	184.020	183.980	0.040	RHS	Yes	Yes	8				
95	184.240	184.050	0.190	RHS	Yes	Yes	12				
96	186.350	186.450	0.100	LHS	Yes	Yes	11	-	-	-	
97	186.450	186.360	0.090	RHS	Yes	Yes	13				
98	186.770	186.920	0.150	LHS	Yes	Yes	11	-	-	-	
99	187.200	186.800	0.400	RHS	Yes	Yes	36				
100	123.400	124.250	0.850	LHS	-	-	-	yes	-	-	-
101	123.400	124.250	0.850	RHS	-	-	-	yes	-	-	-
102	150.840	151.400	0.560	LHS	-	-	-	yes	-	-	-
103	150.840	151.400	0.560	RHS	-	-	-	yes	-	-	-
104	152.800	153.200	0.400	LHS	-	-	-	-	yes	-	-
105	152.800	153.200	0.400	RHS	-	-	-	-	yes	-	-
106	155.490	155.830	0.340	LHS	-	-	-	-	yes	-	-
107	155.490	155.830	0.340	RHS	-	-	-	-	yes	-	-
108	156.870	157.900	1.030	LHS	-	-	-	yes	-	-	-
109	156.870	157.900	1.030	RHS	-	-	-	yes	-	-	-
110	167.160	168.810	1.650	LHS	-	-	-	yes	-	-	-
111	167.160	168.810	1.650	RHS	-	-	-	yes	-	-	-
112	181.200	181.650	0.450	LHS	Yes	yes	-	-	-	-	-
113	181.200	181.650	0.450	RHS	Yes	yes	-	-	-	-	-
114	185.420	186.010	0.590	LHS	-	-	-	-	yes	-	-
115	185.420	186.010	0.590	RHS	-	-	-	-	yes	-	-
Total Length			36.621			Total No's	992				

Median width of 5m was generally adopted along the project road. There are about 75 Median openings locations and about 102 Solar Blinker locations, the details of the same are presented in tables below:

Table 9: Locations of Median Openings

Sl. No.	Chainage (km)	Width (m)	Length (m)	Reserve lane	Remarks
1	121.200	1.2	16	Yes	
2	123.250	1.2	16	Yes	
3	124.790	5	17.4	No	

Sl. No.	Chainage (km)	Width (m)	Length (m)	Reserve lane	Remarks	
4	126.000	5	43.5	No		
5	126.470	5	17.8	No		
6	126.820	5	8.2	No		
7	126.990	5	15.5	No		
8	128.950	5	20	No		
9	129.360	1.2	26.2	Yes		
10	130.950	1.2	20	Yes		
11	131.950	5.0/1.2	20.2	No (Up Direction) / Yes (Down direction)		
12	132.600	5	16	No		
13	133.290	5	8.2	No		
14	133.650	5	20.5	No		
15	134.750	5.0/1.2	19.2	No (Up Direction) / Yes (Down direction)		
16	134.950	1.2	20	Yes		
17	135.595	5	15.2	No		
18	136.000	5	8.2	No		
19	136.450	5	18.8	No		
20	137.230	5	18	No		
21	137.860	5	18.8	No		
22	139.700	5	17.9	No		
23	140.850	5	15.5	No		
24	141.610	1.2/5.0	20	Yes (Up direction)/ No (Down direction)		
25	142.980	1.2/5.0	21.5	Yes (Up direction)/ No (Down direction)		
26	144.750	1.2	34	Yes		
27	146.430	5.0/1.2	23.6	No (Up Direction) / Yes (Down direction)		
28	147.250	5	18	No		
29	148.000	5	15.5	No		
30	148.300	5	15.3	No		
31	149.350	5	15.3	No (Up Direction) / Yes (Down direction)		
32	150.210	5			Toll	
33	150.480	5	15.4	No		
34	151.190	VUP over Location				
35	151.250					
36	151.990	5	15.4	No		
37	153.850	5	15.8	No		
38	154.000	1.2	15.8	No		
39	154.276	1.2	15.8	No		
40	154.740	5	13.3	No		
41	155.400	5	20	No		
42	156.200	5	20	No		

Sl. No.	Chainage (km)	Width (m)	Length (m)	Reserve lane	Remarks
43	156.770	5	18	No	
44	158.780	5.0/1.2	18	No (Up Direction) / Yes (Down direction)	
45	158.950	5	18.5	No	
46	159.820	1.2	40	Yes	
47	160.610	5	19.5	No	
48	161.640	5	20	No	
49	162.140	5	20	No	
50	164.100	1.2	22	Yes	
51	164.400	1.2	16	Yes	
52	166.890	5.0/1.2	16	No (Up Direction) / Yes (Down direction)	
53	168.380	5	16.3	No	
54	169.440	1.2	18	Yes	
55	170.280	1.2	20	Yes	
56	170.980	1.2	20	Yes	
57	172.580	5	15.5	No	
58	173.290	1.2	18.2	Yes	
59	175.500	5	31.5	No	
60	176.280	1.2	50.5	Yes	
61	177.230	5	20.5	No	
62	177.900	1.2	20.6	No (Up Direction) / Yes (Down direction)	
63	178.805	5	15.2	No	
64	180.180	1.2	20.5	Yes	
65	181.880	5	18.2	No	
66	183.690	5.0/1.2	19.5	No (Up Direction) / Yes (Down direction)	
67	184.770	1.2	29.8	Yes	
68	186.180	1.2	21	Yes	
69	187.390	1.2	16.2	Yes	
70	188.405	5	22.2	No	
71	189.450	5	18.3	No	
72	190.050	1.2	18.5	Yes	
73	191.005	1.2	20	Yes	
74	191.850	5	20.6	No	
75	193.450	1.2	18.7	Yes	

Median openings and cross road locations with Solar Blinkers are presented below:

Table 10: Details of Solar Blinkers

Sl. No.	Chainage (km)	Location	Solar Panels	No. of Blinker's	Condition
1	121.090	Median	Yes	1	working
2	121.350	Median	Yes	1	working

Sl. No.	Chainage (km)	Location	Solar Panels	No. of Blinker's	Condition
3	123.360	Median	Yes	1	working
4	124.605	Median	Yes	1	Not working
5	124.900	Median	Yes	1	working
6	125.850	Median	Yes	1	working
7	126.160	Median	Yes	1	Not working
8	127.770	Median	Yes	1	Not working
9	127.970	Median	Yes	1	Not working
10	128.940	Median	Yes	1	working
11	128.980	Median	Yes	1	working
12	129.240	Median	Yes	1	working
13	129.500	Median	Yes	1	working
14	130.800	Median	Yes	1	working
15	131.070	Median	Yes	1	working
16	131.790	Median	Yes	1	working
17	132.050	Median	Yes	1	working
18	133.550	Median	Yes	1	working
19	133.820	Median	Yes	1	working
20	134.800	Median	Yes	1	working
21	135.050	Median	Yes	1	working
22	137.750	Median	Yes	1	Not working
23	137.960	Median	Yes	1	Not working
24	139.580	Median	Yes	1	working
25	139.790	Median	Yes	1	working
26	140.720	Median	Yes	1	working
27	141.000	Median	Yes	1	working
28	141.595	Median	Yes	1	working
29	141.650	Median	Yes	1	working
30	142.800	Median	Yes	1	working
31	143.160	Median	Yes	1	working
32	144.670	Median	Yes	1	working
33	144.770	Median	Yes	1	working
34	146.300	Median	Yes	1	working
35	146.570	Median	Yes	1	working
36	148.210	Median	Yes	1	working
37	148.450	Median	Yes	1	working
38	148.480	Median	Yes	1	working
39	149.300	Median	Yes	1	working
40	149.360	Median	Yes	1	working
41	151.350	Median	Yes	1	working

Sl. No.	Chainage (km)	Location	Solar Panels	No. of Blinker's	Condition
42	151.800	Median	Yes	1	working
43	152.100	Median	Yes	1	working
44	154.590	Median	Yes	1	working
45	154.880	Median	Yes	1	working
46	155.260	Median	Yes	1	working
47	155.640	Median	Yes	1	working
48	156.050	Median	Yes	1	working
49	156.350	Median	Yes	1	working
50	156.615	Median	Yes	1	working
51	156.770	Median	Yes	1	working
52	156.930	Median	Yes	1	working
53	158.590	Median	Yes	1	working
54	158.870	Median	Yes	1	working
55	159.660	Median	Yes	1	working
56	160.020	Median	Yes	1	working
57	160.450	Median	Yes	1	working
58	160.750	Median	Yes	1	working
59	161.500	Median	Yes	1	working
60	161.770	Median	Yes	1	working
61	162.010	Median	Yes	1	Not working
62	162.300	Median	Yes	1	working
63	163.910	Median	Yes	1	working
64	164.280	Median	Yes	1	working
65	166.750	Median	Yes	1	working
66	167.050	Median	Yes	1	working
67	168.240	Median	Yes	1	working
68	168.500	Median	Yes	1	working
69	169.420	Median	Yes	1	working
70	169.490	Median	Yes	1	working
71	170.150	Median	Yes	1	working
72	170.410	Median	Yes	1	working
73	170.810	Median	Yes	1	working
74	171.180	Median	Yes	2	working
75	172.410	Median	Yes	1	working
76	172.740	Median	Yes	1	working
77	173.170	Median	Yes	1	working
78	173.470	Median	Yes	1	working
79	175.300	Median	Yes	1	working
80	175.620	Median	Yes	1	working
81	176.200	Median	Yes	1	working
82	176.500	Median	Yes	1	working

Sl. No.	Chainage (km)	Location	Solar Panels	No. of Blinker's	Condition
83	176.470	Median	Yes	1	working
84	177.720	Median	Yes	1	working
85	178.040	Median	Yes	1	working
86	180.030	Median	Yes	1	working
87	180.300	Median	Yes	1	working
88	184.750	Median	Yes	1	working
89	184.810	Median	Yes	1	working
90	186.040	Median	Yes	1	working
91	186.360	Median	Yes	1	working
92	187.220	Median	Yes	1	working
93	187.350	Median	Yes	1	working
94	189.300	Median	Yes	1	working
95	189.580	Median	Yes	1	working
96	189.850	Median	Yes	1	working
97	190.190	Median	Yes	1	working
98	191.840	Median	Yes	1	working
99	191.880	Median	Yes	1	working
100	193.300	Median	Yes	1	working
101	193.600	Median	Yes	1	working
Total No. of Solar Blinkers				102	

There are few unauthorized median cuts and damaged medians exist along the project corridor and are presented in Table below:

Table 11: Median Damaged Locations

S.No	Chainage	Length	Side	Remarks
1	146.300	2	RHS	
2	138.316	2	Both Side	Un-Authorized
3	134.200	2	Both Side	Un-Authorized
4	132.920	1		Median Opening
5	126.010	1		Island @ Major Junction
6	129.520	6	Both Side	Un-Authorized
7	131.950	2	LHS	
8	151.900	4	Both Side	Un-Authorized
9	157.150	6	LHS	
10	158.000	15	Both Side	Un-Authorized
11	163.800	6	LHS	
12	176.900	6	Both Side	Un-Authorized
13	178.820	4		Median Opening
14	179.300	2	Both Side	Un-Authorized
15	182.410	6	Both Side	Un-Authorized
17	192.900	4	Both Side	Un-Authorized

S.No	Chainage	Length	Side	Remarks
18	193.900	2	Both Side	Un-Authorized
19	180.220	2	RHS	
20	177.220	4	RHS	
21	173.050	2	RHS	
22	168.600	6	Both Side	Un-Authorized
23	163.800	6	Both Side	Un-Authorized (Closed)
24	158.700	2		Median Opening
25	156.730	2	RHS	
26	156.210	2		Median Opening
27	155.340	2		Median Opening
28	152.700	4	RHS	
29	152.420	2	RHS	
Total Length (Km)		105		

Safety barriers have been provided along the project road at high embankments where embankment height is >3m, at sharp curve locations, at approaches of grade separated and cross drainage structures. The length of metal beam crash barrier provided along the project corridor is 64.377 km out of which 86m has got damaged. The Details of safety barriers provided along the corridor include the following:

Table 12: Metal Beam Crash Barrier Locations

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
1	121.100	121.180	Median	0.080		Good
2	121.200	121.240	Median	0.040		Good
3	121.260	121.650	LHS	0.390	1	Damage
4	121.670	121.700	LHS	0.030		Good
5	121.690	121.220	RHS	0.470		Good
6	121.720	122.570	LHS	0.850	6	Damage
7	121.730	121.710	RHS	0.020		Good
8	122.520	121.750	RHS	0.770		Good
9	122.560	122.530	RHS	0.030		Good
10	122.590	122.830	LHS	0.240		Good
11	122.820	122.580	RHS	0.240		Good
12	122.850	123.180	LHS	0.330	2	Damage
13	123.200	123.250	LHS	0.050		Good
14	123.310	122.840	RHS	0.470		Good
15	123.350	123.320	RHS	0.030		Good
16	123.390	123.410	LHS	0.020	6	Damage
17	123.420	123.390	RHS	0.030		Good
18	124.240	124.260	LHS	0.020		Good
19	124.260	124.370	LHS	0.110		Good

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
20	124.260	124.240	RHS	0.020	10	Damage
21	124.350	124.300	RHS	0.050		Good
22	124.400	124.770	LHS	0.370		Good
23	124.590	124.550	RHS	0.040		Good
24	124.750	124.730	RHS	0.020		Good
25	124.820	125.140	LHS	0.320		Good
26	125.160	125.830	LHS	0.670	2	Damage
27	125.180	124.830	RHS	0.350		Good
28	125.220	125.190	RHS	0.030		Good
29	125.781	125.750	RHS	0.031		Good
30	125.850	125.870	LHS	0.020		Good
31	125.850	125.820	RHS	0.030		Good
32	125.890	125.910	LHS	0.020		Good
33	126.400	126.450	LHS	0.050	2	Damage
34	126.440	126.251	RHS	0.189		Good
35	126.470	126.820	LHS	0.350		Good
36	126.830	126.950	LHS	0.120		Good
37	126.950	126.460	RHS	0.490		Good
38	127.050	127.070	LHS	0.020		Good
39	127.070	127.050	RHS	0.020		Good
40	127.180	127.100	RHS	0.080		Good
41	127.480	127.500	Median	0.020		Good
42	127.500	127.480	RHS	0.020		Good
43	127.520	127.550	Median	0.030		Good
44	127.550	127.580	LHS	0.030		Good
45	127.550	127.520	RHS	0.030		Good
46	127.610	127.640	LHS	0.030		Good
47	128.630	128.950	LHS	0.320		Good
48	129.180	129.200	LHS	0.020	1	Damage
49	129.210	129.190	RHS	0.020		Good
50	129.230	129.325	Median	0.095		Good
51	130.690	130.410	RHS	0.280		Good
52	130.790	130.950	Median	0.160		Good
53	131.420	131.400	RHS	0.020		Good
54	131.950	132.050	Median	0.100		Good
55	131.960	132.170	LHS	0.210		Good
56	132.390	132.410	LHS	0.020		Good
57	132.630	133.640	LHS	1.010		Good
58	133.250	132.800	RHS	0.450		Good
59	133.630	133.260	RHS	0.370		Good

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
60	133.700	133.850	LHS	0.150		Good
61	133.850	133.650	RHS	0.200		Good
62	134.040	134.050	LHS	0.010		Good
63	134.100	134.080	RHS	0.020		Good
64	134.600	134.580	RHS	0.020		Good
65	134.750	134.900	LHS	0.150		Good
66	134.800	134.900	Median	0.100		Good
67	134.900	134.800	RHS	0.100		Good
68	134.960	135.100	Median	0.140		Good
69	135.100	134.940	RHS	0.160		Good
70	135.610	136.400	LHS	0.790		Good
71	136.002	135.615	RHS	0.387		Good
72	136.210	136.010	RHS	0.200		Good
73	136.400	136.230	RHS	0.170		Good
74	136.560	136.540	RHS	0.020		Good
75	136.750	136.770	LHS	0.020		Good
76	137.230	137.840	LHS	0.610		Good
77	137.840	137.440	RHS	0.400		Good
78	137.860	138.150	LHS	0.290		Good
79	138.150	137.860	RHS	0.290		Good
80	138.230	138.250	LHS	0.020		Good
81	138.240	138.220	RHS	0.020		Good
82	138.600	138.700	LHS	0.100		Good
83	138.730	138.800	LHS	0.070		Good
84	138.765	139.050	Median	0.285		Good
85	138.820	139.050	LHS	0.230		Good
86	139.050	139.020	RHS	0.030		Good
87	139.160	139.560	Median	0.400		Good
88	139.180	139.160	RHS	0.020		Good
89	139.500	139.300	RHS	0.200		Good
90	139.840	139.860	LHS	0.020		Good
91	139.870	139.850	RHS	0.020		Good
92	141.230	141.260	LHS	0.030		Good
93	141.420	141.440	Median	0.020		Good
94	141.440	141.390	RHS	0.050		Good
95	141.500	141.520	Median	0.020		Good
96	141.610	141.520	RHS	0.090		Good
97	141.750	141.650	RHS	0.100		Good
98	142.020	142.040	LHS	0.020		Good
99	142.050	142.030	RHS	0.020		Good

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
100	142.470	142.970	LHS	0.500		Good
101	142.830	142.950	Median	0.120		Good
102	142.880	142.860	RHS	0.020		Good
103	143.440	143.420	RHS	0.020		Good
104	144.360	144.380	LHS	0.020		Good
105	144.370	144.350	RHS	0.020		Good
106	144.600	144.730	Median	0.130	2	Damage
107	144.760	144.850	Median	0.090		Good
108	146.250	146.270	LHS	0.020		Good
109	146.380	146.360	RHS	0.020		Good
110	146.440	146.530	Median	0.090		Good
111	146.840	148.300	LHS	1.460		Good
112	146.940	147.230	Median	0.290		Good
113	147.200	146.960	RHS	0.240		Good
114	147.230	147.210	RHS	0.020		Good
115	147.250	148.010	Median	0.760		Good
116	148.010	147.250	RHS	0.760		Good
117	148.030	148.350	Median	0.320		Good
118	148.330	148.420	LHS	0.090		Good
119	148.350	148.030	RHS	0.320		Good
120	148.370	148.440	Median	0.070		Good
121	148.430	148.460	LHS	0.030		Good
122	148.480	148.500	LHS	0.020		Good
123	148.550	148.370	RHS	0.180		Good
124	148.700	148.750	LHS	0.050		Good
125	148.780	149.350	LHS	0.570		Good
126	149.190	148.600	RHS	0.590		Good
127	149.300	149.470	Median	0.170		Good
128	149.470	149.300	RHS	0.170		Good
129	149.840	149.860	LHS	0.020		Good
130	149.870	149.610	RHS	0.260		Good
131	149.980	150.005	LHS	0.025		Good
132	150.000	150.100	Median	0.100		Good
133	150.800	150.000	RHS	0.800		Good
134	151.000	150.900	RHS	0.100		Good
135	151.350	151.000	RHS	0.350		Good
136	151.400	151.960	LHS	0.560		Good
137	151.970	152.080	LHS	0.110		Good
138	152.190	154.750	LHS	2.560		Good
139	152.320	152.300	RHS	0.020		Good

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
140	152.350	152.370	LHS	0.020		Good
141	152.540	152.350	RHS	0.190		Good
142	152.570	152.820	LHS	0.250		Good
143	152.820	152.570	RHS	0.250		Good
144	153.160	153.860	Median	0.700		Good
145	153.860	153.180	RHS	0.680		Good
146	153.900	154.270	Median	0.370		Good
147	154.280	153.900	RHS	0.380		Good
148	154.300	154.670	Median	0.370		Good
149	154.670	154.300	RHS	0.370		Good
150	154.720	155.400	Median	0.680		Good
151	154.780	155.420	LHS	0.640	6	Damage
152	155.400	154.700	RHS	0.700		Good
153	155.840	156.130	Median	0.290		Good
154	155.850	156.220	LHS	0.370		Good
155	156.130	155.840	RHS	0.290		Good
156	156.200	155.420	RHS	0.780		Good
157	156.750	156.730	RHS	0.020		Good
158	156.860	157.000	LHS	0.140		Good
159	156.900	157.400	Median	0.500		Good
160	157.390	156.950	RHS	0.440		Good
161	157.460	157.760	Median	0.300		Good
162	157.790	157.400	RHS	0.390		Good
163	157.850	158.040	LHS	0.190		Good
164	157.900	157.800	RHS	0.100		Good
165	158.000	157.800	RHS	0.200		Good
166	158.100	158.150	LHS	0.050		Good
167	158.200	158.230	LHS	0.030		Good
168	158.200	158.370	Median	0.170		Good
169	158.200	158.180	RHS	0.020		Good
170	158.350	158.320	RHS	0.030		Good
171	158.750	158.860	Median	0.110		Good
172	158.780	158.900	LHS	0.120		Good
173	158.780	158.770	RHS	0.010		Good
174	158.960	159.420	LHS	0.460		Good
175	159.480	158.980	RHS	0.500		Good
176	159.600	159.500	RHS	0.100		Good
177	159.650	159.840	Median	0.190		Good
178	159.890	160.000	Median	0.110		Good
179	160.180	160.570	LHS	0.390		Good

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
180	160.570	160.420	RHS	0.150		Good
181	160.700	160.720	LHS	0.020		Good
182	160.900	161.650	LHS	0.750		Good
183	161.570	160.700	RHS	0.870		Good
184	161.690	162.995	LHS	1.305		Good
185	162.070	161.720	RHS	0.350		Good
186	162.700	163.150	LHS	0.450	4	Damage
187	163.150	162.570	RHS	0.580		Good
188	163.210	163.760	LHS	0.550		Good
189	163.750	163.200	RHS	0.550		Good
190	163.900	164.020	Median	0.120		Good
191	163.980	164.050	LHS	0.070		Good
192	164.150	164.220	Median	0.070		Good
193	164.190	164.220	LHS	0.030		Good
194	164.210	164.190	RHS	0.020		Good
195	164.250	164.400	LHS	0.150		Good
196	164.250	164.230	RHS	0.020		Good
197	165.240	165.260	LHS	0.020		Good
198	165.250	165.230	RHS	0.020		Good
199	165.390	165.580	LHS	0.190		Good
200	165.560	165.270	RHS	0.290		Good
201	165.900	165.820	RHS	0.080		Good
202	165.940	165.910	RHS	0.030		Good
203	166.100	166.350	LHS	0.250		Good
204	166.370	165.950	RHS	0.420		Good
205	166.380	166.500	LHS	0.120		Good
206	166.600	166.400	RHS	0.200		Good
207	166.750	166.850	LHS	0.100		Good
208	166.900	167.050	Median	0.150		Good
209	167.150	167.220	LHS	0.070		Good
210	167.340	166.800	RHS	0.540		Good
211	167.570	167.360	RHS	0.210		Good
212	167.850	167.830	RHS	0.020		Good
213	168.245	168.350	LHS	0.105		Good
214	168.390	168.500	LHS	0.110		Good
215	168.540	168.190	RHS	0.350		Good
216	168.640	168.760	LHS	0.120	6	Damage
217	168.770	168.560	RHS	0.210		Good
218	169.350	169.440	Median	0.090		Good
219	169.350	169.330	RHS	0.020		Good

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
220	169.390	169.410	LHS	0.020		Good
221	169.460	169.430	RHS	0.030		Good
222	169.470	169.560	Median	0.090		Good
223	169.600	169.650	LHS	0.050		Good
224	169.670	169.580	RHS	0.090		Good
225	170.160	170.240	Median	0.080		Good
226	170.260	170.410	Median	0.150		Good
227	170.570	170.850	LHS	0.280		Good
228	170.580	170.450	RHS	0.130		Good
229	170.720	170.580	RHS	0.140		Good
230	170.890	171.440	LHS	0.550		Good
231	170.900	170.800	RHS	0.100		Good
232	170.940	170.990	Median	0.050		Good
233	171.000	171.160	Median	0.160		Good
234	171.440	171.070	RHS	0.370		Good
235	171.920	172.040	LHS	0.120		Good
236	172.000	172.150	LHS	0.150		Good
237	172.000	172.450	Median	0.450		Good
238	172.300	172.050	RHS	0.250		Good
239	172.370	172.350	RHS	0.020		Good
240	172.720	172.740	LHS	0.020		Good
241	172.780	172.760	RHS	0.020		Good
242	172.850	173.260	LHS	0.410		Good
243	173.190	173.260	Median	0.070		Good
244	173.280	173.450	LHS	0.170		Good
245	173.280	173.450	Median	0.170		Good
246	175.300	175.330	LHS	0.030		Good
247	175.350	175.380	LHS	0.030		Good
248	175.350	175.320	RHS	0.030		Good
249	175.400	175.370	RHS	0.030		Good
250	175.470	175.490	LHS	0.020		Good
251	175.500	175.480	RHS	0.020		Good
252	175.970	176.070	Median	0.100		Good
253	176.050	176.070	LHS	0.020		Good
254	176.100	176.070	RHS	0.030		Good
255	176.200	176.210	Median	0.010		Good
256	176.210	176.260	Median	0.050		Good
257	176.220	176.190	RHS	0.030		Good
258	176.360	176.440	LHS	0.080		Good
259	176.360	176.410	Median	0.050		Good

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
260	176.450	176.850	LHS	0.400		Good
261	176.860	177.260	LHS	0.400		Good
262	177.050	176.980	RHS	0.070		Good
263	177.260	177.430	LHS	0.170		Good
264	177.260	177.430	Median	0.170		Good
265	177.690	177.670	RHS	0.020		Good
266	177.760	177.870	Median	0.110		Good
267	177.800	177.820	LHS	0.020		Good
268	179.990	180.010	LHS	0.020		Good
269	180.000	179.900	RHS	0.100		Good
270	180.010	179.990	RHS	0.020		Good
271	180.030	180.150	Median	0.120		Good
272	180.170	180.000	RHS	0.170		Good
273	180.180	180.960	LHS	0.780		Good
274	180.180	180.300	Median	0.120		Good
275	181.150	181.360	LHS	0.210		Good
276	181.150	181.360	Median	0.210		Good
277	181.360	181.200	RHS	0.160		Good
278	181.400	181.640	LHS	0.240		Good
279	181.400	181.770	Median	0.370		Good
280	181.640	181.400	RHS	0.240		Good
281	182.000	182.400	LHS	0.400		Good
282	182.210	182.190	RHS	0.020		Good
283	182.410	183.450	LHS	1.040		Good
284	183.470	183.690	LHS	0.220		Good
285	183.730	183.830	Median	0.100		Good
286	183.960	184.050	Median	0.090		Good
287	184.030	184.050	LHS	0.020		Good
288	184.070	184.370	Median	0.300		Good
289	184.700	184.770	Median	0.070		Good
290	184.795	184.950	Median	0.155		Good
291	185.970	186.020	LHS	0.050		Good
292	186.050	186.170	Median	0.120		Good
293	186.180	185.980	RHS	0.200		Good
294	186.200	186.350	Median	0.150		Good
295	186.250	185.950	RHS	0.300		Good
296	186.320	186.450	LHS	0.130		Good
297	186.780	186.870	LHS	0.090		Good
298	187.250	187.390	Median	0.140		Good
299	187.400	186.800	RHS	0.600		Good

Sl. No.	Chainage		Side	Length (m)	Damage (m)	Condition
	From (km)	To (km)				
300	187.410	187.430	Median	0.020		Good
301	188.440	188.460	LHS	0.020		Good
302	188.470	188.450	RHS	0.020		Good
303	189.900	190.040	Median	0.140		Good
304	190.060	190.190	Median	0.130		Good
305	190.390	190.410	LHS	0.020		Good
306	190.410	190.390	RHS	0.020		Good
307	190.840	191.020	Median	0.180	2	Damage
308	191.040	191.100	Median	0.060		Good
309	192.670	192.650	RHS	0.020		Good
310	192.680	192.700	LHS	0.020		Good
311	193.300	193.450	Median	0.150		Good
312	193.480	193.600	Median	0.120	6	Damage
Total Length (Km)				64.377	86	

Pedestrian Guard Rails are observed at only the Bus bay locations and are presented in Table below:

Table 13: Details of Pedestrian Guard Rails

Sl. No.	Chainage		Length	Condition
	From	to		
1	126.420	126.440	0.020	Good
2	126.420	126.440	0.020	Good
3	128.990	129.010	0.020	Good
4	131.990	132.010	0.020	Good
5	133.610	133.630	0.020	Good
6	136.290	136.310	0.020	Good
7	139.240	139.260	0.020	Fair
8	141.600	141.620	0.020	Good
9	144.780	144.800	0.020	Fair
10	148.490	148.510	0.020	Fair
11	151.960	151.980	0.020	Good
12	151.990	152.010	0.020	Good
13	152.990	153.010	0.020	Good
14	153.190	153.210	0.020	Good
15	154.190	154.210	0.020	Good
16	154.590	154.610	0.020	Good
17	154.770	154.790	0.020	Good
18	166.940	166.960	0.020	Good
19	168.365	168.385	0.020	Good

Sl. No.	Chainage		Length	Condition
	From	to		
20	170.290	170.310	0.020	Good
21	170.970	170.990	0.020	Good
22	174.540	174.560	0.020	Good
23	175.490	175.510	0.020	Good
24	176.230	176.250	0.020	Good
25	177.990	178.010	0.020	Good
26	180.090	180.110	0.020	Good
27	181.350	181.370	0.020	Good
28	187.460	187.480	0.020	Good

List of major and minor junctions developed are presented in table below:

Table 14: List of Major Junctions

Sl. No.	Existing Chainage	Type of Junction	Surface Type		Width of Access road		Speed Breaker	Culvert	Sign Boards	
			LHS	RHS	LHS (m)	RHS (m)			LHS	RHS
1	121200	Y-Junction		BT Road		7.2	Yes	No		Go Slow, Stop, Speed Breaker, Place Identification
2	126000	Y-Junction		BT Road		7.2	Yes	No		Speed Breaker, T-Junction, Hazard
3	158750	Y-Junction	BT Road		7.2		Yes	Yes	Stop, Speed Breaker, Hazard	
4	166890	Y-Junction	BT Road		14.0		Yes	No	Stop, Speed Breaker, Keep Left	

Table 15: List of Minor Junctions

Sl. No.	Chainage	Side	LHS Width (m)	RHS Width (m)	Pavement Type
1	124790	LHS	5.8	-	Bituminous
2	124790	RHS	-	3.5	Bituminous
3	126470	RHS	-	6.0	Bituminous
4	127880	RHS	-	7.2	Bituminous
5	128610	LHS	3.5	-	Bituminous
6	128800	LHS	3.5	-	Bituminous
7	128950	LHS	3.0	-	Bituminous
8	128970	RHS	-	3.5	Bituminous
9	129370	LHS	4.5	-	Bituminous
10	129380	RHS	-	3.5	Bituminous
11	130950	RHS	-	3.5	Bituminous
12	131900	LHS	4.5	-	Bituminous
13	133650	RHS	-	5.5	Bituminous
14	133700	LHS	7.2	-	Bituminous
15	134750	LHS	3.5	-	Bituminous

Sl. No.	Chainage	Side	LHS Width (m)	RHS Width (m)	Pavement Type
16	134950	RHS	-	3.5	Bituminous
17	136000	RHS	-	3.0	Bituminous
18	136250	LHS	3.5	-	Bituminous
19	137900	LHS	7.2	-	Bituminous
20	138800	LHS	3.5	-	Bituminous
21	139260	RHS	-	3.5	Bituminous
22	139580	RHS	-	3.5	Bituminous
23	140850	LHS	3.5	-	Bituminous
24	141570	RHS	-	3.5	Bituminous
25	142500	LHS	3.5	-	Bituminous
26	142970	RHS	-	3.5	Bituminous
27	144720	LHS	3.5	-	Bituminous
28	144800	RHS	-	3.5	Bituminous
29	145560	LHS	3.5	-	Bituminous
30	146630	LHS	3.5	-	Bituminous
31	148100	RHS	-	3.5	Bituminous
32	148300	LHS	7.2	-	Bituminous
33	148550	RHS	-	7.0	Bituminous
34	149400	LHS	7.2	-	Bituminous
35	149420	RHS	-	3.5	Bituminous
36	150520	RHS	-	4.0	Bituminous
37	151000	LHS	7.2	-	Bituminous
38	151100	LHS	7.2	-	Bituminous
39	151900	LHS	5.0	-	Bituminous
40	152390	RHS	-	4.0	Bituminous
41	152820	LHS	7.0	-	Bituminous
42	153050	RHS	-	6.0	Bituminous
43	154100	RHS	-	7.2	Bituminous
44	154250	RHS	-	7.2	Bituminous
45	154300	LHS	3.5	-	Bituminous
46	155400	LHS	3.5	-	Bituminous
47	155550	LHS	3.5	-	Bituminous
48	156800	RHS	-	5.5	Bituminous
49	158020	LHS	3.5	-	Bituminous
50	158910	LHS	3.5	-	Bituminous
51	158940	RHS	-	3.5	Bituminous
52	159480	RHS	-	3.0	Bituminous
53	159840	RHS	-	9.2	Bituminous
54	160600	RHS	-	3.5	Earthen
55	160610	LHS	3.5	-	Bituminous
56	160630	RHS	-	3.5	Bituminous

Sl. No.	Chainage	Side	LHS Width (m)	RHS Width (m)	Pavement Type
57	161650	RHS	-	3.5	Bituminous
58	162100	LHS	3.5	-	Bituminous
59	162120	RHS	-	4.3	Bituminous
60	163800	LHS	6.0	-	Bituminous
61	163820	RHS	-	4.0	Bituminous
62	164080	RHS	-	9.2	Bituminous
63	164110	LHS	16.0	-	Bituminous
64	164400	LHS	3.5	-	Bituminous
65	164420	RHS	-	4.0	Bituminous
66	170190	RHS	-	3.5	Bituminous
67	170280	RHS	-	3.5	Earthen
68	170990	RHS	-	3.5	Bituminous
69	172355	RHS	-	3.5	Bituminous
70	172580	LHS	3.5	-	Bituminous
71	173280	LHS	3.5	-	Bituminous
72	173315	RHS	-	5.5	Bituminous
73	175490	RHS	-	7.0	Concrete
74	175510	RHS	-	3.5	Bituminous
75	176270	LHS	6.5	-	Bituminous
76	176360	RHS	-	11.3	Bituminous
77	177910	RHS	-	3.5	Bituminous
78	178805	RHS	-	3.5	Bituminous
79	179950	RHS	-	3.5	Bituminous
80	180180	LHS	3.5	-	Bituminous
81	180190	RHS	-	3.5	Earthen
82	181410	LHS	7.0	-	Bituminous
83	181410	RHS	-	7.0	Bituminous
84	182000	RHS	-	3.5	Bituminous
85	183300	LHS	6.0	-	Bituminous
86	183450	LHS	3.5	-	Bituminous
87	184800	RHS	-	3.5	Bituminous
88	187350	RHS	-	3.5	Bituminous
89	187390	LHS	3.5	-	Bituminous
90	188415	LHS	4.0	-	Bituminous
91	189360	RHS	-	3.5	Earthen
92	189460	LHS	3.5	-	Bituminous
93	190050	LHS	3.5	-	Bituminous
94	191005	RHS	-	3.5	Earthen
95	191830	RHS	-	5.3	Bituminous
96	193460	LHS	3.5	-	Bituminous
97	193465	RHS	-	3.5	Bituminous

Road furniture in the form of signs/markings, gantry signs and traffic safety blinkers, lighting, high mast lights have been provided along the project road at few locations and are presented in the Tables below:

Table 16: Locations of High mast Lighting

Sl. No.	Chainage	Location	Remarks	As per site	Condition
1	121.180	Separator	Major Junction	1	Good
2	126.015	Separator	Major Junction	1	Good
3	Toll Plaza	Shoulder	Toll Plaza	4	Good
4	158.780	separator	Major Junction	1	Good
5	159.840	separator	Major Junction	1	Good
6	166.875	Median	Major Junction	1	Good
7	134.900	Shoulder	Truck Lay Bye	2	Good
8	184.600	Shoulder	Truck Lay Bye	2	Good
9	184.600	Shoulder	Truck Lay Bye	2	Good
Total No's				15	

Table 17: Locations of additional High mast Lighting

Sl. No.	Chainage	Location	Remarks	As per site	Condition
1	129.350	Shoulder	Hotel	1	Good
2	134.940	Shoulder	Minor Junction	1	Good
3	139.680	Shoulder	Minor Junction	1	Good
4	151.950	Shoulder	Bus Stop	1	Good
5	160.620	Shoulder	Minor Junction	1	Good
6	164.070	Shoulder	Minor Junction	1	Good
7	173.310	Shoulder	Minor Junction	1	Good
8	130.935	Shoulder	Minor Junction	1	Good
9	137.800	Shoulder	Minor Junction	1	Good
10	142.960	Shoulder	Minor Junction	1	Good
11	146.200	Shoulder	Minor Junction	1	Good
12	156.800	Shoulder	Bus Stop	1	Good
13	170.350	Shoulder	Bus Stop	1	Good
Total No's				13	

Table 18: Locations of Highway Lighting along Main Carriageway

Sl. No.	Chainage		Single Arm	Double Arm	Location	Condition	Remarks	Length (Km)
	From	To						
1	124.790	-	1	-	Median	Good	Solar Panels	-
2	126.315	126.605	-	9	Median	Good		0.290
3	131.950	-	1	-	Median	Good	Solar Panels	-
4	133.280	133.795	-	13	Median	Good		0.515
5	133.660	-	-	1	Median	Good	Solar Panels	-

Sl. No.	Chainage		Single Arm	Double Arm	Location	Condition	Remarks	Length (Km)
	From	To						
6	135.975	136.605	-	16	Median	Good		0.630
7	137.350	137.930	-	16	Median	Good		0.580
8	140.860	-	1	-	Separator	Good	Solar Panels	-
9	140.880	-	1	-	Median	Good	Solar Panels	-
10	146.530	147.730	-	34	Median	Good		1.200
11	148.030	148.420	-	11	Median	Good		0.390
12	150.010	150.175	-	4	Median	Good		0.165
13	150.400	150.600	-	5	Median	Good		0.200
14	151.795	152.050	-	7	Median	Good		0.255
15	153.000	153.100	3	-	Service Road (LHS)	Good		0.100
16	153.110	155.500	-	60	Median	Good		2.390
17	155.600	155.700	6	-	Service Road (LHS & RHS)	Good		0.100
18	155.850	156.235	-	10	Median	Good		0.385
19	156.770	-	1	-	Median	Good	Solar Panels	-
20	156.790	-	1	-	Median	Good	Solar Panels	-
21	160.605	-	-	1	Median	Good	Solar Panels	-
22	160.625	-	1	-	Median	Good	Solar Panels	-
23	161.620	-	1	-	Median	Good	Solar Panels	-
24	161.630	-	-	1	Shoulder	Good	Solar Panels	-
25	161.640	-	1	-	Median	Good	Solar Panels	-
26	162.180	-	1	-	Median	Good	Solar Panels	-
27	170.000	170.100	6	-	Service Road (LHS & RHS)	Good		0.100
28	170.280	-	1	-	Median	Good	Solar Panels	-
29	170.300	-	1	-	Median	Good	Solar Panels	-
30	173.290	-	1	-	Median	Good	Solar Panels	-
31	173.290	-	-	1	Shoulder	Good	Solar Panels	-
32	175.440	175.710	-	7	Median	Good		0.270
33	176.240	176.650	-	11	Median	Good		0.410
34	181.980	-	1	-	Median	Good	Solar Panels	-
35	182.000	-	1	-	Median	Good	Solar Panels	-
36	182.420	-	1	-	Service Road Edge	Good	Solar Panels	-
37	182.510	-	1	-	Service Road Edge	Good	Solar Panels	-
38	183.290	183.620	-	10	Median	Good		0.330

Sl. No.	Chainage		Single Arm	Double Arm	Location	Condition	Remarks	Length (Km)
	From	To						
39	185.700	185.800	6	-	Service Road (LHS & RHS)	Good		0.100
40	186.180	-	1	-	Median	Good	Solar Panels	-
41	193.430	-	1	-	Median	Good	Solar Panels	-
Total No's			40	217	Total Length			8.410

However, from the Client it is understood that actual Inventory of Single arm is 29 and Double arm is 215 only. The difference may be due to some of the lights may be operated by local panchayats

1.5.2 Major Structure

List of Structures found during the inventory surveys along the corridor are as follows:

Table 19: Details of Major Structures

Sl No.	Design chainage	Type of Str	Side	Structure on	Age of Structure	Span Arrangement (No x Length)
1	139+138	MJB	LHS	MCW	New	4 x 19.2 + 1 x 29.5
2	139+138	MJB	RHS	MCW	Old	2 x 9.0 + 9 x 9.8
3	141+362	MJB	LHS	MCW	Old	2 x 19.0 + 9 x 20
4	141+362	MJB	RHS	MCW	New	2 x 19.0 + 9 x 20
5	149+933	MJB	LHS	MCW	Old	2 x 9.0 + 7 x 9.8
6	149+933	MJB	RHS	MCW	New	3 x 29.0
7	158+193	MJB	LHS	MCW	Old	13 x 5.6
8	158+193	MJB	RHS	MCW	New	2 x 23.2 + 1 x 29
9	171+728	MJB	LHS	MCW	Old	30 x 20
10	171+728	MJB	RHS	MCW	New	30 x 20
11	186+614	MJB	LHS	MCW	Old	15 x 21.7
12	186+614	MJB	RHS	MCW	New	15 x 21.7
13	124+787	MNB	LHS	MCW	New	2x8.0
14	124+787	MNB	RHS	MCW	New	2x8.0
15	125+725	MNB	LHS	MCW	New	2 x 6
16	125+725	MNB	RHS	MCW	New	2 x 6
17	127+510	MNB	LHS	MCW	Old	2 x 6.8
18	127+510	MNB	RHS	MCW	New	2 x 5.8
19	151+083	MNB	LHS	MCW	New	5.0 x 6.0
20	151+083	MNB	RHS	MCW	New	5.0 x 6.0
21	157+725	MNB	LHS	ROB Approach	New	5 x 8.6

Sl No.	Design chainage	Type of Str	Side	Structure on	Age of Structure	Span Arrangement (No x Length)
22	157+725	MNB	RHS	ROB Approach	New	5 x 8.6
23	164+235	MNB	LHS	MCW	New	1 x 11
24	164+235	MNB	RHS	MCW	New	1 x 11
25	166+348	MNB	LHS	MCW	New	1 x 11
26	166+348	MNB	RHS	MCW	New	1 x 11
27	167+750	MNB	LHS	ROB Approach	New	3 x 4
28	167+750	MNB	RHS	ROB Approach	New	3 x 4
29	170+950	MNB	LHS	MCW	New	3 x 11
30	170+950	MNB	RHS	MCW	New	3 x 11
31	175+280	MNB	LHS	MCW	New	2 x 3.6
32	175+280	MNB	RHS	MCW	Old	2 x 3.3
33	176+120	MNB	LHS	MCW	New	5 x 6
34	176+120	MNB	RHS	MCW	Old	5 x 6.3
35	176+165	MNB	LHS	MCW	New	8 x 6
36	176+165	MNB	RHS	MCW	Old	12 x 3
37	176+415	MNB	LHS	SR	New	1 x 10.6
38	176+415	MNB	RHS	MCW	Old	2 x 5.3
39	184+054	MNB	LHS	MCW	Old	3 x 5.8
40	184+054	MNB	RHS	MCW	New	3 x 5.8
41	157+433	ROB	LHS	MCW	New	2 x 10 + 1 x 22.4
42	157+433	ROB	RHS	MCW	Old	1 x 13.7
43	163+220	ROB	LHS	MCW	New	3 x 20 + 1 x 24.7
44	163+220	ROB	RHS	MCW	New	3 x 20 + 1 x 24.7
45	167+660	ROB	LHS	MCW	New	2 x 10 + 1 x 22.4
46	167+660	ROB	RHS	MCW	New	2 x 10 + 1 x 22.4
47	123+833	Flyover	LHS	MCW	New	1 x 21.7
48	123+833	Flyover	RHS	MCW	New	1 x 21.7
49	151+140	VUP	LHS	MCW	New	1 x 20.5
50	151+140	VUP	RHS	MCW	New	1 x 20.5
51	181+430	VUP	LHS	MCW	New	1 x 22.5
52	181+430	VUP	RHS	MCW	New	1 x 22.5
53	159+850	VUP	LHS	MCW	New	2 x 12.0
54	159+850	VUP	RHS	MCW	New	2 x 12.0

Sl No.	Design chainage	Type of Str	Side	Structure on	Age of Structure	Span Arrangement (No x Length)
55	121+700	PUP	LHS	MCW	New	1 x 9.0
56	121+700	PUP	RHS	MCW	New	1 x 9.0
57	153+030	PUP	LHS	MCW	New	1 x 9.5
58	153+030	PUP	RHS	MCW	New	1 x 9.5
59	155+681	PUP	LHS	MCW	New	1 x 9.6
60	155+681	PUP	RHS	MCW	New	1 x 9.6
61	167+247	PUP	LHS	MCW	New	1 x 3.0
62	167+247	PUP	RHS	MCW	New	1 x 3.0
63	169+990	PUP	LHS	MCW	New	1 x 9.6
64	169+990	PUP	RHS	MCW	New	1 x 9.6
65	185+774	PUP	LHS	MCW	New	1 x 3.0
66	185+774	PUP	RHS	MCW	New	1 x 3.0

1.6 QUALITY AUDIT

1.6.1 Pavement Composition

As per CA approved thickness given below:

Designation of Pavement Layer	Layer thickness in mm
Bituminous concrete (BC/AC)	50
Dense Bituminous Macadam (DBM)	175
Wet Mix Macadam (WMM)	250
Granular Mix Sub base (GSB)	200
Drainage/Filter layer	100
Selected Subgrade (8% CBR)	500

After Construction, till date two mandatory Overlays have been done with 40mm BC.

1.6.2 CD Structures

The CD structures along the corridor are constructed appears to be as per the standards and specifications as no design calculations/ as-built drawings for structures made available to verify the same. Presently, all structures appear new and seem to be in good condition. Structure wise conditions along the project corridor are presented below:

Sl. No.	Description	No's as Per As Built Drawings	No's As Per Site	Remarks
1	Major Bridges	6	6	-
2	Minor Bridges	14	14	-
3	ROB	3	3	-
4	Grade Separators	1	1	-
5	VUP	2	3	1 COS
6	PUP	6	6	-
7	Box and Slab Culverts	65	65	-
8	Pipe Culverts	58	58	-
Total Structures		155	156	-

BR.CH 139+138 MJB

GENERAL DESCRIPTION

- Chainage : Km 139+138
- Type of structure : MJB
- Span Arrangement : LHS - 4 x 19.2m + 1 x 29.5m, RHS - 2 x 9.0m + 9 x 9.8m
- Deck Width : 13.50m -LHS & 9.0m -RHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : LHS - RCC Circular Pier & RHS - RCC Wall Type Pier
- Type of Superstructure : LHS - RCC Girder & RHS - RCC Slab
- Type of Bearing : POT-PTFE
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Cleaning required for Expansion Joints
- Bridges are constructed with Split Carriageway.
- RHS seems to be old and LHS seems to be New.
- Repairs done earlier on BHS.



139+138 MJB (LHS)



139+138 MJB (RHS)

BR.CH 141+362 MJB

GENERAL DESCRIPTION

- Chainage : Km 141+362
- Type of structure : MJB
- Span Arrangement : 2 x 19.0m + 9 x 20m (BHS)
- Deck Width : 13.50m -RHS & 9.0m -LHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : RCC Circular Pier (BHS)
- Type of Superstructure : RCC Girder (BHS)
- Type of Bearing : Pot-RHS & Elastomeric -LHS
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- RHS seems to be New and LHS Seems to be old.
- Fair condition.



141+362 MJB (LHS)



141+362 MJB (RHS)

BR.CH 149+933 MJB

GENERAL DESCRIPTION

- Chainage : Km 149+933
- Type of structure : MJB
- Span Arrangement : 2 x 9.0m + 7 x 9.8m (LHS) & 3 x 29.0m (RHS)
- Deck Width : 13.50 m - RHS, 9.0 m - LHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : RCC Circular Pier (RHS) & RCC Wall Type Pier (LHS)
- Type of Superstructure : RCC Girder -RHS & RCC Solid Slab -LHS
- Type of Bearing : Pot
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Leaching observed on entire deck of bridge on LHS and fog seal to be applied over wearing coat as a remedy.
- LHS seems to be old and RHS seems to be New.
- Concrete spalling observed on Pier P5 on LHS.
- Partial delamination of the concrete observed in span 1,2 &3.



149+933 MJB (LHS)



149+933 MJB (RHS)

BR.CH 158+193 MJB

GENERAL DESCRIPTION

- Chainage : Km 158+193
- Type of structure : MJB
- Span Arrangement : 13 x 5.6m (LHS) & 2 x 23.2m +1 x 29m (RHS)
- Deck Width : 13.50m - RHS & 9.0m -LHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : RCC Circular Pier (RHS) &RCC Wall Type Pier (LHS)
- Type of Superstructure : RCC Girder - RHS & RCC Solid Slab - LHS
- Type of Bearing : Pot - RHS
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Foot path damaged in RHS
- LHS seems to be old and RHS Seems to be New
- Fair condition.



158+193 MJB (LHS)



158+193 MJB (RHS)

BR.CH 171+728 MJB

GENERAL DESCRIPTION

- Chainage : Km 171+728
- Type of structure : MJB
- Span Arrangement : 30 x 20m (BHS)
- Deck Width : 13.50m - RHS & 9.0m -LHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Well Foundation in LHS
- Type of substructure : RCC Circular Pier (RHS) & RCC Wall Type Pier (LHS)
- Type of Superstructure : RCC Girder (BHS)
- Type of Bearing : Pot -RHS & Elastomeric -LHS
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Corrosion Strains are observed in RHS
- Concrete spalling and reinforcement exposure observed on Hand railing - LHS
- Reinforcement exposed at slab and piers (P4 - P9 & P13 -P21) on LHS and Slab reinforcement exposed in span -1 on RHS.
- Spalling of concrete observed in girders of span-1 on LHS.
- Spalling observed at dirt wall junction on RHS.



171+728 MJB (LHS)



171+728 MJB (RHS)

BR.CH 186+614 MJB

GENERAL DESCRIPTION

- Chainage : Km 186+614
- Type of structure : MJB
- Span Arrangement : 15 x 21.7m (BHS)
- Deck Width : 13.50 m - RHS & 9.0 m -LHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Well Foundation in LHS
- Type of substructure : RCC Circular Pier (BHS)
- Type of Superstructure : RCC Girder (BHS)
- Type of Bearing : Pot
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Corrosion Strains Are Observed in the Girder Soffit Level at RHS
- Reinforcement exposed in pier cap (P4) on LHS.
- Reinforcement exposure and minor cracks observed at girder resting portions at P5 & P9 locations.
- Foot path damaged.
- Cracks and spalling observed on Hand railing on LHS.



186+614 MJB (LHS)



186+614 MJB (RHS)

BR.CH 124+787 MNB

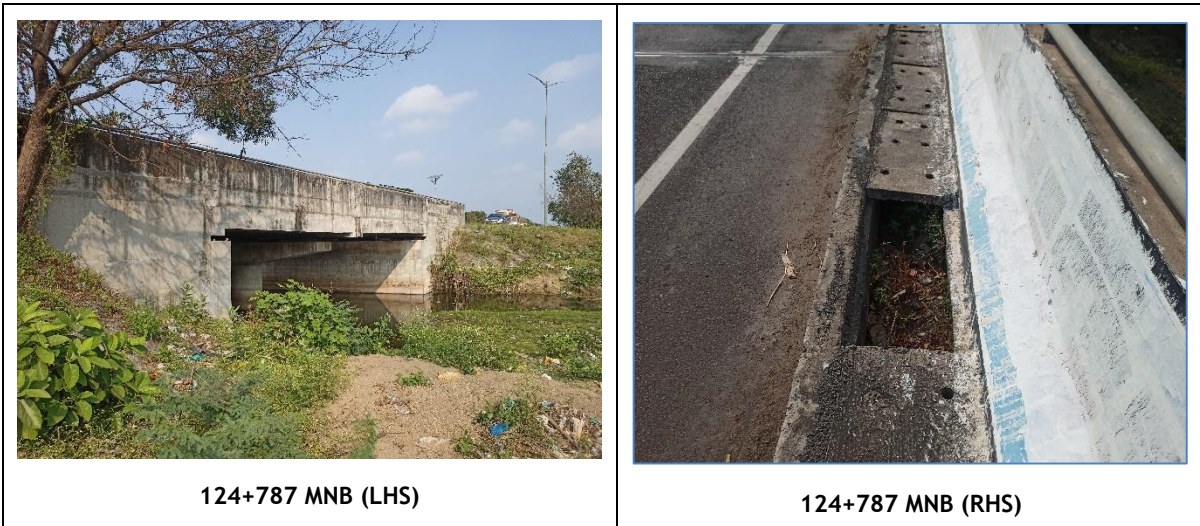
GENERAL DESCRIPTION

- Chainage : Km 124+787
- Type of structure : MNB
- Span Arrangement : 2x8.0m(BHS)
- Deck Width : 10.0 m
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : RCC Circular Pier (BHS)
- Type of Superstructure : RCC Slab (BHS)
- Type of Bearing : Elastomeric
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- By Visual observation Condition is good.
- Footpath slab damaged on RHS.



124+787 MNB (LHS)

124+787 MNB (RHS)

BR.CH 125+725 MNB

GENERAL DESCRIPTION

- Chainage : Km 125+725
- Type of structure : MNB
- Span Arrangement : 2 x 6m (BHS)
- Deck Width : 12.0 m - RHS, 10.0 m -LHS
- Median Width : 5.0 m
- Type of Foundation : Not Visible
- Type of substructure : RCC Box (BHS)
- Type of Superstructure : -
- Type of Bearing : No
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Quadrant pitching damaged on RHS.
- By Visual Observation Structure seems to be Good Condition



125+725 MNB (LHS)



125+725 MNB (RHS)

BR.CH 127+510 MNB

GENERAL DESCRIPTION

- Chainage : Km 127+510
- Type of structure : MNB
- Span Arrangement : 2 x 6.8m (LHS) & 2 x 5.8m (RHS)
- Deck Width : 9.50m -RHS & 10.5m -LHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : RCC Circular Pier (RHS) & RCC Wall Type Pier (LHS)
- Type of Superstructure : RCC Slab (BHS)
- Type of Bearing : Elastomeric (RHS)
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- LHS seems to be old and RHS Seems to New.
- Quadrant pitching damaged on RHS.



127+510 MNB (LHS)



127+510 MNB (RHS)

BR.CH 151+083 MNB

GENERAL DESCRIPTION

- Chainage : Km 151+083
- Type of structure : MNB
- Span Arrangement : 5.0 x 6.0m (BHS)
- Deck Width : 32.5 m.
- Median Width : 5.0 m.
- Type of Foundation : Not Visible
- Type of substructure : RCC Box (BHS)
- Type of Superstructure : -
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Honey comb observed at the top slab.
- Repair works done and It appears that it is in good condition.



151+083 MNB (LHS)



151+083 MNB (RHS)

BR.CH 157+725 MNB

GENERAL DESCRIPTION

- Chainage : Km 157+725
- Type of structure : MNB
- Span Arrangement : 5 x 8.6m (BHS)
- Deck Width : 29 m Overall
- Median Width : 5.0
- Type of Foundation : Not visible
- Type of substructure : RCC Box (BHS)
- Type of Superstructure : -
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- It comes under approach of ROB
- Retaining wall reinforcement exposed on LHS.
- Reinforcement exposed at 3rd intermediate wall.



157+725 MNB (LHS)



157+725 MNB (RHS)

BR.CH 164+235 MNB

GENERAL DESCRIPTION

- Chainage : Km 164+235
- Type of structure : MNB
- Span Arrangement : 1 x 11m (BHS)
- Deck Width : 10.5 m (BHS)
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not visible
- Type of substructure : RCC Solid Wall type Abutment (BHS)
- Type of Superstructure : RCC Solid Slab (BHS)
- Type of Bearing : Elastomeric
- Type of Railing : Crash barrier
- Method of Inspection : Visual

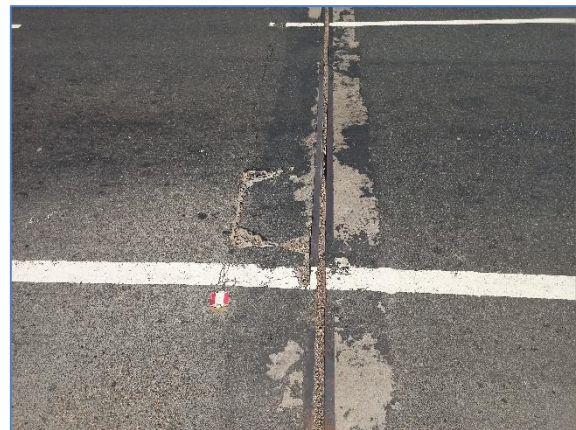
OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Expansion joint concrete damaged at EJ-1 location on RHS.
- Reinforcement exposed in median for small portion where Median is open to sky.
- Small portion of Stone pitching damaged on RHS.



164+235 MNB (LHS)



164+235 MNB (RHS)

BR.CH 166+348 MNB

GENERAL DESCRIPTION

- Chainage : Km 166+348
- Type of structure : MNB
- Span Arrangement : 1 x 11m (BHS)
- Deck Width : 10.5 m (BHS)
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not visible
- Type of substructure : RCC Solid Wall type Abutment (BHS)
- Type of Superstructure : RCC Solid Slab (BHS)
- Type of Bearing : Elastomeric
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Structure is good in condition.



166+348 MNB (LHS)



166+348 MNB (RHS)

BR.CH 167+750 MNB

GENERAL DESCRIPTION

- Chainage : Km 167+750
- Type of structure : MNB
- Span Arrangement : 3 x 4 m (BHS)
- Deck Width : 25.0 m
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not visible
- Type of substructure : RCC Box
- Type of Superstructure : -
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- It comes under approach of ROB.
- Structure is in good condition.



167+750 MNB (LHS)



167+750 MNB (RHS)

BR.CH 170+950 MNB

GENERAL DESCRIPTION

- Chainage : Km 170+950
- Type of structure : MNB
- Span Arrangement : 3 x 11 (BHS)
- Deck Width : 30 Overall
- Median Width : -
- Type of Foundation : Not visible
- Type of substructure : RCC Box (BHS)
- Type of Superstructure : -
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Overall condition good.
- Cleaning of Drainage Spouts is required.



170+950 MNB (LHS)



170+950 MNB (RHS)

BR.CH 175+280 MNB

GENERAL DESCRIPTION

- Chainage : Km 175+280
- Type of structure : MNB
- Span Arrangement : 2 x 3.6 m (LHS), 2 x 3.3 m (RHS)
- Deck Width : 12.0 m (BHS)
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not visible.
- Type of substructure : RCC Pier Wall (RHS) & RCC Box (LHS)
- Type of Superstructure : RCC Slab (BHS)
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Reinforcement is exposed in pier at RHS.
- Reinforcement exposed at the joints in abutment.



175+280 MNB (LHS)



175+280 MNB (RHS)

BR.CH 176+120 MNB

GENERAL DESCRIPTION

- Chainage : Km 176+120
- Type of structure : MNB
- Span Arrangement : 5 x 6 (RHS), 5 x 6.3 (LHS)
- Deck Width : 10.3 (RHS), 11.8 (LHS)
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not visible
- Type of substructure : RCC Box (BHS)
- Type of Superstructure : -
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Portion of the Quadrant pitching damaged on LHS.
- Structure is good in condition.



176+120 MNB (LHS)



176+120 MNB (RHS)

BR.CH 176+165 MNB

GENERAL DESCRIPTION

- Chainage : Km 176+165
- Type of structure : MNB
- Span Arrangement : 12 x 3 m(RHS), 8 x 6 m (LHS)
- Deck Width : 9.0 (RHS), 12.5 (LHS)
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not visible.
- Type of substructure : RCC Box (BHS)
- Type of Superstructure : -
- Type of Bearing : -
- Type of Railing : Crash barrier.
- Method of Inspection : Visual.

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Cleaning of Drainage spouts is required.
- Reinforcement exposed on top slab on LHS.



176+165 MNB (LHS)



176+165 MNB (RHS)

BR.CH 176+415 MNB

GENERAL DESCRIPTION

- Chainage : Km 176+415
- Type of structure : MNB
- Span Arrangement : 2 x 5.3 m (RHS), 1 x 10.6 m (LHS)
- Deck Width : 8.5 m (RHS), 14.5 m (LHS)
- Median Width : 6.0 (Median open to Sky)
- Type of Foundation : Not visible
- Type of substructure : RCC Pier wall (RHS).
- Type of Superstructure : RCC Slab (BHS).
- Type of Bearing : Elastomeric (LHS)
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Stone pitching damaged on LHS.
- Reinforcement exposed at face of the slab on LHS.



176+415 MNB (LHS)



176+415 MNB (RHS)

BR.CH 184+054 MNB

GENERAL DESCRIPTION

- Chainage : Km 184+054
- Type of structure : MNB
- Span Arrangement : 3 x 5.8 m (BHS)
- Deck Width : 8.7 (RHS), 9.0 (LHS)
- Median Width : 4.0 (Median open to Sky)
- Type of Foundation : Not visible
- Type of substructure : RCC Pier wall (LHS), RCC Box (RHS)
- Type of Superstructure : RCC Slab (BHS)
- Type of Bearing : Elastomeric (LHS)
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- repair works done already done, the Condition of Bridge is Good.



184+054 MNB (LHS)



184+054 MNB (LHS)

BR.CH 157+433 ROB

GENERAL DESCRIPTION

- Chainage : Km 157+433
- Type of structure : ROB
- Span Arrangement : LHS - 2 x 10m + 1 x 22.4m & RHS - 1 x 13.7m
- Deck Width : 11.0 m - LHS, 11.0 m -RHS
- Median Width : 15 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : LHS - RCC Wall type Pier
- Type of Superstructure : RCC Girder (BHS)
- Type of Bearing : Pot -LHS & Elastomeric - RHS
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

- ROB on RHS is old ROB and it is under railway maintenance. Concessionaire paying the maintenance fee. ROB on LHS is constructed and maintained by Concessionaire
- Minor damage in Mid span end girder resting portion is noticed.
- Reinforcement Exposed near the Cantilever Portion of 1 m² and Abutment for 0.5 m² - RHS
- Wing wall damaged on RHS.
- Cleaning of Expansion joints is required



157+433 ROB (LHS)



157+433 ROB (RHS)

BR.CH 163+220 ROB & VUP

GENERAL DESCRIPTION

- Chainage : Km 163+220
- Type of structure : ROB
- Span Arrangement : 3 x 20m + 1 x 24.7m
- Deck Width : 10.50 m - BHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : RCC Wall Type Pier
- Type of Superstructure : RCC Girder (BHS)
- Type of Bearing : Pot, Elastomeric
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Cleaning of Expansion Joints is required.
- Leakage through expansion joints observed.
- Reinforcement exposed in pier cap on RHS for small length.
- Rubber sealant damaged at EJ-5 on LHS.
- Spalling and reinforcement exposure observed on soffit of the slab at P3 location on LHS.



163+220 ROB (LHS)



163+220 ROB (RHS)

BR.CH 167+660 ROB

GENERAL DESCRIPTION

- Chainage : Km 167+660
- Type of structure : ROB
- Span Arrangement : 2 x 10m + 1 x 22.4m - BHS
- Deck Width : 11.0 m - LHS & 11.0 m - RHS
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : RCC Wall Type Pier
- Type of Superstructure : RCC Girder (BHS)
- Type of Bearing : Pot
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Cleaning of Drainage spout and Expansion Joints is required.



167+660 ROB (LHS)



167+660 ROB (RHS)

BR.CH 123+883 Grade Separator

GENERAL DESCRIPTION

- Chainage : 123+883
- Type of structure : Separator
- Span Arrangement : 1 x 21.7 m
- Deck Width : 13.50 m
- Median Width : 5.0m
- Type of Foundation : Not Visible
- Type of substructure : RCC Circular Pier
- Type of Superstructure : RCC Girder
- Type of Bearing : Pot
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Approach of Grade Separator is in Curvilinear.
- By Visual observation seems to New.
- Fair condition.



123+883 GRADE SEPERATOR (LHS)



123+883 GRADE SEPERATOR (RHS)

BR.CH 151+140 VUP

GENERAL DESCRIPTION

- Chainage : Km 151+140
- Type of structure : VUP
- Span Arrangement : 1 x 20.5m- only LHS
- Deck Width : 12.35 m
- Median Width : -
- Type of Foundation : Not Visible
- Type of substructure : RCC Circular Pier
- Type of Superstructure : RCC Girder
- Type of Bearing : Pot
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Approach of VUP is in Curvilinear.
- By Visual observation seems to New.
- Cleaning of Expansion joint and Drainage Spout are required
- Dirt wall and crash barrier junction portion slightly damaged.
- Mild bulging in RE panels is noticed and it is understood from Concessionaire that this is there since construction and was monitored closely from then onwards and there is no further deterioration observed.



151+140 VUP (LHS)



151+140 VUP (LHS)

BR.CH 181+430 VUP

GENERAL DESCRIPTION

- Chainage : Km 181+430
- Type of structure : VUP
- Span Arrangement : 1 x 22.5 m
- Deck Width : 12.35 m
- Median Width : 5.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : RCC Wall Type Pier
- Type of Superstructure : RCC Girder (BHS)
- Type of Bearing : Pot
- Type of Railing : Crash barrier and Handrails
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Structure seems to be in Good Condition.



181+430 VUP (LHS)



181+430 VUP (RHS)

BR.CH 159+853 VUP (COS)

GENERAL DESCRIPTION

- Chainage : Km 159+853
- Type of structure : VUP
- Span Arrangement : 2 x 12.0 m
- Deck Width : 2 x 13.5 m
- Median Width : 3.0 (Median open to Sky)
- Type of Foundation : Not Visible
- Type of substructure : -
- Type of Superstructure : RCC Box (BHS)
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Construction completed and opened to traffic.



159+853 VUP (LHS)



159+853 VUP (RHS)

BR.CH 121+700 PUP

GENERAL DESCRIPTION

- Chainage : Km 121+700
- Type of structure : PUP
- Span Arrangement : 1 x 9.0m
- Deck Width : 22.5 m
- Type of Foundation : Not Visible
- Type of substructure : RCC Box
- Type of Superstructure : RCC Box
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- By Visual observation seems to Good Condition.



121+700 PUP (LHS)



121+700 PUP (RHS)

BR.CH 153+030 PUP

GENERAL DESCRIPTION

- Chainage : Km 153+030
- Type of structure : PUP
- Span Arrangement : 1 x 9.5 x 2.6m
- Deck Width : 21.5 m
- Type of Foundation : Not Visible
- Type of substructure : RCC Box
- Type of Superstructure : RCC Box
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- By Visual observation seems to Good Condition.



153+030 PUP (LHS)



153+030 PUP (RHS)

BR.CH 155+681 PUP

GENERAL DESCRIPTION

- Chainage : Km 155+681
- Type of structure : PUP
- Span Arrangement : 1 x 9.6 x 2.6m
- Deck Width : 20.6 m
- Type of Foundation : Not Visible
- Type of substructure : RCC Box
- Type of Superstructure : RCC Box
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- By Visual observation seems to Good Condition.



155+681 PUP (LHS)



155+681 PUP (RHS)

BR.CH 167+247 PUP

GENERAL DESCRIPTION

- Chainage : Km 167+247
- Type of structure : PUP
- Span Arrangement : 1 x 3 x 2.5m
- Deck Width : 25.0 m
- Type of Foundation : Not Visible
- Type of substructure : RCC Box
- Type of Superstructure : RCC Box
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

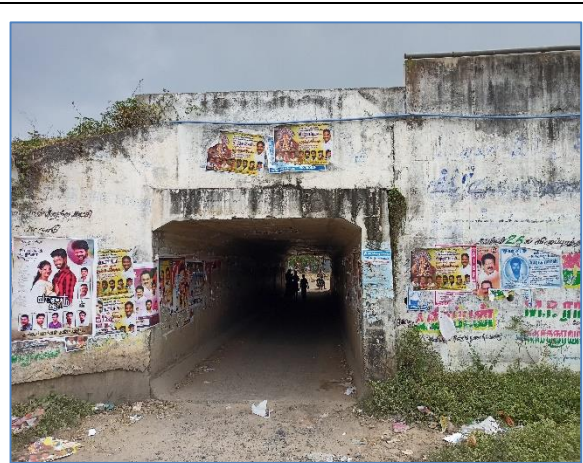
OBSERVATIONS

Visual Observations on condition of the structure are as below:

- Comes under approach of ROB.
- By Visual observation seems to Good Condition.



167+247 PUP (LHS)



167+247 PUP (RHS)

BR.CH 169+990 PUP

GENERAL DESCRIPTION

- Chainage : Km 169+990
- Type of structure : PUP
- Span Arrangement : 1 x 9.6 m
- Deck Width : 20.6 m
- Vertical Clearance : 2.5 m
- Type of Foundation : Not Visible
- Type of substructure : RCC Box
- Type of Superstructure : RCC Box
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

OBSERVATIONS

Visual Observations on condition of the structure are as below:

- By Visual observation seems to Good Condition.



169+990 PUP (LHS)



169+990 PUP (RHS)

BR.CH 185+774 PUP

GENERAL DESCRIPTION

- Chainage : Km 185+774
- Type of structure : PUP
- Span Arrangement : 1 x 3.0 m
- Deck Width : 25 m
- Vertical Clearance : 2.5 m
- Type of Foundation : Not Visible
- Type of substructure : RCC Box
- Type of Superstructure : RCC Box
- Type of Bearing : -
- Type of Railing : Crash barrier
- Method of Inspection : Visual

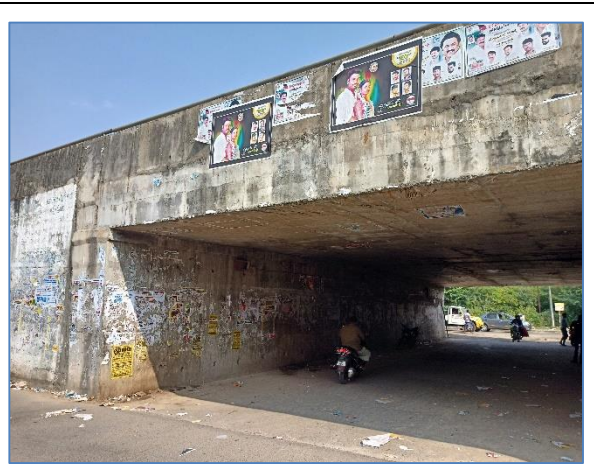
OBSERVATIONS

Visual Observations on condition of the structure are as below:

- By Visual observation seems to Good Condition.




185+774 PUP (LHS)



185+774 PUP (RHS)

Photos of some culverts at site

 <p>A photograph of a concrete culvert structure with a dark opening, situated on a dirt embankment with some vegetation.</p>	 <p>A photograph of a concrete culvert structure with a dark opening, showing some weathering and vegetation on the side.</p>
<p>km 121+735</p>	<p>km @ 129+850</p>
 <p>A photograph of a concrete culvert structure with a dark opening, showing a road surface above and some debris around the entrance.</p>	 <p>A photograph of a concrete culvert structure with a dark opening, showing a road surface above and some debris around the entrance.</p>
<p>km 136+600</p>	<p>km 184+983</p>
 <p>A photograph of a concrete culvert structure with a dark opening, showing a road surface above and some debris around the entrance.</p>	 <p>A photograph of a concrete culvert structure with a dark opening, showing a road surface above and some debris around the entrance.</p>
<p>km 138+400</p>	<p>km 173+540</p>
 <p>A photograph of a concrete culvert structure with a dark opening, showing a road surface above and some debris around the entrance.</p>	 <p>A photograph of a concrete culvert structure with a dark opening, showing a road surface above and some debris around the entrance.</p>
<p>km 136+716</p>	<p>km 163+670</p>

Details of Culverts: -

Sl. No.	Type of structure	Chainage as per Site	Span arrangement (m)	Vertical clearance (m)	Slab Thickness (m)	Remarks
1	Box	121+735	1 x 4.0	4.0	0.4	<ul style="list-style-type: none"> Overall condition is good.
2	Pipe	121+990	1 x 1.0	-		<ul style="list-style-type: none"> Overall condition is good
3	Box	122+450	1 x 4.0	3.2	0.3	<ul style="list-style-type: none"> Local People using as PUP
4	Box	122+842	1 x 4.0	3.5	0.3	<ul style="list-style-type: none"> Overall condition is good.
5	Box	123+182	1 x 4.0	2.5	0.3	<ul style="list-style-type: none"> Overall condition is good.
6	Box	124+372	1 x 4.0	3.5	0.3	<ul style="list-style-type: none"> Stagnation of Water observed
7	Box	125+130	1 x 4.0	3.5	0.3	<ul style="list-style-type: none"> It is satisfactory
8	Pipe	125+380	2 x 1.0	-	-	<ul style="list-style-type: none"> Good Condition
9	Slab	126+115	1 x 2.0	2.3	0.3	<ul style="list-style-type: none"> Both Side Service roads widened 1.7 on LHS
10	Slab	126+854	1 x 3.0	2.0	0.3	<ul style="list-style-type: none"> Stagnation of water and debris. Honey Comb in side wall & leaching.
11	Slab	127+041	1 x 1.5	1.7	0.2	<ul style="list-style-type: none"> Median Drains are in good Condition.
12	Slab	127+938	1 x 4.0	3.5	0.3	<ul style="list-style-type: none"> Honeycombing is observed in Slab. Minor Cracks observed in wing wall joint.
13	Slab	128+240	1 x 4.0	2.7	0.2	<ul style="list-style-type: none"> Minor damage on Wing wall joint
14	Pipe	129+530	2 x 1.0			
15	Slab	129+850	1 x 2.0	2.5	0.2	<ul style="list-style-type: none"> Minor Honeycombing is observed in side wall. Minor Spalling of concrete observed. Reinforcement is exposed at small length Minor Cracks in Wing Wall.
16	Slab	131+652	1 x 3.0	3.0	0.3	<ul style="list-style-type: none"> Stagnation of water Honeycomb & minor Cracks found in Slab Minor damage at Wing Wall

Sl. No.	Type of structure	Chainage as per Site	Span arrangement (m)	Vertical clearance (m)	Slab Thickness (m)	Remarks
17	Pipe	133+730	1 x 0.9			•
18	Slab	133+980	1 x 2.0	1.8	0.3	• Partially Buried on LHS
19	Slab	134+217	1 x 2.0	1.8	0.3	• Reinforcement is exposed in Wing wall joint.
20	Slab	135+246	1 x 2.0			• Minor Cracks found in Wing walls.
21	Slab	136+067	1 x 2.0	1.5	0.25	• Overall condition is good.
22	Pipe	136+590	2 x 0.9			• Stagnation of water observed
23	Slab	136+716	1 x 2.0	1.2	0.25	• Reinforcement exposed in joints • Buried at RHS.
24	Pipe	137+650	1 x 0.9			• Cleaning is required.
25	Slab	138+409	1 x 2.0	1.8	0.25	• RHS Side is Arch type.
26	Slab	139+065	1 x 3.4	4.8	0.3	• Overall Condition is good. • Culvert located Near to the MNB.
27	Slab	139+744	1 x 2.0	1.8	0.2	• Minor damage on Wing joints and rectification is in progress • good in condition.
28	Pipe	140+953	1 x 0.9			• Partially Buried at RHS.
29	Pipe	142+654	3 x 0.9			• Overall condition is good.
30	Slab	143+893	1 x 2.0	2.5	0.25	• Cleaning of Vegetation is required • Mild Damage on Head wall.
31	Slab	145+042	1 x 2.0	1.7	0.4	• Reinforcement observed in slab & top Slab • 1m widened on LHS. • Cracks in wing wall.
32	Slab	146+615	1 x 2.0	1.8	0.25	• LHS seems to be old, top slab damaged • Honeycombing & Reinforcement Exposed in side wall.
33	Pipe	146+991	1 x 0.9			• Partially buried at RHS side.
34	Slab	148+433	1 x 5.7		0.4	• Buried at RHS side.

Sl. No.	Type of structure	Chainage as per Site	Span arrangement (m)	Vertical clearance (m)	Slab Thickness (m)	Remarks
35	Pipe	148+500	2 x 0.9			<ul style="list-style-type: none"> Buried at RHS side.
36	Slab	149+202	1 x 2.0	4.2	0.25	<ul style="list-style-type: none"> good in condition.
37	Pipe	149+600	1 x 1.0	-	-	<ul style="list-style-type: none"> Started from median and may be constructed to discharge drain water.
38	Box	150+125	1 x 3.0	3.5	0.4	<ul style="list-style-type: none"> Stagnation of water.
39	Slab	150+772	1 x 3.0			<ul style="list-style-type: none"> Median side wall is damaged.
40	Pipe	151+170	3 x 0.9			<ul style="list-style-type: none"> Domestic waste observed. Reinforcement Exposed in pipes
41	Slab	152+300	1 x 0.2	1.8	0.4	<ul style="list-style-type: none"> Good in Condition.
42	Slab	153+410	1 x 2.0	1.3	0.25	<ul style="list-style-type: none"> Reinforcement Exposed in joints Partially filled with wastage in LHS. Honey comb observed in side wall.
43	Slab	154+705	1 x 1.5			<ul style="list-style-type: none"> Good Condition Buried at LHS side.
44	Slab	154+776	1 x 2.5	2	0.25	<ul style="list-style-type: none"> Cleaning of Vegetation required Reinforcement Exposed in side wall. RHS stagnation of water.
45	Pipe	155+060	2 x 0.9			<ul style="list-style-type: none"> LHS completely buried.
46	Pipe	155+504	2 x 0.9			<ul style="list-style-type: none"> Overall condition is good.
47	Pipe	157+011	2 x 0.9			<ul style="list-style-type: none"> Good in Condition
48	Pipe	158+521	2 x 0.9			<ul style="list-style-type: none"> Buried on LHS.
49	Pipe	158+860	1 x 1.0			<ul style="list-style-type: none"> Good in Condition.
50	Box	158+960	1 x 4.0	2.5	0.5	<ul style="list-style-type: none"> Overall condition is good.
51	Box	159+610	1 x 4.0	2.5	0.5	<ul style="list-style-type: none"> MCW under construction.
52	Pipe	159+810	1 x 1.0			<ul style="list-style-type: none"> Cleaning is required

Sl. No.	Type of structure	Chainage as per Site	Span arrangement (m)	Vertical clearance (m)	Slab Thickness (m)	Remarks
53	Pipe	160+210	1 x 1.0			• Structure is in good condition.
54	Pipe	160+460	1 x 1.0			• Structure is in good condition.
55	Pipe	160+660	1 x 1.0			• Good Condition
56	Pipe	160+960	1 x 1.0			• Buried at LHS side.
57	Pipe	161+180	1 x 1.0			• Structure is in good condition.
58	Box	161+682	1 x 4.0			• Good Condition
59	Pipe	162+160	1 x 1.0			• Good Condition
60	Pipe	162+439	1 x 1.0			
61	Pipe	163+108	1 x 1.0			• Partially buried with debris.
62	Pipe	163+255	2 x 1.0			• Fair Condition
63	Pipe	163+670	1 x 1.0			• Culvert is in approach
64	Pipe	164+030	1 x 1.0			• vegetation growth is observed • Utilities are passing.
65	Pipe	164+460	1 x 1.0			• Good in condition.
66	Pipe	164+860	1 x 1.0			• Good in condition.
67	Pipe	165+100	1 x 1.0			• Good in condition.
68	Pipe	165+410	1 x 1.0			• Overall condition is Very good.
69	Pipe	165+690	1 x 1.0			• Good in condition.
70	Pipe	166+040	1 x 1.0			• Good in condition.
71	Pipe	166+630	1 x 1.0			• Partially buried with soil.
72	Box	166+880	1 x 3.0	3.5	0.4	• Reinforcement Exposed in joints
73	Pipe	167+010	1 x 1.0			• LHS box and RHS pipe were found.
74	Pipe	167+355	2 x 0.9			• Good in condition.
75	Pipe	168+031	1 x 1.0			• Not visible due to vegetation.

Sl. No.	Type of structure	Chainage as per Site	Span arrangement (m)	Vertical clearance (m)	Slab Thickness (m)	Remarks
76	Box	168+228	1 x 3.0	4.5	0.4	<ul style="list-style-type: none"> Stagnation of water.
77	Box	168+528	1 x 3.0	4.5	0.45	<ul style="list-style-type: none"> Water stagnation Honeycombing is observed in side wall.
78	Box	168+783	1 x 3.0	1	0.45	<ul style="list-style-type: none"> Good in condition.
79	Pipe	169+075	2 x 0.9			<ul style="list-style-type: none"> Box provided at LHS Pipe at RHS.
80	Box	170+330	1 x 2.0	3	0.4	<ul style="list-style-type: none"> Domestic Wastage Fully Vegetation growth.
81	Box	170+490	1 x 2.0	3	0.3	<ul style="list-style-type: none"> Good in condition.
82	Box	170+575	1 x 4.4	3	0.4	<ul style="list-style-type: none"> Good in condition.
83	Slab	172+370	1 x 2.8	3.8	0.4	<ul style="list-style-type: none"> Honeycombing is observed. Vegetation growth observed. Reinforcement is exposed on side walls.
84	Slab	172+641	1 x 1.5	1.5	0.25	<ul style="list-style-type: none"> Vegetation growth observed. Honey comb is observed in extended portion.
85	Pipe	172+778	1 x 0.9			<ul style="list-style-type: none"> Water is passing, Encasement Damaged
86	Box	173+292	1 x 2.5			<ul style="list-style-type: none"> Good in condition.
87	Box	173+540	1 x 1.5	3.3	0.3	<ul style="list-style-type: none"> Good in condition.
88	Pipe	173+847	1 x 0.9			<ul style="list-style-type: none"> RHS covered with vegetation.
89	Pipe	174+238	1 x 0.9			<ul style="list-style-type: none"> Buried & fill is presented. Head wall damaged at RHS.
90	Pipe	175+021	1 x 0.9			<ul style="list-style-type: none"> Good in condition.
91	Slab	175+228	1 x 1.85	2.3	0.3	<ul style="list-style-type: none"> LHS is good. Clearing of Vegetation is required
92	Pipe	175+647	1 x 1.0			<ul style="list-style-type: none"> Good in condition.
93	Slab	176+331	1 x 3.0	3	0.25	<ul style="list-style-type: none"> Good in condition.
94	Pipe	176+605	1 x 0.9			<ul style="list-style-type: none"> Good in condition.

Sl. No.	Type of structure	Chainage as per Site	Span arrangement (m)	Vertical clearance (m)	Slab Thickness (m)	Remarks
95	Pipe	177+790	1 x 0.9			<ul style="list-style-type: none"> • Good in condition.
96	Pipe	177+904	1 x 0.9			<ul style="list-style-type: none"> • Half of the pipe is buried at RHS
97	Slab	179+376	1 x 3.0	3	0.3	<ul style="list-style-type: none"> • Good in condition.
98	Slab	179+505	1 x 2.9	2.8	0.3	<ul style="list-style-type: none"> • Good in condition.
99	Slab	180+372	1 x 2.9	2.5	0.3	<ul style="list-style-type: none"> • Good in condition.
100	Pipe	180+864	1 x 0.9			<ul style="list-style-type: none"> • Good in condition.
101	Pipe	181+210	1 x 0.9			<ul style="list-style-type: none"> • Good in condition.
102	Pipe	181+640	1 x 0.9			<ul style="list-style-type: none"> • Good in condition.
103	Slab	181+778	1 x 3.0	3	0.5	<ul style="list-style-type: none"> • Clearing of Vegetation is required
104	Pipe	182+286	3 x 0.9			<ul style="list-style-type: none"> • Good in condition.
105	Box	182+897	1 x 3.0	1.5	0.4	<ul style="list-style-type: none"> • Good in condition.
106	Pipe	183+115	1 x 0.9			<ul style="list-style-type: none"> • Clearing of Vegetation is required
107	Pipe	183+366	1 x 1.0			<ul style="list-style-type: none"> • Good in condition.
108	Pipe	183+623	1 x 0.9			<ul style="list-style-type: none"> • Fair Condition
109	Slab	183+782	1 x 2.0	2.5	0.2	<ul style="list-style-type: none"> • Fair Condition
110	Slab	183+912	1 x 6.0	1.8	0.5	<ul style="list-style-type: none"> • Wing wall joints damaged at LHS. • Clearing of Vegetation is required • RHS Head wall mild Damaged at end.
111	Slab	184+117	1 x 2.0	2.8	0.25	<ul style="list-style-type: none"> • Reinforcement Exposed in side wall. • Wing wall joints damaged. • Honey comb is in side walls. • LHS old, RHS New.
112	Pipe	184+226	2 x 0.9			<ul style="list-style-type: none"> • Good in condition.
113	Pipe	184+983	2 x 0.9			<ul style="list-style-type: none"> • Fully damaged at LHS& reinforcement exposed for pipe.

Sl. No.	Type of structure	Chainage as per Site	Span arrangement (m)	Vertical clearance (m)	Slab Thickness (m)	Remarks
114	Pipe	185+467	1 x 0.9			<ul style="list-style-type: none"> Stagnation water observed.
115	Slab	187+880	1 x 6.0	1.5	0.42	<ul style="list-style-type: none"> Widening at RHS side.
116	Pipe	188+912	1 x 0.9			<ul style="list-style-type: none"> Good in condition.
117	Slab	189+772	1 x 2.0	2.0	0.25	<ul style="list-style-type: none"> Good in condition.
118	Slab	190+201	1 x 3.0	1.2	0.3	<ul style="list-style-type: none"> Cracks are in slab& steel exposed. Wing walls are partially damaged.
119	Slab	190+372	1 x 1.9	1.3	0.3	<ul style="list-style-type: none"> Vegetation growth observed.
120	Slab	191+048	1 x 2.0	2.0	0.2	<ul style="list-style-type: none"> Good in condition.
121	Slab	191+344	1 x 2.0	2.5	0.5	<ul style="list-style-type: none"> Good in condition.
122	Slab	191+913	1 x 2.0	2.5	0.3	<ul style="list-style-type: none"> Good in condition.
123	Slab	192+734	1 x 2.0	2.3	0.3	<ul style="list-style-type: none"> Widened 1.5m at LHS side.
124	Slab	193+045	1 x 3.0	2.8	0.3	<ul style="list-style-type: none"> Good in condition.
125	Pipe	193+756	1 x 0.9			<ul style="list-style-type: none"> Good in condition at LHS. Buried at RHS side.

1.6.3 Drainage and Slope Protection

Lined Covered drains are observed at service road locations along the project corridor.

Median drains at curve locations are in good condition except for few locations where they need cleaning. No major distress is observed on the carriageway on downstream side at median drain locations.

Slope protection in the form of Stone pitching has been provided along the corridor. At few locations improvement is required to keep the slope intact.

1.6.4 Traffic Safety and Road Furniture

Metal beam crash barriers provided along the project road appear to good in entire length except for few locations where it got damaged and the repairing of the damaged crash barrier is in progress.

Pedestrian guard rails installed at Bus Bay locations appears to be in good condition.

Traffic blinkers established along the corridor and street lighting and high mast lighting are all functioning well.

1.6.5 Road User Facilities

There are 34 No's Bus Bays without shelters and 3 No's Truck lay Bys observed along the project corridor.

1.7 REHABILITATION PLANS AND DESIGNS

1.7.1 Pavement Rehabilitation and Strengthening

Based on the following it is concluded that the immediate Overlay is not required for the project Road

- latest pavement condition data indicates that the pavement is in good condition.
- Latest Roughness data indicates the Roughness values are far lower than threshold value of 3000mm/Km
- Latest BBD Data indicates that the Characteristic Deflection values are far lower than the threshold value of 1.2mm

1.7.2 Structural Rehabilitation

All the structure found to be in good condition except little minor distresses and Cleaning of Expansion Joints, cleaning of drainage spouts and Bearings required.

1.8 OPERATION AND MAINTENANCE

1.8.1 Introduction

Looking at the contractual requirements of maintaining project road under specified level of roughness it is felt that roughness is the most important criterion for finalizing the O&M schedule for the project. Accordingly, the methodology adopted by present consultants includes predicting the roughness year by year under the traffic using a well acknowledged HDH-4 model developed for developing countries like India after lot of research by World Bank. The said model is widely prescribed by MORTH and NHAI during the preparation of detailed project reports for several projects in doing economic analysis for the projects. The economic analysis mainly consists of two parts:

1. Predicting the road deterioration and estimating VOC
2. Estimating Benefits

Considering its importance and present use in India, consultants felt prudent to use the first part, i.e. estimating road deterioration and predicting roughness in HDM 4 model to finalize the O&M schedule for the project. This approach is more scientific as it does not assume hypothetical deflection values at 10th and 20th year and includes main criterion of maintaining roughness at 3000mm/Km as per Schedule L.

1.8.2 CA specifications for Major Maintenance

- Schedule L of CA species that Roughness values should not exceed 3000mm/km in a length of Km.
- A renewal coat of bituminous concrete shall be laid every 5 years after initial construction or where the roughness value reaches 3000mm/km whichever is earlier.
- The structural condition of the flexible pavement can be assessed every year by taking Benkelman Beam Deflection (BBD) measurement. Where ever the characteristic deflection exceeds 1.2mm a bituminous over lay shall be provided appropriately designed according to IRC-81 or its latest versions or amendments to it.

1.8.3 Inputs for O&M Schedule

1.8.3.1 Project Sections

Since roughness is the main criterion for major maintenance, Project Corridor has been divided in to various cases depending the present roughness values:

- Case 1: Roughness value <2000 mm/Km
- Case 2: Roughness values >2000<2500 mm/Km
- Case 3: Roughness>2500<3000 mm/Km
- Case 4: Roughness>3000 mm/KM

Direction wise analysis has been done separately for LHS (UP)/RHS (DN) and each direction length has been divided into sections based on above.

1.8.3.2 Traffic (AADT)

The following traffic data supplied by client has been used in the analysis is as below:

Vehicle/Mode	AADT numbers (FY2022) at Ch.156+250
LCV	1,743
Bus	2,244
2A truck	1,575
MAV truck	2,794

Note: 50:50 directional distributions are considered.

1.8.3.3 Vehicle Damage Factors (VDF)

The following VDF Factors used based on Good Industry Practice

Mode Type	LHS Ch.150+250	RHS Ch.150+250
LCV	1.0	1.0
2 Axle Truck	4.5	4.5
3 Axle Truck	6.0	6.0
MAV (4-6 Axle)	8.0	8.0
Buses	1.0	1.0

1.8.3.4 Deflection (BBD) Values & Roughness Values

BBD and Roughness values are used as obtained from surveys and investigations as below:

LHS:	case-1	case-2	case-3	case-4
	<2000	>=2000 and <2500	>=2500 and <3000	>3000
Length	72900	0	0	0
Roughness	1402	0	0	0
IRI	2.04	0.00	0.00	0.00
Deflection	0.270	0.00	0.00	0.00
Cracking	0.05%	0.00%	0.00%	0.00%
Ravelling	2.14%	0.00%	0.00%	0.00%

RHS:	case-1	case-2	case-3	case-4
	<2000	>=2000 and <2500	>=2500 and <3000	>3000
Length	72900	0	0	0
Roughness	1398	0	0	0
IRI	2.04	0.00	0.00	0.00

RHS:	case-1	case-2	case-3	case-4
	<2000	>=2000 and <2500	>=2500 and <3000	>3000
Deflection	0.283	0.00	0.00	0.00
Cracking	0.14%	0.00%	0.00%	0.00%
Ravelling	1.21%	0.00%	0.00%	0.00%

1.8.4 Options for O&M schedule

Based on the requirements of CA, various options have been considered to be used as responsive overlays triggered at specified level of roughness of 3000mm/km. Micro surfacing has also been considered to examine its feasibility for major maintenance.

Following options were considered in the analysis:

Base Case: MCS at Roughness of 3000mm/Km with regular maintenance

Opt-1: Responsive Overlay of 30mm BC whenever roughness is >3000mm/KM with regular maintenance

Opt-2: Responsive Overlay of 40mm BC whenever roughness is >3000mm/KM with regular maintenance

Opt-3: Scheduled Overlay for every 5 years with overlay of 30mm BC

1.8.5 O&M schedule

The Overlay requirement is not there from HDM Model till end of Concession Period; However, looking at the CA provisions i.e., Mandatory overlay in every 5th year from COD during the Concession Period, the following Overlay schedule is considered.

- **30mm BC Overlay, partly in FY 2024 and partly in FY 2025**

1.9 COST

Cost Component for various items and activities have been worked out by considering the Best Industry practice and most appropriate methods. The gist of the cost components considered are presented below

- Immediate Repair's Cost
- Routine Maintenance Cost
 - Routine Maintenance of Road
 - Repair and Replacement of various road items
 - Tolling system and HTMS maintenance AMC cost
 - Incident management
 - Routine Maintenance for Structures
 - Electricity bill of lighting areas near cities, I/C and other areas & Fuel expenditure
- Periodic Maintenance Cost
 - Functional +Structural overlay
 - Overlay on Service Road
 - Major maintenance works for Structures
 - Replacement of Toll Hardware and software & HTMS at later date
- Toll Plaza Operation cost and Highway Patrolling and maintenance supervision staff cost
- Maintenance of utilities and public amenities
- Operation and management costs of rest areas and lay byes
- Safety audit and other inspection costs
- Insurance
- I.C for O&M period
- Grand Total Cost

Table 20: Abstract of Cost Estimates (without escalation):

S. No	FY	Immediate Repair's Cost + Routine and Operational Cost (Rs. Cr.)	Periodic Maintenance Cost (Rs. Cr.)	Total Cost (Rs. Cr)
1	2023	18.21	-	18.21
2	2024	18.21	37.47	55.69
3	2025	18.21	28.48	46.69
4	2026	18.21	-	18.21
5	2027	14.75	1.74	16.49
	Total:	87.59	67.69	155.29

Table 21: Detailed Cost Summary (without escalation)

S. No	FY	Routine Maintenance						Periodic Maintenance			Toll Plaza Operation cost	SPV Cost	Survey Costs	Insurance & Audit charges	IE Fee	Total Recurring cost
		Routine Maintenance	R&R of Road items	Toll and HTMS AMC cost	Incident management	R&R of Structures	Electricity bill of lighting	Functional +Structural overlay MCW+ S/R	Periodic Maintenance of of TMS & HTMS	Structure specified repairs						
1	2023	3.72	2.19	0.51	3.18	0.44	0.76	0.00		-	3.42	2.1	0.17	1.49	0.26	18.21
2	2024	3.72	2.19	0.51	3.18	0.44	0.76	37.47		-	3.42	2.1	0.17	1.49	0.26	55.69
3	2025	3.72	2.19	0.51	3.18	0.44	0.76	27.30		1.18	3.42	2.1	0.17	1.49	0.26	46.69
4	2026	3.72	2.19	0.51	3.18	0.44	0.76	0.00		-	3.42	2.1	0.17	1.49	0.26	18.21
5	2027	3.01	1.77	0.41	2.57	0.36	0.62	1.09	0.65	-	2.77	1.7	0.17	1.20	0.21	16.49
	Total:	17.91	10.52	2.43	15.27	2.14	3.66	65.86	0.65	1.18	16.47	9.95	0.83	7.14	1.27	155.29

Notes:

- The Base Cost Arrived for FY 2023
- All the material rates are Feb 2022 Rates
- All labour rates are taken from Central minimum wages (October'2021 cycle) and 2.5% escalation applied on the same to arrive FY2023 Rates
- All numbers are without any Escalation.
- Overlay thickness of 30mm BC considered in next MM (part length in FY24 and part length in FY 25)
- All the Cost presented in the above table are excluding Head Office (HQ) Expenses

1.10 COS Works Details

The following table presents the Work status of COS works as on Feb 2021.

S.No	Name of Project	NHAI Order Ref. No.	Approved Amount (Rs.)	Current Status (28.02.2021)
1	Installation of SSWIM, MSWIM and Static Weigh Bridge at toll plaza (6 SSWIM, 2 MSWIM and 2 SWB)	NHAI/11013/23/2009/RO Chennai/880 dated 03.03.2016	1.93 Cr.	Completed
2	Construction of 2 nos. toilet blocks near UEPL toll plaza	NHAI/PIU/VPM/SBM/2018/63 Dt.16.01.2018	0.60 Cr.	RHS side completed LHS side local issue
3	Construction, Operation & maintenance of Highway Nest (Mini) near toll plaza	NHAI/PIU/VPM/Highway Nest (Mini)/2018/125 Dt.28.01.2018	0.09 Cr.	Construction of one highway nest completed. Work of second highway nest is pending due to local issues.
4	Temporary Improvements	NHAI/PIU/VPM/Black Spot/2018/168 Dt.03.02.2018	0.36 Cr.	Completed
5	Medium / Interim remedial measures (TN-091-01, 02 & 04, TN-092-03&04, TN-093-01, 02 & 04, TN-096)	11016/NH-45/51/Vol-4/2018/PIU-VPM/1688 Dt.08.11.2018	3.141 Cr.	Completed
6	Permanent Remedial Measures (TN-098 Gingee Junction) Construction of vehicular under pass (VUP)	11016/NH-45/51/Vol-6/2018/PIU-VPM/469 Dt.19.02.2019	32.87 Cr.	Construction of VUP and approaches completed and open to traffic during December 2021
7	Permanent Remedial Measures (TN-091-03 Kooteripattu Junction))	11016/NH-45/52/Vol-1/2018/PIU-VPM/2357 Dt.25.10.2019	28.31 Cr.	Revised cost estimate submitted with SOR 2021-22
8	Permanent Remedial Measures (TN-092-01 Mundiampakkam Medical College Junction)	11016/NH-45/52/Vol-1/2018/PIU-VPM/2358 Dt.25.10.2019	26.62 Cr.	Descope requisition letter submitted to authority
9	Temporary Improvements and High mast lighting	11016/NH-45/12/Vol-1/2018/PIU-VPM/904 Dt.14.05.2020	1.91 Cr.	Completed

1.11 CONCLUSIONS

Foregoing discussions on various elements of project highway, following critical issues pertaining to project need careful attention for acquiring the same:

1. The Total Project length is 72.900 Km. The entire Project is having flexible pavement except at Toll Plaza location and at other two locations of each 50m where provision for ATCC was made.
2. The agreement was signed on 19.04.2006 and the Appointed date was taken on 16.10.2006.
3. The project achieved Provisional Completion Certificates on 23.07.2009 for entire project length with condition to complete the punch list items within 120 days of PCOD. The Commercial Operations started from 23.07.2009
4. the Effective date of Final Completion is 15.01.2010 for entire project length but the FCC was issued on 04.08.2016.
5. The Concession Period for the project is 20 years and as per the CA original Concession Period end date is 15.10.2026. Subsequently the Project got extension of 98 days during construction and 38 days during operation; With this the revised end of Concession is due on 28.02.2027.
6. The project road in general has good pavement condition except for minor surface related distresses such as minor surface cracking at isolated locations.
7. Patching is observed at few locations and the condition of the patch is good and importantly No Pot holes are seen along the project road.
8. There are no major undulations or depressions are observed along the corridor indicating good Subgrade quality.
9. For this project, a Project specific Manual is provided in Schedule-D. the allowable threshold value of roughness is 3000 mm/km as per Schedule-L.
10. Roughness surveys along corridor indicate that the maximum Roughness in LHS Carriageway is 1586 mm/Km and the maximum Roughness in RHS Carriageway is 1632 mm/Km whilst the allowable roughness as per CA is 3000 mm/Km. It can be concluded that, no immediate overlay is required for entire length of the Project Road from Roughness consideration.
11. Benkelman Beam Survey Data indicates that the characteristic deflection in LHS carriageway is the range of 0.311 to 0.693 mm and on RHS carriageway is 0.331 to 0.657 mm whilst the maximum allowable characteristic deflection as per CA is 1.2mm. it can be concluded that the, no immediate overlay is required for entire length from Pavement Deflection consideration.
12. Maintenance requirements stipulates that, the Surface shall not exceed 3000mm/Km during the service life of pavement at any time. A renewal coat of Bituminous concrete shall be laid every 5year after initial Construction or where the Roughness values reaches 3000mm/Km whichever is earlier to bring it to the initial value of 2000mm/Km. There is no mention regarding the minimum Overlay thickness.

13. Amendment was issues to IRC:81-1997 “Guidelines for Strengthening of Flexible Road Pavements, Using Benkelman Beam Deflection Technique” As per this Amendment (No. 1/IRC:81-1997/August, 2014 to IRC:81-1997), from structural considerations, the recommended minimum bituminous overlay thickness is 40 mm, however Clause 7.6 of IRC:81-1997 stipulates that, where structural deficiency is not indicated from deflection values, thin surfacing may be provided to improve the riding quality as required.
14. As per Clause 507.1 of MoRTH, Specifications for Roads and Bridge Works (Fifth Revision), Single layer of 30mm thick Bituminous Concrete (BC) can be laid on previously prepared bituminous bound surface
15. For the next Major maintenance which is due in FY 2024-25, overlay thickness of 30mm BC for Main Carriageway and Service Road is consider in Costing as this is the Renewal Coat Only (Not a Structural Overlay)
16. Concessionaire installed Solar System of capacity 1x60 KW in the recent past.
17. The Project road has One Toll plazas along the project road with rigid pavement. The Condition of the Rigid Pavement is Good
18. The concessionaire is maintaining the project facilities like truck lay byes, Toilets, Water supply, drinking water and power supply as per the agreement clauses and specifications which have been reviewed
19. Construction of Toilet Block under Swatch Bharat Mission is functional at Vikravandi Toll Plaza RHS. Due to local problem, the construction of toilet block in LHS at vikravandi Toll Plaza has been not started
20. Construction of Highway Nest (Mini) is completed and functioning at Vikravandi Toll Plaza RHS. Due to local problem, the construction of Nest (Mini) in LHS at vikravandi Toll Plaza has been not started.
21. Construction of VUP at Black Spot ID TN-98/TN-093-03 (Gingee Junction): Construction of VUP and approaches completed and open to traffic during December 2021.