

1 GENERAL

National Highways Authority of India (NHAI) is engaged in the development of National Highways. As a part of this endeavor, NHAI has decided to upgrade the Rajkot – Bamanbore – Samakhiali section of NH-8A & NH-8B, from Km 182.500 to Km 306.600 of NH 8A and from Km 185.244 to Km 215.600 of NH 8B into 6-lane divided carriageway configuration.

In this regard, NHAI have retained the services of M/s. Aarvee Associates Architects Engineers & Consultants Pvt. Ltd. in Joint venture with M/s. Nag Infrastructure Consulting Engineers Pvt. Ltd. to carry out feasibility cum preliminary design report vide consultancy agreement signed on 07/08/2012 and LOA was issued vide letter No. NHAI /11012/ MEGA / FR / NH-8A&B/09/51 dated 09/08/2012. Accordingly Feasibility Consultant carried out different surveys to study the Feasibility of the Rajkot – Bamanbore – Samakhiali section.

2 PROJECT OBJECTIVE

The primary objectives of the study are to prepare a proposal to retro-fit a six lane cross-section onto the existing 4 lane highway in a manner which ensures:

- Enhanced safety of the traffic, the road users and the people living close to the highway.
- Enhanced operational efficiency of the highway.
- Fulfilment of the access needs of the local population.
- Minimal adverse impact on the road users and the local population due to construction.
- Feasible and constructible options for the project with least cost option.

3 PROJECT CORRIDOR

Project Road is located in the state of Gujarat which is situated in western India. The state is bounded by Rajasthan in the North, Maharashtra in the South, Madhya Pradesh to the East and Arabian sea in the West. The state has an area of 196204 sq.km. with a coast line of 1600 km.

Project stretch starts from Bamanbore and passes through Rajkot, Wanakner, Morbi and ends at Samakhiali.



Fig: Location Map of the Project Road

The project corridor passes through plain terrains. The predominant land use along the project road is industrial and accounts for about 60% of the project road.

4 DEFICEINCIES OF THE PROJECT ROAD

The existing project road is having four lane divided carriageway configuration. The following are some of the deficiencies in existing Project highway.

- The level of service is going to deteriorate in coming years in some of the sections from "B" to "C".
- Congestion and delays in built-up/industrial areas since the local traffic is not segregated from through traffic.
- Inadequate access control.
- Vehicle competing with slow moving vehicle for the pavement space at habitations.
- Deficient riding quality.
- Inadequate provisions for pedestrian crossing
- Horizontal and vertical profiles are sub-standard at few locations.
- Provisions for safety and passenger amenities are inadequate.

5 EXISTING FEATURES OF THE PROJECT ROAD

- Available Row – about 45m and 60m at very few locations on NH-8B
- Major Towns – Wankaner, Morbi and Rajkot
- Major Junctions – 3
- Minor Junctions – 56
- Bypasses – nil
- ROB's & RUB's – 4 and 1
- VUP's & PUP's – 2 & 1
- Major Bridges – 9
- Minor Bridges – 34
- Pipe Culverts – 68
- Box/slab Culverts – 46
- Grade separators – 2
- Toll plazas – 2
- Busbays – 40

6 SURVEYS AND INVESTIGATIONS

The details of surveys including inventory studies and investigations carried out during the preparation of supplementary Inception report are presented below:

- Traffic surveys soon after commencement of services and confirmatory traffic surveys were conducted in November, 2012.
- Investigations of the existing pavement, road inventory and subgrade, evaluation of the existing pavement as well as collection of samples of the existing pavement and their laboratory testing
- Collection of samples from pits adjacent to the existing road and along the proposed alignment
- Identification of borrow areas for different types of pavement and bridge construction material, collection of samples and their analysis
- Inventory and condition surveys for culverts and bridges
- Topographic surveys

7 TRAFFIC SURVEYS AND ANALYSIS

The traffic characteristics on the project road for the base year are essential for formulating improvement programs and in estimating the financial viability of the project. The objectives of the traffic study are:

To study the variation in the intensity of tollable traffic, consultants have analyzed the variation of traffic along the project road. It has been observed that the traffic is varying from 13,000 PCU to 26,000 PCU. The following observations are made from the analysis of survey data for each location along the project stretch.

Average Daily Traffic (ADT) from the volume counts were accounted for the monthly variations (within one year) to obtain the Annual Average Daily Traffic (AADT). Seasonal Variation Factor was applied for passenger traffic and for commercial traffic, based on secondary data interpretation.

Summary of Average Daily Traffic (ADT) – Phase I & Phase II

Vehicle Type		Phase I			Phase II				
		Km. 213.000	Km. 287.000	Km. 194.000 on NH-8B	Km. 213.000	Km. 242.000	Km. 268.000	Km. 287.000	Km. 194.000 on NH-8B
Tollable Traffic (vehicles)		4325	8678	12081	4456	4961	8664	8795	11889
Tollable Traffic (PCU's)		9324	25220	24637	9689	10744	25121	25587	24310
Total Vehicles	Motorized	9330	9115	20419	9944	8831	9949	9238	19883
	Non-Motorized	46	3	16	47	0	0	2	18
	Total Traffic	9376	9118	20435	9991	8831	9949	9240	19901
Total PCUs	Motorized	13089	25658	30235	13705	13500	26003	25990	29684
	Non-Motorized	24	2	10	24	0	0	2	14
	Total Traffic	13113	25660	30245	13729	13500	26003	25992	29698

Summary of Annual Average Daily Traffic (AADT) – Phase I & Phase II

Vehicle Type		Phase I			Phase II				
		Km. 213.000	Km. 287.000	Km. 194.000 on NH-8B	Km. 213.000	Km. 242.000	Km. 268.000	Km. 287.000	Km. 194.000 on NH-8B
Tollable Traffic (vehicles)		4177	8842	12539	4303	4791	8827	8961	12340
Tollable Traffic (PCU's)		8875	25713	25595	9220	10225	25612	26087	25256
Total Vehicles	Motorized	9215	9285	21153	9843	8722	10129	9410	20598
	Non-Motorized	46	3	16	47	0	0	2	18
	Total Traffic	9261	9288	21169	9890	8722	10129	9412	20616
Total PCUs	Motorized	12580	26157	31386	13184	12960	26504	26493	30817
	Non-Motorized	23	2	10	24	0	0	1	14
	Total Traffic	12603	26159	31396	13208	12960	26504	26494	30830

Forecasting the traffic is an important element for planning and design of infrastructure facility, especially when it is proposed to be taken up on a commercial format. The present traffic demand will increase primarily due to the growth in activities in zones in the project influence area earmarked for industrial development besides socio-economic characteristics of the traffic in influencing regions. Estimation of traffic growth rates is further needed for deciding suitable development strategy and assessing the financial viability of the project. As per clause 3.15.2(e) of TOR, growth rate of traffic is considered as five percent.

Traffic Projections of the different sections

Year from	Year To	Car / Jeep	Car / Jeep (YB)	Tata Magic	RTC Bus	Pri. Bus	Sch. Bus	Mini Bus	2 Axle	3 Axle	M Axle	Over sized	LGV/ LCV	Mini LCV	Total tollable traffic numbers
Km. 213.000 on NH-8A															
2012	2013	1713	93	220	47	41	0	19	353	641	700	5	114	232	4178
2017	2018	2186	119	281	60	52	0	24	451	818	893	6	145	296	5332
2022	2023	2790	151	358	77	67	0	31	575	1044	1140	8	186	378	6806
2027	2028	3561	193	457	98	85	0	39	734	1333	1455	10	237	482	8686
2032	2033	4545	247	584	125	109	0	50	937	1701	1857	13	302	616	11085
2037	2038	5801	315	745	159	139	0	64	1195	2171	2370	17	386	786	14148
2042	2043	7403	402	951	203	177	0	82	1526	2770	3025	22	493	1003	18057
Km. 287.000 on NH-8A															
2012	2013	1710	217	22	221	191	0	26	435	2537	2839	0	312	333	8843
2017	2018	2182	277	28	282	244	0	33	555	3238	3623	0	398	425	11286
2022	2023	2785	353	36	360	311	0	42	709	4133	4624	0	508	542	14404
2027	2028	3555	451	46	459	397	0	54	904	5274	5902	0	649	692	18384
2032	2033	4537	576	58	586	507	0	69	1154	6731	7533	0	828	884	23463
2037	2038	5791	735	74	748	647	0	88	1473	8591	9614	0	1057	1128	29946
2042	2043	7391	938	95	955	825	0	112	1880	10965	12270	0	1348	1439	38219
Km. 194.000 on NH-8B															
2012	2013	4733	473	14	626	576	21	236	1204	1696	1166	10	1148	634	12537
2017	2018	6041	604	18	799	735	27	301	1537	2165	1488	13	1465	809	16001
2022	2023	7710	770	23	1020	938	34	384	1961	2763	1899	16	1870	1033	20421
2027	2028	9840	983	29	1301	1197	44	491	2503	3526	2424	21	2387	1318	26064
2032	2033	12558	1255	37	1661	1528	56	626	3195	4500	3094	27	3046	1682	33264
2037	2038	16028	1602	47	2120	1951	71	799	4077	5743	3948	34	3888	2147	42455
2042	2043	20456	2044	61	2706	2489	91	1020	5204	7330	5039	43	4962	2740	54184

CAPACITY TABLES

S. No.	Homogeneous Section	Chainage		TVC Location	PCUs up to construction year		Year attaining 57000 PCUs (6 lane with LOS B)	
		From Km.	To Km.		PCUs	Year	PCUs	Year
1	HS-1	182.500	254.000	213.000	16922	2016	57946	2035
2	HS-2	254.000	306.000	287.000	34551	2016	58098	2024
3	HS-3 (Bamanbore-Rajkot section)	185.000	215.600	194.000	41500	2016	57960	2021

S. No.	Homogeneous Section	Chainage		TVC Location	PCUs up to construction year		Year attaining 115000 PCUs (6 lane with LOS E)	
		From Km.	To Km.		PCUs	Year	PCUs	Year
1	HS-1	182.500	254.000	213.000	16922	2016	-	-
2	HS-2	254.000	306.000	287.000	34551	2016	112591	2036
3	HS-3 (Ahmedabad-Bamanbore section)	120.000	182.500	182.300	43730	2016	117072	2032

8 TOLL PLAZA LOACTIONS

At present there are two existing toll plazas on the project road. Toll rates at Km 213 and Km 287 are fixed as per NH toll policy. The existing toll plaza at Km 287 on NH 8A is not meeting the minimum 60 Km distance with respect to the toll plaza at Km 308 on NH 8A. The list of toll plazas and the distance between them are given in table below.

Existing Toll Plaza Locations

S. No.	Toll Plaza Location	Toll Plaza Limits
1	Km. 213.000 on NH-8A	Km. 183.500 to Km. 254.000
2	Km. 287.000 on NH-8A	Km. 254.000 to Km. 306.000

For optimizing toll revenues, consultants propose relocation of these toll plaza with one evasion toll booth near Morbi bypass. The locations of the said toll plazas are given in table below:

Proposed Toll Plaza Locations

S. No.	Toll Plaza Location	Toll Plaza Limits
1	On Morbi Bypass	Km 215 to Km 280
1A	Evasion Booth	Km215 to Km 260
2	Km 293	Km 280 to Km 341.5
3	Km 214.000 on NH-8B	Km 185.244 to Km 215.600 of NH8B

The locations of proposed toll plaza at Km 270 on NH 8A and the existing toll plaza at Km 308.800 on NH 8A (Beyond project jurisdiction), will not meet the requirement of minimum 60 Km criteria. But, with reference to the revised NH number of 27, there are no toll plazas within the 60 km distance and the toll plaza at Km 308.8 falls on another highway.

S. No.	Toll Plaza Location	Distance between preceding Toll Plaza in km
1	Km 36 on NH 8A	More than 60 (with reference to toll plaza on NH)
2	Km 96 on NH 8A	60.0
3	Km 159.500 on NH 8A	63.5
4	Km 214 on NH 8B/NH 27	24.0
5	Km 156 on NH 8B/ NH 27 outside the project Road – Existing Toll plaza	58.0
6	Km 264 on Morbi Bypass on 8A / NH 27	50.0

9 MATERIAL AND GEOTECHNICAL INVESTIGATIONS

Borrow areas for Sub grade & Embankment Material

Reviews of the Feasibility surveys showed that there are sufficient borrow areas for sub-grade/embankment materials conforming to design CBR of 10% and the same are recommended as source for sub grade material having CBR more than 10%. Samples were collected borrow areas and following tests were conducted viz. Grain size analysis, Atterberg limits, Free Swell Index (FSI), Moisture–density relationship using heavy compaction i.e. Modified Proctor Test and CBR on soaked samples at three energy levels.

Coarse Aggregates

The present project section of NH-8A traverses through the belt of basalt. There are large deposits of basalt closer to the road alignment. Hence there is abundant quantity available for road construction.

Details of quarries and borrow areas found suitable for coarse aggregates, fine aggregates and sand are provided in the materials report.

Cement, Bitumen and Steel

Cement, bitumen and Steel are the manufactured materials. Cement and steel with IS certification are available in Ahmedabad and Bhavnagar, Gandhidham which are close to the project road. Bitumen of penetration grades or VG grades and Crumb Rubber Modified Bitumen - 55 grade and Polymer Modified Bitumen SBS 70 grade are available from IOCL and other refineries in Vadodara.

10 PAVEMENT DESIGN

From the traffic volume counts, the numbers of commercial vehicles were assessed. The Pavement design is done for both flexible and rigid options. The flexible pavement design is done using IRC: 37-2012. The area of toll plaza including the flared portions shall be provided with rigid pavement. Rigid pavement for toll plaza has been designed in accordance with IRC: 58-2011. The flexible pavement composition is given in the table below.

Pavement Composition as per 5% growth Rates

From (Km)	To (Km)	CBR (%)	MSA	Type of Binder	Crust Composition in mm				
					BC	DBM	Base	Sub-base	Total
182.500	243.500	10	30	VG-40	40	95	250	200	585
243.500	306.600	10	110	VG-40	50	115	250	200	615
185.244	215.600	10	90	VG-40	40	115	250	200	605

Service Roads: As per IRC SP: 87-2010, service roads are to be designed for minimum of 10MSA; For existing Road and service roads in this corridor, suitable overlays are proposed and for the new service roads the recommended pavement composition is given in the following tables.

Pavement Composition for Service Roads Except Industrial Corridor

Pavement Composition	Thickness in mm
Bituminous Concrete (BC), mm	40
Dense Bituminous Macadam (DBM), mm	50
Wet Mix Macadam (WMM), mm	250
Granular Sub base (GSB), mm	200

11 UPGRADE PROPOSALS

- It is proposed to widen the existing 4-lane carriageway to 6-lane carriageway in accordance with six lane manual except for deviations stated in Schedule D.
- Based on the Capacity Augmentation existing 4 lane is retained from Km

182.500 to Km 247.8, Wankaner & Morbi bypasses proposed as four lane with six lane structure and from Km 243.500 to Km 306.600 of NH8A and from Km 185.244 to 215.600 of NH8B proposed widening of four lane into six lane.

- Taking into account the available ROW, constraints due to utilities, feasibility of acquiring additional ROW, either symmetric widening or one side widening is proposed.
- Underpasses are proposed at the crossing of project road with other NH, SH and MDR and also within the built-up areas for facilitating unhindered flow of through traffic and also to avoid traffic conflicts and enhance traffic safety.
- Retaining / widening / reconstruction / new construction of CD works are proposed as per the provisions of the six lane manual and based on the condition of the structures.
- Service roads are proposed in built-up areas, underpass locations and also for connecting cross roads with nearest grade separated structure.
- Existing drainage facilities are relocated wherever warranted and new provisions are made as per the site requirements.
- Traffic signs, pavement markings, pedestrian and other miscellaneous provisions are proposed as per manual.
- Bypasses are proposed for the following congested towns since acquiring additional land along the existing alignment would involve many resettlement and rehabilitation issues:
 - Wankaner bypass of length 7.6500 Km.
 - Morbi bypass of length 19.300 Km.

11.1 CROSS SECTIONS

Considering the above upgradation options vis-à-vis the existing alignment, different cross sections for the six lane configuration have been developed and these are provided in the schedules to the bid documents.

11.2 GRADE SEPARATOR AT KM 182.500 NEAR BAMANBORE & 306 NEAR SAMAKHIALI:

The grade separator at Km 182.500 caters to the through traffic from Ahmedabad to Rajkot. The ramps will cater to right turning traffic and the lane widths are adequate to meet the requirement of projected traffic. In view of this, no upgradation is proposed to the grade separator at Bamanbore.

The Grade separator at Km 306 caters the through traffic from Morbi to Palanpur and other parts of Rajasthan. Existing structure is sufficient to cater the traffic and no upgradation is proposed for structure, where as approaches are widening to six lane.

11.3 IMPROVEMENT PROPOSAL FROM KM 182.500 TO KM 204.400

The section from Km. 182.500 (Bamanbore junction) to Km. 204.400 (Wankaner) does not warrant six lane as per capacity augmentation. Existing four lane is retained, proposed overlays on the existing road based on the BBD surveys and no land acquisition is proposed in this section.

11.4 IMPROVEMENT PROPOSAL FROM KM 204.400 TO KM 212.000- WANKANER BYPASS

The section passes through Wankaner village from Km. 205.800 to Km. 209.500. Wankaner is located in Morbi district and is famous for ceramic tiles factories. Lot of traffic congestion is observed junction at Km 208.388 due to presence of industries and local movement to traffic along/across the National Highways No.8A. Village is developed on both sides with a higher concentration on the LHS.

One of the reasons for proposing bypass for the Wankaner village is, there is public demand to provide an underpass at junction at Km 208.388, which is became as an accident prone area. Construction of Underpass to the junction is not possible due to an existing RUB is 160 m away from the junction towards Bamanbore, Major bridge is 385m away from the junction towards Morbi. Considering above all, hence, Four lane bypass is proposed and different alternative were studied and final alignment is proposed on the Right hand side of the existing Road in consultation with NHAI.

11.5 IMPROVEMENT PROPOSAL FROM KM212.000 TO KM 227.800

The section from Km. 212.000 (Wankaner Bypass end) to Km. 227.800 (Morbi Bypass starting) does not warrant six lane as per capacity augmentation. Existing four lane is retained, proposed overlays on the existing road based on the BBD surveys and no land acquisition is proposed in this section.

11.6 IMPROVEMENT PROPOSAL FROM KM227.800 TO KM 243.800 – MORBI BYPASS

The road passes through Morbi village from Km. 235.300 to Km. 238.800. Morbi is situated in the Rajkot district. Industries are scattered all along the corridor

from Km 225.000 to Km 243.000. Congestion of traffic and public is observed due to presence of industries on either side of the village and local traffic generating and terminating in these industries.

This alignment alternative takes off at Km. 227.800 and traverses on the right hand side of the existing alignment and joins at Km. 243.800. It traverses mostly through cultivated and barren fields and has good geometrics. The total length would be around 19.6 Km.

11.7 IMPROVEMENT PROPOSAL FROM KM 272 TO KM 291

This section passes through wild ass sanctuary and Coastal Regulatory Zone. In this section, six-lane cross section is proposed.

11. 8 GRADE SEPARATORS / VUP / PUP

- VUP with an opening of 2×12.5m for two lane, 2×16×5.5 for four lane and 32mX5.5m for six lane have been proposed at major At-grade Intersections.
- In view of the problems being faced in projects under implementation with the standard PUP dimensions of 7X3 m, the consultants proposed to increase the size of PUP to 10m X 4.0m to facilitate passage of local passenger cars including tractors carrying agricultural produce.

11. 9 BUS BAYS WITH SHELTERS

The bus bay locations along the project road has been identified and reviewed with respect to the access from the main carriageway and requirement of passengers. Based on the study, it has been proposed to relocate some of the existing bus stops/shelters and to provide additional number of bus bays near built-up areas.

11.10 TRUCK LAYBYES

Based on the surveys conducted by the consultant, it was seen that there are very few truck lay byes. The consultants therefore proposed new truck lay-byes with facilities for resting, parking, refreshments and communication as per standard layout.

11.11 LIGHTING

Lighting system in proposed in urban stretches/ built up areas, grade separators, underpasses, toll plazas, rest areas and bus bay.

11.12 ROAD FURNITURE

Road markings and road signs standards shall be proposed as per IRC: 35 -1997 and IRC: 67 -2012 respectively. Road and Traffic signs will be proposed at appropriate places as per relevant IRC guidelines to give caution and to inform the traffic (vehicular and pedestrians) for safe and smooth movement and the provision. Normally signs are placed on the left side of the road; in certain cases however these may be placed overhead or on either side of the road depending upon the site condition, for attracting attention of road users.

12 BRIDGES AND STRUCTURES

For major bridges, the type of superstructure observed is PSC continuous girders, PSC continuous slabs / voided slabs, PSC / RCC simply supported girders & RCC simply supported slabs over stone masonry/PCC/RCC plate, circular piers/abutments and open/pile/well foundations.

For most of the minor bridges, the type of superstructure observed is RCC solid slab and for a few, RCC girder slab. Substructures and retaining walls are brick / stone masonry and plain/reinforced cement concrete.

The project highway has in total 3 Road Over Bridges (ROBs) and the type of structure observed PSC girder and RCC slab type with Open foundations.

The project highways has 1 Road Under Bridge (RUB) with steel composite super structure.

Vehicular Underpasses and Pedestrian Underpasses along the project stretch are mostly RCC box type structures, except one trumpet interchange at NH-8A and NH-8B junction with PSC box superstructure. All the underpasses are new structures constructed during four lane widening.

Most of the existing slab culverts are stone masonry arch structures widened with RCC slab on top and PCC/Stone masonry abutments/piers during four laning. Existing Hume pipe culverts are mostly in size range of 0.9m to 1.2m diameter; except, at a few locations 0.5m diameter pipes are present, which are now proposed to be replaced with 1.2m diameter pipes.

12.1 CONDITION OF CULVERTS

The condition of most of the old slab culverts is not good due to distress such as spalling of concrete, exposed and corroded reinforcement. Some of the pipe culverts are partially/fully choked else buried. All distressed culverts are proposed to be dismantled and reconstructed. Reconstruction is proposed with 1.2 diameter pipe in case of pipe culverts and a box structure in case of box/slab culverts.

12.2 CONDITION OF BRIDGES

As already stated, there are total 43 bridges (34 minor bridges and 9 major bridges) along the existing project road. Condition survey of each bridge along the proposed Project stretch is carried out and the recommendations for rehabilitation of bridges are included in the report II(C).

12.3 DESIGN STANDARDS AND CODES OF PRACTICES

The design standards and loading to be considered are generally based on the requirements laid down in the latest editions of IRC and IS codes of practices & standards specifications, and guidelines of Ministry of Road Transport & Highways. Additional technical references would be used wherever the provisions of IRC/IS codes are found inadequate. Following Codes shall be used in the design.

IRC:5-1998

IRC:6-2010

IRC:22-2008

IRC:24-2010

IRC:78-2000

IRC: 83-Part II & Part III

IRC SP: 87-2010

IRC:112-2011

Relevant IS & BS Specifications

The proposal for widening and improvement of the existing bridges, newly proposed bridges and Flyovers and Underpasses are given in following tables.

Widening /improvement proposal for bridges

Type of Structures	Existing (Nos.) 2/3 Lane Equivalent	Widening (Nos.) 2/3 Lane Equivalent	Reconstruction (Nos.) 2/3 Lane Equivalent	Retained (Nos.) 2/3 Lane Equivalent	New Construction (Nos.) 2/3 Lane Equivalent
Major Bridges	9	9	0	0	3
Minor Bridges	34	12	4	18	12

12.4 WIDENING /IMPROVEMENT PROPOSAL FOR UNDERPASSES

Widening of the existing underpasses on outside would involve construction of new Retaining / RE walls, forming new service roads, drains after acquiring the required ROW. In view of the technical problems, and issues of Land acquisition, the consultants propose inside widening at these locations to the extent feasible.

Proper transition is provided in the approaches from full median width to reduced median width.

12.5 NEW STRUCTURES ALONG PROJECT STRETCH

One ROB on Wankaner bypass, 10 Vehicular Underpasses, 6 Pedestrian Underpasses and 36 Bridges are also newly proposed along the project stretch.

13 ENVIRONMENTAL IMPACT ASSESSMENT

The guidelines considered in the preparation of EIA and EMP and the findings of EIA are being brought out in the report of EIA and EMP which is under preparation. The environment and related clearances that are required to be taken for the project are brought out in subsequent sections.

13.1 FOREST CLEARANCE

As per the Government of Gujarat, Gazette Notification, 16th May 1974 Government of Gujarat declared the road side area of roads under PWD of the study districts such as Ahmedabad, Surendranagar, Rajkot and Kachch as protected forests. Hence, in the entire project stretch, the unutilized width of the RoW is falling within the Protected Social Forestry. Since, the said land is required for undertaking the proposed upgradation to six lanes, the Consultant is in the process of compilation of data for preparation of applications for diversion of the said protected forest land for the purpose of road widening.

13.2 WILD ASS SANCTUARY

As per the Government of Gujarat, Gazette Notification, 22nd February 1973, Government of Gujarat declared that it has been decided to constitute the areas of Little Rann of Kachch and the Government waste land surrounding it as "Wild Asses Sanctuary". Accordingly, the project stretch between Km. 272.000 to Km. 291.000 is falling within the Wild Asses Sanctuary area. Hence, the NOC / permission is required from the State Board of Wildlife (SBWL) and National Board of Wildlife (NBWL) for undertaking widening the existing road to six lane standards. At this juncture, the Consultant is in the process of collection of data and preparation of the Wild Ass Sanctuary clearance proposal, which will be

submitted to the Deputy Conservator of Forests, Dhrangadhra division and subsequently to the SBWL, Gujarat and NBWL, New Delhi.

13.3 COASTAL REGULATION ZONE (CRZ) CLEARANCE

As per the CRZ Notification 1991 and subsequent amendments till January 2011, the coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters which are influenced by tidal action (in the landward side) up to 500 meters from the High Tide Line (HTL) and the land between the Low Tide Line (LTL) and the HTL is notified as Coastal Regulation Zone; and imposes with effect from the date of this Notification, the restrictions on the setting up and expansion of industries, operations or processes, etc. in the said Coastal Regulation Zone (CRZ).

The project stretch is passing through creek area approximately from Km. 280.700 to Km. 281.900. As per the Notification, the project stretch is falling under CRZ -I A (e) category which comprises of; **“National parks, marine parks, sanctuaries, reserve forests, wildlife habitats and other protected areas under the provisions of Wild Life (Protection) Act, 1972 (53 of 1972), the Forest (Conservation) Act, 1980 (69 of 1980) or Environment (Protection) Act, 1986 (29 of 1986); including Biosphere Reserves.”**

The procedure for seeking CRZ clearance for the permissible activities of the proposed project will be followed as per the Notification. The Consultant is in the collected the data and prepared Form-1 CRZ map covering 7 Km radius around the project site. The consultants were engaged M/s Anna University which is an MoEF empaneled agency and the CRZ map is prepared through Institute of Remote Sensing, Anna University, Chennai and the same was submitted along with Form-I to PIU, Ahmedabad in the month of December 2013.

13.4 MOEF CLEARANCE

As per guidelines of MOEF in force at the time of award of consultancy services, the project requires Environmental clearance due to various consideration such as project length, width of land to be acquired, presence of forest, Wildlife and CRZ etc. Further, ToR for carrying out the baseline studies need to be submitted to MoEF along with the Feasibility report and also information on the status of applications for containing clearances for Forest, Wildlife and CRZ. After submission of Draft Feasibility Report, we were preparing the ToR for submission to NHAI and it was learnt that MOEF guidelines were being relaxed for highway

projects. The revised guidelines of MoEF were issued in August 2013. Based on the revised guidelines and further confirmed from the environment cell of NHA, Environmental Clearance is not required for this project since the land width to be acquired is not exceeding 45 m along existing alignment and 60 m for bypasses. For projects that do not require environmental clearance, baseline studies are to be carried out in accordance with the Standard ToR of MOEF. Accordingly, baseline studies are commenced on 16.12.2013 and the studies will be completed in three months and the report will be submitted after completing the field studies.

14 COST ESTIMATES

Cost estimation provides vital input to the financial evaluation of the project. The cost estimates have been prepared for the project corridor separately for widening the existing road to Six lane carriageway including strengthening /widening of the existing pavement, strengthening / widening of existing bridge structures, construction of new bridges, rehabilitation and reconstruction / widening of cross drainage structures, longitudinal drains, junction improvements, vehicular underpasses, Pedestrian underpasses, road furniture, bus bays, truck lay bays, way side amenities, toll plazas, etc.

ABSTRACT OF COST ESTIMATE

Abstract of Cost Estimate – NH 27 from Rajkot to Samakhiali	
Item Description	Total cost in Rs.
BILL NO: 1 - SITE CLEARANCE	36,696,141
BILL NO: 2 - EARTHWORKS	1,415,739,029
BILL NO: 3 - SUB-BASE AND BASE COURSES	2,023,071,770
BILL NO: 4 - BITUMINOUS WORKS	5,004,460,149
BILL NO: 5 - CULVERTS	313,642,351
BILL NO: 6 - BRIDGES	1,993,403,424
BILL NO: 6 (A) - REPAIR AND REHABILITATION OF EXISTING BRIDGES	112,897,533
BILL NO: 7 – DRAINAGE AND PROTECTION WORKS	3,439,218,618
BILL NO: 8 – ROAD JUNCTIONS	47,590,757
BILL NO: 9 – TRAFFIC SIGNS, MARKINGS AND APPURTENANCES	215,712,670
BILL NO: 10 – MISCELLANEOUS	675,140,486
BILL NO: 11 A- MAINTENANCE DURING CONSTRUCTION	40,298,267
Total Construction Cost	15,317,871,194
Lump sum provision for physical and price contingencies, interest during construction and other financing costs, pre -construction expenses etc., as per TOR 3.14	4,404,278,888
Total Cost	19,722,150,082
Construction Cost/ Km in Crores	9.80

15 TOLL REVENUE AND FINANCIAL VIABILITY

The total toll revenue that would be collected at all the toll plazas along different sections of the project stretch during the concession period is given in the table below. Toll Revenue calculations are done by considering the amendments of Toll Fee which are December 2013 and January 2014.

Toll Revenue Summary

Toll revenue during construction (Crores/Year) at existing toll plazas			
Year		Bamanbore to Samakhiali (NH27/8A)	
From	To	Km. 213.000	Km. 287.000
2012	2013	19	46
2013	2014	22	50
2014	2015	24	56
2015	2016	26	62
2016	2017	29	68

Toll revenue after construction (Crores/Year) at proposed toll plazas					
Year		Raj to Bbore (NH27/8B)	Bamanbore to Samakhiali (NH27/8A)		
From	To	Km 214	Km 275 on Bypass	Km 260.4 EB	Km 335
2017	2018	42.71	9.79	17.52	91.12
2018	2019	46.54	10.79	19.60	100.62
2019	2020	51.21	11.80	21.30	110.84
2020	2021	57.56	13.04	23.69	122.36
2021	2022	62.31	14.47	25.93	135.65
2022	2023	69.72	15.97	28.69	149.08
2023	2024	76.59	17.57	31.71	165.04
2024	2025	85.07	19.35	35.27	182.50
2025	2026	93.13	21.34	38.45	201.34

Toll revenue after construction (Crores/Year) at proposed toll plazas					
Year		Raj to Bbore (NH27/8B)	Bamanbore to Samakhiali (NH27/8A)		
From	To	Km 214	Km 275 on Bypass	Km 260.4 EB	Km 335
2026	2027	103.69	23.66	42.70	222.59
2027	2028	113.63	26.11	47.09	246.15
2028	2029	126.31	28.90	52.15	272.15
2029	2030	139.01	31.79	57.43	300.49
2030	2031	153.77	35.23	63.63	333.06
2031	2032	170.96	38.89	70.10	366.70
2032	2033	186.94	43.15	78.06	406.28
2033	2034	208.19	47.58	85.97	450.46
2034	2035	229.81	52.62	94.93	497.55
2035	2036	254.69	58.12	105.63	550.38
2036	2037	283.14	64.42	116.60	610.46
2037	2038	312.87	71.25	129.05	674.16
2038	2039	346.30	78.91	142.52	747.69
2039	2040	383.56	87.35	157.80	827.43
2040	2041	424.23	96.76	174.92	916.42
2041	2042	469.33	107.12	193.79	1016.86
2042	2043	523.03	118.56	214.51	1125.15
2043	2044	577.81	131.59	237.34	1247.83

Financial viability has been carried out taking into account the estimated toll revenues and costs. The assumed Debt, equity ratio, provision for interest during construction, maximum grant to be considered etc., required for Financial Modeling confirm to those given in the RFP (Cl. 3.15). Table below shows the summary of financial analysis.

Financial Viability

Section	Location of Toll Plaza	Volume Count Location	Chainage (Km.)			Tolling length	Bypass Length	Structure Length	Civil Cost in Crores	Concession Period (Years)	Option Wise	
			From	To	Length						Grant (%)	Equity IRR (%)

Rajkot- Bamanbore -Samakhiali (NH-8A & 8B)	TP-1@ Km. 213.5	Km 194	185.24 4	215.6 29	30.385	30.39	0	0	1617	Refer below Options		
	TP-2@ Km. 276 On Bypass	Km 322.603	215.6	280.0	64.371	37.17	27.2	0				
	TP-2.1@ Km. 259.8 Evasion Booth	Km 245.602	215.6	260.4	44.800	37	7.8	0				
	TP-3 @ Km. 328.3	Km 322.603	280.0	342.0	61.953	60.75	0	1.2				
	Option-1:	4Lane road from Bamanbore to Morbi bypass end remaining 6Lane.								25	5	15.47
	Option-2:	4Lane road from Bamanbore to Morbi bypass end remaining 6Lane.								20	1	12.13
	Option-3:	Entire 6 Lane except bypasses								25	12	15.26
	Option-4:	Entire 6 Lane except bypasses								25	0	12.36
	Option-5:	Entire 6 Lane except bypasses								20	10	12.37