Chapter-1

EXECUTIVE SUMMARY

1.0 Introduction

The National Highways Authority of India was constituted by an act of Parliament, the National Highways Authority of India Act, 1988. It is responsible for the development, maintenance and management of National Highways entrusted to it and for matters connected or incidental thereto. The Authority was operationalized in Feb 1995.

1.1 General

The Road infrastructure in Jharkhand requires augmentation. Growth of population and vehicles has burdened the existing road network. This needs to be taken care of by means of maintenance, up gradation and construction.

Keeping in view the growing importance of road network in the state is physical, social, economic and environment fabric, the National Highway Authority Of India initiated a comprehensive Detailed Project Study for the above State Highway Accordingly appointed a Design consultant M/s L.N. Malviya Infra Project Pvt. Ltd., Bhopal for providing the required Consultancy Services for Feasibility study and Preparation of Detailed Project Report for improvement and up-gradation of following State Highway of 42.320 Kms.

Table 1.1 Details of Package

Sl. No.	Name of Road	NH No.
1	NH-133 (Section - II - from Km- 51+350 (Proposed Gandhigram, Godda Bypass) to Km- 94+000 (Hansdiha) of NH-133 in state of Jharkhand))	NH-133

1.2 The Project Road

National Highway-133 is one of the oldest highways in India connecting gandhigram (godda) town – Awarantar, Mahuasol, ghat ghorsanda village, parariya, baliya, kurma, beldiha, kumardhih village, kathon village, bhatonda village, bargachhahiriyari village, sugathan village, dipna village -to hansdiha town in the state of Jharkhand.

Table 1.2 Length of Road

Sr. No.	Name of Road	NH no.	Design Chainage (in Km)		Approx. Length (in Km)	Remark
			From (Km.)	To (Km.)		
1	NH-133 (Section - II – from Km-50+490 (Proposed Gandhigram (Godda) Bypass on NH-133) to Km-93+810 (Hansdiha of NH-133) in state of Jharkhand)	NH-133	50+490	93+810	43+320	

The location plan of the project road section is illustrated in Figure 1.1. Summary of the existing features of the project are shown in Table 1.3.

Figure 1.1: Location Plan

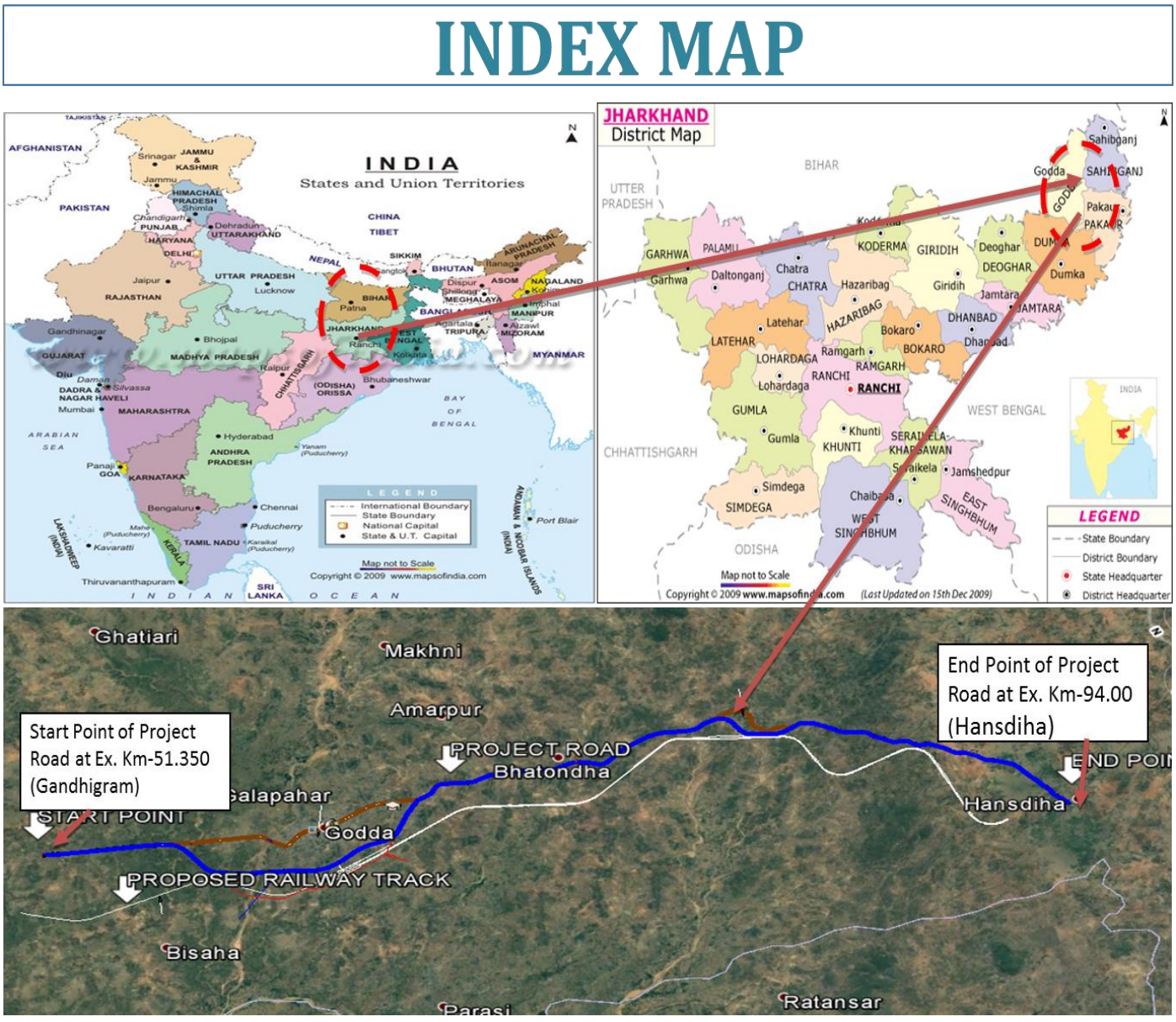

Table 1.3: Existing Detail

S.no.	Particulars	Details	Remarks
1	Start Point	(Gandhigram (Godda) of NH 133) start Existing Ch. 51+350	Gandhigram (Godda) Bypass On Nh-133
2	End Point	(Hansdiha of NH 133) End Existing Ch. 94+000	Hansdiha Town
3	Total Existing Length	42.650 Kms	
4	Districts	2 Nos.	Godda & Dumka
5	Terrain	Plain	
6	Right of Way(m)	The existing Right of Way (ROW) of the project varies from 10-15 meter in Built-up section and 15 - 20 in Open Area along the overall project road	
7	Carriage way	Generally, 2 lanes with Paved Shoulder	
8	Major Bridge	04 Nos.	
9	Minor Bridge	09 Nos.	
10	ROB	0.0 Nos.	
11	HPC Culverts	06 Nos.	
12	RCC Slab/ Box	50 Nos.	
13	Railway Crossings	01 Nos.	
14	Minor Junctions	45 Nos.	
15	Major Junction	04 Nos.	
16	Villages/Towns	58 Nos.	
17	Petrol Pumps	10 No.	

2.0 Socio Economic Profile of the Area

2.1 Project Description

Socio Economic Profile chapter illustrates a brief of the socio – economic profile of the project influenced area (PIA) for NH-133 having a length of 42.650 kms. The road primarily runs in N-E direction and connects districts Hansdiha, Godda, Dumka, Gunghasa Poraiyahat and other important Blocks and Tehsil Headquarters located en- route.

2.1.1 Demographic Profile

The total population of the project influence area is 2, 69,09,428 from Godda District. The literacy rate of Godda, district is having literacy rate of 56.40% over 6 years. Sex ratio is slightly higher in Godda district.

2.1.2 Population Density

The population density is showing an increasing tendency from year 2001 to 2011.

2.1.3 Sex Ratio

The sex ratio has increased in State and Districts from 2001 to 2011.

2.1.4 State income

Jharkhand has several towns and innumerable villages with civic amenities. Urbanization ratio is 24.1% and the per capita annual income is 47718.05 Rupees. Jharkhand also has immense mineral resources: minerals ranging from (ranking in the country within bracket) from iron ore, coal, copper ore, mica, bauxite, Manganese, limestone, china clay, fire clay, graphite, kainite, chromite, asbestos, thorium, sillimanite, uranium (Jaduguda mines, Narwa Pahar) and even gold (Rakha Mines) and silver and several other minerals. Large deposits of coal and iron ore support concentration of industry, in centers like Jamshedpur, Dhanbad Bokaro and Ranchi. Tata Steel, a S&P CNX 500 conglomerate has its corporate office and main plant in Tatanagar, Jharkhand. It reported a gross income of. Rs. 204,910 million for 2005. NTPC will start coal production from its captive mine in state in 2011–12, for which the company will be investing about Rs 1,800 crore.

Over the past decade, the state has witnessed a 25.66% percent growth in population. The population of tribal has, however, decreased over time. This can be attributed to many factors such as rising industrialization, urbanization, low birth rate and high death rate among tribal, immigration of non-tribal communities in the region and emigration of tribal people to other

places.

Literacy rate in Jharkhand has seen upward trend and is 66.41 percent as per 2011 population census. Of that, male literacy stands at 76.84 percent while female literacy is at 55.42 percent.

3.0 Traffic Survey & Analysis

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

- Traffic estimation in terms of volume on various sections.
- Growth factor estimation for traffic forecasting.
- Capacity assessment based on traffic forecasting for next 20 years.
- Pavement and intersection design

Average Daily Traffic On NH-133

Start Date : 20/01/16

Section : Godda To Hansdiha **Location - Km92+500**

Direction : Both ways

DATE	Motorized Traffic											Non-Motorized Traffic					Grand Total
	Passenger Vehicles					Goods Vehicles				Agricultural		Passenger		Goods Vehicles			
	Two Wheeler	Three Wheeler	Car/Jeep	Mini Bus	Bus	Tempo / LCV	Ord. Trucks			Tractor with Trailer	Tractor	Cycle	Cycle Rickshaw	Animal Drawn		Hand Cart	Vehicle (No.)
							2 Axle	3 Axle	M Axle					Animal Drawn	Horse Drawn		
20/1/16 UP	481	46	279	48	95	135	160	365	130	60	1	396	0	1	0	0	**2197**

20/1/16 DN	516	41	256	1	93	240	155	235	125	35	0	495	0	0	0	0	**2192**
21/1/16 UP	536	51	331	7	88	310	260	365	60	45	2	414	0	0	0	0	**2469**
21/1/16 DN	549	36	260	0	91	220	180	470	135	20	0	473	0	0	0	0	**2434**
22/1/16 UP	757	97	301	0	100	225	350	375	10	15	0	231	0	0	0	0	**2461**
22/1/16 DN	711	82	266	1	98	410	540	290	25	20	2	436	0	0	0	0	**2881**
30/1/16 UP	880	69	345	94	34	215	350	415	95	35	2	529	0	0	0	0	**3063**
30/1/16 DN	797	59	325	2	93	200	475	325	15	25	5	383	0	0	0	0	**2704**
31/1/16 UP	719	112	302	0	94	240	330	440	5	30	0	432	0	0	0	0	**2704**
31/1/16 DN	798	69	320	0	88	215	265	265	30	25	0	469	0	0	0	0	**2544**
1/2/16 UP	688	99	271	1	88	405	80	285	120	10	0	569	0	0	0	0	**2616**
1/2/16 DN	675	96	502	1	74	415	260	385	125	20	0	554	0	0	0	0	**3107**

PCU

2/2/16 UP	574	85	201	0	63	322	180	325	235	15	0	509	0	0	0	0	**2509**
2/2/16 DN	602	53	233	0	68	355	190	375	80	40	0	484	0	0	0	0	**2480**
Total Weekly Traffic	**9283**	**995**	**4192**	**155**	**1167**	**3907**	**3775**	**4915**	**1190**	**395**	**12**	**6374**	**0**	**1**	**0**	**0**	**36361**
PCU	**4642**	**498**	**4192**	**233**	**3501**	**5861**	**11325**	**14745**	**5355**	**1778**	**18**	**3187**	**0**	**6**	**0**	**0**	**55339**
Average Daily Traffic	**1326**	**142**	**599**	**22**	**167**	**558**	**539**	**702**	**170**	**56**	**2**	**911**	**0**	**0**	**0**	**0**	**5194**
PCU Factor	0.5	0.5	1.0	1.5	3.0	1.5	3.0	3.0	4.5	4.5	1.5	0.5	2.0	6.0	6.0	3.0	
PCU ADT	**663**	**71**	**599**	**33**	**500**	**837**	**1618**	**2106**	**765**	**254**	**3**	**455**	**0**	**1**	**0**	**0**	7906

7906

3.1 Average Daily Traffic (ADT)

The Average Daily Traffic (ADT) obtained from the volume count surveys for all he locations are given in Table no. 1.4. To study the variation in the intensity of traffic, consultants have analyzed the variation of traffic along the project road. The following observations are made from the analysis for each location along the project stretch.

3.2 Annual Average Daily Traffic (AADT)

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). Due to the absence of monthly traffic data on the study corridor, month-wise fuel sales data is collected from one fuel station on NH-4 for the past one year (from April 2014 to March 2015) to estimate the seasonal factor. The seasonal factor has been calculated for the month June. For car, combined sale of petrol and diesel has been considered as there is petrol based and diesel based cars available in India. For commercial vehicles diesel sale is taken into account based on the assumption that commercial vehicles use only diesel. The seasonal factor is found to be 1.03 for passenger vehicles and 1.04 for commercial vehicles. A month- wise seasonal factor for different types of modes is presented in Table1. 5. Same factors are

Used for all the locations

Table 1.5: Seasonality Factor (SF)

Location	SF for Petrol Vehicles	SF for Diesel Vehicles
Km 92+500	1.03	1.04

The seasonality factors presented above are used to convert Average Daily Traffic (ADT) to Annual Average Daily Traffic (AADT) for various survey locations along the project road. Section-wise AADT thus obtained is shown in Table 1.6, which gives the mode-wise AADT for two survey locations.

Table 1.6: Estimated and Adopted Design MSA

Year	Traffic					Growth Rate (%)					Lane Distribution Factor	Directional Distribution Factor	VDF					Traffic	ESAL (MSA)	
	LCV	2-Axle	3-Axle	MAV	BUS	LCV	2-Axle	3-Axle	MAV	BUS			LCV	2-Axle	3-Axle	MAV	BUS	(CVD)	Yearly	Cumulative
Present Year-2016	558	539	702	170	189	5	5	5	5	5								2158		
Base Year-2018	646	624	813	197	219	5	5	5	5	5	0.75	0.5	1.758	0.845	1.926	27.719	0.234	2499	1.2	**1.2**
Year-2019	678	656	853	207	230	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	2624	1.26	**2.45**
Year-2020	712	688	896	217	241	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	2755	1.32	**3.77**

Year-2021	748	723	941	228	253	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	2893	1.38	**5.15**
Year-2022	785	759	988	239	266	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	3037	1.45	**6.61**
Year-2023	***825***	***797***	***1037***	***251***	***279***	***5***	***5***	***5***	***5***	***5***	***0.75***	***0.5***	***1.758***	***0.85***	***1.93***	***27.72***	***0.2342***	***3189***	***1.53***	***8.13***
Year-2024	866	837	1089	264	293	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	3348	1.6	**9.73**
Year-2025	909	878	1144	277	308	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	3516	1.68	11.42
Year-2026	955	922	1201	291	323	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	3692	1.77	**13.18**
Year-2027	1002	968	1261	305	339	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	3876	1.85	**15.04**
Year-2028	***1052***	***1017***	***1324***	***321***	***356***	***5***	***5***	***5***	***5***	***5***	***0.75***	***0.5***	***1.76***	***0.85***	***1.93***	***27.72***	***0.23***	***4070***	***1.95***	***16.99***
Year-2029	1105	1068	1390	337	374	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	4274	2.04	**19.03**
Year-2030	1160	1121	1460	353	393	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	4487	2.15	**21.18**
Year-2031	1218	1177	1533	371	412	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	4712	2.25	**23.43**
Year-2032	1279	1236	1609	390	433	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	4947	2.37	**25.8**
Year-2033	***1343***	***1298***	***1690***	***409***	***455***	**5**	**5**	**5**	**5**	**5**	***0.75***	***0.5***	***1.76***	***0.85***	***1.93***	***27.72***	***0.23***	***5195***	***2.49***	***28.29***
Year-2034	1410	1363	1774	430	477	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	5454	2.61	**30.9**
Year-2035	1481	1431	1863	451	501	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	5727	2.74	**33.64**
Year-2036	1555	1502	1956	474	526	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	6013	2.88	**36.51**
Year-2037	1633	1578	2054	497	552	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	6314	3.02	**39.54**
Year-2038	***1714***	***1656***	***2157***	***522***	***580***	**5**	**5**	**5**	**5**	**5**	***0.75***	***0.5***	***1.76***	***0.85***	***1.93***	***27.72***	***0.23***	***6630***	***3.17***	***42.71***
Year-2039	1800	1739	2264	548	609	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	6961	3.33	**46.04**
Year-2040	1890	1826	2378	576	640	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	7309	3.5	**49.54**
Year-2041	1985	1918	2497	604	672	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	7675	3.67	**53.21**
Year-2042	2084	2013	2621	635	705	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	8058	3.86	**57.06**
Year-2043	2188	2114	2752	666	740	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	8461	4.05	**61.11**
Year-2044	2297	2220	2890	700	777	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	8884	4.25	**65.36**
Year-2045	2412	2331	3035	735	816	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	9329	4.46	**69.83**
Year-2046	2533	2447	3186	771	857	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	9795	4.69	**74.52**

Year-2047	2660	2570	3346	810	900	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	10285	4.92	**79.44**
Year-2048	2792	2698	3513	851	945	5	5	5	5	5	0.75	0.5	1.758	0.85	1.93	27.72	0.2342	10799	5.17	**84.6**

4.0 Pavement Design:

4.1 Flexible Pavement for Main Carriageway and Cross Road of Junctions:

Flexible pavement design has been carried out for new Construction of widening portion of the main carriageway with 1.5m wide paved shoulder. The pavement for new construction has been designed based on IRC: 37-2012 Guidelines for the Design of Flexible Pavement.

Effective CBR values 8% of Subgrade, and 50 MSA design Traffic is proposed for pavement design and as per IRC: 37-2012 plate-6, following pavement crust has been proposed.

a) Flexible Pavements for Main Carriageway

S. No.	Description	Minimum Crust Composition (for 10 MSA)
1	BC	40 mm
2	DBM	100 mm
3	WMM	250 mm
4	GSB	200 mm
5	Subgrade	500mm
	Total	1090 mm

b) Flexible Pavements for Slip Road

S. No.	Description	Minimum Crust Composition of Flexible Pavement
1	BC	40 mm
2	DBM	60 mm
3	WMM	250 mm
4	GSB	200 mm
5	Subgrade	500mm
	Total	1050 mm

c) Flexible Pavements for Slip Road

S. No.	Description	Minimum Crust Composition of Flexible Pavement
1	PQC M-40	250 mm
2	DLC	150 mm
4	GSB	150 mm
5	Subgrade	500mm
	Total	1050 mm

5. Existing Bridges and Culverts

During bridges and culverts inventory, it was observed that there are 04 nos of major bridge, 19 nos of minor bridge, 01 ROB and 81 nos of slab culverts exists along the corridor. Therefore, a detailed feasibility of the CD-Structures has been prepared based on the hydraulic analysis. The provision of cost is included in estimation for construction of diversion during reconstruction/new construction of CD structures. The summary and proposed improvement for existing bridges and culverts are given bellow in Table 1.10 & 1.11

Table 1.10 Summary of Existing Structure

Type	Major Bridges	Minor Bridges	Pipe Culverts	Vented Causeway	Slab / Box Culverts
Nos.	04	09	06	00	50

Table.1 .11 Summary of Improvement

Improvement proposed	**Type of Structure**						
	Pipe Culvert	Box / Slab Culverts	Minor Bridges	Road over-bridges	Major Bridges	Remarks	Total
new Construction	17	39	7	-	3		**66**
Reconstruction	-	25			-		**25**
Reconstruction +New Construction			4				**4**
Retain + New Construction	-	-	-	-	1		**1**
Retain + Reconstruction			1				**1**
Total	**17**	**64**	**12**	**-**	**4**		**97**

6. Toll Plaza

Existing Chainage (Km.)	**Design Chainage (km)**
77+255 to 77+955	77+460 to 78+160

7. Truck-Lay-bay

Sr. No.	**Existing Chainage (km)**	**Design Chainage (km)**	**Side**	**Remark**
1	76+190	76+400	Both side	

8. Bus-bay with Bus Shelter

Sr. No.	Existing Chainage (km)	Design Chainage (Km)	Side	Remark
1	NA	57+700	Both	(Godda Bypass)
2	73+750	73+950	Both	Dharmudih
3	76+290	76+500	Both	Bhatonda
4	NA	80+700	Both	(Poraiyahat Bypass)
5	91+285	91+100	Both	Baridih
6	93+185	93+000	Both	Hansdiha

9. Realignments& Curve Improvement

Sr. No.	Design Chainages(km)		Length (m)	Remark
	From	To		
1	67300	68700	1400	Curve Improvement
2	69900	70050	150	Curve Improvement
3	70250	71200	950	Curve Improvement
4	72800	73200	400	Curve Improvement
5	83400	83700	300	Curve Improvement
6	85300	85750	450	Curve Improvement
7	86800	87550	750	Curve Improvement
	Total Length		**4400**	**4.40 Kms**

10. Bypasses

Sr. No.	Design Chainages(km)		Design Length (Km)	Remark
	From	To		
1	52+300	66+875	14.575	**Godda Bypass**
2	79+008	82+500	3.492	**Poraiyahat Bypass**
	Total Length		**18.067 Km**	

11. Cost Estimate

NHAI-PIU Sahibganj (Jharkhand)			
Four Laning of Gandhigram (Godda) to Hansdiha Section of NH-133 (PACK-2) from km 50+800 to km 94+000 in the state of Jharkhand			
Four Lane with Paved Shoulder		Length = 43.320 km	
SUMMARY			
S. No.	**Description**	**Amount with Flexible Pavement**	**Amount in Crores**
(1)	**Road Works**		
(i)	Site-Clearance	8,923,403.70	0.892
(ii)	Earthwork, Erosion Control & Drainage	780,778,726.86	78.078
(iii)	Sub-base, Bases (Non-Bituminous) & Shoulders	1,076,232,033.26	107.623
(iv)	Bases & Surface Courses (Bituminous)	1,073,372,138.86	107.337
(v)	Traffic Signs, Markings & Other Appurtenances	162,862,948.27	16.286
(2)	**Cost of Structures2**		
(i)	Major Bridges	596,321,513.12	59.632
(ii)	Minor Bridges	333,114,298.86	33.311
(iii)	Pipe Culverts, Slab Culverts & Box Culverts	315,379,952.53	31.538
(iv)	Cost of Vehicular & Pedestrian Underpass	364,405,822.24	36.441
(v)	Cost of ROB/RUB	226,374,309.62	22.637
(vi)	Cost of Toll Plaza	120,000,000.00	12.000
(vii)	Cost of Truck Lay Byes & Bus Bays & Bus Shelters	84,728,311.76	8.473
(viii)	Cost of RCC drain in Built-up area	190,375,394.39	19.038
(ix)	Junction improvement	218,880,508.74	21.888
(x)	Cost of Service Road	291,971,715.54	29.197
(xi)	Cost of Slip Road	194,938,317.00	19.494
(xii)	Protection Work (Retaining wall/Toe Wall/Pitching etc)	57,395,178.86	5.740
I.	**Cost of Civil Works (Sub Total A)**	**6,096,054,573.58**	**609.605**
II.	Provision for Contingencies @ 2.8% of A	170,689,528.06	17.069

III.	Construction Supervision Charges @2% of Civil cost	121,921,091.47	12.192
IV.	Administrative Charges@1% of Civil cost	60,960,545.74	6.096
V.	Maintenance during DLP @5% of of Civil cost	304,802,728.68	30.480
VI.	Escalation for 24 months (2 Yr) @ 5% per Yr of Civil cost	609,605,457.36	60.961
	Centages	**1,267,979,351.30**	**126.798**
	Total Project Cost	**7,364,033,924.89**	**736.403**
*	Cost of Electrical & Utility Shifting Works	300,000,000.00	30.000
*	Cost of LA Works	2,879,700,000.00	287.970
	Grand Total	**10,543,733,924.89**	**1,054.373**
	Cost per km	350,206,926.25	35.021