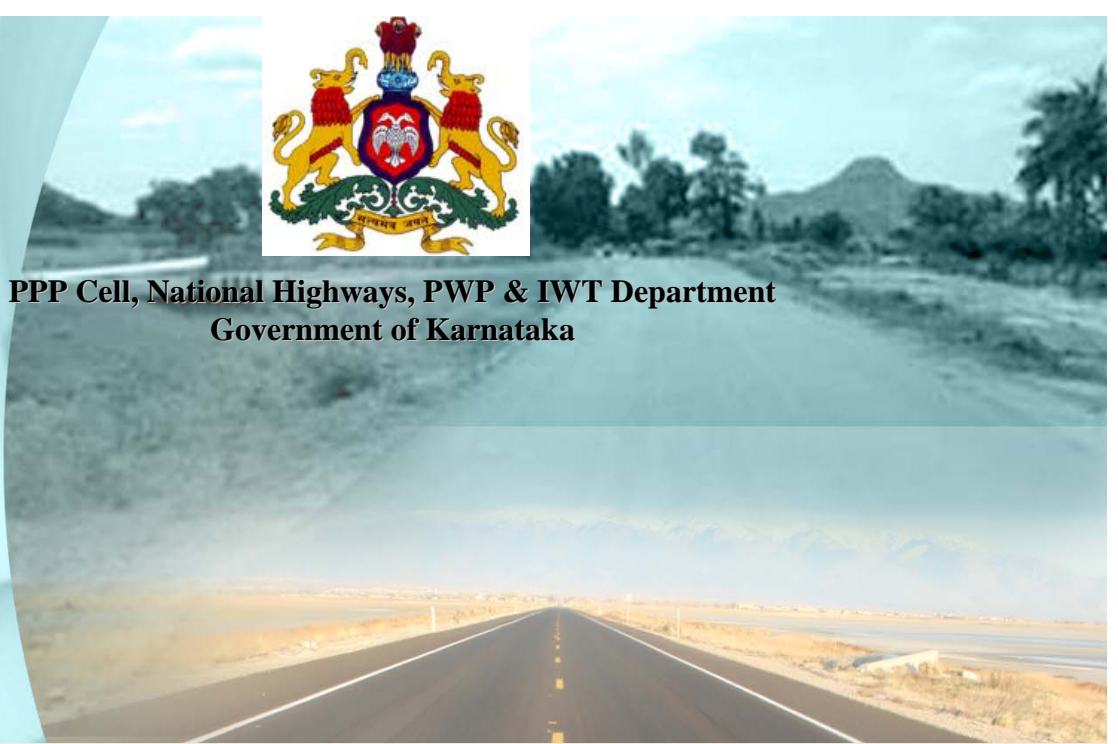


PPP Cell, National Highways, PWP & IWT Department
Government of Karnataka



Rehabilitation and Upgradation to 2 lane/ 2 Lane with Paved Shoulder Configuration of Madhugiri to AP Border Section of NH-234 in the State of Karnataka



SUMMARY OF DRAFT EIA REPORT



 Private Limited
ENGINEERS & PLANNERS
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Summary of EIA

S.1 Introduction

The Environmental Impact Assessment (EIA) Report for the proposed improvements to the Project Road from Bairanahalli to proposed junction at NH 4 at Mulbagal (from existing km 343+800 to km 486+690) has been prepared according to the World Bank Policies as well as the structure of the EIA Report presented in the EIA Notification, 2006 by Ministry of Environment and Forests, Government of India. The EIA is based on detailed field reconnaissance surveys, inventories and available secondary information.

Project stretch forms the part of NH 234 (Mangalore, Karnataka to Thiruvannamalai, Tamil Nadu). The project road runs from west to east between Latitudes of 13°36'5.35" N and 13° 9'28.16"N and Longitudes of 77°19'27.53"E and 78°21'41.29"E, entirely passes through the state of Karnataka. The project road traverses through 3 districts (Tumkur, Chickballapur and Kolar), 7 Taluks and 101 revenue villages. The work would be taken up for upgradation on corridor concept. Therefore, corridors include strengthening in addition to widening to 2 lane / 2 lane with paved shoulder standards in order to have a better facility in a long continuous stretch. Generally the land use along the project stretch is mixed with agricultural, forest, residential and commercial. Summary of Environmental clearances/ permits/ approvals required for the sub-project is presented in **Table S. 1**.

Table S. 1. Environmental Permits / Approvals Required for the Sub-project

Sl. No	Type of Clearance	Statutory Authority
Pre construction stage		
1.	Prior Environmental Clearance under EIA Notification, 2006	Ministry of Environment and Forests (MoEF)
2.	Forest Clearance Under Forest Conservation Act, 1980	Karnataka State Forest Department (KSFD)
3.	Tree felling permission under The Karnataka Forest Produce Transit Rules, 1969 / The Karnataka Preservation of Trees Act, 1976.	Karnataka State Forest Department. (KSFD)
Construction stage (Prior to work initiation)		
4.	CFE (Consent for Establishment) under The Air (Prevention & Control of Pollution) Act, 1981	Karnataka State Pollution Control Board (KSPCB)
5.	CFE (Consent for Establishment) under The Water (Prevention & Control of Pollution) Act, 1974	Karnataka State Pollution Control Board (KSPCB)
6.	Permission to store Hazardous Materials under Hazardous Waste (Management and Handling) Act 1989	Karnataka State Pollution Control Board (KSPCB)
7.	Explosive license under The Explosives Act (& Rules), 1884 (revised in 1983)	Chief Controller of Explosives, petroleum & Explosive Safety Organization

Sl. No	Type of Clearance	Statutory Authority
8.	PUC certificate for vehicles for construction under Central Motor and Vehicle Act 1988	Transport Department, GoK.
9.	Quarry lease deeds and license under The Mines Act, 1958	Department of Mines and Geology, GoK.
10.	NOC for ground water extraction under Section 4 of Environmental (Protection) Act, 1986	Central Ground Water Authority

S.2 Project Description

The project road starts at Bairanahalli at km 343+800 and ends at proposed junction at NH 4 at Mulbagal at km 486+690. Summary of the details of proposed design in terms of its physical features, existing and projected traffic, structures, facilities, amenities, social impact and cost are provided in Table S. 2.

Table S. 2. Summary of Project Activity Details

Sl. No	Description	Quantity	
		Existing	Proposed
1.	Length of the project road (km.)	142.89	139.351
2.	Starting Chainage (km.)	343+800	343+800
3.	Ending Chainage (km.)	486+690	483+151
4.	Speed (kmph)	20-65 kmph	20-100 kmph
5	RoW (m)	9 to 30	12 m RoW - 4.24 km 13 m RoW - 12.66 km 15 m RoW - 106.44 km (minimum) 19 m RoW - 3.25 km (Existing RoW) 21.7m RoW - 1km (Existing RoW)
6	Lane configuration	Intermediate Lane with Earthen Shoulder	Two Lane with Earthen shoulder
7	Pavement type	Flexible	Flexible
8	Number of bypasses & realignments	NA	2 bypasses and 1 realignment
9	Length of bypasses / realignments (km)	NA	9.336
10	Length of existing road bypassed or realigned (km)	14.49	NA
11	Length of existing alignment proposed to be strengthened/ widened (km)	NA	126.747km (Reconstruction from the sub base layer after scarifying the existing BT surface and Widening) 3.268 km (Overlay / Strengthening)
12	Existing traffic (PCUs)	Madhugiri to Gauribidanur – 4572 PCUs Gauribidanur to Chikkaballapur -3036 PCUs Chikkaballapur to Chintamani - 4127 PCUs Chintamani to Mulbagal -1781 PCUs	

		Mulbagal to AP Border- 2289 PCUs			
13	Projected Traffic (PCUs)	Section	Year 1 - 2020	Year 2 - 2030	Year 3 - 2040
		Madhugiri to Gauribidanur	8223	13763	22707
		Gauribidanur to Chikballapur	5432	8768	13762
		Chikballapur to Chintamani	7268	11946	19275
		Chintamani to Mulbagal	3577	6013	9972
		Mulbagal to AP border	4092	6548	10301
Inventory of road structures					
Details of bridges, culverts etc.		Existing	New	Wide-ning	Reconstruc tion.
14.	No. of major bridges	4	1	Nil	Nil
15.	No. of minor bridges	43	5	Nil	16
16.	No. of culverts	233	93	42	126
17.	No. of vehicular underpasses	Nil	Nil	Nil	Nil
18.	No. of vehicular overpasses	1	Nil	Nil	Nil
Details of highway improvements		Existing	Proposed		
19.	No. of major at-grade junctions	23	21		
20.	No. of minor at-grade junctions	275	207		
21.	No. of flyovers	Nil	Nil		
22.	No. of pedestrian/cattle underpasses	Nil	1		
23.	No. of wild animal underpasses	Nil	Nil		
24.	No. of pedestrian foot over bridges	Nil	Nil		
25.	No. of at-grade railway crossings	7	1		
26.	No. of ROB railway crossings	Nil	Nil		
27.	No. of RUB railway crossings	2	4		
28.	Number of viaducts	Nil	Nil		
29.	No. of curves to be improved	NA	67		
30.	No. of junctions with traffic signals	1	Retaining the existing facility		
31.	No. of sign boards proposed	NA	1639		
Other details					
32.	Length of Service road (km)	Nil		Nil	
33.	Length of road with	earthen drain (km) - 228.835		lined drain (km) - 45.617	
		retaining wall (km) - 0		crash barriers (km) - 1.78 km (LHS), 1.76 km (RHS)	
34.	Length of road	requiring cutting (km) - 117.92		requiring filling (km) - 104.801	
		with street lights (km) - 5.296		With footpath (km) – 18.36	
35.	Details of amenities provided	Number of bus bays - 53		Number of truck lay byes – Nil	
		Number of toll plazas – Nil		Number of rest areas - Nil	
36.	No. of buildings to be demolished	Residential - 15		Religious – 38	
		Commercial – 22			
		Resi. & comml. - 5		Others - 8	
37.	Activity under Corporate Social Responsibility (CSR)	Providing water and sanitation facilities for Government schools and hospitals along the project road			
38.	No. of revenue villages	101			
39.	Length of new alignment through: (km)	Agricultural land - 92.49		Forest area - 12.98	

40.	Land Acquisition (ha.)	Total area – 29.73 Ha	Forest land – 1.43 Ha
41.	No. of trees proposed to be cut	1954	
42.	Project cost (Rs. in Crore)	EMP Cost	3.39 Cr
		R&R Cost	11.56 Cr
		Utility Shifting Cost	20.2 Cr
		Civil Cost	439.00 Cr
		Total Cost	474.15 Cr

S.3 Analysis of Alternatives

To avoid traffic through congested areas and its subsequent impacts as well as to reduce the extent of social impact, bypasses are recommended at two locations – bypasses at Gauribidanur and Mulbagal. Realignment at Amithiganahalli was proposed to bring about a geometric correction as well as to avoid two railway crossings. During feasibility study, for each of the bypass locations, three alternatives were considered and evaluated based on engineering, environmental and social viability and techno-financial feasibility and best possible alignment (right side of the bypass location) was finalized. **Table S. 3** gives the summary of recommended bypass / realignment.

Table S. 3. Summary of Proposed Bypass / Realignment

Sl. No	Bypass / Realignment Name	Existing Chainage		Length of Existing Road Bypassed / Realigned (km)	Design Chainage		Length of Bypass / Realignment (km)
		From	To		From	To	
Bypass							
1	Gauribidanur	362+430	369+735	7.305	362+430	368+300	5.87
2	Mulbagal	483+130	488+380	5.25	481+920	483+151	1.231
Total				12.555			7.101
Realignment							
1	Amithiganahalli	429+330	431+440	2.11	427+995	430+230	2.235
Total length of the road increased / decreased							-5.329

S.4 Description of Environment

Collection of the baseline environmental status of the project influence area helps to predict the magnitude of impacts that are likely to be caused due to the proposed improvements of the project road. It also helps to identify critical environmental attributes required to be monitored during and after the proposed developments. In addition to the baseline environmental monitoring, field inspection at all the sensitive locations, collection of secondary information for all the environmental components and discussions with the officials, NGO's and local public were conducted by the Consultants to prepare the baseline environmental profile of the project area.

S.4.1 Land Environment

Land use: The land use along the project stretch is predominantly agricultural, followed by residential and commercial uses. In addition to this, a small portion of the alignment passes through forest land. The major settlement areas found along the project road are Gauribidanur, Chickballapur

Sidlaghatta, Chintamani, Srinivasapur and Mulbagal, which accommodates around 10% of the total project stretch.

Geography and Topography: The project districts belong to semi-arid drought-prone region of Karnataka. The project area occupies the table land of Mysore, bordering the Eastern Ghats. Topographically, the region is having undulating plain with a number of scattered hillocks. Around 95% of the project length passes through plain terrain, the monotony of which is intercepted in between with few short stretches of rolling terrain and hilly terrain. This project road is located at an average altitude of 830 m above mean sea level.

Geology and Mineralogy: The project districts are underlain by the rocks of various geological formations of the archaean and quaternary periods. The region is rich in mineral deposits like graphite, ochre, china clay, iron ore, chromite, manganese and kaolin.

Soil Characteristics: In Tumkur district red loamy soils are predominant. In Chickballapur and Kolar districts, the soil on the elevated ground is red and gravelly, with very often rocks of gneiss or granite, of little cohesion, appearing on its surface. Soil quality of the project area was analysed as the part of baseline environmental monitoring on 12th April 2012. As per the monitoring result, pH of the soil varied from 7.68 to 7.81 there by indicating that soil is neutral in nature. Electrical conductivity in the samples were observed to be ranging from 0.347 to 0.476 mmhos/cm. Nitrogen content of the soil varied from 176 to 212 kg/ha, Phosphorus content of the soil varied from 152.3 to 171.5 kg/ha and potassium content of the soil varied from 23.39 to 40.1 kg/ha

S.4.2 Water Environment

Hydrology: The project road is crossing only one river, Pennar river. It also abutting / crossing 11 lakes, 1 stream and 23 ponds along the road. During the reconnaissance survey, no water was found in these water bodies due to the dry climate.

Drainage Conditions /Issues: In rural areas, drainages are limited to the settlements, while in urban and semi-urban areas, there is extensive use of concrete section of rectangular channel drains, either open or covered. In most cases, there is no kerb or channel at the pavement edge and water runs off directly into the side drains.

Surface and Ground Water Quality: As part of the baseline environmental monitoring programme surface and ground water sampling was done on 20th January 2012. Ground water samples were collected from five locations i.e., Bairanahalli, proposed bypass location at Gauribidanur, near ghat section, Sidhlaghatta and Mulbagal. Monitoring results shows that, the ground water samples at Gauribidanur, Sidhlaghatta and Mulbagal showing a high value of hardness (>300 mg/l as CaCO₃), total dissolved solids (500 mg/l), Chloride (>250 mg/l) and alkalinity (200 mg/l). All samples shows a considerable quantity of Fluoride (1.4 to 1.7 mg/l). Most of the other parameters are within the standards (IS 10500). Surface water samples were collected from three locations; Checkalmadagu dam, near ghat section and near proposed bypass at Mulbagal. Monitoring results shows that all the parameters are within the standards of IS 2296.

S.4.3 Air Environment

Meteorology: Tumkur district experiences summer season from March to May with maximum temperature of 40 or 41° C, where as Chickballapur and Kolar districts experience tropical dry climate throughout the year, with a mean maximum temperature of 39.2°C. December is generally the coldest month of the year in all the three districts with daily minimum temperature going down to 9° C or 10° C in Tumkur district and upto 13°C to 12°C in Chickballapur and Kolar districts. Humidity in all the project districts is high in the south-west monsoon period in November and moderate during the rest of the year. The Tumkur district receives approx. 674.1 mm of average annual rainfall together from south west monsoon and north east monsoon while Chickballapur district and Kolar is mainly dependent on the north-east monsoon and the average annual rainfall is 743.7 mm.

Ambient Air Quality. Air sampling and analysis were conducted during January – April 2012 along the project road at four pre-defined locations such as Bairanahalli, Patrenahalli, Chintamani town and proposed bypass at Mulbagal for the following parameters: Sulphur dioxide (SO₂), Nitrogen Dioxide (NO₂), Carbon Monoxide (CO) and Hydro Carbon (HC), Particulate Matter < 10 micron sized particle (PM₁₀), and Particulate matter < 2.5 micron sized particle (PM_{2.5}). The analysis results shows that the parameters assessed are well within the stipulated CPCB limits for ambient air quality.

S.4.4 Noise Environment

The major source of noise is passing vehicles along the existing national highway. There are no large industrial establishments along the alignment that could be significant source of noise. Noise monitoring conducted along the project road as part of baseline environmental monitoring from 12th to 15th April, 2012 at same locations where the air sampling was conducted. The result shows that, noise levels at all the locations for both day and night time are within the permissible limits.

S.4.5 Biological Environment

Flora and fauna: There are about 1954 trees proposed to be cut for the proposed improvements and most of these including *Melia azadirachta*, *Tamarindus indica*, *Ficus religiosa*, *Ficus glomerata*, *Delonix regia*, *Pongamia pinnata* and *Azadirachta indica* are mostly common to the region. Wild animals like bear and wildboar can be seen in the forest areas of project districts. Among the birds, jungle fowls are common while peacocks are also sometimes seen. However, no wildlife corridors are reported across the project road. No vulnerable, threatened or endangered species of flora and fauna are present along the project road. As per the reconnaissance, it is revealed that the plants and animals found along the project road are common to the region.

Presence of forests: The project road is abutting / crossing five forest areas namely Kurudi reserve forests, Narasihma Devara Betta reserve forest, Alamgiri State Forest, Kallur State Forest and Srinivasapur State Forest, about 10 km on its way. The Forests along the project road are classified as dry deciduous or thorny scrub type with the open forest canopy and the vegetation is more or less xerophytic in nature. Diversion of 1.43 ha of forest land from Narasihma Devara Betta reserve forest is required for the proposed geometrical improvements of the project road. Diversion of forest land is not proposed from other forest areas.

Protected Areas: No protected wildlife areas are situated within 15 km from the project road. .

S.4.6 Socio-Economic and Health Environment

The project road is passing through 101 villages, spread over seven taluks in three districts. In project villages the population varies from 400 to 4000 and in towns it varies from 20000 to 40000. The screening survey and socio economic survey shows that, major occupation of people in the project area is agriculture. In addition, some of the affected families are working as agricultural labourers, while some others are running business.

S.5 Anticipated Environmental Impacts and Mitigation

Measures

S.5.1 Potential Negative Impacts of the Project during Construction Phase

The activities during the construction phase of the project road includes levelling of site, clearing of trees along the alignment, widening of existing road with paved shoulders, construction of culverts and bridges, and quarry operations for the road work. Some of the potential direct and indirect negative impacts of the project during construction phase will be the following.

- Filling in low-laying areas for embankments of the road
- Diversion of forest areas and cutting of trees
- Chances of loss of topsoil due to clearing and grubbing of vegetation for new alignment, borrow area and quarry operation, construction camps and material stacking yard
- Minor impacts on flora and fauna due to the construction activities
- Temporary impact on the drainage pattern due to embankment, culvert and bridge constructions
- Minor impact on traffic management system
- Increased air pollution (including dust) during project road construction
- Increased noise levels due to the movement of vehicles and construction activities
- Chances of soil erosion leading to loss of top soil and pollution of surface water bodies
- Spillage of oils and other hazardous materials may lead to pollution of surface and sub-surface waters depending upon the quality of spillage
- Minor impact on water quality of rivers and canals due to construction of bridges and culverts

S.5.2 Potential Positive Impacts of the Project

The positive impacts of the project are

- Reduction in air pollution along existing road due to reduction in traffic congestion and smooth vehicular movement

- Reduction in air and noise pollution and accidents in built-up areas due to construction of bypasses.
- Reduction in fuel consumption and travel time due to better service level of roads
- Improved safe and efficient connectivity between the project districts.
- Generation of local employment during road construction
- Improvement of local economy and industry due to better infrastructure facilities

S.5.3 Potential Negative Impacts of the Project during Operation Phase

During the operational phase of the project, traffic in the project road and the average speed of vehicles will increase. Some of the potential direct and indirect negative impacts of the project during operation phase are the following.

- Increased noise pollution along existing road and bypasses due to the vehicular movement at higher speed than the present situation
- Decreased air quality along bypasses due to newly introduced vehicular traffic
- Minimum impact on natural drainage pattern of the project area
- Pollution of water bodies and impacts on its ecosystem if hazardous chemical or oil spillage into the canals and streams

S.6 Environmental Monitoring Programme

An Environmental Monitoring Plan as presented in **Table S. 4** is proposed as part of the EMP to evaluate the efficiency of implementation of mitigation measures recommended in the EMP and to facilitate management decisions for the project.

Table S. 4. Environmental Monitoring Plan

Air Quality Monitoring	
Project stage	Construction and operation stages
Parameter	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO and Pb
Sampling Method	High volume air sampler to be located 50 m from the source of pollution in the downwind direction. Method specified by CPCB for analysis shall be followed
Standards	Revised National Ambient Air Quality (NAAQ) Standards set by CPCB
Frequency	Once in every season for three seasons (except monsoon) per year for every year of construction
Duration	Continuous 24 hours / or for 1 full working day
Locations	One monitoring station near each construction related facility namely, hot mix plant, labour camp, staff quarters, borrow location and quarry location, and at sensitive locations along the project road at an average distance of 10 km during construction stage. Monitoring shall be done at each additional construction related facility, if present. At sensitive locations along the project road at an average distance of 10 km during operation stage.
Measures	Wherever air pollution parameters increase above specified standards, additional measures as decided by the engineer shall be adopted
Implementation	Contractor through approved monitoring agencies
Supervision	MoRTH (or) Sub consultants appointed by MoRTH

Water quality Monitoring	
Project stage	Construction stage
Parameter	pH, BOD, COD, TDS, Pb, Oil & Grease, Detergents and Faecal Coliforms for Surface water. pH, TDS, Total hardness, Sulphate, Chloride, Fe, and Pb for groundwater.
Sampling Method	Grab sample collected from source and analysis as per Standard Methods for Examination of water and Waste water
Standards	Indian standards for Inland Surface Water (IS; 2296, 1982) and for Drinking water (IS; 10500,1991)
Frequency	Twice a year (pre monsoon and post monsoon seasons) during the entire construction period
Duration	One-time grab sampling
Location	At major water bodies along the road at an average distance of 20 km
Measures	At locations of increased water pollution towards down stream, all inflow channels shall be checked for pollution loads and channel delivering higher pollution loads shall be terminated from disposal into the water source.
Implementation	Contractor through approved monitoring agencies
Supervision	MoRTH (or) Sub consultants appointed by MoRTH
Noise Level Monitoring	
Project stage	Construction and operation stages
Parameter	Noise level on dB (A) scale
Sampling Method	Measure equivalent noise levels using an integrated noise level meter kept at a distance of 15m from edge of the pavement
Standards	Noise Pollution (Regulation and Control) Rulers, 2000
Frequency	Once in every seasons (except monsoon) for each year of construction
Duration	Reading to be taken at 15 seconds interval for 15 minutes every hour for 24 hours and then average will be taken
Location	Near the hot mix plant and near sensitive locations such as school hospital etc. along the road at an average distance of 10 km during construction stage. Monitoring shall be done at each additional hot mix plant, if present. Near sensitive locations such as school hospital etc. along the road at an average distance of 10 km during operation stage
Measures	Incase of noise levels causing disturbance to the sensitive receptors, management measures as suggested in the EMP shall be carried out.
Implementation	Contractor through approved monitoring agencies
Supervision	MoRTH (or) Sub consultants appointed by MoRTH
Soil Quality Monitoring	
Project stage	Construction
Parameter	Monitoring of Pb, SAR and Oil & Grease
Sampling Method	Sample of soil collected to be acidified and analyzed using absorption spectrophotometer
Standards	Threshold for each contaminant set by IRIS database of USEPA until national standards are promulgated
Frequency	During the pre monsoon and post monsoon seasons in each year for the entire construction period
Duration	One-time grab sampling
Location	At productive agricultural lands abutting traffic detours and traffic diversions and major intersections at an average distance of 20 km along the road.
Measures	At location of increased pollution levels, source shall be identified and shall be diverted from future disposal
Implementation	Contractor through approved monitoring agencies

Supervision	MoRTH (or) Sub consultants appointed by MoRTH
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S.7 Additional Studies

S.7.1 Compliance to Terms of Reference (ToR)

MoEF has finalized the ToR for the project on 17.02.2012. Compliance to the additional ToR by MoEF is provided in **Annexure S.1**.

S.7.2 Public Consultation

Public consultations were conducted at Gauribidanur, Chickballapur, Sidlaghatta, Chintamani, Srinivasapur and Mulbagal. The main issues raised during consultation were the demand for compensation at market rates for land acquisition and demand for a bypass at these locations. With regard to the compensation, it was replied that a compensation on a case by case basis will be fixed the compensation on a case by case basis based on prevailing guidance values. The location of bypasses and re-alignments and the rationale for the same were also explained to the people.

S.7.3 Social Impact Assessment and R&R Action Plan

The Resettlement Action Plan (RAP) document describes the principles and approach to be followed in minimizing and mitigating negative social and economic impacts of the project. The RAP has been developed based on applicable acts / policies viz. National Highways Act-1956, and National Policy on Resettlement and Rehabilitation-2007 (NPRR).

The additional land required for the proposed improvement was estimated to be 29.73 ha, which includes private, govt. and forest land (Forest land approximately 1.43 Ha). Around 174 families would be affected in their livelihood due to this project. Total number of structures to be affected is 88.

R & R budget given below in **Table S. 5** is broadly subdivided into four subsections such as; 1) Assistance for Loss of Land, 2) Assistance for Loss of buildings and Structures 3) Other assistance and 4) RAP Implementation and the total amount adds upto Rs.11.56 crores.

Table S. 5. Final R & R Budget

Cost Head	Amount (INR Cr)
Cost for Land Acquisition	6.22
Value of Private Trees	0.694
Cost for Structures Replacement	0.958
Assistance and Other Implementation Cost	3.688
Total Cost	11.56

S.7.4 Natural Resource Conservation and Optimisation

During the stage of feasibility studies, several options for the design of highways were explored with respect to the alignment, proposed ROW etc. The initial option considered comprised 4 bypasses and 4 realignments with an ROW of 60 m. This necessitated felling of about 6662 trees along the project road and diversion of considerable area of forest-land for the construction of the road. In order to reduce this huge impact on forest flora and land use of the area, it was decided to restrict the proposed

ROW to 15 m. in forest stretches. The numbers of bypasses were also reduced to two and realignment to one. This drastically reduced the number of affected trees to 1954, compared to earlier 6662. Total forest land to be diverted for the proposed project also came down and is estimated to be 1.43 Ha.

S.7.5 Road Safety

Road safety audit refers to systematic checking of the safety aspects of existing highway and traffic management schemes so as to identify the safety problems in the beginning and incorporate the remedial measures / improvements in the highway design. A detailed road safety auditing was conducted for the full length of the project road under study with respect to following major parameters: (i) Identification of deficient locations in terms of poor geometry and land use characteristics (ii) absence of proper marking or signages and (iii) presence of encroachments.

Based on the above audit, following criteria are incorporated in road design: (i) the horizontal geometry of the roadway, design speed, sight distance, super elevation and aesthetics and (ii) the vertical alignment including design of gradient, summit and valley curves based on permissible safe sight distance and permissible gradients. Accordingly, following safety measures are adopted for this project:

- Provision of bypasses at Gauribidannur and Mulbagal where road is passing through dense settlements, realignments at Amithiganahalli where the geometry is very poor.
- Improvement of 21 junctions with better traffic management and safety measures.
- Provision of required traffic signages, road markings, retro reflective road markings, crash barriers, delineator posts and guard stones with reflectors and road studs at appropriate locations.
- Provision of 53 bus bays, proper pedestrian facilities and safety appurtenances like foot paths, zebra crossings and pedestrian guard rails, markers / reflectors on abutting of culverts along busy commercial areas and settlement locations.
- Removal of electric, telephone posts and trees, which are seen adjacent to the carriageway edge, or provision of reflectors and hazard markers using reflective paints etc.

S.8 Project Benefits

All road users will be benefited from the proposed improvement on account of comfort, safety and reduced vehicle operating costs. The project road will give better connectivity for Madhugiri, Gauribidanur, Chickaballapur, Chintamani and Srinivaspur Towns to Bangalore International Air Port through NH 7. This will lead to increase in export of agricultural products like fruits, vegetables and flowers through the airport. Industries coming up along this road due to its proximity to Bangalore City will also find it easy to export their products. Better connectivity to Bangalore City through this road will eventually lead to the growth of the towns along this road as satellite towns of Bangalore. The project road will also act as a bypass of NH 4 for Bangalore City from Sira to Mulbagal. Through traffic from Mumbai and Pune to Tamil Nadu can use this road to bypass Bangalore City. The people traveling from Shimoga, Chickmagalur, Hassan towards Mulbagil and beyond on NH-4 will find the

distance shorter by about 25.0 km and travel time and fuel will be saved as they will not be entering Bangalore city

A significant economic benefit of the improvement project is generation of employment opportunities during the construction activities, which will be available to the people, including affected community. Besides, they will also draw benefits from the economic activities as a result of increased traffic flow and movement of vehicles. In the long term, project road will help in the economic development of the entire region.

S.9 Environmental Management Plan

In order to address the impacts predicted for various project activities, mitigation measures, environmental enhancement measures, monitoring actions and a reporting schedule are suggested in the form of an Environmental Management Plan (EMP). The EMP includes a list of all project related activities and impacts and their mitigation measures at different stages of project, namely, pre-construction phase, construction phase and operation Phase, Environmental monitoring plan and a clear reporting schedule. The EMP sets a time frame to all proposed mitigation and monitoring actions with specific responsibility assigned to the proponents, the contractors and the regulatory agencies.

S.9.1 Block Cost Estimate for EMP

The cost of implementing the mitigation measures and conducting the environmental monitoring as per the Environmental Monitoring Plan works out to **Rs 3.39 Crores** during construction phase. The operational cost of the same is estimated at **Rs 4.80 lakhs per annum** during the first three years and from 4th year onwards the estimated cost per annum is **Rs. 34.84 lakhs**.

Annexure S.1. Compliance Note on Additional ToR given by MoEF

Sl. No	Additional ToR	Action Taken
1	The proposal indicates the acquisition of 0.371 ha protected forest land. Necessary stage – I forestry clearance shall be obtained as per OM dated 31.03.2011 and submitted along with final EIA report.	Application was submitted to Chief Conservator of Forests (CCF), Karnataka State Forest Department on 08.08.2011. Forest area to be diverted was marked on ground through a joint inspection with Forest Officials during March 2012. After the ground survey the forest area to be diverted is 1.43 ha. The process for Forest Clearance is under way.
2	It is indicated that 2330 nos. trees are proposed to be cut, the information should be provided about their species and whether it also involved any protected or endangered species. Necessary green belt shall be provided on both side of the highway with proper central verge and cost provision should be made for regular maintenance.	Girth-wise list of trees to be felled for the project is presented as Annexure 9.2. Species-wise trees list is incorporated in Table 5.11. No. of trees proposed to be cut is finalised to 1954 after the site verification with forest officials. About 5862 trees are to be planted as avenue plantation and its cost is included in the EMP cost.
3	NOC from Archaeological Department shall be obtained since the project is passing within 300 m from Archaeological site.	Since the project avoids the stretches from km 328+450 to km 343+800, where Madhugiri Fort, an archeologically protected monument is situated and currently the project stretch is not coming within the 300m from this site, thus NOC is not required.
4	Submit the details of the road safety audit and plans for meeting the IRC safety requirements.	Road safety study was conducted for project to ensure road safety and it is presented in section 7.4.
5	Examine and submit a brief description of the project, project name, nature, size, its importance to the region/state and the country	Details of the project, project name, nature, size, its importance to the region / state and the country are discussed in section 1.4.
6	The water tank along the project road shall not be disturbed.	All affected water tanks will be rehabilitated in such a way that local public should not be disturbed for daily water use due to project activity. Relocation of these water systems will be carried out in consultation with concerned govt. officials and the owners
7	Any litigation(s) pending against the proposed project and/or any directions or orders passes by any court of law / any statutory authority against the project is to detailed out.	No legislation pending or directions or orders passed by any court of law / any statutory authority against the proposed project.
8	Submit detailed alignment plan, with details such as nature of terrain (plain, rolling, hilly), land use pattern, habitation, cropping pattern, forest area, environmentally sensitive places, mangroves, notified industrial areas, sand dunes, sea, river, lakes, details of villages	Key plan showing the alignment with environmental features is presented in Annexure 2.1.

Sl. No	Additional ToR	Action Taken
	tehsils, districts and states, latitude and longitude for important locations falling on the alignment by employing remote sensing techniques followed by ground truthing and also through secondary data sources.	
9	Describe various alternatives considered, procedures and criteria adopted for selection of the final alternative with reason	Various alternatives considered, procedures and criteria adopted for selection of the final alternative are presented in Chapter 3 – Analysis of Alternatives of this report.
10	Submit Land use map of the study area to a scale of 1:25,000 based on recent satellite imagery delineating the crop lands (both single and double crop), agricultural plantations, fallow lands, waste lands, water bodies, built-up areas, forest area and other surface features such as railway tracks, ports, airports, roads, major industries etc. and submit a detailed ground survey map on 1:2000 scale showing the existing features falling within the right of way namely trees structures including archeological & religious, monuments etc. if any.	Land use map and ground survey map for the project location is presented in Annexure 2.4 and 2.5.
11	If the proposed route is passing through any hilly area, examine and submit the stability of slopes, if the proposed road is to pass through cutting or embankment / control of soil erosion from embankment	Details on stability of slope at hill section along project road are given in section 4.4.7. The project is passing through rolling and plain terrain. As per IRC: 56-2011, embankment slope protection measure are considered in design to avoid the soil erosion.
12	If the proposed route involves tunneling, the details of the tunnel and locations of tunneling with geological structural fraction should be provided. In the case of road passes trough a flood plain of the river, the details of micro drainage, flood passages and information on flood periodicity at least of last 50 yrs in the area should be examined	Since the proposed project does not involves any tunneling, this comment is not applicable.
13	The project is passing through an Elephant Corridor a map duly authenticated by Chief Wildlife Warden showing these features vis-à-vis the project location and the recommendation or comments of the Chief Wildlife Warden thereon should be furnished at the stage of EC. An underpass in Elephant corridor shall be provided.	The project road is not passing through any Elephant Corridor. It is noticed that, this comment has seen in all the ToRs of projects considered in the 108 th EAC meeting of MoEF.
14	Study regarding the Animal bypasses / underpasses etc. across the habitation areas shall be carried out. Adequate cattle passes	A detailed study has been carried out regarding animal and cattle bypass/ underpass. According to this study, one cattle pass is proposed at

Sl. No	Additional ToR	Action Taken
	for the movement of agriculture material shall be provided at the stretches passing through habitation areas.	proposed Gauribidanur bypass (km 364+430). Details are given in Section 2.4.7.2
15	If the proposed route is passing through a city or town, with houses and human habitation on the either side of the road, the necessity for provision of bypasses/diversions/under passes shall be examined and submitted. The proposal should also indicate the location of wayside amenities, which should include petrol station/service centre, rest areas including public conveyance, etc	Bypass for major built up locations are presented in Chapter 3- Analysis of Alternatives. Wayside amenities proposed for the project is given in section 2.4.8.
16	Submit details about measures taken for the pedestrian safety and construction of underpasses and foot-over bridges along with flyovers and interchanges	Road safety study was conducted for project to ensure road safety and it is presented in section 7.4. Details of Pedestrian / cattle underpasses are discussed in the section 2.4.7. No flyover is proposed for this project.
17	Assess whether there is a possibility that the proposed project will adversely affect road traffic in the surrounding areas (e.g. by causing increases in traffic congestion and traffic accidents).	No traffic congestion or traffic accidents are envisaged due to project. Annexure 9.16 presents guidelines for traffic management plan to avoid any such incidents.
18	Clearly indicate/provide details regarding the location, date (along with site photographs with the background of monitoring equipments and/or sample collection in process) and protocol adopted for sampling and analysis of various environmental parameters as a part of the baseline data collection.	Details of protocol adopted for sampling and analysis of various environmental parameters are given section 4.4.3, 4.5.3, 4.6.2 and 4.7.1. Photographs with the background of monitoring equipments and/or sample collection in process are presented in Annexure 4.3. Details of locations selected for monitoring is given in Annexure 4.1 and 4.2. Dates of monitoring done is given the certificates of monitoring agency, is attached as Annexure 4.4, 4.5, 4.6 and 4.7.
19	Examine and submit the details of sand quarry, borrow area and rehabilitation.	Proposed sand quarry, borrow area are presented in Annexure 2.10. Guidelines for quarry and borrow area siting, management and redevelopment plan are presented as Annexure 9.9 and 9.10 respectively.
20	Climate and meteorology (max and min temperature, relative humidity, rainfall, frequency of tropical cyclone and snow fall); the nearest IMD meteorological station from which climatological data have been obtained to be indicated.	Details of climate and meteorology is presented in section 4.6.1
21	The air quality monitoring should be carried out as per the new notification issued on 16th November, 2009.	The air quality monitoring was carried out as per the new notification issued on 16 th November 2009.
22	Identify project activities during construction and operation phases, which	Impact of Noise during construction and operation phase is presented in section 5.6.

Sl. No	Additional ToR	Action Taken
	will affect the noise levels and the potential for increased noise resulting from this project. Discuss the effect of noise levels on near by habitation during the construction and operational phases of the proposed highway. Identify noise reduction measures and traffic management strategies to be deployed for reducing the negative impact if any. Prediction of noise levels should be done by using mathematical modelling at different representative locations.	Prediction of noise level using TNM at sensitive receptor locations is given in section 5.6.1.3. Mitigation measures are given in section 5.6.1.2 and in Table 9.1.
23	Examine the impact during construction activities due to generation of fugitive dust from crusher units, air emissions from hot mix plants and vehicles used for transportation of materials and prediction of impact on ambient air quality using appropriate mathematical model, description of model, input requirement and reference of derivation, distribution of major pollutants and presentation in tabular form for easy interpretation shall be carried out.	Impacts and mitigation measures of air pollution during construction and operation phase is presented in section 5.5.2.1 and 5.5.2.2. Prediction of impact on ambient air quality using CALINE4 during construction and operation phase is presented in section 5.5.2.3.
24	Also examine and submit the details about the protection to existing habitations from dust, noise, odour etc. during construction stage.	Mitigation measures for air and noise pollution at existing habitations is presented in section 5.5 and 5.6 respectively.
25	If the proposed route involves cutting of earth, the details of area to be cut, depth of cut, locations, soil type, volume and quantity of earth and other materials to be removed with location of disposal/ dump site along with necessary permission.	Total volume of earth cutting for the project is presented in section 2.3.2.3.
26	If the proposed route is passing through low lying areas, details of fill materials and initial and final levels after filling above MSL, should be examined and submit.	Total quantity of filling material required for the project is presented in section 2.3.2.4. Tentative borrow area location is presented in Annexure 2.10.
27	Examine and submit the water bodies including the seasonal ones within the corridor of impacts along with their status, volumetric capacity and quality likely impacts on them due to the project.	All the water bodies along the project road are seasonal one. Details water bodies along the project road is presented in Table 4.7
28	Examine and submit details of water quantity required and source of water including water requirement during the construction stage with supporting data and also classification of ground water based on the CGWA classification.	Details of water requirement and source of water supply is presented in Table 2.14.

Sl. No	Additional ToR	Action Taken
29	Examine and submit the details of measures taken during constructions of bridges across river/canal/major or minor drains keeping in view the flooding of the rivers and the life span of the existing bridges. Provision of speed breakers, safety signals, service lanes and foot paths should be examined at appropriate locations through out the proposed road to avoid the accidents.	IRC: 34 -2011 “Recommendations for Road Construction in Areas Affected by Water Logging, Flooding and/or Salts Infestation” is adopted to ensure the drainage pattern. Details on safety signals and road furniture are presented in section 2.4.8. No service road is provided for this project Foot paths are constructed for a length of 41.32 km at major built up locations.
30	If there will be any change in the drainage pattern after the proposed activity, details of changes shall be examined and submitted.	No natural drainages are altered due to road construction. As per IRC: SP: 42-1994 “Guidelines on Road Drainage” is adopted to ensure the drainage pattern.
31	Rain water harvesting pit should be at least 3 - 5 m. above the highest ground water table. Provision shall be made for oil and grease removal from surface runoff.	Rainwater harvesting pits have been proposed at least 3 - 5 m. above the highest ground water table. Schematic diagram of Rainwater harvesting pits, catch drain and oil interceptors are presented in Annexure 9.3 and 9.4 respectively.
32	If there is a possibility that the construction/widening of road will cause impact such as destruction of forest, poaching, reductions in wetland areas, if so, examine the impact and submit details.	Proposed project requires diversion of 1.43 Ha forestland. No wetland area is present along project road
33	Submit the details of road safety, signage, service roads, vehicular under passes, accident prone zone and the mitigation measures.	Road safety study was conducted for project and presented in section 7.4. Details on safety signals and road furniture are presented in sections of 2.4.8, 2.4.9, 2.4.10 and 2.4.11.
34	IRC guidelines shall be followed for widening & up-gradation of road.	List of codes of practices of IRC guidelines followed for environment for the project is presented as Annexure 1.8.
35	Submit details of social impact assessment due to the proposed construction of road.	Social Impact Assessment and Resettlement Action Plan for the project have been prepared as a separate report. Summary of this is presented in section 7.2.3.
36	Examine road design standards, safety equipment specifications and Management System training to ensure that design details take account of safety concerns and submit the traffic management plan.	Guidelines for Traffic Management plan is presented in Annexure 9.16. Report on Road safety study is given in section 7.4. Road safety audit for the proposed project is presented in Annexure 9.5.
37	Accident data and geographic distribution should be reviewed and analyzed to predict and identify trends ? in case of expansion of the existing highway and provide Post accident emergency assistance and medical care to accident victims	Report on Road safety study is given in section 7.4.
38	If the proposed project involves any land reclamation, details to be provided for	Land reclamation is not proposed for the project

Sl. No	Additional ToR	Action Taken
	which activity land to reclaim and the area of land to be reclaimed	
39	Details of the properties, houses, businesses etc. activities likely to be effected by land acquisition and their financial loses annually.	Social Impact Assessment and Resettlement Action Plan for the project have been prepared as a separate report. Summary of the same is presented in section 7.2.3.
40	Detailed R&R plan with data on the existing socio-economic status of the population in the study area and broad plan for resettlement of the displaced population, site for the resettlement colony, alternative livelihood concerns/ employment and rehabilitation of the displaced people, civil and housing amenities being offered, etc and the schedule of the implementation of the project specific.	Social Impact Assessment and Resettlement Action Plan for the project have been prepared as a separate report. Summary of the same is presented in section 7.2.3.
41	Submit details of Corporate Social Responsibility. Necessary provisions should be made in the budget.	Details of Corporate Social Responsibility is presented in Table 2.15 of section 2.9. Block cost for EMP includes the budget for Corporate Social Responsibility, which is presented as Table 9.2 of section 9.3.
42	Estimated cost of the project including environmental monitoring cost and funding agencies, whether governmental or on the basis of BOT etc and provide details of budget provisions (capital & recurring) for the project specific R&R Plan	Details of project cost are presented in section 2.10. Block cost estimation for Environmental Management Plan is presented in Table 9.2 of section 9.3.
43	Submit environmental management and monitoring plan for all phases of the project viz. construction and operation.	Environmental Monitoring plan is given in Table 6.1 of section 6.2. Detailed Environmental Management Plan is presented in Table 9.1 of section 9.2.