EXECUTIVE SUMMARY

0.1 INTRODUCTION

The Government of India (GoI) is aimed at improving the connectivity in border areas under 'Bharatmala' Scheme. For which National Highways Authority of India (herein after referred to as the "Authority" or "NHAI") has been assigned the work of Project Management Consultancy for the selected stretches/corridors of various roads in few states across India. As a part of this endeavour, NHAI has decided to undertake the project namely "Consultancy services for preparation of DPR for development of Economic Corridors, Inter Corridors, Feeder Routes and Coastal Roads to improve the efficiency of freight movement in India",

In order to fulfil the above task, the NHAI has entrusted M/s Aarvee Associates Architects Engineers & Consultants Pvt. Ltd. (herein after referred to as the "Consultant") to provide services for Akkalkot – KN/TS Border greenfield stretch of Maharashtra Bharatmala project. According to new EIA Notification issued on 14th September, 2006 by the MoEF&CC, GoI and amended Notification on 22nd August 2013 on Highway projects, "New, expansion or modernization of any activity falling within categories of developmental and industrial activities shall be undertaken in any part of India only after it has been accorded environmental clearance by the MoEF&CC in accordance with the procedures specified in the Notification". Among categories listed in Schedule of Notification and amendments thereof, the proposed project stretch falls under Category-A of the Schedule. Hence, Environmental Clearance is required for this project. Accordingly, Form-1 was submitted to MoEFCC and obtained the Terms of Reference (ToR), MoEFCC vide file no. 10-70/2020-IA.III, dated January 15, 2021 (**Annexure – 1**). Based on the ToR issued by MoEFCC, the EIA Study has been conducted and detailed in the report.

0.2 PROJECT DESCRIPTION

0.2.1 Location

The proposed project stretch, Akkalkot - KN/TS Border is passing through Solapur district in Maharashtra state and Kalaburagi (Gulbarga), Yadgir and Raichur districts in the state of Karnataka and chosen as one of the important Economic corridor routes of Bharatmala project. The proposed project corridor starts on NH-150 E at Kms 99+800 near Rampur village in Solapur district and ends at Singnodi village or KN/TS Border in Raichur district in Karnataka state. The project corridor is passing through the major settlements like Akkalkot, Aland, Afzalpur, Gulbarga, Jevargi, Shahpur, Wadgera, Devdurga and Raichur etc. Location map of the proposed project stretch is given in Figure 0.1.

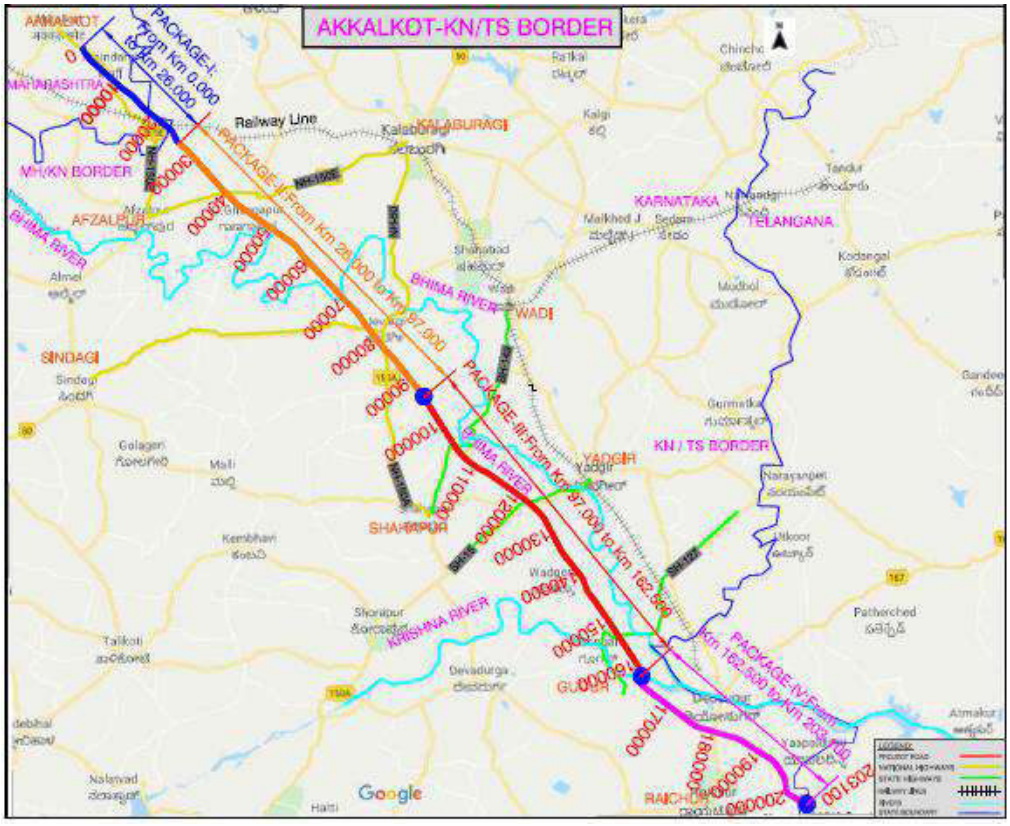

Figure 0.1: Location map of the proposed Akkalkot - KN/TS Border project stretch

0.2.2 Description and Salient Features of the Proposed Project

The design chainage, existing chainage and length of the existing and proposed road stretch are given in Table 0.1. The salient features and the engineering features of the project stretch are given in Table 0.2 and Table 0.3 respectively.

Table 0.1: Details of Proposed Project Stretch

S. No.	Design Chainage (Ch. Km.)		Greenfield/ Realignment Length	Remarks	Tentative Scheme of Widening
	From	To			
1	0.000	203.100	203.100	Akkalkot – KN/TS Border Section	Greenfield Alignment
Total length of the proposed project stretch = 203.100 Km					

Table 0.2: Salient Features of Proposed Project Stretch

S. No	Particulars	Details
1	Location	The project road starts on NH 150 E at Km 99.800 near Rampur village in the state of Maharashtra, and ends at KN/TS Border near Singnodi village in the State of Karnataka. The corridor traverses through the districts of Solapur in Maharashtra, Kalaburagi (Gulbarga), Yadgir and Raichur in Karnataka.
2	Latitude and longitude	17°30'31.02"N, 76°13'38.21"E (near Rampur) to 16°12'11.12"N, 77°30'1.12"E (near Singoli)
3	Elevation above mean sea level	360m-620 m
4	Terrain	Plain Terrain 98%, Rolling Terrain 2%
5	Major settlements along the proposed project stretch	Akkalkot, Aland, Afzalpur, Kalaburagi, Jevargi, Shahpur, Wadgera, Devdurga and Raichur etc.
6	Nearest National Highways	NH-548B, NH-150 E, NH-50, NH-52, NH-150, NH-150A & NH-167
7	Nearest railway stations	Nearest Railway Stations for proposed project Corridor are furnished here under: Gulbarga-43 Kms Yadgir-13 Kms Raichur-20Kms Wadi Junction – 40 Kms Solapur-42 Kms
8	Nearest Airports	Nearest Airports for proposed project Corridor are furnished here under: Gulbarga-55 Kms Solapur – 45 Kms Hyderabad-210Kms Pune – 301 Kms
9	Nearest cities	Nearest Cities for proposed project Corridor are furnished here under: Gulbarga-40 Kms Yadgir-11 Kms Raichur-18Kms Solapur-39 Kms
10	Rivers/streams	Bori, Bheema and Krishna Rivers Crossing the alignment at different locations
11	Hills/valleys	--
12	Reserved forests/protected forest	--

S. No	Particulars	Details
13	National parks/wildlife sanctuary /core biosphere reserve	--
14	Archaeologically important places	Korangi Hanuman Temple near Gulbarga-43 Kms from Stretch, Gulbarga Fort – 48 Kms from stretch & built in 12th Century Sharana Basaveswara Temple-53 Kms from stretch & built in 12th Century Saat Gumbaz (this is a series of seven tombs of Bahmani military leaders built side-by-side in Gulbarga)-52 kms from stretch Venkateswara Temple with Devanagari Lipi Inscription in Richur-28 kms from stretch Sangameswar&Muralidhar Temple in Solapur-78 Kms from akkalkot starting point
15	List of major industries	KPCL Raichur Thermal Power Station ACC Cements pvt. ltd in Wadi, JP Cements in Shahabad, NSL Sugars in Aland,

Table 0.3: Engineering features of the project stretch

S. No.	Parameters		Existing	Proposed
1	Right of Way (m)		-	60
2	Design speed (km/hr)		-	100
3	Bridges	Major Bridge	-	9
		Minor Bridge	-	65
4	Railway Over Bridge (ROB)		-	3
5	Railway Under Bridge (RUB)		-	-
6	No. of culverts	Box/slab	-	290
		Pipe	-	
7	Causeways		-	-
8	LVUPs/SVUPs		-	15/57
9	Vehicular underpasses/ overpasses		-	5/0
10	Gradeseparated Intersections		-	8
11	Toll Plazas		-	10
12	Rest Areas		-	4
13	Mini Nest Area		-	1
14	Bypasses		-	1 (203.1 kms)
15	Realignments/geometrical improvements		-	-
16	Total number of trees affected		-	4500 no's

S. No.	Parameters	Existing	Proposed
1	Right of Way (m)	-	60
17	Avenue & Median plantation proposed (Avenue=199600 & Median = 133200)	3,32,800 Nos.	
18	Land to be acquired (hectares)	1980	
19	Solid waste generated from the workers camp (kg/day)	1000 Kg/Day (Considering solid waste generation of 0.5 Kg/day/person x 2000 nos.)	
20	Project cost including GST (in crore)	4621.43 (4 Packages)	

0.2.3 Details of salient features along the project stretch

The study has been conducted to know about proposed amenities along the project stretch. The chainage wise details of junctions, settlements, cross drainage structures, ROBs/RUBs etc., have been recorded.

- ***Built-up Areas:*** The existing project stretch is passing through outskirts of many towns and villages viz., Akkalkot, Jewargi, Wadgera, Baswanthpur, Bevinbenchi, Chiksugur and Chandrabanda etc.
- **At grade intersections:** Along the green field corridor, several access roads from adjacent towns/villages lead to the proposed road, which may necessitate provision of grade separated intersections. There are 10 major and a few minor intersections along the project corridor.
- **Cross Drainage Structures:** There are no existing cross drainage structures observed all along the project corridor. During the reconnaissance survey it was observed that the proposed alignment crosses river Bori, Bhima and Krishna at Km 1.800, Km 70.500 and Km 161.500.
- **Railway Crossings:** The alignment of the project corridor crosses the existing railway lines at three locations. The list of railway line crossings are given in Table 0.4.

Table 0.4: List of proposed Railway line crossings

S.No	Chainage (Km)	Railway Line	Main Line
1	23.900	Solapur-Kalaburagi	Mumbai-Secunderabad
2	180.300	Yadgir - Raichur	Mumbai - Chennai
3	197.000	Raichur-Gadwal	Mumbai-Secunderabad

0.2.4 Traffic Analysis

Traffic projections are important in order to assess the amount of vehicles running on the road in the future. It helps to estimate air and noise pollution in the nearby areas. The project corridor is having tolling facility and projection of traffic is important for assessing the toll revenue that could accrue in the coming years. The traffic growth is influenced by several factors such as state economy, agricultural production, industrial production etc. The traffic projection summary has been given in chapter 2.

0.2.5 Cost of The Project

Estimated cost for the construction of the proposed project stretch is around **Rs. 4621.43 crores (4 Packages).**

0.3 Approach and Methodology

The approach to carry out site specific EIA study is organized in four tasks and is based on the field investigations and reconnaissance surveys in the project area, collection, collation and analysis of secondary data and discussions with key stakeholders on the potential impacts of the project. Information on various environmental components are collected through survey-oriented screening, collection of data using questionnaire, monitoring of air, noise, water and soil quality and collection of secondary data.

The screening exercise along the existing road pinpointed the environmental constraints. The hot spots identified during the screening exercise are further assessed for their criticality and impacts jointly by teams of environmental specialist, social impact specialist, design engineers and surveyors. The proposed project stretch has been examined in detail for any direct or indirect impact on environmental characteristics during EIA report preparation. Mitigation measures have been included in road design to minimize the adverse effects of proposed greenfield highway project from Akkalkot to KN/TS Border.

0.4 ENVIRONMENTAL REGULATORY FRAMEWORK

The proposed greenfield highway development project is attracting various National, State, and World Bank environmental laws, rules and regulations. These regulations and rules are helpful in impact mitigation and improvement of environment. The environmental impact assessment study was carried out as per the requirement of the National/State/World Bank environmental guidelines. The applicability of various regulatory norms is given in Chapter 4.

0.5 Analysis of Alternatives

The purpose of this chapter is to identify an environmentally feasible alignment for NH. The assessment of alternative alignment for the proposed highway is very challenging task due to presence of towns, villages, water bodies, homestead, agriculture lands, non-agriculture areas, built-up areas, tin sheds etc. In order to choose the best alignment, various alternatives are analysed using Environmental Impact Assessment Decision Support System (EIADSS). The outcome of the EIADSS analysis is explained in detail in Chapter 5.

0.6 BASE LINE STATUS OF PROJECT SITE

This chapter provides an overall description of the existing environmental status within the study region. The primary baseline data within the RoW as well as the area falling within 500 m on the either side of the RoW with the help of the NABL Approved Laboratories M/s. Vison Labs, Hyderabad (Certificate No. TC-5064, Valid until 25.11.2021) from December 2020 to February 2021. The secondary data was collected within 10 km radius of the project area. The site and its environs were analysed during the field study to know the pre-existing status of the study area and the same is described below.

0.6.1 Site and its environs

The reconnaissance survey and subsequent field studies were carried out in the study area which falls in Solapur district in Maharashtra state and Gulbarga (Kalaburagi), Yadgir and Raichur districts of Karnataka state. Major aspects emphasized with respect to the geography, topography, soil, climate, drainage, demography etc., of the region were collected and analysed. The details of the same are given in Chapter-6.

0.6.2 Air Environment

After a preliminary reconnaissance of the study region and taking into account the meteorological, topographic conditions, major settlements & its traffic volume and details on existing industrial activities in the study region, one (01) micro-meteorological station and six (06) ambient air quality monitoring stations were identified in the study area spread along Akkalkot to KN/TS Border. Ambient air quality of the project corridor was assessed by collecting air data for 24 hours twice in a week from December 2020 to February 2021 as per national guidelines.

- **Meteorological Parameters**

  Temperature: *The m*ean temperature of the area is 15.5ºC minimum and 40.1ºC maximum. During winter, temperature varies between 15.5ºC and 34.0ºC, in summer 21.6ºC and 40.1ºC, and in autumn (post-monsoon) 17.9ºC and 32.5ºC.

Relative Humidity: The yearly mean humidity of the area is varying from 22 – 82%. Variation in RH from 25 to 58% during winter to 22 to 56% during summer and in autumn 38% to 68%.

Wind Speed: Wind speed normally is in the range of 7.6 to 11.3 Km/hr in the project area and wind speed range was high during May, June, July and August due to frequent dust storms

Wind Direction: As per IMD data, the predominant wind direction is towards NE, W, NW. The Windrose Diagrams, Solapur (1981-2010) is presented in Figure 0.2.

Rainfall: The rainfall in this region, in general increases from the south-west towards the north east. The maximum annual rainfall is received during the south-west monsoon season. July & August are being the peak rainy months.

- **Ambient Air Quality Monitoring Stations**

Five (06) ambient air quality monitoring stations were identified & installed in Akkalkot - KN/TS Border project corridor. The criteria followed for the selection of air quality monitoring station is recommended by IS: 5182 and CPCB.

- **Analysis of Ambient Air Quality Data**

Ambient air quality was monitored for the presence of contaminants existing in air i.e., Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter (PM_{10} & $PM_{2.5}$) and Carbon Monoxide (CO).

Respirable Suspended Particle (PM10): PM_{10} values were observed in the range of 33.6-83.2 µg/m^3 as against the CPCB standard of 100 µg/m^3 for residential / industrial / rural. The maximum value was recorded at Akkalkot (AAQ 6) and minimum value at Banderwad (AAQ 4).

Fine Suspended Particle (PM2.5): $PM_{2.5}$ values were found in the range of 16.9-33.8 µg/m^3 as against the CPCB standard of 60 µg/m^3 for residential/industrial/rural. The maximum value was recorded at Akkalkot (AAQ 6) and minimum value at Banderwad (AAQ 4).

Sulphur Dioxide (SO2): **SO_2** values were observed in the range of 4.1-10.6 µg/m^3 as against the CPCB standard of 80 µg/m^3 for residential/industrial/rural. The maximum value was recorded at Akkalkot (AAQ 6) and minimum values at Sirwal (AAQ 2) and Dudhani (AAQ 5).

Nitrogen Dioxide (NO2): **NO_2** values were observed in the range of 8.8-22.8 µg/m^3 as against the CPCB standard of 80 µg/m^3 for residential/industrial/rural.

The maximum value was recorded at Akkalkot (AAQ 6) and minimum value at Sirwal (AAQ 2).

Carbon Monoxide (CO): CO levels were observed below 1.0 mg/m^3 all monitoring stations as against the CPCB standard of 4 mg/m^3 for residential/industrial/rural/areas other than ecologically sensitive areas.

As a whole, gaseous pollutant concentrations at all monitoring locations are well below the National Ambient Air Quality standards for the study period. In general, the ambient air quality of the study region is satisfactory.

0.6.3 Noise Environment

Keeping in view of the proposed improvement and widening project, field monitoring was carried out at twenty-five (25) noise monitoring locations. The locations were selected based on land use pattern, traffic intersections and diversions along the existing alignment.

Analysis of Noise Data:

The daytime noise levels were observed to be in the range of 49.5 –60.5 dB (A). Maximum noise level of 60.5 dB(A) was observed near to Chowdapur (NQ 19) and minimum level of 49.5 dB(A) was observed Near to Srirangapatnam – Jevargi Road, NH/SH -19 (NQ 14). The night time noise levels were observed to be in the range of 36.7 – 45.1 dB(A). Maximum noise level of 45.1 dB(A) was observed at junction on NH 34 – near to Bhognalli-Sindhoor Road (NQ 20) and minimum level of 36.7 dB(A) was observed near to Srirangapatna – Jevargi Road, NH/SH -19 (NQ 14).

0.6.4 Water Environment

Assessment of water quality in the study area includes.

- Surface Water Quality (IS: 2296)
- Ground Water Quality (IS: 10500)

Surface Water Quality

During the preliminary assessment, nine (09) surface water sampling locations were identified and samples were collected for assessing the water quality for physico-chemical and biological parameters.

- pH values are varying between 7.42 to 7.98 which are well within the Class C limits of 6.5-8.5 in all surface water samples.
- Colour of water is varying between 10 – 100 Hazen units, which is well below the Class C limit of 300 Hazen.
- Total Hardness (TH) values are varying between 120-390 mg/L.

- Total Dissolved Solids (TDS) concentrations are varying from 302 mg/L to 1064 mg/L which are well below the Class C limit concentration of 1500 mg/L.
- BOD concentrations are varying from <1.0 mg/L to 6 mg/L. Higher BOD values may be due to the intrusion of domestic waste water into the surface water body.

Concentrations of trace metals like Fe, Zn, As, Cr, Cd etc., are found to be well below the Class C limits. Overall, surface water quality is found to be satisfactory.

Ground Water Quality

For assessing the ground water quality in the study area, eight (08) sampling locations were identified (bore wells/dug wells). Ground water samples collected from various sources were analysed for physico-chemical and biological parameters. The results are compared with BIS: 10500 Drinking Water Standards. The brief description of analysis is given below:

- pH values are varying between 7.1 to 8.0 which are well within the desirable limit of 6.5-8.5.
- Odour of all samples are found to be un-objectionable.
- Colour of all samples are less than 1 Hazen (desirable and permissible limit of colour are 5 & 15 Hazen).
- Total Hardness (TH) values are observed to be varying between 110 mg/L – 390 mg/L. Desirable and permissible limit of Total Hardness are 200 mg/L & 600 mg/L respectively.
- Total Dissolved Solids (TDS) values are observed to be varying between 280 mg/L to 1043 mg/L.
- Dissolved Iron values are observed to be varying between 0.06 – 0.24 mg/L. Desirable limit of Dissolved Iron is 0.3 mg/L.
- Data on trace metal concentrations are found to be well below the desirable limit.

The ground water quality in the study area is satisfactory as compared with BIS: 10500 standards. The water can be used for domestic, commercial and agriculture purposes. It can also be used for drinking purpose after subjecting to relevant treatment.

0.6.5 Land Environment

Land Use: A buffer of 10 km was generated on both sides of the proposed alignment. Overall land use/land cover statistics of the project corridor is given below in Table 0.5.

Table 0.5: Land Use/Land Cover Statistics

Landuse/Landcover	Length (Km)	Percentage (LU/LC)
Agricultural land	186.86	92.00

Landuse/Landcover	Length (Km)	Percentage (LU/LC)
Barren Land	10.16	5.00
Water body	1.22	0.60
roads	1.01	0.50
quarries	3.85	1.90

Soil Quality: The soil samples of different area along the project stretch were collected from six (06) locations near agricultural areas for assessing the physic-chemical characteristics of the soil. The results of soil quality analysis are provided below,

- Soil along the study area is Sandy Clay in nature.
- pH values are varying from 7.58 to 8.35.
- EC of the analysed samples are varying between 110 µS/cm to 324 µS/cm.
- Total available Nitrogen in the soil samples are varying between 340 mg/kg to 450 mg/kg.
- Total Phosphates in the samples are varying between 54 mg/Kg to 74 mg/Kg.
- Total Potassium in the samples are varying from 174 mg/Kg to 230 mg/Kg and are found to be sufficient requirement for the plantation and agricultural purposes.

0.6.6. Biological Environment

Biological impact assessment generally includes listing of plants and animals present in core and buffer areas of the project site. The identified species are then checked for their status according to IUCN list of threatened categories viz., endemic, endangered, vulnerable, rare, indeterminate and insufficiently known. In certain cases, it is also considered desirable to conduct vegetation analysis using standard phyto-sociological methods.

As part of this assignment, a flora and fauna study has been conducted for the project road. The project corridor starts from NH-150E at Km 99.800 near Rampur village in Maharashtra and ends near Singnodi village in Karnataka. The corridor traverses through Solapur district of Maharashtra, Kalaburagi (Gulbarga), Yadgir and Raichur districts in Karnataka. It traverses mostly through plain terrain and agricultural fields.

Study of Ecology & Biodiversity in the Project Area

The biological study of the area has been conducted in order to understand the ecological status of the existing flora and fauna to generate baseline information and evaluate the

probable impacts on the biological environment. The project road starts on NH 150 E at Km 99.800 near Rampur village in the state of Maharashtra and ends at KN/TS Border near Singnodi village in the State of Karnataka. The corridor traverses through the districts of Solapur in Maharashtra, Kalaburagi (Gulbarga), Yadgir and Raichur in Karnataka. It traverses mostly through plain terrain, with agricultural fields throughout the alignment and constraints like wildlife, major hills are not anticipated. The Bori, Bhima and Krishna are the major rivers crossing the alignment.

Floral Study

The vegetation sampling was carried out by using the least count quadrats method across different habitats. The quadrats are useful for quantification of density and abundance of the vegetation in the study area. The data collected for biodiversity information were quantitatively analyzed for density, frequency, abundance and Shannon-Wiener Diversity Index. The detailed assessment of Floral studies with respect to tress , shrubs and herbs are given in Chapter 6.

Faunal Study

Rapid surveys were carried out at the site of intensive surveys were conducted at study site, which would be subjected to higher degree of disturbance by project related activities. Data on the presence/absence of the different animal species in the project area was recorded largely based on direct and indirect evidence such as tracks, spoors, dung and calls. Secondary information sources such as published information, unpublished reports, personal communication and informal interviews with villagers were also taken into account for supplementing primary data collected during field studies.

Avi-fauna study (Bird surveys) was conducted at the sampling points marked for intensive study. While traversing the area, birds were identified either by direct sighting or by calls. Casual observations were also recorded as and when the team moved through the study area. The details are provided in the Chapter 6.

Endangered/ Threatened and Endemic Species

Faunal studies were also conducted during February 2019. During the survey of the study site, no threatened/ endemic species in and around the study area were observed. One of the most important animal species found in the area is the Mugger Crocodiles. The Solapur district of Maharashtra, Raichur, Gulburga and Yadgir of Karnataka region of the river Krishna is known for the semi aquatic Reptile, Crocodile. This region is also considered as the breeding region for Crocodiles. Crocodiles comes under the VU category of the IUCN or IW(P)A schedule. Hence an in depth study has been proposed to develop a comprehensive conservation plan for Crocodiles in the region.

0.6.7 Socio Economic Environment

The project road runs through the districts of Solapur district in Maharashtra and Gulbarga, Yadgir and Raichur districts of Karnataka state for about 203.1 kms. The proposed road connects major town of Akkalkot, Aland, Shahpur, Gulbarga, Jevargi and Raichur etc. Located in the Southeastern part of Maharashtra and Karnataka states. Brief socio-demographic profile of the project districts is given in below Table 0.6.

Table 0.6: Socio-demographic Profile of the Project Districts

Items	Solapur	Gulbarga	Yadgir	Raichur
Population	951558	543147	1174271	234073
Sex Ratio	978	964	989	989
Child sex ratio	919	930	951	936
Literacy Rate (%)	82.80	82.30	51.83	77.65

0.7 IMPACTS DURING CONSTRUCTION AND OPERATION PHASE

0.7.1 Impact on Soil Quality

The loss of fertile topsoil/humus may occur during excavation along the project corridor, hence care and precaution need to be taken to preserve the layer and reuse the soil as it contains the humus. Soil erosion may occur due to the rolling topography and intensity of rainfall. Major problem of erosion may occur due to the removal of age-old trees along the roadside within RoW. The removal will result in the instability of soil binding and soil structure, as uprooting will make the soil loose. Erosion may occur due to the swift velocities of drains inI monsoon season.

0.7.2 Impact on Water Resources and Water Quality

To prevent accumulation of water on the roadside, Nine (09) major bridges and Sixty-five (65) minor bridges are proposed, No major and minor bridges will be dismantled and reconstructed. In the case of culverts, 290 box culverts (new) are proposed. For the above said cross drainage structures (bridges and culverts), care has been taken to the safe flow of water towards the downstream. Cross drainage structures like bridges and culverts are designed for 100 year return flood. During reconstruction of old cross drainage structures and construction of new ones, diversion is required to aid uninterrupted movement of traffic. Material will not be put in the drainage to avoid blockage and prevent the erosion. This will help in protecting the aquatic ecology. For CD structures, care has been taken for safe flow of water towards the downstream. Construction activities may temporarily deteriorate surface water quality in terms of increased turbidity and oil and grease concentration.

0.7.3 Impact on Air Quality

Road construction will involve earth excavation, backfilling and concreting. Impacts on air during the construction phase could be due to earth excavation, backfilling and transportation of construction materials etc., which may lead to rise in air pollution. The predicted impacts during construction phase assessed using Fugitive Dust Emission (FDE) Model and Operation phase using CAL3QHCR model developed by USEPA.

Fugitive Dust Emissions (FDE): Total reduction of 1001849 Tonnes/year Tonnes/year of PM_{10} and 2226332 Tonnes/year of PM_{100} is anticipated with 95% EMP efficiency for fugitive dust emissions from haulage roads, excavation and loading & unloading activities during construction phase of the project.

CAL3QHCR Model: The model developed by USEPA was used for prediction of the air quality in the operation phase of the project. The assessment of air quality was performed for the project stretch considering worst case scenario for number of vehicles expected on 2050 (ultimate year). The maximum concentration of CO predicted for the year 2050 is 3.16 ppm (3.60 mg/m^3) near KN/TS Border village. CO values are varying between 0.40 ppm to 0.80 ppm (0.46 mg/m^3 to 0.92 mg/m^3) in most of the surrounding areas of proposed road stretch. When compared with the National Ambient Air Quality Standard (NAAQS) of 4 mg/m^3 (3.49 ppm) for 1 hour, predicted values for the year 2050 are well below the prescribed standard limit near the project corridor. predicted values of $PM_{2.5}$ for year 2050 are varying from place to place. The maximum concentration of $PM_{2.5}$ predicted for the year 2050 is 54.59 $\mu g/m^3$ near KN/TS Border village. $PM_{2.5}$ values are varying between 20.21 to 28.15 $\mu g/m^3$ in most of the surrounding areas of the proposed project stretch. When compared with the National Ambient Air Quality Standard (NAAQS) of 60 $\mu g/m^3$ for 24 hour, predicted values for the year 2050 are well below the prescribed standard limit in the study corridor.

However, the impact on ambient air quality will not be significant, since the dust and gases generated is confined to the proposed area and as it will be taken care of by adopting suitable control measures as described in EMP. However, this impact is localized.

0.7.4 Impact on Noise Quality

The impact of noise levels from the project on the neighbouring communities would be anticipated with the increase in vehicles and vary with vehicles speed. The major sources for noise pollution during construction will be movement of vehicles transporting construction material to the construction yard and the noise generating activities at the yard itself. The construction equipment with high noise levels, loading and transportation of material near the borrow areas will affect the construction personnel and other humans in the area. The impact of the noise during operation phase is predicted using FHWA Model.

FHWA Noise Modelling: The future noise levels are predicted using Federal Highway Administration (FHWA) noise modeling technique. The noise levels are predicted for two stretch viz., Akkalkot-KN/TS Border Project for a length of 203.10Kms for different years (2020, 2030, 2040 and 2050) with project scenario at 500 m distance from the either side of the carriageway. Noise levels are predicted at 09 traffic sections of the project for the ultimate year (2050), the predicted values are in the range of: Leq day:58.6 to 64.1 and Leq night: 58.5 – 61.4 dB(A). The predicted noise levels are well within the stipulated CPCB standards (65 dB(A) for commercial area) and slightly exceeding the standard (55 dB(A) during the night time. The avenue plantation in the project in three rows are suggested will further reduce the noise upto 5 dB(A).

0.7.5 Socio-Economic Environment

Positive impacts are anticipated on the socio-economic environment during the project construction and operation phases. A number of marginal activities and jobs would be available to the locals near to the project area. The project will provide livelihood opportunities to them during construction phase. The project will provide improvements in road network leading to improved socio-economic status of the study area. The land prices are anticipated to rise. Project will increase access to various places, investments, jobs, education, and health services.

0.8 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Based on the detailed evaluation of the likely impacts on various environmental parameters, an environmental management plan is prepared. The mitigation measures for minimization of adverse impacts, green belt development/plantation programme have been incorporated in the chapter on environmental management plan. Post-project monitoring and analysis shall be carried out as described in this report. The frequency, methodology of sampling and testing for various pollutants specified by CPCB will be followed. This plan also specifies the organizational requirements and institutional strengthening necessary for sound environmental management of the project. The major components of the EMP are:

- EMP implementing agency
- Monitoring of the EMP implementation
- Training on environmental management
- Budget for EMP implementation

Environmental Management Cell (EMC) of NHAI will supervise and implement the mitigation measures as documented in the EMP. This EMC must also be adequately empowered to discharge the responsibilities as outlined in the EMP. To ensure smooth implementation of EMP, the project proponent will have to collaborate with various government agencies like Public Works Department, Revenue Department, State Pollution

Control Board, State Forest Department, Police Department and other allied departments.

0.9 COSTS TOWARDS IMPLEMENTATION OF ENVIRONMENT MANAGEMENT PLAN

The key provisions made towards the implementation of EMP are:

- During the construction phase of the project, air pollution will be increased due to various construction activities i.e. excavation, loading, unloading, movement of vehicles etc., and the same will be mitigated by sprinkling of water thrice in a day. Budgetary provision of Rs. 21.90 Lakhs made in the EMP.
- **Avenue Plantation:** Three rows of avenue plantations are proposed all along the project corridor as per IRC: SP-21: 2009. Around 1,99,600 nos. of trees as avenue plantation need to be planted. The avenue plants proposed are *Pongamia pinnata, Albizia lebbeck, Albizia amara, Azadirachta indica, Mangifera indicate, Peltophorum, Syzygium cumini, Delonex regia, Tectona grandis, Muntingia calabura, Ficus benghalensis, Ficus religiosa* etc. Budget allocaton for the avenue plantation is 1896.20 lakhs.
- **Median Plantation:** Project median is also used for plantation (4 m median is provided in all TCS). The median plantation is proposed in two rows and the number of species proposed are around 1,33,200 Nos. The median plants proposed in the project are *Bougainvillea sp., Bauhinia purpurea, Cassia fistula, Gmelina arborea, Polyalthia longifolia, Alstonia scholaris, Caesalpinia pulcherrima* etc. The budget allocation in EMP for the median plantation is 466.2 lakhs.
- **Rain Water Harvesting (RWH):** Around 812 nos. of RHW pits are proposed on either side of the road at an interval of 500 m. The proposed RWHs are having dia. of 1.5 m with a depth of 3.8 m. A budget provision of 162.4 lakhs is made for the same in EMP.
- **Muck/Debris/C & D Waste Disposal:** The quantity of muck/surplus earth and C & D waste generated from the project is 8,75,446 cum. The whole muck and C & D waste are disposed in identified barren lands within 10 km of the project stretch. An estimated amount of Rs. 1022.08 lakhs provision is made in the EMP for the safe disposal of the muck and C & D waste.
- **Fly Ash Utilisation:** Fly Ash requirement for the project is estimated to be around 60,53,724cum, which is assessed duly adopting the Fly Ash Notification, 2016. The fly ash will be available from Tuticorin Thermal Power Plant which is located 187 km away from Melur. A budget provision of 12,685.58 lakhs is made for the same in EMP.

- The EMP Budgetary provision towards CSR activities allocated for Rs.100.0 Lakhs and CER activities allocated for Rs.50.0 Lakhs
- Total budget for the implementation of EMP during construction & operation phases of the project is estimated to be Rs. 195.76 crores (inclusive of GST @18%).