



Development of 4/6 lane (Greenfield) access control Expressway from Bengaluru- Kadappa - Vijayawada (BKV) Section Package III: Starts near Uppalapadu village (Design Ch. 226.000) and ends near Muppavaram village on NH-16 (Design Ch. 342.500) in the state of Andhra Pradesh.

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PROPOSED TERMS OF REFERENCE(TOR)

FOR EIA & EMP STUDY

1.0 Introduction

The National Highway Authority of India (herein after referred to as the "Authority" or "NHAI") is engaged in the development of the National Highways under the scheme of Bharatmala Pariyojana.

Bharatmala Pariyojana is a new umbrella program for the highways sector that focuses on optimizing efficiency of freight and passenger movement across the country by bridging critical infrastructure gaps through effective interventions like development of Economic Corridors, Inter Corridors and Feeder Routes, National Corridor Efficiency Improvement, Border and International connectivity roads, Coastal and Port connectivity roads and Green-field expressways.

A total of around 24,800 kms are being considered in Phase I of Bharatmala. In addition, Bharatmala Pariyojana phase -I also includes 10,000 kms of balance road works under NHDP, taking the total to 34,800 kms. Bharatmala Phase I - is being implemented over a period of five years i.e. 2017-18 to 2021-22.

The second phase of the Bharatmala programme has been announced on 21st January 2021. In this phase it has been aimed that 5,000 km of projects are planned to be constructed and Detailed Project Reports (DPRs) are being prepared prior to the approval of the projects so as to speed up the implementation process.

As part of this endeavour, NHAI has decided to undertake the project namely "Development of 4/6 lane (Greenfield) access control Expressway from Bengaluru- Kadappa - Vijayawada (BKV) Section Package III: Starts near Uppalapadu village (Design Ch. 226.000) and ends near Muppavaram village on NH-16 (Design Ch. 342.500) in the state of Andhra Pradesh, Total Length - 116.5 km".

In order to fulfil the above task, the National Highway Authority of India has appointed M/s Aarvee Associates Architects Engineers & Consultants Pvt. Ltd. to provide services for the above-mentioned project. The Letter of commencement of services was issued on 22nd July 2021.

2.0 Project Description

The proposed greenfield project expressway Development of 4/6 lane (Greenfield) access control Expressway from Bengaluru- Kadappa - Vijayawada (BKV) Section Package III: Starts near Uppalapadu village (Design Ch. 226.000) and ends near Muppavaram village on NH-16 (Design Ch. 342.500) in the state of Andhra Pradesh. The total length of the project corridor is 116.5 km.



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Table 2.1: Project Stretch Details

S. No	Stretch	Length	Taluka/Mandals	District(s)
1	Starts near Uppalapadu village (Design Ch. 226.000) and ends near Muppavaram village on NH-16 (Design Ch. 342.500) in the state of Andhra Pradesh	From 226.00 km to 342.500 km	Chandrashekara puram, Pamuru, Kanigiri, Kanigiri, Veligandla, Marripudi, Podili, Darsi, Thallur, Chikumarthi, Addanki, Korisapadu and Janakavarampanguluru.	Prakasam

2.1 Site and its Environs

The study has been conducted to know the existing amenities in the project road. The chainage wise features like terrain, land-use, pavement type & condition and carriageway width, shoulder type, condition & width, nature of soil, curve geometry, intersection details, location of water bodies, height of embankment or depth of cut, cross drainage structures, existing utility services, general drainage conditions etc., have been recorded. The road inventory has been referenced to the existing kilometre & hectometre stones established along the roadside.

Table 2.1.1: Salient features of the project road

S.No	Parameter	Description
1.	Location of the project	The proposed greenfield project expressway starts near Uppalapadu village (Design Ch. 226.000) and ends near Muppavaram village on NH-16 (Design Ch. 342.500) in the state of Andhra Pradesh.
2.	Terrain	Plain, rolling and hilly terrain
3.	Taluk/Mandals	Chandrashekara puram, Pamuru, Kanigiri, Kanigiri, Veligandla, Marripudi, Podili, Darsi, Thallur, Chikumarthi, Addanki, Korisapadu and Janakavarampanguluru.
4.	Rivers/canals/streams	The alignment is passing across Musi river at km 301.000. The proposed road is also crossing small streams.
5.	Forest area and sanctuaries	<ul style="list-style-type: none"> The proposed project passes through Pulimikonda R.F for a length of 1.800 Kms. The proposed project involves diversion of 16.20 ha of forest land.
6.	ROW	90 m
7.	Administrative locations	Prakasam
8.	State	Andhra Pradesh



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Table 2.1.2: Engineering features of the project road -Package-III

Sl. No.	Description	Greenfield Alignment (Alternative -1)	Greenfield Alignment (Alternative -2)	Greenfield Alignment (Alternative -3)
1	Starting & Ending Chainages	Design Chainage: Km 226.000 to Km 342.500	Design Chainage: Km 221.000 to Km 339.537	Design Chainage: km. 222.295 to Km 340.322
2	Length of Proposed alignment (km)	116.500	118.537	118.027
3	Length of Existing Road Widening & Curve Improvement	-	-	-
4	Length of Bypass	-	-	-
5	Number of Bypasses	-	-	-
6	District	Praksam	Praksam	Praksam
7	Design Speed, in kmph	120 kmph	120 kmph	120 kmph
8	Existing ROW	-	-	-
9	Proposed ROW, in m	90m	90m	90m
10	Proposed Lane Configuration	4-Lane with 6 lane structures	4-Lane with 6 lane structures	4-Lane with 6 lane structures
11	Proposed Pavement	Flexible Pavement	Flexible Pavement	Flexible Pavement
12	Estimated Total Traffic-AADT (PCU)- (COD)	23511 PCUs (2025)	23511 PCUs (2025)	23511 PCUs (2025)
13	Proposed Interchange (in Nos.)	5	5	5
14	Flyover (in Nos.)	Nil	Nil	Nil
15	Vehicular underpass (in Nos.)	18	20	19
16	Vehicular overpass (in Nos.)	NIL	Nil	Nil
17	LVUP (in Nos.)	18	23	19
18	SVUP (in Nos.)	-	-	-
19	ROB Numbers	-	-	-
20	Major Bridges (in Nos.)	14	19	20
21	Minor Bridge (in Nos.)	58	67	64
22	Culvert (in Nos.)	296	287	297
23	Toll Plaza @ interchange	5	5	5
24	No. of Toll lanes	10	10	10
25	Rest Area	2	2	2
26	Truck Lay Bye/parking	2	2	2
27	Total Civil Cost in Crore	4560.98	5270.16	4053.45



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Sl. No.	Description	Greenfield Alignment (Alternative -1)	Greenfield Alignment (Alternative -2)	Greenfield Alignment (Alternative -3)
28	Civil cost per km	39.15	44.46	34.34
29	Land to be acquired (Ha)	1172	1191.8	1187.2
30	Pre-Construction Activities: LA, EC, Forest, CRZ etc.	Will be Initiated	Will be Initiated	Will be Initiated
31	Recommendation	Recommended	Not Recommended	Not Recommended



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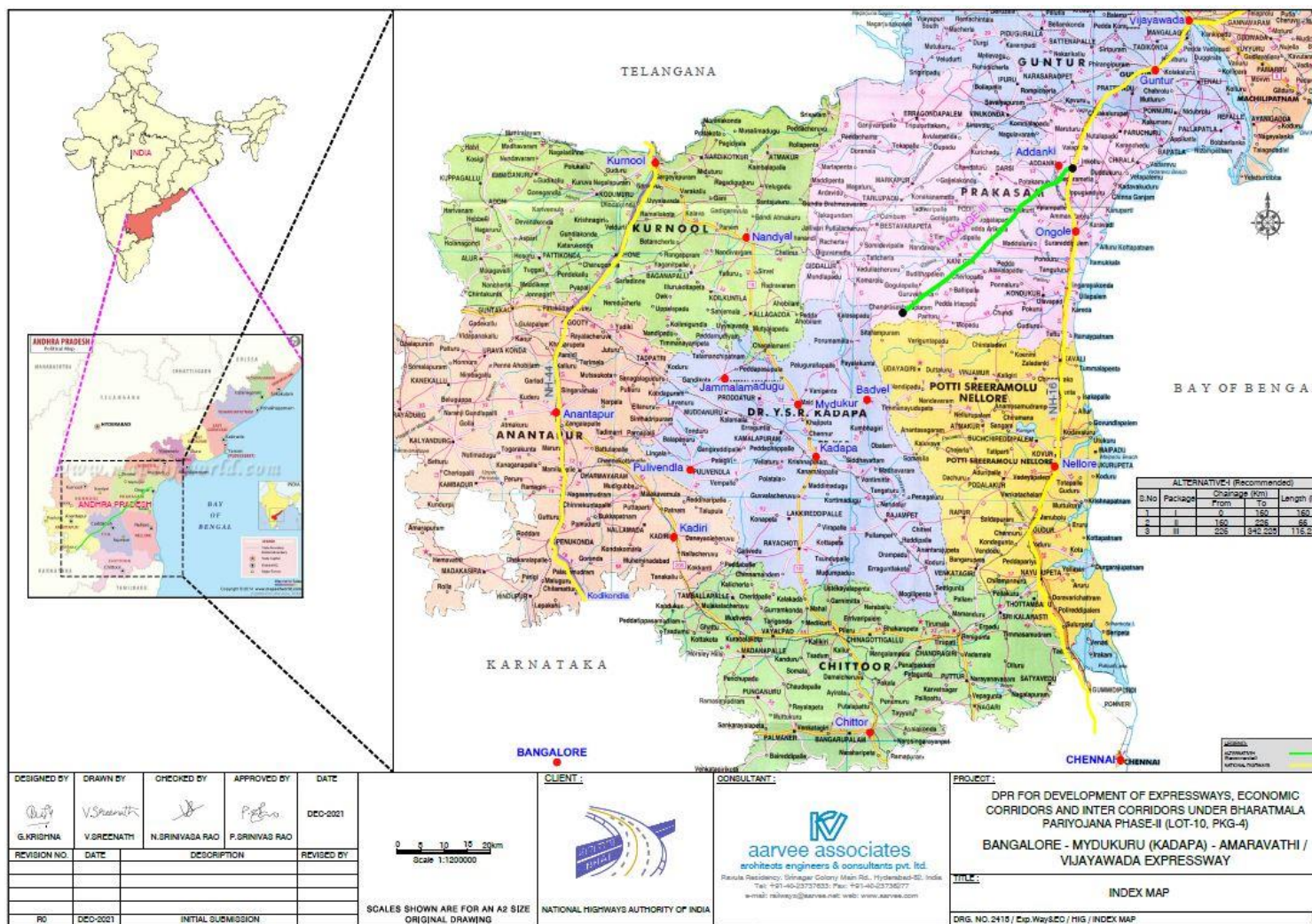


Figure 2.1: Index Map (Package-III)



2.2 TERRAIN

Terrain is classified by the general slope of the country across the highway alignment. Based on this criterion, the entire project stretch traverses predominantly through rolling terrain followed by mountainous and plain terrain.

2.3 ABUTTING LANDUSE

During the reconnaissance survey, majority of adjoining land was observed as agriculture and rest covered with barren lands and some built-up areas. These areas are mix up with fast and slow moving vehicular traffic. Different types of residential / commercial structures (Pucca/ Semi Pucca) are noticed in the built-up section.

2.4 FOREST AND WILD LIFE

The proposed project passes through Pulimikonda R.F for a length of 1.800 Kms. The proposed project involves diversion of 16.20 ha of forest land.

2.5 DEMOGRAPHIC DETAILS

The project road runs entirely through the Prakasam districts of Andhra Pradesh state. The project road mostly carries a mix of intra-state and inter-state traffic from the surrounding states like Karnataka.

2.5.1 Prakasam

The population of the district is 33.93 lakhs (Census 2011). The river Krishna flows towards North West of the district. The area of the district is mostly covered under Nagarjuna Sagar Canal system irrigating an ayacut of 4.4 lakh acres. There is another completed major irrigation project viz., Krishna Western Delta irrigating an ayacut of 72,120 acres, and Five medium irrigation projects viz. Rallapadu, Mopadu, Cumbum tank, Veeraraghavunikota anicut, Paleru Bitragunta anicut, The geographical features of the district are as follows.

Table 2.4.1: The classification of total area of Prakasam District

Geographical Area	Area (in lakh acres)	in % with Total Area
Total geographical area	43.55	100
Forest	10.93	25
Cultivable area	16.56	38
Barren and un-cultivable land	3.85	9
Land put to non agricultural use and others	12.21	28
Sown area	16.01	37
Irrigated area	10.5	24
Normal average rain fall	750 mm	

ECONOMY

According to the Periodic Labour Force Survey 2018-19 (July 2018-June 2019), Andhra Pradesh has an unemployment rate of 5.3%, which is lower than the unemployment rate of 5.8% at the national level. In 2020-21, agriculture, manufacturing, and services sectors contributed to 33%, 26%, and 41% of the economy. In 2020-21, manufacturing and services sectors registered negative growth.



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TRANSPORT

There are 1.38 Crore Motor Vehicles registered in the State as on 30.11.2020, of which 1.21 Cr are non-transport vehicles used for personalized purposes and 16.58 Lakhs Transport Vehicles. Out of 1.21 crore Non-Transport Vehicles, 1.08 Crores are Motor Cycles which constitute 89.20%, Four wheelers (jeeps and motor cars) are 8.85 Lakhs which constitute 7.30%, and 4.26 Lakhs are other vehicles i.e Tractors, Trailers road rollers, rig mounted, construction equipment ,Fire tenders and others of the Non-Transport segment. Under YSR Vahana Mithra scheme, an amount of Rs 10,000/- was sanctioned to 273985 eligible beneficiaries in 2020-21.

Presently, APSRTC (13 Districts) has 4 Zones, 12 Regions and 128 Depots with a total fleet strength of 11439 buses. As on March, 2021, it recorded fuel efficiency of 5.33km per liter and the average vehicle productivity per day of its fleet is 203 kms and the Corporation achieved 29.01% fleet utilization in view of pandemic Corona situation. Tourism APSRTC received "Kausalacharya Award 2020" from the Ministry of Skill Development and Entrepreneurship, Govt.of India on 10th Sept'2020 for imparting skill development training in various trades to ITI Apprentices during the last four years i.e. from 2016 to 2019.

INDUSTRY

The state is located on the eastern coast with a coastline of 974 Km which is the second-longest in India. New business opportunities in Andhra Pradesh are plenty as the state has 6 ports, 6 airports, over 123,000 km of the road network and 2,600 km of the rail network, and an around-the-clock power supply. The state has an installed power capacity of over 24,000 MW and has abundant water resources with 10% consumption allocated for industrial development through Krishna and Godavari River basins. It has been Ranked No. 1 in the implementation of Energy efficiency and conservation programmes by the World Bank. For 2018-19, Andhra Pradesh's growth rate is estimated to be 11.02%, much higher than the national average

The state's Industrial output was \$22.1 Billion in FY 2019-20, growing at Year-over-Year growth of 5.67%. The major industries in Andhra Pradesh span across Automobile & Auto-components, Electronics, Food Processing, Biotechnology & Lifesciences, Capital Goods, Mining, Textiles & Leather, and IT & ITeS. Sri City Special Economic Zone that houses 180 companies from 27 countries, is a key example of well-planned infrastructure at a strategic location near Chennai.

AGRICULTURE

Role of Agricultural Sector in State Economy is very significant. The contribution of Agriculture under primary sector to the State Gross Value Added for the year 2017-18 is 15.65% (Advance) on the basis of current Prices. However, 62.17% of the working population is still dependent on Agriculture and Allied activities. Agriculture in Andhra Pradesh is mostly dependent on Rainfall. Monsoon and Seasonal Conditions play a major role in the Agricultural production. The proportion of Area under agriculture (including Fish Ponds) is 37.10%. The Gross Irrigated Area (37.30 Lakh Hect) is 50.10 % of Gross Area Sown (74.45 lakh Hect) in the State.

MINES AND GEOLOGY

Minerals are one of the main sources of revenue to Andhra Pradesh and are also a major contributor for the economic growth of the State. Andhra Pradesh is a mineral rich state



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containing a vast variety of mineral wealth particularly industrial minerals. The State is focusing on inventory of mineral resources, key issues of legislation, objective and strategies in tune with the National Mineral Policy for accelerating growth leading to overall development of the mining sector. The main aim of State Mineral Policy is to serve as a guiding force to translate the State's mineral potential into reality with eco-friendly and sustainable mining. The State Mineral and Mining sector contributed Rs.2,072 crores of Mineral Revenue to the state exchequer during 2019-20 and Mineral Revenue during 2020-21 (upto Nov 2020) is Rs.1,095 Crores

FORESTS

As per Indian State Forest Report, 2019, Andhra Pradesh state forest covers an area of 37392.24 Sq. Kms, which amount to 22.94% of the total geographical area. Out of this, Very Dense Forest is 1994.22 Sq. Kms, Moderate Dense Forest is 13938.36 Sq. Kms, Open Forest is 13204.82 Sq.Kms and Scrub Forest is 8254.84 Kms

Government has started Eco-Tourism initiatives by taking up creation of new community based EcoTourism Centres and strengthening the existing EcoTourism centers by the Forest Department involving local tribes in implementation and management by CBETs / EDCs duly empowering their economic status. The state has 13 wildlife sanctuaries and 3 national parks covering an area on 8139.89 sq.km, which is 21.87% of the State's Forest area and 4.99% of the State's geographical area.

RIVERS

The State is divided into three physical regions based on the topography (Coastal Plains, Peninsular Plateau and Eastern ghats). The general slope changes from west to east and south-west to north-east. The peak summits in the State are Tirumala (1150 mts) and Chintapalli (1680 mts). Andhra Pradesh is covered under Zones I to III of the Seismic map of India. The average rainfall of the State is 940 mm with a least rainfall of 521 mm in Anantapur.

The State receives substantial rainfall during the north-east monsoon period. Three major perennial rivers, viz., Godavari, Krishna and Pennar and several other minor rivers drain the State. The river Godavari with its tributaries Pranahita, Manjeera, Maner, Indravati, Kinnerasani, Pamuleru and Sileru drains through the northern parts of the State into Bay of Bengal. The river flows through Adilabad, Karimnagar, Nizamabad, Medak, Ranga Reddy, Warangal, khammam, Krishna, East & West Godavari and Visakhapatnam districts. The River Krishna with its tributaries Tungabhadra, Vedhavati, Hundri, Musi, Paleru and Munneru flows through the central parts of the State. It drains Anantapur, Kurnool, Mahabubnagar, Ranga Reddy, Nalgonda, Guntur and Krishna districts into Bay of Bengal. The river Pennar, the third biggest river, with its tributaries Chitravati, Papaghamni, Cheyyeru and Pincha drains parts of Rayalaseema region. Vamsadhara, Nagavali, Sharada, Yeleru, Gundlakamma, Swarnamukhi and Paleru are some of the important rivers in the State, which have smaller catchments and drain into the Sea.

2.12 SOILS

There are various types of soils and the formation of a soil is primarily influenced by factors like climate, altitude and composition of bedrock etc. Disproportion in the distribution of rainfall in the country and excessive heat contribute special characters to the soils. Most of soils in the State are made up of a combination of three basic types, namely, sand, silt, and clay. Category-wise soils are given in Annexure 5.3. Of the 22 categories of soils adding to the



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total geographical area of the state, ten types are predominant and together account for over 88% of the area.

2.13 LAND UTILIZATION

The percent share of the different segments of land use of the total geographical area 162.97 lakh hectares of the state in the year 2019-20 is as shown in below Table 2.13.1.

Table 2.13.1: Landuse Classification - Andhra Pradesh

S.No	Area Classification	Area in Lakh Hect.	Percentage to Total Geographical Area
1.	Net area sown (including fish culture)	60.49	37.11
2.	Forest	36.88	22.63
3.	Land put non-agricultural uses	20.74	12.73
4.	Barren and uncultivable land	13.36	8.20
5.	Current fallow lands	14.52	8.91
6.	Other fallow lands	9.25	5.68
7.	Cultivable waste lands	4.12	2.53
8.	Remaining land	3.61	2.21

2.14 TOURISM

Andhra Pradesh Tourism Development Corporation (APTDC) is a state government agency which promotes tourism in Andhra Pradesh, describing the state as the Koh-i-Noor of India. Andhra Pradesh has a variety of tourist attractions including beaches, hills, caves, wildlife, forests and temples.

3.0 Scope of the Study

The report contains the findings of the study to identify risks, identification of most likely risks, health and Environmental hazards/Impacts along the Right of Way (RoW) & possible natural and man made disasters happening in the project area and suggesting suitable remedial measures in all stages of the project i.e. Design phase, Construction phase, and Operation phase and preparation of Disaster Management Plan.

The scope of the environmental report is given below:

- Reconnaissance survey, environmental screening and categorization framework for the proposed project to include the environmental aspects from the planning stage of the project.
- Review of National, state and local environmental regulatory requirements on environmental aspects, including necessary clearances from State and Central Government in the context of proposed expressway project.
- Collecting secondary baseline data from relevant sources for various environmental attributes around the project site.
- Conduct environmental analysis of alternatives for different project components and provide specific inputs to technical analysis of alternatives.
- An environmental impact assessment for the proposed project to identify and quantify potential impacts of the project.



- Impact prediction and assessment of key aspects of the project such as ambient air, noise, water etc., and assessment of other aspects of the project with sustainable mitigative measures.
- Suggesting a typical environmental management plan with appropriate line estimates duly addressing the key environmental attributes.
- Suggesting post project environmental studies to be carried-out.

The objectives of the study are:

- ✓ Identify the hazards
- ✓ Decide areas of hazards in the project and how it shows impact.
- ✓ Evaluation of risks and decide on precautions
- ✓ Record of findings and its implementation
- ✓ Assessment of hazards likely happening due to result from the proposed project and suggesting suitable mitigation measures.
- ✓ Preparation of Disaster Management Plan in order to support in the event of road accidents (major road mishaps, gas tanker explosions, fire hazards etc.) and natural calamities (floods, cyclones, earth quakes etc.).

4.0 Terms of Reference for EIA study

4.1 Study Area

A detailed study of all the environmental features falling within the immediate corridor of impact, which has been considered as 500 m on both sides from center line of road. The other sensitive environmental issues such as protected areas notified under wildlife (protection) Act 1972, critically polluted areas as notified by Central Pollution Control Board, notified Eco-sensitive areas, interstate boundaries and international boundaries, water bodies of ecological significance etc., were identified within 15 km from the alignment. The detailed information from the RoW as well as the area falling within 500 meters on the either side road were collected from primary sources and the other environmental features within 15 kms aerial distance as explained above were collected from secondary data sources. Rapid EIA studies will be carried out for the proposed project in accordance with the Environmental Impact Assessment Notification, 2006 and amendment thereof as well as MoEF EIA Guidance Manual, 2010. The Environmental Baseline data will be generated based on the EIA Guidance Manual, 2010. Environmental Baseline monitoring report will be prepared as per Standard ToR given in EIA guidance manual by MoEF. The details of the EIA study is given below.

4.2 Description of the Environment

The baseline data on various environmental features will be collected from secondary and primary sources from field surveys and investigations in order to describe the environmental settings of the project area. The data on different environmental components along the project corridor will be collected by site reconnaissance survey in order to establish environmental condition of the project area. The study area covers 15 km either side of the project stretch.



4.3 Baseline Data Generation

(a) Secondary Data Collection:

Secondary data will be collected from secondary sources like publishes, literature from various government and private agencies, NGOs, or institutions on physical, biological and social components of environment. The data will be reviewed for establishing existing environmental and ecological status within the project area.

(b) Field Survey:

Field survey carried out for the identification of the environmental sensitive zones within the study area and physical verification of all the identified sensitive zones with respect to the location of the project alignment and activities proposed. Field surveys are included with the measurement of environmental quality in terms of ambient air quality, water quality, soil quality, background noise level and ecology (Flora, fauna and roadside trees). Procedure for the measurement of environmental quality surveys carried out as per guidelines of the Ministry of Environment and Forests, Government of India. Following details on different environmental features will be collected either from the secondary sources or from field surveys.

(i) Physical Environment:

- **Topography:** Topography, ground conditions, altitude, slope, etc.
- **Soil and Geology:** Soil type and its characteristics, soil erosion and land slide problem, geology of the area.
- **Water Environment:** An inventory survey of all water bodies located within 500 m on either side of the project road sections will be carried out. Details of rivers, streams, springs, lakes, reservoirs within 500 meters of the proposed road right of way will be collected from the site along with their usage and importance for the local population. Study of hydrology of the project road, natural drainage of the project region, existing drainage pattern of the project road, runoff flow direction, possible flooding and erosion shall be collected. Information on ground water table, ground water availability in the project area, exploitation of ground water was studied from the generated primary data.
- **Meteorological Data:** Meteorological data covering maximum and minimum wind speed, wind direction, rain fall, relative humidity and temperature for last 30 years period will be collected from the nearest Indian Meteorological Department (IMD) station i.e. station. History of special weather phenomenon like cyclones, cloud bursts, etc., will be collected from the nearest meteorological station for a period of 50 years. The wind velocity, wind direction and wind rose, rainfall, temperature and relative humidity along the proposed alignment are being recorded using a micro-meteorological station during the study period.
- **Environmental Quality:** Baseline environmental quality data in terms of water, ambient air, noise levels and soil quality would be generated as follows:
- **Ground & Surface Water Resources and Quality:** Water samples from ground water and surface water resources along the project road alignment will be collected and analysed for the physico-chemical & biological parameters. Surface water samples will be collected from different water bodies/rivers/streams along the project stretch and ground water samples from most commonly used ground water sources along the project road. Surface water samples will be analysed for pH, Temperature, Turbidity, Conductivity, Sulphate (SO₄), Nitrate (NO₃), Total Hardness (as CaCO₃), Chloride (as Cl), Fluoride (as F), COD (as O₂), Iron (as Fe), Dissolved Oxygen, Total Dissolved Solid, BOD, Calcium (as Ca), Magnesium



(as Mg), Arsenic (as As), Lead (as Pb), Copper (as Cu), Zinc (as Zn), Manganese (as Mn), Total Chromium (as Cr), Sodium (as Na), Potassium (as K), Total Alkalinity (as CaCO₃), Total Solid, Phosphate (as P), Nitrite (as NO₂), Total Suspended Solid and Total Coliform and ground water samples will be analysed for pH, Total Dissolved Solids (TDS), Calcium (as Ca), Chloride (as Cl), Fluoride (as F), Odour, Taste, Iron (as Fe), Magnesium (Mg), Total Nitrogen, Hexavalent Chromium, Nitrate (as NO₃), Sulphates (as SO₄), Zinc (as Zn), Lead (Pb), Arsenic (as As), Total Hardness (as CaCO₃), Sodium (as Na), Potassium (as K), Total Alkalinity (as CaCO₃), Escherichia coli (MPN) MPN/ 100ml.

- **Ambient Air Quality:** Ambient air quality monitoring process will be carried out all along the project stretch covering different category of land use (residential, commercial/industrial, sensitive zones like schools, college and hospital) with a frequency of twice a week for one month. The ambient air quality monitoring are being carried out for Particulate Matter (size less than 10 µm) or PM₁₀, Particulate Matter (size less than 2.5 µm) or PM_{2.5}, Sulphur Dioxide (SO₂), Nitrogen Dioxide (NO₂) and Carbon Monoxide (CO) by following the MoEF guidelines.
- **Noise Environment:** The noise monitoring will be carried out along the project alignment covering sensitive locations such as residential, hospitals, schools, sanctuaries etc. The noise monitoring will be done for 24 hrs at each location. During night time and day time, equivalent noise levels will be generated for each monitoring locations to have an idea of noise pollution levels in the study area.
- **Soil Quality:** The soil samples of different area along the project stretch will be collected for assessing the physico-chemical characteristics of the soil in the project area. The quality parameters are pH, Electrical conductivity, sand (%), silt (%), clay (%), texture, moisture retention capacity (%), infiltration rate, bulk density, porosity, organic matter, nitrogen, potassium, phosphorous, sulphates and sodium sulphates.
- **Existing Land Use Pattern:** Land use pattern will be established along the project road classifying forest area, agriculture land, barren land, urban & rural settlements, water bodies, hills etc., along the project road.

(ii) Biological Environment

Flora and Fauna: Information on vegetation within the study areas will be collected from secondary source as well as through site investigation. The vegetation study includes forest area & road side plantation within the proposed RoW. List of flora and fauna within 10 km on either side of project road will also be collected.

Ecological Sensitive Locations: Details of ecological sensitive locations, such as Wildlife Sanctuary, National Parks, Bio-Reserve etc., will be collected & studied within 10 km on either side of project road.

Ecological Studies: Terrestrial and aquatic ecological studies will be conducted along & within the proposed RoW. Common trees, shrubs, other vegetation, common fauna, rare and endangered species are surveyed, identified and studied. The roadside trees within the proposed RoW will be surveyed for botanical & vernacular name of species, girth wise enumeration etc.

(iii) Socio-Economic and Cultural Environment Socio-economic Details: Study of demographic details including population, schedule caste, schedule tribe, literacy, occupation pattern in the settlements along the project road, economic and social conditions, life styles, etc., along the project road and study of infrastructure facilities in



the settlements along the project road. The social study comprising socio-economic survey along the project road and reflect the number and details of Project Affected Persons (PAPs) along the project road. Following data will be collected:

- Details of the properties, houses, businesses etc.
- Activities likely to be effected by land acquisition and annual financial loses.
- Data covering the vulnerable groups or persons including women, children, elderly.
- People below the poverty line, indigenous people and people in notified settlements
- Data on diseases in the locality and existing health care facilities
- Data on demography including traditional skills and sources of livelihood along the proposed site.

Places of Tourist, Historic, Archaeological and Religious Interests: Places of tourist interest, historical, archaeological and places of religious interests (if any) will be identified along the project road in the immediate vicinity and also within study area (15 km on either side of the project road).

Common Resources: An inventory of common community resources such as educational institutions, health centres, recreation centres, courts, libraries, community centres, public toilets, religious and cultural features etc., situated along the project corridor are prepared.

4.4 Analysis of Alternatives to the Project Road

In-depth study of related maps, topographic sheets, physical inspection and environmental and social screening will be carried out in order to find out the technically and environmentally sound, most feasible and environmental friendly alignment. Alternatives are considered for the analysis of "without" and "with" project situations and components. The selected alternatives will be compared in terms of their potential social environmental impacts, capital & recurrent costs, suitability under local conditions, institutional training and monitoring requirements. For each alternative, environmental costs and benefits will be quantified and criteria for the selection of alternative will be stated. Analysis of alternative includes alignment selection, finalization of bypasses, road widening to reduce the cutting of tree, minimizing the demolition of structures, grade separators, services roads, vehicular, pedestrian and cattle underpass, quarry materials, road safety, etc.

4.5 Anticipated Environmental Impacts and Mitigation Measures

The environmental impact assessment will be conducted in accordance with the requirement of the Ministry of Environment & Forests (MoEF) norms and guidelines. The collected primary and secondary data are compiled and analyzed to establish a comprehensive database and assess the existing baseline environmental condition. After establishing the baseline status of the study corridor and analysis of the project proposals and activities, the potential impacts on environmental components would be identified for pre-construction, construction and operational stages of the project. On the basis of the existing baseline environmental condition within the project area and



the nature and extent of activities envisaged in construction/operation phase, **the impacts would be identified and assessed for "Without and With Project Scenario"** during construction and operation phases of the project. Wherever practicable, a quantitative analysis will be performed for the impacts by using appropriate modeling method. All potential direct and indirect influence due to the proposed project will also addressed. The scope of work not confined only to alignment but the impacts due to the associated construction activities assessed. The following aspects are given due importance during assessment of impacts and recommending remedial measures:

- Alignment of the project road and topographical changes.
- Roadside drainage to avoid water logging, erosion & environmental degradation. Impact on soil along the project road.
- Impact of solid waste generated and solid waste management plan. Impact on borrow area and quarries.
- Impact on road safety.
- Impact on ambient air quality due to air pollution during construction activities and vehicle movement. Prediction of ambient air quality due to projected vehicular traffic would be carried out using computer based CALRoads View software (CAL3QHCR).
- Impact of noise level during construction activities and vehicle movement. Prediction of noise levels would be carried using Federal Highways Noise Administration (FHWA) model during operation phase.
- Assessment of impacts of road construction on ground and surface water sources in the study area.
- Impact of solid waste generated during construction phase of the project.
- Nature, quantity and disposal of construction spoils, wastes and waste water. Impacts of flora and fauna and ecological resources due to construction and operation of the project.
- Public health & sanitation, and occupational health & safety of construction workers.
- Impact on safety of local people during construction and operation phases. Population affected and socio-economic impacts.

4.6 Public Consultation and Information Disclosure

Public consultations will be conducted in the affected areas along the project road. The issues discussed during public consultation will be incorporated in the design framework, environmental management and mitigation plan.

4.7 Environmental Monitoring Programme

Environmental monitoring plan for construction and post construction phases of the project road will be formulated to ensure effectiveness of implemented environmental mitigation measures. Cost of Environmental Monitoring Plan for construction and post construction phase of the project will be given in EIA/EMP report.

4.8 Environment Management Plan

After detailed analysis of all the environmental impacts and issues, a proper and adequate Environmental Management Plan (EMP) will be prepared with the aim to avoid, mitigate or eliminate the adverse impacts due to the project. This will cover roles and responsibilities for mitigation operations, emergency response procedures &



Development of 4/6 lane (Greenfield) access control Expressway from Bengaluru- Kadappa - Vijayawada (BKV) Section Package III: Starts near Uppalapadu village (Design Ch. 226.000) and ends near Muppavaram village on NH-16 (Design Ch. 342.500) in the state of Andhra Pradesh.

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supervision, financing, monitoring and reporting. EMP also includes the prospects of environmental enhancement within the project area. EMP will envisage the plans for the proper implementation of mitigation measures to reduce the adverse environmental impacts due to project activities during construction and operation phase. The following issues are addressed in the EMP:

- Preventive, mitigation, compensatory & enhancement measures for minimization & abatement of the undesirable impacts caused during the construction and operation stage.
- Details of management plans (compensatory plantation, solid waste management plan, borrow area management plan, occupational safety and health plan) including their implementation schedule and supervision programme.
- Identified/recommended institutional set up for implementation of the EMP including institutional requirements, staffing and training.
- Environmental monitoring programme during construction and operation phase including performance indicators, monitoring mechanisms, implementation programme and cost.
- Resettlement action plan for affected families as per NHAI Policy and NRRP 2007. Environmental Management Budget considering the environmental aspects for the project.

4.9 Structure of EIA Report

EIA report is followed the structure as per EIA Notification, 2006 and consists of the following Chapters:

1. Introduction
2. Project Description
3. Analysis of Alternatives (Technology and Site)
4. Description of the Environment
5. Anticipated Environmental Impact & Mitigation Measures
6. Public Consultation
7. Risk & Disaster Management Plan
8. Project Benefits
9. Environmental Monitoring Program and Environmental Management Plan
10. Summary & Conclusion
11. Disclosure of consultant engaged