सत्यमेव जयते
Goverment Of India

GREEN NATIONAL HIGHWAYS CORRIDOR PROJECT

DEVELOPMENT OF KOYYURU-CHAPARATHIPALEM-LAMMASINGI-PADERU SECTION OF NH-516E IN THE STATE OF ANDHRA PRADESH UNDER GNHCP SCHEME

ENVIRONMENT IMPACT ASSESSMENT AND ENVIRONMENT MANAGEMENT PLAN
(Revision VI)

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MINISTRY OF ROAD TRANSPORT AND HIGHWAYS

GOVERNMENT OF INDIA

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ABBREVATIONS

ADT	Average Daily Traffic
AADT	Annual Average Daily Traffic
AH	Asian Highway
AMSL	Above Mean Sea Level
APR&BD	AP Roads and Building Department
APPCB	Andhra Pradesh Pollution Control Board
ASI	Archaeological Survey of India
BDL	Below Detection Limit
BOQ	Bill of Quantities
CCE	Chief Controller of Explosives
CD	Cross Drainage
CFE	Consent for Establish
CFO	Consent for Operate
CE	Chief Engineer
CGWA	Central Ground Water Authority
CoI	Corridor of Impact
CPCB	Central Pollution Control Board
CO	Carbon Monoxide
DEIAA	District Level Environmental Impact Assessment Authority
DFO	Divisional Forest Officer
DPR	Detailed Project Report
EC	Environmental Clearance
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMF	Environment Management Framework
EMP	Environment Management Plan
ESO	Environment & Safety Officer
ESR	Environmental Screening Report
FRO	Forest Range Officer
GHG	Green House Gas
GNHCP	Green National Highways Corridor Project
GoI	Government of India
IRC	Indian Roads Congress
IS	Indian Standards
LCV	Light Commercial Vehicle
LHS	Left Hand Side
Km	Kilometer
MoEF&CC	Ministry of Environment, Forest and Climate Change
MoRT&H	Ministry of Road Transport and Highways
NBWL	National Board for Wildlife
NAAQS	National Ambient Air Quality Standards
NGHM	National Green Highways Mission
NGO	Non-Governmental Organization
NH	National Highways
NHDP	National Highways Development Program
NOC	No Objection Certificate
NO_2	Nitrogen Dioxide
NRSC	National Remote Sensing Centre
OD	Origin and Destination
OP	Operational Policies
PCU	Passenger Car Units
PIU	Project Implementation Unit
POL	Petroleum, Oil and Lubricants

PMC	Project Management Cell
PROW	Proposed Right of Way
PUP	Pedestrian Under Pass
PWD	Public Works Department
RCC	Reinforced Cement Concrete
RET	Rare, Threaten and Endangered
RHS	Right Hand Side
RoW	Right of Way
SEAC	State Expert Appraisal Committee
SEIAA	State Level Environmental Impact Assessment Authority
SEI	Significant Environmental Issues
SO_2	Sulphur Dioxide
SIA	Social Impact Assessment
SOI	Survey of India
SH	State Highway
TCS	Typical Cross Section
ToR	Terms of Reference
VEC	Valued Ecosystem Components
VUP	Vehicular Under Pass
WB	World Bank
WMM	Wet Mix Macadam

EXECUTIVE SUMMARY

E1 INTRODUCTION

The up gradation with Paved Shoulders of Koyyuru - Paderu Road Section of NH- 516E is proposed by construction under Green National Highways Corridor Project (GNHCP) through its support to the Govt. of India's Bharatmala Pariyojana and financed by the World Bank. It will promote the vision of enhancing effectiveness of the transport network of India with cost and natural resources efficiency and safe high capacity highways.

The project road section from Koyyuru to Paderu passes through rural and semi urban sections. The total existing length of project road is 135.687 kms. Major settlements along the project road are K.D Peta, Lammasingi, Gangaraju Madugula and Paderu. 70 % of the existing road is in moderate to poor condition. 46.14% project road is single lane, 27.597 % road is intermediate lane to Two Lane, and 26.260 % road is two lane. The proposed project road between Koyyuru -Paderu will facilitate the transportation of agriculture produce from the surrounding areas in Visakhapatnam district to their market places in Andhra Pradesh and Orissa by enabling movement of heavy vehicles in all weather conditions.

NH-516E serves major arterial road for North West part of Andhra Pradesh state and Connects Bharatmala Corridors viz, NH-16 (AH45) at Rajahmundry and NH-26 at Vizianagaram to Jagdalpur at Chhattisgarh state improving the lower weaker sections of the region. The project road section from Koyyuru to Paderu passes through rural and semi urban sections. The total existing length of project road is 135.687 kms. Major settlements along the project road are K.D Peta, Lammasingi, Gangaraju Madugula and Paderu. The existing pavement of the project road is flexible. There are 268 nos. of cross drainage structure including major and minor bridges, causeways and pipe culverts in which 01 number of Major and 21 no's of Minor bridges along the project highway.

E2 OBJECTIVE

The objective of the Environmental Assessment is the characterization of the existing status of the environment, to identify the probable adverse and positive impacts on the environment and community due to the proposed project and to delineate various measures to mitigate the adverse impacts and to enhance positive environmental impacts.

E3 METHODOLOGY

The methodology for the EIA study employs a traditional approach of identifying the environmental sensitivities along the project corridor and analyzing the environmental issues identified. The EIA process simultaneously informs the design of the project road about these issues so that necessary modification can be carried to minimize these environmental concerns.

E4 POLICY AND LEGAL FRAMEWORK

The Government of India has laid out various policy guidelines, acts and regulations pertaining to environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of environment. As per this Act, the responsibility to administer, the legislation has been jointly entrusted to the Ministry of Environment, Forests and Climate Change (MoEF&CC) at National level, whereas Andhra Pradesh Pollution Control Board (APPCB) at State level in the present context to "Improvement and up gradation of Koyyuru –Paderu Road Section in the State of Andhra Pradesh". The World Bank's environmental safeguard policy also applicable is to prevent and mitigate undue harm to people and the environment in the development process.

E5 BASELINE ENVIRONMENTAL CONDITIONS

The project road entirely traverses within Koyyuru, Lammasingi, Chaparathipalem and Paderu region of Visakhapatnam district of Andhra Pradesh. Topography along the project road is mostly hilly, rolling and plain. Geologically, the area constitutes a part of Eastern Ghats Mobile Belt of Archaean age. It includes rocks of Khondalite Group, Charnockite Group and Migmatite complex. Sediments of Upper Gondwana, Cainozoic laterite and Quaternary deposits overlie the Archaeans. The district is underlain by variety of geological formations from the oldest Archaeans to Recent Alluvium. The Archaean group of rocks includes Khondalites and Charnockites of Eastern Ghat super group and Granitic gneisses of Migmatite group. The Gondwana rocks which are represented by sandstones are in very limited aerial extent.

Climatologically the district experiences tropical sub-humid type of climate with moderate summer and good seasonal rainfall. October and November receive rainfall from northeast monsoon. Winter season with cool and fine weather prevails from December to February followed by summer season up to early June.

The average annual rainfall of the district is 1116 mm. and monthly rainfall ranges from nil rainfall in January to 207.5 mm in October. The percentage distribution of rainfall, season-wise, is 60.36% in southwest monsoon, 24.36 % in northeast monsoon, 0.97 percentage in winter and 14.3 % in summer. Geomorphologically the district can be divided into three regions, viz., and northern hilly terrain with valleys, middle pediplains and alluvial coastal plains. The northern half of the district is mainly occupied by the structural hills and valleys, which is part of the Eastern Ghats. The hill range trends parallel to coast. The average altitude of hills is over 900 m MSL. The hills are densely forested. By virtue of their topography, these hilly terrains largely form run off areas and are not suitable for ground water development. The valleys fill areas underlain by weathered formations in the Araku and Paderu areas posses' high infiltration and high permeability.

Soils found in the area around project road are red soils, sandy loams and sandy clay and they constitute 96% of the total area. The soil in the along the road are predominantly loamy with medium fertility. There are mostly red loamy soils, as far as dry lands are concerned and clay loamy in case of wet lands.

Air pollution means the presence in the outdoor atmosphere of one or more contaminants or combinations thereof in such quantities and of such duration as are or may tend to be injurious to human, plant or animal life or property. Air pollutants include particulate matter and gaseous pollutants. With project road activities a range of pollutants may be released into the atmosphere that will be dispersed and may have adverse impact on neighborhood air environment.

As per wind hazard map of Andhra Pradesh, the project road traverses in high damage risk zone for 80% of length and remaining 20% length in moderate zone. In general, India is divided into 4 seismic zones (II, III, IV, V); Zone –II being the least active seismic zone, whereas Zone-V is the highest seismic zone as given in Table 0 11 The project road falls under Zone – IV, which is at High risk and warrant earthquake resistant designs for structures. The Overall vulnerability of the project road can be stated as moderate

The study area of 133.974 Km comprises of 39.595 Km of forest area distributed between Nadimpalem and Rompula village is the longest having 12.2 km and with deep Ghat and curves which has got maximum number of species enumerated from the study. The terrain has an important influence and the occurrence of both flora and fauna. A simplified terrain-based designation of habitats recognized natural forest, cashew plantations (lower altitude), coffee plantations (higher altitude) and areas for settlement and cultivation. No national parks, wildlife sanctuaries or biosphere reserves occur in the vicinity of the route, however many forest reserves are present where wildlife is partially protected. Faunal studies revealed that wildlife is elusive and not easily detected. Wildlife presence was therefore assessed through community consultation, with at least 23 small and large wildlife species shown to be present. Priority species include Sloth Bear, Gaur (Bison) and Indian Pangolin. An assessment of the project design relative to expected wildlife occurrence revealed that most wildlife crossing requirements will be accommodated by the proposed drainage infrastructure. Recommendations are therefore provided within the EMP to expand one box culvert, install reflectors and three canopy bridges within the natural forest habitat.

E6 ANTICIPATED ENVIRONMENTAL IMPACTS

Physiographic impacts could be due to the construction of the embankments of one bypass (KD peta Bypass 3.340 Km) and 44 realignments in the length of 42.410 Km at Koyyuru - Paderu Section of NH-516E and improvement of sharp curves. The height and width of the embankment will be altered, when the road is widened and rehabilitated as per the new design for the project road. In most of the stretch along the project road, project will stick to the existing ROW without any noticeable changes.

Borrow earth will be required in the project road for filling and will be obtained from several borrow areas to be opened in the nearby areas or from the existing approved borrowing areas. Except the construction of embankments, there would not be any other impacts to geomorphology of the area during construction stage.

Most of the excavated materials from existing roads will be reused as construction materials. If not used, contractor may dispose of this in the nearby areas causing untidiness near disposal areas. Therefore, this is seen as a potential impact. It may increase soil erosion and could generate considerable impacts on natural drainage courses, and siltation to runoff during rains. Likely impact on the geological resources will occur from the extraction of construction materials like borrow of earth, granular sub-base and aggregate for base courses, culverts and bridges.

The project road is located in seismic zone II as per BIS classification with low seismic risk. All cross-drainage structures and bridges on the project roads need to consider the seismic coefficients with regards to the seismic energy propagation along the fragile geological/lithological strata. The construction and operation phase of the project road are not expected to add the seismicity issues due to the project road.

The biodiversity impact assessment and wild-life mitigation plan was prepared for the forest area in the project corridor and the mitigation measures like compensatory afforestation, wild animals habitat improvement, underpass proposed at 28 locations for the movement of mammals and reptiles.

The road has many alongside settlements and the traffic flow is seriously impacted by severe conflicts between the local and the through traffic on the road. This is further compounded by the various land use conflicts, in terms of uncontrolled development along the road and the encroachments onto the ROW.

E7 ALTERNATIVE ANALYSIS

The population growth, increase in traffic volumes and the economic development along the project road would continue to occur and will worsen the already critical situation on the road. The existing unsafe conditions and the adverse environmental consequences in terms of the environmental quality along the road would continue to worsen in the absence of the proposed improvements. Moreover, if it is decided not to proceed with the project, then the associated reduced socioeconomic development of this remote, relatively poorly connected area cannot be justified.

Therefore, the no-action alternative is neither a reasonable nor a prudent course of action for the project road, as it would amount to failure to initiate any further improvements and impede economic development. The 'with project scenario' is found to have a positive impact in the long run on social, environmental, economic and financial issues. This scenario includes the up gradation/widening to two lane up gradation with paved shoulders of the existing stretch as envisaged in the project objectives.

The scenario is economically viable and will improve the existing conditions. It, would thereby, contribute to the development goals envisaged by the Government of Andhra Pradesh and enhance the growth potential of the area. To avoid the large-scale acquisition of land and properties, the project envisages the possible 2-laning of the road within the existing ROW to the possible extent, In spite of the various development benefits likely to accrue due to the project, as is the case of every road development project; the project would be accompanied by certain impacts on the physical, biological and social environmental components.

The potential impacts on the various environmental components can be avoided through good environmental practices and implementation of mitigation measures. Wherever avoidance of negative impact has not been possible, appropriate mitigation and enhancement actions will be worked out to effectively offset the environmental impacts inflicted due to the project.

E8 GREEN INITAITIVES

Increasing demand for natural material for other construction activities e.g. building construction, urban development projects has put pressure on the exiting natural resources e.g. aggregates, sand, soil. Procuring natural construction material for the road construction has thus not only become difficult due to increased competition from other sectors but also escalated both time and money required for procuring them. Increased regulatory compliance requirements have also made availability difficult. Added to this is the increase lead distance because at times these materials have to be procured from quarries away from the construction site thus not only increasing cartage cost but also increasing the carbon-footprint of the project.

Carbon footprint is a commonly used term to describe the total amount of carbon dioxide (CO_2) and other greenhouse gas (GHG) emissions for which an individual or organization is responsible. It is usually defined as the total amount of CO_2 and other GHGs emitted over the full life cycle of a product or service. It measures the total GHG emissions caused directly by a person, organization, event or product. Carbon sources or carbon emission sources are formed in the pavement structure within the boundary of the pavement system, including a series of intermediate products and the unit process of collection. Bitumen pavement construction was divided into two parts, namely, Bitumen mixture production and Bitumen mixture construction. Bitumen mixture production includes aggregate stacking, aggregate supply, bitumen heating, aggregate

heating, and mixture mixing. The construction of Bitumen mixture was divided into Bitumen mixture transportation, Bitumen mixture paving, and compaction of Bitumen mixture.

Gaseous emission during construction will be from road construction machinery, equipment and trucks used for material transportation. The operation of vehicles and equipment will result in emissions of carbon monoxide, Sulphur dioxide, and oxides of nitrogen. The greatest impact on air quality due to emissions from vehicles and plant will be in the areas immediately adjacent to site access. Generally, additional vehicle movements generated during the construction phase will have the potential to influence the local air quality at sensitive receptors located at close proximity to road and pollutant concentration is likely to reduce with increase distance from road.

E9 PUBLIC CONSULTATIONS

The consultations are a necessary step to obtain the views of people who may be affected by development projects or may otherwise have an interest in their outcomes, and to inform them about changes that could affect them. Such feedback assumes greater significance in the case of people who may be adversely affected. Since these stakeholders usually do not have a direct role in decisions about projects that affect them, consultations are an important mechanism to ensure that their concerns are taken into account while these decisions are made. In view of above background public consultation meetings were planned duly having discussion with the PO and RDO at Paderu. In the planning process the views of concerned MROs have been taken up.

E10 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan has been prepared which mainly centered on the understanding of the interactions between the environmental setting and the project activities and the assessment of the anticipated impacts.

Mitigation measures for anticipated environmental impacts have been elaborated as specific actions which would have to be implemented during the project implementation. The EMP would help the contractors/PIU to implement the project in an environmentally sustainable manner and where contractors, understand the potential environmental impacts arising from the project road and take appropriate actions/mitigation measures to properly mitigate/manage such environmental impacts. EMP can thus be considered to be an overview document for contractors that will guide environment management of all anticipated impacts in proposed two lane up gradation with paved shoulders of Koyyuru - Paderu Section of NH-516 E. This EMP may also be considered as flexible and will be further developed by the Contractor in the Contractor's Environment Management Plan.

The Environmental Management Plan (EMP) will guide the environmentally-sound construction of the project road and ensure efficient lines of communication/co-ordination between the PIU, Contractor, GNHCP-PMU. The EMP has been prepared for three stages of project road construction activities as: (i) Pre-construction Stage; (ii) Construction Stage; and (iii) Demobilization Stage. EMP for above project road have been prepared and presented in Table 9-1. Various guidelines, checklists and reporting formats for implementation of EMP are given as Annexure at the end of EIA Report.

The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impacts of the project road; and (iv) ensure that safety recommendations are complied with.

Budgetary provisions for implementation of EMP shall be integrated with the bid/construction contract in the form of technical specifications and environmental performance requirements. The costs to be incurred on implementation of EMP shall be incidental to the civil works and therefore, no separate environment budget/cost will be provided to the contractor for implementation of EMP. A cost of 1195.585 Lakhs is under EMP Budget. The contractor will ensure effective implementation of EMP during pre-construction, construction and demobilization stages. EMP for operation stage will be implemented by PIU/PMU.

E11 EXECUTIVE SUMMARY OF SIA

1. Project Purpose

The project is envisaged to augment capacity for safe and efficient movement of traffic in the National Highways (NH-516E) corridor where the intensity of traffic has increased significantly. Improvements of these selected national highways would

improve connectivity, facilitate speedy and smooth transportation with less interruption at a lesser transport cost and in less time, induce economic development of existing growth centres, provide impetus for the development of new growth centres, employment generation and as a consequence poverty alleviation in the project areas would take place.

2. Resettlement Policy Framework

RPF describing the applicable policies and provisions, process for census survey and consultations, entitlement matrix and implementation programme is prepared which is the basis for preparing this RAP. The RPF can be found at:
https://morth.nic.in/sites/default/files/RPF_GNHCP_13072021.pdf
The applicable entitlement framework for compensation and R&R assistance, as available in the RPF, is also provided in subsequent sections of this report for ready reference. The principles, process and provisions described in RPF will be adhered to while implementing this RAP.

3. Resettlement Action Plan

The objective of this Resettlement Action Plan is to assist the affected people to improve or at least restore their living standards to the pre-impacted level and ensure timely payment of compensation and assistance. This RAP is limited to the impacts arising out of the land acquisition and physical displacement and associated impacts. The document describes the magnitude of impacts, mitigation measures proposed, eligibility criteria for availing compensations, baseline socio-economic characteristics, entitlements based on type of loss and tenure, the institutional arrangement for delivering the 11 entitlements and mechanism for resolving grievances and monitoring. The budget and time table for implementation are also provided.

4. Impacts and Land Acquisition

Land acquisition is done in the project locations as per the final alignment designs and the proposed RoW which is considered to be 24 m in the existing road, 30 m at realignment/bypasses and 17 m in the forest locations. In the proposed project road, the land is to be acquired for bypass, realignments, junction improvement, curve improvement and widening. The socio-economic survey has been conducted during April - July 2021 to assess the loss of structures and land along the proposed road alignment. A total of 37.43 ha land is to be acquired for the project. Of the total land to be acquired for the proposed project, 30.555 ha constitute of private land and government land constitutes about 7.307 ha. This area is spread across 3 packages. The acquisition is relatively more in the 1st and 3rd packages, whereas in package 2, it is only 4.398 ha. In all the packages, there is quite a high impact on structures. In package-3, more structures are impacted comparatively in the other two packages. As the road passes across many villages, the impact on the structures is relatively high. A sample has been collected from three packages. In package-3, 617 private structures and 43 Common Property Resources' (CPRs) have been furnished. Similarly, package-2 has 450 Pvt. Structures and 59 CPRs, and package-1 has215 and 30 private and CPRs, respectively. The package wise details are given in chapter 5. Among the project affected HHs, displaced families and livelihoods affected families are also observed. The Resettlement Action Plan is prepared for the project, based on the detailed socio-economic survey conducted for sample HHs for three packages. Among the CPRs affected, most of them are schools, temples, bus shelters etc.

The link for SIA: https://morth.nic.in/rehabilitation-and-upgradation-two-lane-paved-shoulder-configurations-koyyuru-paderu-road-section-km

The link for TDP: https://morth.nic.in/draft-tdp-project-rehabilitation-and-upgradation-two-lane-paved-shoulder-configurations-koyyuru

1 INTRODUCTION

1.1 BACKGROUND

The Ministry of Road Transport and Highways, under Government of India intends to develop and maintain National Highway 516E connecting to Koyyuru - Paderu road section (Km 120+000 to Km 253+974) in the State of Andhra Pradesh. Subsequently, M/s. Mukesh & Associates Consultant & Engineers in joint venture with Artefact Projects Ltd., Nagpur (Package no. NH/AP R&B-09) has been appointed for preparation of Feasibility cum Detailed Project Report (DPR) for Koyyuru - Chaparathipalem - Lammasingi - Paderu stretch in the State of Andhra Pradesh, for up-gradation to Two Lanes with paved shoulder configurations.

Roads and Buildings department, Government of Andhra Pradesh through their letter Lr. No/600/New NH/Pckg-5/EE (NH&CRF) DEE-6/AEE-3/2015-16, Agreement Number L.S.CR AGREEMENT NO: dated 03.08.2016 instructed the consultants to commence the assignment and the project activities. However, Ministry vide its letter RW/NH-24020/9/2016-EAP(Vol.III)Part dated 22.05.2020 established Project Implementation Unit (PIU), Visakhapatnam for the devlopment of project stretch and thereafter all the project related activites are being taken up directly by Ministry.

The NH-516E has been selected to uplift the weaker section of the vicinity and also to improve the tourism development at Lammasingi, Araku and Borra Caves etc., and enhance transportation of agriculture products like coffee, spices etc. in the region. This project highway lies in Visakhapatnam district in the state of Andhra Pradesh.

The project alignment is consolidation of existing SH-38 and Major and Other District Road passing through mainly Koyyuru, Krishnadevipeta, Chintapalli, Lammasingi and Paderu towns Chintapalli which forms an important artery for movement of main goods/defense goods from Rajamundry, Vijaywada and Chennai to Odissa and West Bengal. Major types of Goods transported through this road are Coffee, Agricultural Product along with seasonal crops. The project alignment is spanning through Visakhapatnam district with a total Existing length of 135.687 Kms. The main objective of the project road is to connect the tribal villages falling under the project stretch. The majority part of project road passes through tribal areas.

For construction point of view, the project corridor has been divided in to three packages as given below:

Table 1-1 Project Highway packages

S. N	Package	Design Chainage (Km)	Section	Length (Km)
1	Package I	Km 120+000 – Km 165+500	Koyyuru – Chaprathipalem	45.500
2	Package II	Km 165+500 – Km 205+000	Chaprathipalem - Lammasingi	39.500
3	Package III	Km 205+000 – Km 253+974	Lammasingi -Paderu	48.974
			Total Project Length	**133.974**

1.2 OBJECTIVES OF THE PROJECT

The main objective is, the upgradation of existing road to two-lanes with paved shoulder configuration; and alleviate the current unsafe and congested conditions of the project road connecting the villages and towns with one another and to the National Highway network for the benefit of the road users at large. A modest design speed for the safe and efficient movement of people and goods is also seen as the objective and the design reflects this.

This proposed project's aided aim is to provide congestion free, safe and smooth road to the users travelling through it and also to the population residing along it. The other objective of widening and strengthening the

project road is (with required cost effectiveness, coupled with environmental management standards) for achieving sustainable development of the region, state and ultimately the country.

1.3 EXISTING CONDITION OF THE PROJECT ROAD

The project road section from Koyyuru to Paderu passes through rural and semi urban sections. The total exisitng length of project road is 135.687 km. Major settlements along the project road are K.D Peta, Chinhapalli, Lammasingi, G. Madugula and Paderu. Almost 70% of the existing road is in moderate - poor condition. Out of which 37.06% project road is single lane, 28.94% road is intermediate lane to Two Lane, and 34 % road is two lane.

1.4 GREEN NATIONAL HIGHWAYS CORRIDOR PROJECT (GNHCP)

Two lane upgradation with Paved Shoulders of Koyyuru - Paderu Road Section of NH-516E is proposed and constructed under Green National Highways Corridor Project (GNHCP) through its support to the Govt. of India's Bharatmala Pariyojana and financed by the World Bank. It will promote the vision of enhancing effectiveness of the transport network of India with cost and natural resources efficiency and safe high capacity highways.

The GNHCP operation is aligned with the Government of India's objective of eliminating poverty and ensuring access to minimum standard of basic needs for all citizens through investing in growth enablers transport & connectivity Infrastructure. The basic proposition of the GNHCP includes strengthening of road pavement in addition to widening to two-lane/two-lane with paved shoulder standards and promoting/ demonstrating green and resilient approaches while doing so. The list of roads (sub-projects) identified for inclusion in this project are given in below Table 1-1.

Table 1-2: The list of roads (sub-projects) identified for inclusion

S.No	State	Highway	Section	Length (In kms)
1	Andhra Pradesh	NH-516E	Koyyuru-Paderu	133.974
2	Andhra Pradesh	NH-516E	Bowdara to Vizianagram	26.94
3	Andhra Pradesh	NH-516E	Paderu-Araku	49.37
4	Himachal Pradesh	NH-707	Poanta Sahib to Gumma	94.99
5	Himachal Pradesh	NH-707	Gumma to Fediz	9.8
6	Rajasthan	NH-158	Ras-Beawar-Mandal	116.75

1.5 PROJECT HIGHWAY: KOYYURU-PADERU ROAD SECTION OF NH-516E

The project highway starts from Koyyuru (17°38'9.53"N Latitude, 82°13'58.60"E Longitude) and ends at Paderu (18°4'48.68"N Latitude, 82°39'49.32"E Longitude). The existing length of project highway is 135.687 kms. The project stretch traverses through Rolling & Plain (80%) and hilly terrain (20%) and have mostly poor geometry except at few locations where curve improvement may not be required. The project road is located in Visakhapatnam district of Andhra Pradesh.

The project road connects the important towns/villages like K.D.Peta, Chinthapalli, Lammasingi, G.Madugula and Paderu.The project road starts from Koyyuru at existing chainage Km 45/900 to 26/181 of SH 38 route from Narsipatanam to Koyyuru, 0/00 to 42/410 of Other District Road (ODR) route from K.D.Peta to Rintada , Km 54/132 to Km 29/420 of Major District Road (MDR) route from Narsipatanam to Sileru, Km 26/509 to Km 0/00 of Other District Road (ODR) Alignment route from G. Madugula to Lammasingi and Km 22/337 to Km 0/000 of Major District Road (MDR) route from G. Madugula to Paderu ends at Paderu on NH-516E in Visakhapatnam district of Andhra Pradesh. The other improvements would include removal of geometric deficiencies, repairs, rehabilitation of bridges, culverts, embankment and providing traffic safety

measures.The index map of the project road has been shown in the Figure 1-1. The alignment marked on the Survey of India (SOI) topo sheet is presented in the Figure 1-2.

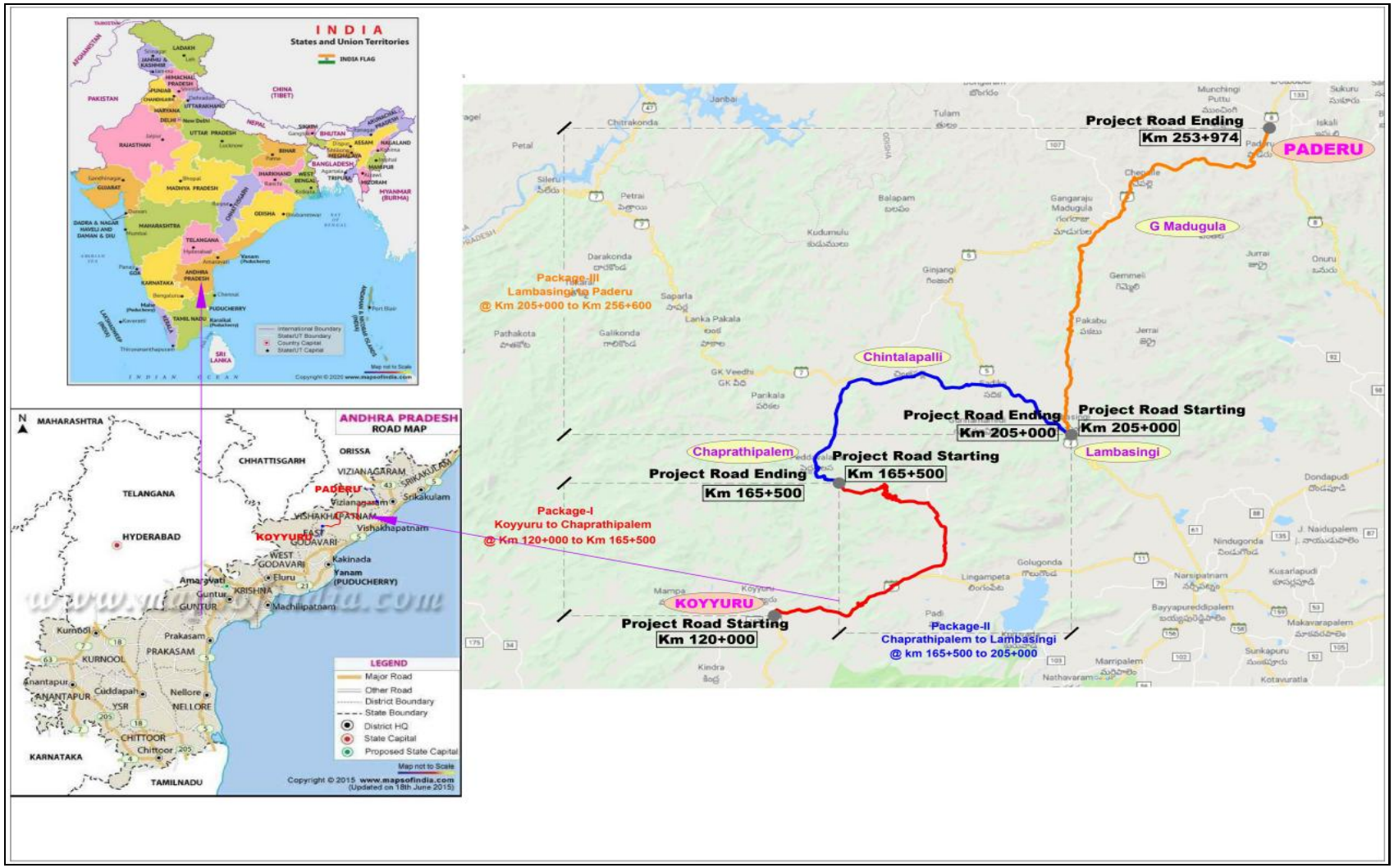


Figure 1-1: Key map showing project road

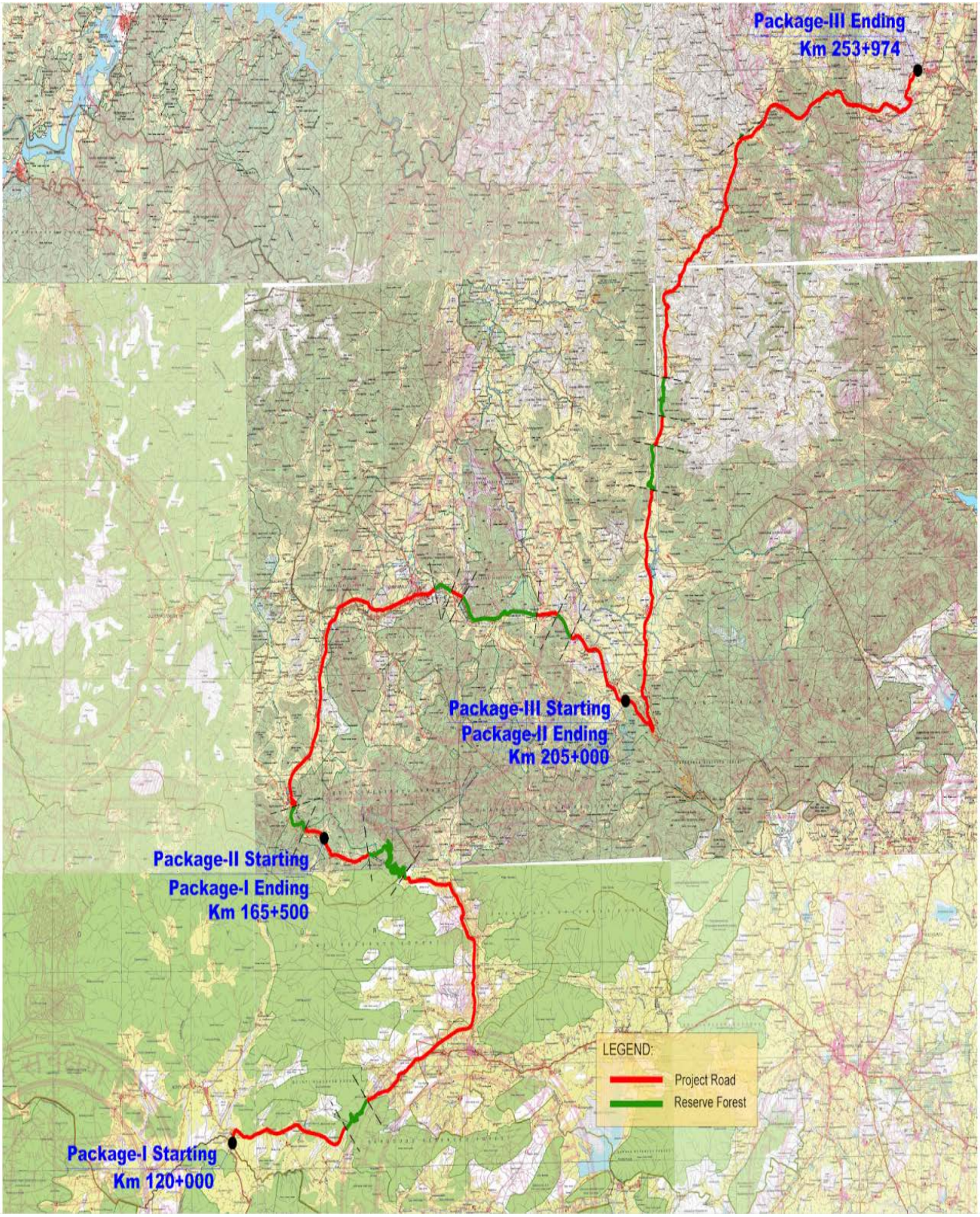


Figure 1-2: Topo map showing the project road

1.6 NEED OF THE PROJECT ROAD

The Project Highway connects Chintapalli, Lothuguda, and Paderu in Vishakhapatnam District. This project Highway will lead to great substantial development in the state of Andhra Pradesh from point of view of Economy & Transportation.

The proposed project road between Koyyuru -Paderu will facilitate the transportation of agriculture produce from the surrounding areas in Visakhapatnam district to their market places in Andhra Pradesh and Orissa by enabling movement of heavy vehicles in all weather conditions.

NH-516E serves as the major arterial road for North West part of Andhra Pradesh state and connects Bharatmala Corridors viz, NH-16 (AH45) at Rajahmundry and NH-26 at Vizianagaram to Jagdalpur at Chhattisgarh state improving the lower weaker sections of the region.

The project alignment is a consolidation of existing SH-38 (NH-516E),MDR and ODRs passing through mainly Koyyuru, Krishnadavipeta, Chinthapalli, Lothugedda and Paderu towns and forms an important artery for movement of main goods/defense goods from Chennai -Vijayawada- Rajamundryto Odissa - West Bengal.

The project alignment also boosts Tourism in hill stations i.e.,Lammasingi, Araku and Borra Caves. It also helps to connect the tribal villages, follies under the project stretch and providesimproved transportation facilities forlocally produced major goods like coffee, cashew, tamarind, turmeric and many other agricultural produces.

Creates development of more Health facilities, Educational Opportunities, Trading for the tribal people especially for Women, Improves Road Safety, Enhances mobility to remote places and Facilitates overall economic development of the region

Logistic Efficiency:
The project Road substantially improves the good network between Andhra Pradesh and Orissa and it provides connectivity to around 19 villages along the Project corridor. By improving this road, the movement of all kind of heavy vehicles will be ensured in all weather conditions, also improve the transportation of agricultural products from the surrounding areas to the market places. The average Roughness value will be reduced to about 2,200 mm per km compared to the existing level of more than 4,000 mm per km. With improvement of this Project Road, reduction in Travel time, Vehicle Operating Costs (VOC) and Traffic congestion will be achieved. The tourism also will be improved by connecting the places like Lammasingi, Araku and Borra caves etc.,

Resource Efficiency:

The excavated material from Road cutting will be utilized in Embankment filling, filling of low lying areas, landscaping at Tourism spots, as well as rehabilitation of borrow areas. The 65% (approx) of the cut material found suitable, will be utilized for road construction before taking the material from borrow areas. Approximately 1.4 lakh cum of rock cutting may be utilized for producing aggregates for concrete & for bituminous layers and stone masonary breast/ retaining wall. Material obtained by dismantling of structures will be used in backfilling of low lying areas along the Project corridor. By using cement treated base the thickness of BT layer may be reduced giving rise to resource efficiency. Thus, use of transport and earth-moving machinery will be reduced substantially. Also, during construction phase efforts may be made to engage unskilled local labour in order to generate employment opportunities in the region.

Green Corridor:

Use of aggregates will be minimized by adopting the cement treated bases in pavement design, construction of gabion walls in place of retaining walls on hill side, slope protection etc., Slopes will be protected by vegetation in place of stone pitching to avoid erosion. Energy dissipating like check dams, collection chambers or water harvesting for valley portions at all culverts on both upstream and downstream.

1.7 BENEFITS OF THE PROJECT

The implementation of the project will have the following direct benefits:

The project road widening will help in economic growth along the project road and surroundings.
Strategic importance of the Project road: The national highway 15 connects two metropolitan cities of Chennai & Kolkata but passes along the east coast. A large part of the hinterland in Andhra Pradesh is thus not served by this highway. NH-516E meets the strategic requirement. It originates from NH-16 at Rajahmundry and terminates at Vizianagaram, thus serving the districts of Anakapalle, ASR Raju and Vizianagaram. These packages 1, 2 & 3 serves ASR Raju and Vizianagaram districts.

Improved quality of life is expected among the population in the project influence area. The project road widening will provide economic boost to the local population through facilitation of easy transportation of materials to the commercial centres.
Employment & business opportunities will be available to the locals during construction phase.

Social benefit: The road widening will help in social development of Andhra Pradesh and population residing along the project road and with rise in social activities, there may be intermingling to have a more cohesive culture.

Improvement in Road Safety: The existing road suffers with many safety issues such as deficient curves, congested habitations etc., The proposed project will help in road improvement and will help in reduction of accidents. The road geometry is being adjusted to improve deficient curves.

The proposed project road (PR) with a total length of 133.974 km, is based on its importance of strengthening the road linkage between Koyyuru -Paderu in Visakhapatnam district, which along with upgradation of Bowdara-Vizianagaram and Paderu –Araku stretches also on NH-516E forms an important artery for movement main goods (e.g. coffee, spices, agricultural produce and seasonal crops) between Andhra Pradesh and Orissa.

The proposed upgradation would help improve the horizontal and vertical geometry, develop high level bridges in place of causeways and narrow bridges and enhance safety features thus enabling movement of heavy vehicles in all weather conditions, reducing travel times, vehicle operating costs, and traffic congestion, and improve the transportation of agricultural products from the surrounding areas to the marketplaces.

The project road, which passes through Koyyuru, K.D Peta, Chintapalli Lammasingiand Paderu and also provides connectivity to around 64 villages in terms of the connectivity linkages to these towns and villages. Tourism is already a major contributor to Andhra Pradesh's economy, with a contribution of around 13%. Upgradation of the Project road along with upgradation of Bowdara-Vizianagaram and Paderu -Araku stretches of NH-516E, would improve connectivity for tourists visiting various famous tourist destinations in the region such as Lammasingi (a small village in the Eastern Ghats of Chintapalli mandal in A.P. at an altitude of 1,000 m above sea level with a deciduous forest cover consisting of several

coffee, pine, and eucalyptus plantations, and known for its diversity of bird life), Araku Valley (located in the Eastern Ghats about 114 kilometres from Visakhapatnam, close to the Odisha state border, and famous for its coffee plantations, which are largely in the tribal areas), Borra caves (located in the Ananthagiri hills of the Araku Valley caves, these are considered the deepest caves in the country, at an elevation of about 705 m). Better connectivity would enhance work force participation and tourism related activities in the region.

In addition to the above, other various positive impacts and benefits expected from the proposed project are furnished below.

- **Improvement of project road would increase new economic and employment opportunities by catering good connection to new markets and production centres. As a result villagers would be able to transport their produce faster and get more profit margins instead of depending solely on local 'haats' and middlemen.**
- **With this project, good connectivity would attract industrialists, businessmen to set up agro-based industries on the locally produced natural fruits and vegetables. Thus, It will create opportunity in the uplift of poor farmers.**
- **Improved connectivity will attract tourists.**
- **Improves the condition of existing traffic flow by removing all bottlenecks at various locations.**
- **With road improvement, it will reduce the cost of transportation and fuel consumption.**
- **Increases the carrying capacity of the existing traffic volume and enable it to cater to the future traffic.**
- **Essential and emergency services like schools, health centre, public distribution system etc., can be availed faster.**

1.8 NEED OF ENVIRONMENTAL IMPACT ASSESSMENT STUDY (EIA)

The objective of Environmental Impact Assessment is the characterization of existing status of the environment, to identify the probable adverse and positive impacts on the environment and community due to the proposed project and to delineate various measures to mitigate the adverse impacts and to enhance positive environmental impacts.

The Environmental Assessment provides tool for decision-making as well as it helps in ensuring the sustainable development with mitigating adverse environmental impacts by providing site specific Environmental Management Plan (EMP). In order to achieve these objectives, detailed surveys and monitoring have been carried out along the proposed project road to identify Valued Ecosystem Components (VEC) and project specific significant environmental issues (SEI).

1.9 SCOPE OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The scope of EIA is to meet the Environmental Framework requirements and environmental assessment guidelines of the World Bank by collecting primary and secondary environmental baseline data within the project boundary and surrounding areas;

Assessing potential adverse environmental impacts that might arise during design, construction and operation phases with respect to design proposal of the project and using the environmental baseline study;

Suggesting appropriate mitigation measures to effectively manage potential adverse environmental impacts; and Analyse the alternatives in terms of alternatives of upgradation of the alignment, technology, design and operation, including the "without and with project" situation. A detailed analysis for each of the alternatives, was carried out to analyse the feasibility in terms of capital and recurrent costs; their suitability under local conditions and quantify the environmental impacts to the extent possible, and attach economic values where feasible and explain the rationale behind the preferred/chosen option

There are six Public Consultations conducted with the Public/key Stakeholders and incorporate their concerns into the project design.

Developing an Environmental Management Plan (EMP) including Environmental Monitoring Plan (EMoP) to implement suggested mitigation measures and management plans to minimize adverse impacts through effective management systems including formulation of monitoring and reporting requirements and formats for implementation of the EMP components.

1.10 APPROACH AND METHODOLOGY OF EIA STUDIES

The methodology for the EIA study employs a traditional approach of identifying the environmental sensitivities along the project corridor and analysing the identified environmental issues. The EIA process simultaneously informs the design of the project road about these issues so that necessary modification can be carried to minimise these environmental concerns.

Thereafter, the impact assessment that is carried out would identify the impacts which are still likely to happen and also identify mitigation measures which need to be adopted during the construction and operation of the National Highway.
Social Impact Assessment (SIA) and Tribal Development Plan (TDP) has been prepared as stand-alone documents.

1.10.1 ENVIRONMENTAL SCREENING AND SCOPING

Environmental screening exercise of the project road has been undertaken to facilitate inputs on environmental considerations and scoping inputs in determining the major environmental issues and defines the scope of work for conducting environmental assessment.

Screening is the first stage of the EIA process. The screening procedure is necessary and intended to ensure that the form or level of impact on Environmental parameters is commensurate with the importance of the issues raised by a proposal for road development.

The screening process can have one of four outcomes:

- **No further level of EIA is required**
- **Comprehensive EIA is required**
- **Limited EIA is required (often called preliminary or initial assessment)**
- **Further study is necessary to determine the level of EIA required**

Methodology (Step by Step Process) adopted for Environmental Screening Exercise:

The requirements for screening and the procedure to follow are often defined in the applicable EIA law or regulations. The screening is to carry out prior to the development of the project so that the proponent and other participants are aware of the EIA obligations.

Specific methods used in screening include:
Legal (or policy) approach for the applicability of EIA
Inclusion list of projects (with or without thresholds) for which an EIA is automatically required.
Exclusion list of activities which do not require EIA because they are insignificant or are exempt by law (e.g. national security or emergency activities).

The study is being carried out in following stages:

Assessment of the potential significant impacts and identification of the mitigation measures to address impacts adequately.

- Reviews of literature, laws and guidelines and discussions with concerned agencies and organizations, National & State Authorities and on-site;
- Reconnaissance survey along with public consultation to inform the people about the project and collect the information/suggestions on environmental issues. The environmental data to be collected within a corridor of 100 meters of center of road after Monsoon Season. The vegetation analysis has been carried out by counting the number of trees within corridor of direct impact and observing the vegetation density along the project road;
- Interaction with other members of the Project Team to ensure that environmental considerations were given adequate weight in project planning and design — data and other material.

The monitoring network with regard to air, water and noise pollution

- The study of analysis of alternatives incorporating environmental concerns including 'with' and 'without' project scenario and modification in the proposed project due to environmental considerations.

As per the recommendation of the Environmental Screening report, detailed Environmental Assessment will be taken up as a next step of the consultants in the assignment. The scoping exercise defines geographical boundaries for the project road for impact assessment as well as defining the project influence area to assess the impacts due to project interventions during construction and operation phases.

The environmental screening typically identifies the natural habitats (e.g. national parks, wildlife sanctuaries, sacred groves, protected areas, forests, water bodies etc.), major rivers and waterways, notified cultural heritage sites and any other potentially sensitive areas. The information available from secondary sources along with the inputs from the site visits and consultation with local people are used to identify these issues and sensitive receptors which might be located along the project corridor.

1.10.2 DELINEATION OF THE PROJECT IMPACT ZONE

For carrying out further environmental studies and subsequently the assessment, it was required to delineate the Corridor of Impacts (COI) and Project Influence Zone. Depending on the severity of impact the project influence zone has been classified as:

1.10.3 CORRIDOR OF IMPACT (COI) AND PROJECT INFLUENCE ZONE

The area of the proposed Right of Way (ROW) has been considered as the Corridor of Impact. The proposed RoW is 30m at re-alignments and bypasses, 24m at existing and rural areas and 20m in forest area. At Toll

plaza it is 40 to 90 m. The project influence zone has been considered as 10 km[1] either side of the project road.

1.10.4 COLLECTION OF PRIMARY AND SECONDARY ENVIRONMENTAL DATA

Primary and secondary data were collected through field monitoring and various verifiable sources for different environmental components e.g. ambient air, soil, water, noise, climate, physiography, ecology, etc.

1.10.5 COLLECTION OF PRIMARY BASELINE INFORMATION

Baseline studies were conducted for gathering the environmental conditions along the project corridor, these studies includes,

- **Baseline environmental surveys for assessing the ambient air, ground and surface water, soil and noise levels.**
- **Enumeration of trees to identify the location, number, types spread, girth, etc. Local name, value of the trees within the proposed RoW;**
- **Separate Ecological surveys to identify the habitats and the flora & fauna and Bio-diversity impact assessment of the forest areas abutting the Project highway.**
- **Socio-economic surveys to identify the condition of the impacted persons.**

In addition to the above, survey interactions were carried out with the populations along the project corridor to gather local level information on the following:

Local practices and traditions with respect to conservation and use of natural resources:

- **Farming practices and Cropping pattern;**
- **Perception of the people about the project**
- **Traffic surveys were used to estimate the present and future traffic**
- **Preliminary engineering surveys to identify the topographical features**

This information was used to develop the baseline environmental condition in the project area and identify the environmental sensitivities which might still get affected by the proposed alignment. The sources from which baseline information gathered are presented in Table 1-3.

Table 1-3: Secondary Data Collected for EIA Studies

Environmental and Social Aspect	Parameters of Concern	Source of Information
Climatic Condition in the Project Influence Area	Temperature and Rain Fall	IMD (Indian Metrological Department)
Soil & Geology	Soil type and its stability, Fertility of the Soil potentiality for soil erosion	Geological Survey of India, State Mining Department
Slopes	Direction of slope, Percentage of slope	Contour Survey, Satellite image and Survey of India topographic

[1] As per EIA manual for highway sector, the project influence zone is considered as 10 km radius. Landuse and physical environment studies are carried out for 10 km radius from Project road. However, for ecological & other studies, aspect-wise project influence area has been defined in the EIA manual {highways-title.cdr (environmentclearance.nic.in)}.

Environmental and Social Aspect	Parameters of Concern	Source of Information
Drainage/ Flooding	Existing drainage map and flooding level including its extent of water spread. Identification of drainage channel and its catchments area around the Project stretch	Satellite Imagery/ Topo sheet /Hydrology study/State Water Resource Department.
Water Bodies and Water Quality	Identification of water bodies/canal/drainage channels where the run off surface water will flow/due to erosion and also due to spillage oil and other hazardous materials. Status of surface water and ground water quality	Topo sheets/field study. Hydrological data from the CGWA Reports
Air Quality	Air quality status of the project area.	Monitoring of the ambient air quality carried out by the Savant Enviro. Tech Pvt. Ltd, an NABL Accredited Laboratory.
Ambient Noise levels	Existing noise level in the project area	Monitoring of the ambient noise level carried out by the Savant Enviro. Tech Pvt. Ltd an NABL Accredited Laboratory.
Forest Within Proposed ROW Legal Status – Protected Areas, Endangered Plant and Animal, Ecological Sensitive Area, Migratory Corridor/ route,	Status of the forests, Conservation of forest area, & endangered plant and animal and any other species	Department of Forest, Govt. of Andhra Pradesh, DFOs, Discussion with local community and local FRO
Trees and Vegetation Cover	Identification of existing tree species and the project influence area	Forest Department and Field Survey.
Settlements within the PROW	Settlements & its population along the corridor. Its location & numbers	Population/ District Census report 2011. Topographic survey data.
Cultural / Heritage and Ancient Structures.	Conservation areas if any Protected structures, monuments and heritage structures.	Archaeological Survey of India, State Archaeological Department

1.10.6 CONSULTATION WITH KEY STAKEHOLDERS

During the EIA process, a preliminary identification of key stakeholders was carried out. An inventory of actual / potential stakeholders, including local groups and individuals, local institutions which may be directly or indirectly affected by the project or with interest in the development activities in the region was made at a preliminary stage.

Actual stakeholders were identified through discussions with local Revenue department officials and also in consultation with members of the local community.

Consultation with the community is a continual process that was carried out during the EIA study and would also be continued during the construction and operation phases of the project. The consultations

with community and local institution like panchayats also helped in developing preliminary understanding of the requirement of people in the area and identification of the enhancement proposals.

1.10.7 IMPACTS IDENTIFICATION AND EVALUATION

The principal impact assessment (IA) steps comprise of the following:

Impact evaluation: to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/ receptor.

Impact prediction: to determine what could potentially happen to resources/receptors as a consequence of the project and its associated activities.

Mitigation and enhancement: to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.

Residual impact evaluation: to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

1.10.8 ENVIRONMENTAL MANAGEMENT AND MONITORING

The final stage in the EIA Process is preparation of the management and monitoring measures that are needed to ensure:

Environmental Impacts and their associated project components remain in conformance with applicable regulations & standards and Mitigation measures which would be effectively implemented.

An Environmental Management Plan is a compilation of control and mitigation measures to be implemented with respect to environmental performance for the project road. The Environmental Management Plan includes mitigation measures, budgetary estimates, performance indicators, reporting and monitoring activities.

1.10.9 THE LIMITATIONS OF EIA STUDY

The EIA report is based on the preliminary designs which were prepared for the road. Further, the report has been developed based on information available, scientific principles and professional judgement to certain facts with resultant subjective interpretation. Professional judgement expressed herein is based on the available data and information.

1.10.10 STRUCTURE OF THE EIA REPORT

The EIA report for the project road has been prepared by complying to country's regulations and The World Bank Guidelines for Environmental Assessment. The EIA report has been structured in the following Chapters:

Chapter 1: Introduction describes background, brief description of project road, needs and benefits of the project road, scope of environmental assessment, needs of EIA study, approach and methodology adopted and structure for EIA report.

Chapter 2: Project Description describes existing road conditions and facilities, traffic projections, right of way, proposed bypass and realignment, proposed roadway improvements, bridge and cross drainage structures, junctions improvement, underpass, community facilities, construction materials requirement and sources, way side amenities, road safety improvement proposal, etc.

Chapter 3: Policy, Legal and Administrative Framework presents the legal and administrative framework of World Bank, Government of India and Government of Andhra Pradesh. This section underlines various clearances, permissions, consents involved for the project road at the State level and at the Central level.

Chapter 4: Baseline Environmental Conditions presents the existing environmental conditions along the corridor, which were ascertained by conducting a field survey along with collection of secondary information pertaining to the corridor. Primary data for various environmental parameters was generated using suitable monitoring devises. The methodology was strictly adhered to the stipulated guidelines by MOEF&CC and CPCB.

Chapter 5: Anticipated Environmental Impacts describes identification and evaluation of anticipated environmental impacts caused on various environmental and social parameters by the various activities proposed for the upgradation of the project road.

Chapter 6: Analysis of Alternatives presents analysis of alternatives carried out during EIA studies considering with and without project, alternatives for bypasses and realignments, pavement technologies, construction materials, etc.

Chapter 7: Green Initiatives Chapter describes green highway, green initiatives, GHG emissions reduction and climate resilient initiatives adopted in the project and estimated GHG emissions reduction.

Chapter 8: Consultations with Key Stakeholders provides details of consultation carried out in order to know the feedbacks of local population and the project affected people (PAP). Key stakeholder Consultation meetings were held with the stake holders to record their views on the environmental issues pertaining to the road and the suggested remedies to be adopted for the proposed project road.

Chapter 9: Environmental Management Plan describes mitigation measures to avoid or minimization of anticipated environmental impacts during design, preconstruction, construction and de-mobilization phases. Environmental Management Plan that include institutional aspects of the project implementation and cost estimates for implementation of EMP.

Annexures referred in the EIA report have been enclosed at the end of EIA report.

2 PROJECT DESCRIPTION

2.1 PROJECT ROAD

The project highway starts from Koyyuru (17°38'9.53"N Latitude, 82°13'58.60 E Longitude) and ends at Paderu (18°4'48.68"N Latitude, 82°39'49.32"E Longitude). The existing length of project highway is 135.687 kms traversing through K.D.Peta, Chinthpalli,Lammasingi, G.Madugula and Paderu in the district of Vishakhapatnam of Andhra Pradesh State. The key map of the project road is shown in Figure 2-1.

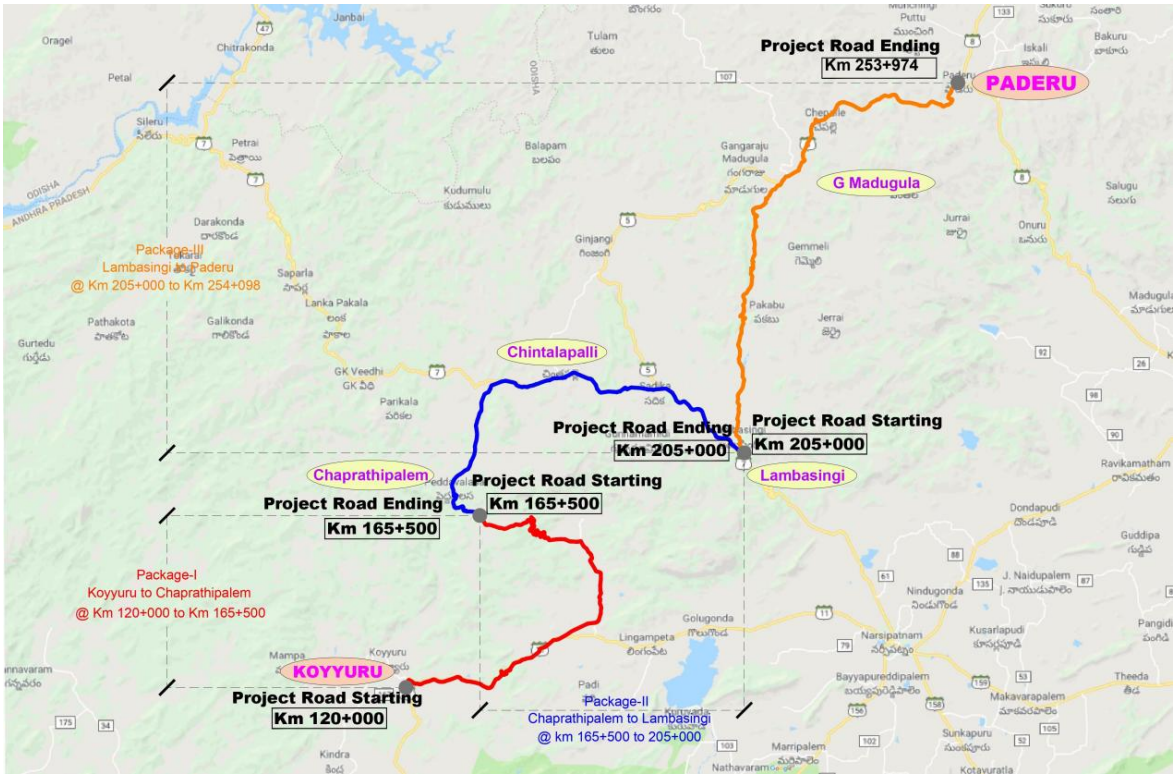


Figure 2-1: Key map of the project road

The project road starts at existing Km 45/900 on SH38 (Design chainage:120+000) at Koyyuru and ends at existingKm 0/000 on MDRroute from Paderu to G. Madugula (Design chainage:253+974) at Paderu. The project road traverses through rolling and hilly terrain and have mostly poor geometry. The existing length of the road is 135.687 kms. The proposed road is the part of NH-516E. District wise project road alignment details are given in Table 2-1.

Table 2-1: District wise project Road alignment

Road section	From (km)	To (km)	Length(km)	District
NH-516E	120+000	253+974	133.974	Visakhapatnam

Most of the land along the project road is passing adjacent to agricultural area, built up areas and the forest area whereas there is nominal barren land. The forest land involved in the proposed project is of approximately 60.06Ha.

2.2 PROJECT FEATURES

The features of the existing road are presented in the following sections.

2.2.1 RIGHT OF WAY

The Right of Way along the project corridors varies from 14.00 m to 30.00m (Design chainages are given in Table 1-3)

2.2.2 SETTLEMENTS

The project road traverses through six major built-up/settlements. The presence of these settlements obstructs the flow of traffic due to reduction in speed and also creates a potential hazard to pedestrians. The major settlements along the road are listed in Table 2-2.

Table 2-2: List of Major Built-Up / Settlements along Project Road

S.No	Name of village/ Town/ Habitation	District
1	Koyyuru	Visakhapatnam
2	K.D.Peta	
3	Chinthapalli	
4	Lammasingi	
5	G.Madugula	
6	Paderu	

The constraint of improving or upgrading the current road is the land availability in these built-up sections.

2.3 MAJOR VILLAGES/TOWNS ON PROJECT ROAD

The villages and settlements are on either side of the project road. The details of settlements along the project road are tabulated below.

Table 2-3: Details of settlements along the project road in Koyyuru to Paderu section

Package	District	Mandal	Name of Village	Design Chainage (Km)		
				From	To	Length
I	Visakhapatnam	Koyyuru	Pothavaram (24)	120+000	121+900	1.9
I	Visakhapatnam	Koyyuru	Nadimpalem (26)	121+900	126+400	4.5
I	Visakhapatnam	Koyyuru	Chintalapudi (28)	126+400	128+850	2.45
I	Visakhapatnam	Koyyuru	Bointi Reserve Forest	128+850	131+800	2.95
I	Visakhapatnam	Koyyuru	Ravimanupakalu (30)	131+800	132+450	0.65
I	Visakhapatnam	Koyyuru	Ravanapalli (169)	132+450	134+520	2.07
I	Visakhapatnam	Koyyuru	Yerranaidupakalu (168)	134+520	135+540	1.02
I	Visakhapatnam	Gollugunda	Chidikada (157)	135+540	137+300	1.76
I	Visakhapatnam	Gollugunda	Krishnadevipetta (156)	137+300	138+150	0.85
I	Visakhapatnam	Gollugunda	Lakshmipur (155)	138+150	139+880	1.73

Package	District	Mandal	Name of Village	Design Chainage (Km)		
				From	To	Length
I	Visakhapatnam	Koyyuru	Bhimavaram (65)	139+880	141+780	1.9
I	Visakhapatnam	Koyyuru	Valasampeta (63)	141+780	143+160	1.38
I	Visakhapatnam	Koyyuru	JajulapalemAliasRamarajupalem (62)	143+160	144+350	1.19
I	Visakhapatnam	Koyyuru	Makaram (38)	144+350	145+890	1.54
I	Visakhapatnam	Koyyuru	Nadimpalem (59)	145+890	147+960	2.07
I	Visakhapatnam	Koyyuru	Nallagonda (60)	147+960	146+960	1.07
I	Visakhapatnam	Koyyuru	Battapanakulu (41)	146+960	149+070	1.11
I	Visakhapatnam	Koyyuru	Katragedda (42)	149+070	151+170	2.1
I	Visakhapatnam	Koyyuru	Bointi Reserve Forest	151+170	162+640	11.47
I	Visakhapatnam	G.K.Veedhi	Rampulu (350)	162+640	165+200	2.56
I	Visakhapatnam	G.K.Veedhi	Chaprathipalem (351)	165+200	167+670	2.47
I	Visakhapatnam	G.K.Veedhi	Bointi Reserve Forest	167+670	169+900	2.23
II	Visakhapatnam	G.K.Veedhi	Pedavalasa (198)	169+900	171+380	1.48
II	Visakhapatnam	G.K.Veedhi	Pedajadumuru (205)	171+380	173+700	2.32
II	Visakhapatnam	G.K.Veedhi	Nimmalapalem (204)	173+700	175+310	1.61
II	Visakhapatnam	G.K.Veedhi	Yernabilli (210)	175+310	175+730	0.42
II	Visakhapatnam	G.K.Veedhi	Sankada (209)	175+730	177+100	1.37
II	Visakhapatnam	G.K.Veedhi	Asarada (212)	177+100	179+100	2
II	Visakhapatnam	G.K.Veedhi	Rinthada (334)	179+100	182+620	3.52
II	Visakhapatnam	Chintapalli	Antharla (361)	182+620	186+000	3.38
II	Visakhapatnam	Chintapalli	Chinagedda (376)	186+000	189+200	0.94
II	Visakhapatnam	Chintapalli	Chinthapalli Reserve Forest	189+200	190+600	1.4
II	Visakhapatnam	Chintapalli	Rowrintada (377)	190+600	192+300	1.7
II	Visakhapatnam	Chintapalli	Krishnapuram (409)	192+300	198+550	2.43
II	Visakhapatnam	Chintapalli	Madigunta (410)	198+550	200+300	2.4
II	Visakhapatnam	Chintapalli	Rajupakalu (412)	200+300	201+850	1.55
II	Visakhapatnam	Chintapalli	Diguvapakalu (419)	201+850	202+700	0.85
II	Visakhapatnam	Chintapalli	Chitralagoppu (418)	202+700	203+050	0.35
II	Visakhapatnam	Chintapalli	Lammasingi(420)	203+050	208+500	5.8
III	Visakhapatnam	Chintapalli	Tajangi (432)	208+500	213+600	5.1

Package	District	Mandal	Name of Village	Design Chainage (Km)		
				From	To	Length
III	Visakhapatnam	G.Madugulla	Kistapuram (1351)	213+600	215+300	1.7
III	Visakhapatnam	G.Madugulla	Pinakiltaru (1352)	215+300	216+400	1.1
III	Visakhapatnam	G.Madugulla	Pedakil Taru (1353)	216+400	217+400	1
III	Visakhapatnam	G.Madugulla	Varagulapalem (1331)	217+400	225+400	2.1
III	Visakhapatnam	G.Madugulla	Balamanusanku (1329)	225+400	225+900	0.5
III	Visakhapatnam	G.Madugulla	Kulapadu (1328)	225+900	228+100	2.2
III	Visakhapatnam	G.Madugulla	Maddulabanda (1326)	228+100	230+100	2
III	Visakhapatnam	G.Madugulla	Madhuramamidi (1324)	230+100	231+000	0.9
III	Visakhapatnam	G.Madugulla	Pedavurumu (1323)	231+000	231+800	0.8
III	Visakhapatnam	G.Madugulla	Gangarajumadugula (580)	231+800	234+100	2.3
III	Visakhapatnam	G.Madugulla	Pathagangarajumadugula (575)	234+100	235+900	1.8
III	Visakhapatnam	G.Madugulla	Nittaputtu (571)	235+900	236+500	0.6
III	Visakhapatnam	G.Madugulla	Singam (573)	236+500	237+800	1.3
III	Visakhapatnam	G.Madugulla	Bandaveedhi (562)	237+800	239+800	1.5
III	Visakhapatnam	G.Madugulla	Ganneruputtu (563)	239+800	240+500	0.7
III	Visakhapatnam	G.Madugulla	Kondalakodapalli (560)	240+500	244+200	3.7
III	Visakhapatnam	Paderu	Solamulu (559)	244+200	244+800	0.6
III	Visakhapatnam	Paderu	Eradapalli (549)	244+800	244+900	0.1
III	Visakhapatnam	Paderu	Ladaput (552)	244+900	246+300	1.4
III	Visakhapatnam	Paderu	Gonduru (554)	246+300	249+100	2.8
III	Visakhapatnam	Paderu	Karakaputu (617)	249+100	250+600	1.5
III	Visakhapatnam	Paderu	Lagisapalli (619)	250+600	251+600	1
III	Visakhapatnam	Paderu	Paderu (618)	251+600	253+400	1.8
III	Visakhapatnam	Paderu	Gudivada (633)	253+400	253+974	0.574

2.3.1 EXISTING TRAFFIC

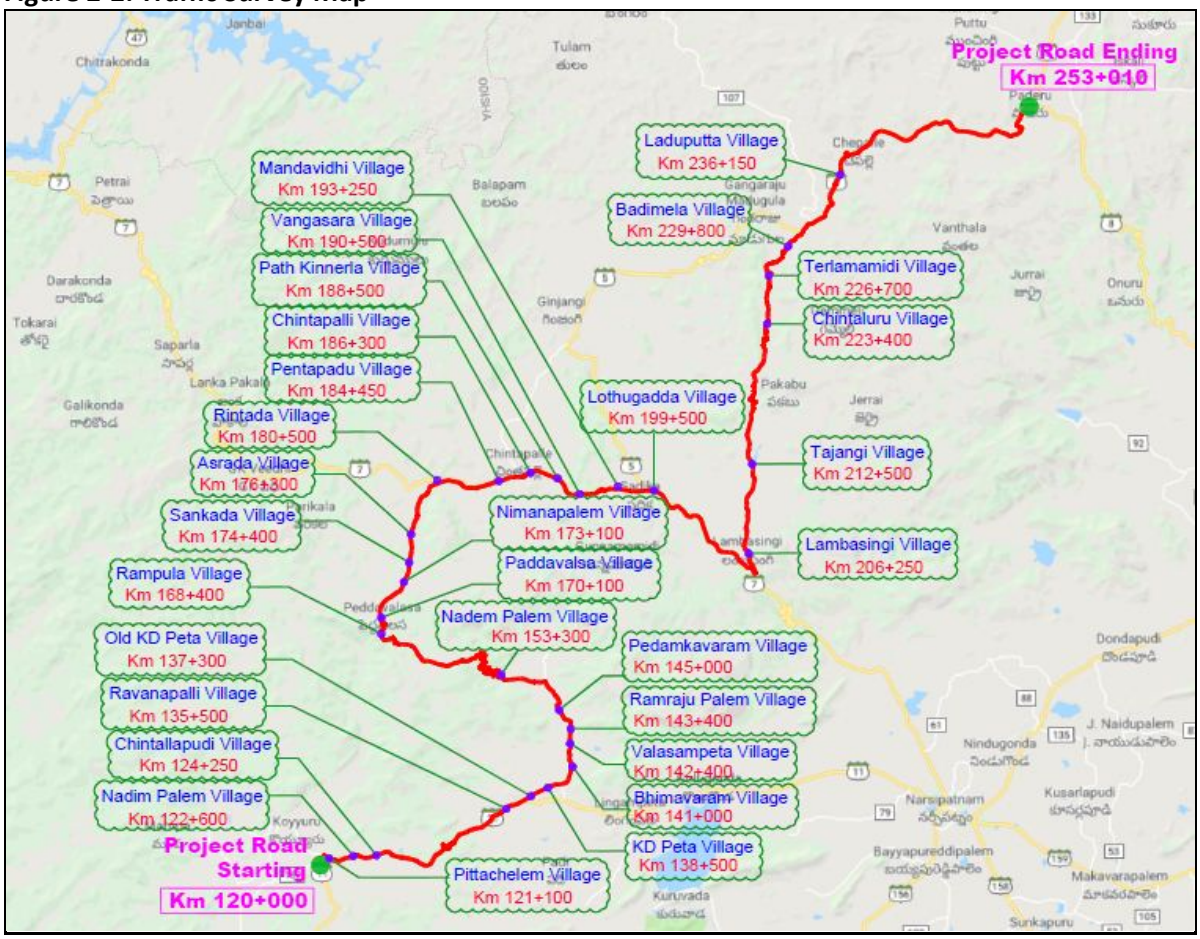
During the study, a 7 day classified traffic volume count survey was conducted at approved mid-block location of each homogeneous section at Km 133+050 (K.D.Peta), Km 188+500 (Pathakinnerla) and Km 236+300 (Laduputta). The existing traffic data details are as given in Table 2-3.

Table 2-4: Existing Traffic – ADT & AADT

Types of Vehicles	ADT			AADT		
Location (Chainage)	133+050	188+500	236+300	133+050	188+500	236+300
2-W	876	945	1169	745	804	995

3-W	176	174	209	150	148	178
Car/Jeep/Van/Utility	88	89	219	83	84	206
6 Seater	9	9	11	8	8	10
Mini Bus	3	3	3	3	3	3
Govt. Bus	48	46	33	49	47	34
Pvt. Bus	1	1	2	1	1	2
Govt.(Car/Jeep/Van)	4	4	4	4	4	4
Ambulances	2	2	4	2	2	4
Govt. Trucks	0	1	0	0	1	0
Mini LCV	54	56	102	51	53	96
LCV	15	23	44	15	24	45
2 AT	6	25	19	6	26	20
3 AT	1	12	2	1	12	2
MAV	0	5	4	0	5	4
HME	1	1	1	1	1	1
Tractor	7	15	4	7	15	4
Tractor + Trailer	9	8	4	9	8	4
Cycle	42	41	16	42	41	16
Cycle Rickshaw	0	0	3	0	0	3
Animal Drawn	0	0	0	0	0	0
Total	**1342**	**1460**	**1853**	**1177**	**1287**	**1631**

Figure 2-2: Traffic Survey Map



Based on the existing network, traffic intensity, alternative routes and major traffic generation & dispersal points along the project road, the entire project road is categorized as one traffic homogenous section and presented in Table 2-4.

2.3.2 ESTIMATED TRAFFIC PROJECTIONS

The traffic projections were carried out as part of the DPR. It considered a growthing population, economic growth etc as parameters for forecasting growth. It was observed that threshold traffic values in rolling terrain was not achieved even after 20 years. Thus, a two-lane paved shoulder configuration was adopted.

2.3.3 EXISTING ROAD

Carriageway:

The project road from Koyyuru to Paderu passes through rural and semi urban sections. The total length of exisitng project road is 135.687 kms. Major settlements along the project road are K.D Peta, Chinthapalli, Lammasingi, G. Madugula and Paderu. 70 % of the existing road is in moderate to poor condition. Out of which 37.06% project road is single lane, 28.94 % road is intermediate lane to Two Lane, and 34 % road is two lane. The existing pavement of the project road is mostly flexible.

2.3.4 RAILWAY LEVEL CROSSING

There is no railway crossing along the project road.

2.3.5 JUNCTIONS AND INTERSECTIONS

Reduction in conflict points: Following measures are to be taken for reduction in conflicts points:

- **Selective use of channelizing islands for channelizing directional traffic.**
- **Introducing GIVE WAY or STOP Signs for the traffic entering the Junction from minor road.**
- **05 numbers of Y junctions & 02 numbers of T-type junctions wherever possible.**
- **Providing acceleration lanes on main road for left turning traffics from minor road & providing deceleration lane on main road for left turning traffic**

The existing alignment has 08 major junctions and 19 minor junctions at prominent habitations. These junctions would be developed to improve the sight distance for oncoming traffic, safety of vehicles as per IRC:SP:41. Details of junctions are given in Table 2-7 & 2-8.

Table 2-5: Junctions and Intersection details

Major Junction					
Sl. No	Name of Intersection	Existing Chainage (Km)	Connecting To	Type of Junction	Remarks
1	Pothavaram	45/218 of SH-38	Koyyuru	Y	
2	Lakshmipur	0/000 of SH-38 of ODR	Narasipatanam	Y	
3	Rinthada	42/410 (ODR) &54/149 (MDR)	Narasipatnam-Chintapalli-Sileru	Y	
4	Chintapalli	48/714 (MDR)	Meduru –G.Madugula	T	
5	Lothuguda	39/245 (MDR)	Vangasari –Meduru - G.Madugula	Y	
6	Lammasingi	26/500 of ODR	Lothugadda – Narasipatnam	Y	Lammasingi
7	Pedavurumu	0/000 of ODR & 22/337 of MDR	Lothugadda - Chintapalli	Y	Pedavurumu
8	Gudivada	0/000 of MDR	K.J.Puram	Y	Gudivada

Table 2-6: Minor Junctions

Minor Junctions								
S. No	Existing Chainage (Km)	Road Leading To LHS	Road Leading To RHS	Cross Road	Type of Junction	Type of Surface	Direction	Remarks
1	38/507of SH-38	-	Kakarapadu	VR	Y	BT	RHS	
2	29/957of SH-38	-	Yerranaidupakalu	VR	Y	BT	RHS	
3	04/117of ODR	-	Ramarajapalem	VR	T	BT	RHS	
4	08/848of ODR	-	Teegalametta	VR	T	BT	RHS	
5	31/558 (ODR)	Jadumuru	-	VR	T	BT	LHS	
6	36/728 (ODR)	Sankada	-	VR	Y	BT	LHS	
7	38/855 (ODR)	Asuradda	-	VR	T	BT	LHS	
8	51/800 (MDR	-	Antherla	VR	Y	BT	RHS	
9	49/760 (MDR)	Meduru		VR	T	BT	LHS	

Minor Junctions								
S. No	Existing Chainage (Km)	Road Leading To LHS	Road Leading To RHS	Cross Road	Type of Junction	Type of Surface	Direction	Remarks
10	47/279 (MDR)	Bayalukinchangi	-	VR	T	CC	LHS	
11	33/276 (MDR)	Siripuram	-	VR	T	BT	LHS	
12	32/662 (MDR)	-	Kommangi	VR	Y	BT	RHS	
13	32/395 (MDR)	-	Yerrabanda	VR	T	BT	RHS	
14	20/787 (ODR)	Chinthaluru &Lammangi		VR	+	CC	Both	
15	14/510 (ODR)	-	Kitumula	VR	T	BT	RHS	
16	21/193 (ODR)	Singarbha	-	VR	T	BT	LHS	
17	11/406 (MDR)	Rachakanuku	-	VR	T	BT	LHS	
18	7/700 (MDR)	Vallai&Goddalipadu	-	VR	Y	BT	LHS	
19	0/925 (MDR)	-	Gudivada	VR	Y	BT	RHS	

2.3.6 TREE CUTTING

The approximate numbers of trees to be affected in the proposed RoW for the proposed project is 7803 . Chainage-wise details are provided in Annexure-1.

2.3.7 EMBANKMENT DETAILS

High embankments are observed along the existing road where valley areas are present and stream running is parallel to the road. As the terrain along the road is plain and rolling, the existing road is at grade with natural ground at few locations and has high embankments at approaches to major, minor bridges and in valley areas. The average embankment height varies in between 2m to 4m and at level in built-up areas.

2.3.8 DEFICIENT VERTICAL AND HORIZONTAL GEOMETRY AND IMPROVEMENT

The existing alignment predominantly traverses through barren/open land and through patches of dense urban built up sections and also some patches of forest. The deficient / substandard horizontal curves will be improved by providing the required radius as per the codal provision for the design speed of 80kmph / 100kmph. The curves will be improved for maximum possible radius.

2.3.9 SAFETY OF THE USERS

Traffic safety measures such as Road studs, signages, markings, crash barriers, traffic calming measures etc. will improve safety of road users.

Present road traverses through sharp curves, steep gradients, lower sight distances, resulting in unsafe movement of traffic.

The following safety measures have been proposed in the project:

- Elimination of sharp curves by improving the horizontal geometry, improving the vertical profile by flattering the steep gradients to ensure the smooth flow of traffic.
- Use of pre-cast culverts to avoid traffic disruption during construction.
- Provision of utility ducts across and along the road in urban areas.

- Enough Pavements marking for pedestrian crossings.
- Raised pavement marking to define the carriageway edges as well as centre line.
- Provision of parapet walls with wire rope crash barriers (in place of metal beam crash barriers) for the locations where embankment height is more than 3.0m.
- Provision of retaining wall all along the valley side to improve safety.

Provision of solar lighting, delineators to enhance safety during fog.

Providing road signages to inform more road users.

2.3.10 DESIGN SPEED

The design standards for the project road have been set from IRC SP 73-2015 "Manual of Specifications and Standards for Two-Laning of Highways with Paved shoulders".

The project road is proposed for improvement of two lanes with paved shoulders with design speed of 80-100 kmph in plain terrain and 40-50 kmph in hilly terrain.

2.3.11 WIDENING PROPOSAL WITH TYPICAL CROSS SECTIONS (TCS)

In view of traffic requirements, widening scheme with various typical cross sections have been developed to meet the need of the project road. Details of proposed and widening and upgradation scheme with cross sectional elements for particular typical cross sections and location-wise application of TCS are given in Table 2.9. Corresponding typical cross section are shown in Figure 1 to Figure 6.

Table 2.7 Typical cross sections and locationwise of TCS

Cross Section Type	Description	Length (km)
Type-1	Two Lane with Paved Shoulder- New/Reconstruction	68.980
Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section	10.180
Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction	13.289
Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction	27.570
Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall	13.100
Type-6	Toll Plaza	0.855
Total Length		**133.974**

Table 2-8 : Widening Proposal with Typical Cross Sections

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
1	120+000	120+300	0.3	Type-1	Two Lane with Paved Shoulder- Reconstruction
2	120+300	120+350	0.05	Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section
3	120+350	120+900	0.55	Type-1	Two Lane with Paved Shoulder- Reconstruction
4	120+900	121+060	0.16	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall
5	121+060	121+700	0.64	Type-1	Two Lane with Paved Shoulder- Reconstruction
6	121+700	121+800	0.1	Type-1	Two Lane with Paved Shoulder- New construction
7	121+800	122+160	0.36	Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section
8	122+160	122+980	0.82	Type-1	Two Lane with Paved Shoulder- Reconstruction
9	122+980	123+200	0.22	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
10	123+200	124+400	1.2	Type-1	Two Lane with Paved Shoulder- Reconstruction
11	124+400	124+750	0.35	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
12	124+750	124+950	0.2	Type-1	Two Lane with Paved Shoulder- Reconstruction
13	124+950	125+050	0.1	Type-1	Two Lane with Paved Shoulder- New construction
14	125+050	127+200	2.15	Type-1	Two Lane with Paved Shoulder- Reconstruction
15	127+200	127+450	0.25	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
16	127+450	127+560	0.11	Type-1	Two Lane with Paved Shoulder- Reconstruction
17	127+560	128+060	0.5	Type-1	Two Lane with Paved Shoulder- New construction
18	128+060	128+950	0.89	Type-1	Two Lane with Paved Shoulder- Reconstruction
19	128+950	129+350	0.4	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall
20	129+350	129+900	0.55	Type-4	Two Lane with Paved Shoulder- in Hilly terrain - Reconstruction
21	129+900	130+100	0.2	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall
22	130+100	130+500	0.4	Type-4	Two Lane with Paved Shoulder Hilly terrain - Reconstruction
23	130+500	130+850	0.35	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
24	130+850	131+300	0.45	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
25	131+300	131+600	0.3	Type-1	Two Lane with Paved Shoulder- Reconstruction
26	131+600	131+980	0.38	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
27	131+980	132+120	0.14	Type-1	Two Lane with Paved Shoulder- New construction
28	132+120	132+200	0.08	Type-1	Two Lane with Paved Shoulder- Reconstruction
29	132+200	133+490	1.29	Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section
30	133+490	133+800	0.31	Type-1	Two Lane with Paved Shoulder- Reconstruction
31	133+800	134+370	0.57	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
32	134+370	134+450	0.08	Type-1	Two Lane with Paved Shoulder- New construction
33	134+450	134+600	0.15	Type-1	Two Lane with Paved Shoulder- Reconstruction
34	134+600	134+860	0.26	Type-1	Two Lane with Paved Shoulder- New construction
35	134+860	135+930	1.07	Type-1	Two Lane with Paved Shoulder- Reconstruction
36	135+930	136+200	0.27	Type-1	Two Lane with Paved Shoulder- New construction
37	136+200	136+600	0.4	Type-1	Two Lane with Paved Shoulder- Reconstruction
38	136+600	139+130	2.53	Type-1	Two Lane with Paved Shoulder- New Construction in Bypass
39	139+130	139+800	0.67	Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section
40	139+800	139+940	0.14	Type-1	Two Lane with Paved Shoulder- New Construction in Bypass
41	139+940	140+360	0.42	Type-1	Two Lane with Paved Shoulder- Reconstruction
42	140+360	140+520	0.16	Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section
43	140+520	141+480	0.96	Type-1	Two Lane with Paved Shoulder- Reconstruction
44	141+480	141+740	0.26	Type-1	Two Lane with Paved Shoulder- New construction
45	141+740	142+000	0.26	Type-1	Two Lane with Paved Shoulder- Reconstruction
46	142+000	142+360	0.36	Type-1	Two Lane with Paved Shoulder- New construction
47	142+360	143+290	0.93	Type-1	Two Lane with Paved Shoulder- Reconstruction
48	143+290	143+700	0.41	Type-6	**Toll Plaza @ 143+470**
49	143+700	144+040	0.34	Type-1	Two Lane with Paved Shoulder- Reconstruction

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
50	144+040	144+150	0.11	Type-1	Two Lane with Paved Shoulder- New construction
51	144+150	144+290	0.14	Type-1	Two Lane with Paved Shoulder- Reconstruction
52	144+290	144+640	0.35	Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section
53	144+640	145+190	0.55	Type-1	Two Lane with Paved Shoulder- Reconstruction
54	145+190	145+600	0.41	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
55	145+600	146+100	0.5	Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section
56	146+100	146+240	0.14	Type-1	Two Lane with Paved Shoulder- New construction
57	146+240	147+430	1.19	Type-1	Two Lane with Paved Shoulder- Reconstruction
58	147+430	147+770	0.34	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
59	147+770	148+390	0.62	Type-1	Two Lane with Paved Shoulder- Reconstruction
60	148+390	148+500	0.11	Type-2A	Two Lane with Paved Shoulder- New/Reconstruction with toe wall on both side in embankment section
61	148+500	149+240	0.74	Type-1	Two Lane with Paved Shoulder- Reconstruction
62	149+240	149+420	0.18	Type-1	Two Lane with Paved Shoulder- New construction
63	149+420	150+050	0.63	Type-1	Two Lane with Paved Shoulder- Reconstruction
64	150+050	150+150	0.1	Type-1	Two Lane with Paved Shoulder- New construction
65	150+150	150+350	0.2	Type-1	Two Lane with Paved Shoulder- Reconstruction
66	150+350	151+350	1	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
67	151+350	151+900	0.55	Type-1	Two Lane with Paved Shoulder- Reconstruction
68	151+900	152+450	0.55	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall
69	152+450	153+300	0.85	Type-4	Two Lane with Paved Shoulder- in Hilly terrain - Reconstruction
70	153+300	153+700	0.4	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall
71	153+700	154+500	0.8	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
72	154+500	155+000	0.5	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
73	155+000	155+300	0.3	Type-4	Two Lane with Paved Shoulder- in Hilly terrain - Reconstruction
74	155+300	155+750	0.45	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall
75	155+750	157+050	1.3	Type-4	Two Lane with Paved Shoulder- in Hilly terrain - Reconstruction
76	157+050	157+250	0.2	Type-1	Two Lane with Paved Shoulder- Reconstruction
77	157+250	157+600	0.35	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
78	157+600	158+200	0.6	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall
79	158+200	161+100	2.9	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
80	161+100	161+350	0.25	Type-1	Two Lane with Paved Shoulder- Reconstruction
81	161+350	161+650	0.3	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
82	161+650	165+150	3.5	Type-1	Two Lane with Paved Shoulder- Reconstruction
83	165+150	165+250	0.1	Type-1	Two Lane with Paved Shoulder- New construction
84	165+250	165+380	0.13	Type-1	Two Lane with Paved Shoulder- Reconstruction
85	165+380	165+500	0.12	Type-5	Two Lane with Paved Shoulder- New/Reconstruction in cutting section with Retaining wall
86	165+500	165+650	0.15	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
87	165+650	167+610	1.96	Type-1	Two Lane with Paved Shoulder - Reconstruction
88	167+610	169+900	2.29	Type-4	Two Lane with Paved Shoulder in Hilly terrain
89	169+900	170+470	0.57	Type-4	Two Lane with Paved Shoulder in Hilly terrain
90	170+470	171+200	0.73	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
91	171+200	172+570	1.37	Type-1	Two Lane with Paved Shoulder - Reconstruction
92	172+570	173+000	0.43	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
93	173+000	173+440	0.44	Type-1	Two Lane with Paved Shoulder - Reconstruction
94	173+440	174+000	0.56	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
95	174+000	176+320	2.32	Type-1	Two Lane with Paved Shoulder - Reconstruction

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
96	176+320	176+735	0.415	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
97	176+735	177+565	0.83	Type-1	Two Lane with Paved Shoulder - Reconstruction
98	177+565	177+800	0.235	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
99	177+800	178+100	0.3	Type-1	Two Lane with Paved Shoulder - Reconstruction
100	178+100	178+240	0.14	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
101	178+240	179+850	1.61	Type-1	Two Lane with Paved Shoulder - Reconstruction
102	179+850	180+000	0.15	Type-1	Two Lane with Paved Shoulder - New construction
103	180+000	180+955	0.955	Type-1	Two Lane with Paved Shoulder - Reconstruction
104	180+955	181+700	0.745	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
105	181+700	183+700	2	Type-1	Two Lane with Paved Shoulder - Reconstruction
106	183+700	184+100	0.4	Type-1	Two Lane with Paved Shoulder - New construction
107	184+100	184+350	0.25	Type-1	Two Lane with Paved Shoulder - Reconstruction
108	184+350	184+750	0.4	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
109	184+750	186+100	1.35	Type-1	Two Lane with Paved Shoulder - Reconstruction
110	186+100	187+230	1.13	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
111	187+230	188+440	1.21	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
112	188+440	188+940	0.5	Type-1	Two Lane with Paved Shoulder - Reconstruction
113	188+940	197+900	8.96	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
114	197+900	198+000	0.1	Type-1	Two Lane with Paved Shoulder - New construction
115	198+000	198+270	0.27	Type-1	Two Lane with Paved Shoulder - Reconstruction
116	198+270	198+780	0.51	Type-1	Two Lane with Paved Shoulder - Reconstruction
117	198+780	198+950	0.17	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
118	198+950	199+070	0.12	Type-1	Two Lane with Paved Shoulder - New construction
119	199+070	199+480	0.41	Type-1	Two Lane with Paved Shoulder - Reconstruction

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
120	199+480	199+650	0.17	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
121	199+650	203+850	4.2	Type-1	Two Lane with Paved Shoulder - Reconstruction
122	203+850	204+400	0.55	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
123	204+400	204+510	0.11	Type-1	Two Lane with Paved Shoulder - New construction
124	204+510	204+750	0.24	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
125	204+750	205+000	0.25	Type-4	Two Lane with Paved Shoulder in Hilly terrain - Reconstruction
126	205+000	205+400	0.4	Type-1	Two Lane with Paved Shoulder - Reconstruction
127	205+400	205+700	0.3	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
128	205+700	206+100	0.4	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
129	206+100	206+400	0.3	Type-1	Two Lane with Paved Shoulder - Reconstruction
130	206+400	207+400	1	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
131	207+400	207+650	0.25	Type-1	Two Lane with Paved Shoulder - Reconstruction
132	207+650	207+810	0.16	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
133	207+810	208+300	0.49	Type-1	Two Lane with Paved Shoulder - Reconstruction
134	208+300	209+050	0.75	Type-1	Two Lane with Paved Shoulder - Reconstruction
135	209+050	209+260	0.21	Type-1	Two Lane with Paved Shoulder - Reconstruction
136	209+260	209+800	0.54	Type-1	Two Lane with Paved Shoulder - Reconstruction
137	209+800	209+950	0.15	Type-1	Two Lane with Paved Shoulder - Reconstruction
138	209+950	210+600	0.65	Type-1	Two Lane with Paved Shoulder - Reconstruction
139	210+600	210+850	0.25	Type-1	Two Lane with Paved Shoulder - Reconstruction
140	210+850	211+900	1.05	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
141	211+900	212+070	0.17	Type-1	Two Lane with Paved Shoulder - Reconstruction
142	212+070	212+800	0.73	Type-1	Two Lane with Paved Shoulder - Reconstruction
143	212+800	213+000	0.2	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall

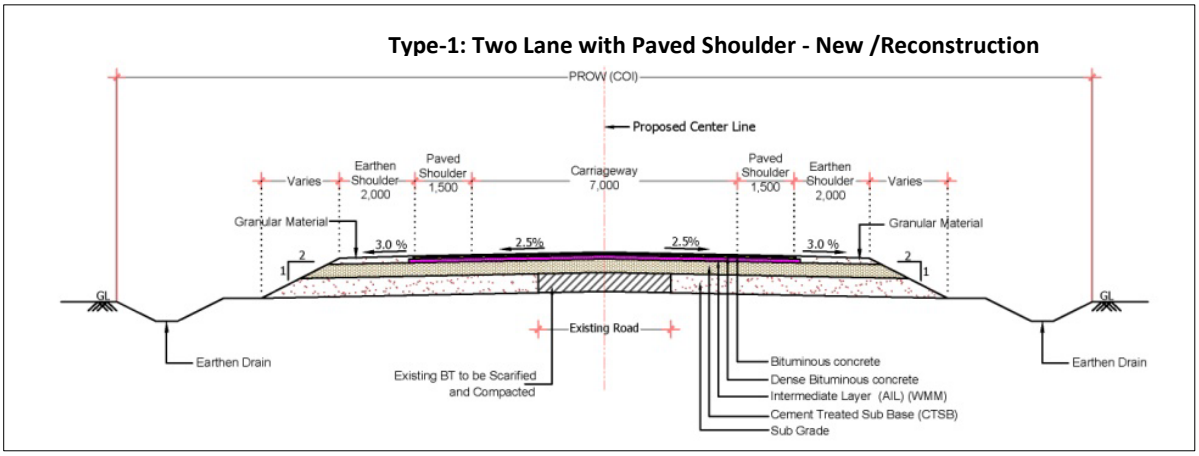
S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
144	213+000	213+700	0.7	Type-1	Two Lane with Paved Shoulder - Reconstruction
145	213+700	213+900	0.2	Type-1	Two Lane with Paved Shoulder - Reconstruction
146	213+900	214+200	0.3	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
147	214+200	215+200	1	Type-1	Two Lane with Paved Shoulder - Reconstruction
148	215+200	215+645	0.445	Type-6	**Toll Plaza @ 215+423**
149	215+645	216+050	0.405	Type-1	Two Lane with Paved Shoulder - Reconstruction
150	216+050	216+340	0.29	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
151	216+340	217+100	0.76	Type-1	Two Lane with Paved Shoulder - Reconstruction
152	217+100	217+300	0.2	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction
153	217+300	217+900	0.6	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
154	217+900	218+100	0.2	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction
155	218+100	218+280	0.18	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
156	218+280	218+530	0.25	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction
157	218+530	220+300	1.77	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
158	220+300	220+500	0.2	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
159	220+500	220+640	0.14	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
160	220+640	220+800	0.16	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction
161	220+800	221+250	0.45	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
162	221+250	221+550	0.3	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction
163	221+550	221+780	0.23	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
164	221+780	222+680	0.9	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
165	222+680	223+850	1.17	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
166	223+850	224+200	0.35	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction
167	224+200	224+600	0.4	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
168	224+600	224+800	0.2	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
169	224+800	225+700	0.9	Type-1	Two Lane with Paved Shoulder - Reconstruction
170	225+700	226+150	0.45	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
171	226+150	226+550	0.4	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
172	226+550	226+730	0.18	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
173	226+730	227+300	0.57	Type-1	Two Lane with Paved Shoulder - Reconstruction
174	227+300	227+700	0.4	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
175	227+700	228+300	0.6	Type-1	Two Lane with Paved Shoulder - Reconstruction
176	228+300	228+800	0.5	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
177	228+800	229+550	0.75	Type-1	Two Lane with Paved Shoulder - Reconstruction
178	229+550	230+340	0.79	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction
179	230+340	230+800	0.46	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
180	230+800	231+100	0.3	Type-1	Two Lane with Paved Shoulder - Reconstruction
181	231+100	231+970	0.87	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
182	231+970	232+400	0.43	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
183	232+400	233+500	1.1	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
184	233+500	234+000	0.5	Type-1	Two Lane with Paved Shoulder - Reconstruction
185	234+000	234+900	0.9	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
186	234+900	235+150	0.25	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
187	235+150	236+000	0.85	Type-1	Two Lane with Paved Shoulder - Reconstruction
188	236+000	236+400	0.4	Type-4	Two Lane with Paved Shoulder - in Hilly terrain - Reconstruction
189	236+400	237+250	0.85	Type-1	Two Lane with Paved Shoulder - Reconstruction
190	237+250	237+550	0.3	Type-1	Two Lane with Paved Shoulder - Reconstruction
191	237+550	237+900	0.35	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
192	237+900	239+060	1.16	Type-1	Two Lane with Paved Shoulder - Reconstruction
193	239+060	239+620	0.56	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
194	239+620	240+390	0.77	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
195	240+390	241+770	1.38	Type-1	Two Lane with Paved Shoulder - Reconstruction
196	241+770	242+050	0.28	Type-3	Two Lane with Paved Shoulder in Built-up area - Reconstruction
197	242+050	242+570	0.52	Type-1	Two Lane with Paved Shoulder - Reconstruction
198	242+570	242+720	0.15	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
199	242+720	243+400	0.68	Type-2A	Two Lane with Paved Shoulder - New/Reconstruction with toe wall on both side in embankment section
200	243+400	243+600	0.2	Type-1	Two Lane with Paved Shoulder - Reconstruction
201	243+600	244+150	0.55	Type-1	Two Lane with Paved Shoulder - Reconstruction
202	244+150	244+350	0.2	Type-4	Two Lane with Paved Shoulder - in Hilly terrain – Reconstruction
203	244+350	245+840	1.49	Type-1	Two Lane with Paved Shoulder - Reconstruction
204	245+840	246+350	0.51	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
205	246+350	246+800	0.45	Type-1	Two Lane with Paved Shoulder - Reconstruction
206	246+800	247+300	0.5	Type-1	Two Lane with Paved Shoulder - Reconstruction
207	247+300	248+400	1.1	Type-1	Two Lane with Paved Shoulder - Reconstruction
208	248+400	248+800	0.4	Type-3	Two Lane with Paved Shoulder in Built-up area – Reconstruction
209	248+800	249+100	0.3	Type-1	Two Lane with Paved Shoulder - Reconstruction

S.No	Design Chainage (Km)		Length (km)	TCS Type	Widening Scheme
	From	To			
210	249+100	249+400	0.3	Type-1	Two Lane with Paved Shoulder - Reconstruction
211	249+400	249+750	0.35	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
212	249+750	250+300	0.55	Type-1	Two Lane with Paved Shoulder - Reconstruction
213	250+300	251+000	0.7	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
214	251+000	251+600	0.6	Type-1	Two Lane with Paved Shoulder - Reconstruction
215	251+600	252+300	0.7	Type-5	Two Lane with Paved Shoulder - New/Reconstruction in cutting section with Retaining wall
216	252+300	253+974	1.674	Type-3	Two Lane with Paved Shoulder in Built-up area – Reconstruction
TOTAL LENGTH			**133.974**		

Type-1: Two Lane with Paved Shoulder - New /Reconstruction



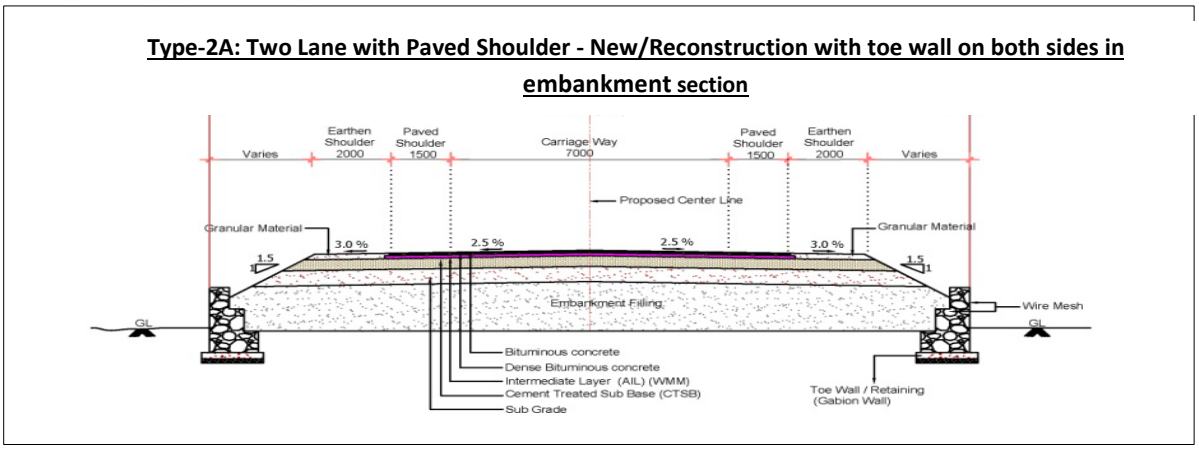


Figure 2-3: Typical Cross Section Type 1 and Type 2A [IRC:SP:73-2018: Fig 2.2 (Modified)]

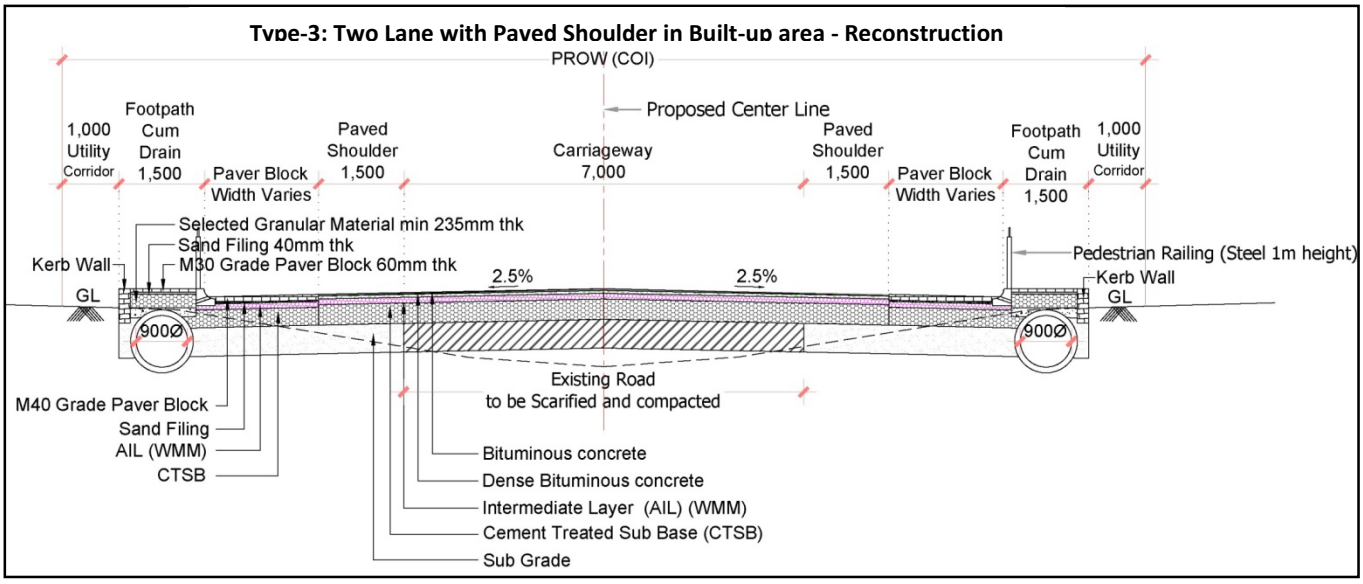
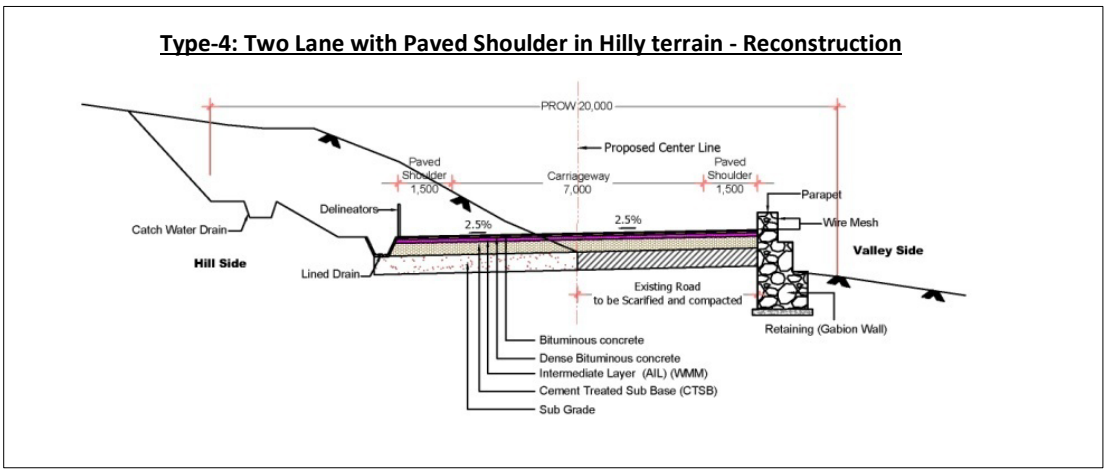


Figure 2-4:Typical Cross Section Type 3 [IRC:SP:73-2018: Fig 2.5 (Modified)]



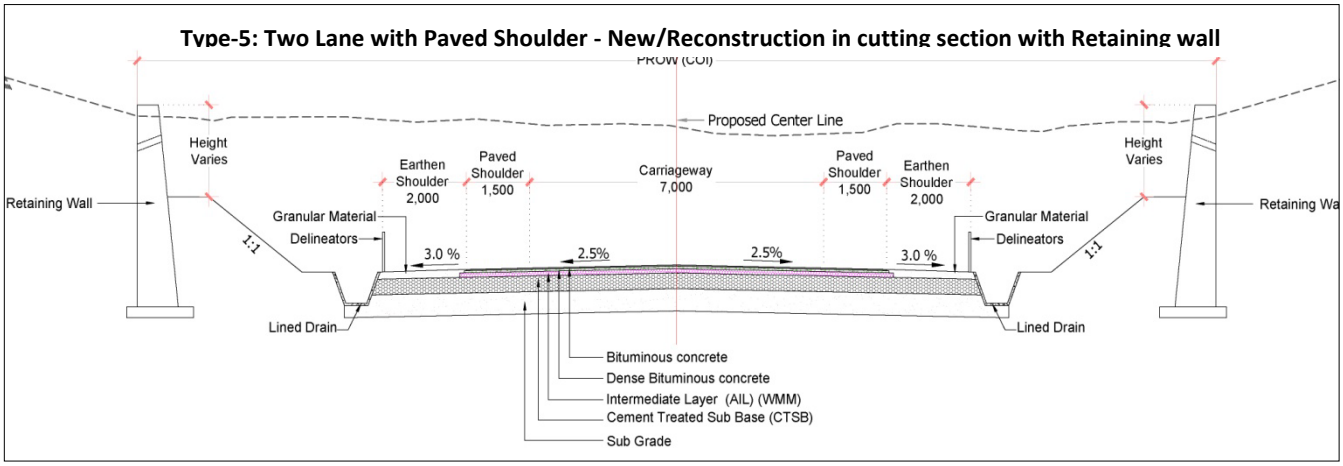


Figure 2-5: Typical Cross Section Type 4 and Type 5 [IRC:SP:73-2018: Fig 2.11, 2.2 (Modified)]

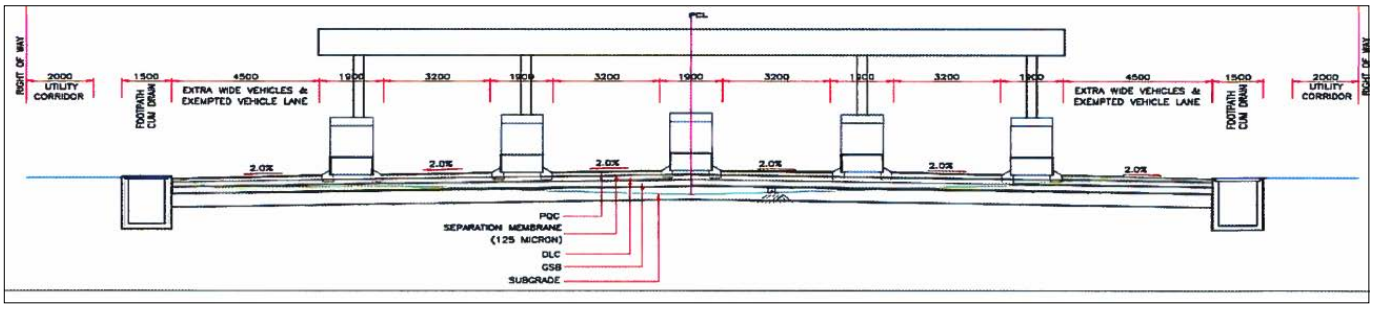


Figure 2-6: Typical Cross Section Type 6

2.3.12 CHAINAGE-WISE TERRAIN (PLAIN, ROLLING AND HILLY) OF THE PROJECT ROAD

The RoW for the proposed development in different terrains have been optimised taking into consideration the relevant provisions of IRC:SP:48 and IRC:52. Chainage wise details of the project road in plain, rolling, and hilly terrain is given in the following **Table No: 2.9**.

S.No	Package	Design Chainage(m)			Type Terrain
		From	To	Length	
1	I	120000	128800	8800	Plain Terrain
2	I	128800	129300	500	Hilly Terrain with Forest
3	I	129300	129553	253	Steep Terrain (G>5%)
4	I	129553	131300	1747	Rolling Terrain with Forest
5	I	131300	132200	900	Hilly Terrain with Forest
6	I	132200	150528	18328	Plain Terrain
7	I	150528	150723	196	Steep Terrain (G>5%)
8	I	150723	161100	10377	Rolling Terrain with Forest

S.No	Package	Design Chainage(m)			Type Terrain
		From	To	Length	
9	I	161100	162327	1227	Hilly Terrain with Forest
10	I	162327	162908	581	Steep Terrain (G>5%)
11	I	162908	165500	2592	Plain Terrain
12	II	165500	168033	2533	Plain Terrain
13	II	168033	168334	301	Steep Terrain (G>5%)
14	II	168334	169800	1466	Plain Terrain
15	II	169800	170200	400	Rolling Terrain
16	II	170200	183361	13161	Plain Terrain
17	II	183361	183785	424	Steep Terrain (G>5%)
18	II	183785	186996	3211	Plain Terrain
19	II	186996	187316	320	Steep Terrain (G>5%)
20	II	187316	189545	2229	Plain Terrain
21	II	189545	190071	526	Steep Terrain (G>5%)
22	II	190071	193165	3094	Plain Terrain
23	II	193165	193671	506	Steep Terrain (G>5%)
24	II	193671	202057	8386	Plain Terrain
25	II	202057	202338	281	Steep Terrain (G>5%)
26	II	202338	205000	2662	Plain Terrain
27	III	205000	215641	10641	Plain Terrain
28	III	215641	215972	331	Steep Terrain (G>5%)
29	III	215972	217400	1428	Plain Terrain
30	III	217400	218300	900	Rolling Terrain with Forest
31	III	218300	219325	1025	Steep Terrain (G>5%)
32	III	219325	220075	750	Steep Terrain (G>5%)
33	III	220075	220665	590	Steep Terrain (G>5%)
34	III	220665	220900	235	Plain Terrain
35	III	220900	221475	575	Steep Terrain (G>5%)
36	III	221475	222700	1225	Plain Terrain
37	III	222700	223000	300	Rolling Terrain with Forest
38	III	223000	223400	400	Plain Terrain
39	III	223400	223700	300	Rolling Terrain with Forest
40	III	223700	225800	2100	Plain Terrain
41	III	225800	226050	250	Steep Terrain (G>5%)
42	III	226050	226725	675	Steep Terrain (G>5%)
43	III	226725	230030	3305	Plain Terrain
44	III	230030	230430	400	Steep Terrain (G>5%)
45	III	230430	230875	445	Plain Terrain
46	III	230875	231340	465	Steep Terrain (G>5%)

S.No	Package	Design Chainage(m)			Type Terrain
		From	To	Length	
47	III	231340	231620	280	Steep Terrain (G>5%)
48	III	231620	232000	380	Plain Terrain
49	III	232000	232870	870	Steep Terrain (G>5%)
50	III	232870	238500	5630	Plain Terrain
51	III	238500	238800	300	Rolling Terrain with Forest
52	III	238800	244830	6030	Plain Terrain
53	III	244830	245200	370	Steep Terrain (G>5%)
54	III	245200	246365	1165	Plain Terrain
55	III	246365	246745	380	Steep Terrain (G>5%)
56	III	246745	247425	680	Plain Terrain
57	III	247425	247825	400	Steep Terrain (G>5%)
58	III	247825	253974	6149	Plan Terrain
Total Length (m)				**133974**	

2.3.13 PAVEMENT DESIGN

The pavement conditions have been assessed based on visual observations (formation of cracks, rutting, potholes, raveling) and pavement investigation. The existing road condition varies from good to very poor. There are some stretches which are badly damaged because of the poor condition of the sub-grade and other factors. There are also some sections where overflowing of rain water observed which caused damage of existing pavement. Existing pavement condition of the Project road observed to be 70.1 % in poor condition and 29.9 % in good condition.

The pavement design for new construction of project road as per IRC:37-2018 were calculated as 1.33 MSA for a period of 15 years. As per traffic survey the cumulative no. of standard axles for stretch works out around 3 MSA. As per IRC:SP:73 – 2015 (Section 5.4.1), the flexible pavement shall be designed for a minimum design period of 15 years, subject to the condition that design traffic shall not be less than 20 msa.

Alternative pavement composition for cement treated sub-base (CTSB) also worked out as per IRC:37-2018 and found economical compared to the conventional pavement design.

Table 2 10: Package-wise location details of retaining/breast/toe walls proposed along the project road

Retaining Wall Location						
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Direction**	**Remarks**
1	I	120+900	121+060	0.160	Both	
2	I	128+950	129+350	0.400	Both	
3	I	129+900	130.100	0.200	Both	
4	I	130+500	130+850	0.350	Both	
5	I	151+900	152+450	0.550	Both	
6	I	153+300	153+700	0.400	Both	
7	I	154+500	155+000	0.500	Both	

Retaining Wall Location						
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Direction**	**Remarks**
8	I	155+300	155+750	0.450	Both	
9	I	157+600	158+200	0.600	Both	
10	I	165+380	165+500	0.120	Both	
		Total		**7.460**		

Toe Wall Location						
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Direction**	**Remarks**
1	I	120+300	120+350	0.050	Both	
2	I	121+800	122+160	0.360	Both	
3	I	132+200	133+490	1.290	Both	
4	I	139+130	139+800	0.670	Both	
5	I	140+360	140+520	0.160	Both	
6	I	144+290	144+640	0.350	Both	
7	I	145+600	146+100	0.500	Both	
8	I	148+390	148+500	0.110	Both	
		Total		**6.980**		

Gabion Wall (Hilly Terrain /Forest Locations)						
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Direction**	**Remarks**
1.	I	128+800	128+950	0.15	Valley side	Forest /Hilly Terrain
2.	I	129+350	129+900	0.55	Valley side	Forest /Hilly Terrain
3.	I	130+100	130+500	0.4	Valley side	Forest /Hilly Terrain
4.	I	130+850	131+300	0.45	Valley side	Forest /Hilly Terrain
5.	I	131+300	131+600	0.3	Valley side	Forest /Hilly Terrain
6.	I	131+600	131+980	0.38	Valley side	Forest /Hilly Terrain
7.	I	131+980	132+100	0.12	Valley side	Forest /Hilly Terrain
8.	I	150+350	151+350	0.45	Valley side	Forest /Hilly Terrain
9.	I	151+350	151+900	0.55	Valley side	Forest /Hilly Terrain
10.	I	152+450	153+300	0.85	Valley side	Forest /Hilly Terrain
11.	I	153+700	154+500	0.8	Valley side	Forest /Hilly Terrain
12.	I	155+000	155+300	0.3	Valley side	Forest /Hilly Terrain
13.	I	155+750	157+050	1.3	Valley side	Forest /Hilly Terrain
14.	I	157+050	157+250	0.2	Valley side	Forest /Hilly Terrain

Gabion Wall (Hilly Terrain /Forest Locations)						
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Direction**	**Remarks**
15.	I	157+250	157+600	0.35	Valley side	Forest /Hilly Terrain
16.	I	158+200	161+100	2.9	Valley side	Forest /Hilly Terrain
17.	I	161+100	161+350	0.25	Valley side	Forest /Hilly Terrain
18.	I	161+350	161+650	0.3	Valley side	Forest /Hilly Terrain
19.	I	161+650	165+150	1.05	Valley side	Forest /Hilly Terrain
		Total		**11.650**		

Package II

Retaining Wall						
S.No	**Package**	**Design Chainage (Km)**		**Length (Km)**	**Direction**	**Remarks**
		From	**To**			
1.	II	165+500	165+650	0.3	Both	
2.	II	198+780	198+950	0.34	Both	
		Total Length (Km)		**0.64**		

Toe Wall Location						
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Direction**	**Remarks**
1.	II	170+600	171+600	1.000	Both	
2.	II	172+500	173+000	0.500	Both	
3.	II	173+440	174+000	0.560	Both	
4.	II	178+100	178+240	0.140	Both	
5.	II	184+350	184+750	0.400	Both	
		Total (Km)		**2.600**		

Gabion Wall (Hilly Terrain /Forest Locations)						
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Direction**	**Remarks**
1.	II	167+610	169+900	2.290	Valley side	Forest /Hilly Terrain
2.	II	169+900	170+470	0.570	Valley side	Forest /Hilly Terrain
3.	II	187+230	188+440	1.210	Valley side	Forest /Hilly Terrain
4.	II	188+940	197+900	8.960	Valley side	Forest /Hilly Terrain
5.	II	199+480	199+650	0.170	Valley side	Forest /Hilly Terrain
6.	II	203+850	204+400	0.550	Valley side	Forest /Hilly Terrain
7.	II	204+510	204+750	0.24	Valley side	Forest /Hilly Terrain
8.	II	204+750	205+000	0.25	Valley side	Forest /Hilly Terrain

Gabion Wall (Hilly Terrain /Forest Locations)						
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Direction**	**Remarks**
1.	II	167+610	169+900	2.290	Valley side	Forest /Hilly Terrain
		Total length (Km)		**14.240**		

Package III

Retaining Wall Location							
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Total Length (Km)**	**Direction**	**Remarks**
1.	III	207+650	207+810	0.160	0.32	Both	Non Forest
2.	III	212+800	213+000	0.200	0.4	Both	Non Forest
3.	III	213+900	214+200	0.300	0.6	Both	Non Forest
4.	III	216+050	216+340	0.290	0.58	Both	Non Forest
5.	III	218+100	218+280	0.180	0.36	Both	Forest
6.	III	218+530	220+300	1.770	3.54	Both	Forest
7.	III	221+780	222+680	0.900	1.8	Both	Forest
8.	III	224+600	224+800	0.200	0.4	Both	Forest
9.	III	225+700	226+150	0.450	0.9	Both	Non Forest
10.	III	226+550	226+730	0.180	0.36	Both	Non Forest
11.	III	230+340	230+800	0.460	0.92	Both	Non Forest
12.	III	231+970	232+400	0.430	0.86	Both	Non Forest
13.	III	237+550	237+900	0.350	0.7	Both	Non Forest
14.	III	239+620	240+390	0.770	1.54	Both	Non Forest
15.	III	242+570	242+720	0.150	0.3	Both	Non Forest
16.	III	245+840	246+350	0.510	1.02	Both	Non Forest
17.	III	249+400	249+750	0.350	0.7	Both	Non Forest
18.	III	250+300	251+000	0.700	1.4	Both	Non Forest
19.	III	251+600	252+300	0.700	1.4	Both	Non Forest
		Total Length (Km)		**9.050**	**18.100**		

Toe Wall Location							
S. No	**Package**	**From (Km)**	**To (Km)**	**Length (Km)**	**Total Length (Km**	**Direction**	**Remarks**
1.	III	205+700	206+100	0.400	0.8	Both	Non Forest
2.	III	217+300	217+900	0.600	1.2	Both	Forest
3.	III	220+300	220+500	0.200	0.4	Both	Non Forest

Toe Wall Location							
S. No	Package	From (Km)	To (Km)	Length (Km)	Total Length (Km	Direction	Remarks
4.	III	220+500	220+640	0.140	0.28	Both	Non Forest
5.	III	221+550	221+780	0.230	0.46	Both	Non Forest
6.	III	222+680	223+850	1.170	2.34	Both	Forest
7.	III	224+200	224+600	0.400	0.8	Both	Non Forest
8.	III	226+150	226+550	0.400	0.8	Both	Non Forest
9.	III	228+300	228+800	0.500	1	Both	Non Forest
10.	III	231+100	231+970	0.870	1.74	Both	Non Forest
11.	III	242+720	243+400	0.680	1.36	Both	Non Forest
		Total Length(Km)		**5.590**	**11.180**		

Gabion Wall (Hilly Terrain /Forest Locations)						
S. No	Package	From (Km)	To (Km)	Length (Km)	Direction	Remarks
1.	III	217+100	217+300	0.200	Valley side	Forest /Hilly Terrain
2.	III	217+900	218+100	0.200	Valley side	Forest /Hilly Terrain
3.	III	218+280	218+530	0.250	Valley side	Forest /Hilly Terrain
4.	III	220+640	220+800	0.160	Valley side	Forest /Hilly Terrain
5.	III	221+250	221+550	0.300	Valley side	Forest /Hilly Terrain
6.	III	223+850	224+200	0.350	Valley side	Forest /Hilly Terrain
7.	III	229+550	230+340	0.790	Valley side	Forest /Hilly Terrain
8.	III	234+000	234+900	0.900	Valley side	Forest /Hilly Terrain
9.	III	236+000	236+400	0.400	Valley side	Forest /Hilly Terrain
10.	III	244+150	244+350	0.200	Valley side	Forest /Hilly Terrain
		Total Length(Km		**3.750**		

2.3.14 BYPASSES AND REALIGNMENTS

Construction of 1 bypass (K.D.Peta Bypass) is proposed in the project. Realignment and curve improvement is proposed at the locations where the existing road has a poor geometry. Details of bypass, proposed Curve Improvement and realignment are given in As far as possible, improvements to the road have to be accommodated within the available ROW. However at some stretches horizontal as well as vertical geometry of the existing road is very poor and has been improved to National Highway standards. Geometric Improvements have been proposed as per design standards at the following locations given below in the table

Table2-11 Locations of geometrical improvement of alignment

S. No.	Design Chainage (Km)		Length (m)	Package	Remark
	From	To			
Realignments					

S. No.	Design Chainage (Km)		Length (m)	Package	Remark
	From	To			
1	121+747	122+025	278	I	
2	128+800	132+100	3300	I	
3	132+100	132+147	47	I	
4	134+600	134+862	262	I	
5	135+930	136+200	270	I	
6	139+940	140+377	437	I	
7	142+362	142+470	108	I	
8	144+035	144+146	111	I	
9	145+970	146+175	205	I	
10	150+075	150+150	75	I	
11	150+900	162+700	11800	I	
Total			**16893**		
Curve Improvements					
1	123+518	123+609	91	I	
2	124+945	125+040	95	I	
3	127+560	127+700	140	I	
4	127+925	128+092	167	I	
5	134+370	134+446	76	I	
6	136+200	136+387	187	I	
7	136+500	136+600	100	I	
8	142+800	143+000	200	I	
9	143+290	143+700	410	I	
10	144+483	144+633	150	I	
11	149+235	149+430	195	I	
12	150+000	150+075	75	I	
13	150+150	150+343	193	I	
14	165+137	165+250	113	I	

S. No.	Design Chainage (Km)		Length (m)	Package	Remarks
	From	To			
Realignments					
1.	167+610	169+610	2000	II	
2.	179+850	180+120	270	II	
3.	183+700	184+100	400	II	
4.	184+260	184+530	270	II	
5.	187+230	188+440	1210	II	
6.	188+940	194+930	5990	II	
7.	196+330	197+900	1570	II	

S. No.	Design Chainage (Km)		Length (m)	Package	Remarks
	From	To			
8.	197+900	198+350	450	II	
9.	202+470	202+700	230	II	
10.	204+030	204+180	150	II	
Total			**12540**		
Curve Improvements					
1.	165+500	165+600	100	II	
2.	165+680	165+850	170	II	
3.	166+200	166+800	600	II	
4.	167+440	167+610	170	II	
5.	169+610	169+880	270	II	
6.	170+000	170+400	400	II	
7.	170+400	170+550	150	II	
8.	171+600	171+800	200	II	
9.	173+000	173+800	800	II	
10.	174+750	175+200	450	II	
11.	176+750	177+300	550	II	
12.	178+030	178+300	270	II	
13.	181+200	181+400	200	II	
14.	181+640	181+750	110	II	
15.	182+620	182+800	180	II	
16.	185+300	185+700	400	II	
17.	185+800	186+340	540	II	
18.	194+930	195+300	370	II	
19.	198+800	199+600	800	II	
20.	199+600	200+100	500	II	
21.	203+400	203+500	100	II	
22.	203+640	203+800	160	II	
23.	204+300	204+500	200	II	
24.	204+500	204+700	200	II	
25.	204+850	204+940	90	II	
Total			**7980**		

S. No.	Design Chainage (Km)		Length (Km)	Package
	From	To		
Curve Improvement				
	205+050	205+150	0.100	III

S. No.	Design Chainage (Km)		Length (Km)	Package
	From	To		
	205+400	205+610	0.210	III
	206+670	206+770	0.100	III
	207+450	207+600	0.150	III
	211+770	211+950	0.180	III
	213+845	214+770	0.925	III
	214+900	215+060	0.160	III
	215+220	215+645	0.425	III
	215+800	216+450	0.650	III
	217+300	217+400	0.100	III
	224+600	224+750	0.150	III
	230+290	230+380	0.090	III
	231+650	231+750	0.100	III
	233+800	234+000	0.200	III
	234+250	234+650	0.400	III
	235+590	235+690	0.100	III
	238+700	238+900	0.200	III
	240+000	240+100	0.100	III
	243+440	243+540	0.100	III
	245+340	245+500	0.160	III
	246+800	246+920	0.120	III
	247+380	247+539	0.159	III
	249+050	249+200	0.150	III
	Total	5.029		
Realignment				
	207+950	208+275	0.325	III
	209+025	209+225	0.200	III
	210+065	210+390	0.325	III
	210+600	210+850	0.250	III
	212+835	213+730	0.895	III
	217+400	220+300	2.900	III
	221+900	224+200	2.300	III
	225+700	225+910	0.210	III
	227+630	227+860	0.230	III
	227+860	228+060	0.200	III
	228+430	228+545	0.115	III
	229+550	230+100	0.550	III

S. No.	Design Chainage (Km)		Length (Km)	Package
	From	To		
	230+500	230+830	0.330	III
	231+000	231+338	0.338	III
	232+700	233+000	0.300	III
	234+000	234+250	0.250	III
	234+650	234+900	0.250	III
	236+000	236+500	0.500	III
	237+137	237+600	0.463	III
	238+600	238+700	0.100	III
	241+650	241+765	0.115	III
	244+150	244+350	0.200	III
	245+900	246+050	0.150	III
	246+250	246+540	0.290	III
	247+539	247+900	0.361	III
	248+800	249+050	0.250	III
	249+900	250+000	0.100	III
	250+830	251+310	0.480	III
	Total	12.977		

Table 2-12

As far as possible, improvements to the road have to be accommodated within the available ROW. However at some stretches horizontal as well as vertical geometry of the existing road is very poor and has been improved to National Highway standards. Geometric improvements have been proposed as per design standards at the following locations given below in the table

Table2-12 Locations of geometrical improvement of alignment

S. No.	Design Chainage (Km)		Length (m)	Package	Remark
	From	To			
Realignments					
1	121+747	122+025	278	I	
2	128+800	132+100	3300	I	
3	132+100	132+147	47	I	
4	134+600	134+862	262	I	
5	135+930	136+200	270	I	
6	139+940	140+377	437	I	
7	142+362	142+470	108	I	
8	144+035	144+146	111	I	
9	145+970	146+175	205	I	
10	150+075	150+150	75	I	
11	150+900	162+700	11800	I	

S. No.	Design Chainage (Km)		Length (m)	Package	Remark
	From	To			
Total			**16893**		
Curve Improvements					
1	123+518	123+609	91	I	
2	124+945	125+040	95	I	
3	127+560	127+700	140	I	
4	127+925	128+092	167	I	
5	134+370	134+446	76	I	
6	136+200	136+387	187	I	
7	136+500	136+600	100	I	
8	142+800	143+000	200	I	
9	143+290	143+700	410	I	
10	144+483	144+633	150	I	
11	149+235	149+430	195	I	
12	150+000	150+075	75	I	
13	150+150	150+343	193	I	
14	165+137	165+250	113	I	

S. No.	Design Chainage (Km)		Length (m)	Package	Remarks
	From	To			
Realignments					
11.	167+610	169+610	2000	II	
12.	179+850	180+120	270	II	
13.	183+700	184+100	400	II	
14.	184+260	184+530	270	II	
15.	187+230	188+440	1210	II	
16.	188+940	194+930	5990	II	
17.	196+330	197+900	1570	II	
18.	197+900	198+350	450	II	
19.	202+470	202+700	230	II	
20.	204+030	204+180	150	II	
Total			**12540**		
Curve Improvements					
26.	165+500	165+600	100	II	
27.	165+680	165+850	170	II	
28.	166+200	166+800	600	II	
29.	167+440	167+610	170	II	
30.	169+610	169+880	270	II	
31.	170+000	170+400	400	II	

S. No.	Design Chainage (Km)		Length (m)	Package	Remarks
	From	To			
32.	170+400	170+550	150	II	
33.	171+600	171+800	200	II	
34.	173+000	173+800	800	II	
35.	174+750	175+200	450	II	
36.	176+750	177+300	550	II	
37.	178+030	178+300	270	II	
38.	181+200	181+400	200	II	
39.	181+640	181+750	110	II	
40.	182+620	182+800	180	II	
41.	185+300	185+700	400	II	
42.	185+800	186+340	540	II	
43.	194+930	195+300	370	II	
44.	198+800	199+600	800	II	
45.	199+600	200+100	500	II	
46.	203+400	203+500	100	II	
47.	203+640	203+800	160	II	
48.	204+300	204+500	200	II	
49.	204+500	204+700	200	II	
50.	204+850	204+940	90	II	
Total			**7980**		

S. No.	Design Chainage (Km)		Length (Km)	Package	Remarks
	From	To			
Curve Improvement					
1.	205+050	205+150	0.100	III	
2.	205+400	205+610	0.210	III	
3.	206+670	206+770	0.100	III	
4.	207+450	207+600	0.150	III	
5.	211+770	211+950	0.180	III	
6.	213+845	214+770	0.925	III	
7.	214+900	215+060	0.160	III	
8.	215+220	215+645	0.425	III	Toll Plaza
9.	215+800	216+450	0.650	III	
10.	217+300	217+400	0.100	III	
11.	224+600	224+750	0.150	III	
12.	230+290	230+380	0.090	III	
13.	231+650	231+750	0.100	III	
14.	233+800	234+000	0.200	III	

S. No.	Design Chainage (Km)		Length (Km)	Package	Remarks
	From	To			
15.	234+250	234+650	0.400	III	
16.	235+590	235+690	0.100	III	
17.	238+700	238+900	0.200	III	
18.	240+000	240+100	0.100	III	
19.	243+440	243+540	0.100	III	
20.	245+340	245+500	0.160	III	
21.	246+800	246+920	0.120	III	
22.	247+380	247+539	0.159	III	
23.	249+050	249+200	0.150	III	
	Total		**5.029**		
Realignment					
1.	207+950	208+275	0.325	III	
2.	209+025	209+225	0.200	III	
3.	210+065	210+390	0.325	III	
4.	210+600	210+850	0.250	III	
5.	212+835	213+730	0.895	III	
6.	217+400	220+300	2.900	III	
7.	221+900	224+200	2.300	III	
8.	225+700	225+910	0.210	III	
9.	227+630	227+860	0.230	III	
10.	227+860	228+060	0.200	III	
11.	228+430	228+545	0.115	III	
12.	229+550	230+100	0.550	III	
13.	230+500	230+830	0.330	III	
14.	231+000	231+338	0.338	III	
15.	232+700	233+000	0.300	III	
16.	234+000	234+250	0.250	III	
17.	234+650	234+900	0.250	III	
18.	236+000	236+500	0.500	III	
19.	237+137	237+600	0.463	III	
20.	238+600	238+700	0.100	III	
21.	241+650	241+765	0.115	III	
22.	244+150	244+350	0.200	III	
23.	245+900	246+050	0.150	III	
24.	246+250	246+540	0.290	III	
25.	247+539	247+900	0.361	III	
26.	248+800	249+050	0.250	III	
27.	249+900	250+000	0.100	III	

S. No.	Design Chainage (Km)		Length (Km)	Package	Remarks
	From	To			
28.	250+830	251+310	0.480	III	
	Total		**12.977**		

Table 2-13: Proposed Bypasses, Realignments and Curve Improvement Locations

Proposed Bypass				
S.No	Design chainage		Design Length(km)	Bypass
	Start	End Point		
1	136+600	139+940	3.340	K.D. Peta Bypass
Total			**3.340**	

Realignment & Curve Improvement Locations				
Package	Location	Length (m)	Location	Length (m)
I	Curve Improvement	2192	Realignment	16893**
II	Curve Improvement	7980	Realignment	12540**
II	Curve Improvement	5029	Realignment	12977**
Total		**15201**		**42410**
** -Include Forest Length.				

2.3.15 SERVICE ROADS

There are no Service roads provided in the proposed project.

Table2-14: Service roads proposed along Project Road

S.No	Design Chainage (Km)		Length (Km)	Remarks
	From	To		
Nil				

2.3.16 PROPOSED STRUCTURES

There are a total of 268 cross drainage structures (including 1 no. major bridge, 21 minor bridges, 111 slab culvert and 135 pipe culverts in the existing project road.

Based on the improvement proposal, 1 major bridge is proposed as a new construction at K.D.Peta Bypass. Out of 21 existing minor bridges, 8 bridges are proposed for reconstruction, 9 bridges are proposed for widening and the remaining 4 bridges need no improvement. Newly, 12 bridges are proposed for newconstrcution due to realignment , curve improvement and as well as convertion of culvert into bridges. The summary of proposed structures on the project road is presented in Table 2-17.

Table 2-15: List of Structures on the Project Road

Type of Structures	Existing Structures	Re-construction	Widening	No Improvement	New construction	Remarks
Major Bridge	1	1	0	0	1	I. 1 MJB New construction at K.D Peta Bypass.
Minor Bridge	21	9	8	4	11	I. 1 MNB New construction at K.D. Peta Bypass & 2 No's no Improvement due to Bypass. II. 2 MNB New construction due to realignment &1 no of culvert converted to MNB. III. 7 no's of culvert converted to MNB
HPC	134	0	120	7	3	I. 5 no's Not improved due to bypass& realignment. II. 2 no's Not improved due to realignment. IIII. 6 no's of pipe culvert converted to MNB
Box	0	0	0	0	65	Additional culvert (Box) –All Packages
LVUP	0	0	0	0	0	-
VUP	0	0	0	0	0	-
CUP	0	0	0	0	0	-
Slab	104	0	86	17	11	I. 9 no's Not improved due to bypass & Realignment. II. 5 no's Not improved due to Realignment. III. 1 no of slab culvert converted to MNB & 3 no's Not improved due to Realignment
Siphon	3	0	3	0	0	-
Causeway	5	0	0	0	2	III. These 3 causeways are newly construct as box culvert
Total	**268**	**10**	**217**	**28**	**93**	

2.3.17 MAJOR AND MINOR BRIDGE

The existing major bridges have the superstructure as RCC girder type and RCC wall type abutment and circular pier resting on open foundation. The details are given in the Table 2-18.

Table 2-16: Structure Details

S. No.	Existing Chainage (km)	Design Chainage (km)	Existing Structure Details			Proposed Structure Details			Improvement Proposal
			Type	Span / Length	Width (m)	Span (C/C of exp.)	Width (m)	Type	
1	9/348 (ODR)	147+935		4 x 25.4				RCC Girder	Widening (RHS)

Minor bridges reconstruction details are given in Table 2-19.

Table 2-17: Minor Bridges to Be Repaired and Widened along Project Road

S.No	Existing Chainage (Km)	Design Chainage (Km)	Existing Span Arrangement (m)	Proposed Span Arrangement (m)	Carriageway width	Overall width	Remarks
1.	40+333 (SH-38)	125+444	1 x 22.2	1 x 22.2m	11	16	
2.	31+378 (SH-38)	134+515	3 x 8.5	3 X 8.5m	11	16	
3.	0+384 (ODR)	-	4 x 10.7	-	-	-	No Improvement
4.	0+729 (ODR)	-	1 x 10.0	-	-	-	No Improvement
5.		139+455		3 X 20.0	11	16	
6.		139+746		2 x 8.0	2 x 10.5	26	
7.	2+773 (ODR)	141+412	3 x 10.5	3 x 10.5	11	16	
8.	5+801 (ODR)	144+398	5 x 11.0	3 X 19.0	11	16	
9.	7+300 (ODR)	145+901	4 x 11	3 x 16.0	11	16	
10.	9+348 (ODR)	147+935	4 x 25.4	4 x 25.4	11	16	
11.	11+650 (ODR)	150+204	3 x 5.5	1 x 18.0	11	16	
12.	27+714(ODR)	166+739	3 x 1.20	1x 10.0	11.0	16.0	
13.	52/837(MDR)	182+618	1 x 17.0	1 x 17.0	11.0	16.0	
14.	51/056(MDR)	184+360	1 x 14.0	1 x 16.0- SK-35- R	11.0	16.0	
15.	46/298(MDR)	189+133	1 x 13.0	1 x 16.0	11.0	16.0	
16.	42/551(MDR)	192+817	1 x 19.4	1 X 20.0	11.0	16.0	
17.	40/356(MDR)	195+015	1 x 17.4	1 x 17.4	11.0	16.0	
18.	36/046(MDR)	199+180	1 x 17.0	1 X 17.0	11.0	16.0	
19.	33/476(MDR)	201+735	2 x 10.4	2 x 14.0	11.0	16.0	
20.	21/653(ODR)	210+250	1 x 24.0	1 x 24.0	11	16	
21.	17/405(ODR)	214+474	2 x 4.0	1 x 12.0	11	16	
22.	14/605(ODR)	217+258	2 x 5.0	2 X 6.0	11	16	

S.No	Existing Chainage (Km)	Design Chainage (Km)	Existing Span Arrangement (m)	Proposed Span Arrangement (m)	Carriageway width	Overall width	Remarks
23.	11/207 (ODR)	220+596	8 x 0.9m Dia	2 x 5.0	11	16	
24.	7/735 (ODR)	224+065	4 x 1.2m Dia	2 x 4.0	11	16	
25.	6/313 (ODR)	225+491	5 x 1.0m & 1 x 0.9m Dia	2 x 5.0	11	16	
26.	3/733 (ODR)	228+046	8 x 0.6m Dia	2 x 6.0	11	16	
27.	20/462(MDR)	233+618	1 x 10.5	2 x 6.0 - Sk right – 18	11	16	
28.	17/578(MDR)	236+492	3 x 6.5	2 x 12.0 - sk - left – 20	11	16	
29.	16/705 (MDR)	237+364	1 x 4.3m	2 x 4.0	11	16	
30.	13/964 (MDR)	240+091	6 x 0.9m Dia	2 x 4.0	11	16	
31.	9/439(MDR)	244+600	3 x 17.3	3 x 17.3	11	18.1	
32.	8/011 (MDR)	246+019	7 x 1.0m Dia	2 x 5.0	11	16	

2.3.18 METAL BEAM & RCC CRASH BARRIER AT BRIDGE LOCATIONS (BOTH SIDE)

Table 2.18: Metal Beam & RCC Crash Barrier at Bridge Locations (Both Side):

Package-I

Package	Metal Beam Barrier (m)		Length (m)	Crash Barrier (m)		Length(m)	Metal Beam Barrier(m)		Length (m)
I	125349	125429	80	125429	125459	29.2	125459	125519	60
I	134449	134499	50	134499	134531	32.5	134531	134601	70
I	139050	139422	371.5	139422	139489	67	139489	139569	80
I	139568.5	139840	271.5	-	-	-	-	-	-
I	141333	141393	60	141393	141431	38.5	141393	141433	40
I	144246	144366	120	144366	144430	64	144430	144670	240
I	145634	145874	240	145874	145929	55	145929	145989	60
I	147791	147881	90	147881	147989	108.6	147989	148039	50
I	150142	150192	50	150192	150217	25	150217	150267	50
	Length		**1061.5**	**Length**		**419.8**	**Length**		**921.5**
Total Length of RCC Crash Barrier (m) = 840 (419.8X2)									
Total Length of Metal Beam Crash Barrier(m) = 3966 (1983X2)									
Total Length of Metal Beam & RCC Crash Barrier at Bridge Locations=4806									

Package-II

Package	Metal Beam Barrier (m)		Length (m)	Crash Barrier (m)		Length (m)	Metal Beam Barrier(m)		Length (m)
II	166700.00	166730.50	30.5	166730.50	166747.50	17	166747.50	166790.00	42.5
II	182580.00	182606.00	26	182606.00	182630.00	24	182630.00	182660.00	30
II	184300.00	184348.50	48.5	184348.50	184371.50	23	184371.50	184760.00	388.5
II	188970.00	189121.50	151.5	189121.50	189144.50	23	189144.50	189150.00	5.5
II	192780.00	192803.50	23.5	192803.50	192830.50	27	192830.50	192840.00	9.5
II	194980.00	195002.90	22.9	195002.90	195027.10	24.2	195027.10	195040.00	12.9
II	199100.00	199168.00	68	199168.00	199192.00	24	199192.00	199220.00	28
II	201680.00	201717.50	37.5	201717.50	201752.50	35	201752.50	201800.00	47.5
	Length		**408.4**	**Length**		**197.2**	**Length**		**564.4**
Total Length of RCC Crash Barrier (m) = 394.4 (197.2X2)									
Total Length of Metal Beam Crash Barrier(m) = 1945.6 (972.8X2)									
Total Length of Metal Beam & RCC Crash Barrier at Bridge Locations=2340									

Package-III

Package	Metal Beam Barrier (m)		Length (m)	Crash Barrier (m)		Length(m)	Metal Beam Barrier(m)		Length(m)
III	210160	210234.5	74.5	210234.5	210265.5	31	210265.50	210280.00	14.5
III	214410	214464.5	54.5	214464.5	214483.5	19	214483.50	214570.00	86.5
III	217020	217248	228	217248	217268	20	217268.00	217380.00	112
III	220480	220587	107	220587	220605	18	220605.00	220670.00	65
III	223990	224057	67	224057	224073	16	224073.00	224480.00	407
III	225440	225482	42	225482	225500	18	225500.00	225550.00	50
III	228000	228036	36	228036	228056	20	228056.00	228110.00	54
III	233580	233608	28	233608	233628	20	233628.00	233660.00	32
III	236420	236476.5	56.5	236476.5	236507.5	31	236507.50	236560.00	52.5
III	237310	237356	46	237356	237372	16	237372.00	237440.00	68
III	240040	240083	43	240083	240099	16	240099.00	240140.00	41
III	244550	244570.5	20.5	244570.5	244629.5	59	244629.50	244660.00	30.5
III	245980	246010	30	246010	246028	18	246028.00	246070.00	42
	Length		**833**	**Length**		**302**	**Length**		**1055**
	Total Length of RCC Crash Barrier (m) = 604 (302X2)								
	Total Length of Metal Beam Crash Barrier(m) = 3776 (1888X2)								
	Total Length of Metal Beam & RCC Crash Barrier at Bridge Locations=4380								

Table 2.19 Location of S - Curve Sign Board at the Approaches of Curve
Package-I

S.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
1	I	167+320	LHS	S Curve	W- Beam Metal crash barrier
2	I	167+510	RHS	S Curve	W- Beam Metal crash barrier
3	I	172+800	LHS	S Curve	W- Beam Metal crash barrier
4	I	173+130	RHS	S Curve	W- Beam Metal crash barrier
5	I	179+830	LHS	S Curve	W- Beam Metal crash barrier
6	I	180+060	RHS	S Curve	W- Beam Metal crash barrier
7	I	183+100	LHS	S Curve	W- Beam Metal crash barrier
8	I	183+400	RHS	S Curve	W- Beam Metal crash barrier
9	I	185+280	LHS	S Curve	W- Beam Metal crash barrier
10	I	185+610	RHS	S Curve	W- Beam Metal crash barrier
11	I	186+620	LHS	S Curve	W- Beam Metal crash barrier
12	I	186+740	RHS	S Curve	W- Beam Metal crash barrier
13	I	186+820	LHS	S Curve	W- Beam Metal crash barrier
14	I	186+970	RHS	S Curve	W- Beam Metal crash barrier
15	I	182+030	LHS	S Curve	W- Beam Metal crash barrier
16	I	192+190	RHS	S Curve	W- Beam Metal crash barrier
17	I	182+450	RHS	S Curve	W- Beam Metal crash barrier
18	I	192+560	LHS	S Curve	W- Beam Metal crash barrier

Package-II

Sr.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
1	II	167+320	LHS	S Curve	W- Beam Metal crash barrier
2	II	167+510	RHS	S Curve	W- Beam Metal crash barrier
3	II	172+800	LHS	S Curve	W- Beam Metal crash barrier
4	II	173+130	RHS	S Curve	W- Beam Metal crash barrier
5	II	179+830	LHS	S Curve	W- Beam Metal crash barrier
6	II	180+060	RHS	S Curve	W- Beam Metal crash barrier
7	II	183+100	LHS	S Curve	W- Beam Metal crash barrier
8	II	183+400	RHS	S Curve	W- Beam Metal crash barrier
9	II	185+280	LHS	S Curve	W- Beam Metal crash barrier
10	II	185+610	RHS	S Curve	W- Beam Metal crash barrier
11	II	186+620	LHS	S Curve	W- Beam Metal crash barrier
12	II	186+740	RHS	S Curve	W- Beam Metal crash barrier
13	II	186+820	LHS	S Curve	W- Beam Metal crash barrier
14	II	186+970	RHS	S Curve	W- Beam Metal crash barrier

Sr.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
15	II	182+030	LHS	S Curve	W- Beam Metal crash barrier
16	II	192+190	RHS	S Curve	W- Beam Metal crash barrier
17	II	182+450	RHS	S Curve	W- Beam Metal crash barrier
18	II	192+560	LHS	S Curve	W- Beam Metal crash barrier

Package-III

Sr.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
1.	III	206+856	Right	S Curve	W- Beam Metal crash barrier
2.	III	207+049	Left	S Curve	W- Beam Metal crash barrier
3.	III	207+294	Right	S Curve	W- Beam Metal crash barrier
4.	III	208+692	Right	S Curve	W- Beam Metal crash barrier
5.	III	210+122	Right	S Curve	W- Beam Metal crash barrier
6.	III	210+740	Right	S Curve	W- Beam Metal crash barrier
7.	III	216+927	Left	S Curve	W- Beam Metal crash barrier
8.	III	217+190	Right	S Curve	W- Beam Metal crash barrier
9.	III	217+347	Left	S Curve	W- Beam Metal crash barrier
10.	III	217+418	Left	S Curve	W- Beam Metal crash barrier
11.	III	217+483	Left	S Curve	W- Beam Metal crash barrier
12.	III	218+574	Right	S Curve	W- Beam Metal crash barrier
13.	III	218+863	Right	S Curve	W- Beam Metal crash barrier
14.	III	218+993	Left	S Curve	W- Beam Metal crash barrier
15.	III	219+120	Left	S Curve	W- Beam Metal crash barrier
16.	III	220+625	Right	S Curve	W- Beam Metal crash barrier
17.	III	221+965	Left	S Curve	W- Beam Metal crash barrier
18.	III	223+367	Left	S Curve	W- Beam Metal crash barrier
19.	III	225+733	Left	S Curve	W- Beam Metal crash barrier
20.	III	226+073	Left	S Curve	W- Beam Metal crash barrier
21.	III	227+034	Left	S Curve	W- Beam Metal crash barrier
22.	III	227+139	Left	S Curve	W- Beam Metal crash barrier
23.	III	229+084	Left	S Curve	W- Beam Metal crash barrier
24.	III	232+240	Right	S Curve	W- Beam Metal crash barrier
25.	III	232+379	Left	S Curve	W- Beam Metal crash barrier
26.	III	234+073	Right	S Curve	W- Beam Metal crash barrier
27.	III	235+764	Left	S Curve	W- Beam Metal crash barrier
28.	III	236+259	Left	S Curve	W- Beam Metal crash barrier
29.	III	236+376	Right	S Curve	W- Beam Metal crash barrier
30.	III	236+471	Left	S Curve	W- Beam Metal crash barrier
31.	III	238+488	Right	S Curve	W- Beam Metal crash barrier

Sr.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
32.	III	238+554	Left	S Curve	W- Beam Metal crash barrier
33.	III	240+198	Left	S Curve	W- Beam Metal crash barrier
34.	III	241+680	Right	S Curve	W- Beam Metal crash barrier
35.	III	243+645	Right	S Curve	W- Beam Metal crash barrier
36.	III	243+773	Left	S Curve	W- Beam Metal crash barrier
37.	III	245+461	Left	S Curve	W- Beam Metal crash barrier
38.	III	246+094	Left	S Curve	W- Beam Metal crash barrier
39.	III	246+263	Right	S Curve	W- Beam Metal crash barrier
40.	III	250+757	Right	S Curve	W- Beam Metal crash barrier
41.	III	251+024	Left	S Curve	W- Beam Metal crash barrier
42.	III	251+280	Right	S Curve	W- Beam Metal crash barrier
43.	III	251+457	Left	S Curve	W- Beam Metal crash barrier
44.	III	252+110	Left	S Curve	W- Beam Metal crash barrier
45.	III	252+225	Right	S Curve	W- Beam Metal crash barrier
46.	III	252+919	Left	S Curve	W- Beam Metal crash barrier

Table 2.20 Location of Hair pin bend sign board

Package-I

S.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
1	I	169+850	LHS	Hair Pin Bend	W- Beam Metal crash barrier
2	I	169+930	RHS	Hair Pin Bend	W- Beam Metal crash barrier
3	I	170+120	LHS	Hair Pin Bend	W- Beam Metal crash barrier
4	I	170+200	RHS	Hair Pin Bend	W- Beam Metal crash barrier

Package-II

Sr.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
1	II	169+850	LHS	Hair Pin Bend	W- Beam Metal crash barrier
2	II	169+930	RHS	Hair Pin Bend	W- Beam Metal crash barrier
3	II	170+120	LHS	Hair Pin Bend	W- Beam Metal crash barrier
4	II	170+200	RHS	Hair Pin Bend	W- Beam Metal crash barrier

Package-III

S.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
1	III	217+700	LHS	Hair Pin Bend	W- Beam Metal crash barrier
2	III	222+600	RHS	Hair Pin Bend	W- Beam Metal crash barrier

S.No	Package	Design Chainage (Km)	Side	Remarks	Safety Measure
3	III	230+100	LHS	Hair Pin Bend	W- Beam Metal crash barrier
4	III	238+400	RHS	Hair Pin Bend	W- Beam Metal crash barrier

2.3.19 VEHICULAR UNDER PASS (VUP)

Vehicular under Pass is not provided for the proposed road.

2.3.20 RAIL OVER BRIDGE

Railway line does not Passes in the proposed road.

Toll plazas and Rest Areas

2 Toll Plazas, 2 Rest Areas & 2Trucks Lay Byes:

The details of the facilities proposed in the project road are given below in the Table 2-29, Table 2-30 and Table 2-31

Table 2-21: Proposed Toll Plaza

S. N	Location	Tollable section	Applicable Length (Km)
1	Package-I: Km 143+470(4/852 of ODR) at Ramarajupalem Village	Km120+000 to Km165+500	45.5
2	Package-III: Km 215+423(16/466 of ODR) at Kistapuram & Pinakiltaru Village	Km 165+500 to Km 253+974	88.474
Total Tollable (km)			**133.974**

Table 2-22: Rest Areas

S. No	Existing Chainage (Km)	Design Chainage(Km)	Side	Remarks
1	4/283 of ODR	142+900	LHS	Valasampeta village

Table 2-23: Proposed Truck lay-byes

S. No	Existing Chainage (Km)	Design Chainage (Km)	Side	Remarks
1	--	138+180	LHS	Krishnadevipeta & Lakshmipur village
2	39/310 of ODR	178+270	LHS	Asurada village
3	22/838 of ODR	209+155	LHS	Tajangi village

2.4 OTHER STRUCTURES AND IMPROVEMENTS

2.4.1 BUS SHELTERS

Bus shelters are proposed at the locations given in Table 2-32.

Table 2-24: Proposed Bus shelters at the locations

S.No	Design Chainage (Km)	Side		Remarks	S.No	Design Chainage (Km)	Side		Remarks
1.	123+170	LHS	RHS	Nadimpalem (26) Village	2.	186+360	LHS	RHS	Chintapalli
3.	125+650	LHS	RHS		4.	192+650	LHS	RHS	Rowrintada

S.No	Design Chainage (Km)	Side		Remarks	S.No	Design Chainage (Km)	Side		Remarks
5.	127+288	LHS	RHS	Chintalapudi Village	6.	196+145	LHS	RHS	Krishnapuram
7.	134+100	LHS	RHS	Ravanapalli Village	8.	197+510	LHS	RHS	Krishnapuram
9.	135+780	LHS	RHS	Chidikada Village	10.	199+440	LHS	RHS	Rajupakulu
11.	142+800	LHS	RHS	Valasampeta Village	12.	201+930	LHS	RHS	Diguvapakalu
13.	144+080	LHS	RHS	Ramarajapalem Village	14.	202+790	LHS	RHS	Lammasingi
15.	145+480	LHS	RHS	Nalagonda Village	16.	205+470	LHS	RHS	Lammasingi Village
17.	147+550	LHS	RHS	Nadimpalem(59) Village	18.	207+025	LHS	RHS	Lammasingi Village
19.	149+130	LHS	RHS	Battapanakulu& Katragadda Village	20.	211+525	LHS	RHS	Tajangi Village
21.	164+250	LHS	RHS	Rampulu Village	22.	221+013	LHS	RHS	Boddumamidi Village
23.	166+540	LHS	RHS	Chaprathipalem	24.	227+213	LHS	RHS	Kulapadu Village
25.	170+925	LHS	RHS	Pedavalasa	26.	231+569	LHS	RHS	Pedevurumu Village
27.	172+815	LHS	RHS	Pedajadumuru	28.	232+719	LHS	RHS	G Madugula Village
29.	176+525	LHS	RHS	Sankada	30.	233+712	LHS	RHS	G Madugula Village
31.	178+495	LHS	RHS	Asurada	32.	237+762	LHS	RHS	Singam & Machipuram Village
33.	181+170	LHS	RHS	Rinthada	34.	239+022	LHS	RHS	Banda veedhi Village
35.	183+475	LHS	RHS	Antharla	36.	246+253	LHS	RHS	Banda veedhi Village
37.	185+600	LHS	RHS	Antharla	38.	248+333	LHS	RHS	Gunduru Village

This is a preliminary identified locations which will be updated during the course of execution of road construction work as per the site conditions.

2.4.2 DRAINAGE

The IRC: SP 42 was followed for the design of highway drainage. The planning of highway and drainage is intricately linked with the terrain, alignment of the highway and the proposed cross drainage works. The planning and designing of adequate drainage system is a primary requirement for maintaining a structural soundness and functional efficiency of a road. Pavement structure including sub-grade must be protected

from any ingress of water; otherwise over a period of time it may weaken the sub-grade by saturating it and cause distress in the pavement structure.

Hence, disposal of water from the pavement and sub-grade is a basic consideration in road design. Over and above quick drainage takes away the water from pavement surface and reduces chances of skidding of vehicles. In order to guard the pavement from the poorly drained conditions planning, designing, construction and maintenance of longitudinal drains on either side of the roads is very much essential. The surface water from the pavement and shoulders will be made to flow into the drains by providing suitable cross slopes / camber.

Earthen drains will be provided through-out the project road to ensure efficient drainage from carriageway to drain. All drains will be connected to cross drainage structure. Median drains will be provided with rain water harvesting structure.

Surface Drains

Surface drainage system is proposed for the road stretch in the built-up sections to carry out the surface water into the percolation pits/rainwater harvesting pits. The details of the surface drains are shown in Table 2-

Table 2-25: Location of Lined Drain & Catch Drain

S.N	Existing Chainage (Km)		Design Chainage (Km)		Length (Km)	TCS Type	Widening Scheme
	From	To	From	To			
1.	36/421	35/916	129+350	129+900	0.55	Type-4	Hilly terrain Reconstruction with Retaining Structure
2.	35/721	35/372	130+100	130+500	0.40	Type-4	Hilly terrain Reconstruction with Retaining Structure
3.	35/022	34/627	130+850	131+300	0.45	Type-4	Hilly terrain Reconstruction with Retaining Structure
4.	34/341	33/951	131+600	131+980	0.38	Type-4	Hilly terrain Reconstruction with Retaining Structure
5.	11/792	12/767	150+350	151+350	0.45	Type-4	Hilly terrain Reconstruction with Retaining Structure
6.	13/812	14/594	152+450	153+300	0.85	Type-4	Hilly terrain Reconstruction with Retaining Structure
7.	14/954	15/730	153+700	154+500	0.80	Type-4	Hilly terrain Reconstruction with Retaining Structure
8.	16/200	16/456	155+000	155+300	0.30	Type-4	Hilly terrain Reconstruction with Retaining Structure
9.	16/895	18/149	155+750	157+050	1.30	Type-4	Hilly terrain Reconstruction with Retaining Structure
10.	18/350	18/695	157+250	157+600	0.35	Type-4	Hilly terrain Reconstruction with Retaining Structure
11.	19/287	21/068	158+200	161+100	2.90	Type-4	Hilly terrain Reconstruction with Retaining Structure
12.	21/331	21/631	161+350	161+650	0.30	Type-4	Hilly terrain Reconstruction with Retaining Structure

S.N	Existing Chainage (Km)		Design Chainage (Km)		Length (Km)	TCS Type	Widening Scheme
	From	To	From	To			
13.	45/010	44/830	120+900	121+060	0.16	Type-5	New/Reconstruction in cutting section with Retaining wall
14.	36/822	36/421	128+950	129+350	0.40	Type-5	New/Reconstruction in cutting section with Retaining wall
15.	35/916	35/721	129+900	130+100	0.20	Type-5	New/Reconstruction in cutting section with Retaining wall
16.	35/372	35/022	130+500	130+850	0.35	Type-5	New/Reconstruction in cutting section with Retaining wall
17.	13/251	13/812	151+900	152+450	0.55	Type-5	New/Reconstruction in cutting section with Retaining wall
18.	14/594	14/954	153+300	153+700	0.40	Type-5	New/Reconstruction in cutting section with Retaining wall
19.	15/730	16/200	154+500	155+000	0.50	Type-5	New/Reconstruction in cutting section with Retaining wall
20.	16/456	16/895	155+300	155+750	0.45	Type-5	New/Reconstruction in cutting section with Retaining wall
21.	18/695	19/287	157+600	158+200	0.60	Type-5	New/Reconstruction in cutting section with Retaining wall
22.	26/347	26/468	165+380	165+500	0.12	Type-5	New/Reconstruction in cutting section with Retaining wall
23.	26/468	26/619	165+500	165+650	0.15	Type-5	New/Reconstruction in cutting section with Retaining wall
24.	28/582	30/900	167+610	169+900	2.29	Type-4	Hilly terrain Reconstruction with Retaining Structure
25.	30/900	31/475	169+900	170+470	0.57	Type-4	Hilly terrain Reconstruction with Retaining Structure
26.	48/175	46/954	187+230	188+440	1.21	Type-4	Hilly terrain Reconstruction with Retaining Structure
27.	46/353	37/400	188+940	197+900	8.96	Type-4	Hilly terrain Reconstruction with Retaining Structure
28.	36/411	36/242	198+780	198+950	0.17	Type-5	Hilly terrain Reconstruction with Retaining Structure
29.	35/706	35/536	199+480	199+650	0.17	Type-4	Hilly terrain Reconstruction with Retaining Structure
30.	31/288	30/720	203+850	204+400	0.55	Type-4	Hilly terrain Reconstruction with Retaining Structure
31.	30/600	30/184	204+510	204+750	0.24	Type-4	Hilly terrain Reconstruction with Retaining Structure
32.	30/184	29/914	204+750	205+000	0.25	Type-4	Hilly terrain Reconstruction with Retaining Structure
33.	24/276 (	24/116	207+650	207+810	0.160	Type-5	Hilly terrain Reconstruction with Retaining Structure
34.	19/103	18/900	212+800	213+000	0.200	Type-5	Hilly terrain Reconstruction with Retaining Structure

S.N	Existing Chainage (Km)		Design Chainage (Km)		Length (Km)	TCS Type	Widening Scheme
	From	To	From	To			
35.	17/988	17/683	213+900	214+200	0.300	Type-5	Hilly terrain Reconstruction with Retaining Structure
36.	15/820	15/545	216+050	216+340	0.290	Type-5	Hilly terrain Reconstruction with Retaining Structure
37.	14/783	14/551	217+100	217+300	0.200	Type-4	Hilly terrain Reconstruction with Retaining Structure
38.	13/940	13/758	217+900	218+100	0.200	Type-4	Hilly terrain Reconstruction with Retaining Structure
39.	13/758	13/532	218+100	218+280	0.180	Type-5	Hilly terrain Reconstruction with Retaining Structure
40.	13/532	13/303	218+280	218+530	0.250	Type-4	Hilly terrain Reconstruction with Retaining Structure
41.	13/303	11/500	218+530	220+300	1.770	Type-5	Hilly terrain Reconstruction with Retaining Structure
42.	11/178	11/012	220+640	220+800	0.160	Type-4	Hilly terrain Reconstruction with Retaining Structure
43.	10/636	10/260	221+250	221+550	0.300	Type-4	Hilly terrain Reconstruction with Retaining Structure
44.	10/025	9/122	221+780	222+680	0.900	Type-5	Hilly terrain Reconstruction with Retaining Structure
45.	7/975	7/604	223+850	224+200	0.350	Type-4	Hilly terrain Reconstruction with Retaining Structure
46.	7/213	7/012	224+600	224+800	0.200	Type-5	Hilly terrain Reconstruction with Retaining Structure
47.	6/109	5/658	225+700	226+150	0.450	Type-5	Hilly terrain Reconstruction with Retaining Structure
48.	5/256	5/070	226+550	226+730	0.180	Type-5	Hilly terrain Reconstruction with Retaining Structure
49.	2/207	1/421	229+550	230+340	0.790	Type-4	Hilly terrain Reconstruction with Retaining Structure
50.	1/421	0/940	230+340	230+800	0.460	Type-5	Hilly terrain Reconstruction with Retaining Structure
51.	22/116	21/685	231+970	232+400	0.430	Type-5	Hilly terrain Reconstruction with Retaining Structure
52.	20/080	19/180	234+000	234+900	0.900	Type-4	Hilly terrain Reconstruction with Retaining Structure
53.	18/074	17/680	236+000	236+400	0.400	Type-4	Hilly terrain Reconstruction with Retaining Structure
54.	16/513	16/162	237+550	237+900	0.350	Type-5	Hilly terrain Reconstruction with Retaining Structure
55.	14/439	13/635	239+620	240+390	0.770	Type-5	Hilly terrain Reconstruction with Retaining Structure
56.	11/482	11/330	242+570	242+720	0.150	Type-5	Hilly terrain Reconstruction with Retaining Structure

S.N	Existing Chainage (Km)		Design Chainage (Km)		Length (Km)	TCS Type	Widening Scheme
	From	To	From	To			
57.	9/893	9/682	244+150	244+350	0.200	Type-4	Hilly terrain Reconstruction with Retaining Structure
58.	8/197	7/686	245+840	246+350	0.510	Type-5	Hilly terrain Reconstruction with Retaining Structure
59.	4/610	4/257	249+400	249+750	0.350	Type-5	Hilly terrain Reconstruction with Retaining Structure
60.	3/693	2/988	250+300	251+000	0.700	Type-5	Hilly terrain Reconstruction with Retaining Structure
61.	2/389	1/675	251+600	252+300	0.700	Type-5	Hilly terrain Reconstruction with Retaining Structure

Built-up Location

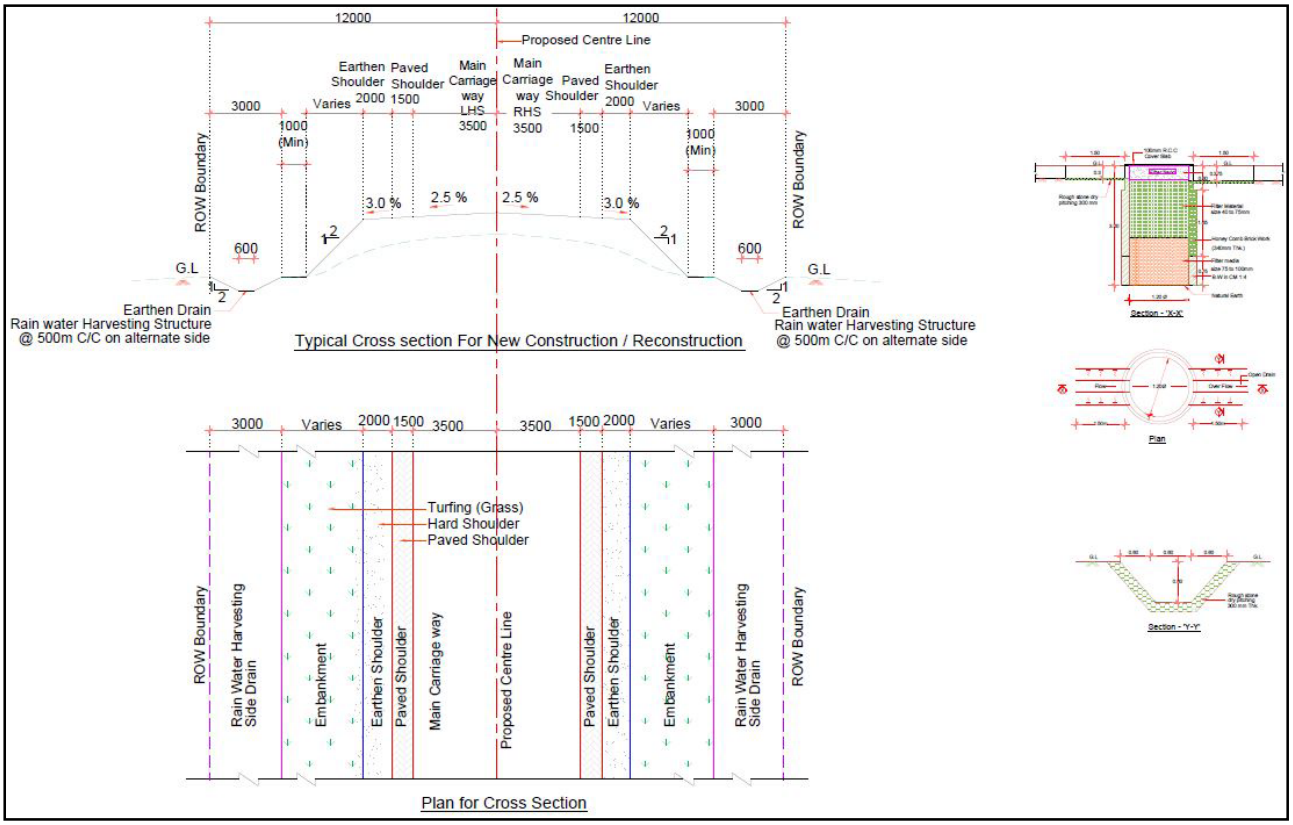
S.N	Design Chainage (Km)		Length (Km)	Refer to Cross section	Remarks
	From	To			
1.	122+980	123+200	0.22	Type-3	Nadimpalem (26)
2.	124+400	124+750	0.35	Type-3	
3.	127+200	127+450	0.25	Type-3	Chintalapudi
4.	133+800	134+370	0.57	Type-3	Ravanapalli
5.	145+190	145+600	0.41	Type-3	Makaram
6.	147+430	147+770	0.34	Type-3	Nadimpalem (59)
7.	170+470	171+200	0.73	Type-3	Pedavalasa
8.	172+570	173+000	0.43	Type-3	Pedajadumuru
9.	176+320	176+735	0.415	Type-3	Sankada
10.	177+565	177+800	0.235	Type-3	Asurada
11.	180+955	181+700	0.745	Type-3	Rintada
12.	186+100	187+230	1.13	Type-3	Antharla & Chintapalli
13.	205+400	205+700	0.3	Type-3	Lammasingi
14.	206+400	207+400	1	Type-3	Lammasingi
15.	210+850	211+900	1.05	Type-3	Tajangi
16.	220+800	221+250	0.45	Type-3	Vanjari
17.	227+300	227+700	0.4	Type-3	Kulapadu
18.	232+400	233+500	1.1	Type-3	Gangarajumadugula
19.	234+900	235+150	0.25	Type-3	P.Gangarajumadugula
20.	239+060	239+620	0.56	Type-3	Bandaveedhi
21.	241+770	242+050	0.28	Type-3	Kondalakodapalli
22.	248+400	248+800	0.4	Type-3	Gonduru
23.	252+300	253+974	1.674	Type-3	Paderu

2.4.3 RAIN WATER HARVESTING UNITS

As per ministry of environment and forest notification, New Delhi dated 14.01.1997 (as amended on 13.01.1998, 05.01.1999 & 06.11.2000), the construction of rainwater harvesting structure is mandatory in and around water crisis area, notified by central ground water board. The Provision of Rain water Harvesting Structures has been provided as per Ministry policy Circular No –RW/NH-33044/14/2003-S& R ® dated on 05.09.2019. A total number of 268 RWH units has been proposed.

Rain water Harvesting Structures shall be constructed at every 500m on either side of the road after consultation with Central Ground Water Board/State Ground Water Board, wherever technically feasible.

Fig 2.6 : Typical design of rainwater harvesting unit (with drawing)



2.4.4 FOOT PATHS

The footpaths are proposed in built-up areas where the pedestrian traffic is likely to be mixed with vehicle traffic. In order to separate the pedestrian traffic footpaths are proposed. The width of footpath is proposed as 1.5m and will be constructed over built up drains. The capacity of 1.5 m wide footpath as per IRC: 86 is 800 numbers / hour in both directions. Since, the project road runs mostly in small settlements. Footpath is not required.

Table 2-26: Foot paths

TCS Type	Description	Length (Km)	Package
Type-3	Two lane carriageway with paved shoulder in Built-up area - Reconstruction	2.14	I

Type-3	Two lane carriageway with paved shoulder in Built-up area - Reconstruction	3.685	II
Type-3	Two lane carriageway with paved shoulder in Built-up area - Reconstruction	7.464	III

2.5 LOCATIONS OF STONE BOULDERS, STONE QUARRIES AND BORROW AREAS WITH LEAD CHART

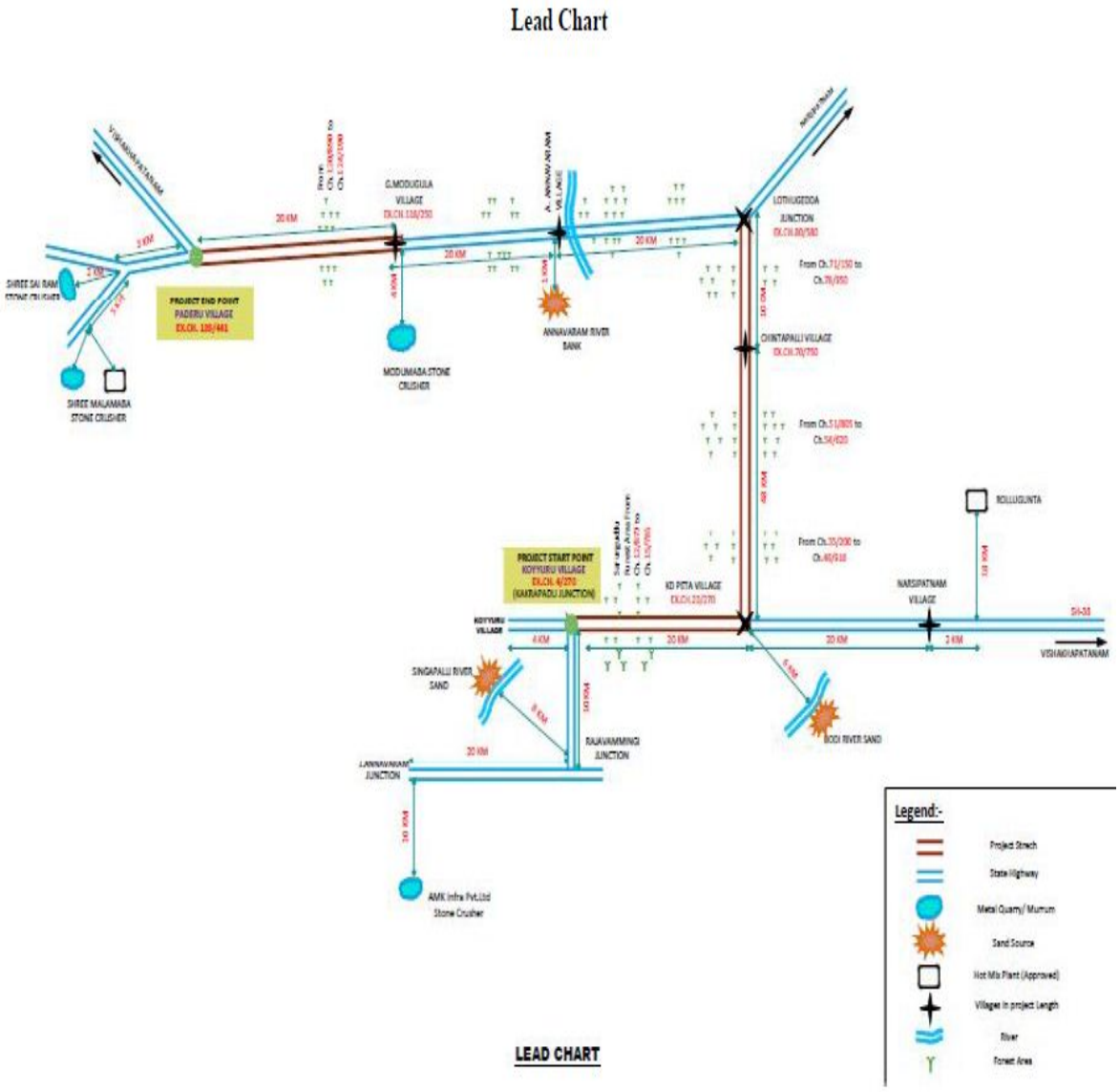


Fig 2.7 Lead chart Stone boulders, stone quarries and borrow areas

2.6 WILDLIFE UNDERPASSES

The biodiversity impact assessment study and the wildlife mitigation plan prepared for the Project highway has identified 28 underpasses for the movement of mammals (Bison, Sloth bear, deer, wild boar) and reptiles (Cobra) with various dimensions. Different types of underpasses like Box culverts, pipe culverts, and culverts with furniture will be constructed for passage of herpeto-fauna, amphibians etc.

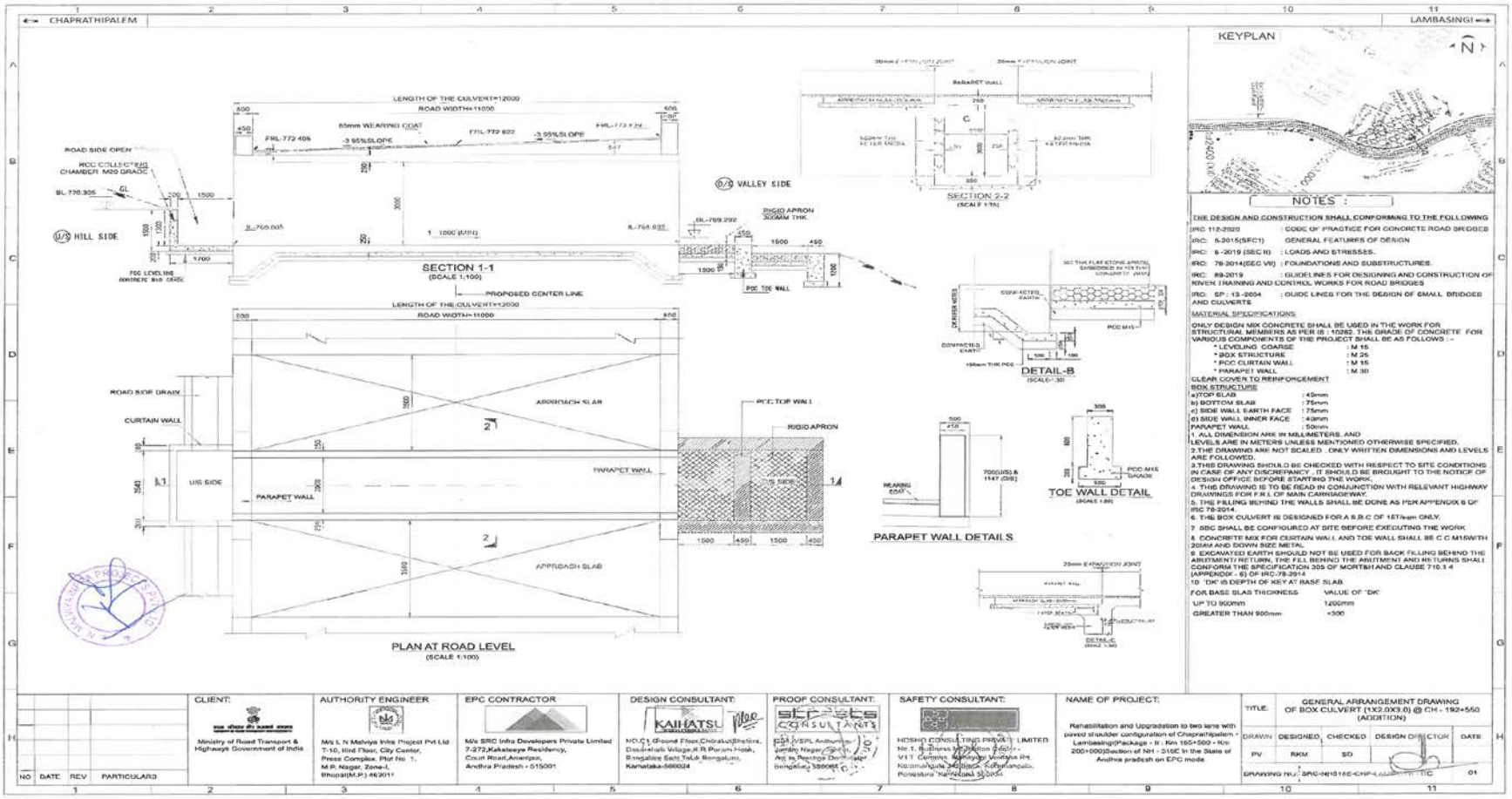
Vegetation or other habitat features (Rocks, fallen timber) will be placed, planted or allowed to regrow so that animals are directed to preferred crossing locations.

TABLE 2.27: NEW WILDLIFE UNDERPASSES ARE PROPOSED AT FOLLOWING LOCATIONS:

S. No	Forest Patch	Length in "Km"	Area in "Ha"	Structure Proposed	Location	Proposed Center Line Coordinates		Size (Span x Opening x Height) in "m"
						Easting	Northing	
1	Patch - 1 (128+800 - 132+100)	3.300	6.58	Box culvert	131+494	639323.49	1951828.7	1 x 4 x 4 x 5
2				Box culvert	132+039	639638.85	1952278.7	1 x 2 x 1.5
3	Patch - 2 (150+900 - 162+700)	11.800	23.58	Box culvert	150+920	642162.24	1962689.8	1 x 2 x 1.5
4				Box culvert	150+980	642177.41	1962632.5	1 x 2 x 1.5
5				Box culvert	151+855	641902.09	1962837.4	1 x 2 x 2
6				Box culvert	152+460	641930.48	1962927.2	1 x 2 x 2
7				Box culvert	152+590	641936.3	1962950.1	1 x 2 x 1.5
8				Box culvert	153+660	641759.13	1962967.6	1 x 2 x 1.5
9				Box culvert	153+770	641724.74	1962975.3	1 x 2 x 1.5
10				Box culvert	154+045	641522.16	1962854.2	1 x 2 x 1.5
11				Box culvert	154+470	641702.45	1963010.2	1 x 2 x 3
12				Box culvert	154+550	641657.61	1963024.5	1 x 2 x 1.5
13				Box culvert	154+755	641466.48	1962942.9	1 x 2 x 3
14				Box culvert	154+900	641346.49	1962879.4	1 x 2 x 1.5
15				Box culvert	155+010	641322.74	1962901.4	1 x 2 x 1.5
16				Box culvert	155+180	641462.88	1962996.0	1 x 2 x 2
17				Box culvert	155+540	641298.48	1962925.5	1 x 2 x 3
18				Box culvert	155+650	641265.67	1962948.8	1 x 2 x 1.5
19				Box culvert	157+560	641068.59	1963344.0	1 x 2 x 2

20	Patch -3 (167+610 - 169+610)	2.000	4.02	Box culvert	168+660	634834.37	1965044.6	1 x 2 x 3 x 2
21	Patch - 4 (187+230 - 188+300)	1.070	1.51	Pipe culvert	188+135	644986.4	1975944.0	1 X 1.2m Dia
22	Patch - 5 (189+250 - 194+900)	5.650	6.30	Box culvert	192+240	648404.01	1974617.4	1 x 2 x 3 x 2
23				Box culvert	192+550	648661.34	1974779.1	1 x 2 x 3 x 3
24	Patch - 6 (196+330 - 197+900)	1.570	1.08	Box culvert	197+786	653198.43	1973662.9	1 x 2 x 2
25	Patch - 7 (217+400 - 220+300)	2.900	9.90	Box culvert	217+640	658476.87	1980570.3	1 x 2 x 3 x 5
26	Patch - 8 (221+900 - 224+200)	2.300	6.85	Box culvert	222+940	659258.64	1984598.4	1 x 3 x 4 x 4
27				Box culvert	223+460	659219.71	1985092.9	1 x 2 x 3 x 4
28				Minor bridge	224+065	659283.87	1985543.8	2 x 5, 16m (Deck Width)
	Patch - 9 (238+600 - 238+700)	0.1	0.24	-	-	-	-	-
		Total	60.060					

GENERAL ARRANGEMENT DRAWING OF BOX CULVERT AT KM 192+550 (S. NO. 23) WHICH WILL ACT AS UNDERPASS FOR ANIMAL CROSSING



3 POLICY AND LEGAL FRAMEWORK

This section presents the national and state level environmental legislations and regulations and World Bank Policies relevant to the "Improvement and upgradation of Koyyuru – Paderu Road Section (Km 120/000 to Km 253/974) in the State of Andhra Pradesh".The various environmental regulations applicable and regulatory consents and clearances required for the proposed up-gradation project are also been incorporated in this section.

3.1 LEGAL FRAMEWORK

The Government of India has laid out various policy guidelines, acts and regulations pertaining to environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of environment. As per this Act, the responsibility to administer, the legislation has been jointly entrusted to the Ministry of Environment, Forests and Climate Change (MoEF&CC) at National level, whereas Andhra Pradesh Pollution Control Board (APPCB) at State level in the present context to "Improvement and upgradation of Koyyuru –Paderu Road Section (Km 120+000 to Km 253+974) in the State of Andhra Pradesh".

3.2 APPLICABLE NATIONAL AND STATE REGULATIONS

The key environmental and other regulations relevant to Improvement and upgradation of Koyyuru – Paderu Road Section of NH-516 E in the State of Andhra Pradesh are presented in Table 3-1.

Table 3-1: Environmental Regulations Relevant to the Project Road

S.No	Act / Rules	Purpose	Applicable	Reason forApplicability	RegulatoryClearances Required, if any	Authority
1	Environment Protection Act 1986	To protect and improve overall environment	Yes	It is umbrella legislation. Various notifications, rules and schedules are promulgated under this act.		MoEF&CC, APPCB
2	Environmental Impact Assessment Notification, 2006 & subsequent activities	Prior environmental clearance for designated activities for category A and B projects under the Environmental Impact Assessment Notification, 2006 & subsequent activities	Yes	The project road is not covered under the preview of EIA Notification 2006 and subsequent amendment. However,for opening of new borrow areas and stone quarry, prior environmental clearance will be required from SEIAA/DEIAA.	No	SEIAA/ DEIAA
3	Notification for use of Fly ash, 3rd November,2009 and its amendment on 25th January, 2016	"No agency, person or organization shall, within a radius of 300 Kilometres of a thermal power plant undertake construction or approve design for construction	Yes	Simahadri Thermal power plant near Vishakhapatanam is nearest to the project highway & is located at a distance of about 100 km from project Highway. Flyash can provide technically viable, environmentally	Use of Fly ash in the Road construction.	

S.No	Act / Rules	Purpose	Applicable	Reason forApplicability	RegulatoryClearances Required, if any	Authority
		of roads or flyover embankments with top soils; the guidelines or specifications issued by the Indian Road Congress (IRC) as contained in IRC specification No. SP: 58 of 2001 as amended from time to time regarding use of fly ash		sound & cost effective alternative to natural borrow soil.		
13	Mines and Minerals (Development and Regulation) Amendment Act, 2015	This act has been notified for safe and sound mining activity.	Yes	The construction of project road will require aggregate through mining from riverbeds and quarries	Permit and mining lease for stone quarry	Department of mining, State Government
14	Minor Mineral and concession Rules, 2015	For opening new borrow / quarry	Yes	Regulate use of minor minerals like stone, soil, river sand etc.	Permit and mining lease for stone quarry	District Collector
15	Ancient Monuments and Archaeological Sites and Remains Act, 1958	Protection of Archaeological Monuments sites and Remains	No	No notified Archaeological Monuments is located within 300m of the project highway. However for chance finds the said act will be applicable.	Permission from ASI	Archaeological Survey of India

S.No	Act / Rules	Purpose	Applicable	Reason forApplicability	RegulatoryClearances Required, if any	Authority
16	Explosive Act 1984	An Act to regulate the manufacture, possession, use, sale, [transport, import and export] of Explosives	Yes	If contractor open stone quarry and use explosive for quarrying	License for storage and handling of explosive.	Chief Controller of Explosives
17	The Building and Other Construction Workers (regulation of employment and conditions of service) Act, 1996	To regulate the employment and conditions of construction workers and to provide for their safety, health and welfare measure and for other matter incidental thereto	Yes	To ensure safety and welfare measures for workers employed at construction sites.Compliance to provisions of health and safety measures for the construction workers in conformity with BOCW rule concerning safety and health in construction. These regulations to be complied with during the construction of proposed road works.	Safety and welfare measures for work force employed at construction sites are to be regulated in conformity with this act.	State Labour Department
18	Bonded Labour System (Abolition) Act, 1976 along with Rules, 1976	An Act to provide for the abolition of bonded labour system with a view to preventing the economic and physical exploitation of	Yes	Contractors shall employ number of Labours during Construction Phase. Contractor will ensure that there is no Bonded Labour by him or sub contractors.	Labour License	State Labour Department

S.No	Act / Rules	Purpose	Applicable	Reason forApplicability	RegulatoryClearances Required, if any	Authority
		the weaker sections of the people and for matters connected therewith or incidental thereto				
19	Contract Labour (Regulation and Abolition) Act 1970 along with rules, 1971	The Object of the Contract Labour Regulation and Abolition) Act, 1970 is to prevent exploitation of contract labour and also to introduce better conditions of work	Yes	Contractors shall employ numbers of work-force during Construction Phase. The Act applies to the Principal Employer of an Establishment and the Contractor where in 20 or more workmen are employed or were employed even for one day during preceding 12 months as Contract Labour.	Labour License	State Labour Department
20	Employees Provident Funds and Miscellaneous Provisions Acts 1952 along with EPF Scheme Rules and Forms	It is a beneficent piece of social welfare legislation aimed at promoting and securing the well-being of the employees	Yes	Contractors shall be employing Workman more than 20 persons during Construction Phase	Compliance of regulations as provisioned in EPF Rules.	State Labour Department

S.No	Act / Rules	Purpose	Applicable	Reason forApplicability	RegulatoryClearances Required, if any	Authority
21	Employees State Insurance Act 1948 along with Rules and Regulations	Protect the interest of workers in contingencies such as sickness, maternity, temporary or permanent physical disablement, death due to employment injury resulting in loss of wages or earning capacity. the Act also guarantees reasonably good medical care to workers and their immediate dependents	Yes	Contractor shall be applying large number of labours during construction which will include both Men and Women	Insurance Policy (ESIC)	State Labour Department
22	Equal Remuneration Act, 1976 along with allied Rules	An Act to provide for the payment of equal remuneration to men and women workers and for the prevention of	Yes	Contractor shall be applying large number of labours during construction which will include both Men and Women.	Compliance of regulations as per Equal remuneration rules.	State Labour Department

S.No	Act / Rules	Purpose	Applicable	Reason forApplicability	RegulatoryClearances Required, if any	Authority
		discrimination, on the ground of sex, against women in the matter of employment and for matters, connected therewith or incidental thereto.				
23	Inter State Migrant Workmen (Regulation of Employment and Conditions Service Act, 1979	Act of the Parliament of India enacted to regulate the condition of service of inter-state labourers in Indian labour law. The Act's purpose is to protect workers whose services are requisitioned outside their native states in India. Whenever an employer faces shortage of skills among the locally available	Yes	Contractor Shall be employing large number of migrant semi-skilled & unskilled workers during Construction from other States	Compliance of regulations as per ISMW rules to regulate the employment of Inter-state migrant workmen and to provide for their conditions of services and for matters connected therewith.	State Labour Department

S.No	Act / Rules	Purpose	Applicable	Reason forApplicability	RegulatoryClearances Required, if any	Authority
		workers, the act creates provision to employ better skilled workers available outside the state.				
24	Minimum Wages Act 1948 along with Central Rules 1950	To ensure that workman gets at least minimum wages as fixed by Govt. Minimum wages sets the lowest limit below which wages cannot be allowed to sink.	Yes	Contractor Shall be employing large number of workers during Construction	Compliance of regulations as mentioned in minimum wages act concerning Indian labour law that sets the minimum wages that must be paid to skilled & unskilled labours.	State Labour department
25	Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participations) Act , 1995 along with Rules,1996 and National Trust for Welfare of Persons with Disabilities Act,1999 with rules 2000.	It gives the effect to proclamation on the full participation and equality of the persons with disabilities in the Asian & Pacific Region and provides for their education, employment, creation of barrier free	Yes	Contractor shall be employing large number of workers	Compliance of regulations to provide serives, facilities to people with disabilities to provide equal opportunities for participating as productive citizens.	State Labour department

S.No	Act / Rules	Purpose	Applicable	Reason forApplicability	RegulatoryClearances Required, if any	Authority
		environment, social security, etc.				
26	Central Motor Vehicle Act 2019	The Act provides in detail the legislative provisions regarding licensing of drivers/ conductors, registration of motor vehicles, control of motor vehicles through permits, special provisions relating to state transport undertakings, traffic regulation, insurance, liability, offences and penalties.	Yes	These rules will be applicable to road users		Motor Vehicle Department

3.2.1 OTHER APPLICABLE NATIONAL LAWS AND REGULATIONS

Other key laws, including amendments thereof, pertaining to environment, health and safety aspects that are applicable to proposed interventions under GNHCP include:

- **Easement Act, 1882, as amended**
- **Public Liability Insurance Act, 1991, as amended**
- **The Public Liability Insurance Rules, 1991, as amended**
- **Plastic Waste Management Rules, 2016, as amended**
- **Batteries (Management and Handling) Rules, 2001, as amended**
- **Petroleum Rules, 2002, as amended**
- **Gas Cylinder Rules, 2004, as amended**

Environmental issues during road construction stage generally involve equity, safety and public health issues. The following laws will also apply to GNHCP:

Workmen's Compensation Act 1923: The Act provides for compensation in case of injury by accident arising out of and during employment.

Payment of Wages Act, 1936: It lays down as to by what date the wages are to be paid, when it will' be paid and what deductions can be made from the wages of the workers.

Child Labour (Prohibition and Regulation) Act, 1986: The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry.

3.3 KEY STATUTORY CLEARANCES/PERMISSIONS REQUIREMENTS – CONSTRUCTION STAGE

During the construction stage, some of the key statutory requirements that need to be obtained by the Contractor as part of mobilization (pre-construction) have been listed in Table 3-2. MoRTH to ascertain that the clearances obtained from the Statutory authority before the plant/utilities are commisioned for the project.

Table 3-2: Key statutory clearances

S.No	Clearance/ Consents Requirement	Statute under which clearance/permission is required	Statutory Authority
1	Stone Quarry	EIA Notification, 2006 + Mines and Minerals (Development and Regulation) Amendment Act, 2015	DEIAA/SEIAA + Department of Mines
2	Hot mix plant, Crusher and Batch Mix Plant	Air (Prevention and Control of Pollution) Act, 1981	AP Pollution Control Board
3	Storage, Handling and Transport of Hazardous Wastes	Hazardous and Other Waste (Management and Transboundary Movement) Rules 2016	AP Pollution Control Board
4	Storage and Handling Fuel/Oil (such as Diesel)	Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules, 2000	Chief Controller of Explosives

S.No	Clearance/ Consents Requirement	Statute under which clearance/permission is required	Statutory Authority
5	Location, emissions, sewage/waste water discharge from plants, labour camps and construction camp sites	Water (Prevention and Control of Pollution) Act, 1974 + Air (Prevention and Control of Pollution) Act, 1981	AP Pollution Control Board
6	Permission for Withdrawal of Groundwater for Construction	Guidelines to Regulate and Control Ground Water Extraction in India, 2019	Central Ground Water Board
8	Disposal of Construction Wastes	Construction and Demolition (C&D) Waste Management Rules, 2016	Local Civic Body
9	Traffic Management and Regulation during construction and maintenance	National Road Safety Policy + Guidelines of Indian Roads Congress	Traffic Police Department and District Administration.

3.4 WORLD BANK SAFEGUARD POLICIES APPLICABLE TO PROJECT ROAD

The safeguard policies of the World Bank relevant to the Improvement and upgradation of Koyyuru-Paderu road in the State of Andhra Pradesh are given in Table 3-3

Table 3-3: Relevant and Applicability of WB Safeguard Policies for Up-gradation of Koyyuru-Paderu in the State of Andhra Pradesh

S.No	World Bank safeguard Policy	Kea features	Policy applicability to Sub project	Policy Triggered or Not
1	OP/BP 4.01 Environmental Assessment	Overall governing policy intended to ensure Bank-financed projects are environmentally sound and sustainable	All potential impacts due to the improvement and up-gradation project road are to be assessed and necessary mitigation measures are to be incorporated accordingly.	Triggered
2	OP/BP 4.36 Forests	Policy is intended to support sustainable and conservation-oriented forest management, harness potential of forests to reduce poverty in a sustainable manner, integrate forests into sustainable economic development, and protect vital local and global environmental services and values of forests.	The proposed improvement and upgradation of the project road passes through forest area.	Triggered

S.No	World Bank safeguard Policy	Kea features	Policy applicability to Sub project	Policy Triggered or Not
3	OP/BP 4.11 Physical Cultural Resources	Policy is intended to ensure that projects identify and inventory cultural resources that are potentially affected by the project. Projects should include mitigation measures, when there are adverse impacts on physical cultural resources	Construction of road will be on existing road corridor and will avoid cultural property resources (CPR) and therefore does NOT warrant shifting or affect CPRs. However, there may be direct or indirect impact on nearby cultural properties along the road	Triggered
4	OP/BP 4.11 Involuntary Resettlement	Involuntary Resettlement Policy addresses direct economic and social impacts from project activities that may cause involuntary taking of land resulting in: (i) relocation or loss of shelter, (ii) loss of assets or access to assets, and/or (iii) loss of income sources or livelihoods	The proposed improvement and upgradation of the project road require land acquisition and Involuntary Resettlement	Triggered
5	Natural Habitats OP 4.04	This policy supports the protection, maintenance and rehabilitation of natural habitats. The Bank doesn't finance projects that involve the conversion of designated critical Natural Habitats.	If project is likely to be in proximity to sensitive natural habitats with wildlife	Triggered
6	Access to Information	The policy governs the public accessibility of information in the Bank's possession. The Bank allows access to any information in its possession that is not on a list of exceptions. Documents such as EMF, all EIAs and EMPs will be disclosed both by the Borrower and the	For the sub- project road, consultations with key stakeholder have been carried out during the planning and design stages, to determine the baseline conditions and issues; locally viable mitigation measures for addressing environmental impacts; consensus on engineering	Triggered

S.No	World Bank safeguard Policy	Kea features	Policy applicability to Sub project	Policy Triggered or Not
		Bank. The policy requires the Borrower to consult Project Affected People and local NGOs through various phases of the project cycle. It requires that groups being consulted be provided on-time, comprehensible and easily accessible information.	designs especially where realignments are concerned and to provide for community and stakeholder involvement in designing sub-project propositions.	

3.5 INDIAN ROAD CONGRESS (IRC) CODE OF PRACTICES APPLICABLE FOR THE PROJECT ROAD

Key Indian Road Congress (IRC) Code of Practices applicable for the project road with respect to environment are given in Table 3.4:

Table 3-4: Indian Road Congress Code of Practices for Project Road

S.No	IRC Code Theme	Year	Description
1	Recommended Practice for Construction of Earth Embankments and Sub-Grade for Road Works (First Revision)	IRC:36-2010	Issues relating to Borrow pits
2	Guidelines for Pedestrian facilities	IRC: 103 -1988	Safety of Pedestrians
3	Recommended Practice for Recycling of Bituminous Pavements	IRC:120-2015	For recycling of bituminous pavements
4	Guidelines for Use of Construction and Demolition Waste in Road Sector	IRC:121-2017	Use of Construction and Demolition Waste in Road Sector
5	Guidelines on Landscaping and Tree Plantation	IRC:SP:21-2009	Landscaping and Tree Plantation along of the road.
6	Guidelines for Road Drainage	IRC: SP: 42-1994	Drainage
7	Highway safety code	IRC: SP: 44-1994	Highway safety
8	Guidelines for Traffic management in work zones	IRC:SP-55-2014	Worksite Safety Management
9	Guidelines for use of fly ash in Road Embankments	IRC:SP:58-2001	Use of fly ash in Road Embankments
10	Guidelines for Use of Geotextiles in Road Pavements and Associated Works	IRC:SP:59-2002	Use of Geotextiles in Road Pavements and Associated Works
11	Guidelines for Soil and Granular Material Stabilization Using Cement Lime and Fly Ash	IRC:SP-89-2010	Soil and Granular Material Stabilization Using Cement Lime and Fly Ash

S.No	IRC Code Theme	Year	Description
12	Guidelines on Requirements for Environmental Clearance for Road Projects	IRC:SP-93-2017	Requirements for Environmental Clearance for Road Projects
13	Guidelines for the use of Waste Plastic in Hot Bituminous Mixes (Dry Process) in Wearing Courses	IRC:SP-98-2013	Use of waste plastic in hot bituminous mixes (dry process) in wearing courses
14	Use of Cold Mix Technology in Construction and Maintenance of Roads Using Bitumen Emulsion	IRC:SP-100-2014	Use of Cold Mix Technology in Construction and Maintenance of Roads Using Bitumen Emulsion.
15	Interim Guidelines for Warm Mix Asphalt	IRC:SP-101-2014	Warm Mix Asphalt
16	Guidelines on Preparation and Implementation of Environment Management Plan	IRC:SP-108-2015	Preparation and Implementation of Environment Management Plan

3.6 ENVIRONMENTAL STANDARDS AND IS CODES

Environmental standards applicable to the Improvement and upgradation of Koyyuru-Paderu in the State of Andhra Pradesh are as given below:

1. National Ambient Air Quality Standards, 2009
2. Measurement of Air Pollution - IS: 5182-1977
3. Ambient Noise Standards
4. Measurement of Noise from Moving Road Vehicles - IS: 3028-1980
5. Measurement of Noise from Stationery Road Vehicles - IS: 10399-1982
6. Measurement of Noise Pollution from Machines - IS: 4758-1968
7. Stack Emissions of CPCB for Hot Mix Plants
8. Discharge Standards of CPCB for Disposal of Treated Sewage
9. Drinking Water Quality Standards - IS:10500:2012
10. CPCB Standards for Surface Water Use

3.7 APPLICABLE MORTH AND IRC SPECIFICATIONS

All road works in India are to be in accordance with the MoRTH specifications for Road and Bridge works and guidelines of Indian Roads Congress (IRC). The MoRTH specifications have special provisions towards protection of environment under Clause 501, Annexure A and the contractor is to satisfy the provisions. Apart from the Annexure A to clause 501, there are provisions for control of erosion, drainage, dust suppression, borrow area and haul road management under relevant sections. A few other key applicable clauses include in below Table 3-5:

Table 3-5:MoRTH Clauses

Section 111	Precautions for safeguarding the environment
Clause 201.2	Preservation of Property/Amenities during clearing and grubbing
Clause 301.3.2	Stripping and storing of topsoil for reuse during excavation for roadway and drains
Clause 302.4	Restriction on timings for blasting operations
Clause 304.3.6	Public safety near towns/villages where excavation is carried out
Clause 305.2.2.2	Location of borrowing and relevant regulations
Clause 305.3.3	Stripping and storing of topsoil at borrow locations

Section 306	Soil erosion and sedimentation control
Clause 407.4.2	Provisions for turfing on median and islands
Section 517	Recycling of bituminous pavement and excavated material
Clause 701.2.1	Use of geo-textiles for control of soil erosion
Section 810	Use of Metal beam crash barriers for safety, relevant regulations and specifications

4 BASELINE ENVIRONMENTAL CONDITIONS

4.1 GENERAL

The project road, two lane upgradation with paved shoulders of Koyyuru to Paderu Section of NH-516E is situated in Visakhapatnam district of Andhra Pradesh.The baseline environmental conditions along the project road are discussed in the following sub sections:

The collection of baseline information on physical, biological and socio-economic aspects of the project area is the most important reference for carrying out environmental impact assessment studies. The description of environmental settings includes the characteristic of area in which the activity of project road would occur and cover area likely to be impacted by anticipated environmental impacts. For environmental assessment along the project road, information and data have been obtained by intensive site visits, primary data collection by monitoring and analysis, secondary data from published sources, and various government agencies. Important ecosystem components have been systematically analyzed in this environmental assessment report.

The primary data for ambient air quality, ambient noise level, water quality (ground and surface) and soil quality were collected through environment monitoring undertaken by M/s Pragathi Labs & Consultants Pvt. Ltd , Vishakhapatnam and Hyderabad. It is NABL Accredited Laboratory.

In order to understand and collect the baseline environmental conditions in the study area, relevant primary and secondary data were collected through sampling, monitoring, actual field visits and published secondary sources. The methodologies adopted are classified below:

The preparation of questionnaire for environmental surveys.
Field observations of these questionnaires.
Sampling, monitoring and analysis of environmental components like ambient air, ground and surface water, soil and the noise level.
Collection of secondary data for various environmental components from various departments.
Compilation, analysis and presentation in the report.
Baseline data was collected during January to March months of 2021.

4.2 STUDY AREA

The proposed Right of Way (RoW) of the project road has been considered as Corridor of Impact (CoI) for baseline environmental study, while 10 km area on either side (aerial distance) from the project road have been considered as project influence area (PIA) for collection of primary and secondary data. The primary environmental monitoring and field survey were carried out along the project road.

4.3 PHYSICAL ENVIRONMENT

The physical environmental profile along the project road has been discussed in the following subsections:

4.3.1 TOPOGRAPHY AND PHYSIOGRAPHY

The project road entirely traverses within Koyyuru,Chaparathipalem, Lammasingi and Paderu region of Visakhapatnam district of Andhra Pradesh. Topography along the project road is mostly hilly, rolling and plain. Digital elevation model of the project area is shown in Figure 4-1.

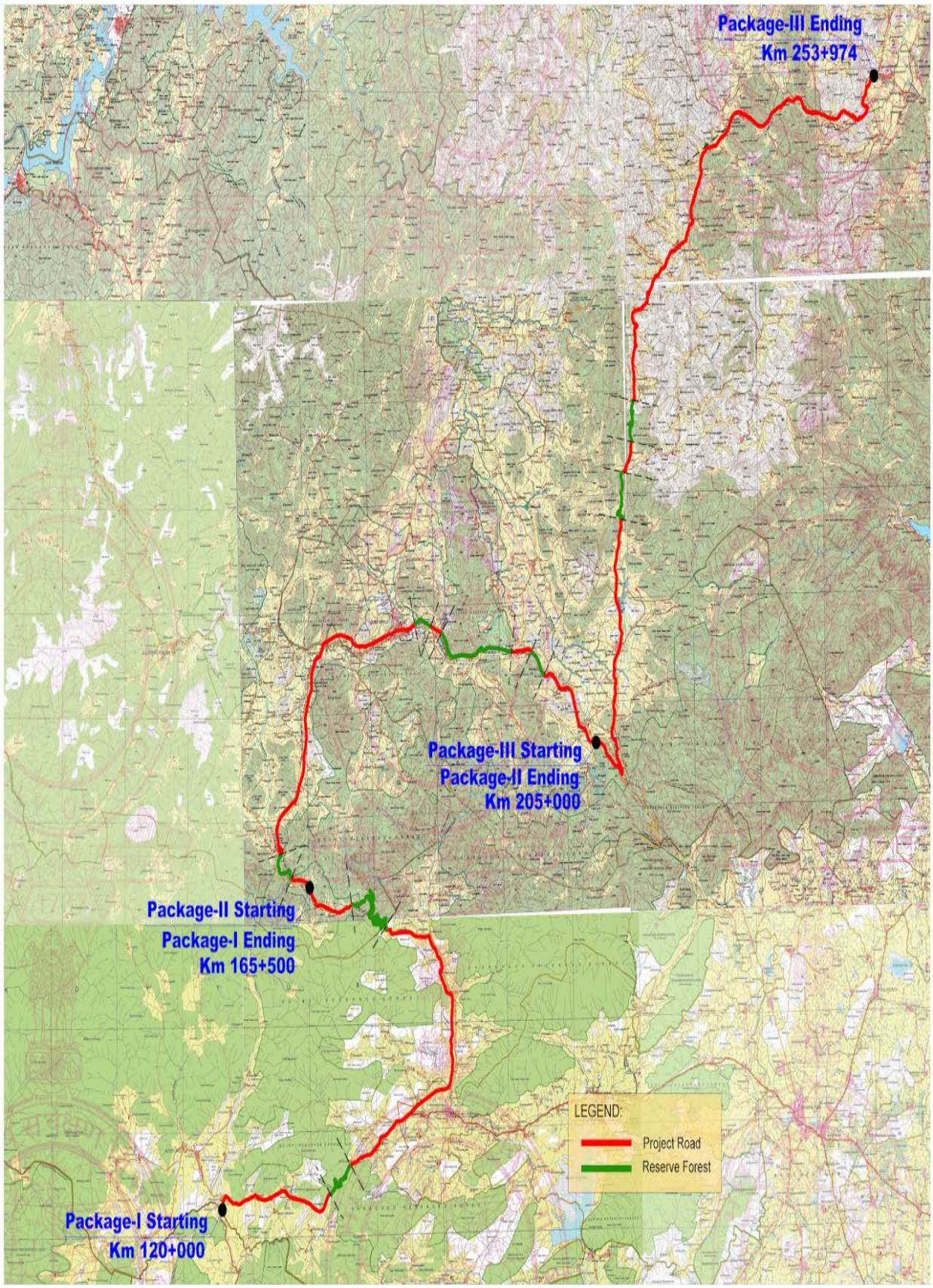


Figure 4-1: Digital elevation Model map

Source:AP space application centre, Vijayawada

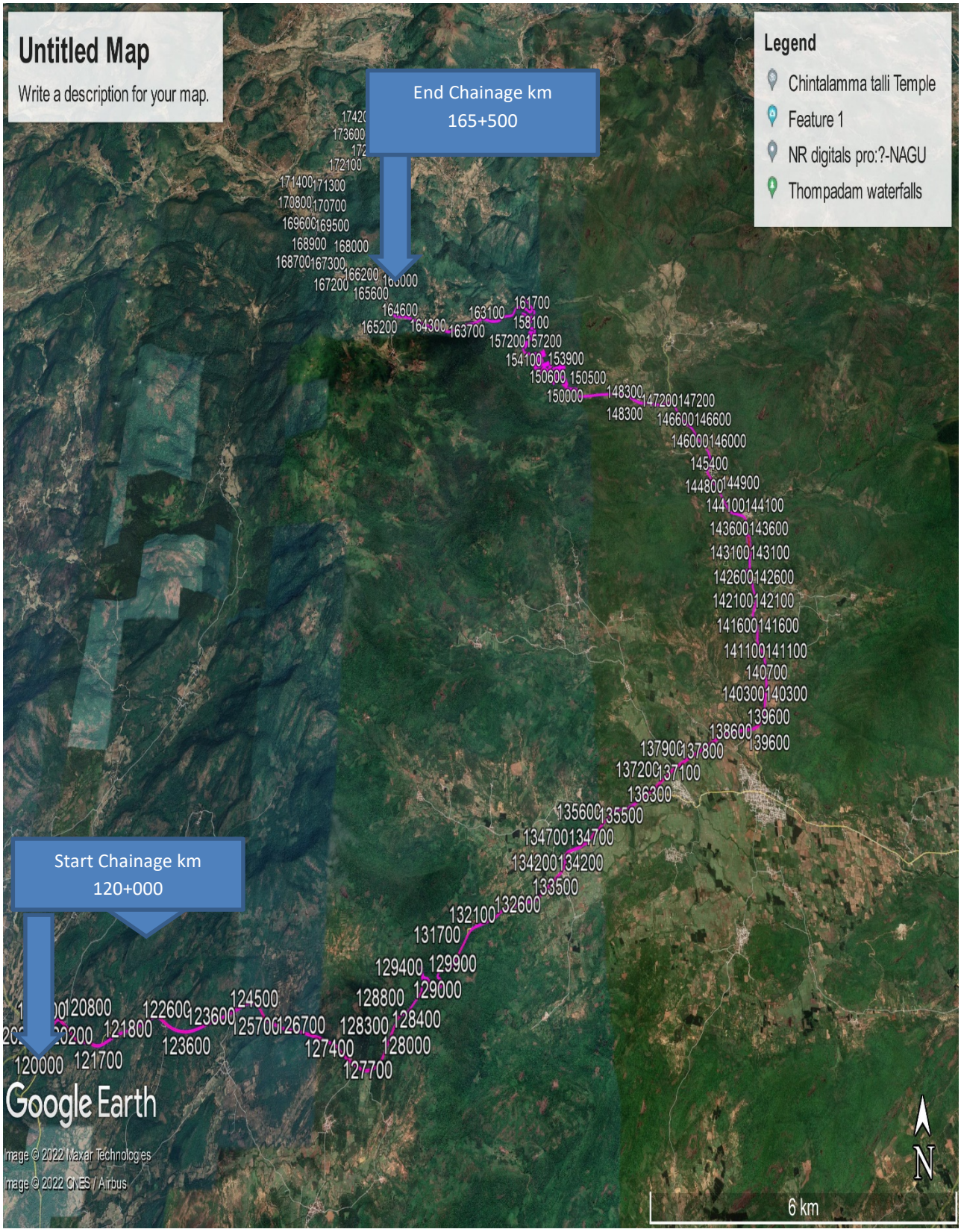


Figure 4-2: Package 1 Road map

Source:Google Earth, Maxar Technologies, CNES/ Airbus

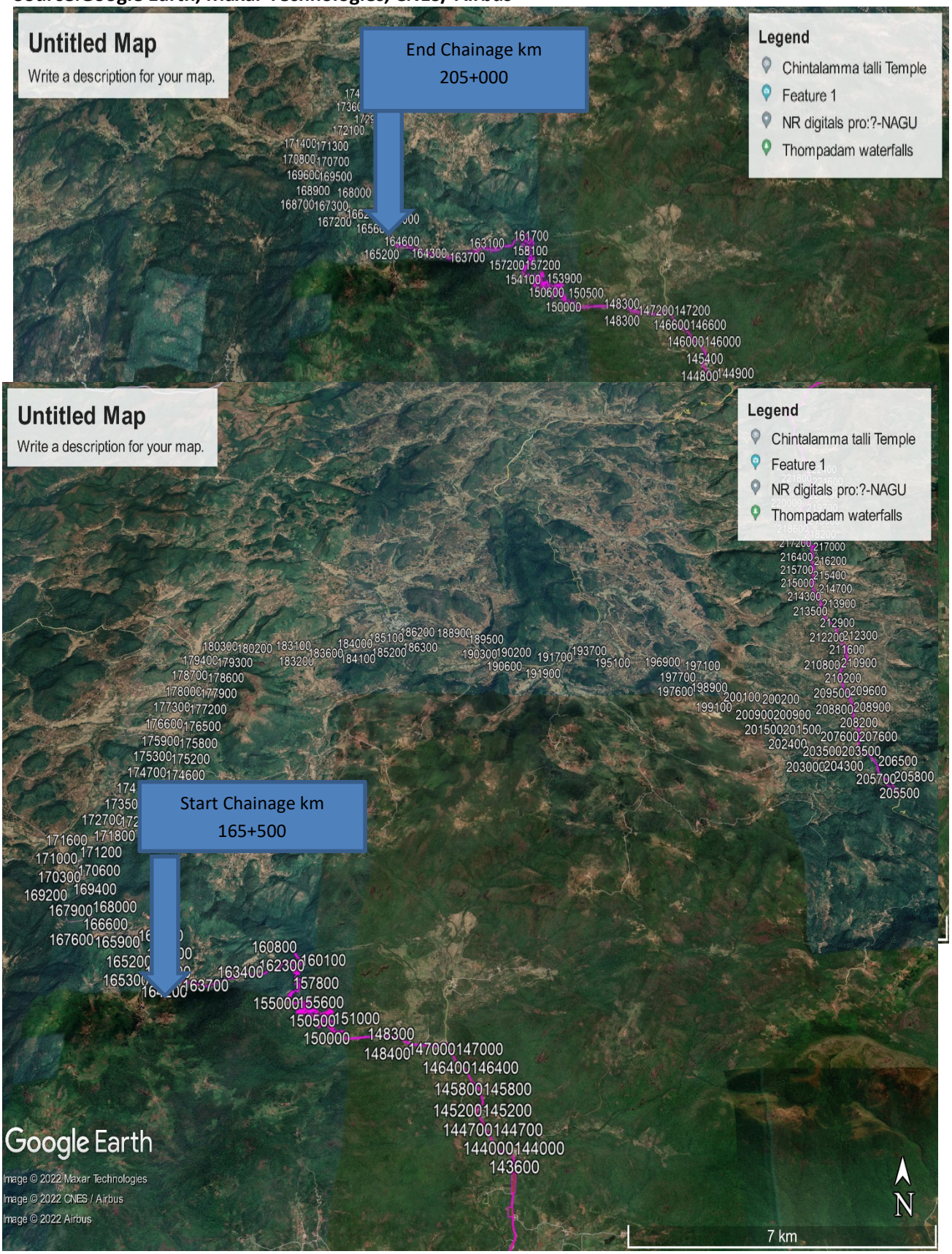


Figure 4-3: Package 2 Road map

Source:Google Earth, Maxar Technologies, CNES/ Airbus

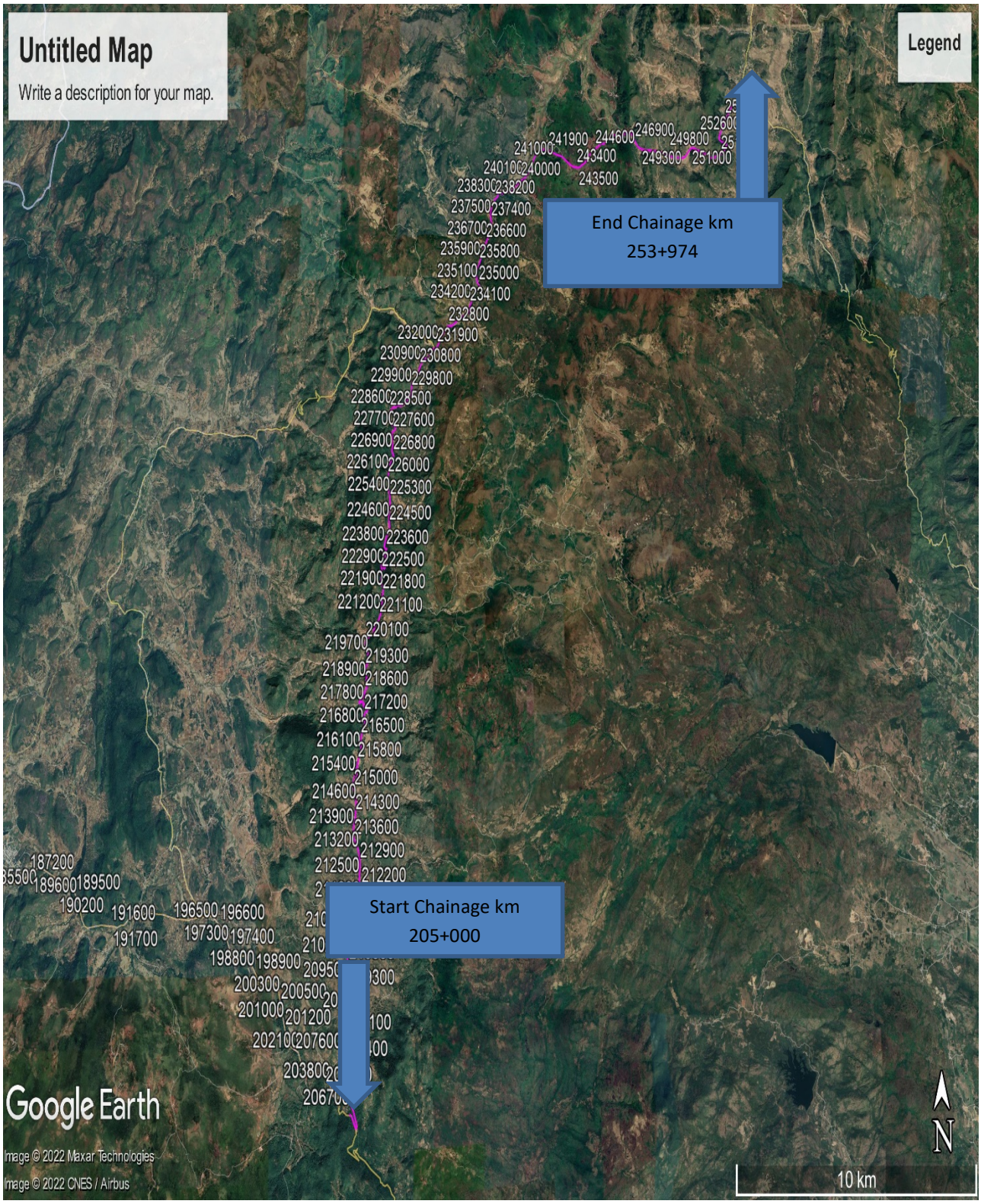


Figure 4-4: Package 3 Road map

Source:Google Earth, Maxar Technologies, CNES/ Airbus

4.3.2 GEOLOGY

Geologically, the area constitutes a part of Eastern Ghats Mobile Belt of Archaean age. It includes rocks of Khondalite Group, Charnockite Group and Migmatite complex. Sediments of Upper Gondwana, Cainozoic laterite and Quaternarydeposits overlie the Archaeans. The project road is within denundation terraces as shown in Figure 4-2.

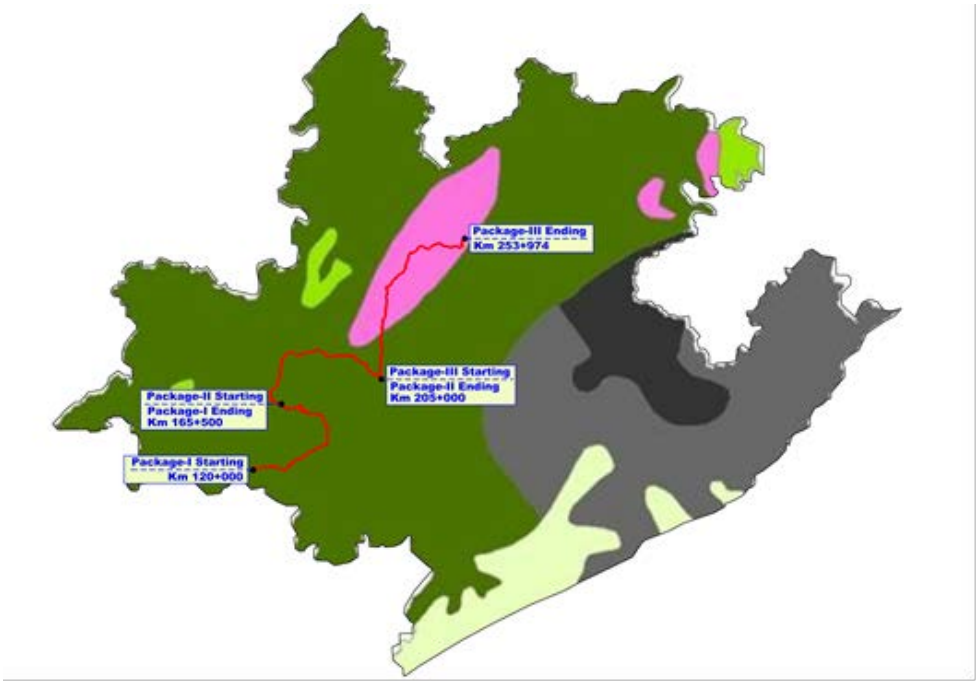


Figure 4-2: Geological Map of Vishakhapatnam district

Source: https://www.mines.ap.gov.in/miningportal/downloads/applications/visakhapatnam.pdf

4.3.3 HYDROGEOLOGY

The district is underlain by variety of geological formations from the oldest Archaeans to Recent Alluvium. The Archaean group of rocks includes Khondalites and Charnockites of Eastern Ghat super group and Granitic gneisses of Migmatite group. The Gondwana rocks which are represented by sandstones are in very limited aerial extent.

Ground water occurs in almost all geological formations. Ground water occurs under unconfined to semi-confined conditions in the hard formations, while it occurs under unconfined to confined conditions in soft formations. The yields in the weathered zones of hard formations range from 25 to 100 m3/day. The bore wells drilled in the hard formations, generally tap the fractured and fissured zones. The yields of the bore wells in these formations range between 5 to 25m3/hr.

The transmissivity values of the aquifers in the consolidated formations generally vary from 1 to 772 m2/day, whereas specific capacity ranges from 1 to 290 lpm/mdd and is shown in Figure 4-3.

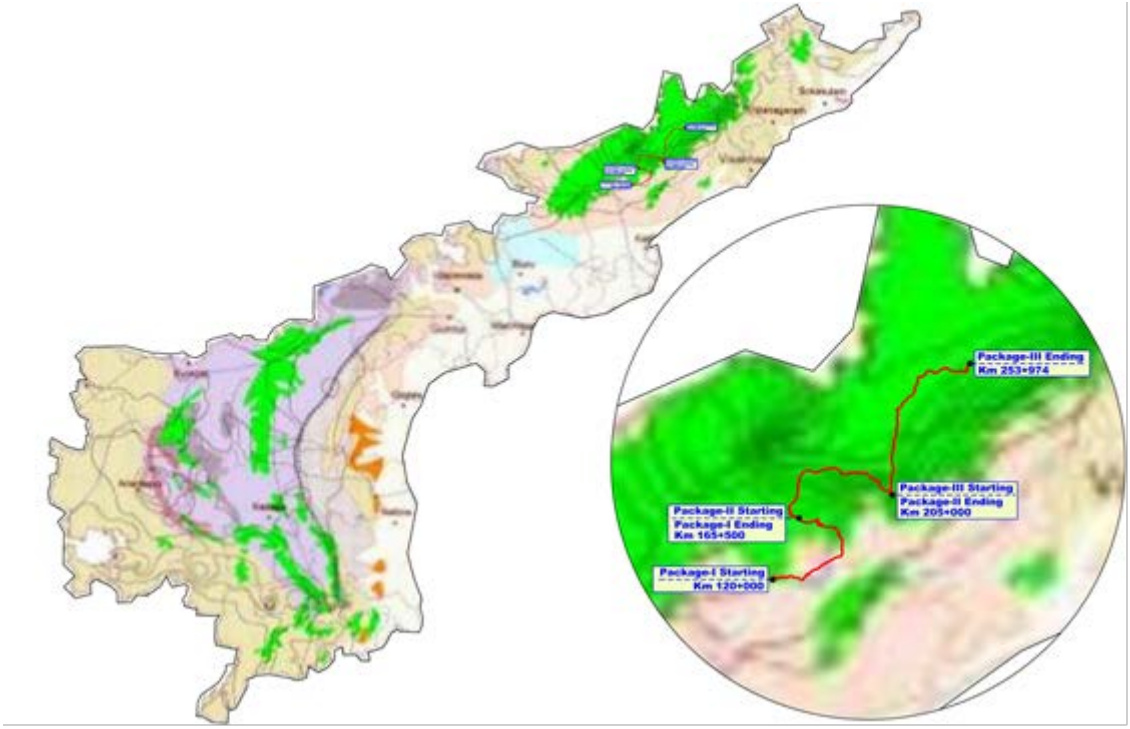


Figure 4-3: Hydrogeological map of Visakhapatnam district showing project road

Source: https://www.mines.ap.gov.in/miningportal/downloads/applications/visakhapatnam.pdf

4.3.4 HYDROLOGY

The plains division in Vishakhapatnam district is watered and drained by Sarada, Varaha and Thandava Rivers and rivulets Meghadrigedda and Gambheeramgedda. The major nalla is crossing the project road at km 139+480 and at km 147+970 and at km 244+600. Besides, large number of streams and road side tanks are present along the project road. Only seasonal flow is observed in all the water bodies.

Table 4.1 Natural Streams crossing the Project road

S.No	Chainage of Crossing	S.No	Chainage of Crossing
1	121+900	19	204+615
2	124+050	20	210+255
3	125+450	21	217+270
4	131+500	22	220+595
5	134+515	23	223+750
6	139+480	24	225+500
7	141+425	25	228+070
8	144+400	26	228+790
9	145+900	27	230+050
10	147+970	28	233+615

S.No	Chainage of Crossing	S.No	Chainage of Crossing
11	150+210	29	234+890
12	182+630	30	236+500
13	184+360	31	237+380
14	189+135	32	238+900
15	192+835	33	240+095
16	195+015	34	242+080
17	199+190	35	244+600
18	201+730	36	246+015

4.3.5 CLIMATE AND RAINFALL

Climatologically, the district experiences tropical sub-humid type of climate with moderate summer and good seasonal rainfall. October and November receive rainfall from northeast monsoon. Winter season with cool and fine weather prevails from December to February followed by summer season upto early June.

The average annual rainfall of the district is 1116mm. and monthly rainfall ranges from nil rainfall in January to 207.5mm in October. The percentage distribution of rainfall, season-wise, is 60.36% in southwest monsoon, 24.36% in northeast monsoon, 0.97% in winter and 14.3% in summer.

Site Specific climate data form the study period of March to May 2020, the temperature varying from 21.50C -37.60C, wind speed is 00 to 11 m/sec and the annual rainfall of the area is 1013mm.

Micro Meteorology: Micro meteorological studies were conducted during the study period. Methodology plays a vital role in effecting the dispersion of pollutants, once discharged into the atmosphere, their transport, dispersion and diffusion into the environment. The meteorological data is very useful for interpretation of the baseline information and for model study of air quality impacts also.Since meteorological data show wide fluctuations with time, meaningful interpretation can only be drawn from long term and reliable data. Such source of data is the India.

Meteorological Department (IMD) that maintains a network of meteorological stations at several important locations.
The station was installed in such a way that there are no obstructions facilitating free flow of wind. Wind speed, wind direction, humidity and temperature are recorded on hourly basis in the study period.

Calm period is observed to be 12.37 % during the time of monitoring.
The predominant wind is west direction.

The wind rose diagram for the study area for March to May 2018 at Koyyuru is given in Figure 4.10. It will be submitted along with the Air and Noise Modelling

4.3.6 GEOMORPHOLOGY

Geomorphologically, the district can be divided into three regions, viz., northern hilly terrain with valleys, middle pediplains and alluvial coastal plains. The northern half of the district is mainly occupied by the

structural hills and valleys, which is part of the Eastern Ghats. The hill range trends parallel to coast. The average altitude of hills is over 900 m amsl. The hills are densely forested. By virtue of their topography, these hilly terrains largely form run off areas and are not suitable for ground water development. The valleys fill areas underlain by weathered formations in the Araku and Paderu areas posses high infiltration and high permeability.

The different soils in the district are red loams, sandy loams, sandy soils and black cotton soils. Red loamy soils are predominate and occupy about 70% in the district. Sandy loamy soils are largely confined to the coastal areas and to certain stretches in the interior mandals of Chodavaram, Narsipatnam, K.Kotapadu and Madugula. Black cotton soils occur in parts of K.Kotapadu, Devarapalli, Chedikada, Paderu and Hukumpeta mandals. Geomorphological map of Vishakhapatnam District showing project road is presented in Figure 4-4.

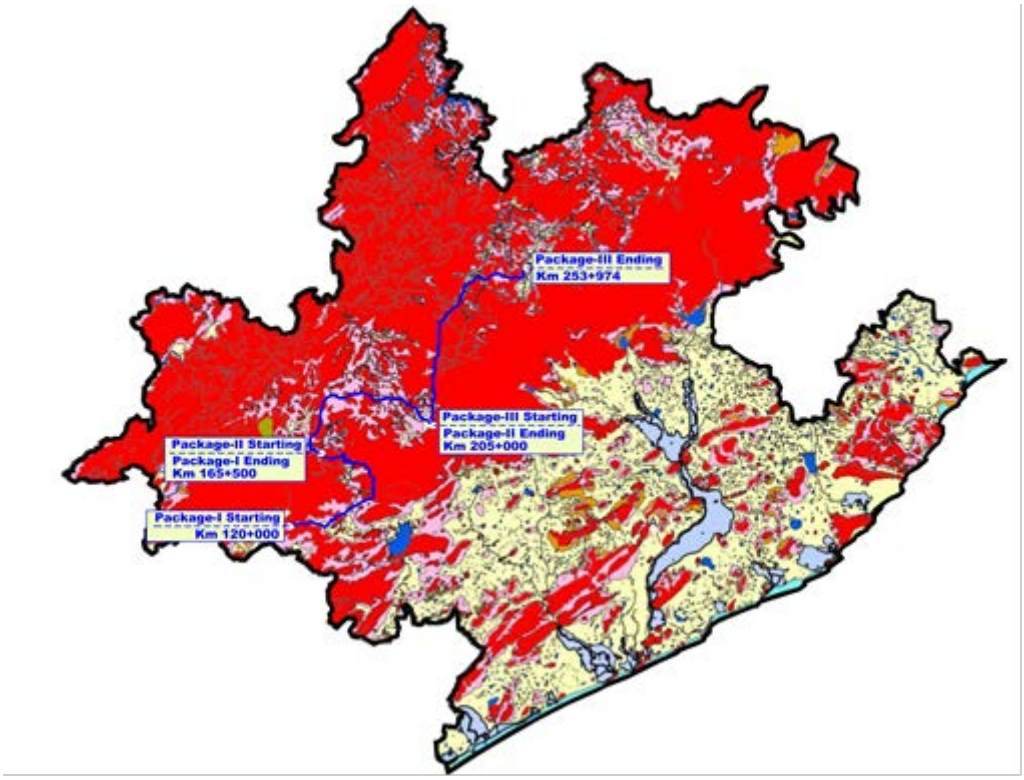


Figure 4-4: Geomorphological Map of Vishakhapatnam showing project road

Source: https://www.mines.ap.gov.in/miningportal/downloads/applications/visakhapatnam.pdf

4.3.7 SOIL

Soil Type in the Area:

Soils found in the area around project road are red soils, sandy loams and sandy clay and they constitute 96% of the total area. The soil in the along the road are predominantly loamy with medium fertility. There are mostly red loamy soils, as far as dry lands are concerned and clay loamy in case of wet lands. The soils at some places are as thick as 4 metres. It is likely that the thick soil cover might represent alluvium along the valleys. Soil along the project area is fertile and used for paddy cultivation. The project stretch near Lammasingi is prone to soil erosion as per initial environmental examination, however, it will be studied in detail during the geotechnical studies to be carried out by the EPC Contractor.
Soil map of the area is presented in Figure 4-5

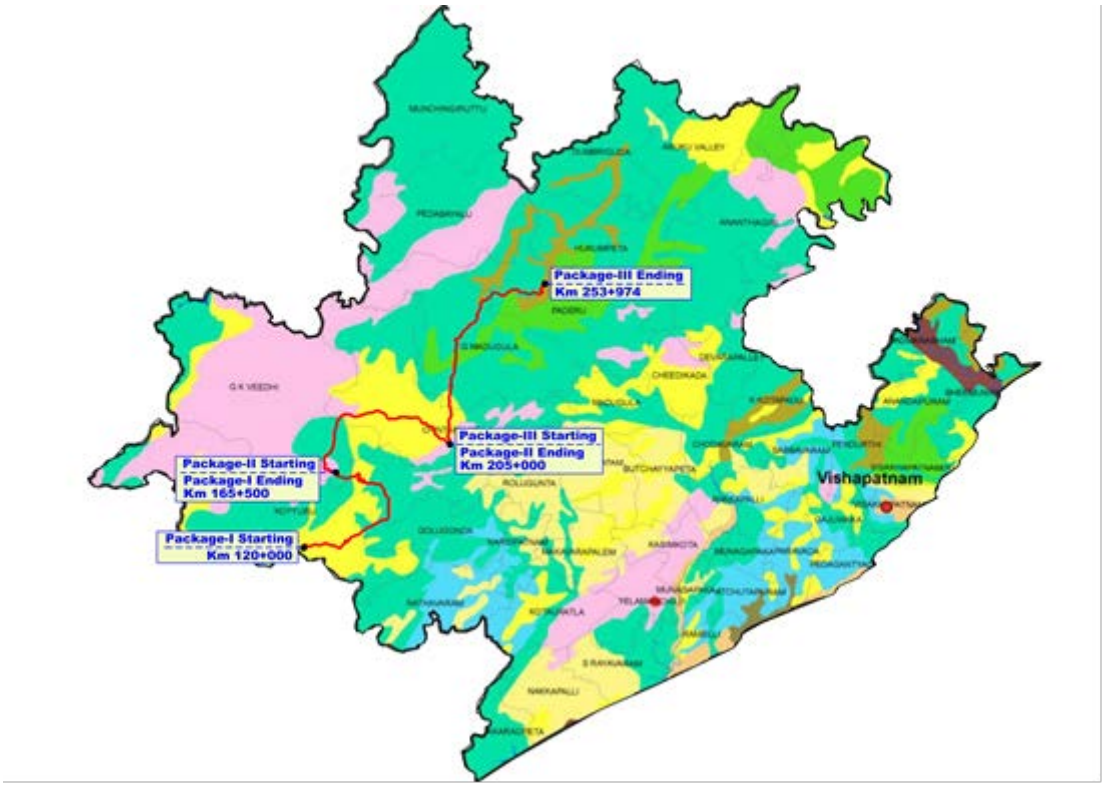


Figure 4-5: Soil Map of Vishakhapatnam District Showing Project Road

Source: https://www.mines.ap.gov.in/miningportal/downloads/applications/visakhapatnam.pdf

Soil characteristics of the area:

The soil characteristics include both physical, chemical and nutrients parameters of soils. M/s. Pragathi Labs and Consultants private limited field team carried out soil survey to assess the soil characteristics of the study area.

For studying the soil characteristics of the area along the project road, five samples were collected to assess the baseline soil conditions along the project road. Soil sampling locations details are given in Table 4.1 &Figure 4-6.

Table 4-1: Soil Sampling Locations

S.No	Location code	Location Name	Chainage	Latitude	Longitude
1	S 1	Paderu	251+200	N 18°34”34.4964	E 82°39’36.2916”
2	S 2	G.Madugula	233+650	N 18°0’538956	E 82°32’16.1376”
3	S 3	Lammasingi	208+100	N17°49’53.472	E 82°29’7.53”
4	S 4	Bointi forest	156+100	-	-
5	S 5	K.D. Peta Byepass near Laxmipuram village	139+600	N 17°40’46.0488	E 82°22’47.8236”

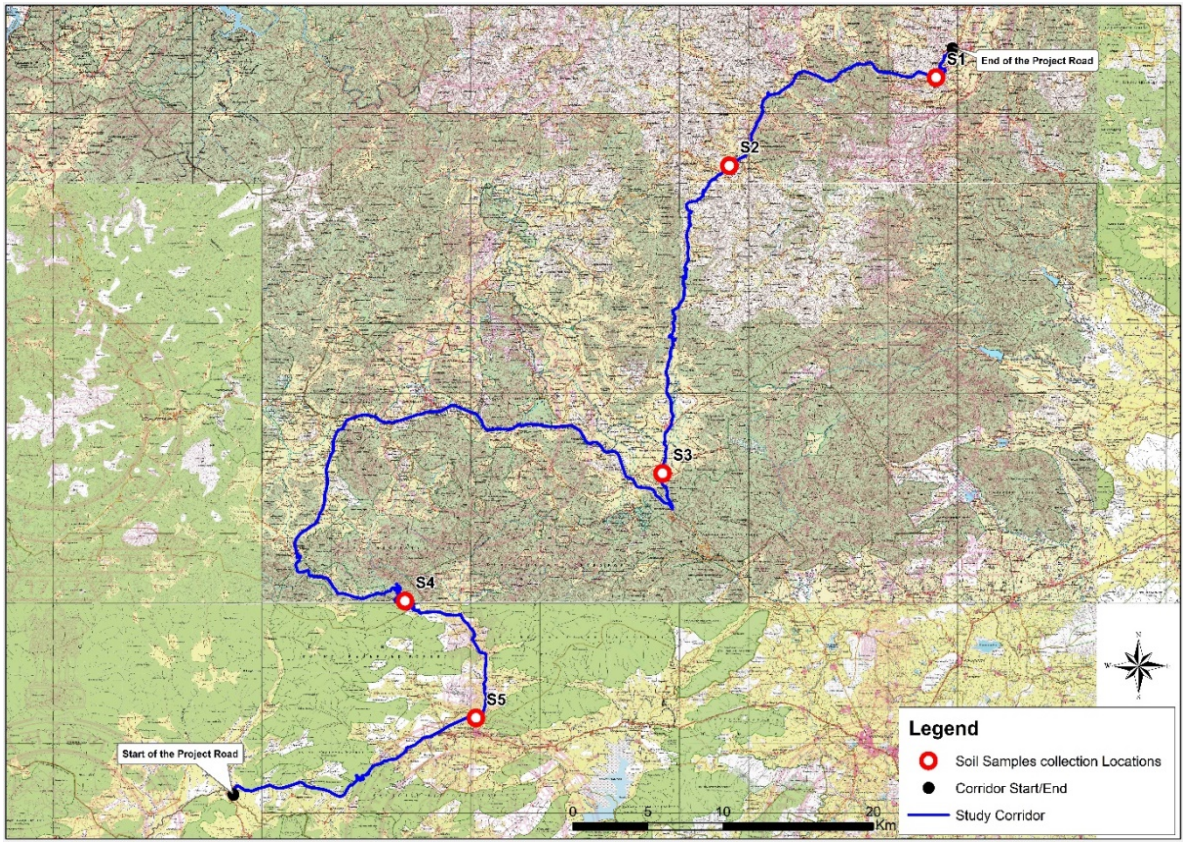


Figure 4-6: Map Showing Soil Sampling Locations along Project Road

The physical, chemical, nutrient characteristics of soil samples were determined. The samples were collected by ramming a core-cutter into the soil up to a depth of 15 cm. Soil characteristics along the project road are presented in Table 4-2.

Table 4-2: Soil characteristics

S.No	Parameters	Units	S 1	S2	S3	S4	S 5
1	Moisture	%	05	04	06	05	04
2	Organic Matter	%	1.65	0.5	0.4	1.26	0.5
3	Bulk Density	(g/cc)	1.43	1.48	1.44	1.50	1.48
4	pH	--	5.5	5.3	6.0	6.2	7.8
5	EC	µmhos/cm(1:5)	172	160	1350	179	514
6	Calcium as Ca	mg/100g	540	520	840	750	560
7	Magnesium as Mg	mg/100g	190	170	260	190	170
8	Texture	--	Clay	Clay Loam	Silty Loam	Silty Loam	Clay Loam
9	Sulphates as SO4	mg/100g	180	140	190	140	120

4.3.8 WATER QUALITY

To determine the ground and surface water quality in the study area, four ground water and one surface samples were collected during the study period. Ground and surface water sampling location details are given in Table 4-3.

Table 4-3: Ground and Surface Water Sampling Location Details

S.No	Location Code	Location Name	Chainage	Latitude	Longitude
Groundwater locations					
1	GW 1	Paderu Borewell	253+400	N 18°4'39.482	E 82°39'3.248
2	GW 2	G.Madugula Open well	232+900	N 18-°0'44.7522'	E 82°31'53.7168
3	GW 3	Bointi Forest near Katragadda village Borewell	150+200	-	-
4	GW 4	KD peta Byepass near Laxipuram village borewell	139+400	N 17°40'29.8524"	E 82°22'46.9524"
Surface water Locations					
1	SW 1	Thajangi Reservoir	213+000	N 17°52'9.9048	E 82°29'43.584''

Note: Bore well sample representing Residential area, Reservoir sample collected downstream.

These samples were taken as grab samples and were analyzed for various parameters compared with the standards for drinking water as per IS: 10500.

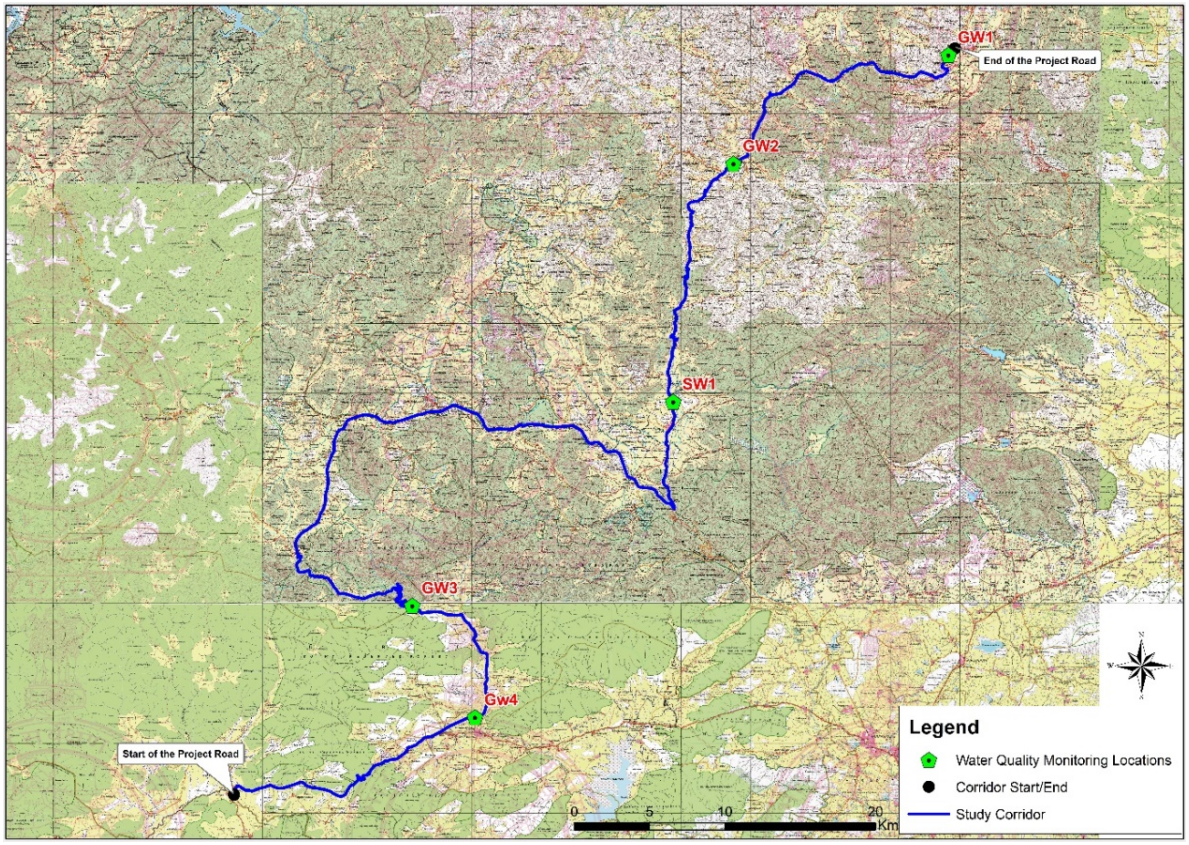


Figure 4-7: Ground and Surface water sampling locations along Project Road

Samples were collected in polyethylene carboys for chemical analysis. Samples collected for metal content were acidified with 1 ml of HNO_3. Selected physic-chemical characteristics have been analyzed for projecting the existing water quality status in the study area. Parameters like temperature, Dissolved Oxygen (DO), and pH were analyzed at the time of sample collection.

The samples were collected and analyzed as per the procedures specified in "Standard Methods for the Examination of Water and Wastewater" published by American Public Health Association (APHA).

Ground water quality analysis results are given in Table 4-4. From the tabulated data the following inferences are made:

pH: The pH value of all ground water samples ranges from 6.9 to 7.5 and meets the acceptable drinking water standards.

S. No	Parameter	Method	Unit	GW1	GW 2	GW3	GW4	IS 10500-2012 Limits	
								Acceptable	Permissible
1	Odour	IS:3025(P05)		Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
2	color	IS:3025(P04)	Hazen	<1.0	<1.0	<1.0	<1.0	5	15

3	pH	IS:3025(P11)	--	6.9	5.8	6.7	7.5	6.5 to 8.5	6.5 to 8.5
4	Electrical Conductivity	IS:3025(P14)	µmhos /cm	378	104	191	1210	NS	NS
5	Total Dissolved Solids	IS:3025(P16)	mg/L	227	49	103	767	500	2000
6	Total Hardness	IS:3025(P21)	mg/L	125	30	55	405	200	600
7	Total Alkalinity	IS:3025(P23)	mg/L	110	25	40	345	200	600
8	Calcium as Ca	IS:3025(P40)	mg/L	40	9.0	14	90	75	200
9	Magnesium as Mg	IS:3025(P46)	mg/L	6	2.0	04	43	30	100
10	Sulphate as SO4	IS:3025(P24)	mg/L	19	09	19	56	200	400
11	Iron as Fe	IS:3025(P53)	mg/L	0.3	0.2	0.1	0.1	0.3	0.3
12	Chlorides as Cl	IS:3025(P32)	mg/L	47	15	25	142	250	1000
13	Chromium as cr	IS:3025(P52)	mg/L	0.01	0.02	0.02	0.04	0.05	0.05
14	Cadmium as Cd	IS:3025(P41)	mg/L	0.001	0.001	0.001	0.002	0.003	0.003
15	Lead as Pb	IS:3025(P47)	mg/L l	0.01	0.01	0.01	0.01	0.01	0.01
16	Copper as Cu	IS:3025(P42)	mg/L	0.02	0.03	0.03	0.04	0.05	1.5
17	Zinc as Zn	IS:3025(P49)	mg/L	1.1	1.3	1.5	2.0	5.0	15
18	Nickel as Ni	IS:3025(P54)	mg/L	0.01	0.01	0.01	0.02	0.02	0.02
19	Fluorides as F	IS:3025(P60)	mg/L	1.0	1.2	1.3	1.4	1.0	1.5
20	Aluminum as Al	IS:3025(P55)	mg/L	0.01	0.01	0.04	0.01	0.03	0.2
21	Boron as B	IS:3025(P57)	mg/L	0.002	0.001	0.002	0.001	0.5	1.0
22	Manganese as Mn	IS:3025(P59)	mg/L	0.1	0.2	0.2	0.2	0.1	0.3
23	Ammonical Nitrogen as NH3	IS:3025(P34)	mg/L	0.02	0.01	0.04	06	0.5	No relaxation
24	Sodium as Na	IS:3025(P45)	mg/L		09	18	91	NS	NS
25	Potassium as K	IS:3025(P45)	mg/L		1.2	1.1	1.0	NS	NS
26	Phosphate as PO4	IS:3025(P11)	mg/L		05	1.2	1.1	NS	NS

Colour: The colour of ground water samples was found <1 hazen unit and meets the acceptable limit of drinking water standards.

Odour: The odour in ground water samples was agreeable and meets the acceptable limit for drinking water standards.

Total Dissolved Solids (TDS): TDS in ground water samples range from 49 to 767 mg/l and meet desirable limit of 2000 mg/l in all the ground water sampling locations.

Total Alkalinity: Total alkalinity in ground water samples ranges from 25 mg/l to 345 mg/l and meets permissible limit of 600 mg/l in all the ground water sampling locations in the absence of alternate source of water.
Total Hardness: Total hardness of ground water samples ranges between 30 mg/l to 405 mg/l and meets permissible limit (600 mg/l) in the absence of alternate source of water.

Calcium: Calcium content in ground water samples ranges from 9 mg/l to 90 mg/l and and meets permissible limit (200 mg/l) in the absence of alternate source of water.

Magnesium: Magnesium content in ground water samples ranges from 6 mg/l to 43 mg/l and meets permissible limit (100 mg/l) in the absence of alternate source of water.

Sulphate: Sulphate content in ground water samples ranges from 9 mg/l to 56 mg/l and meets the acceptable limit of 200 mg/l at all the ground water sampling locations.

Iron: Iron content in all ground water sample ranges from 0.10 to 0.30 mg/l and meets acceptable limit of 0.3 mg/l at all the ground water sampling locations.

Chloride: Chloride content in ground water samples range from 15 mg/l to 142 mg/l and meets acceptable limit of 250 mg/l at all the ground water sampling locations.

Other Parameters: Other analysed parameters given in the table were found within acceptable limit / below detection limit (BDL) for ground water samples. Overall drinking water quality of ground water samples was found fit for drinking.

Table 4-4: Ground Water Analysis Results

BDL: Below Detectable Limit; NS: Not Specified in IS:1050

Surface Water Quality

Surface water quality analysis results are given in Table 4.5. From the tabulated data it is observed that surface water quality is reasonable and meet acceptable limit of IS 10500:2012, except biological contamination in the surface water Table 4-5.
Table 4-5: Surface Water Analysis Results (Tajangi reservoir Surface water)

S.No	Parameter	Method	Unit	SW1 Results	IS: 2296 Limits Class C Norms
1	color	IS:3025(P04)	Hazen	02	300
2	pH	IS:3025(P11)	--	6.7	6.5-8.5
3	Electrical Conductivity	IS:3025(P14)	µmhos/cm	90	NS
4	Total Dissolved Solids	IS:3025(P16)	Mg/L	46	NS
5	DO	IS:3025(P44)	Mg/L	06	4.0
6	BOD,3 days @27°c	IS:3025(P44)	Mg/L	03	03

S.No	Parameter	Method	Unit	SW1 Results	IS: 2296 Limits Class C Norms
7	Chlorides as Cl	IS:3025(P32)	Mg/L	15	600
8	Sulphate as SO4	IS:3025(P24)	Mg/L	07	400
9	Nitrate as NO3	IS:3025(P34)	Mg/L	0.8	50
10	Iron as Fe	IS:3025(P53)	Mg/L	0.1	50
11	Fluorides as F	IS:3025(P60)	Mg/L	1.0	1.5
12	Lead as Pb	IS:3025(P47)	Mg/L	0.01	0.1
13	Copper as Cu	IS:3025(P42)	Mg/L	0.01	1.5
14	Zinc as Zn	IS:3025(P49)	Mg/L	0.2	1.5
15	Cadmium as Cd	IS:3025(P41)	Mg/L	0.001	0.01
16	Chromium as Cr	IS:3025(P52)	Mg/L	0.01	0.05
17	Oil & Grease	IS:3025(P39)	Mg/L	05	0.1

4.3.9 AMBIENT AIR QUALITY

Air pollution means the presence in the outdoor atmosphere of one or more contaminants or combinations thereof in such quantities and of such duration as are or may tend to be injurious to human, plant or animal life or property. Air pollutants include particulate matter and gaseous pollutants. With project road activities a range of pollutants may be released into the atmosphere that will be dispersed and may have adverse impact on neighbourhood air environment. Thus, collection of base line data of ambient air quality occupies important role for the environmental impact assessment study. The ambient air quality status along the project road forms basis for prediction of the impacts due to the project activities.

Description of Sampling Locations:

The location of ambient air quality stations is contingent on the meteorological status of the area. Hence, the micro meteorological data was collected before initiating the ambient air quality monitoring. There ambient air quality monitoring locations namely at MRO office, Paderu;near Police station of G. Madugula, at Lammasingi village, at KD peta byepass near Laxmipuram, and at Bointi reserve forest were selected along the project road.
Table 4-6presents the ambient air quality monitoring locations with chainage of locations on the project road. Ambient air quality monitoring locations are shown in the Figure 4-8.

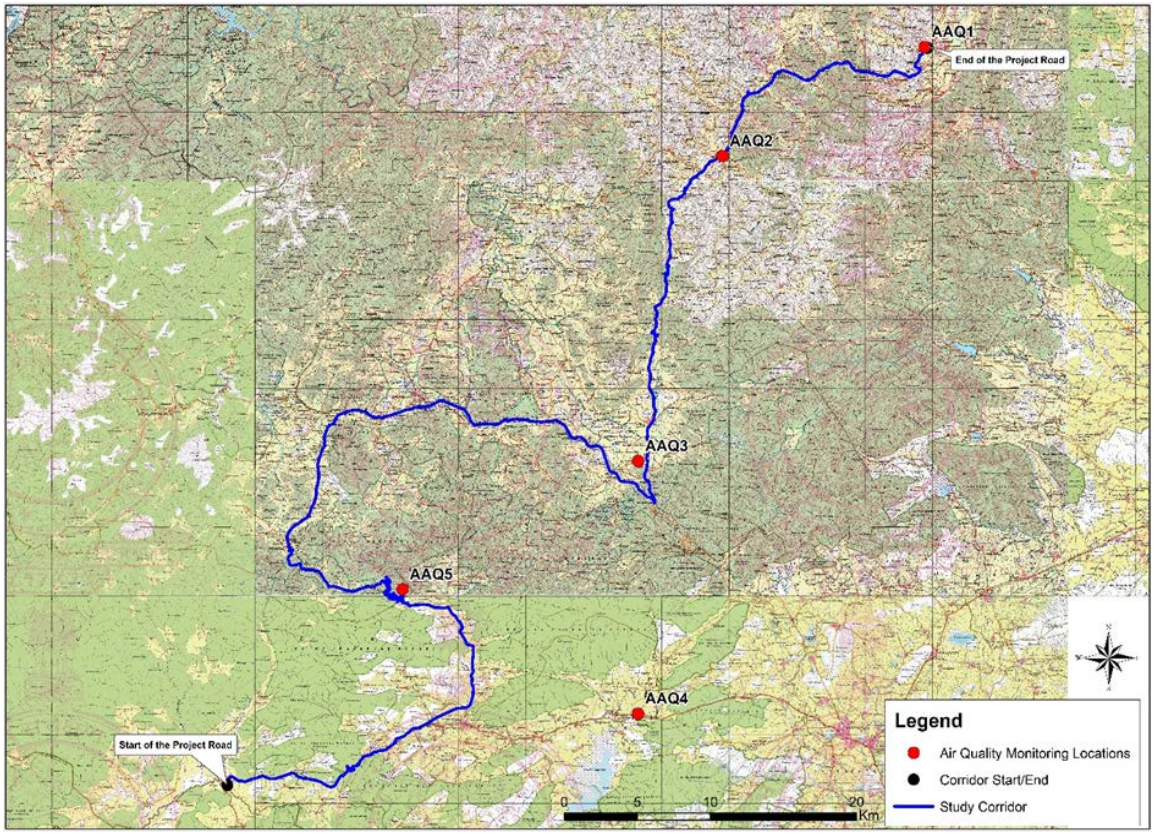


Figure 4-8: Ambient Air Quality Monitoring Locations

Table 4-6: Details of Ambient Air Quality Monitoring Locations

S.No	Location Code	Location Name	Chainage	Latitude	Longitude
1	AAQ1	MRO office, Paderu	253+90	N18°4'50.9038''	E82°32'42.174
2	AAQ2	G.Madugula police station	233+650	N 18°0'54.738''	E 82°32'15.126
3	AAQ3	Lammasingi village	208+100	N17°49'53.058''	E 82°29'8.052'''
4	AAQ4	KD peta byepass near Lakshmipuram	139+600	N17°40 45.0678	E 82°22'42.468
5	AAQ5	Bointi forest	156+100	-	-

The results of ambient air quality monitoring carried out along the project road are presented in Table 4-7. National ambient air quality standards for industrial, residential, rural & other areas are met for all monitored parameters at all five ambient air quality monitoring locations.

Table 4-7: Ambient Air Quality status along the project Road

Location	Concentration, µg/m3				
	PM10	PM 2.5	SO2	NO2	CO
PADERU	54	22	13	17	0.21
G MADUGULA	51	20	12	15	0.19
LAMMASINGI	48	18	10	14	0.15
BOINTI FOREST	46	17	09	12	0.12
KD PETA BYEPASS	50	19	11	16	0.16

Prescribed limits

Pollutants	NAAQSIndustrial Limit (µg/m3)	Method of Analysis
Sulphur dioxide (SO2)	80	IS 5182 (Part 2)
Nitrogen Oxide (NO2)	80	IS 5182 (Part 6)
Particulate Matter (PM10)	100	IS 5182 (Part 23)
Particulate Matter (PM2.5)	60	IS 5182 (Part 24)
Carbon monoxide (CO)	2.0	IS 5182(P10)

4.3.10 NOISE MEASUREMENTS

A preliminary reconnaissance survey was undertaken to identify the major noise generating sources along the project road. The noise measurement at five locations was carried out. Lutron Make Noise Level Meter instrument was used to ascertain noise status at monitoring sites along the project road. Table 4-8 & Figure 4-9 presents the ambient noise monitoring locations with chainage of locations on the project road.

Table 4-8: Details of Ambient Noise Monitoring Locations

S.No	Location code	Location Name	Chainage	Latitude	Longitude
1	N 1	Paderu	253+900	N18°4'50.2752'''	E 82° 39'44.796
2	N 2	G.Madugula	233+650	N 18°0'55.018	E 82° 32'15.09
3	N 3	Near Lammasingi village	208+100	N17°49'53.058''	E 82°29'8.052'''
4	N 4	Near Bointi Forest	156+100	-	-
5	N5	Near KD Peta byepass	139+600	N17°40 45.0678	E 82°22'42.468

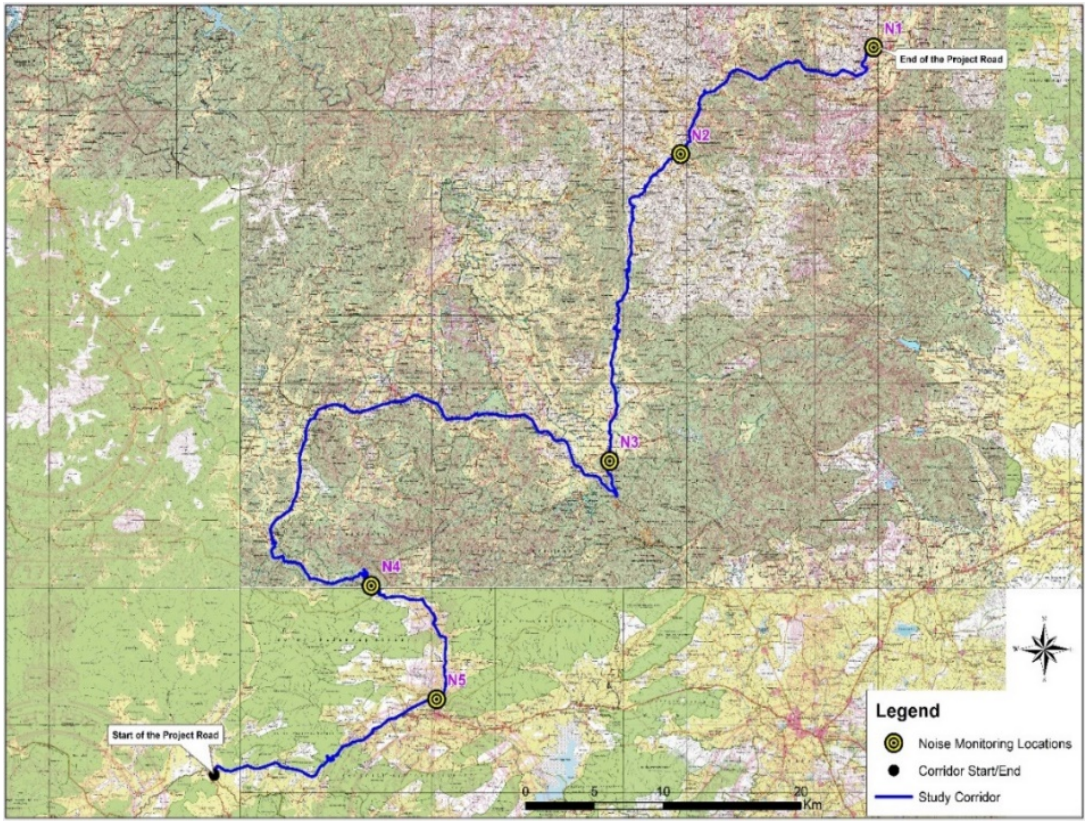


Figure 4-9: Noise Monitoring Locations Map

Results :

Table 4-9: Noise Monitoring Results

S. No	Locations	Equivalent Levels dB (A) Leq	
		Day Time (Ld)(6 am to 10pm)	Night Time (Ln)(10 pm to 6 am)
1	PADERU	53	44
2	G MADUGULA	52	43
3	LAMMASINGI	49	40
4	BOINTI FOREST	47	38
5	KD PETA BYEPASS	51	41

Table 4-10: Ambient Air Quality Standards in Respect of Noise

Category of Area	Limits in dB(A) Leq	
	Day Time	Night Time
Industrial Area	75	70
Residential Area	55	45

Day and night-time Leq were calculated from hourly Leq values and given in Table 4-9. Day and night-time Leq were compared with the stipulated noise standards. Day time Leq levels at Paderu Junction and Koyyuru are exceeded from stipulated standards due to unnecessary vehicles horn, traffic congestion and various advertisers through amplifier. Night time Leq levels at all three locations are within the stipulated limit.

4.3.11 LAND USE / LAND COVER CLASSIFICATION OF THE STUDY AREA

Using the standard land use classification system developed by National Remote Sensing Centre (NRSC), about Seven classes of level I, land use/land cover classes were identified and mapped using satellite data along the project corridor. Further, the imagery is interpreted and ground checked for corrections.The land use/land cover of Koyyuru to Paderu road based on satellite imagery is given in Figure 4-10.

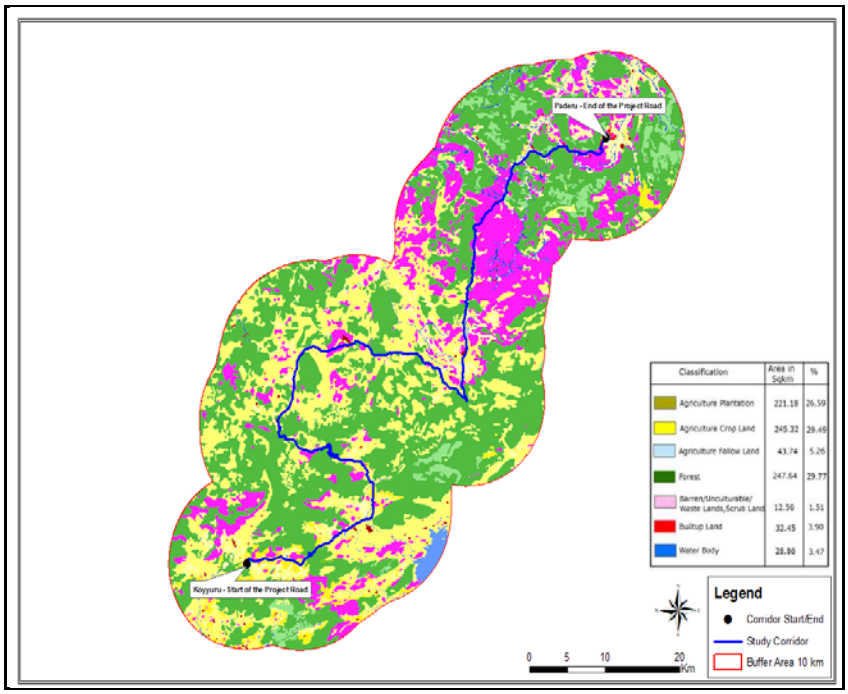


Figure 4-10: Land use and land cover of the Project road

Forest land occupy around 29.77%, agriculture crop land occupy 29.49%, agriculture plantation land occupies 26.59%, fallow land occupy around 5.6%, built–up land occupies about 3.9%, water bodies occupy around 3.47% and Baren land around 1.51% of the total study area (10 km either side of the project road).

4.3.12 CHAINAGE WISE DETAILS OF COMMUNITY PROPERTY RESOURCE (CPR), HANDPUMPS, PIPELINES AND OTHER UTILITIES

Table 4.11: Package I:

1	Design Chainage	Village	Len-gth 'm'	Pipe Line Type	Dia of Pipe Line 'mm	Amenities					
						Bore Well with pump set	Pump House	Open Well	Hand pump	Water Tank	Remarks
1	Km 120.000 to Km 165.500	Battapanakulu (41)	500	HDPE	63	-	1*	-	-	-	
2		Bhimavaram (65)	100	HDPE	63	-	-	-	-	-	
3		Chintalapudi (28)	460	HDPE	63	-	-	-	2	-	

1	Design Chainage	Village	Len-gth 'm'	Pipe Line Type	Dia of Pipe Line 'mm	Amenities					
						Bore Well with pump set	Pump House	Open Well	Hand pump	Water Tank	Remarks
4		Jajulapalem Alias Ramarajupalm (62)	300	HDPE	63	-	-	-	1*	-	
5		Katragedda (42)	400	HDPE	63	-	-	-	1**	-	
6		Nadimpalem (26)	700	HDPE	63	-	-	-		-	
7		Nadimpalem (59)	570	HDPE	63	1	1**	-	1	-	
8		Pothavaram(24)				1**	-	-	1	-	
9		Ravanapalli (169)	500	HDPE	63	1	1	-	-	1(OHSR)	
10		Valasampeta (63)	500	HDPE	63 & 50	1	1	-	2	-	
11		Kakarapadu	550	HDPE	63	-	-	-	-	-	
12		Pittachalam	520	HDPE	63	-	-	-	-	-	
13		Thotaluru	600	HDPE	75	-	-	-	-	-	
14		Thotaluru	2200	HDPE	63	-	-	-	-	-	
15		Mulagalametta	500	HDPE	63	-	-	-	-	-	
16		Pedamakavarm	600	HDPE	63	-	1**	-	-	-	
17		Rampulu (350)	2100	HDPE	63	-	1*	-	-	-	
		Total	**11100**			**3**	**2**	-	**6**	**1**	

Table 4.12: Package II:

S. N	Design Chainage	Village	Length 'm'	Pipe Line Type	Dia of Pipe Line in 'mm'	Amenities					
						Bore Well with pumpset	Pump House	Open Well	Hand pump	Water Tank	Remarks
1	Km 165.500	Chaprathipalem (351)	900	HDPE	63			1			

S. N	Design Chainage	Village	Length 'm'	Pipe Line Type	Dia of Pipe Line in 'mm'	Amenities					
						Bore Well with pumpset	Pump House	Open Well	Hand pump	Water Tank	Remarks
2	to Km 205.000	Pedajadumuru(205)	1700	HDPE	63				2		
3		Pedavalasa (198)	1200	HDPE	63				1		
4		Rinthada (334)	1700	HDPE	63	1	1		2		
5		Sankada (209)	1200	HDPE	63						
6		Asarada	2600	HDPE	63	1	1		1		
7		Antharla (361)	420	HDPE	63					1(GLSR)	
8		Chinagedda (376)	4200	HDPE	140				1		
9		Chinthaluru (391)							2		
10		Chinthapalli (362)	900	HDPE	140						
11		Diguvapakalu (419)	370	HDPE	63				1		
12		Krishnapuram (209)	540	HDPE	63						
13		Rowrintasa (377)	60	HDPE	63						
14		Mabigunta (410)	620	HDPE	63						
15		Rajupakalu(412)									
		Total	**16410**			**2**	**2**	**1**	**7**	**1**	

PACKAGE III:

Effecting Water supply in NHAI widening in G.Madugula Mandal Rural water supply										
S.No	**Chainage**		**Village Location**	**Borewell with motor**	**Borewells**	**RO Plant**	**Solar**	**Pumpsheds**	**Wells**	**OHSR**
	From	**To**								
1	242/100	242/700	K.Kodapalli	1	0	0	1	0	0	0
2	241/700	242/100	K.Kodapalli	1	0	0	0	1	0	0
3	242/00		K.Kodapalli	0	0	1	0	0	0	0
4	239/100	239/700	Bandaveedhi	0	2	0	0	0	0	0
5	238/250		Bandaveedhi	0	1	0	0	0	0	0
6	238/100		Matyapuram	1	0	0	1	0	1	0
7	234/900		Santhabayalu	0	1	0	0	0	0	0

8	233/900		G.Madugula	0	1	0	0	0	0	0
9	232/800	233/00	Gandhinagar	1	2	0	0	0	0	1
10	230/900		Maduramamidi	1	0	0	0	0	0	0
11	229/400		Maddulabanda	0	1	0	0	0	0	0
12	228/900		Maddulabanda	0	1	0	0	0	0	0
13	227/300	227/700	Kulapadu	2	1	0	0	1	0	0
14	227/100		Kulapadu	1	0	0	0	1	0	0
15	226/150		Girigoyyipalem	1	1	0	1	0	0	0
16	225/800		Vanjari	2	0	1	0	0	0	0
17	221/00	221/800	Vanjari	2	0	0	0	0	0	0
18	220/800	221/300	Vanjari	0	1	0	0	0	0	0
19	219/00		Pinkiltharu	0	1	0	0	0	0	0
20	214/700	214/900	Krishanapuram	2	1	0	1	1	0	0
21	214/300	214/400	Goppulapalem	1	0	0	0	1	0	0
		Total		**16**	**14**	**2**	**4**	**5**	**1**	**1**

4.3.13 HAZARD AND VULNERABILITY PROFILE

The hazard and vulnerability profile of the project region which includes wind hazards, earth quake hazards, flood hazards are summarized below Figure 4-11:

WIND HAZARD

As per wind hazard map of Andhra Pradesh, the project road traverses in high damage risk zone for 80% of length and remaining 20% length in moderate zone. The wind hazard map showing the project road is shown.

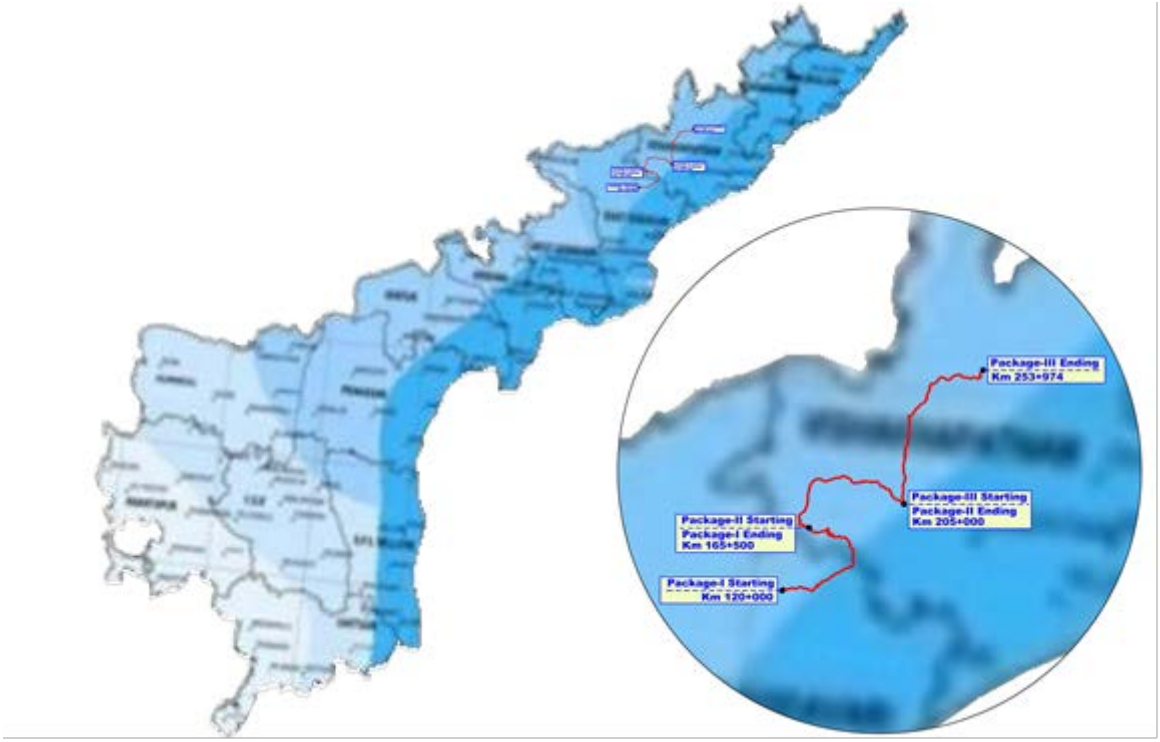


Figure 4-11: Wind Hazard Map

EARTHQUAKE ZONES

In general, India is divided into 4 seismic zones (II, III, IV, V); Zone –II being the least active seismic zone, whereas Zone-V is the highest seismic zone as given in Table 4-11.
The project road falls under Zone – II, The earthquake hazard map along the project road is shown in Figure 4-13

Table 4-11: Earthquake Zones of India

Zone	Intensity
Zone - V	Very High risk - Intensity IX
Zone -IV	High risk - Intensity VIII
Zone - III	Moderate risk - Intensity VII
Zone - II	Low Damage Risk - Intensity VI
Zone - I	Not in Use

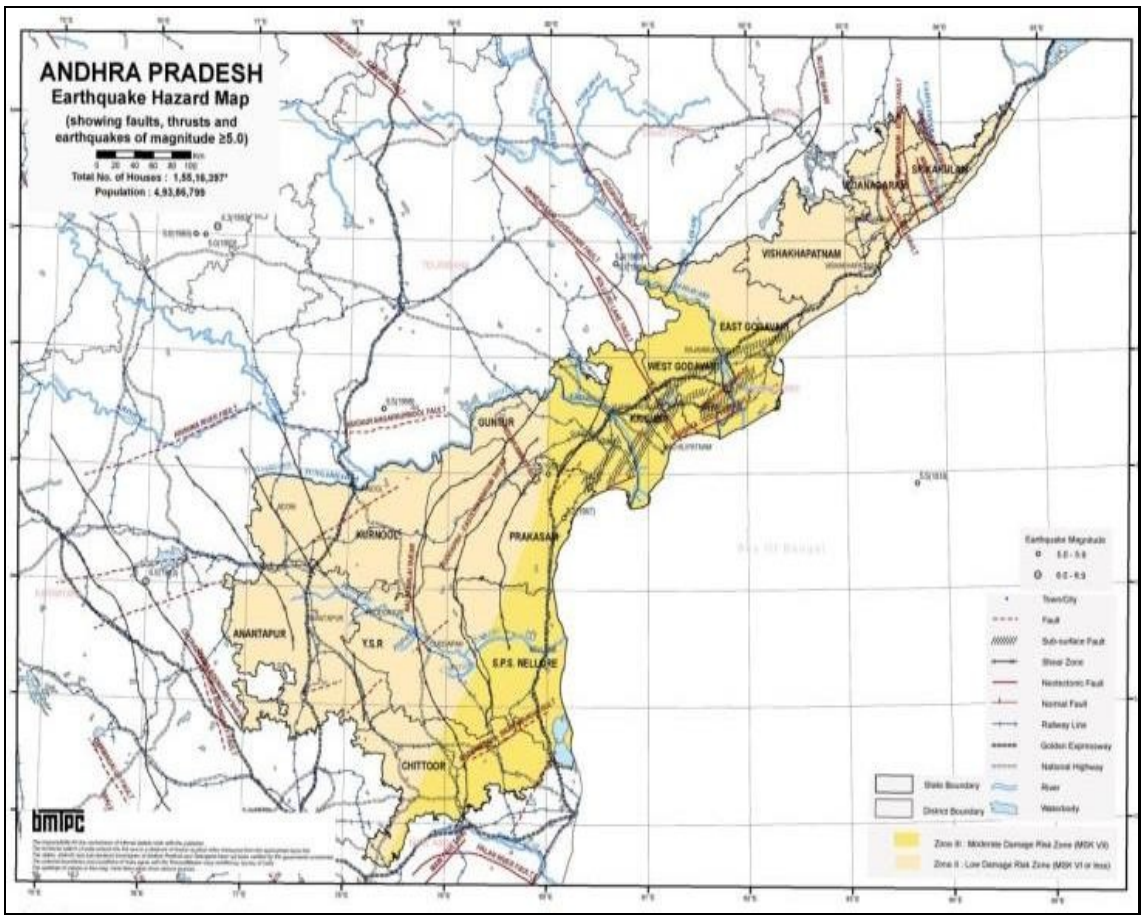


Figure 4-12: The earthquake hazard map

VULNERABILITY STATUS OF PROJECT

The Overall vulnerability of the project road can be stated as moderate. List of various hazards and Vulnerability status along the project road are given in Table 4-12.

Table 4-12: Over all Vulnerability of Project road

S.No	Name of Road	District	Hazards		
			Earthquake	Flood	Vulnerability
1	Koyyuru – Paderu	Visakhapatnam	Zone-II	-	High

4.4 BIOLOGICAL ENVIRONMENT

4.4.1 FLORA AND FAUNA

The current study was conducted to assess the Biodiversity existing along the upgradation of NH-516E from Koyyuru to Paderu, Visakhapatnam District covering an area of 133.974 km.

Methodology: Biodiversity inventory including the flora and fauna was conducted on both sides along the road. In order to study the area, a digital map of existing road is obtained from the Narsipatnam Division, Roads and Buildings Department, Government of Andhra Pradesh. This map contains the proposed alignment of the road along with chainage points at every 100m interval starting from 120+000 to 253+974

covering 133.974 km length. The width of the proposed road is 24m (12m on both sides from the proposed Center Line (PCL)). This map served as reference document for preparation survey plans, making necessary ground arrangements and to conduct biodiversity assessment along the proposed National Highway. The study was conducted for assessment of flora and fauna separately by the expert team of 4 members. The floral studies were conducted based on the direct sightings on the ground and the faunal studies were conducted based on the direct observations, based on secondary sources, interacting with the communities and pellet observations. The details are as narrated below.

Floral Studies: Intensive surveys were conducted to enumerate the tree diversity of the area on the both sides of the road to an extent of 24m (12m left and 12m right from the proposed center line). Critical surveys were done where ever the proposed upgradation deviates from the existing road. Care is taken on the turnings of the road to follow the proposed road alignments. Vital surveys were conducted in the Ghats/forest areas. There was a proposed rest area on LHS with a length of 195.7m and width of 105m at chainage 142+900 in Valasmpeta village and a second rest area is proposed at chainage 215+720 in Pinakiltaru village on RHS with a length of 156.8m and width of 116m. A toll plaza of width 90m and a length of 407.6 m at chainage 143+470 and another toll plaza at chainage 215+407 with a length of 423.4m and a width of 90m were thoroughly studied and the tree enumeration was conducted as per the demarcations.

The Girth at Breast Height (GBH) of each tree was measured by using a simple measuring tape and the height of the each tree was calculated by using simple traditional methods (Shade method). The phenology of the tree was also observed and recorded. The data recorded was computerized and processed to showcase the results. The unknown species were identified using the secondary sources and through the expert consultations. The photographs and short audio visuals (A/V) were documented as an evidence for the conducted survey. Wherever some important species of flora/fauna were sighted the data with respect to the geographical coordinates and Chainage points were documented by using note cam android mobile application. Nikon D 70 Camera was used during the survey for documentation purposes.

Fauna Studies: Fauna studies were carried out to assess the list of animal species that occur along the upgradation of NH-516E. The ocular observations were made on direct and indirect evidences or signs of avifauna, reptiles and mammalian fauna through search for hoof marks, pug marks, scats, dung and pellets. Secondary data from the publications and from informal interviews were done with the villagers and the questions were focused on the past sightings of wild animals over the past one decade and their hunting practices if any and man- animal conflict incidents. Photographs were taken during the survey.
The survey areas across the proposed National Highway have plain areas and some with undulated hill ranges with a maximum altitude to 1100m. The entire stretch of proposed 133.974km National Highway was surveyed by using the enumerated methodology, special care was taken on the hill areas where there is thick greenery and villages nearby.

FLORAL Studies: The survey has enumerated a total of 8623 tress (including 127 Bamboo clumps) belonging to 112 species and 43 taxonomic families (Annexure -I) in addition the other category of species (Liana, Shrubs, Climbers, Herbs) found in the study are Coffea arabica (Coffee), Piper nigrum (Black Pepper) and Ananas comosus (Pineapple) are under cultivation by the individual farmers and by the Andhra Pradesh Forest Development Corporation (APFDC). The other wild species found in the survey are Agave americana, Bauhinia vahlii, Calamus rotang, Chlerodendrone serratum, Caesalpinia bonduc, Lantana camera, Mimosa pudica, and the common grasses like Cymbopogon coloratus, Heteropogon contartus. The Pteridophyte found in the study is Adiantum incisum. Epiphytic orchids were also encountered from the survey are Dendrobium Sp. and Vanda tesellata.

Distribution of Trees across Girth Classes: A total of 8496 trees (excluding bamboo) were enumerated from the study, distribution of trees across various girth classes are as followsTable 4-13.

Table 4-13: Distribution of Trees across Girth classes

S.No	GBH Class	Total Number ofIndividuals (TNI)
1	01 to 99	4085
2	>99 to 199	2824
3	>199 to 299	1099
4	>299 to 399	321
5	>399 to 499	78
6	>499 to 599	52
7	>599 to 699	24
8	>699 to 799	7
9	>799 to 899	5
10	>899 to 999	1
Sub Total		8496
11	Bamboo Clumps	127
Grand Total		8623

Forest Area: The study area of 133.974Kms comprises of 30.595 km of forest area distributed between Nadimplaem and Rampula village is the longest having 12.2 km and with deep Ghat and curves which has got maximum number of species enumerated from the study. The details of the forest pockets along with the Chainage points and total number of trees enumerated are given in Annexure

However The faunal species provided in the report taken from the secondady sources this information pertained entire district, There is no presence of tigers Spotted.

Forest Details:

The Forest of Andhra Pradesh is mostly moist and dry deciduous type in nature and its canopy density widely changes in different months. The State has 1,60,204 Sqm. geographical area having 22 percent forest cover. The district has 11, 16,100 hectares of geographical area and the notified forest comprises 4,70,800 hectares of forest which amounts to 42 per cent, the highest in the State.

The common species available are Guggilam, Tangedu, Sirimanu, Kamba, Yegisa, Nallamaddii, Gandra, Vepa etc. Bamboo shrubs are sparsely scarcely scattered. Major flora found along the project rod area: Innu maddi, Kondatangedu, pasupu-kadamba, Mango/Mamidi, Ippa Puwu, Imli, Manduka-Parnamu/Indian trumpet flower, Bongu- Veduru, Dhaman, Teak, Guava, Amaltaas, Katira, Peepal tree, Chulta, East Indian ebony, Indian gooseberry, Bastard teak, Indian-almond, Neem, Banyan. The strip of the land along the coast and the interior called the plains division and hilly area of the Eastern Ghats flanking it on the North and West called the Agency Division.

The Agency Division consists of the hilly regions covered by the Eastern Ghats with an altitude of about 900m dotted by several peaks exceeding 1200 metres. Also, 1615 metres embraces the mandals of Paderu, G.Madugula, Hukumpeta, Chintapalli, G.K. Veedhi,Koyyuru, Pedabayalu, Munchingiput,Dumbriguda, Arakuvalley and Ananthagiri. There exists ITDA at Paderu. The basic profile of ITDA, Paderu is given in Table 4-14.

Table 4-14: ITDA details along Project Road

Basic Profile of ITDA, Paderu	
Geographic area of Visakhapatnam District	11,167Sq. Kms
Area of the I.T.D.A.	6,293 Sq. Kms
% Agency area to the total district area	56.38%
District Population	42,90,589
Population of Paderu division	6,04,047
Population of Scheduled Tribes	5,47,951
Tribal Households	1,34,233
% of Agency Population to the Dist. Population	14.08%
Population Density in the District (per Sq. Km.)	384
Population Density in Agency Area (per Sq. Km.)	96
PTGs Tribes	Khond, Gadaba, Poorja
Non-PTGs Tribes	Bhagatha, Valmiki, Kondadora, Kotia, Kammara, Nookadora
No. of Schedule Mandals	10 (Full) + 2 (Partial)
Gram Panchayats	244
No. of revenue villages	2,312
Tribal habitations	3,574
No. of PTG Habitations	1,093
No. of Non-PTG habitations	2,481

Forest Area Details in the Project Road shown in Table 4-15.

Table 4-15: Details of Forest land to be diverted along Project Road

S.NO	DIVISION	RF. BLOCK	DESIGN CHAINAGE (m)		LENGTH(m)	DIRECTION	WIDTH(m)	AREA (Ha)
			FROM	TO				
1	Narsipatnam	Bointi	128800	128950	150	Both	20	0.300
2	Narsipatnam	Bointi	128950	130100	1150	Both	20	2.300
3	Narsipatnam	Sarugudu IV	130100	130200	100	Both	20	0.200
4	Narsipatnam	Bointi	130200	132100	1900	Both	20	3.790
5	Narsipatnam	Bointi	150900	159700	8800	Both	20	17.510
6	Narsipatnam	Bointi	159700	159850	150	Both	20	0.300
7	Narsipatnam	Bointi	159850	160150	300	Both	20	0.600
8	Narsipatnam	Bointi	160150	161900	1750	Both	20	3.490
9	Narsipatnam	Bointi	161900	162700	800	Both	20	1.600
					15100	**PACKAGE-I**		**30.090**
10	Narsipatnam	Bointi	167610	169610	2000	LHS	10	2.010
11	Narsipatnam	Bointi	167610	169610		RHS	10	1.990
12	Narsipatnam	Rintada	187230	188300	1070	LHS	10	0.750
13	Narsipatnam	Rintada	187230	188300		RHS	10	0.750
14	Narsipatnam	Lammasingi	189250	190700	1450	LHS	10	2.320
15	Narsipatnam	Wangasara	190700	192550	1850	Both Sides	20	1.450
16	Narsipatnam	Wangasara	192550	194100	1550	LHS	10	2.470

17	Narsipatnam	Wangasara	194100	194943	843	Both Sides	20	0.800
18	Narsipatnam	Wangasara	196330	197730	1400	LHS	10	0.840
					10163	**PACKAGE-II**		**13.380**
19	Narsipatnam	Krishnapuram	217400	218705	1305	Both	35	4.490
20	Narsipatnam	Krishnapuram	218705	220240	1535	Both	35	4.940
21			220240	220300	60	Both	24	0.140
22	Narsipatnam	Krishnapuram	221872	224000	2128	LHS	15	3.140
23			221872	224000		RHS	15	3.140
24			224000	224200	200	LHS	12	0.250
25			224000	224200		RHS	12	0.250
26	Paderu	Machigedda	238600	238700	100	RHS	12	0.240
					5328	**PACKAGE-III**		**16.590**
TOTAL FOREST AREA (Ha)								**60.060**

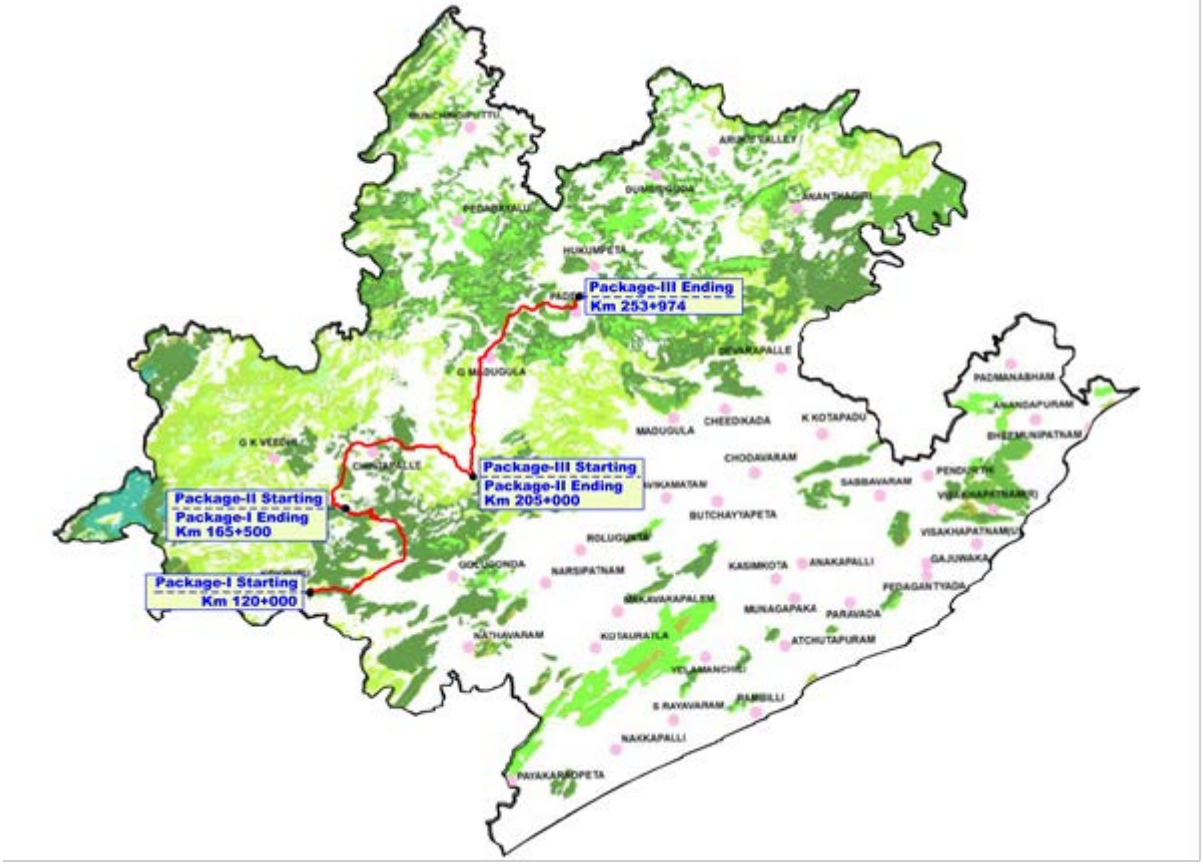


Figure 4-13: Forest Cover map of Vishakhapatnam District showing Project Road

Studies at Rest Area and Toll Plaza: Special efforts were put to study the areas demarcated for rest areas (2) and Toll plaza (2). The details are as follows:

Table 4-16: Trees in Rest areas and Toll plazas

S.No	Category	Proposed Area	Chainage Points	Geographical Coordinates	Species	TNI
1	Rest Areas(2)	195.7 m Length and 105 width and 156.8m Length and 116m Width	142+900 and 215+720	N17°42'29" E 82°23'01" to N17°42'31" E 82°23'00"	Anacardium occidentale, Azadirechta indica, Borassus flabellifer, Ficus benghalensis, Mangifera indica, Tectona grandis	207
2	Toll Plaza (2)	407.6 m Length & 45m width and 423.4 m length and 45m width	Km 120+000 to 165+500 and Km 165+500 to 253+974	N17°42'45" E 82°23'01" to N17°42'58" E 82°23'02"	Anacardium occidentale, Azadirechta indica, Bambusa arundinacea, Borassus flabellifer, Ceiba pentandra, Erythrina variegata, Eucalyptus globulus, Ficus benghalensis, Ficus mollis, Gliricidia sepium, Mangifera indica, Plumeria rubra, Syzygium cumini, Tectona grandis	384

Curve Points: Some curves / turnings of the existing road are proposed to realign as straight roads by removing the green cover of the area. In such locations intensive inventories were carried out to conduct tree enumeration of the area. The details of such locations are as followsTable 4-17

Table 4-17: Trees at Curve Points and Turnings

S.No	Chainage Points	Geographical Coordinates	Species Enumerated	TNI
1	121700 to 122050	N17°38'17" E82°14'39" to N17°38'17" E 82°14'39"	Butea monosperma, Chloroxylon swietenia, Mangifera indica, Semecarpus anacardium, Syzygium cumini, Tamarindus indica, Terminalia tomentosa	10
2	131900 to 132150	N17°39'07" E 82°18'56" to N17°39'12" E 82°19'01"	Anacardium occidentale, Bambusa arundinacea, Dalbergia paniculata, Mangifera indica	15
3	KD Peta Bypass (136700 to 139900)	N17°40'18" E 82°21'11" to N17°41'00" E 82°22'51"	Azadirechta indica, Borassus flabellifer, Chloroxylon swietenia, Ficus benghalensis, Ficus religiosa, Gliricidia sepium, Lannea coromandelica, Premna tomentosa, Sapindus emarginatus, Streblus asper, Tamarindus indica	39
4	146000 to 146200	N17°43'58" E 82°22'36" to N17°44'03" E 82°22'33"	Borassus flabellifer, Casurina equisitifolia, Dalbergia paniculata, Mangifera indica, Phoenix sylvestris, Tamarindus indica, Tectona grandis	16

S.No	Chainage Points	Geographical Coordinates	Species Enumerated	TNI
5	189000 to 189300	N17°51'49" E 82°22'28" to N17°51'49" E 82°22'24"	Anogeissus latifolia, Annoa reticulate, Bambusa arundinacea, Ficus racemosa, Grevillea robusta, Mangifera indica, Syzygium cumini, Terminalia tomentosa	29
6	197700 to 198300	N17°50'44" E 82°26'42" to N17°50'44" E 82°27'01"	Ailanthus excels, Dalbergia lanceolaria, Ficus benghalensis, Lannea coramadelica, Mangifera indica, Schleichera oleosa, Tamarindus indica, Tectona grandis,	46
7	Buradha Veedhi (204400 to 204750)	N17°48'44" E82°29'19" to N17°48'36" E82°29'26"	Ailanthus excels, Albizia lebbeck, Artocarpus heterophyllus, Ceiba pentandra, Dalbergia lanceolaria, Ficus benghalensis, Ficus racemosa, Lannea coramadelica, Mangifera indica, Syzygium cumini, Tamarindus indica,	20
8	Teak Forest (217300 to 217350)	N17°54'23" E 82°29'47" to N17°54'23" E 82°29'48"	Tectona grandis	13
9	Deep Valley (219100 to 219300)	N17°54'58" E 82°29'46" to N17°58'01" E 82°29'46"	Ailanthus excels, Delonix regia, Mangifera indica, Schleichera oleosa, Tectona grandis, Terminalia tomentosa	9
10	243400 to 243600	N18°03'39" E82°35'22" to N18°03'40" E82°35'28"	Ailanthus excels, Grevillea robusta, Ficus benghalensis, Oroxylum indicum, Tectona grandis	11
Total				208

Fauna: Even though there are no considerable direct signs of mammals we could able to record a few reptiles, aves and mammals. The faunal species that were predicted to be present in the present study area were given below inTable 4-18. There is no any designated movement routes.

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Table 4-18: Faunal Species

Sl No.	Scientific name	English name	Vernacular name
1	*Felis chaus* (Schreber, 1777)	Jungle cat	Adavi pilli
2	*Paradoxurus hermaphroditus* (Pallas, 1777)	Common Palm Civet	Chinna Punugu Pilli

3	*Viverricula indica* (É. Geoffroy Saint-Hilaire, 1803)	Small Indian Civet	Punugu Pilli
4	*Herpestes edwardsii* (É. Geoffroy Saint-Hilaire, 1818)	Indian Grey Mongoose	Mungeesa
5	*Herpestes smithii* Gray, 1837	Ruddy Mongoose	Mungeesa
6	*Herpestidae Herpestes vitticollis* Bennett, 1835	Stripe-necked Mongoose	Mungeesa
7	*Leporidae Lepus* nigricollis F. Cuvier, 1823	Indian Hare	Kundelu
8	*Cercopethicidae Macaca* mulatta (Zimmermann, 1780)	Rhesus Macaque	Kothi
9	*Cercopethicidae emnopithecus entellus* (Dufresne, 1797)	Northern Plains Gray Langur	Kondamucchu
10	*Tupaiidae Anathana ellioti* (Waterhouse, 1850)	Madras Tree Shrew	Chettu Gayyaali
11	*Ratufa indica*	Giant Squirrel	
12	*Gongylophis conicus*	Rough scaled sand boa	
13	*Semnopithecus*	Grey langur	Kondamutchu
14	*Spilornis cheela*	Crested Serpent eagle	Dega

List of Tree species enumerated from the study shown in Table 4-19.

Table 4-19: List of Tree names enumerated along Project road

S.No	Scientific Name	Vernacular Name	Family	Habit
1	**Acacia nilotica**	Nalla Thumma	**Mimosaceae**	**Tree**
2	**Aegle marmelos**	Bilva	**Rutaceae**	**Tree**
3	**Ailanthus excels**	Peddamanu	**Simaroubaceae**	**Tree**

S.No	Scientific Name	Vernacular Name	Family	Habit
4	Alangium salvifolium	Ooduga	Alangiaceae	Tree
5	Albizia lebbeck	Dirisena	Mimosaceae	Tree
6	Albizia odoratissima	Chinduga	Mimosaceae	Tree
7	Albizia procera	Tella Chinduga	Mimosaceae	Tree
8	Albizia saman	Nidra Ganneru	Mimosaceae	Tree
9	Alstonia scholaris	Yedu Aakula Chettu	Apocynaceae	Tree
10	Anacardium occidentale	Jeedi Chettu	Anacardiaceae	Tree
11	Annona reticulata	Ramaphalam	Annonaceae	Tree
12	Annona squamosa	Sithaphalam	Annonaceae	Tree
13	Anogeissus latifolia	Chirumaanu/Thirumaanu.	Combretaceae	Tree
14	Araucaria columnaris	Christmas Chettu	Araucariaceae	Tree
15	Artocarpus heterophyllus	Panasa	Moraceae	Tree
16	Azadirechta indica	Vepa	Meliaceae	Tree
17	Bauhinia racemosa	Beedi Aaku	Fabaceae	Tree
18	Bombax ceiba	Buruga Chettu	Bombacaceae	Tree
19	Borassus flabellifer	Thadi Chettu	Arecaceae	Tree
20	Bridelia retusa	Maddi-kayalu	Phyllanthaceae	Tree
21	Buchanania lanzan	Saraapappu	Anacardiaceae	Tree
22	Butea monosperma	Moduga Chettu	Fabaceae	Tree
23	Canthium dicoccum	Kommi Chettu	Rubiaceae	Tree
24	Careya arborea	Budadhermi	Lecythidaceae	Tree
25	Carica papaya	Boppayi	Caricaceae	Tree
26	Caryota urens	Jeeluga	Arecaceae	Tree
27	Cascabela thevetia	Pacha Ganneru	Apocynaceae	Tree
28	Cassia fistula	Rela	Fabaceae	Tree
29	Cassine glauca	Noorijia	Celastraceae	Tree
30	Casuarina equisetifolia	Sarugudu	Casuarinaceae	Tree
31	Ceiba pentandra	Tellaburaga	Malvaceae	Tree
32	Chloroxylon swietenia	Billudu	Rutaceae	Tree
33	Cochlospermum religiosum	Konda Gogu	Bixaceae	Tree
34	Cocos nucifera	Kobbari Chettu	Arecaceae	Tree
35	Cordia dichotoma	Bankanakkera	Boraginaceae	Tree
36	Dalbergia lanceolaria	Kondapachari	Fabaceae	Tree
37	Delonix alata	Chitti keshwaramu	Fabaceae	Tree
38	Delonix regia	Peddaturayi	Fabaceae	Tree
39	Diospyros chloroxylon	Ullinda	Ebenaceae	Tree
40	Diospyros melanoxylon	Tuniki	Ebenaceae	Tree
41	Dolichandrone falcata	Chittivoddi	Bignoniaceae	Tree
42	Erythrina variegata	Nelaguridi	Fabaceae	Tree

S.No	Scientific Name	Vernacular Name	Family	Habit
43	Eucalyptus globulus	Neelagiri	Myrtaceae	Tree
44	Feronia elephantum	Bilva	Rutaceae	Tree
45	Ficus amplissima	Peddajuvvi	Moraceae	Tree
46	Ficus arnottiana	Konda Ravi	Moraceae	Tree
47	Ficus benghalensis	Marri	Moraceae	Tree
48	Ficus hispida	Kakimedi	Moraceae	Tree
49	Ficus microcarpa	Plaksa	Moraceae	Tree
50	Ficus mollis	Kondamarri	Moraceae	Tree
51	Ficus racemosa	Medi	Moraceae	Tree
52	Ficus religiosa	Raavi	Moraceae	Tree
53	Ficus variegata	Atti chettu	Moraceae	Tree
54	Firmiana colorata	Karubopajja	Malvaceae	Tree
55	Gardenia latifolia	Pedda Bikki	Rubiaceae	Tree
56	Gliricidia sepium	Madri	Fabaceae	Tree
57	Grevillea robusta	Silver Oak	Proteaceae	Tree
58	Gyrocarpus americanus	Nallaponaku	Hernandiaceae	Tree
59	Haldina cordifolia	Kadamba	Rubiaceae	Tree
60	Hardwickia binata	Narayepi	Caesalpiniaceae	Tree
61	Hibiscus rosa-sinensis	Mandaram	Malvaceae	Tree
62	Holarrhena pubescens	Girimallika	Apocynaceae	Tree
63	Holoptelea integrifolia	Nemalinara chettu	Ulmaceae	Tree
64	Ixora pavetta	Torch tree	Rubiaceae	Tree
65	Lagerstroemia parviflora	Chenangi	Lythraceae	Tree
66	Lannea coromandelica	Ajasrngi	Anacardiaceae	Tree
67	Leucaena leucocephala	Subabulu	Fabaceae	Tree
68	Madhuca indica	Ippa	Sapotaceae	Tree
69	Madhuca longifolia	Chinna – Ippa	Sapotaceae	Tree
70	Mallotus philippensis	Kunkuma-chettu	Euphorbiaceae	Tree
71	Mangifera indica	Mamidi	Anacardiaceae	Tree
72	Markhamia lutea	Nile tulip	Bignoniaceae	Tree
73	Melia azedarach	Pedda Vepa	Meliaceae	Tree
74	Millingtonia hortensis	Kavuki	Bignoniaceae	Tree
75	Morinda pubescens	Togaru Maddi	Rubiaceae	Tree
76	Moringa oleifera	Munaga	Moringaceae	Tree
77	Morus alba	Mulberry	Moraceae	Tree
78	Musa × paradisiaca	Arati	Musaceae	Tree
79	Neolamarckia cadamba	Kadamba	Rubiaceae	Tree
80	Oroxylum indicum	Pampini	Bignoniaceae	Tree
81	Pandanus tectorius	Mogali	Pandanaceae	Tree

S.No	Scientific Name	Vernacular Name	Family	Habit
82	**Phoenix sylvestris**	Eetha Chettu	**Arecaceae**	**Tree**
83	**Phyllanthus emblica**	Pedda Usiri	**Phyllanthaceae**	**Tree**
84	**Plumeria rubra**	Devaganneru	**Apocynaceae**	**Tree**
85	**Polyalthia cerasoides**	Tellachilakadudi	**Annonaceae**	**Tree**
86	**Polyalthia longifolia**	Asokamu	**Annonaceae**	**Tree**
87	**Pongamia pinnata**	Ganuka	**Fabaceae**	**Tree**
88	**Premna latifolia**	Peddanellakura	**Lamiacea**	**Tree**
89	**Premna tomentosa**	Nagaru	**Lamiacea**	**Tree**
90	**Psidium guajava**	Jaama	**Myrtaceae**	**Tree**
91	**Pterocarpus marsupium**	Yegisa	**Fabaceae**	**Tree**
92	**Pterospermum xylocarpum**	Lolugu chettu	**Malvaceae**	**Tree**
93	**Ricinus communis**	Aamudamu	**Euphorbiaceae**	**Tree**
94	**Santalum album**	Sandle Wood	**Santalaceae**	**Tree**
95	**Sapindus emarginatus**	Kunkudu Chettu	**Sapindaceae**	**Tree**
96	**Schleichera oleosa**	Posku	**Sapindaceae**	**Tree**
97	**Schrebera swietenioides**	Tondamukkudi	**Oleaceae**	**Tree**
98	**Semecarpus anacardium**	Nalla Jeedi	**Anacardiaceae**	**Tree**
99	**Soymida febrifuga**	Somi Chettu	**Meliaceae**	**Tree**
100	**Sterculia urens**	Erra Poliki	**Malvaceae**	**Tree**
101	**Streblus asper**	Barinika	**Moraceae**	**Tree**
102	**Strychnos potatorum**	Visha Mushti	**Loganiaceae**	**Tree**
103	**Syzygium cumini**	Neredu	**Myrtaceae**	**Tree**
104	**Tamarindus indica**	Chintha	**Fabaceae**	**Tree**
105	**Tecoma castanifolia**	Pachagotla	**Bignoniaceae**	**Tree**
106	**Tectona grandis**	Teku	**Lamiaceae**	**Tree**
107	**Terminalia bellirica**	Thanikaya	**Combretaceae**	**Tree**
108	**Terminalia catappa**	Badamu	**Combretaceae**	**Tree**
109	**Terminalia tomentosa**	Innu maddi	**Combretaceae**	**Tree**
110	**Thespesia populnea**	Gngaravi	**Malvaceae**	**Tree**
111	**Vitex altissima**	Nemali Adugu	**Lamiaceae**	**Tree**
112	**Wrightia tinctoria**	Thella Paala	**Apocynaceae**	**Tree**

Table 4-20: Chainage wise Species Recorded

S. No	Location	Chainage Points	Total Length (m)	Species Recorded	Trees Enumerated (TNI)
1	Koyyuru to K.D. Peta	128+800 to 132+000	3200	Anogeissus latifolia, Bambusa arundinacea, Borassus flabellifer, Ceiba pentandra, Lannea coramandelica, Ficus variegate, Haldinia cordifolia, Holoptelia integrifolia, Mangifera indica, Prosopis juliflora, Tamarindus indica	248
2	Nadimpalem to Rampula Village	150+300 to 162+500	12200	Artocarpus heterophyllus, Anogeissus latifolia, Ailanthus excels, Grevilia robusta, Ficus amplissima, Lannea coromandelica, Mangifera indica, Mallotus philippensis, Albizia odoratissima, Pterospermum xylocarpum, Schleichera oleosa, Terminalia bellarica, Phyllanthus emblica, Mangifera indica, Ficus variegate, Anogeissus latifolia, Chloroxylon swietenia, Ceiba pentandra, Schleichera oleosa, Lannea coromandelica, Terminalia tomentosa, Ficus amplissima, Ficus microcarpa, Gyrocarpus americana, Dalbergia paniculata, Ceiba pentandra, Tectona grandis, Bauhinia racemeosa,Babusa arundinacea, Strychnos potatorum, Polyalthia cerasoides, Bombax ceiba, Ficus benghalensis, Dalbergia lanceolaria, Bridelia montana, Tamarindua indica, Sterculia urens, Ficus benghalensis, Albizia odorotissima, Canthium dicoccum, Soymida febrifuga, Morinda pubescens, Melia azadirech, Feronia elephentum, Buchanania lanzan, Wrightia tinctoria, Pterocarpus marsupium, Semecarpus anacardium, Premna tomentosa, Cassia fistula, Diospyros melanoxylon, Dendrocalamus strictus, Phyllanthus emblica, Ficus religiosa, pongamia pinnata, Melia azadirech, Schrebera swietenoides, Butea monosperma, Ixora pavetta, Alangium salvifolium	591
3	Rampula to Chaparathi Palem	167+500 to 170+400	2900	Dalbergia lanceolaria, Ceiba pentadra, Chloroxylon swietenia, Mangifera indica, Ficus altissima, Grewilia robusta, Anogeissus latifolia, Ailanthus excelsa, Syzygium cumini, Albizia amara, Mallotus phillippensis, Artocarpus heterophyllus, Lannea coromandelica, Thespecia populnea, Haldinia cordifolia, Terminalia tomentosa, Scleichera oleosa, Ficus amplissima, Sapindus emarginatus	236

S. No	Location	Chainage Points	Total Length (m)	Species Recorded	Trees Enumerated (TNI)
4	Teak Forest	217+300 to 218+100	800	Terminalia tomentosa, Schleichera oleosa, Anogeissus latifolia, Bambusa arundinacea, Tamarindus indica, Mangifera indica, Tectona grandis, Ficus benghalensis, Thespecia populnea, Canthium dicoccum, Syzygium cumini, Vitex altissima, Holoptelia integrifolia,	103
5	Vanjari to Kulapadu	222+000 to 224+000	2000	Artocarpus heterophyllus, Mangifera indica, Syzygium cumini, Schleichera Oleosa, Ailanthus excelsa, Ficus Sp., Lannea coramandelica, Ceiba pentandra, Coffee, Pepper,	322
Total			21100		1500

	
Measuring GBH	**Forest**
	
Forest at Rampula Ghat	**Interaction with communities for Collection of Secondary data (Fauna)**

	
Ficus variegate	**Sterculia urens**
	
Chainage marked on road	**Rough scaled sand boas, Road kill**

Giant Squirrel Ratufa indica

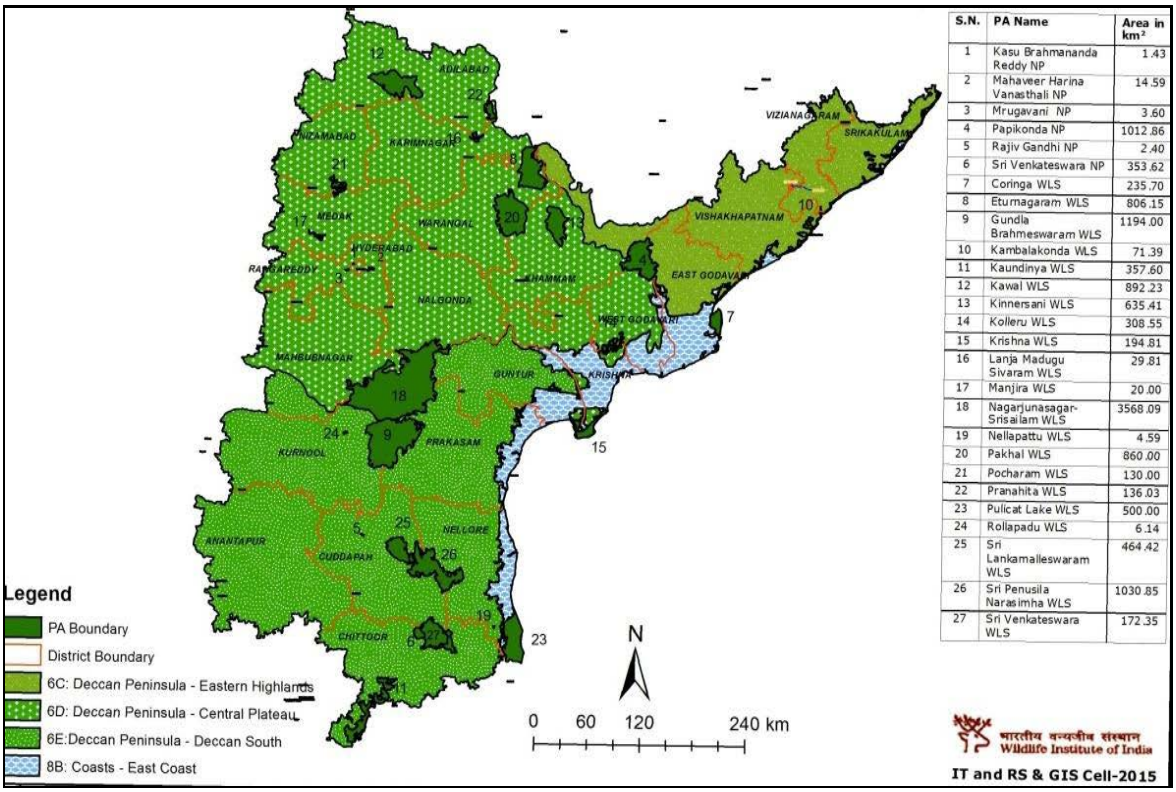
Grey langur

Crested serpent eagle

Figure 4-14: Site Photographs

4.4.2 WILDLIFE PROTECTED AREAS

Wildlife Protected Area Map for Andhra Pradesh is given in Figure 4-16. There are no National Park, Wildlife Sanctuary, Biosphere Reserve and any other notified sensitive area within the 15 Km radius from the project road.



S.N.	PA Name	Area in km²
1	Kasu Brahmananda Reddy NP	1.43
2	Mahaveer Harina Vanasthali NP	14.59
3	Mrugavani NP	3.60
4	Papikonda NP	1012.86
5	Rajiv Gandhi NP	2.40
6	Sri Venkateswara NP	353.62
7	Coringa WLS	235.70
8	Eturnagaram WLS	806.15
9	Gundla Brahmeswaram WLS	1194.00
10	Kambalakonda WLS	71.39
11	Kaundinya WLS	357.60
12	Kawal WLS	892.23
13	Kinnersani WLS	635.41
14	Kolleru WLS	308.55
15	Krishna WLS	194.81
16	Lanja Madugu Sivaram WLS	29.81
17	Manjira WLS	20.00
18	Nagarjunasagar-Srisailam WLS	3568.09
19	Nellapattu WLS	4.59
20	Pakhal WLS	860.00
21	Pocharam WLS	130.00
22	Pranahita WLS	136.03
23	Pulicat Lake WLS	500.00
24	Rollapadu WLS	6.14
25	Sri Lankamalleswaram WLS	464.42
26	Sri Penusila Narasimha WLS	1030.85
27	Sri Venkateswara WLS	172.35

Figure 4-15: Wildlife Protected Area Map of Andhra Pradesh

4.4.3 ASSESSMENT OF WILDLIFE OCCURRENCE

An assessment of the occurrence of wildlife within Packages I and II was conducted to assess the potential impact presented by the road development and to determine likely areas where wildlife crossings can be expected. Field surveys were conducted from 11 to 15 September 2023 which involved an assessment of habitats and extensive community engagements.

4.4.3.1 DESCRIPTION OF HABITATS

An understanding of the layout of habitats across the landscape provides a useful indicator of expected wildlife movement, particularly for species restricted to certain habitats, such as the area of natural forest. The general landscape within the study area is dominated by a low escarpment which separates a lower-lying landscape from the higher lying landscape (Figure 4-18). The project route climbs this escarpment in Package I between Katrygadda village and Rampula village.

The following land use/habitat types habitats were recognized in the study area (Figure 4-16) with their approximate layout illustrated in Figure 4-18:

- Natural forest comprising a tall forest mostly located on steep slopes rising up towards the escarpment
- Cashew nut plantations located in the lower-lying parts of the study area
- Coffee plantations located in the higher-lying parts of the study area
- Settlement and cultivation occurring widely throughout the study area, comprising large areas of rice paddies and other crops
- Vegetation in the remaining areas is dominated by cleared forest in varying stages of regeneration.

Figure 4-16: Examples of habitat types encountered along the Project route

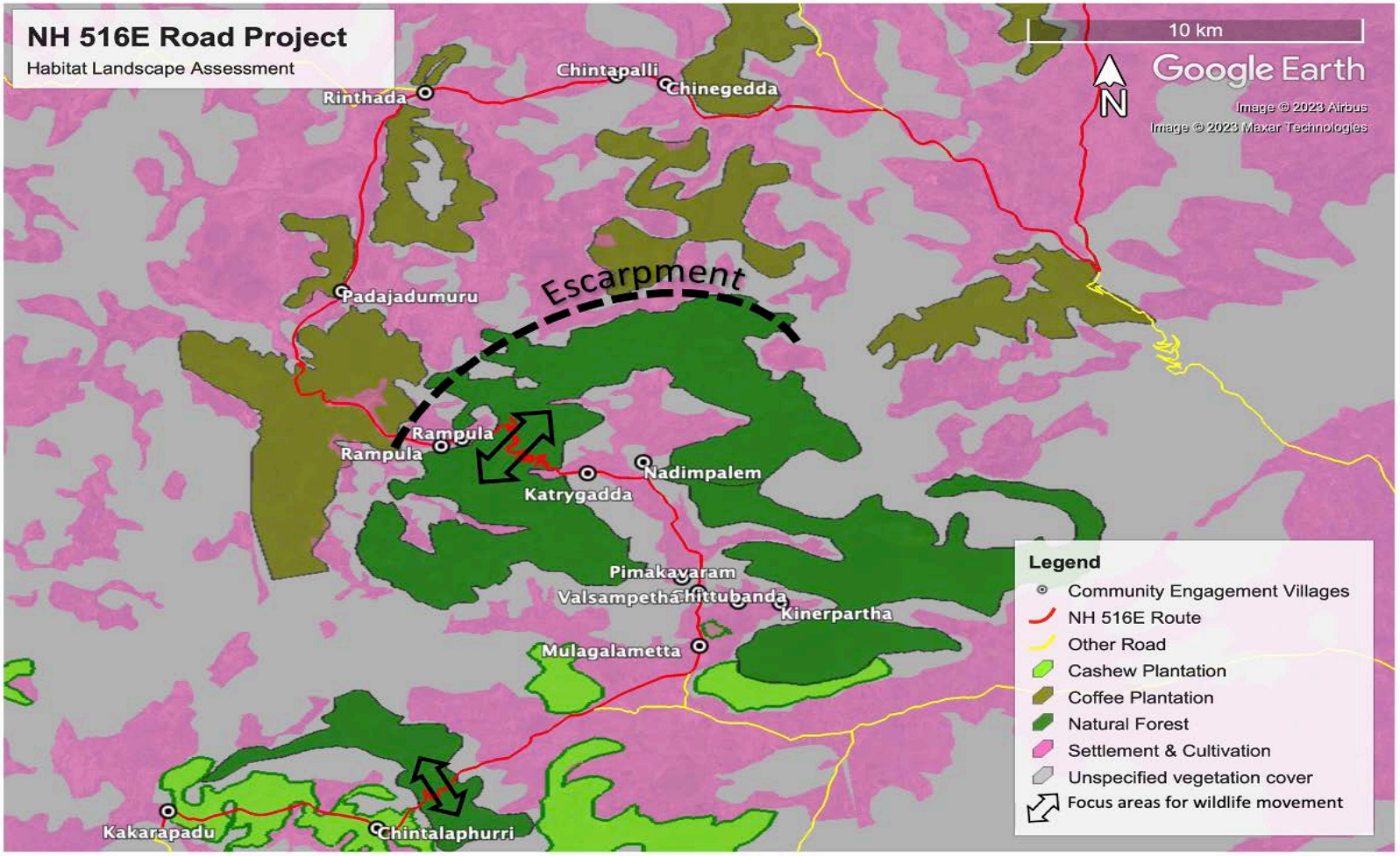


Figure 4-17: Map of habitats across the landscape showing focus areas for expected wildlife movement within areas of natural forest

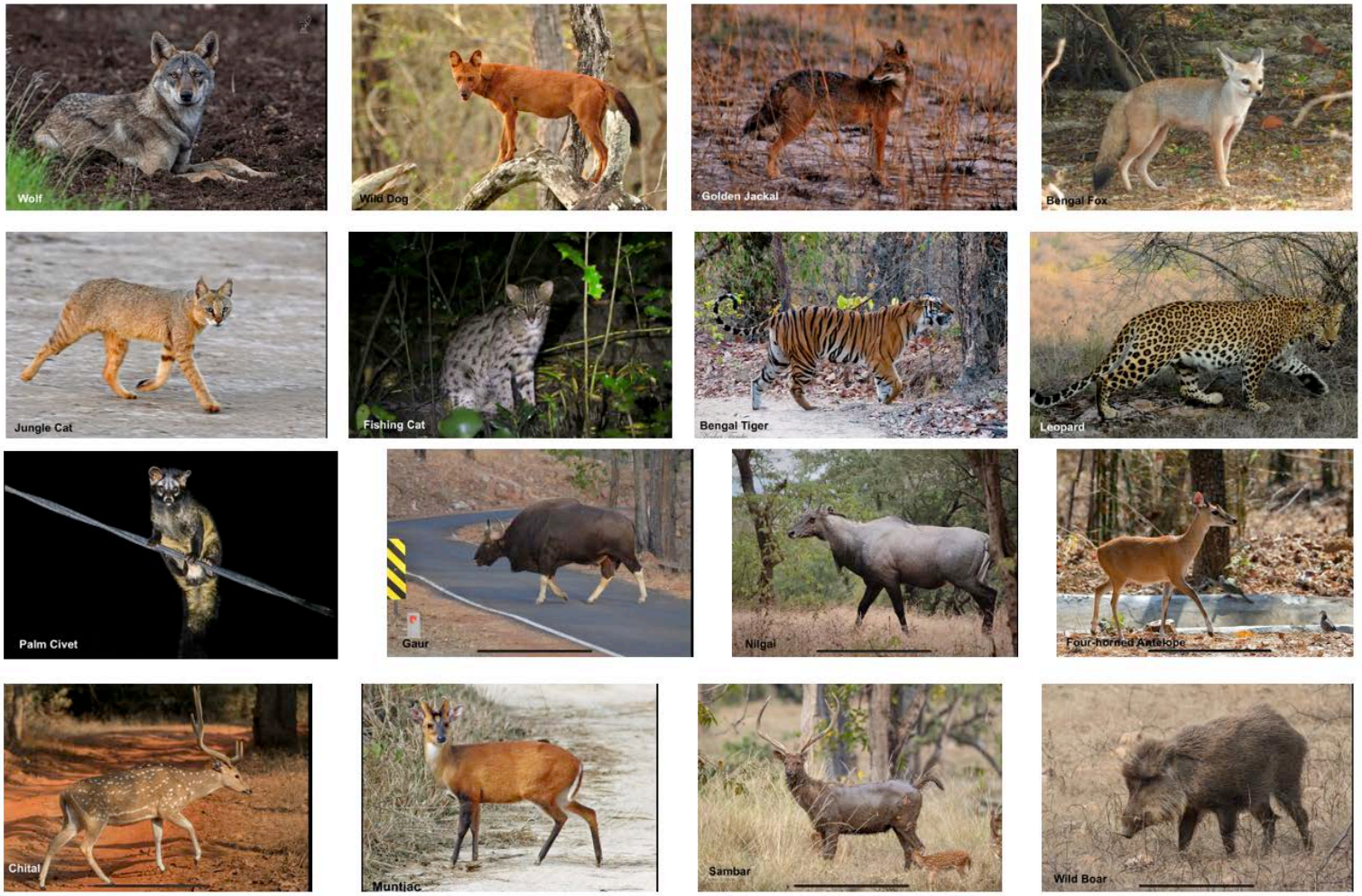


Figure 4-18: Pictures of wildlife occurring within the region shown to community members to assess wildlife occurrence (source: iNaturalist)

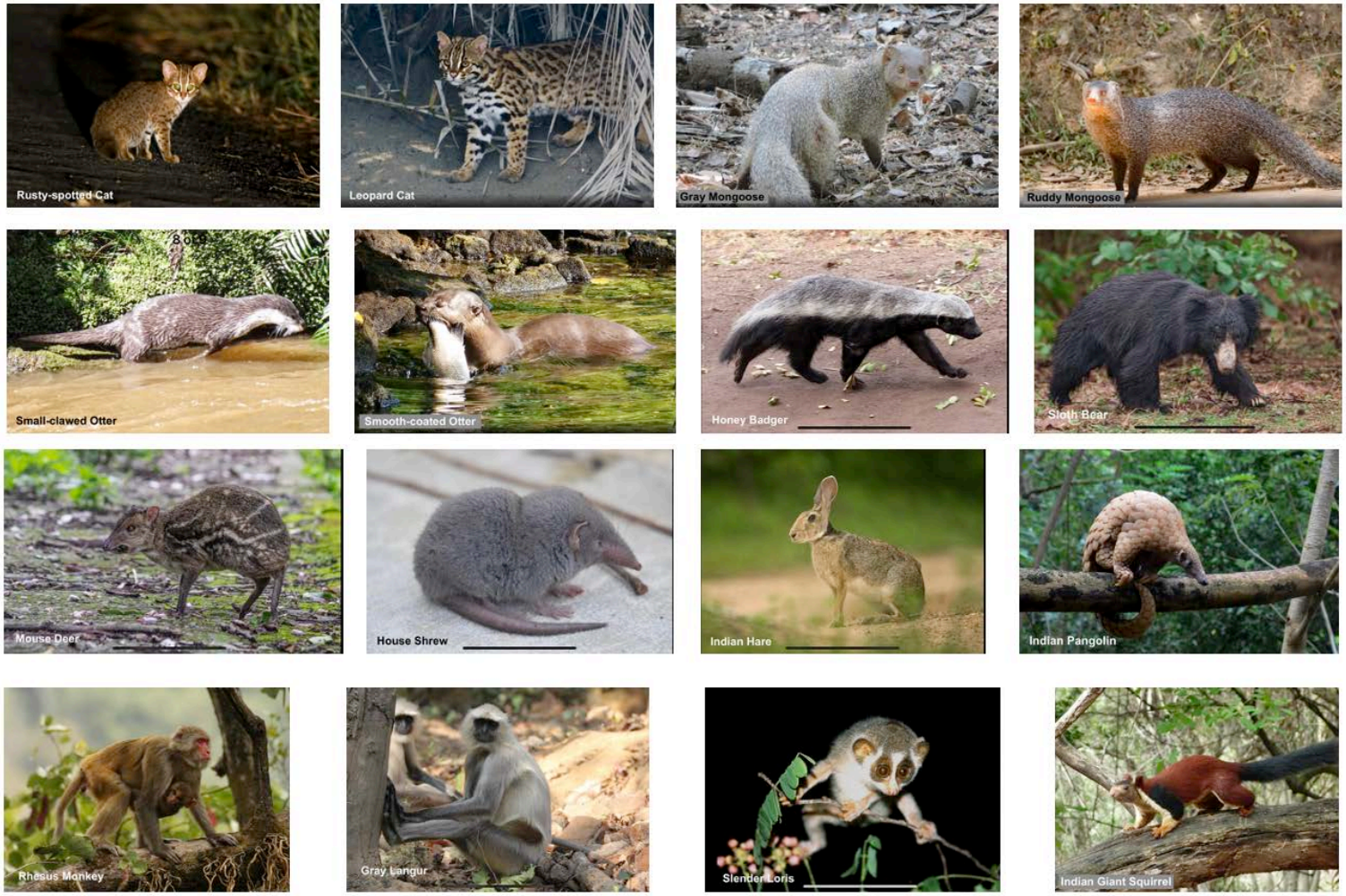


Figure 4-19: Further pictures of wildlife occurring within the region shown to community members to assess wildlife occurrence (source: iNaturalist)

The presence of wildlife was assessed through consultation with community members in 15 village locations within Packages I and II (Table 4-21). People were shown a selection of 34 pictures of mammals likely to occur in the region. A list of mammals (excluding bats and lesser rodents) was obtained from IBAT and characteristic pictures (Figure 4-19 and Figure 4-20) downloaded from the iNaturalist website. A simple approach was followed using a mobile phone to show the pictures to community members (Figure 4-17) and their responses were noted.

Figure 4-20: Photographs of community engagement surveys

Table 4-21: Village locations where consultations with community members were held

Date	Village Name	Construction Package	Route Chainage
11-Sep-23	Chintalaphuri	Package I	127+300
11-Sep-23	Kakarapadu	Package I	120+700
12-Sep-23	Valsampetha	Package I	142+800
12-Sep-23	Chittubanda	Package I	East of 142+500
12-Sep-23	Kinerpartha	Package I	East of 142+400
12-Sep-23	Mulagalametta	Package I	141+000
12-Sep-23	Pimakavaram	Package I	West of 143+300
12-Sep-23	Nadimpalem	Package I	North of 147+500
12-Sep-23	Katrygadda	Package I	149+200
13-Sep-23	Rampula (cattle herders)	Package I	162+800
13-Sep-23	Rampula	Package I	163+500
13-Sep-23	Padajadumuru	Package II	173+500
13-Sep-23	Rinthada	Package II	181+200
14-Sep-23	Chintapalli	Package II	187+300
14-Sep-23	Chinegedda	Package II	188+800

The results achieved from consultations regarding wildlife presence is illustrated in Table 4-22 with interpretation for each species provided thereafter.

Table 4-22: Data on wildlife occurrence gathered through community engagements in villages along the project route

Wildlife Name	Chintalap.	Kakarap.	Valsamp.	Chittub.	Kinerp.	Mulaga.	Pimakav.	Nadimp.	Katryga.	Rampul.1	Rampul.2	Padajad.	Rinthada	Chintap.	Chineg.
Grey Wolf	Yes	Yes	Rare	Yes	Yes			Few	Yes						
Golden Jackal	Yes		Rare	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	
Dhole (Wild Dog)				Rare	Yes									Long ago	
Bengal Fox				Forest	Yes			Yes		Yes	Yes	Yes		Yes	Yes
Jungle Cat			Yes	Yes	former	Yes	Yes	Yes	Yes		Yes	Yes	Yes		
Bengal Tiger			Reservoir	Reservoir						Long ago	Long ago		Long ago	Long ago	
Leopard			20 yrs ago	Yes	Long ago					E. Godavari			Long ago	70 km	
Fishing Cat				Yes	Yes	Yes	few		Yes	Low alt.				Yes	
Rusty-spotted Cat					Yes		Yes		Yes		Uncertain			Uncertain	
Leopard Cat					15 km	Yes			Uncertain						
Grey Mongoose			few								Yes	Yes	Yes	Yes	Yes
Ruddy Mongoose	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes
Small-clawed Otter						Yes		Yes							
Smooth-coat. Otter															
Honey Badger							(long ago)								
Sloth Bear		Former	Former	Former	3 yrs ago		10 km	30 km	Forest		30 km		50 yrs ago	70 km	
Palm Civet	Forest				Yes				Yes	Forest	Yes				

Wildlife Name	Chintalap.	Kakarap.	Valsamp.	Chittub.	Kinerp.	Mulaga.	Pimakav.	Nadimp.	Katryga.	Rampul.1	Rampul.2	Padajad.	Rinthada	Chintap.	Chineg.
Gaur (Bison)	Forest		Forest	Forest	E.Godavari	2 yrs ago	Yes		Few	Long ago				40 km	80 km
Nilgai	Rare			Few	Unlikely										
4-horn. Antelope	Few		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Few	Former	Few	
Chital	Few		Rare	Yes	E.Godavari		Yes	Yes	Yes	Long ago		Long ago			20 km
Barking Deer			20 km		Yes	Yes	Yes	Yes	Yes	Few	Yes	Few			
Sambar	Few				Forest				Yes						
Wild Boar	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Yes	Abundant	Abundant
Mouse Deer			Yes		Yes	Yes		Yes	Rare	Uncertain	Yes	Yes			
House Shrew	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Indian Hare	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Abundant	Yes	Yes	Yes	Abundant	Yes
Indian Pangolin	Forest		Rare	Illegal t.	Illegal t.	Yes	Forest	Forest	Yes				Few	20 km	
Rhesus Monkey	Abundant		Abundant	Abundant	Abundant	Abundant	Abundant	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Gray Langur	Forest		Forest	Forest	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Few	10 km	Few
Slender Loris															
Palm Squirrel			Abundant	Abundant	Yes	Yes	Yes	Yes	Abundant	Yes	Yes	Yes		Rare	Yes
Giant Tree Squirrel	Yes	Yes	Forest	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes

4.4.3.2 INTERPRETATION OF COMMUNITY RESPONSES FOR SPECIES OCCURRENCE

4.4.3.3 CARNIVORES – CANIDS (DOG FAMILY)

Indian Grey Wolf (*Canis lupus pallipes*) (EN)
Presence and Distribution: Community members engaged in at least seven villages were confident that Gray Wolf are present in the lower-lying areas of the project route. This agrees with a map provided by Jhala et al. (2022) showing Gray Wolf are present at low density in the project area of Andhra Pradesh. Wolves can be responsible for livestock losses but none of the communities highlighted problems associated with occurrence of wolves, and these predators are therefore expected to occur at very low density. Community members did not describe wolves as being restricted to forest habitats, wolves are naturally highly mobile and are therefore expected to occur in a variety of habitats in the lower-lying areas of the project route. Results revealed that wolves are not present in the higher-lying areas of the project route.
Mitigation Approach: Wolves breed in holes in the ground (dens) and will therefore readily enter confined spaces such as box and pipe culverts. No specific requirements are therefore considered necessary for underpass structures to accommodate wolf crossings.
Priority Status: The Gray Wolf is globally is not threatened, however the subspecies occurring in India is described as Endangered with a remaining population of 2000 to 3000 individuals (Sharma et al. 2004) and are listed on iNaturalist as an Endangered subspecies. Gray Wolf must therefore be considered an important species for the project, but a moderate priority for mitigation development due to non-specific requirements and low density of occurrence.

Golden Jackal (*Canis aureus*) LC
Presence and Distribution: Jackal appear to be widespread in the project area as most community members recognized them and acknowledged their presence. Golden Jackal reportedly scavenge around human settlements, and thrive in the absence of larger predators such as wolves (Chourasia, 2020). Results reveal Golden Jackal are widespread in the project area, occurring in both lower and higher-lying areas, and not restricted to natural habitats.
Mitigation Approach: Golden Jackal, similar to wolves, will den in underground burrows and will therefore readily enter small spaces such as box and pipe culverts. No specific requirements are therefore considered necessary for underpass structures to accommodate Golden Jackal crossings.
Priority Status: Golden Jackal are not threatened, frequently associated with disturbed habitats, do not have specific mitigation requirements and are therefore considered a low priority species.

Dhole/Wild Dog *(Cuon alpinus)* EN
Ecologists in Visakhapatnam were confident that Dhole are present in the region but no convincing evidence of their presence was obtained during engagements with communities. Two community reports of presence could have been mistaken for feral domestic dogs. This species is therefore considered not present and is not included in the mitigation approach, however if present, the mitigation applied to Gray Wolf and Golden Jackal would be applicable.

Bengal Fox (Vulpes bengalensis) LC
Presence and Distribution: Bengal Fox was recognised by many of the village members engaged during this survey. People mentioned this fox is responsible for eating chickens and scavenges around settlements, and sufficient evidence was obtained to demonstrate this fox is present. Responses received suggest Bengal Fox occurs throughout the project area. It may be more abundant in settlement and agricultural areas as Johnsingh & Jhala (2004) state agro-pastoral landscapes are the preferred habitat but this species avoids dense forest and steep slopes.

Mitigation Approach: Bengal Fox dig their own dens and will therefore enter into restricted spaces. This fox is small, weighing approximately 4 kg and should readily pass through 1.2 meter pipe culverts and larger box culverts.
Priority Status: Bengal Fox is not threatened and has no specific mitigation requirements and is therefore included as a low priority species.

4.4.3.4 CARNIVORES – FELIDS (CAT FAMILY)

Jungle Cat (*Felis chaus*) LC
Presence and Distribution: Numerous community members recognized the Jungle cat pictures and stated this species is responsible for killing their chickens. The many responses suggest that this cat occurs throughout the project area, but may be similarly distributed to Bengal Fox as it has adapted to settlement and cultivated areas. Despite its name, it avoids dense forest (Gray et al. 2014).
Mitigation Approach: Jungle cats are a medium sized cat (shoulder height: 36 cm; weight: 2 to 16 kg) that frequently uses abandoned burrows or hollow trees and should therefore readily enter confined spaces. Pipe culverts with a 1.2 m diameter proposed in the project design should therefore provide abundant underpass facilities for this cat.
Priority Status: Jungle cat are not threatened and widespread, and considered a low priority species without specific mitigation requirements.

Tiger (Panthera tigris) EN
Presence and Distribution: Engagements with community members included specific questions on the occurrence of tigers. Community members in Valsampetha and Chittubanda stated that a nomadic individual tiger was present in the vicinity of the Thandava Reservoir. Discussions with MoRTH officers in Viskapathanam confirmed the occurrence of a nomadic individual tiger. However there was no evidence of regular tiger occurrence in the project area. The status of Tigers 2022 report issued by the National Tiger Conservation Authority and Wildlife Institute of India (2023) estimates a tiger population of 63 individuals in Andhra Pradesh, which is a 31% increase since 2018. A map provided in the report illustrates a small tiger presence in East Godavari district approximately 80 km west of the start of Package I (Figure 4-21)
Mitigation Approach: The project is not located in a core tiger habitat or corridor, and field data reveals there is no reliable presence of tigers in the project vicinity. Nomadic individuals may continue to appear at irregular intervals but it is not possible to predict the habitats in which they will occur or plan mitigation to accommodate them. The Eco-friendly guidelines for linear infrastructure (Wildlife Institute of India, 2016) require tiger-friendly infrastructure in critical tiger corridors and core areas. Underpass structures should have a minimum height of 5 meters. ADB guidelines (2019) require a minimum height of 4.5 meters. At least 11 minor bridges and 14 box culverts will be constructed with a clearance or height equal to or exceeding 4 meters. Some of these structures are located in natural habitat, and no additional requirements are proposed to accommodate tiger crossings.
Priority Status: Tigers are an Endangered species and are considered a high priority species although specific mitigation cannot be provided.

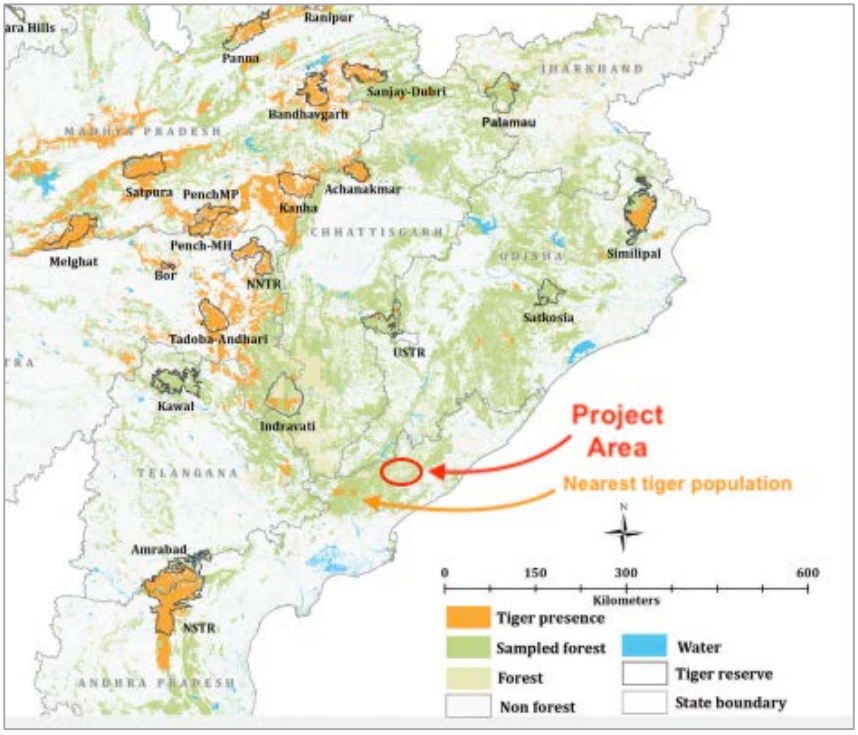


Figure 4-21: Map of current tiger presence in the Central India and Eastern Ghats landscape of India, adapted from the Status of Tigers 2022 report, which reveals a tiger presence in East Godavari District west of the project

Leopard (Panthera pardus) VU
Presence and Distribution: No evidence of presence of leopards was achieved through community consultations, however online literature reveals an estimated leopard population of 461 to 523 individuals in Andhra Pradesh, which is greater than the tiger population. The Chintapalli Forests in the extended project area are known to support leopards (Times of India, 2009 and 2021). Leopards are elusive and suitable habitat and prey populations do exist, and occasional (nomadic) individuals are therefore expected to occur in the natural forests along the project route.
Mitigation Approach: Similar to tiger, movements of leopard cannot be predicted but are expected to be focused on the natural forest habitats through Package I. Leopards have a maximum shoulder height of 75 cm and will be accommodated by underpass structures with a 3 meter height or greater.
Priority Status: Leopards are threatened and are included as a moderate priority species although specific mitigation cannot be provided.

Fishing Cat (Prionailurus viverrinus) VU
Presence and Distribution: Communities in the lower-lying parts of the project responded positively to the presence of fishing cat and with sufficient confident regarding the correct identification. This cat is associated with streams and wetland habitats and may be associated with rice paddies.
Mitigation Approach: Habitats in which Fishing cats occur require good drainage and are therefore associated with box culverts, which will exceed the underpass requirements for the species. No additional requirements are therefore necessary.
Priority Status: Fishing cats are a threatened species, but are readily accommodated with existing infrastructure, and are therefore included as a moderate priority species.

Lesser Cats: Rusty-spotted Cat (*Prionailurus rubiginosus*) NT; Leopard Cat (*P. bengalensis*) LC

Community members engaged during this survey were uncertain regarding the presence of Rusty-spotted Cat and did not recognize the Leopard Cat. Communities may have misidentified Rusty-spotted Cat, and there is insufficient evidence to confirm the presence of either species.

4.4.3.5 OTHER CARNIVORES

Indian Grey Mongoose (*Herpestes edwardsii*); Ruddy Mongoose (*H. smithii*) - LC
Presence and Distribution: Community responses reveal that both mongoose species are present in the area. Most respondents were aware of the difference between Grey and Ruddy mongoose, with Grey Mongoose occurring in the lower-lying areas and largely restricted to the forest habitats. Ruddy Mongoose are more prominent in the higher-lying areas and frequently in settled and cultivated areas.
Mitigation Approach: Mongoose are small and are expected to readily use pipe culverts as underpass structures and to hide. Sufficient culverts are included in the project design and no additional recommendations are required.
Priority Status: Mongoose species are not threatened, are easily accommodated in the existing design and therefore a low priority species for this study.

Small-clawed Otter (*Aonyx cinereus*); Smooth-coated Otter (*Lutrogale perspicillata*) - VU
Community members in Mulagalametta and Nadimpalem villages mentioned the presence of otters but these animals are restricted to water bodies where they hunt for fish and other aquatic prey. The project route does not pass near suitable habitat and otters are therefore not considered relevant to this project.

Honey Badger (*Mellivora capensis*) LC
No evidence of honey badger was obtained and this species is considered not present.

Sloth Bear (*Melursus ursinus*) VU
Presence and Distribution: Many community members responded that Sloth Bear were formerly present in the area but their numbers have declined. However some communities stated they were seen in the area recently. Evidence suggests that Sloth Bear numbers are low and possibly restricted to a few individuals that may have a nomadic behavior in the lower-lying areas. Sloth bear are attracted to the Cashew nut plantations when the crop is ripe and crop protection may be an underlying reason for the decline in their population. The News Minute online news site reported the death of two sloth bears in July 2021 in the vicinity of Narsipatnam close to the project area, which confirms the presence of the bears.
Mitigation Approach: Sloth Bears are large but elusive animals that need safe crossing facilities otherwise they are likely to avoid roads. ADB Guidelines recommend that underpass structures with a 3 meter clearance. Various box culverts and bridges are included in the project design, but are narrow structures likely to restrict the movement of Sloth bears. A recommendation is therefore provided to expand the width of a 2 x 4 meter box culvert in the lower natural forest habitat (chainage 150+683) to better accommodate these bears.
Priority Status: Sloth Bears are a threatened species with specific mitigation requirements and therefore included as a priority species for the project.

Common Palm Civet (Paradoxurus hermaphroditus) LC
Presence and Distribution: Limited evidence of the presence of palm civets was obtained from community engagements although a few members stated the species is present in the natural forest habitats.
Mitigation Approach: Palm civet are an arboreal species that escape danger by climbing trees. Their presence in the project area is not confirmed, but would benefit from canopy bridges proposed for Indian Pangolin if they are present.
Priority Status: Palm civet are tentatively listed as a moderate priority species for the project.

4.4.3.6 UNGULATES

Gaur/Bison (*Bos gaurus*) VU
Presence and Distribution: Community members in six of the lower-lying villages confirmed the presence of Gaur (known locally as Bison) in the natural forests associated with Package 1. Gaur are a large bovine species that is not expected outside of areas, but community responses are supported by iNaturalist records in 2021 west of Maredmulli in East Godavari District (70 km from the start of Package 1), also the project area is located on the edge of core Gaur habitat based on Ashokkumar et al. (2011).
Mitigation Approach: The Eco-friendly guidelines for linear infrastructure (Wildlife Institute of India, 2016) require a 5 to 6 meter clearance for underpass structures to accommodate Gaur, while ADB guidelines require a 4 to 4.5 meter clearance. The current design includes five box culverts with 4 to 5 meter clearances. These will need to be supported with signage to warn traffic of the potential presence of large wildlife.
Priority Status: Gaur are a threatened species with specific mitigation requirements and therefore included as a priority species for the project.

Chital/Spotted Deer (*Axis axis*) LC
Presence and Distribution: Many community members recognized Chital due to their distinctive appearance but most respondents were uncertain of their presence in the project area. However sufficient responses were obtained to suggest a small population of these deer may survive in the natural forests associated with Package 1.
Mitigation Approach: Chital are small ungulates but the males have large antlers during the breeding season, which increases their requirements for underpass structures. The Eco-friendly guidelines for linear infrastructure (Wildlife Institute of India, 2016) recommend underpass structures with a minimum height of 5 meters. Drainage included in the project design should be sufficient to accommodate the few individuals that may be present in the project area.
Priority Status: Chital are included as a moderate priority species.

Four-horned Antelope (*Tetracerus quadricornis*) VU; Barking Deer/Muntjac (*Muntiacus vaginalis*) LC
Presence and Distribution: These two species are small sized ungulates which were recognized by community members. People mentioned that populations of these ungulates have declined but are present in the natural forest habitats of Package 1.
Mitigation Approach: These ungulates are smaller than Chital and without large antlers. The ADB guidelines recommend underpass structures with a 3 meter height clearance for small ungulates, and these species can therefore be accommodated by drainage structures included within the project design.
Priority Status: Four-horned antelope and Barking deer are included as moderate priority species.

Nilgai (Boselaphus tragocamelus) LC; Sambar (Rusa unicolor) VU
No evidence of either of these large ungulates was obtained and they are considered not present.

Mouse Deer (*Moschiola indica*) LC
Presence and Distribution: Mouse Deer are a very small and elusive ungulate, and as a result many community members did not recognize them. However sufficient community members did respond that the species is present in natural forest habitats, and possibly in greater numbers in the higher lying areas. Ecologists in Visakhapatnam stated Mouse Deer have been bred and released to boost wild populations, but it is not known if such releases have been conducted in the project area.
Mitigation Approach: Mouse Deer are very small (30 cm shoulder height) and thrive in dense forest habitats. They have small home ranges and do not move extensively. Based on their dense habitat they are likely to pass through large pipe culverts and box culverts and the existing project design is considered sufficient to accommodate these little deer.
Priority Status: Moderate Priority

Wild Boar (*Sus scrofa*) LC
Presence and Distribution: All community members responded that Wild Boar (wild pigs) are abundant and many stated that these pigs cause damage to crops and are present throughout the project area.
Mitigation Approach: These animals will readily use pipe culverts as refuge sites and sufficient structures are included within the project design to accommodate the species.
Priority Status: Wild boar are abundant, not threatened and considered a low priority species.

4.4.3.7 PRIMATES

Rhesus Monkey (*Macaca mulatta*) LC
Presence and Distribution: Rhesus Monkey (Macaque) are abundant in the project area, particularly in the vicinity of villages where they scavenge for food waste.
Mitigation Approach: Rhesus Monkey frequently occur along roadsides where they beg for food from passing vehicles, and have adapted to avoid injury from traffic. Increased traffic along the road once construction is completed is likely to attract monkeys to the roadside and there is little mitigation available to prevent that. Crossing facilities are therefore not required for these monkeys.
Priority Status: These monkeys are abundant, not threatened and a low priority species for the project.

Gray Langur (Semnopithecus entellus) LC
Presence and Distribution: Gray Langur were confirmed by communities to be present in forest habitats and responses suggest these monkeys are present throughout the project area, in natural forest habitat and coffee plantation forests. They are described as mainly terrestrial, folivorous (specialized in eating leaves), and diurnal occurring in a wide variety of habitats, including close to human habitations (Molur et al. 2003).
Mitigation Approach: Monkeys do not enter in burrows and Langur are therefore unlikely to use underpass facilities, however installation of canopy bridges proposed for pangolin will facilitate the movement of Gray Langur across the road.
Priority Status: This species is not threatened but populations are declining (IUCN Red List) and the species is listed as a moderate priority for the project.

Grey Slender Loris (*Loris lydekkerianus*) NT
There was no evidence that Loris are present, however this is a highly elusive animal that is difficult to detect. Mitigation is proposed for other canopy-dwelling species that would serve Slender Loris should they be present in the forest habitats.

4.4.3.8 LESSER MAMMALS

Indian Pangolin (*Manis crassicaudata*) EN
Presence and Distribution: Indian Pangolin were recognized by many community members and sufficient evidence of their presence was provided. Community members in two villages explained that the Forest Department actively combats poaching and illegal trade in this species, which occurs in the project area Communities stated this pangolin is restricted to the natural forest habitat in Package I. Indian Pangolin are described as mainly ground-dwelling, but is arboreal and a good climber using its prehensile tail and claws to climb trees (Heath 1995).
Mitigation Approach: Indian Pangolin live in burrows and will therefore readily enter into confined spaces such as pipe culverts. They will also move through the tree canopy and will benefit from installation of canopy bridges between large trees in the natural forest habitat.
Priority Status: Indian Pangolin are classified on the IUCN Red List as Endangered and are therefore considered a high priority species for the project.

Giant Tree Squirrel *(Ratufa indica)* LC

Presence and Distribution: Every community consulted confirmed the presence of Giant Tree Squirrel reflecting its abundance and also its distinctive appearance. Some members explained that this squirrel has been kept as a pet but stated the squirrel is restricted to forest habitats, which aligns with ecological description of the species on the IUCN Red List.
Mitigation Approach: This large squirrel is arboreal and is expected to benefit from the recommendation to install canopy bridges in the natural forest habitat proposed for Indian Pangolin.
Priority Status: Giant tree squirrel is not threatened but included as a moderate priority species.

House Shrew (*Suncus murinus*) LC; Indian Hare (*Lepus nigricollis*) LC; Five-striped Palm Squirrel (*Funambulus pennantii*) LC

These lesser species are widespread in the project area, frequently associated with settlements, not threatened and are addressed as low priority species. No mitigation is proposed for these species.

4.4.3.9 SUMMARY OF PRIORITY GROUPS AND MITIGATION APPROACH

Table 4-23 presents a summary of the species priority classifications, threatened status and results of community engagements regarding occurrence and habitat preferences. Mitigation approach is presented to align to the extent possible with the Eco-friendly guidelines for linear infrastructure (Wildlife Institute of India, 2016).

Table 4-23: Summary of species priority classifications, threatened status and results of community engagements

Priority	English Name	Status	Occurrence	Habitat	Mitigation Approach
Higher Priority	Gaur (Bison)	VU	Present	Lowlands Forest	Bridge available, reflectors, signage
	Sloth Bear	VU	Scarce	Lowlands Forest	Expand width of one box Culvert
	Indian Pangolin	EN	Present	Lowlands Forest	Canopy Bridges, Box Culverts
Moderate Priority	Grey Wolf	LC	Present	Lowlands	Box Culverts available
	Golden Jackal	LC	Present	General	
	Four-horn. Antelope	VU	Present	Forest	
	Barking Deer	LC	Present	Forest	
	Mouse Deer	LC	Present	Forest (Upland)	
	Fishing Cat	VU	Present	Streams, wetlands	Box/Pipe Culverts available
	Gray Langur	LC	Present	Forest	Canopy Bridge proposed for Pangolin
	Palm Civet	LC	Uncertain	Forest	
	Giant Squirrel	LC	Present	Forest	
Low Priority	Golden Jackal	LC	Present	General	Box Culverts available
	Bengal Fox	LC	Present	General (Upland)	
	Jungle Cat	LC	Present	General	
	Chital	LC	Scarce	Lowlands Forest	
	Wild Boar	LC	Present	General	

Priority	English Name	Status	Occurrence	Habitat	Mitigation Approach
	Rhesus Monkey	LC	Present	General	
	Palm Squirrel	LC	Present	General	
	Grey Mongoose	LC	Present	Forest (Upland)	
	Ruddy Mongoose	LC	Present	General	Box/Pipe Culverts available
	House Shrew	LC	Present	General	
	Indian Hare	LC	Present	General	
Cannot Mitigate	Tiger	EN	Unpredictable	Forest	
	Leopard	VU	Unpredictable	Forest	
	Rusty-spot. Cat	NT	Unlikely	Forest	Not mitigated
	Slender Loris	NT	Unlikely	Forest	

4.4.3.10 ASSESSMENT OF THE CURRENT ROAD DESIGN FOR WILDLIFE CROSSINGS

The existing road design includes 16 minor bridges within Packages I and II, of which 13 minor bridges will have a ground clearance exceeding 3 meters. One bridge is located entirely within natural habitat near Katrygadda at chainage 151+200. This bridge has a limited clearance of 3 meters and 18 meter width, which will serve as a useful underpass facility for most wildlife with the exception of the larger species.

A total of 142 box culverts are included in the design of which 73 box culverts have a depth of 3 meters or greater. All box culverts are designed with a 2 meter width which is narrow and creates a tunnelling effect. Wildlife that does not readily enter confined spaces such as deer and primates may be reluctant to use these facilities. One box culvert (chainage 150+700) is therefore proposed to be widened to double its proposed width (to 4 meters wide) to improve its capacity to accommodate Sloth Bear and possibly Gaur.

Seventy pipe culverts are included in the design of which the vast majority have a 1.2 meter diameter. These pipe culverts may be used by lesser species such as mongoose and wild boar which will not hesitate to enter confined spaces.

Natural forest occurs on steep slopes and metal beam crash barriers are planned to be installed extensively throughout this habitat (between chainages 129+000 to 131+900 and 150+300 to 161+800). The Wildlife densities are low and installation of fencing is not justified. Wildlife occurs primarily on the steep mountain slope where natural forest remains. The road design in this area will be cut against the steep slope. The vertical upslope on roadside will act as a deterrent to wildlife movement, and crash barriers on the downslope (For road safety purpose) will similarly deter wildlife movement, therefore no fencing or other barriers are proposed.

Effectiveness of the bridges, culverts and crash barriers can be improved through installing reflectors at regular intervals within the natural forest, in a manner that reflects light from approaching vehicles into the surrounding habitat. This will cause animals in the vicinity to move away as vehicles approach during hours of darkness. Signage is also proposed where the road enters natural forest to warn raod users of the presence of large wildlife and the risk of traffic accident, particulalrly during hours of darkness.

The natural forest supports a diversity of arboreal species that will benefit from canopy bridges located installed between large trees on each side of the road. These are low cost structures that can be installed

once construction work is complete. MoRTH have installed canopy bridges in other road projects and are requested to use that expertise for the installation of canopy bridges in Package I.

Recommendations for improved wildlife crossings are provided as mitigation in the EMP section of this EIA.

4.5 SOCIO-ECONOMIC ENVIRONMENT

With the geographical area of 1,62,760 sq km Andhra Pradesh ranks as the 8th largest state in the country. Situated in a tropical region, the state has the 2nd longest coastline in the country with a length of 974 km. Andhra Pradesh is the tenth largest state in the Country, in terms of population. As per 2011 Census, the State accounts for 4.10% of the total population of the country.

The decadal growth of population rose from 18.88 % during 1961-71 to 21.13 % during 1981-91. Subsequently a significant decline was observed in the rate of growth of population and decline is even more prominent at 9.21 % during 2001-11, lower than the all-India's growth rate of 17.72 %.

The density of population for Andhra Pradesh is 304 persons per square kilometer, as against 368 persons per square kilometer at all India level in 2011. The sex ratio in the state was up from 983 in 2001 to 997 in 2011 and is higher than all India figures of 943 in 2011. The literacy rate of the State is 67.35 % in 2011 as against 62.07 %in 2001. The literacy rate of the State is lower than the all India literacy rate at 72.98% %. Literacy in Andhra Pradesh increased over 37 percentage points from 29.94 % in 1981 to 67.35 % in 2011. Female literacy rate has gone up from 52.72 % in 2001 to 59.96 % in 2011.

Urbanization has been regarded as an important component for growth realization. The percentage of urban population to the total population in the State is 29.47 % in 2011 as compared to 24.13 % in 2001.

4.5.1 DEMOGRAPHIC FEATURES OF THE PROJECT DISTRICT

Demographic profile has an important bearing on the development process. According to the 2011 census, the total population of Visakhapatnam district is around 42.90 lakhs.

The proportion of urban population is 47.45% in Visakhapatnam district. The number of households in Visakhapatnam district is 1097042 of which around 52.82 % are in rural area and the remaining 47.18 % are in urban areas. The average household size is 3.91 in Visakhapatnam district. The sex ratio is 1006 in total. The proportion of SC population is around 7.68 %. The ST population in Visakhapatnam district is around 14.42 %. The basic demographic details are presented in below Table 4-21.

Table 4-24: Demographic profile of Visakhapatnam District

Description	Total	Rural	Urban
No.of Households	1097042	579417	517625
Persons	4290589	22544667	2035922
Male	2138910	1113234	1025676
Female	2151679	1141433	1010246
Sex Ratio (Females per 1000 Males)	1006	1025	985
Proportion of SC Population (%)	7.68	6.74	8.72
Proportion of ST Population (%)	14.42	25.72	1.89

Source : Primary Census Abstract, Census of India, 2011

Literacy

The literacy rate of Visakhapatnam district as per 2011 census is around 59.86 %. It is observed that the literacy rate of male in both rural and urban areas are higher as compared to female literacy rate in the

district. A variation across the rural and urban areas and the gender gap in literacy for the project district is presented in the
Table 4-22.

Table 4-25: Gender Wise Literacy Rate in Visakhapatnam District

Literacy Rate %	Total	Rural	Urban
Persons	59.86	47.55	73.48
Male	66.52	55.55	78.43
Female	53.23	39.75	68.46
Gender gap in literacy	13.29	15.80	9.98

Source: Primary abstract census, 2011

Work Participation

The occupational classification as per 2011 Census shows that the percent total workers in Visakhapatnam district account for 44.05 % of total population of the district. The proportion of main workers to total population in Visakhapatnam district is around 34.52 %. Out of the total main workers, male main workers accounted for 49.08 % and female main workers are around 20.05 %. Of the remaining total population, around 9.53 % are marginal workers. It can be seen from the below table that, in the project district that nearly 55.95 % of the total population are non-workers. The details across gender are presented in the following Table 4-24.

Table 4-26: Percentage of Workers and Non-Workers in Visakhapatnam District of Andhra Pradesh (w.r.t. Total Population)

Description	Total	Male	Female
Work Participation Rate %	44.05	57.93	30.25
Proportion of Main Workers (%)	34.52	49.08	20.05
Proportion of Marginal Workers (%)	9.53	8.85	10.20
Proportion of Non workers	55.95	42.07	69.75

Source: Primary Census Abstract, Census of India, 2011

Occupation Profile

The occupation classification in Visakhapatnam district shows that, out of the total main workers, cultivators comprising (19.23 %), Agricultural Labourers (25.42 %), Household Industries workers (2.55 %) and other workers (52.80 %). Occupation profile of Visakhapatnam District is given in Table 4.24.

Table 4-27: Occupation Profile of Visakhapatnam District of Andhra Pradesh (w.r.t. Total Main Workers)

Occupation	Total	Male	Female
Cultivators %	19.23	17.33	23.84
Agricultural labourers%	25.42	20.11	38.36
Household Industries%	2.55	2.28	3.20
Other workers%	52.80	60.28	34.60

4.5.2 DEMOGRAPHIC PROFILE OF SETTLEMENT ALONG THE PROJECT ROAD

Demographic profile of settlement along the project road are given in Table 4.25 as per census records 2011. Demographic Profile of Settlements Along the Project Road is in Annex

The project influence area covers three mandals of which one mandal Golugonda falls in Narsipatnam division and while Koyyur and G.K. Veedhi pertains to Paderu division of Visakhapatnam district. There are 13 mandals under the administration of Narsipatnam revenue division. Paderu is the headquarters of the Mandal and the division is situated about 110 Kms from Visakhapatnam. Paderu is a broad picturesque and rich valley with an altitude of over 900 District Survey Report – 2018 DMG, GoAP 26 meters above the sea level. The entire Paderu is inhabited by schedule tribes with different sects and is surrounded by a good number of hill streams. The presiding deity here is Modakondamma and important religious observation celebrated every year attracts a large number of people.

Koyyuru Mandal is having the largest rural area of 874.20 Sq., Sri Raja Sagi Suryanarayana Raju Thandava Reservoir Project is constructed across River Thandava (Bodderu) during 1965 to 1975 with Latitude 17°-45'-50'' North & Longitude 82°-15'-20'' East to provide Irrigation facilities to an ayacut of 51465 Acres. Out of which 32689 Acres covered in 3 mandals namely Nathavaram, Narsipatnam & Kotauratla in Visakhapatnam District and 18776 Acres in 3 mandals namely Kotananduru, Tuni & Rowthulapudi of East Godavari Districts. The project is Situated near G.K.Gudem (v) near Golugonda (M) of Visakhapatnam District and is about 28 Km from Narsipatnam Municipality. The details of the Mandals are presented in below **Table 4-25.**

Table 4-285: Mandals at a Glance

S: No	Indicators	Profile of the Mandals					
		Golugonda	Koyyur	G.K. Veedi	Chintapally	G Madugala	Paderu
1	Latitude	17°41'42.50"N	17° 40' 0.12" N	17° 52' 0.12" N	17° - 52' – 11" N	18.0180° N	18.0806° N
2	Longitude	82°33'52.23"E	82° 13' 59.88" E	82° 12' 0" E	82° -21' – 04" E	82.4983° E	82.6645° E
3	Area (sq. km)	232.47	1089.2	1126.84	674	556	454
4	Households (No.)	14298	13570	14944	17142	13119	14689
5	Population (No.)	52852	50639	63174	71640	53884	58983
6	Male (No &%)	26353	25047	30486	35217 (49.15)	26966 (50.04)	28644 (48.56)
		-49.86	-49.46	-48.25			
7	Female (No &%)	26499	25592	32688	36243 (50.59)	26918 (49.95)	30339 (51.43)
		-50.14	-50.53	-51.74			
8	SC (%)	10.96	2	0.9	0.83	0.17	0.95
9	ST (%)	14.15	81.3	90	90.31	92.73	82.55
10	Population density	227	81	67	106	97	130
	(per sq. km.)						
11	Sex Ratio	1006	1022	1072	1034	998	1059
	(femalesper 1000 males)						
	Average Literacy Rate	49.18	48.83	43.08	42.63	38.52	60.01
12	Male Literacy (%)	57.13	58	59	53.72	50.03	71.03
	Female Literacy(%)	41.28	42	41.31	31.94	26.99	49.73
13	Main Workers	28,391	14859	29610	41051 (43.34)	25740 (47.77)	22662 (38.42)
	(No &%)		-29.34	-46.87			
	(Male) – (No &%	15,821 (55)	NA	NA	NA	NA	NA

S: No	Indicators		Profile of the Mandals					
			Golugonda	Koyyur	G.K. Veedi	Chintapally	G Madugala	Paderu
	Female) (No&%)		12,570 (45)	NA	NA	NA	NA	NA
20	Main	Cultivation (No &%)	3,416	4669 (9.22)	19054 (30.16)	16262 (22.70)	21054 (39.07)	13755 (23.32)
	Workers	Agriculture Labour – (No&%)	18,478 (34.96)	16430 (32.4)	12246 (19.38)	20938 (29.23)	8816 (16.36)	11552 (19.59)
	(%)	HH Industries – (No &%)	758 (1.43)	300 (0.59)	823 (1.30)	1362	855	932
						-1.9	-1.59	-1.58
21	Other than HH Industries (No &%)		5389(10.29)	8154 (16.19)	4727 (7.48)	4088	3180 (5.90)	5222
						-5.71		-8.85
22	Marginal workers (No &%)		7496 (14.18)	14694 (29.02)	7240 (11.41)	11599 (16.19)	8165 (15.15)	8797 (14.91)
23	Non workers(No &%)		24461 (46.28)	21080 (41.64)	26324 (41.60)	28990 (40.47)	19979 (37.08)	27522 (46.66)
24	Total workers(No)		23391	29553	33705	42650	33905	31461

Source: Hand book of statistics, Vishakhapatnam, 2016

4.6 MANDAL PROFILES

Golugonda

Golugonda is a Mandal located in Visakhapatnam district of Andhra Pradesh. It is one of 43 Mandals of Visakhapatnam district. There are 36 villages and 0 towns in Golugonda Mandal. Golugonda is surrounded by Nathavaram Mandal towards South, Narsipatnam Mandal towards East, Rolugunta Mandal towards East, Kotauratla Mandal towards East .According to 2011 census, Total Golugonda population is 52,852 people are living in this Mandal, of which 26,353 are male and 26,499 are female. Expected **Population of Golugonda Mandal in 2020/2021** is between 51,266 and 65,536. Literate people are 25,993 out of 15,055 are male and 10,938 are female. Total workers are 28,391 depends on multi skills out of which 15,821 are men and 12,570 are women. Total 3,416 Cultivators are depended on agriculture farming out of 2,513 are cultivated by men and 903 are women. 12,973 people works in agricultural land as a labour in Golugonda, men are 7,379 and 5,594 are women.

The sex-ratio of Golugonda Mandal is around 1006 compared to 993 which is average of Andhra Pradesh state. The literacy rate of Golugonda Mandal is 49.18% out of which 57.13% males are literate and 41.28% females are literate. The total area of Golugonda is 232.47 sq.km with population density of 227 per sq.km.

There are 14.15% Scheduled Caste (SC) and 10.96% Scheduled Tribe (ST) of total population in Golugonda Mandal. The main crops grown are cotton, rice, maize etc.

Koyyuru

Koyyuru is a Mandal located in Visakhapatnam district of Andhra Pradesh. It is one of 43 Mandals of Visakhapatnam district. There are 162 villages and 0 towns in Koyyuru Mandal.

As per the Census India 2011, Koyyuru Mandal has 13570 households, population of 50639 of which 25047 are males and 25592 are females. The sex-ratio of Koyyuru Mandal is around 1022 compared to 993 which is average of Andhra Pradesh state. The literacy rate of Koyyuru Mandal is 43.42% out of which 50.62% males are literate and 36.37% females are literate. The total area of Koyyuru is 1051.27 sq.km with population density of 48 per sq.km.

There are 1.08% Scheduled Caste (SC) and 81.39% Scheduled Tribe (ST) of total population in Koyyuru Mandal. Koyyuru consist of 241 Villages and 33 Panchayats. Gollivalasa is the smallest Village and Adakula is the biggest Village. It is in the 24 m elevation (altitude). PapiKondalu (Papi Hills), Kakinada, Rajahmundry , Ananthagiri , Araku Valley (ArakuLoya).

Gudem Kotha Veedhi (GK Veedhi)

Gudem Kotha Veedhi is a Mandal in Visakhapatanam District. Nearby cities to GK Veedhi are Narsipatnam City, Malkangiri City, Tuni City and Pithapuram City. The mandal consists of 299 Villages and 16 Panchayats . Kakulagedda is the smallest Village and Rinthada is the biggest Village. It is situated at 24m elevation (altitude).

Ananthagiri , Araku Valley (Araku Loya) , PapiKondalu (Papi Hills) , Kakinada , Visakhapatnam (Vizag) are the nearby important tourist destinations. Total population of Gudem Kotha Veedhi Mandal is 56,150 living in 12,275 Houses, which are spread across total 299 villages and 16 panchayats. Males are 27,889 and Females are 28,261 Total 4,746 persons lives in town and 51,404 lives in Rural.

Both the mandals viz. Koyyur and GK Veedhi constitute 80% of tribal households in Paderu division region earn about half of their incomes from agriculture which is facing a number of challenges. The important among these are:

- High incidence of land alienation,
- Poor access to institutional credit,
- Lower levels of investment,
- Absence of efficient market environment for competitive price discovery, and
- Lack of an effective extension system.

Innovative strategies are needed to gain leverage from the organic trait of their farm produce. Similarly, proactive initiatives are required to build the farmers' institutions and pool their collective strength so that they can deal with markets, institutions, and development functionaries

Chintapalli:

Golugonda is a Mandal located in Visakhapatnam district of Andhra Pradesh. It is one of 43 Mandals of Visakhapatnam district. There are 244 villages and 1 towns in Chintapalli Mandal. It has an average elevation of 839 meters (2755 feet). It is 132 km from Visakhapatnam and 19 km from Andhra's "Kashmir", Lammasingi. The highest point in Eastern Ghats is also in Chintapalli. The total area of Chintapalli mandal is 674 sq.km with population density of 106 per sq.km. According to 2011 census, Total Chintapalli population is 71,640 people, of which 35,217 are male and 36,243 are female. Literate people are 26,411, of which 16,334 are male and 10,077 are female. Total workers are 42,650 depending on multi skills.

As per the Census India 2011, Chintapalli Mandal has 17142 households. The sex-ratio of Chintapalli Mandal is around 1034 compared to 993 which is average of Andhra Pradesh state. The literacy rate of Chintapalli Mandal is 42.63% out of which 53.72% males are literate and 31.94% females are literate. There are 0.83% Scheduled Caste (SC) and 90.31% Scheduled Tribe (ST) of total population in Chintapalli Mandal. The main crops grown are Black pepper, coffee and rajma etc.

G. Madugala:

G. Madugala is a Mandal located in Visakhapatnam district of Andhra Pradesh. It is one of 43 Mandals of Visakhapatnam district. There are 292 villages in G. Madugala Mandal. It has an average elevation of 1097 metres (3602 ft). The total area of G. Madugala mandal is 556 sq.km with population density of 97 per sq.km. According to 2011 census, Total population of G. Madugala is 53884 people, of which 26966 are male and 26,918 are female. Literate people are 17960, of which 11,672 are male and 6288 are female. Total workers are 33905 in mandal.

As per the Census India 2011, G. Madugala Mandal has 13119 households. The sex-ratio of G. Madugala Mandal is around 998 compared to 993 which is average of Andhra Pradesh state. The literacy rate of G. Madugala Mandal is 38.52% out of which 50.03% males are literate and 26.99% females are literate. There are 0.17% Scheduled Caste (SC) and 92.73% Scheduled Tribe (ST) of total population in G. Madugala Mandal. The main crops grown are turmeric, pipla, coffee, pepper and cashew etc.

Paderu:

Paderu is a Mandal located in Visakhapatnam district of Andhra Pradesh. It is one of 43 Mandals of Visakhapatnam district. There are 198 inhabited villages ans 270 hamlets in Paderu Mandal. The total area of G. Madugala mandal is 454 sq.km with population density of 130 per sq.km. According to 2011 census, Total population of Paderu is 58983 people, of which 28644 are male and 30,339 are female. Literate people are 31274, of which 17,867 are male and 13407 are female. Total workers are 31461 in mandal. 31274 17867 13407

As per the Census India 2011, Paderu Mandal has 14689 households. The sex-ratio of Mandal is around 1059 compared to 993 which is average of Andhra Pradesh state. The literacy rate of Paderu Mandal is 60.01% out of which 71.03% males are literate and 49.73% females are literate.

There are 0.95% Scheduled Caste (SC) and 82.55% Scheduled Tribe (ST) of total population in Paderu Mandal. The main crops grown are Paddy, Bengal gram, Green gram, Korra and Black gram etc.

4.7 TOURISM

As per tourist map of Andhra Pradesh, Lammasingi, Borra caves and Araku valley are the tourist spots near to Paderu. Lammasingi is 35 km distance from Paderu. Araku valley is 45 km and Borra caves are 81 kms . The Tourist map of Andhra Pradesh is shown in Figure 4-17.

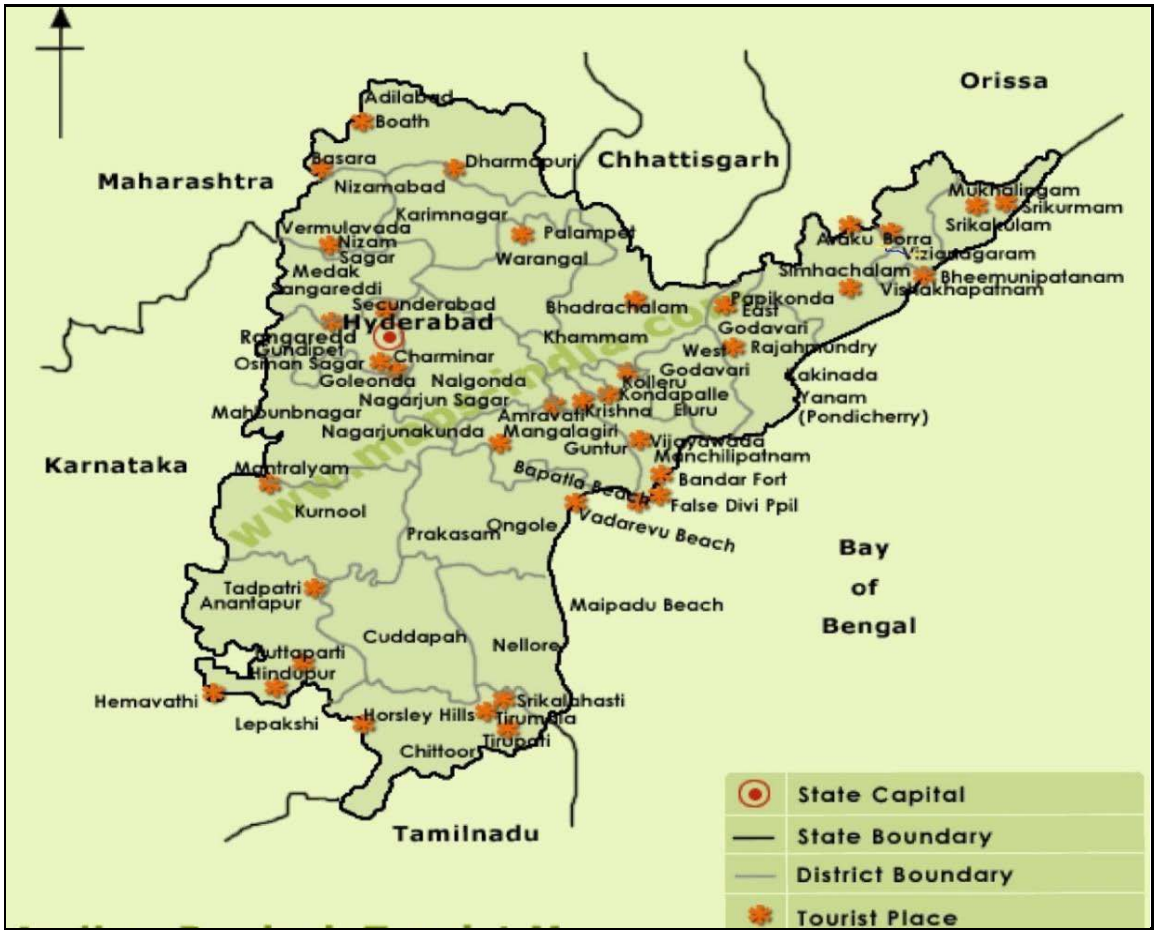


Figure 4-1: Tourist Map of Andhra Pradesh

4.8 INDUSTRIES

There are no specific industries along the project road.

4.9 ARCHAEOLOGICAL AND HISTORICAL MONUMENTS

The project road doesn't have any notified/protected archaeological or historical monument.

5 ANTICIPATED ENVIRONMENTAL IMPACTS

5.1 ENVIRONMENTAL IMPACTS & ISSUES

This section presents identification and evaluation of anticipated impacts during pre-construction, construction and operation phases of the upgradation to two lane with paved shoulders configuration of Koyyuru- Paderu Section of NH-516E in Andhra Pradesh. The planning of the proposed project intervention points towards the impacts in the pre-construction, the construction stages and the operation stages.

The subsequent sections dealwith the prediction of impacts due to the project on the physical, biological and socio & cultural environment. Table 5-1 and 5-2 present thegeneral environmental impacts expected due to the proposed up-gradationof the project road. Environmental impacts have been assessed based on the information collected from the project activities as per DPR, screening & scoping of environmental attributes, and baseline data collected duringthe EIA study.

The quantum of anticipated impacts on physical, biological and socio-economic environment has been discussed in detail in subsequent paragraphs.

Table 5-1 Physical and Biological Environment

Project Activity	Planning and Design phase	Pre-Con struction Phase		Construction Phase				Road operation
Environment Component Affected		Removal of Old Structures	Removal of trees and vegetation	Earth works including and borrow area	Laying of pavement	Vehicle & Equipment operation & maintenance	Asphalt & crusher plants	Vehicle operation
Air	Dust generation during dismantling	Reduced buffering of air pollution, Hotter, drier microclimate along the road	Dust generation	Asphalt odour and emissions	Dust, Pollution	Soot, Odour, gaseous Dust, Pollution	Odour / Smoke from Cooking of food	Dust, vehicular emissions
Land	Impact on productive land if land acquisition required	Generation of debris	Erosion and loss of top soil	Erosion and loss of top soil	Land contamination due to improper disposal of bitumen waste/ solid wastes	Contamination by fuel and lubricants and compaction	Contamination and compaction of soil at camp& Plants	Contamination from Wastes and sewage sewage disposal
Water	Impact on Water Sources	Siltation due to loose earth	Siltation due to loose earth	Alteration of drainage, Break in continuity of ditches Siltation, Stagnant water pools in quarries and borrow area.	Reduction of ground water recharge area	Contamination by fuel and lubricants	Contamination by asphalt leakage or fuel	Contamination from wastes and untreated

Project Activity	Planning and Design phase	Pre-Con struction Phase		Construction Phase				Road operation
Noise	Noise Pollution	High Noise due to machinery	Noise Pollution	Noise pollu-tion	Noise pollu-tion	Noise Pollution	--	Noise from traffic movement
Flora	Tree cutting	Loss of Biomass and vegetation cover due to Removal of vegetation	Lowered productivity loss of ground for vegetation	--		Lower productivity Use as fuel wood	Felling trees for fuel	Compensatory plantation and road side plantation

Table 5-2: Anticipated Impacts on Social and Cultural Environment

Project Activity	Planning and Design Phase	Pre-Construction Phase			Construction Phase					Operation	
										Direct	Indirect
Env. Compo-nent Affected	Design decisions & Implementati on policies	Land acquisitio n	Removal of Structures	Removal of trees & vegetatio n	Earth works including quarrying	Laying of Paveme nt	Vehicle & machine operation & maintenanc e	Asphalt and crusher plants	Labour Camps	Vehicle Operation	-
Agricultur al land	-	Change in land prices	Change in land economic value	Loss of standing crops	Loss of productiv e land	-	-	Dust on agricultural land reduction in productivit y	-	-	Conversio n of Agricul-tural Land
Buildings and built structures in ROW	-	-	Loss of structures, Debris generation,	-	Dust Depositio n on	-	Noise, vi-bration may cause dam-age to	Dust accu-mulation on building	-	Vibration and noise	Change in building use

Project Activity	Planning and Design Phase	Pre-Construction Phase			Construction Phase					Operation	
										Direct	Indirect
			Noise and Air pollution		structures		structures near to road	and structure			and charac-teristics
People and Commu-nity	Impact on near by communitty structure,	-	Impact on people and loss of livelihood	Loss of shade & communi ty tree.	Health hazard to people	Odour and dust	Noise and Air pollution and discomfort	Air and noise pollution and discomfort	Communi ty clashes with mi-grant labour	Risk of accident due to increase in speed on smooth carriagew ay	Induced pollution and increase in accident rate
Cultural Assets	-	Impact on access to cultural structure	Displaceme nt loss of structure from RoW	--.	--	-	--	Dust accumulati on	-	Damage from vibration & air pollution	-
Utilities and Amenities	-	-	Interruptio n in supply	-	-	-	Damage to utility and amenities	Dust accumulati on on water bodies	Pressure on existing amenities	-	Utilities and Amenitie s
Labour's Health & Safety	-	-	-	-	Stagnatio n of water and disease	Asphalt odour and dust	Accident and injuries to labour/publ ic	Impact on health due to inhale of dust	Health hazard from raw sewage disposal /waste	Road safety issues	-

During construction of the project, following environmental impacts are anticipated on topography and physiography:-

Minor changes are anticipated in existing profile of the land due to borrow pits and construction of re-alignments and improvement of sharp curb.

- **Disturbance on geological setting due to quarrying.**
- **Uncontrolled digging of borrow pits resulting in water accumulation & breeding of vector disease.**
- **Construction of embankments for realignments,**
- **Debris disposal,**
- **Construction of diversions roads for construction of bridge and culverts.**

Physiographic impacts could be due to the construction of the embankments of Bypass (at KD peta) and also dueto the realignments in the length of 16300m and improvement of sharp curves at various locations. The height and width of the embankment will be altered, when the road is widened and rehabilitated as per the new design for the project road. In most of the stretch along the project road, alignment will stick to the existing ROW without any noticeable changes.

Borrow earth will be required in the project road for filling and will be obtained from several borrow areas to be opened in the nearby areas or from the existing approved borrowing areas. Except the construction of embankments, there would not be any other impacts to geomorphology of the area during construction stage.

Most of the excavated materials from existing roads will be left reused as construction materials. If not used, contractor may dispose off this in the nearby areas causing untidiness near disposal areas. Therefore, this is seen as a potential impact. It may increase soil erosion and could generate considerable impacts on natural drainage courses, and siltation to runoff during rains.

Likely impact on the geological resources will occur from the extraction of construction materials like borrow of earth, granular sub-base and aggregate for base courses, culverts and bridges.

5.2 OPERATIONAL PHASE

Upgradation and widening of the project road will not cause any topographic, physiographic and geological changes during operational stage.

5.3 IMPACT ON SEISMOLOGICAL CHARACTERISTICS

The project road is located in seismic zone II as per BIS classification with low seismic risk. All cross-drainage structures and bridges on the project roads need to consider the seismic coefficients with regards to the seismic energy propagation along the fragile geological/lithological strata. The construction and operation phase of the project road are not expected to add the seismicity issues due to the proposed project road.

5.4 IMPACT ON SOIL

Construction Phase

Soil Erosion: Erosion of top-soil can be considered as moderate, direct and have a long-term negative impact resulting from the construction of existing road along with realignments and curve improvements for Koyyuru – Paderu NH-516E. The potential of soil erosion is pervasive during the construction stage, especially in realignment and earth work on the existing alignment. Starting with clearing and grubbing,

vegetation will be stripped away, exposing raw soil. Earth works and embankment will also prone to erosion during rains. The protection of earthern slopes shall be undertaken with vegetative turfing, stone pitching, geo-fibre with grass seeding. In the ghat sections, chute drains shall be provided for safe passage of rainwater and to prevent the soil erosion.

Road Slopes and Spoils: Erosion problems may occur on newly constructed slopes and earth fills in realignments depending on soil type, angle of slope, height of slope and climatic factors like wind (direction, speed and frequency) and rain (intensity and duration). Soil erosion will add siltation to the runoff during the monsoon season. Construction work shall be planned in such a way that the earthwork activities are completed before onset of monsoon and suitable erosion protection measures for embankments shall be completed.

Construction of New Bridges and Culverts: Along with construction of new structures, reconstruction/widening of bridges and culverts is also planned. 1 Major bridge, 12 minor bridges, 2 pipe culverts and 111 box culverts are proposed to be newly constructed. Whereas, 8 existing minor bridges, 121 existing pipe culverts are proposed to be reconstructed and 9 existing minor bridges and 86 slab culverts are proposed to be widened. Construction of bridges involves excavation of natural water channels bed and banks for the construction of the foundation and piers. If the residual spoil is not properly disposed of, increased sedimentation in downstream of the bridge may take place during the monsoon. Also, the bridge-end fills require armoring to ensure minimum gullying and slumping. Adequacy of cross-drainage structures shall be ensured during design review.

During the construction period, some amount of drainage alteration and downstream erosion/siltation is anticipated. Some of these alterations may be because of construction of temporary traffic detours/diversion. Except for these temporary works, in almost all cases there should be an improvement in the drainage characteristics of the surrounding area due to improved design and added culvert/ditch capacity. Changes in the drainage pattern due to the raising of the road profile has not been discussed in specific cases, as the likely impact will not adverse and does not warrant mitigation as the road design itself takes care of cross drainage.

Quarries and Borrow Areas: The excavation of quarries and borrow pits for obtaining aggregate materials and soil for road construction can cause, and indirect long direct -term major adverse impacts on the environment. While loss of productive soil is the most direct negative impact from borrow areas, other significant indirect negative impacts can also occur. Since most of the construction materials would be available from existing quarries nearby, relatively few new borrow areas may be required. Further, the reuse of construction & demolition waste will be envisaged during construction stage to reduce the use of natural resources for the Project road. One of the long-term residual adverse impacts of borrow pits not reclaimed, is the spread of mosquitos. Mosquitoes breeding and multiplying in stagnant water that collects in these pits can affect human health at villages located in close vicinity.

Generation of Debris: The major source of debris generation is dismantling of existing cross drainage structures, scarifying of bitumen from carriageway and removal of existing road for upgradation. The reuse of debris generated will be an asset during road construction.

5.5 WATER ENVIRONMENT

5.5.1 WATER RESOURCE – IMPACTS

Surface Water –Impacts

The project roads are crossing natural streams at 36 locations, which remain dry in non-rainy days. There is no perennial river crossed by the project roads. As per the preliminary design, there is no encroachment on water bodies. Thus, no impact is envisaged.

Construction Phase

Depending on the source of water there could be minor depletion of water sources due to the construction water requirements.

Operation Phase

During operation phase, water will be used primarily for maintenance of plantations and domestic use, hence no impact is anticipated on surface water resources.

B. Ground Water – Impacts

Construction Phase

Along the project road, ground water resources are available and water will be exploited from tube wells where surface water resources are not available. Estimated water requirement will be 30 to 40 kl per day per kilometer. Therefore, the eventual impact of the proposed upgradation of the project road will be negated to a considerable extent. Contractor shall ensure that the water for construction purpose permit shall be obtained from the State Ground Water Board/Central Ground Water Board.

C. Specific impacts of the proposed construction works on the water quality of Sources :

The major nalla is crossing the project road at km 139+480, km 147+970 and km 244+600. Besides, large number of streams and road side tanks are present along the project road. Only seasonal flow is observed in all the water bodies.
The construction camp discharges may cause degradation of water quality which shall be possible due to accidental discharges into water-courses from drainage of workers camps and from spillages from vehicle parking and/or fuel and lubricant storage areas.

Operation Phase

During the operation phase, ground water resources will be having no significant impact during operation phase. Further, water harvesting will be provided along the project road in unpopulated areas for recharging the ground water table.

5.5.2 WATER QUALITY – IMPACTS

Impact on Surface Water Quality

Degradation of surface water quality due to sediment transport with runoff through erosion of soil and earth may occur from activities like removal of trees, clearing and grubbing, removal of grass cover, excavation, stock piling of materials as part of the pre-construction and construction activities. The soil type present along the project corridor consists of the loamy/silty soil, which are prone to erosion.

The impacts due to increased sediment laden run-off will make the water more turbid. This is a significant negative impact on the water bodies/flowing streams. Heavier sediment may smother the algae growing in the lower strata and could completely alter the nature of the watercourse. Excessive sediment loads may also mean disruption to areas of fish breeding/aquatic life.

Deteoration of Surface Water – The deteoration of the surface water quality can occur from pavement construction works, bridges construction works, construction plants, machinery and accommodations of workers. The sources of water pollution from the construction activities are as follows:

- **Water flow from scarified bitumen material**
- **Rain water flow from muck disposal area.**
- **Oil spills from the maintenance of the machinery and operation of the diesel generator sets on site**
- **Oil spill from diesel storage and parking places**
- **Operation of the emulsion sprayer and laying of hot bituminous mix**
- **Discharge of sewage and waste from labour and plants**
- **Storage and stock yards of bitumen and emulsion.**

Degradation of water quality is also possible due to accidental discharges into water-courses from drainage of workers camps and from spillages from vehicle parking and/or fuel and lubricant storage areas.

B. Impact on Groundwater Quality

- **No impact is anticipated on ground water during pre-construction phase.**

Construction Phase

During construction phase, ground water quality can be affected due to following reason:

- **Spillage of diesel, lube oil and used oil could lead to ground water pollution in long term and can affect ground water quality.**

- **Leached water from scarified bituminous waste materials entering into ground.**

- **Disposal of solid wastes used POL wastes, oil contained cotton wastes in non-environmentally sound manner and leaching to ground water.**

Operational Stage

- **During the normal operation phase, no impact is anticipated on the ground water quality of the area.**

5.6 IMPACT ON AIR ENVIRONMENT

Construction Phase

During construction phase, there will be two main sources of air emissions i.e. mobile sources and fixed sources. Mobile sources are mostly vehicles involve in construction activities while emissions from fixed sources include diesel generator set, construction equipment and excavation/grading activities those produce dust and gaseous emissions.
Certain amount of dust and gaseous emissions will be generated during the construction phase from excavation machines and road construction machines. Pollutants of primary concern include Particulate Matter ($PM_{2.5}$) and Particulate Matter (PM_{10}). However, suspended dust particles may be coarse and will be settled within a short distance from construction area. Therefore, anticipated impact on ambient air quality will be temporary and restricted within the closed vicinity of the construction activities along the project road only.

Considerable amount of emissions of carbon monoxide (CO), unburned hydrocarbon, sulfur di-oxide, particulate matters, nitrogen di-oxide (NO_2), etc, will be generated from the hot mix plant and may cause air pollution problem in nearby areas.

Summarily, generation of dust is likely due to:

- **Site clearance and use of construction vehicles and machineries**
- **Transport of raw materials, borrow and quarry materials to construction sites**
- **Earthworks**
- **Stone crushing operations at the crushers**
- **Handling and storage of aggregates at the asphalt plants**
- **Concrete batching plants**
- **Asphalt mixing plants due to mixing of aggregates with bitumen.**

Generation of dust is a critical issue and is likely to have adverse impact on vegetation in surrounding areas. Generation of exhaust gases is likely due to movement of heavy machinery for clearance of the RoW for construction. High concentration of HC and Nox are likely from hot mix plant operations. Toxic gases are released through the heating process during bitumen production. Although the impact will be much localized, it can be dispersed downwind depending on the wind speeds.

Air Pollution Modelling for Construction Phase

During the construction phase, the activities related to earthwork/rock excavation, borrow area operations, transport of material, storage and handling of construction materials, quarrying and/or stone crushing operations, movement of construction vehicles on unpaved roads, Hot-mix plant, handling of cement in batching plants, among others would contribute to the increased dust levels in terms of PM10, PM2.5, and other air pollutants like SO2, and Nox, and carbon monoxide levels.

For prediction of maximum Ground Level Concentrations (GLC's), the air dispersion modeling software (AERMOD version 9.9.5) was used. AERMOD is steady state advanced Gaussian plume model that simulates air quality and deposition fields upto 50 km radius. AERMOD is approved by USEPA and is widely used software. It is an advanced version of Industrial Source Complex (ISCST3) model, utilizes similar input and output structure to ISCST3 sharing many of the same features, as well as offering additional features. The model is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases and multiple sources including point, area, flare, line and volume sources. Dispersion modeling using AERMOD requires hourly meteorological data.

Site specific metrological data recorded during 1st December 2020 to 28th February 2021 at site is used for executing modeling studies. The site specific meteorological data is processed using AERMET processor.For predicting the incremental Ground Level Concentration, projected traffic for the year 2048 has been considered for worst case scenario.

Table 5-3: Table Showing Vehicles/day for variuos Scenarios

Year (Vehicles/day)	Scenario – I (Vehicles/day)	Scenario – II (Vehicles/day)	Scenario – III (Vehicles/day)
2016	1304	1304	1304
2023	1928	1972	2023
2028	2542	2652	2787
2033	3257	3470	3726
2038	4064	4418	4874
2043	4955	5418	6226
2048	6038	6622	7934

The maximum concentration of PM10 predicted is 4.75 µg/m3. PM10 values are varying between 0.60 to 4.75 µg/m3 in the surrounding areas of the road project stretch. These incremental values when considered in conjunction with the monitored baseline values will be within the National Ambient Air Quality Standard (NAAQS) of 100 µg/m3 for 24 hourly PM10 concentration, hence predicted values are well below the prescribed standard limit on the road project stretch.

The maximum concentration of PM2.5 predicted is 0.172 µg/m3. PM2.5 values are varying between 0.1 to 0.172 µg/m3 in the surrounding areas of the road project stretch. These incremental values when considered in conjunction with the monitored baseline values will be within the National Ambient Air Quality Standard (NAAQS) of 60 µg/m3 for 24 hourly PM2.5 concentration, predicted values are well below the prescribed standard limit on the road project stretch.

The predicted 1st high 8 Hour values of CO are varying from place to place in Koyyuru –Paderu road. The maximum concentration of CO predicted is 30.9 µg/m3 (0.309 mg/m3). CO values are varying between 9 µg/m3 to 30.9µg/m3 (0.009 mg/m3 to 0. 309mg/m3) in the surrounding areas of proposed road stretch. These incremental values when considered in conjunction with the monitored baseline values will be within the National Ambient Air Quality Standard (NAAQS) of 4 mg/m3 (4000 µg/m3) for 8 hourly CO concentration, predicted values are well below the prescribed standard limit on the road project stretch. The predictions for GLCs Nox 4.26 ug/m3 and predicted GLCs for HC is 1.31ug/m3.

The predicted concentrations of PM10, PM2.5, HC and Nox and CO are found to be well below the NAAQ standards at all the places. It is already suggested in EMP to go for avenue plantation on either side of the proposed project road and median plantation. This will further reduce the concentration of PM & CO.

In the existing scenario, due to lesser width and higher roughness, the average vehicle speed is low, which results in more exhaust gas emissions. In the post-project scenario, improved road conditions and congestion free traffic movement will reduce emissions.Furthermore, lower growth of traffic and better road conditions with improved average speed, which constitutes about 95% of the total project road length, will not have any significant increase in concentration of PM and CO even after 20 years of operation, subject to regular maintenance of the road condition and maintaining the average speed of traffic.However, in Koyyuru-Paderu road, the emissions are envisaged to increase due to increase in traffic density.

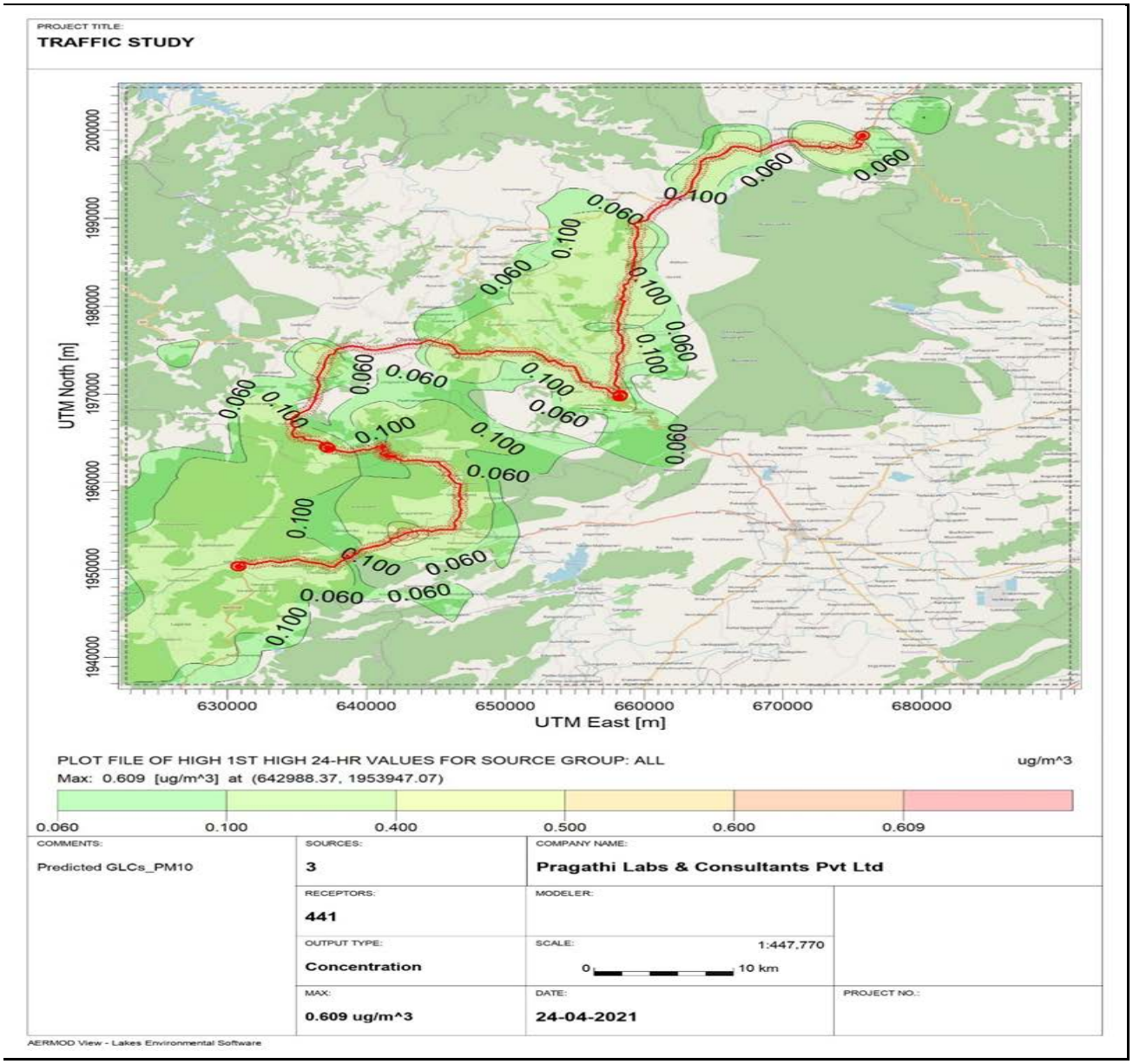


Figure 5-1:Map Showing PM10 Concentrations along Project Road

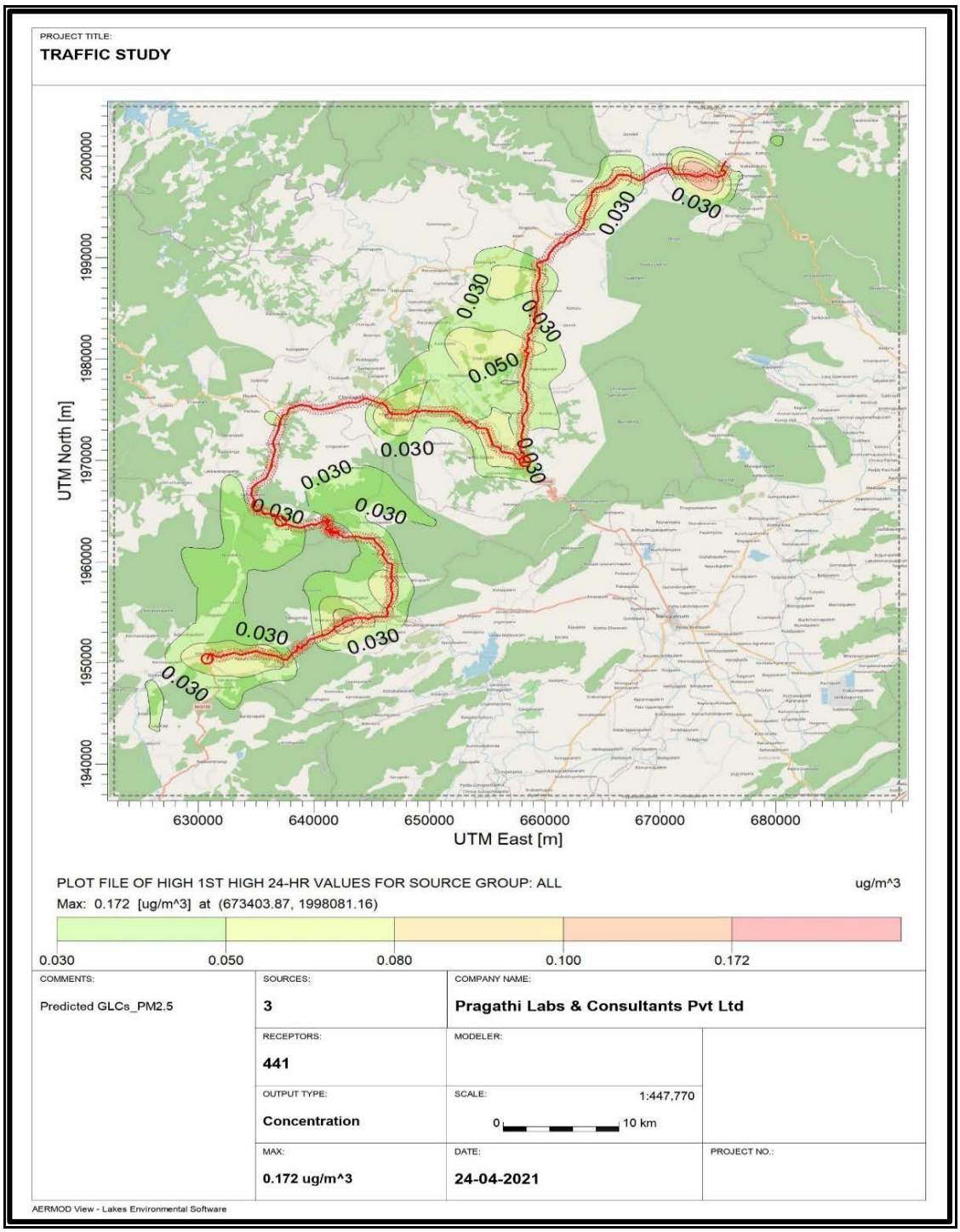


Figure 5-2:Map Showing PM2.5 Concentrations along Project Road

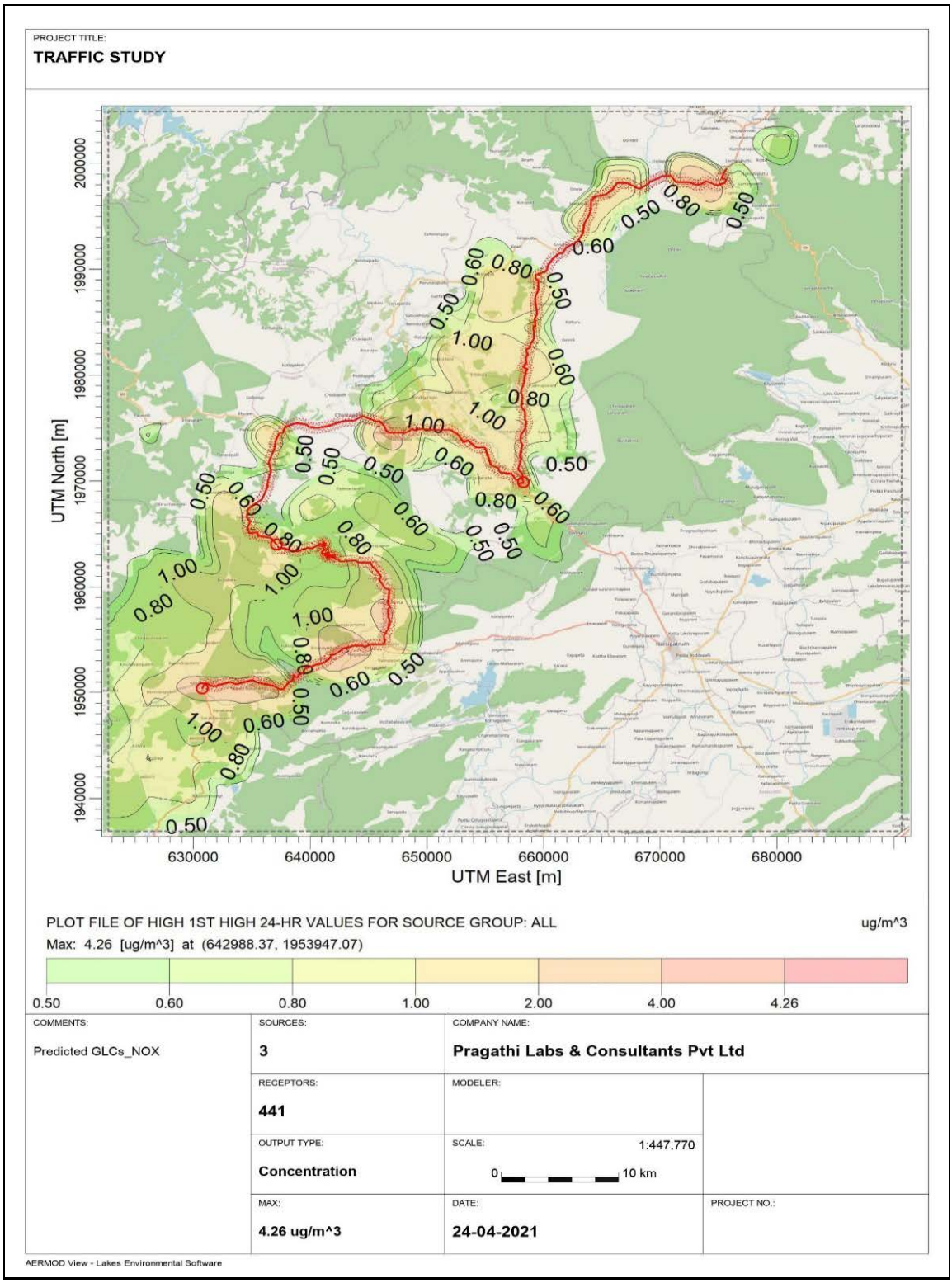


Figure 5-3:Map Showing Nox Concentrations along Project Road

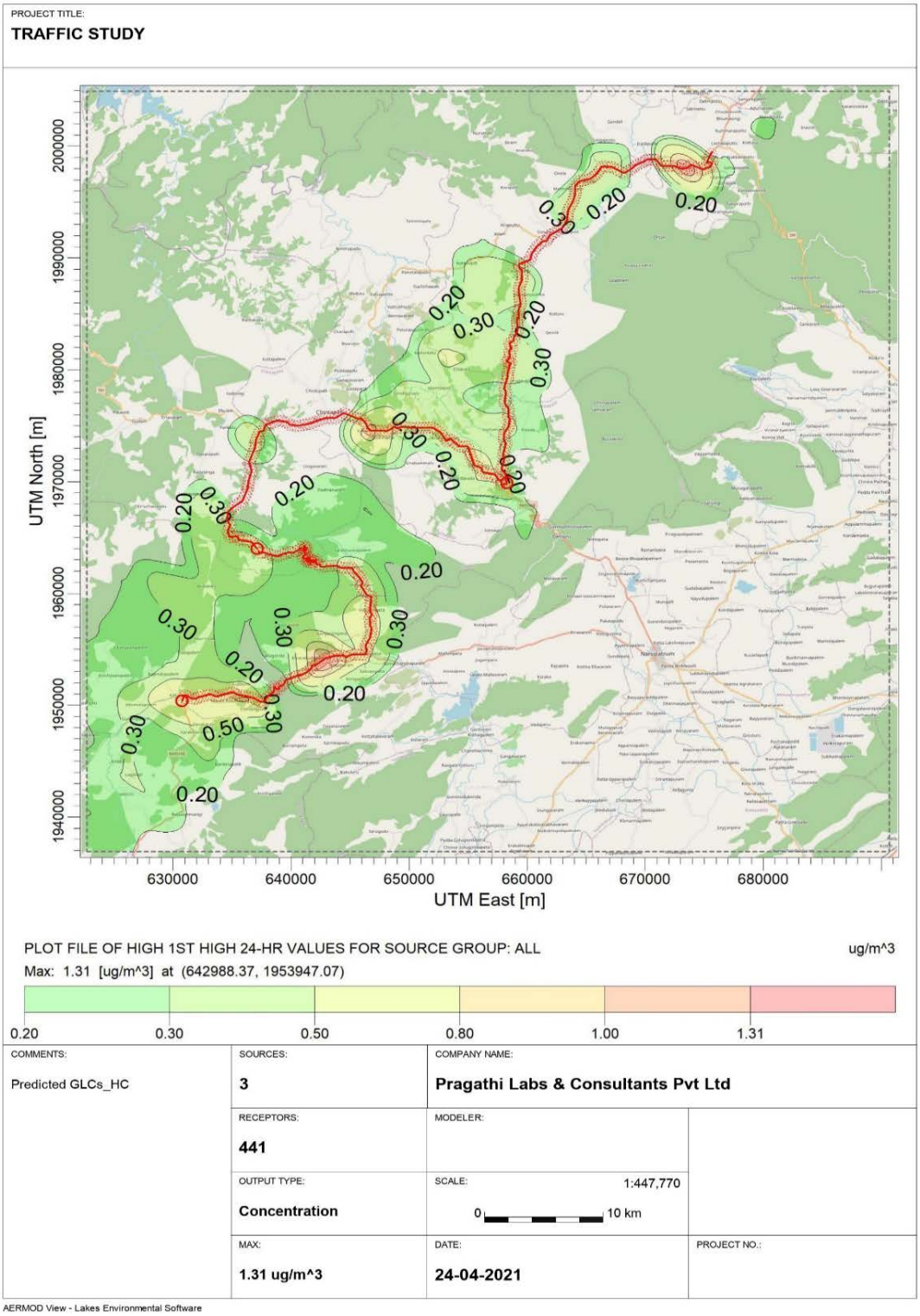


Figure 5-4:Map Showing HC Concentrations along Project Road

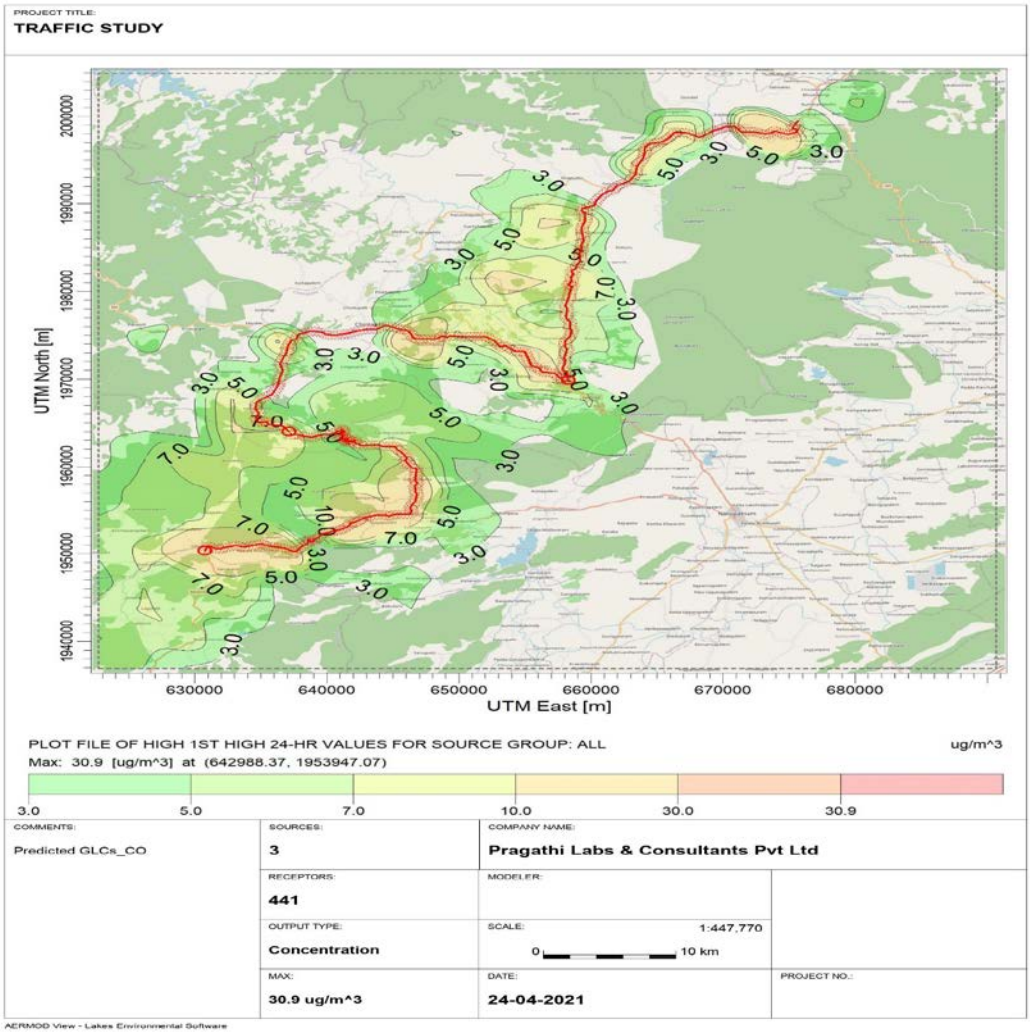


Figure 5-5: Map Showing CO Concentrations along Project Road

EMISSION FACTOR

PM10 (g/vkt)	HC (g/vkt)	CO (g/vkt)	Nox (g/vkt)
0.02	0.045	1	0.14

As per CPCB guideline for Vehicular Emission

EMISSION RATE

Road Description	Distance km	PM_{10}(g/s)	$PM_{2.5}$(g/s)	HC(g/s)	CO(g/s)	Nox(g/s)
Segment 1 (Km 120+000 – Km 165+500)	45.5	0.056	0.01	0.12	2.83	0.39
Segment 2 (Km 165+500 – Km 205+000)	39.50	0.06	0.01	0.13	3	0.42
Segment 3 (Km 205+000 – Km 253+974)	48.974	0.09	0.03	0.22	4.94	0.69

The estimated concentrations of PM_{10}, $PM_{2.5}$, CO, Nox and HC for the Projected traffic is given below:

PEAK HOURLY PREDICTION RESULTS

Pollutant	Predicted GLC's ((µg/m^3)	Distance (km)
PM 10	0.609	0.1
PM 2.5	0.172	0.1
CO	30.9	0.1
Nox	4.26	0.1
HC	1.31	0.1

Maximum Predicted Ground Level concentration is occurring at 0.1 km from the centerline of the road nearby Nagapuram, Andhra Pradesh.

5.7 IMPACT ON NOISE ENVIRONMENT

Construction Phase

Highway traffic noise, is a complex phenomenon because its intensity and characteristics vary with time depending upon the frequency as well as type of vehicles on the road. The impacts of noise due to the project roads will be of temporary significance locally in the construction phase. Table 5-3 below present the source of noise pollution and the impact categorization.

Table 5-4: Impact of Noise

S No.	Phase	Source of Noise pollution	Impact categorization
1.	**Pre-construction**	**Man, material & machinery movements Establishment of labor camps, onsite offices, stock yards and construction plants**	**All activities will last for a short duration and also shall be localized in nature**
2	**Construction Phase**	**Plant Site, stone crushing, asphalt production plant and batching plants, diesel generators etc Work zones – Sensitive receptors like Community health centre, schools near the Project road and Community residing near to the work zones**	**Plant Site: Impact will be significant in close vicinity. Work zones: Such impacts again will be of temporary nature as the construction site will go on changing with the progress of the works. Sensitive receptors shall be taken care so that noise level doesn't exceed the permissible limit.**

Construction – Related Noise

With regards to noise related impacts, construction phase is a difficult stage. During this period noise impacts will be high due to operation of construction machineries and the conflict with the regular traffic requiring more honking of vehicle horns and more stop and go (acceleration and deceleration process).

All temporary noise related impacts in the immediate vicinity of the project roads will occur during the construction activities. This will be occurred along the construction zones as well as construction camps, hot mix plants, WMM plants, crusher and quarry sites (if required).

Typical noise levels associated with highway construction is given in Table 5-4. The magnitude of impact will depend upon the specific types of equipment to be used, the construction methods employed and the scheduling of the work.

Table 5-5: Typical Noise Levels Associated with Road Construction

Sno.	Activity Noise Levels	(d(B)A)
1	Grading & Clearing	84
2	Excavation	89
3	Foundations	88
4	Finishing of Road	84

Project Road Noise modelling

Dhwani-pro noise model is developed to undertake construction, industrial and traffic noise propagation studies for noise assessment. The model is used to predict the impact of noise on receptors from the noise generation source. It is also used to predict impact due to group noise sources in the industrial complex (multiple sound sources) and traffic.

A noise propagation modeling study has been conducted to find out the impact from the noise generated because of the estimated total traffic flow as well as the significance of these impacts. The noise modeling has been done taking into account the design speed at various stretches and the stretches with restricted speeds have also been considered.Noise level readings were recorded in 5 locations . Noise levels were recorded by the use of a digital noise level meter, the instrument was calibrated before and after each set of readings. The monitoring was carried out on 24-hourly basis and the hourly Leq. Values were derived and reported. The Noise Monitoring Locations were (N1) PADERU, (N2) G MADUGULA, (N3) LAMMASINGI Village, (N4) Near BOINTI FOREST, (N5) KD PETA BYEPASS as shown in figure below.

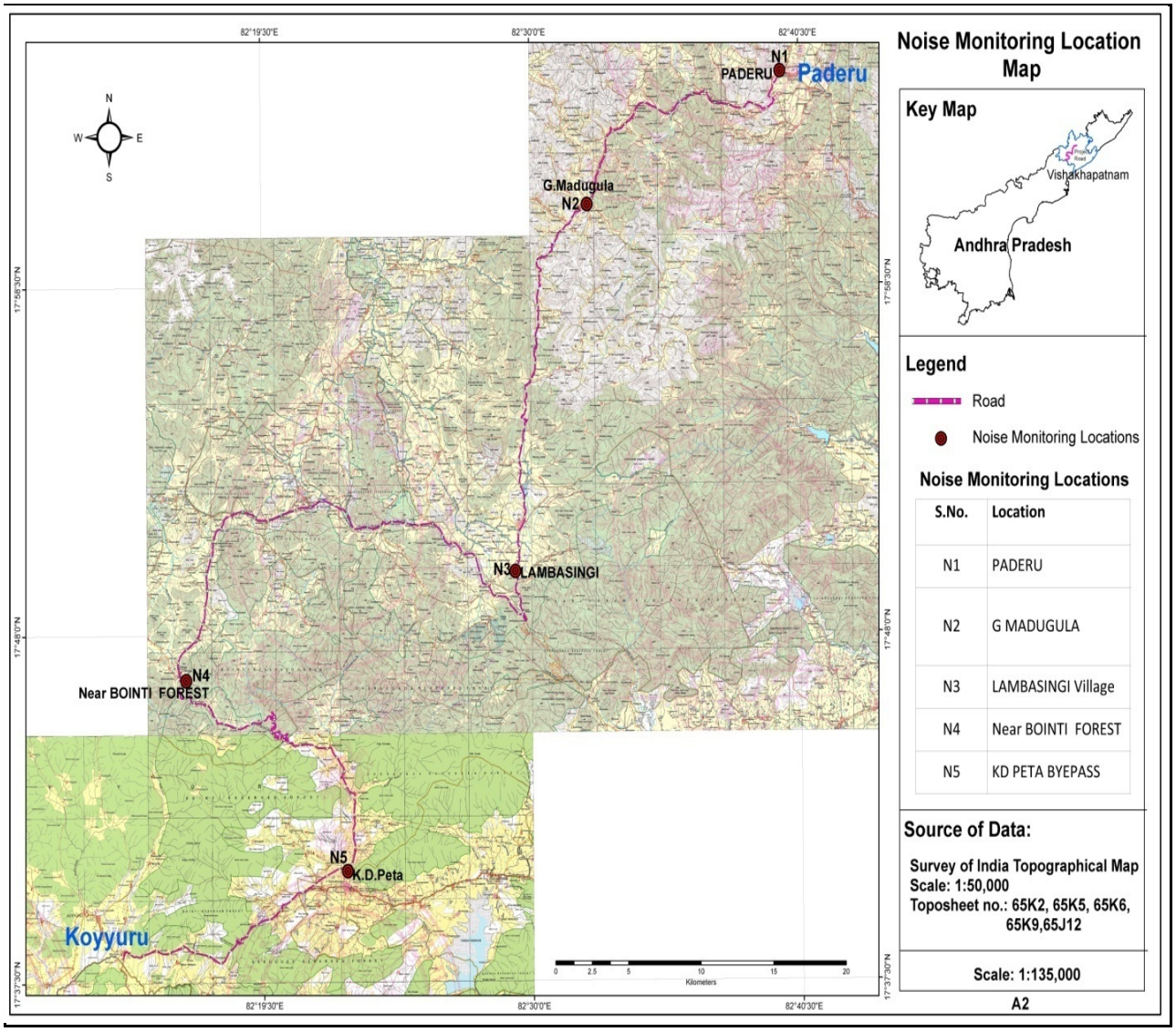


Figure 5-6: Map Showing Noise Monitoring Locations along Project Road

As per the data shown below, the maximum Leq values for day and night time are found to be 53 dB(A) and 44 dB(A) respectively. These maximum values may be attributed towards the nearby commercial activities and traffic movements. The minimum Leq values for day & night time are found to be 47 dB(A) and 38 dB(A) respectively.

Table 5.5 Noise level Monitoring Data [dB (A)]

S. No	Locations	Equivalent Levels dB (A) Leq	
		Day Time (L_d) (6 am to 10pm)	Night Time (L_n) (10 pm to 6 am)
1	**PADERU**	53	44
2	**G MADUGULA**	52	43
3	**LAMMASINGI Village**	49	40
4	**BOINTI FOREST**	47	38
5	**KD PETA BYEPASS**	51	41

STANDARDS IN RESPECT OF NOISE

Category of Area	Limits in dB(A) Leq	
	Day Time	Night Time
Industrial Area	75	70
Residential Area	55	45

Noise Mapping

Noise would be an inevitable due to the regular vehicular movement on proposed project road of Koyyuru – Paderu. Noise mapping was carried out using standard noise model for mapping traffic noise. The source of the noise is considered as traffic noise. The traffic data was processed first and then used as an input in the noise model. The noise model was carried out at each monitoring point. The noise levels during the day and night time shown above are within the limits for all the land uses i.e., commercial, residential/rural and sensitive. As part of EIA study for the proposed project, Noise study was conducted by measurement the existing noise levels at various places around the site. The noise assessment was carried out with respect to the existing as well as the predicted noise that may come from the proposed project The contour maps showing noise levels due to traffic of the project stretch at each point is shown below,

Noise level Monitoring Data

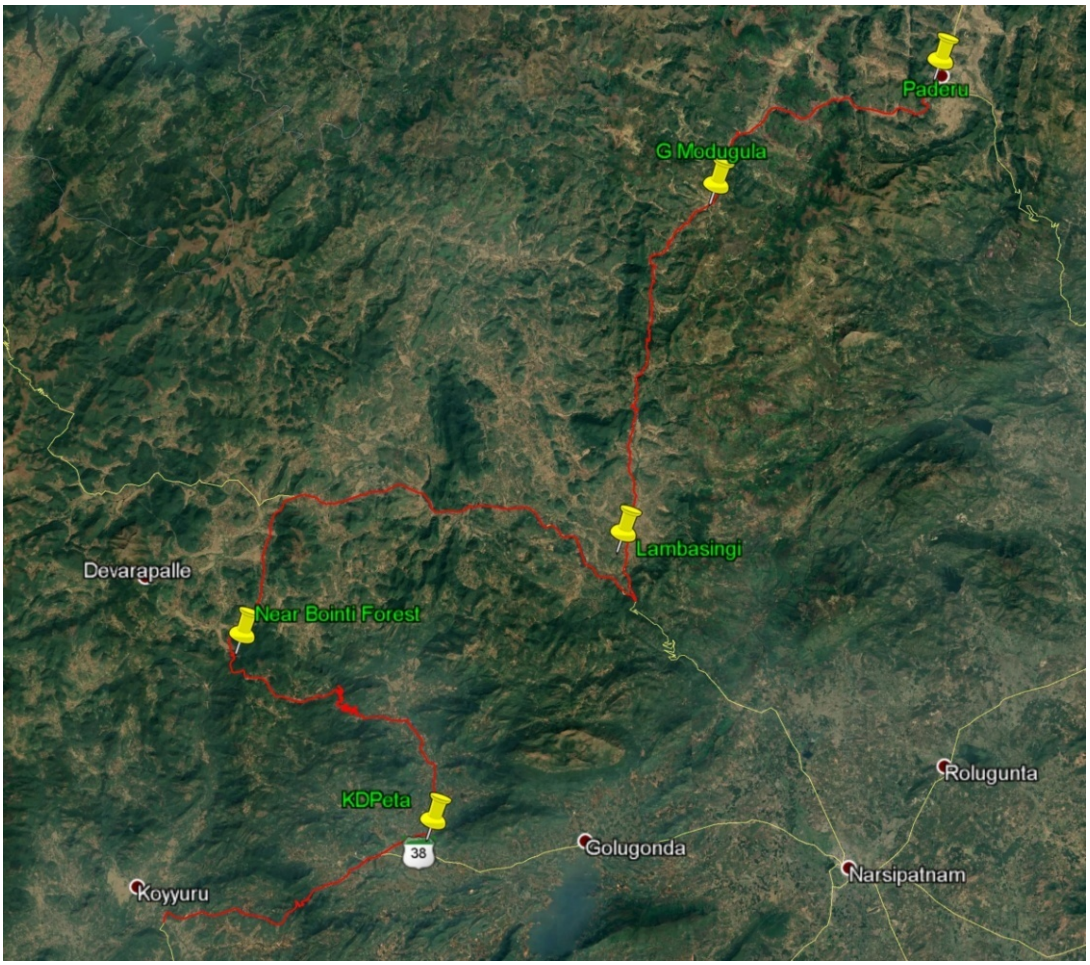
Noise level readings were recorded in 5 locations

Noise levels were recorded by the use of a digital noise level meter, the instrument was calibrated before and after each set of readings.

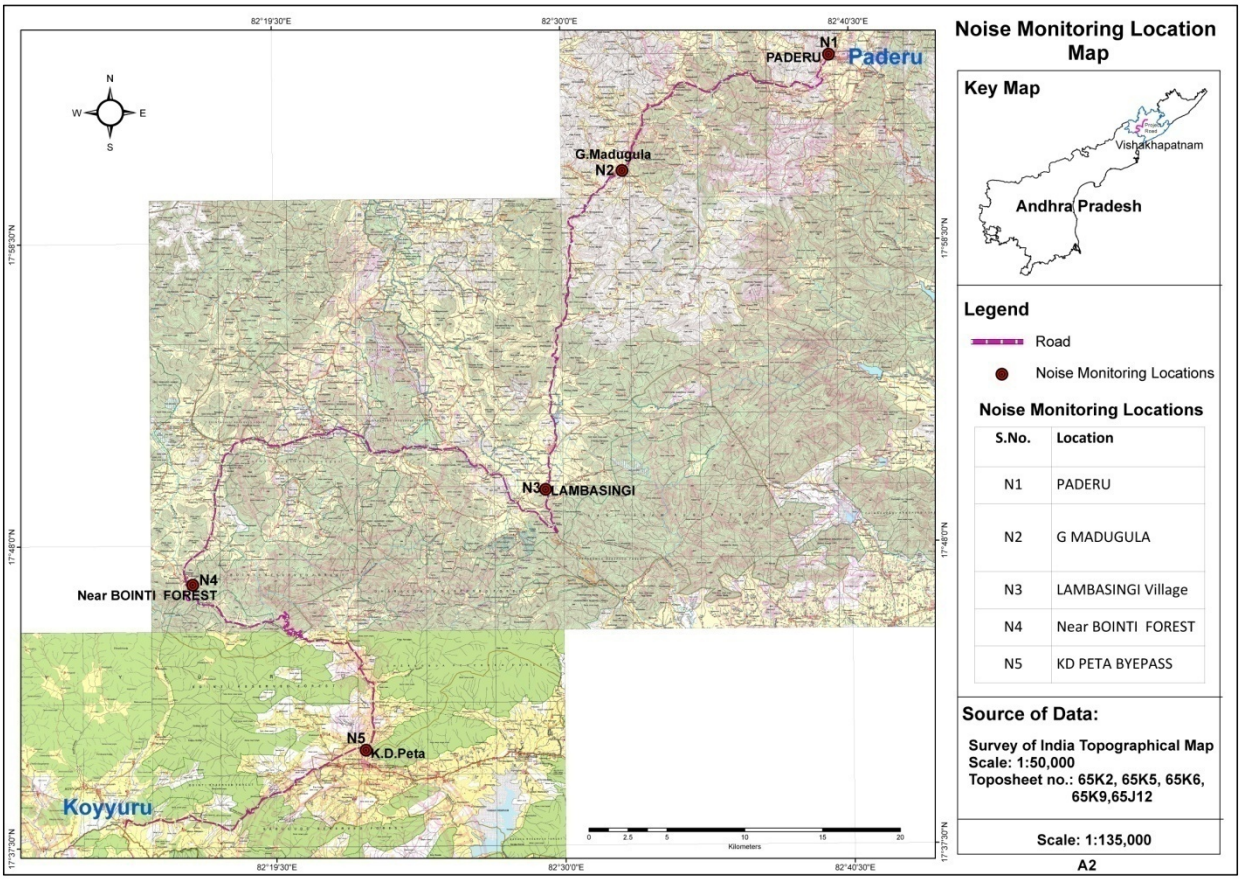
The monitoring was carried out on 24-hourly basis and the hourly Leq. Values were derived and reported

Noise Monitoring Locations

S.No.	Location
N1	PADERU
N2	G MADUGULA
N3	LAMBASINGI Village
N4	Near BOINTI FOREST
N5	KD PETA BYEPASS



Noise Monitoring Locations



As can be seen from the table below, the maximum daytime Leq as well as night time Leq values were found to be 53 dB(A) and 44 dB(A). The maximum values may be attributed towards the nearby commercial activities and traffic movements. The minimum values for day & night time were found to be 47 dB(A) and 38 dB(A) respectively.

Table

Noise level (Existing and Future) [dB(A)]

S. No	Locations	Equivalent Levels dB (A) Leq		Future Levels dB (A) Leq		Noise limits as per CPCB in dB (A) Leq	
		Day Time (L_d) (6 am to 10pm)	Night Time (L_n) (10 pm to 6 am)	Day Time (L_d) (6 am to 10 pm)	Night Time (L_n) (10 pm to 6 am)	Day Time (L_d) (6 am to 10pm)	Night Time (L_n) (10 pm to 6 am)
1	**PADERU**	53	44	73	64	55	45
2	**G MADUGULA**	52	43	72	63	55	45
3	**LAMBASINGI Village**	49	40	70	60	55	45
4	**BOINTI FOREST**	47	38	77	68	55	45
5	**KD PETA BYEPASS**	51	41	81	68	55	45

Note: Future noise levels were predicted based on the projected traffic data of 2048

STANDARDS IN RESPECT OF NOISE

Category of Area	Limits in dB(A) Leq	
	Day Time	Night Time
Industrial Area	75	70
Residential Area	55	45

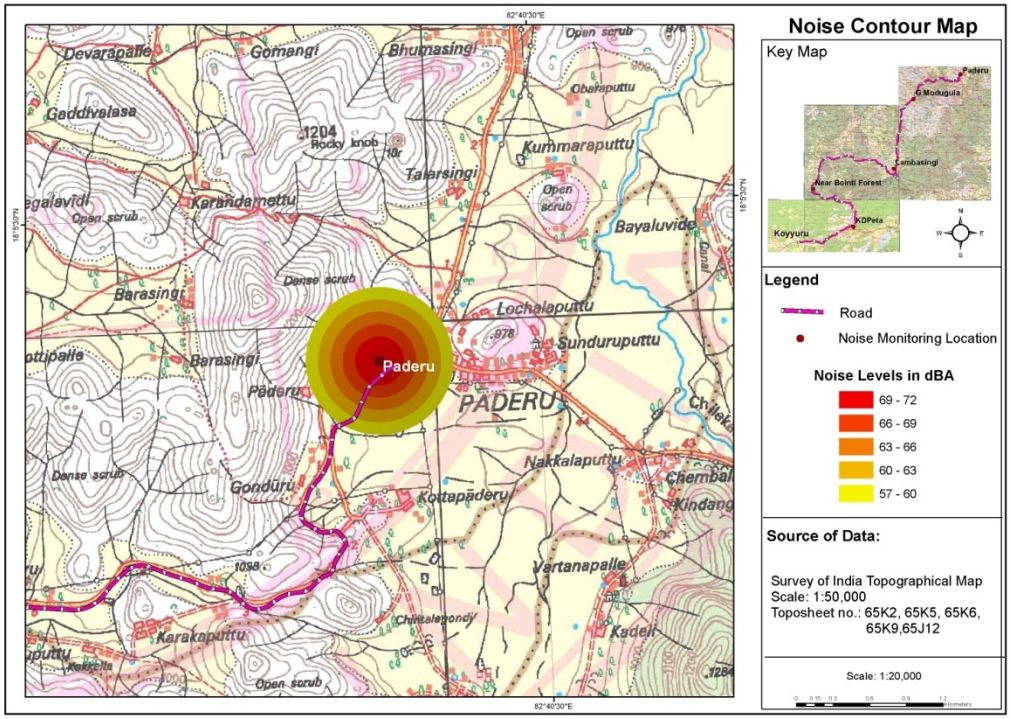
Traffic data: The existing and projected traffic data is given below:

Year	Scenario – I	Scenario – II	Scenario – III
2016	1304	1304	1304
2023	1928	1972	2023
2028	2542	2652	2787
2033	3257	3470	3726
2038	4064	4418	4874
2043	4955	5418	6226
2048	6038	6622	7934

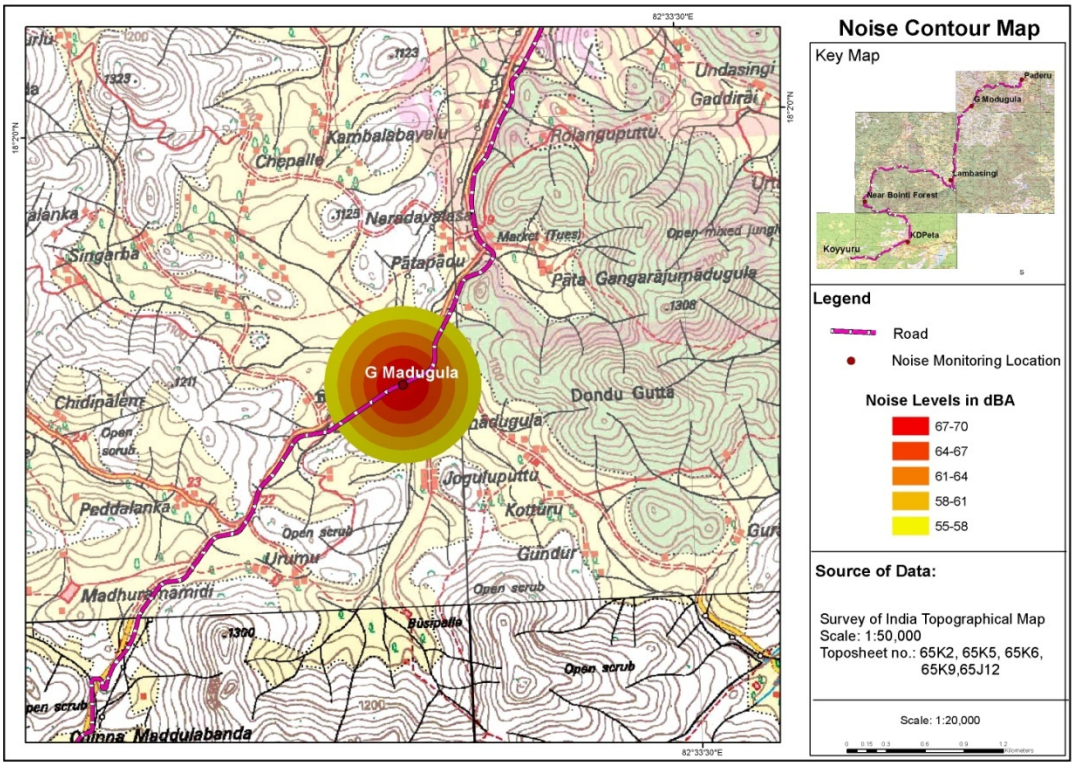
Noise Mapping with existing traffic:

Noise would be an inevitable due to proposed Project Road Koyyuru to Paderu, District Vishakhapatnam, Andhra Pradesh. Noise mapping was carried out using standard noise model for mapping traffic noise. The source of the noise is considered as traffic noise. The traffic data was first processed and the traffic data was used as input data in the noise model. The noise modelling was carried out with the existing traffic is given below:

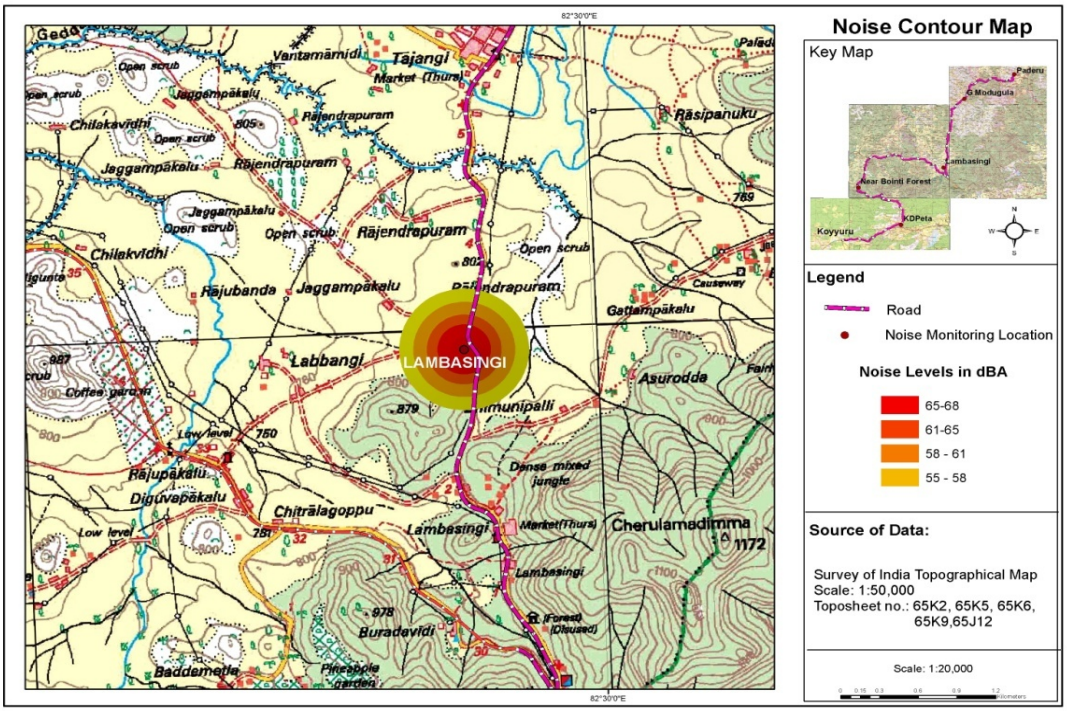
The following are the noise maps generated for each point:



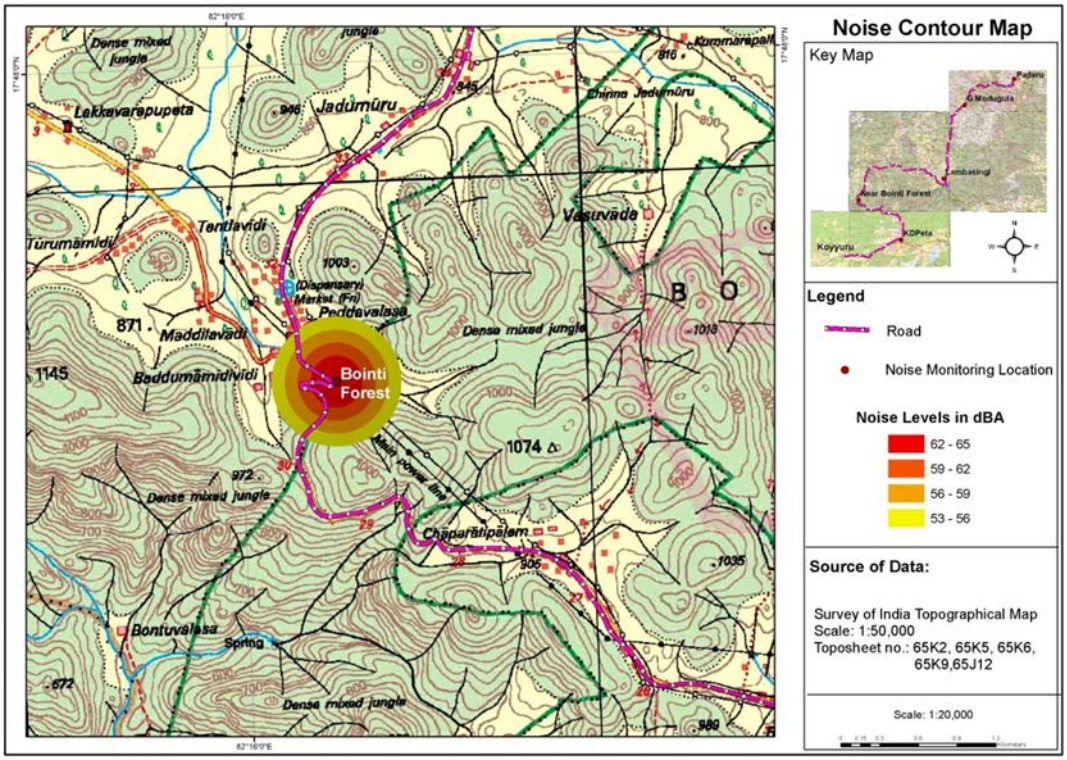
The figure shows the noise map of PADERU



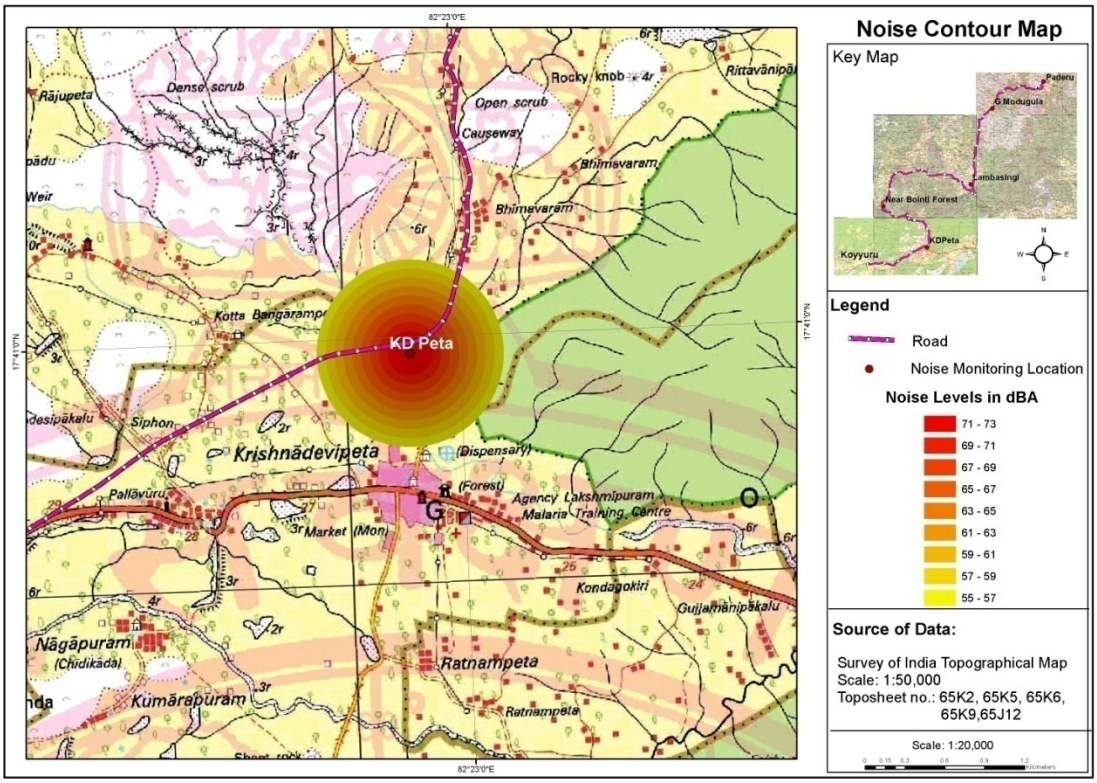
The figure shows the noise map of MADUGULA



The figure shows the noise map of LAMBASINGI



The figure shows the noise map of Bointi Forest

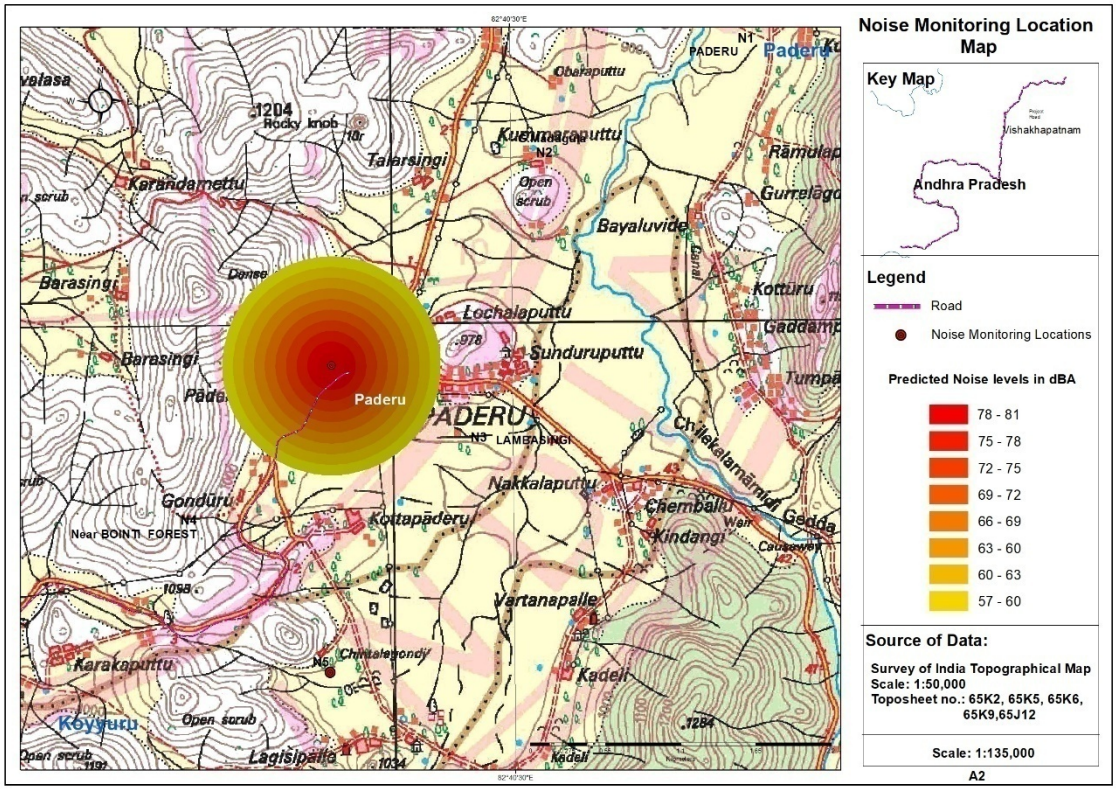


5) The figure shows the noise map of KD Peta

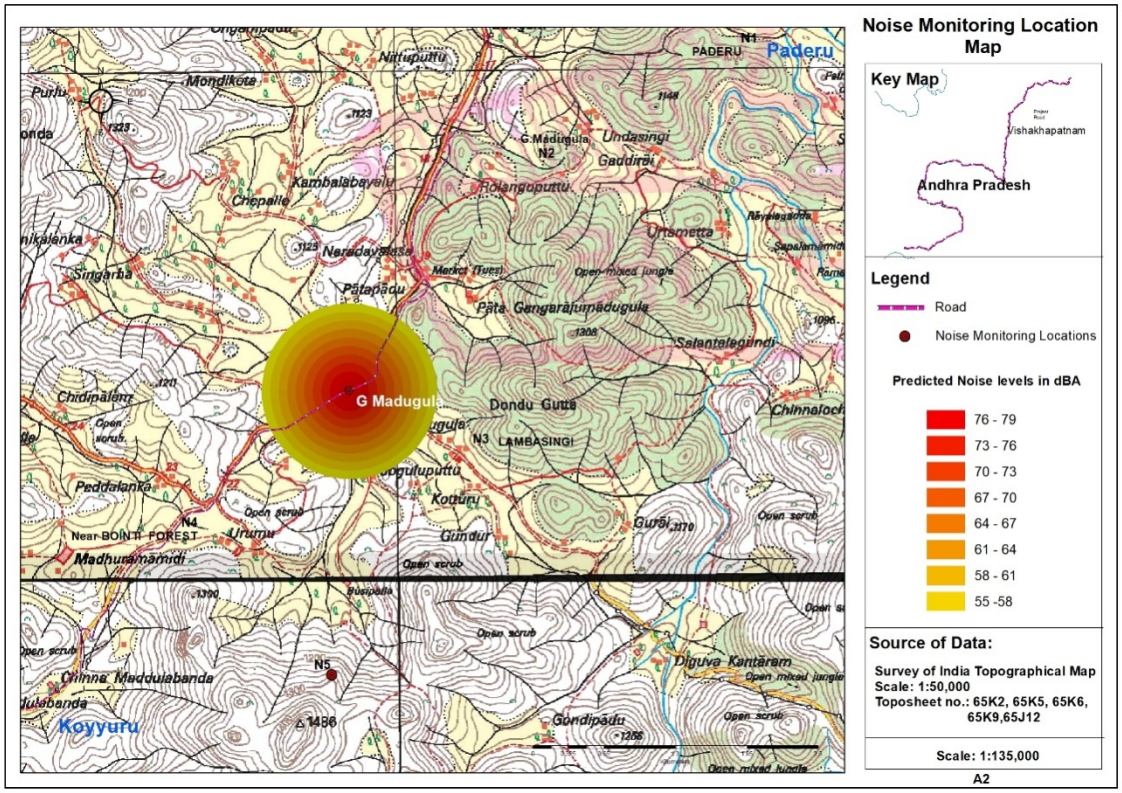
Noise mapping with projected traffic:

Noise maps were also developed using the projected traffic data of 2048 given in the table 2.5, considering maximum traffic scenario-III. The predicted traffic was assigned to geographic condition of propose road. Noise modelling was carried out of each location where there is major settlement. The noise maps developed for Paderu, Madugula, Lambasingi , Bointi and KD Peta are given below:

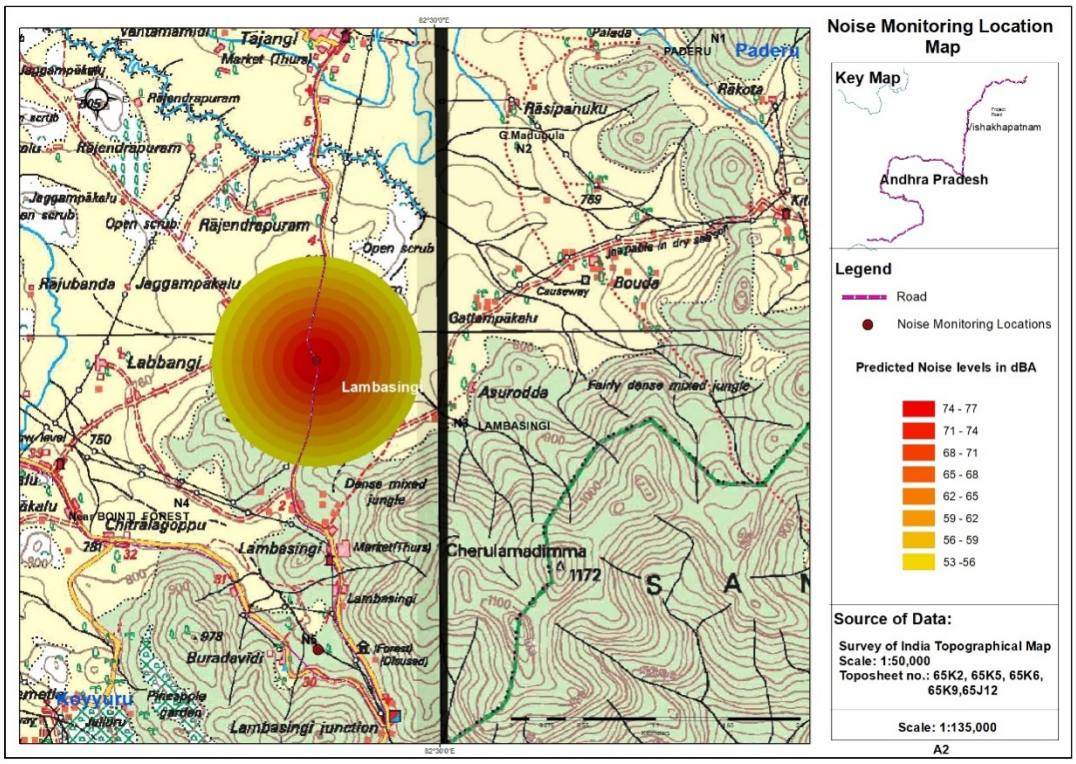
The following are the predicted noise maps generated for each point:



150) The figure shows the predicted noise map of PADERU

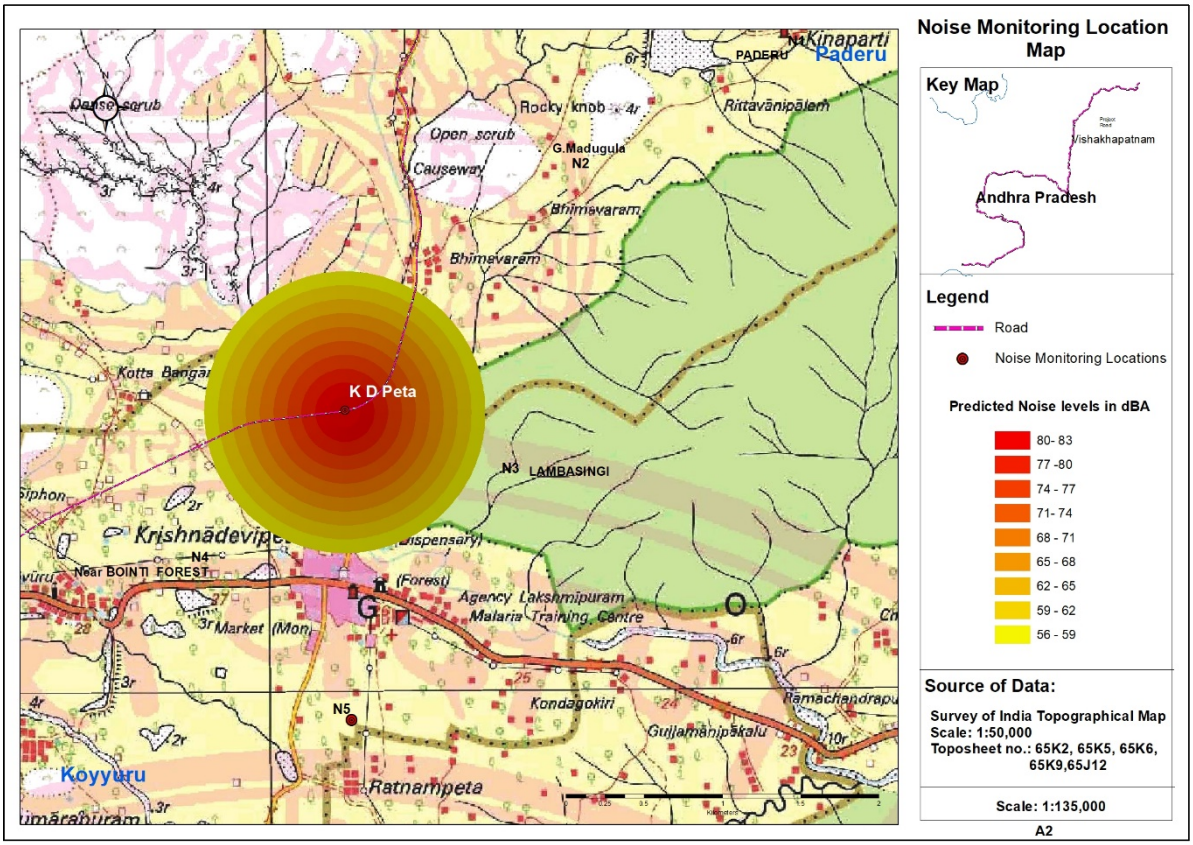


2) **The figure shows the predicted noise map of MADUGULA**



3) The figure shows the predicted noise map of LAMBASINGI

The figure shows the predicted noise map of Bointi Forest



The figure shows the predicted noise map of KD Peta

Operational Noise

During operation phase, noise levels will be reduced due to smooth flow of traffic on reconstructed/upgraded road. However, traffic will be increased on the road in due course of time and subsequently noise levels are expected to increase.

Conclusion:

The difference between the noise maps with existing traffic and estimated traffic is that, with the increase of traffic, the noise spreads further distance of 200m to 250m from the center of proposed road. Therefore, it is advised that, there should not be any development of sensitive receptors such as schools, collages, courts, hospitals within the distance of 250m from the center of road.

5.8 IMPACT ON FLORA AND FAUNA

5.8.1 ANTICIPATED IMPACTS

The proposed up-gradation of the project road 60.06 hectares forest areas. Existing road side vegetation and trees were recorded during the field survey. Crops fields and open land are observed on both sides of the project road. Some of the indigenous of trees are likely to be cut down due to the upgradation.

Depending on the final design for upgradation/widening of road, the tree cutting and resultant pressure on flora and fauna (mainly avifauna) could be the potential impact during preconstruction/construction.

The major impact in this project on flora involves the removal of trees to permit construction and to provide clear zone for safety of the road users.
Table 5-6 below presents the major adverse impacts on the flora & fauna and the indicators chosen to assess the impacts for this study.

Table 5-6: Impacts Due To Construction and Indicators

Impacts Due To Construction	Indicators
Tree Felling	No. of Trees to be felled
Vegetation	Area of vegetation loss

Forest Area

There is a forest area of around 60.06 hectares present along the project road. Therefore, impact related to forest will be appeared in the project.

Wildlife

Wildlife does occur in the project area but at low density. Wildlife will be impacted and the following is an overview of expected impacts resulting from activities:

Construction Phase: Habitat loss will occur as a result of road widening and excavation of borrow pits. Noise, movement of construction equipment and increased human presence will have a temporary disturbance effect on wildlife causing individuals to avoid the affected area. Responses will differ between species and influenced by the habitat where they are present. Particularly sensitive species are expected to be Sloth Bear, Gaur, Pangolin, Wolf, Deer, Antelope and Gray Langur.

Operational Phase: Important impacts during this phase will be fragmentation of habitats to species reluctant to cross the road and death and injury resulting from accidents with passing traffic. Species sensitive to road kill impacts will be Sloth Bear, Gaur, Pangolin, Wolf, Deer, Antelope and Gray Langur.

Tree Cutting

Approximately 7803 trees are likely to be felled for upgradation of the project. Trees growing within the proposed toe line (bottom of formation) will need to be removed for upgradation of the project road. Roadside trees with strong and rigid stems can pose safety hazards. Some trees obstruct clear sight distances. Others have a propensity to overturn when old and are potential safety hazards depending upon age and decay condition. All such trees that are safety hazards need to be cleared. All efforts will be made to minimize cutting of trees.

Removal of Vegetation

Clearing and grubbing is the foremost requirement to start the construction activities of the project roads. The impact due to removal of vegetation includes:

Dust generation during windy atmosphere.

Loss of productive top soil.
Measures have been taken in reducing and curtailing the clearing and grubbing of excess land.

Impact of Dust on the Vegetation Growth

During the construction activities, dust will be emitted and deposited on the leaves of vegetation/crops along the project roads. Dust deposition on the leaves will affect the photosynthesis process and subsequently hamper the growth of the plants.

5.9 IMPACTS RELATING TO OCCUPATIONAL HEALTH & SAFETY

Poor sanitation arrangement and improper methods used for collection and disposal of solid wastes and effluent, accommodation without ventilation, unhygienic food, electrical safety, risk from mosquito and reptile etc at the construction workers camp will impact occupational health and safety.

5.10 ROAD SAFETY ASPECTS

Increase of incidence of accidents is anticipated due to disruptions of traffics movements in construction work zones of the project road. Necessary Work zone Traffic management plan (WTMP) shall be prepared to guide the traffic and safety for the Road user's including vulnerable road user. The EPC Contractor will prepare the WTMP and get it approved by the Authority Engineer. Safety Expert of AE will ensure that the precautionary measures as per guidelines and WTMP are in place.

5.11 LABOUR INFLUX

The influx of migrant labours will have both negative and positive impacts on the nearby community and local environment. The labours who will be accommodated in temporary camp site within the project boundary can have significant interface with the nearby community.

However, the influx of migrant workers would lead to a transient increase of population in the immediate vicinity or the project area for a limited time. This would put pressure on the local resources such as roads, water, gas for cooking, food materials etc.

The impact of labour influx can be minimized by hiring the local labours which may avoid the additional stress on resources and provide a livelihood to people residing in the vicinity of the project.

5.12 SEA/SH (SEXUAL EXPLOITATION & ABUSE/ SEXUAL HARASSMENT)

Gender based violence (GBV) is an umbrella under which the SEA/SH risks are covered which will be taken up as an integral format for framing the Gender Action Plan (GAP). Most of the contract labour is expected to be men, and women's participation as contract labour or community labour is expected to be low. Contractors will need to maintain harmonious relations with local communities by ensuring labourers/workers adhere to Code of conduct (CoC). The CoC commits all persons engaged by the Contractor, including Sub-contractors and Suppliers, to acceptable standards of behaviour. The CoC will include sanctions for non-compliance, including non-compliance with specific policies related to gender-based violence, sexual exploitation & abuse and sexual harassment.

6 ANALYSIS OF ALTERNATIVES

6.1 INTRODUCTION

This chapter discusses the analysis of alternatives that have been considered for the two lane upgradation with paved shoulders of Koyyuru to Paderu Section of NH-516E in Andhra Pradesh. The analysis of alternatives has been carried out 'With project' and 'Without project' scenarios in terms of potential environmental impacts. The minimization of environmental impacts by considering design alternatives determines the extent of mainstreaming of the environmental components. An evaluation of the various alignment options has been done for arriving at the most promising alignment of the project road.

6.2 WITH AND WITHOUT PROJECT ALTERNATIVES

6.2.1 WITHOUT PROJECT SCENARIO

The road has many alongside settlements and the traffic flow is seriously impacted by severe conflicts between the local and the through traffic on the road. This is further compounded by the various land use conflicts, in terms of uncontrolled development along the road and the encroachments onto the ROW.

The population growth, increase in traffic volumes and the economic development along the project road would continue to occur and will worsen the already critical situation on the road. The existing unsafe conditions and the adverse environmental consequences in terms of the environmental quality along the road would continue to worsen in the absence of the proposed improvements. Moreover, if it is decided not to proceed with the project, then the associated reduced socioeconomic development of this remote, relatively poorly connected area cannot be justified.

Therefore, the no-action alternative is neither a reasonable nor a prudent course of action for the project road, as it would amount to failure to initiate any further improvements and impede economic development.

6.2.2 WITH PROJECT SCENARIO

The 'with project scenario' is found to have a positive impact in the long run on social, environmental, economic and financial issues. This scenario includes the upgradation/widening to two lane upgradation with paved shoulders of the existing stretch as envisaged in the project objectives.

The scenario is economically viable and will improve the existing conditions. It, would thereby, contribute to the development goals envisaged by the Government of Andhra Pradesh and enhance the growth potential of the area.

To avoid the large-scale acquisition of land and properties, the project envisages the possible two laning of the road within the existing ROW to the possible extent, In spite of the various development benefits likely to accrue due to the project, as is the case of every road development project; the project would be accompanied by certain impacts on the physical, biological and social environmental components.

The potential impacts on the various environmental components can be avoided through good environmental practices and implementation of mitigation measures. Wherever avoidance of negative impact has not been possible, appropriate mitigation and enhancement actions will be worked out to effectively offset the environmental impacts inflicted due to the project. A Comparative assessment of the

"with and without" project scenarios along with anticipated benefits with project scenario are presented in Table 6-1.

Table 6-1: "With and Without" Project Scenarios – A Comparative Assessment

Component	"With" Project Scenario	'Without" Project Scenario
Highway Geometrics	2 lane paved shoulder is being developed with geometric improvements.	Existing intermediate/two lane carriageway with poor geometrics
Design Speed	40/80 kmph for 2 lane with Paved Shoulders	20-40 kmph in entire project section.
Congestion in Settlements	Free flow of traffic due to widened carriageway and improved geometry	Congestion in urban/rural areas due to mixing of local, pedestrian and through urban and rural areas.
Felling of road side trees	Felling of trees located near the road edge as these trees shall become a road hazard. Triple the number of new young and healthy trees to be planted in compensation.	No felling of trees. The trees close to carriageway may become a safety hazard to the road users.
Pedestrian safety	Realignment of congested stretch for the safety of pedestrian. Along the settlement stretches with significant pedestrian traffic, provision of pedestrian (zebra) crossings and footpath has been kept in urban sections.	Pedestrian safety an issue of major concern especially along the settlements and congested sections
Road Safety Measures	Provision of proper road markings, zebra crossings, crash barriers and improvement of geometry to enhance road safety and to reduce accidents.	Accident incidents shall rise with an increased traffic volume.
Environmental Quality	Development of road and realignment in urban settlements will improve environmental quality due to lowered pollution levels and relieving of congestion of traffic. Besides tree plantation shall not only provide aesthetics but also improve the quality of air.	Poor due to congestion and high emission levels because of slow movement of traffic. A further deterioration is expected due to increase in traffic volumes and further congestion.
Drainage	Will be improved due to reconstruction/additional new construction of culverts	These issues remain unaddressed without the proposed project.
Road Side Amenities	Appropriate road side amenities to be provided at various locations along the project road.	Continue to remain inadequate
Better Transportation Facilities	Reduction in time and fuel consumption for easy and fast movement through the major towns and villages. Better Access to markets.	Increased vehicle operating costs due to reduced speeds
Environmental Enhancement	Enhancement of water bodies, community and cultural properties and also water front in an aesthetic manner.	No enhancement proposal for without project scenario.

Component	"With" Project Scenario	'Without" Project Scenario
Development	Higher potential for development due to improvement in access and consequent increase in connectivity.	Development activities will be greatly hampered by the gross inadequacy .
Financial and Economic Analysis	Project financially viable as per the HDM model. The cost of operation and maintenance, Vehicle Operating Cost (VOC) and other ancillary cost are moderate to low.	The cost of maintenance while catering to the projected higher traffic, accident cost, Vehicle
Loss of vegetative cover	Vegetative cover will be removed within corridor of Impact. Compensatory plantation will enhance vegetative cover of area after 3-4 years.	No such impact in without project scenario
Impacts to wildlife	Threatened species will be exposed to increased traffic resulting in death and injury to people and wildlife from accidents.	Traffic accidents may occur, but at a much reduced rate compared to the "With" Project Scenario
Access to basic facilities such as Markets, schools, Hospitals etc.	Easy access to basic facilities due to fine road	Difficulty in accessing the basic facilities due to heavy traffic and congestion under

By looking at the above table, "with" project scenario, with its minor adverse impacts is more acceptable than the "without" project scenario which would mean an aggravation of the existing problems. The potential benefits of the proposed road improvements are substantial and far-reaching both in terms of the geographical spread and time. Hence, it is clear that the implementation of the project will have definite advantage to area in development of its economy and progress for its people.

6.3 ENVIRONMENTAL CONSIDERATIONS

The various avoidance measures for minimizing the extent of environmental impacts and avoiding of sensitive environmental features have been worked out. Keeping in view, the site conditions and the scope of development of the area, the 'With' and 'Without' project scenarios has been compared for the lone existing alignment and is represented in Table 6.2.

Table 6-2: 'With' and 'Without' Project Scenario

With Project		Without Project	
Positive Impacts	Negative Impacts	Positive Impacts	Negative Impacts
❖ The improvement of road surface will improve riding quality, thus reduce the traffic congestion and reduction in wastage of fuel. ❖ Providing better level of service in terms of improved riding quality and smooth traffic flow. ❖ Access to new employment opportunities ❖ Employment of local workers for the execution of project	❖ About 97.017 Ha of additional land shall be acquired ❖ Increase of traffic will lead to air and noise pollution. ❖ Removal of trees and vegetation due to widening and upgradation	❖ No acquisition of land or properties and hence no displacement of families. ❖ No felling of existing trees and vegetation	❖ Travel time and fuel consumption level will be more due to poor road surface. ❖ Increase in dust pollution and vehicular emission ❖ The accident rate will increase

With Project		Without Project	
Positive Impacts	Negative Impacts	Positive Impacts	Negative Impacts
❖ Better access to health care and other social services ❖ Improved quality of life of the local people ❖ Increase of aesthetics and environmental condition due to Avenue Plantation along the project road ❖ Provision of systematic utility duct will enhance the road aesthetics as well as reduction in frequent damage of road due to repairing/ up gradation of utilities. ❖ Adaptation of Green technologies for the construction of the road	❖ Minor changes in land use pattern along the project area. ❖ Short term Increase in dust pollution and noise pollution during construction period. ❖ Public Safety and Inconvenience due to construction activities till construction period. ❖ Inconvenience due to relocation of public utilities		❖ Further deterioration of project road.

Table 6-3: Minimization of Environmental Impacts

Environmental and social considerations	Provisions considered in project road design
Maintaining Design Speed for through traffic on the road	Improved geometrics
Improvement of Road Safety	Intersection improvements; geometric improvements at curves, road safety signage etc.,
Adequate drainage	Provisions of longitudinal drains and CD Structures
Reduction of Air and Noise Pollution	Intersection improvements, tree plantations, Implementation of EMP
Minimisation of Tree Loss	Maximum effort shall be given to avoid avoidable tree felling
Minimisation of Property Acquisition	Realignments; Concentric widening to minimize social impacts and SIA & RAP
Displacement of Commercial Properties	Concentric widening to minimize social impacts and SIA & RAP
Minimisation of Loss of Utility Lines	Centre line alterations to minimize shifting requirements
Erosion control and Stabilisation of Slope	Turfing / Stone Pitching and Bio-engineering including Plantation measures

With the above comparison, it can be concluded that "With" project scenario, positive/beneficial impacts will greatly enhance social & economic development of the region and improve the environment, when compared to the "Without" project scenario, which may further deteriorate the existing environment and quality of life and risks involved in commuting. Hence the "With" project scenario with some reversible impacts is an acceptable option rather than "Without" project scenario. The implementation of the project therefore will definitely be advantageous to improve the environmental quality of the sub-region besides to achieve an all-round development of the economy and progress of the region.

There is little increase in the pollution levels during construction. Dust and particulate matter during construction will affect the air quality on a short-term basis but will be temporary in nature. The safety of road users as well as surrounding population will enhance to great extent due to the project with provisions of new safety protective works, junction improvements, new bridges, traffic lights, street lightings, truck lay byes, bus shelters, etc which are adequate in the present scenario.

6.4 ANALYSIS OF ALTERNATIVES ALIGNMENT

After having examined the feasibility of the road-improvement in the existing alignment, it is concluded that some of the project segment (mainly thickly built- up stretches) may have technical, social and environmental constraints during construction because these critical stretches are experiencing congestion, encroachment of RoW and poor geometry. Therefore, it is pertinent to develop alternative alignment to these critical stretches. These alternatives have been analyzed keeping in view social, environmental and technical parameters and thus the best alternative has been finalized.

The need for bypass around the congested towns along the project road was identified and also considering the quantum of development within the towns.

K.D.Peta Bypass

Krishna devipeta popularly known by its abbreviated form K.D. Peta, is a village in Golugonda mandal of Visakhapatnam district in the state of Andhra Pradesh, India. It lies 111 km west of Visakhapatnam city.

The existing road alignment from Km 29/312 of SH 38 (Route from Narasipatanam to Koyyuru) to Km 1/282 of ODR (Route from K.D.Peta to Rintada) passes through the very congested places with commercial cum residential activities along the project road. The available width between the building line to building line is only 10.0 m. Initial public consultation was conducted on 25.06.2019 at K.D.Peta location on the existing alignment.

The alignment bypass proposed is to avoid the congested areas with the design length of 3.340 Kms and area to be acquired is 10.02 Ha on LHS found to be suitable. While the conditions are not feasible for any other option as bypass to pass through the LHS as the length increases besides overall costs for the resettlement and rehabilitation.

Criteria for Fixing Realignment

Obligatory sensitive reasons through which realignment options should not pass, are detailed in sections below.
Habitations: Proposed alignment has been fixed in such a way that it traverses at a minimum distance of 200-300m from built up areas and avoiding important buildings and structures. However, realignment options have been adopted to minimise the impact on settlement due to project.

Wildlife Sanctuaries, National Parks, Reserve Forest and other Eco Sensitive zones: No ecologically protected area (Wildlife Sanctuaries, National Parks, etc.) are located within 15 Km distance from the project road.

Alternative Analysis of NH-516E Koyyuru – Chaprathipalem section

Three alignment options have been studied and are discussed below:

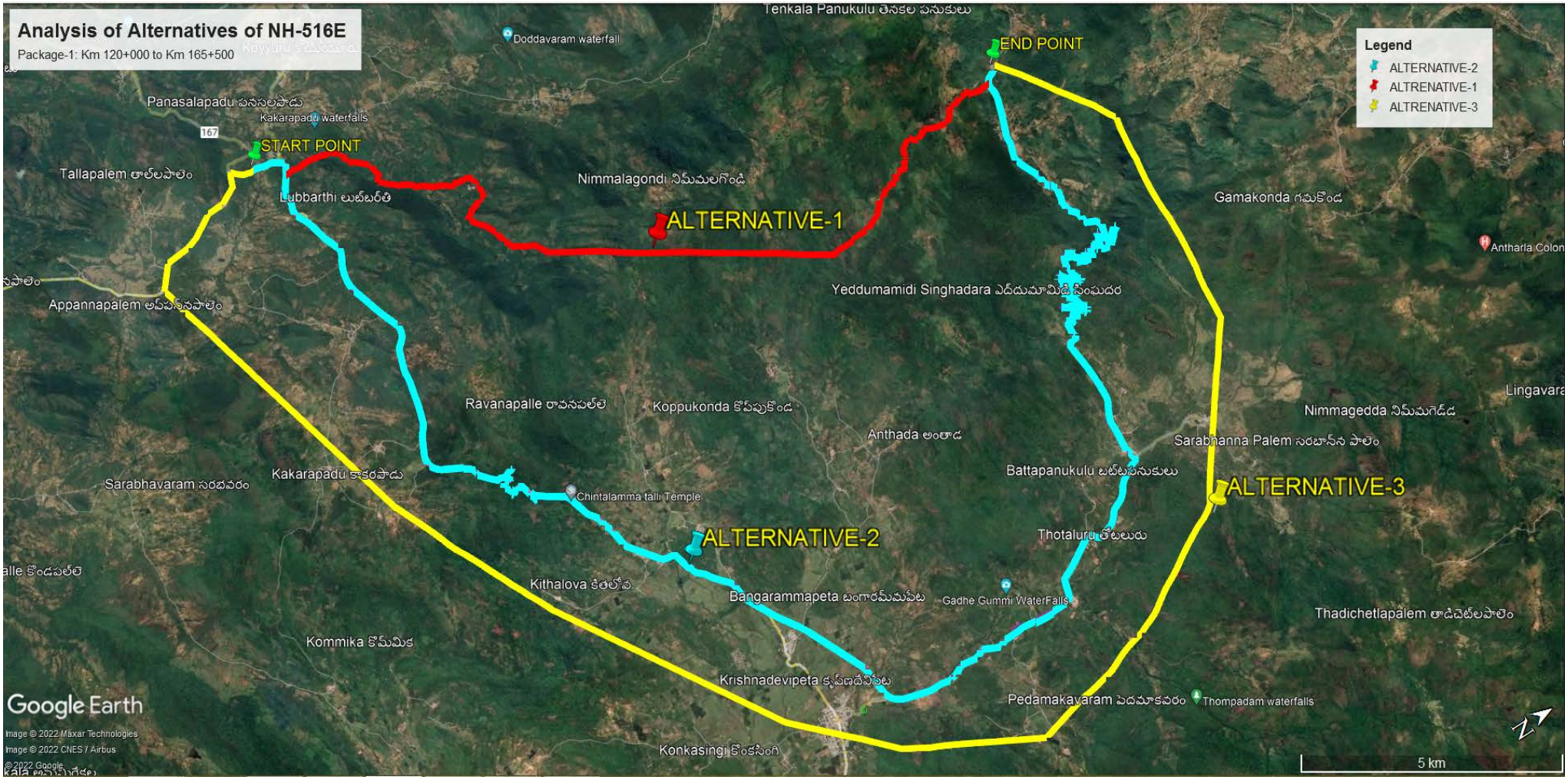


Figure 6.4: Alternative Alignment Studied for NH-516E Koyyuru – Chaprathipalem section

The option study is given in **Table 6.4**

Table 6.4: Option Study of NH-516E

Description	Option 1	Option 2	Option 3
Side and Length of Alternative	Western Side of NH- 516E	NH-516E Existing Alignment	Northern Side of NH- 516E
	Length = 18.1 Km	Length = 45.500 Km	Length = 40.300 Km
Nature of Alignment	Complete Green-field alignment	Improvements in the Existing alignment except a Bypass measuring length of 3.3 Km	3 Km length of existing NH-516E, and the 37.3 Km Green-field alignment
Land Type & Use	99% Forest area and 1% Agricultural Area	33% of Forest Area, 15% Built-up area, 52% Agricultural land	Agricultural land 17%, the built-up area 3%, the forest area 80%
Built up Areas	5 Villages are getting affected	19 Villages (Marginal land acquisition)	9 Villages are getting affected
Forest Area	36.2 Ha	30.0 Ha	74.6 Ha
Environmental Issues	Bisecting the Nallagonda RF into two sections compromising the sanctity of the Nallagonda RF.	Minimum Acquisition of Forest land as it is utilizing existing ROW to the maximum extent making minimum demand of the forest areas	Complete green field alignment in the in the Forest areas lead to permanent destruction of the forest areas and its continuity in the hill ranges
Cutting Areas	Large cutting areas are coming within RoW in the forest areas.	Smaller portions of cutting areas coming within the RoW	Large cutting areas within RoW in the forest areas
Other Issues	There is a fall of 230m in the proposed alignment	Existing alignment without any steep slopes	There is a fall of 210m in the proposed alignment
Decision	**Not Recommended**	**Recommended**	**Not Recommended**

6.5 RE-ALIGNMENTS& CURVE IMPROVEMENT

In the entire Stretch of Koyyuru-Paderu Road, in order to improve existing poor road geometry, sixteen re- alignments have been proposed as presented in the Table 6-3 below.

Realignment & Curve Improvement Locations				
Package	Location	Length (m)	Location	Length (m)
I	Curve Improvement	2192	Realignment	16893**
II	Curve Improvement	7980	Realignment	12540**
II	Curve Improvement	5029	Realignment	12977**
Total		15201		42410
** -Include Forest Length				

Table 6-3: Realignments Proposed for Koyyuru-Paderu Road

6.6 ALTERNATIVES CONSIDERED FOR MINIMIZATION OF TREE CUTTING

The alignment would as far as possible stay within the existing right of way in forest areas. The study area of 133.974 Km comprises of 39.595 km of forest area distributed between Nadimpalem and Rampula village is the longest having 12.2 km and with deep Ghat and curves which has got maximum number of species enumerated from the study. Existing road side vegetation and trees were recorded during the field survey. Crops fields and open land are observed on both sides of the project road. Some of the indigenous of trees are likely to be cut down due to the upgradation. Depending on the final design for upgradation/widening of road, the tree cutting and resultant pressure on flora and fauna (mainly avifauna) could be the potential impact during preconstruction/construction. The major impact in this project on flora involves the removal of trees to permit construction and to provide clear zone for safety of the road users. After considering alternatives overall 7803 trees need to be cut for the road alignment during the preliminary design, however during the final design the reduction in number of trees to be cut shall be considered.

6.7 ALTERNATIVE MATERIALS AND TECHNOLOGIES

Increasing demand for natural material for other construction activities e.g. building construction, urban development projects has put pressure on the exiting natural resources e.g. aggregates, sand, soil. Procuring natural construction material for the road construction has thus not only become difficult due to increased competition from other sectors but also escalated both time and money required for procuring them. Increased regulatory compliance requirements have also made availability difficult. Added to this is the increase lead distance because at times these materials have to be procured from quarries away from the construction site thus not only increasing cartage cost but also increasing the carbon-footprint of the project.

The use of alternate materials for construction focuses on the management and reuse of alternate material including waste materials locally available in the project area or generated by the project itself.

6.7.1 GREEN INITIATIVES

Green Initiatives describes green highway, green initiatives, GHG emissions reductions and climate resilient initiatives adopted in the project and estimated GHG emissions reduction.

6.8 WATER DEMAND OF THE PROJECT

In general, water footprint resembles the usage of freshwater resources in terms of volumes of water consumed. The water requirement for the project is mainly during construction stage activities like dust suppression, wet mix, drinking water purpose for labour etc. However, water is also required for Green belt/Plantation purpose along the project road. The estimated Water demand along the project road is given in below table and in figure 7-4 below.

Figure 7-1: Details of Water Requirement for Construction stage

S.No	Name of the road project	Proposed Length (in Km)	Dust suppression /Allied activity of Construction (Wetmix etc.,) (KLD)	Domestic Purpose (KLD)	Trees to be planted	Green Belt/ Plantation (KLD)	Total (KLD)
1	Koyyuru Paderu	133.974	9	976	8339	8257	9243

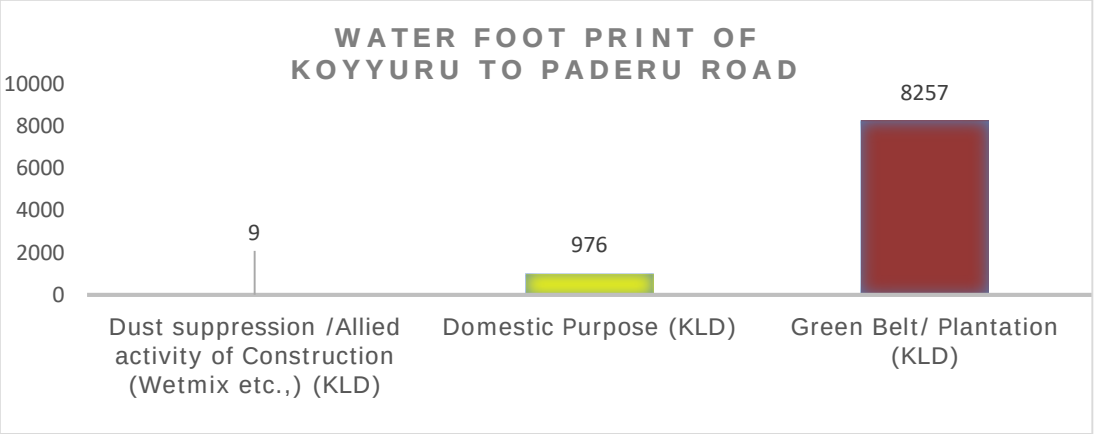


Figure 7-2: Estimated Water foot print along the project road

6.9 UTILIZATION OF COCO FIBRE IN ROAD CONSTRUCTION

Coconut shell is one of the waste materials. It is a solid waste in form of shell with approximately 3.18 million tonnes produced annually. Coconut shell (CS) and coconut fiber (CF) as shown in Figure 7-6 are the new waste materials that used in highway industry. This is because coconut shell has good weather resistance thus it is suitable to use as embankment protection materials at Narsipeta bypass and existing high embankment road section before Narsipeta bypass.

Figure 7-3: Coconut shell (left) and coconut Fiber (right)

The chemical compositions of Coconut shell contains is 33.61% cellulose, 36.51% lignin, 29.27% pentosanes and 0.61% ash. Coconut shell has low ash content but high volatile matter, While coconut fiber has the lowest cellulose content, but with twice amount of lignin (41-45%) compared to jute and sisal which makes it has greater resistance and hardness. Coconut fiber will act as stabilizing additives when added into the asphalt mix around 180°C.

Coconut fiber generates many advantages when react with asphalt mixture as it can reduce bleeding of the binder and advancing the macrotexture of the coating. Besides, it can help to reform the mechanical characteristics and improve surface drainage pavement of tyres.

Coconut Fiber enables the use of discontinuous of grain size, which can increase the content of binder, hence the aggregates will coat with thicker film. This can reduce the oxidation of asphalt mixtures, moisture penetration and separation.

On the other hand, all asphalt applications has one problem, it will become brittle at low temperatures and soft at high temperatures. Coconut fiber can increase the range of temperature of porous asphalt thus help to resist degradation. This function can reduce the drying and cracking that occur in conventional asphalt pavement when faces various climate. At high mixing and compaction temperatures, coconut fiber also helps in reduce the flow of asphalt hence it can help to prevent bleeding and make sure the air void content is not clogged by asphalt binder.

Coconut fiber has outstanding moisture absorption because the irregular of crack in the cross section surface provides unique structure. The unique structure also results in better air permeability and moisture conductivity. In addition, the unique structure of the Coconut fiber will improve the moisture susceptibility, viscoelasticity and rutting resistance as well as ameliorate low temperature anti-cracking properties, durability, material toughness, fatigue life and lowering reflective cracking of asphalt concrete mixtures and pavements.

Detailed investigated should be done on the Coconut shell and Coconut fiber like reinforcing mechanisms as well as optimum fiber and shell content. The various properties of Coconut shell and Coconut fiber like fiber and shell content, fiber length, shell's size, shell's shape and orientation of fibers should be focus in the asphalt pavement in the future research. In addition, field performance of shell and fiber modified asphalt pavement should be determine the boundary effects on the test results. New research field can be conducting such as investigate modeling of mechanical properties of Coconut shell and Coconut fiber modified asphalt pavement by using composite science principles.

6.10 GABION WALLS FOR SLOPE PROTECTION

Gabion baskets were used for slope protection work. It is easily and quickly assembled and provided the advantage of being sustainable, resilient and flexible in nature as mostly recycled hill cut material will be used during construction. Typical gabion walls for slope protection are given in Figure 7-7.

Figure 7-4: Gabion Walls for Slope Protection

Gabion retaining wall is flexible, free draining, permeable, environmentally friendly, quick and easy to assemble and cost-effective.

7 PUBLIC CONSULTATIONS

7.1 PUBLIC CONSULTATIONS

The consultations are a necessary step to obtain the views of people who may be affected by development projects or may otherwise have an interest in their outcomes and to inform them about changes that could affect them. Such feedback assumes greater significance in the case of people who may be adversely affected. Since these stakeholders usually do not have a direct role in decisions about projects that affect them, consultations are an important mechanism to ensure that their concerns are taken into account while decisions are made.

In view of the above, public consultation meetings were planned by having a discussion with the PO, ITDA, Paderu and RDO, Paderu. In the planning process, the views of concerned MROs were also taken up. According to the field situations six meetings were carried out in 3 spells. Official letters were drafted and sent to the concerned officials in detail so as to necessary arrangements can be made for having a successful public consultation. The letters are given in Annexure-1 for reference. The Schedule of the meetings is as follows,

Table 8-1: Schedule of Meeting held

Date	Mandal	Villages Covered
29.12.2020	Paderu	3
08.01.2021	Chintapalli	10
08.01.2021	G.K. Veedhi	9
27.01.2021	G. Madugula	13
28.01.2021	Koyyuru	13
28.01.2021	Golugonda	3

Public consultation meetings were held with various stakeholders of the project to garner their views/opinions/ thought process/problems.

7.1.1 ISSUES DISCUSSED IN THE PUBLIC CONSULTATIONS

Issues discussed in the public consultations are listed below:

Brief introduction of the project, its importance, implementation and funding agency.
Loss of structures like Residential, Commercial, Residential & Commercial, PRs and others.
Loss of Agriculture lands.
Compensation for the affecting structures and lands.
Affecting CPRs.
Resettlement and Rehabilitation sites.
Road safety and health (HIV/AIDS).
Affecting Water bodies.
Gender issues.
Vulnerable persons.
Other issues.
Summary of the consultations have been documented/recorded as below:

7.2 PUBLIC CONSULTATION MEETING-1

At Paderu Mandal,
Location: RDO office, Paderu,

Date: 29.12.2020.

Public consultation meeting was conducted about proposed road project of NH-516E at Paderu mandal of Paderu division at RDO office on 29th December, 2020 around 3.00pm. Opening remarks of the meeting were given by Thasildhar of Paderu mandal by giving a brief on Land Acquisition procedures and administration rules related to National Highway project to the public who were to be affected under the NH-516 E proposed road.

Taking forward the meeting, Shri Bharat, Site Engineer explained the PAFs about technical aspects of the proposed project and also about the land acquisition works like stone plantation, identification and survey of boundaries related to this project.

Then Shri. VSN Murthy, Consultant for NH-516E explained about various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Highlighting the benefits to be accrued through the implementation of the proposed road project along NH–516E, Shri Dr. K. Mohana Rao, Social Impact Assessment expert explained in detail to the PAFs about the need and impact that would be created by project on the lives of the people in that area such as increased good transportation network to other states, increase in inter district transportation, better road connectivity of villages to highways would entail better transportation of the agriculture products/produce to local market yard for sale, decrease in number of road accidents, development of tourism belt in Araku and Lammasingiareas, better educational facilities for the children in that region.

Figure 8-1: Public Consultation meeting at Paderu Mandal (RDO Office)

Key issues Identified:

Fear of loss of land and difficulty to buy the land in current scenario. (Bonji Babu).

The PAFs are dependent primarily on these lands for their livelihood.

Most of the PAFs are apprehensive of the compensation not received so far for the previous road widening project for which they have given their land.

7.3 PUBLIC CONSULTATION MEETING-2

At Chinthapalli,
Location: MDO Meeting Hall, Chintapalli,
Date: 08.01.2021.

Public consultation meeting was conducted about proposed road project of NH-516E at Chinthapalli mandal of Paderu division at MDO Meeting Hall near MRO office on 08th January, 2021 around 11.00 am. Opening remarks of the meeting were given by Thasildhar of Chinthapalli mandal by giving a brief on Land Acquisition procedures and administration rules related to National Highway project to the public who were to be affected under the NH-516E proposed road.

Taking forward the meeting, Shri. Bharat, Site Engineer explained the PAFs about technical aspects of the proposed project and also about the land acquisition works like stone plantation, identification and survey of boundaries related to this project.

Then Shri. VSN Murthy, Consultant for NH-516E explained about various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Figure 8-2: Public Consultation meeting at Chinthapalli

Key Issues Identified:

Comoensation guidelines for non-tribal residents (settlers) for the loss of land.

Compensation need to be provided for the crop loss of coffee trees and pepper plants by considering the time for planning to harvest.

Diversion need to be considered in the corridor of Lammasingi to Tasagu road.
How land compensation will be calculated since there is no registrations in the tribal areas. Prospective PAFs seeking clarification on it.

Women participated in the meeting pleaded to avoid formation of the road through the residential areas to avoid loss of residential structures.

Revising the alignment in Lammasingi village is a major request from the villagers.

7.4 PUBLIC CONSULTATION MEETING-3

At G.K. Veedi mandal,
Location: MRO office, G.K. Veedi,
Date: 08.01.2021.

Public consultation meeting was conducted about proposed road project of NH-516E at G.K. Veedi mandal of Paderu division at MRO office on 08th January, 2021 around 11.00 am. Opening remarks of the meeting were given by Thasildhar of G.K. Veedi mandal by giving a brief on Land Acquisition procedures and administration rules related to National Highway project to the public who were to be affected under the NH-516E proposed road.

Taking forward the meeting, Shri. Bharat, Site Engineer explained the PAFs about technical aspects of the proposed project and also about the land acquisition works like stone plantation, identification and survey of boundaries related to this project.

Then Shri. VSN Murthy, Consultant for NH-516E explained about various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Figure 8-3: Public Consultation meeting at G.K. Veedi Mandal, Tahsildar Office

Key Issues Identified:

Sufficient measures need to be put in place to avoid such inconvenience for agricultural farming activities..

New culverts need to be constructed. Existing culverts need to be protected and the repairs works has to be taken up simultaneously if any.
How land compensation will be calculated as there is no registrations in the tribal areas. Prospective PAFs seeking clarification on it.

Compensation for the trees grown at the residences off the road.

Bus shelters has to be constructed at the village points.

7.5 PUBLIC CONSULTATION MEETING-4

At G. Madugula Mandal,
Location: MRO office, G. Madugula,
Date: 27.01.2021.

Public consultation meeting was conducted about proposed road project of NH-516E at G. Madugula mandal of Paderu division at MRO office on 27th January, 2021 at 11.00 am. Opening remarks of the meeting were given by Thasildhar of G. Madugula mandal by giving a brief on Land Acquisition procedures and administration rules related to National Highway project to the public who were to be affected under the NH-516E proposed road.

Taking forward the meeting, Shri. Bharat, Site Engineer explained the PAFs about technical aspects of the proposed project and also about the land acquisition works like stone plantation, identification and survey of boundaries related to this project.

Then Shri. VSN Murthy, Consultant for NH-516E explained about various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Highlighting the benefits to be accrued through the implementation of the proposed road project along NH – 516 E, Shri. Dr. K.Mohana Rao, Social Impact Assessment Expert explained in detail to the PAFs the need and impact that would be created by project on the lives of the people in that area. Increased good transportation network to other states, increase in inter district transportation, better roads from village to main road will entail better transportation of the agriculture products / produce to local market yard for sale. This inturn would have ripple effect like decrease in number of road accidents, development of tourism belt in Araku and limbasingi areas, there by improved roads would naturally entail better educational facilities for the children in that region.

Figure 8-4: Public Consultation meeting at G. Madugula Mandal, Thasildar Office

Key issues Identified:

During the previous road laying project, some of the irrigation channels/ feeder channels were not protected and as a result farmers are not getting their lands irrigated naturally.

How land compensation will be calculated as there is no registrations in the tribal areas. Prospective PAFs seeking clarification on it.

How to update their land ownership details if not updated before.

Compensation for Government distributed patta lands.

Compensation for structures on government lands.

7.6 PUBLIC CONSULTATION MEETING-5

At Koyyuru Mandal,
Location: MRO office, Koyyuru,
Date: 28.01.2021.

Public consultation meeting was conducted about proposed road project of NH-516E at Koyyuru mandal of Paderu division at MRO office on 28th January, 2021 at 10.00 am. Opening remarks of the meeting were given by Thasildhar of Koyyurumandal by giving a brief on Land Acquisition procedures and administration rules related to National Highway projects to the public who were to be affected under the NH-516E proposed road.

Taking forward the meeting, Shri. Bharat, Site Engineer explained the PAFs about technical aspects of the proposed project and also about the land acquisition works like stone plantation, identification and survey of boundaries related to this project.

Then Shri. VSN Murthy, Consultant for NH-516E explained about various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Figure 8-5: Sri .Thirupataiah, Thasildhar,Koyyuru mandal briefing to the PAFs about LA Procedures

Key Issues Raised:

Mr. Bhimaraju (Ramaraju palem): Requested the Thasildhar, Koyyuru to take a note of his concerns on losing his land and livelihood. Since his family is solely dependent on the land produce for their livelihood, requested the Government to fix applicable market rates as compensation for this land.

Mr. Pampa Govind (Thotaluru): Expressed his concern of losing his agricultural land including Geedimamidi thota and trees to which Thahasildar, explained in detail about the land Acquisition procedures and Compensation procedures as per Land Acquisition Act, 2013.

Mrs. D.Subhdramma (Katragadda Puram): Expressed her reservations on losing land and livelihood because of this project and sought for compensation details.

Mr. G. Bhimaraju (Ramaraju palem): Expressed his concern of losing his agricultural land including Geedimamidi thota and trees to which Thahasildar, explained in detail about the land Acquisition procedures and Compensation procedures as per Land Acquisition Act, 2013.

Mr. Battina Nagendrakumar(Ramaraju Palem): Enquired with Thahasildar if the compensaton is paid only to the Patta lands or for non – Patta lands as well.

Mr. Jampa Simhachalam(Katragadda): Requested the authorities to provide employment to one person in his family since his family is losing land and livelihood both.

7.7 PUBLIC CONSULTATION MEETING-6

At Golugonda Mandal,
Location: Kalyanamandapam, Sri Ramulavari Temple premises, K.D. Peta,

Date: 28.01.2021.

Public consultation meeting was conducted about proposed road project of NH-516E at Golugonda mandal of Narsipatnam division at Kalyanamandapam, Sri Ramulavari Temple premises, K.D. Peta on 28th January, 2021 at 12.30pm. Opening remarks of the meeting were given by Thasildhar of Golugonda mandal by giving a brief on Land Acquisition procedures and administration rules related to National Highway projects to the public who were to be affected under the NH-516E proposed road.

Taking forward the meeting, Shri. Bharat, Site Engineer explained the PAFs about technical aspects of the proposed project and also about the land acquisition works like stone plantation, identification and survey of boundaries related to this project.

Then Shri. VSN Murthy, Consultant for NH-516E explained about various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Figure 8-6: Site Engineer speaking on Technical aspects pertaining to NH-56E at Golugonda mandal

Key Issues Raised :

Mr. Rajagopal (K.D.Peta): Since the proposed, NH-516 E road is passing right through the mid of his land, requested the authorities to provide employment to one person in his family since his family is losing both land and livelihood.

Mr. P.V.Ramana (K.D.Peta): Requested to explain on detail the Land Acquisition procedures and the process of compensation payment. To this Thasildhar explained land Acquisition process and Compensation procedures as per Land Acquisition Act, 2013.

Mr. Kannuru Rajababu (K.D.Peta): Since the proposed, NH-516 E road is passing right through the mid of his land, which s currently of no use. Requested the authorities to provide employment to one person in his family since his family is losing both land and livelihood.

Mr. Kolagal Ramarao (Siripuram): He expressed his reservations that private party has approached him for sale of his land for Rs. 70 lakhs per 1 acre. He enquired with the authorities as to whether if same compensation amount would be paid to him if the Government is acquiring his land. To this Thahasildhar explained land Acquisition process and Compensation procedures as per land acquisition Act 2013.

Mr. S.Vasudeva Rao (K.D.Peta) : Raised query if any unemployment allowance is paid to the PAFs? How much rate is fixed by Govt. As compensationper acre of the land acquired? In how many instalments would be compensation be remitted to the actual land losers. To this a senior person in K.D.Peta explained land Acquisition process and Compensation procedures as per Land Acquisition Act, 2013.

Mr. Sivakesu (K.D.Peta): Enquired that his land is in court case and if his land is to be acquired for the project, would he be eligible for the compensation as per Government.

7.8 INFORMATION DISCLOSURE

To keep more transparency in planning and for further active involvement of affected persons (Aps) and other key stakeholders the project information including EIA report will be disclosed on the Website of MoRTH.

The details are attached as **Annexure-19.**

8 ENVIRONMENT MANAGEMENT PLAN

8.1 INTRODUCTION

Environmental Management Plan has been prepared which is mainly centered on the understanding the interactions between the environmental settings, project activities and the assessment of the anticipated impacts.

Mitigation measures for anticipated environmental impacts have been elaborated as specific actions which shall be implemented during the project implementation. The EMP would help the contractors/PIU to implement the project in an environmentally sustainable manner and where contractors understand the potential environmental impacts arising from the project road and take appropriate actions/mitigation measures to properly mitigate/manage such environmental impacts.

EMP can thus be considered to be an overview document for contractors that will guide environment management of all anticipated impacts in proposed two lane upgradation with paved shoulders of Paderu-Koyyuru Section of NH-516E. This EMP may also be considered as flexible and will be further developed by the Contractor in the Contractor's Environment Management Plan.

8.2 OUTLINE OF EMP AND ITS IMPLEMENTATION STRATEGY

The EMP is a guiding tool which discusses the potential environmental impacts and specific mitigation/management measures for the proposed two lane upgradation with paved shoulders of Koyyuru-Paderu Section of NH-516E. It refers to the responsibilities ensuring commitment for implementation and means of verification/supervision whether the same has been implemented properly or not. The timing and frequency of monitoring along with the supervision responsibility and reporting requirements are also provided in the Environmental Management Plan.

As a part of the EMP, the contractors will commit to identification of the environmental and social impacts at the project road. In case of any future changes in the project road design, the EMP will need to be updated to reflect the new scope of the activities. Such revisions will be finalized in consultation with the World Bank.

The PIU will be responsible to ensure implementation of EMP by the contractors with the overall accountability resting with the GNHCP-PMU. Whereas, the PIU/Authority Engineer will ensure periodic quality audit/guidance by imparting regular training, monitoring and ensuring that all EMP provisions and requirements are translated into contract documents so that these requirements are implemented to their full intent and extent.

Overall responsibility will be on the Contractor for effective implementation of EMP and adherence to all the mitigation measures as outlined in this EMP associated with their respective activities. The Contractor will be required to comply with the provisions of the EMP.

8.3 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management Plan (EMP) will guide the environmentally-sound construction of the project road and ensure efficient lines of communication/co-ordination between the PIU,Contractor, GNHCP-PMU. The EMP has been prepared into three stages based on project road construction activities i.e., (i) Pre-construction Stage; (ii) Construction Stage; and (iii) Demobilization Stage . EMP for the above project road have been prepared and presented in Table 9.1 Various guidelines, checklists and reporting formats for implementation of EMP are given as Annexures at the end of EIA Report.

The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site, (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the sub-project (iii) detail specific actions deemed necessary to assist in mitigating the environmental impacts of the project road and (iv) ensure that safety recommendations are complied.

Budgetary provisions for implementation of EMP shall be integrated with the bid/construction contract in the form of technical specifications and environmental performance requirements. The costs to be incurred on implementation of EMP shall be incidental to the civil works and therefore, no separate environment budget/cost will be provided to the contractor for implementation of EMP.

The contractor will ensure effective implementation of EMP during pre-construction, construction and demobilization stages. EMP for operation stage will be implemented by PIU/PMU.

The Contractor is deemed not to have complied with the EMP if,
i) within the boundaries of the project site/ancillary sites, site extensions and haul/access roads,
(ii) there is evidence of contravention of clauses,
(iii) if environmental damage ensues due to negligence,
(iv) the contractor fails to comply with corrective action measures or other instructions issued by the PIU/GNHCP-PMU within a specified timeframe and
(v) the Contractor fails to respond adequately to complaints from the public.

Table 9-1:Responsibilities during planning and execution

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
A	Pre construction stage			
	Pre construction stage activities by PIU			
A 1	Tree Cutting	• Approximately 7803 trees are likely to be felled for upgradation of the project. All efforts shall be made to minimise cutting of trees. • Prior permission shall be obtained for cutting trees	PIU	PMU
A 2	Tree preservation	• All efforts shall be made to preserve trees including evaluation of minor design adjustments/alternatives as applicable to save trees. • In the event of design changes, additional assessments including the possibility to save tree shall be made. Stacking, Transport and storage of wood shallbe done as per relevant norms. Systematic corridor level documentation of trees cut and those saved will be maintained by PIU	PIU	PMU
A 3	Utility Shifting	Electric lines and OFC cables are running parallel to the road and the offset varies from 1m to 15m from the edge of the road. Deep bore wells, pump rooms, etc., are present along the project road stretch. In addition to the above, Panchayat and Municipal water supply distribution lines and drainage lines are also present and most of these public utilities are located very close to the highway on either sides of the road. Hence, these have to be relocated to accommodate the proposed 2-lane highway. In Package –I nearly 11100m pipeline (HDPE) is there within the Row need to be shifted. Along with that, 3 borewells with pumpsets, 2 pumphouses, 6 handpumps and one water tank needs to be shifted. In Package –II , 16410 m pipeline (HDPE) is there within the Row need to be shifted. Along with that, 2 borewells with pumpsets, 1 open well, 2 pumphouses, 7 handpumps and one water tank needs to be shifted. In Package III, 16 borewell with motors	PIU	PMU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		, borewells 14, R O plants, Solar 4, pumpsets 5, wells 1 are there to be shifted. Priorpermissions shall be taken from concerned department officials, i.e., Telecommunication for OFC cables, PRD for water pipelines and APEPDCL for electric poles and towers. Utility shifting shall be undertaken by PIU. Chainagewise reference pf Utility given in the chapter 2 of this report.		
	Orientation of implementation agencies	PIU shall organize orientation sessions to the contractor. This shall include on-site training sessions. Training shall include project staff, Contractors, consultants.	PIU	PMU
	Pre-construction Activities By the Contractor			
A 4	Appointment and Mobilization of Environment & Safety Officer	• The contractor shall appoint qualified Environment and Safety officer (ESO) who work for implementation of EMP including occupational health and safety measures. • The Contractor shall inform the PIU on the appointment and mobilization of each ESO.	Contractor	Authority Engineer and PIU
A 5	Regulatory Approvals	• Prior permission shall be obtained from the concerned department for any works related to culverts,embankment construction, for protective work etc along or near natural streams. • Labour license from Department of Labour. • If contractors intends to open new stone quarry or borrow areas, then prior Environmental clearance shall be obtained from SEIAA/DEIAA. • For setting up Stone Crushing plant, HWM plants, Batching plant, DG sets a consent to establishment and operate shall be obtained from Andhra Pradesh Pollution control Board or if contractor intend to procure construction materials from authorized third party agencies then contractor will collect and submit clearance/approval from authorized third party agencies.	Contractor	AuthorityEngineer and PIU.

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
A 6	Procurement of Machinery, Crushers, Batching Plants Etc	• Specifications of Machinery, crushers, and batching plants shall comply with the requirements of the relevant environmental legislations. Crusher, Batching plants and hot mix plant shall be located 250m away from settlements/ commercial establishments, preferably in the downwind direction. • No plants should be set-up within 250m from the residential/settlement locations. The Contractor shall submit a detailed layout plan for such sites and seek prior approval of PIU before entering into formal agreement with a land owner for setting-up such sites. • Actions by PIU/PMU against any non-compliance shall be borne by the Contractor at his own cost. Arrangements to minimize dust pollution through provision of water spray shall be provided at such sites.	Contractor	Authority Engineer, PIU
A 7	Construction Camp Locations – Selection, Design & Layout	• The Contractor will obtain consent from land owners in writing for temporary use of land for construction and labour camps, etc. • The Contractor shall submit a detailed layout plan for construction and labour camps and seek prior approval of PIU/Authority Engineer before entering into formal agreement with a land owner for setting-up such sites. • Layout of construction camp will ensure proper planning of plants, materials storage, sufficiently wide roads for free and safe movement of vehicles, construction equipment and workers.	Contractor	Authority Engineer, PIU
A 8	Arrangements for Temporary Land for Camp	The Contractor shall obtain consent from land owners in writing for temporary use of land for Construction camp, labour camp, etc.	Contractor	Authority Engineer, PIU
A 9	Construction Vehicles, Equipment and	• All vehicles and equipment to be procured for the proposed upgradation works of project road shall conform to the relevant Bureau of Indian Standard (BIS) norms. The discharge standards promulgated	Contractor	Authority Engineer, PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
	Machinery.	under the Environment Protection Act, 1986 and Motor Vehicles Act, 2019 shall be strictly adhered to. • The silent/quiet equipment like DG set as per regulations shall be used at the construction site or labour camp. • The contractor shall maintain records of Pollution Under Control (PUC) certificates for all vehicles used during the contract period, which shall be Produced to PIU for monitoring whenever required.		
A 10	Arrangement for Construction water	• The contractor shall source construction water preferentially from Surface water bodies in the project area. Boring of any tube wells shall be drilled only after obtaining necessary permission from Central Ground Water Authority. • To avoid disruption/disturbance to other water users, the contractor shall extract water from fixed locations. The contractor shall consult the local people before finalization of the locations. • Contractor can extract ground water only in case surface water sources are not available and that too only after proper permission from Central Ground Water Authority.	Contractor	Authority Engineer, PIU
A 11	Sand (all river beds used directly or indirectly for the project)	If the supplier of sand is another (third) party, then the authentic copy of lease agreement that has been executed between the local Thasildar and the supplier has to be submitted to PIU/PMU of the project, before any procurement is made from such a site. Environmental clearance for stone quarry and borrow area shall be obtained from DEIAA/SEIAA.	Contractor	Authority Engineer, PIU
A 12	Labor requirement	• The contractor preferably shall use unskilled/semiskilled labour from local areas to give the maximum benefit to the local community to avoid any additional stress on the existing facilities. On an average 150 labours/ day will be required during construction stage depending upon extent of construction work. • All applicable labour regulation shall be complied by the contractor.	Contractor	Authority Engineer, PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• Necessary facilities shall be provided to workers as per The Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996		
A 13	Traffic Management Plan- Planning for Traffic Diversions and Detours	• Detailed traffic control plan shall be prepared by the contractor and same shall be submitted to the PIU for approval. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements including night time safety measures, details of traffic arrangement after cessation of work each day, safety measures undertaken for transport of hazardous materials and arrangement of flagmen etc to regulate traffic congestion. • The contractor shall provide specific measures for safety of pedestrians and workers as a part of traffic control plans. The contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • The Contractor shall also inform local community about diversion in traffic routes and pedestrian access arrangements with assistance from PIU.	Contractor	Authority Engineer, PIU
A 14	Stockyard/ Storage of Construction Material and Establishing Equipment Laydown Area	• Contractor in consultation with PIU shall identify the site for temporary use of land storage of construction materials including pipes etc. These sites shall not cause an inconvenience to local population / traffic movement. These locations shall be approved by the PIU. • Selection of location for materials storage and equipment lay-down areas must take into account of prevailing winds, distances to adjacent land uses, general on – site topography and water erosion potential of the soil. Impervious surfaces must be provided wherever necessary. • Protect material stockpiles from storm water (e.g. by excavating a cutoff ditch around stockpiles to keep away storm water).	Contractor	Authority Engineer, PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• Enclosed storage for fuel with non- permeable flooring. • Contractor shall cover material stockpiles with tarpaulin or other materials. Avoid stockpiling material near natural streams. • Proper cover and stacking of loose construction material will be ensured during construction of outfall structures at construction site to prevent surface runoff and contamination of receiving water body. • Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances like bitumen, diesel, used oil and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. Necessary training and awareness program shall be carried out to make sure that the contractor and its staff are well aware about hazardous nature of substances.		
A 15	Information Dissemination and Communication Activities	• Prior to construction activity, information dissemination shall be undertaken by the contractor at the project site. The wider dissemination of information to public shall be undertaken through the disclosure of EA / EMP reports on the website of MORTH. • Project information Board showing the name of work, project cost, duration, date of commencement, date of completion, executing agency and contact details (including telephone numbers) shall be displayed on both sides of the roads in english and in vernacular languages. • Information boards shall also be setup at the sites of construction camps, labour camps, plants and stockyard site. • Details of nodal officer with telephone numbers shall be displayed for registering compliant/grievances by stakeholder/general public.	Contractor	Authority Engineer, PIU
B	Construction Stage			

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
B 1	Site clearance(Clearing and grubbing)			
B 1.1	Clearing, grubbing and leveling	• If required vegetation shall be removed from the construction zone only. • All works shallbe carried out in such a way that the damage or disruption to flora other than those identified is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shallbe removed with prior approval of PIU. • The Contractor, under any circumstances shall not cut or damage trees. • Trees identified under the project shall be cut only after receiving necessary permissions. Vegetation with girth size of over 30 cm will be considered as trees and shall be compensated.	Contractor	Authority Engineer, PIU
B 1.2	Dismantling of Culverts	Reconstruction of 38 culverts is proposed in the project road. All necessary measures shall be taken especially while working close to cross drainage channels to prevent earthwork, stonework, materials and appendage as well as the method of operation from impeding cross-drainage at streams, water canals, existing irrigation and drainage systems. Demolition wastes shallbe collected and disposed as per the provision of Construction & Demolition Rule 2016.	Contractor	Authority Engineer, PIU
B 1.3	Generation and Disposal of debris	• Debris generated due to the dismantling of the existing road shall be suitably reused in the proposed construction. • Scarified asphalts and the other construction wastes shall be appropriately re-used in road construction with the permission of PIU. The dismantled road and scarified bitumen waste shall be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes, parking areas along the roads or in any other manner approved by the PIU.	Contractor	Authority Engineer, PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• The Contractor shall suitably dispose off unutilized debris and waste materials either through filling up of borrows areas located in wasteland or at pre-designated disposal locations, subject to the approval of the Environmental Expert of PIU. • At locations identified for disposal of residual bituminous wastes, the disposal shallbe carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. The Contractor shallensure that the surface area of such disposal pits is covered with a layer of soil. • All arrangements for transportation during construction including dismantling and clearing debris shall be considered incidental to the work and shall be planned and implemented by the Contractor as approved and directed by the Environmental Expert of PIU. • The pre-designed disposal locations areshallbe a part of Solid Waste Management Plan which shall be prepared bythe Contractor in consultation and with approval of Environmental Expert of PIU. • Debris generated from pile driving or other construction activities shall be disposed in sucha way that it does not flow into the surface water bodies or form mud puddles in the area.		
B.1.4	Stripping and Stocking and preservation of top soil	• The topsoil from areas to be permanently covered shall be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of the temporarily acquired area and/or right of use shallbe earmarked for storing topsoil. The locations for stock piling shallbe pre-identified in consultation and with approval of Environmental Specialist of PIU. The following precautionary measures shallbe taken to preserve them till they are used: (a) Stockpile shall be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To	Contractor	Authority Engineer, PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		retain soil and to allow percolation of water, silt fencing shall protect the edges of the pile. (b) Stockpiles shall not be surcharged or otherwise loaded and multiple handling shallbe kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation. It shall be ensured by the Contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be utilized for: • Covering all disturbed areas including borrow areas is necessary, only in a case where there is rehabilitation • Dressing of slopes of road embankment • Agricultural fields of farmers acquired temporarily land.		
B 1.5	Accesability	The Contractor shallprovide safe and convenient passage for vehicles, pedestrians and livestock from roadsides and property accesses connection to the project road by providing temporary connectingroad. The Contractor shallalso ensure that the existing accesses will not be undertaken without providing adequate provisions. The Contractor shalltake care that the cross roads are constructed in such a sequence that construction work on the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.	Contractor	Authority Engineer, PIU
B 1.6	Planning for Traffic Diversions And Detours	•Temporary diversions shall be constructed with the approval of the Environmental Specialist of PIU. Detailed Traffic Control Plans shall be prepared by the Contractor and approved by Environmental Specialist seven days prior to commencement of works on any section of road. • The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures	Contractor	Authority Engineer, PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		for night time traffic and precaution for transportation of hazardous materials and arrangement of flagmen. • The Contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • The Contractor shall also inform local community of changes to traffic routes, conditions and pedestrian access arrangements. The temporary traffic detours shall be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).		
B.2 Procurement of Construction Materials				
B 2.1	Procurement for Aggregate and other construction materials	• No borrow area shall be opened without permission of the Environmental Specialist and without obtaining necessary regulatory permission. The location, shape and size of the designated borrow areas shall be as approved by the Environmental Specialist and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 36: 2010). The borrowing operations shall be carried out as specified in the guidelines for siting and operation of borrow areas. • The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be maintained dust free by the Contractor. Sprinkling of water shall be carried out twice a day to control dust along such roads during their period of use. • During dry seasons (winter and summer) frequency of water sprinkling shall be increased in the settlement areas and Environmental Specialist of PIU will decide the sprinkling time depending on the local requirements. Contractor shall rehabilitate the borrow areas as soon as	Contractor	Authority Engineer, PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		borrowing of soil is over from a particular borrow area in accordance with the approved borrow area Redevelopment Plan.		
B 2.2	Quarry Operations & Crushers	The Contractor shall obtain materials for approved quarries. The crushers will be operated after obtaining consent to establish and consent to operate from APPCB.	Contractor	Authority Engineer /PIU
B.2.3	Transporting Construction Materials	• Contractor shall maintain all roads, which are used for transporting construction materials, equipment and machineries. • All vehicles delivering fine materials like aggregate, cement, earth, sand, etc. to the site will be covered by Tarpaulin to avoid spillage of materials and wind-blown dust from the top of vehicles. • Existing road used by vehicles of the contractor or any of his subcontractor or suppliers of materials shall be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. • The contractor shall make effort to transport materials to the site in nonpeak hours	Contractor	Authority Engineer /PIU
B 3 Construction work				
	Labour Camp Site	• Project information board shall be displayed at the labour camp site. • Electrical cables and wires shall be properly arranged with proper electrical safety. Loose electrical connections shall not be allowed at the labour camp. • Red danger sign with bone & skull shall be displayed as per The Electrical Rules at three phase motors, electrical panels and electrical machines, DG sets, etc. • Housekeeping at labour camp shall be maintained properly. Daily sweeping and cleaning shall be done at the labour camp. • HIV Aid awareness posters shall be displayed at the camp site. • Solid waste generated at the camp site shall be collected in covered	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		waste bins. Then, it shall be segregated as biodegradable (food waste, paper, etc) and non-biodegradable (plastic, polyethylene bag, etc) wastes. Polyethylene/plastic wastes will be stored in empty cement bags and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc) solid waste shall be disposed in compost pit. Non-biodegradable inert wastes shall be sent to nearest land fill site. Proper drinking water, well ventilated accommodation, sanitation, canteen facilities shall be provided to workers at the labour camp. • Suitable signages shall be displayed at labour camps.		
B 3.2	Drainage and Flood control	• Major bridges, minor bridges , pipe culverts and box culverts are proposed to be constructed in the proposed project • The Contractor shall ensure that no construction materials/debris shall block the water flow or create water lodging at the work site. The Contractor shall take remedies to remove accumulated water (if any) from the construction sites, camp sites, storage yard, excavated areas etc. • Construction works shall be planned well in advance prior to on-set of monsoon to avoid water- pool besides providing temporary cross drainage systems. The contractor shall take all adequate precautions to ensure that construction materials and excavated materials are enclosed in such a manner that erosion or run off of sediments is controlled. • Silt fencing shall be installed prior to the onset of the monsoon at all therequired locations, as directed by PIU/PMU. Prior to monsoon, the contractor shall provide either permanent or temporary drains to prevent water accumulation in surrounding residential, commercial and Agricultural areas.	Contractor	Authority Engineer /PIU
B 3.3	Siltation of Water Bodies	• The project road crossing natural streams at design chainage which remain dry in non-rainy days.	Contractor	Authority Engineer, PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
	and Degradation of Water Quality	• The Contractor shall not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction. • The Contractor shall construct silt fencing at the base of the embankment construction for the entire perimeter of any water body (including wells) adjacent to the project road and around the stockpiles at the construction sites including ancillary sites close to water bodies. The fencing shall be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road. • Contractor shall ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse. • On completion of construction of culverts and bridges, drainage channels shall be cleared by collecting debris and disposed suitably. Detours/diversions constructed for construction of culverts and bridges shall be cleared before onset of monsoon.		
B 3.4	Slope Protection and Control of Soil Erosion	• For construction of realignments earth filling shall be required for embankment for new road construction, which shall require slope protection and control of soil erosion. • The Contractor shall construct slope protection works as per design, or as directed by PIU to control soil erosion and sedimentation through use of Breast walls, Retaining Walls, gabion wall, dykes, sedimentation chambers, basins, fibber mats, mulches, grasses, slope, drains and other devices. • All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such no separate payment shall be made for them. Contractor shallensure the following aspects	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• After construction of road embankment, the side slopes shall be covered with grass and shrubs as per design specifications. • Turfing works will be taken up as soon as possible provided the season is favourable for the establishment of grass sods. Other measures of slope stabilization shall include mulching netting and seeding of batters and drains immediately on completion of earthworks. • In borrow pits, the depth shall be so regulated that the sides of the excavation shall have a slope not steeper than 1 vertical to 2 horizontal, from the edge of the final section of the bank. • Along sections abutting water bodies, pitching shall be done as per design specifications to protect slopes.		
B 3.6	Pedestrian and Vehicular Traffic Movement Management	• Detailed traffic control plans shall be prepared and submitted to the PIU for approval one week prior to commencement of works. • The traffic control plans shall contain details of temporary diversion, details of arrangements for construction (road stretches, timing and phases). • Construction itinerary shall be provided in advance so that the road users can use alternative routes. • Warning and safety signs of ongoing works shall be erected. • Suitable retro reflective warning signs shall be placed near construction locations and they shall be visible at night. • Alternative access ways shall be communicated to the community by way of announcement appropriately for the public information. • The contractor shall take all necessary measures for the safety of traffic during construction and shall provide, erect and maintain such barricades, including signs, markings, flagmen as proposed and approved by PIU. The contractor shall ensure that all signs, barricades,	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		pavement markings are provided as per applicable IRC code and guidelines. Install signage, barricading, fencing as required and include safety measures for transport of materials/ equipment's, which shall be limited to certain times, and arrangements for flagmen at intersection.		
B 3.7	Provision of wildlife crossings	• A box culvert at chainage 150+683 (with dimensions 1x2x4 m) needs to be constructed at double the width (dimensions 1x4x4 m) to provide a better underpass facility for Sloth Bear. • Reflectors need to be installed at regular along the sides of the road passing through natural forest habitat, in a manner that light from approaching cars is reflected into the surroundings to encourage wildlife to move away during darkness. • Signage needs to be installed at each stretch of road passing through natural forest habitats to warn road users of the potential presence of large wildlife and risk of traffic accidents.	Contractor	Authority Engineer /PIU
		• Three canopy bridges need to be installed across the road passing through natural forest between chainages 129+000 and 131+800, and between 150+300 and 161+800. Locations needs to be selected during construction to be but widely spaced and installed where canopy bridges can be installed between large trees on either side of the road. Design will follow exisiting designs adopted by MoRTH elsewhere in India.	MoRTH	Authority Engineer /PIU
B 3.8	Excavation works for longitudinal drains along road corridor	• As per DPR, Earthen drains shall be provided through-out the project road to ensure efficient drainage from carriageway to drain. All drains shall be connected to cross drainage structure. Median drains shall be provided with rain water harvesting structure. • At the excavation site, warning sign boards shall be displayed in vernacular language and English.	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• Entry of general public/unauthorized person shall be restricted. • During excavation for laying of concrete (RCC) cover drains necessary safety measures shall be taken by the contractor. • Excavation of 1.5 meters deep or greater requires sides protection (Close Timbering and step cutting) unless the excavation is made entirely in stable rock. • Contractor shall follow strict protocol during construction/ excavation for longitudinal drainage especially along the sensitive receptors like schools, mosque, community centers, religious places, shrines, grave yard etc. Excavated earth will be collected and disposed in pre-identified site with the approval of PIU. Excavated earth shall not be dump on the carriageway or shoulders. • Casted drain block and drain cover shall not be stacked on the road. • To ensure elimination of excavation hazards, excavation shall be carried out in the presence of competent person. • Suitable barricading shall be provided around the excavation site. • Suitable personal protective equipment shall be provided to the workers		
B 3.9	Handling of cement bags	• Cement bags shall be stored and emptied in covered area to control fugitive dust emissions. • While handling and emptying cement bags, workers shall wear masks, hand gloves and protective goggles. • Manual transferring of cement bags from one place to another place shall not be allowed. For this purpose, trolley shall be used.	Contractor	Authority Engineer /PIU
B 3.10	Work-zone safety Management	• The Contractor shall prepare the construction safety plan as per provisions under the IRC 67-2001, SP-55 for safe work zone and the same shall be approvedby the environmental specialist of PIU/PMU prior to start of road works.	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• Temporary barricades shall be provided to delineate construction zone as well as material stacking areas. The construction site and the labour facility (if any) shall be appropriately barricaded to prevent entry and accidental tress passing of workers, staff and others into the construction site. • All operational areas shall be access controlled. Watch and ward facilities at all times shall be provided by the contractor. • Proper retro reflective warning signage shall be installed on the access road next to the construction site about movement of construction machinery and vehicles. • In excavations for longitudinal surface road drains, culverts etc., a high visibility warning and retro reflective signage shall be displayed in vermicular language and English. Entry of unauthorized persons shall be restricted. Excavation of 1.5 metres deep or greater shall be adequately barricaded. • There shall be adequate lighting arrangement at night to prevent mishaps after construction activity ceases for the day. All the retro reflective Safety signage as per IRC 55 shall be erected at construction site for generating awareness among local Community and road user during the construction.		
B 3.11	Sensitive Receptors Impact Management	• The construction operationsat each sensitive receptor i.e., schools, religious places, shrines, community centers, grave yards etc and general residential houses shall be limited to a time period of 7:30 am to 6:00 pm. • Periodic maintenance and calibration of construction equipment's/vehicles shall meet applicable CPCB emission standards. • Contractor shall ensure regular dust suppression measures by way of standard and efficient water sprinkling through water tankers at designated sensitive receptors.	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• Noise barriers shall be installed during the construction phase to protect the school from the noise of construction activities. • Adequate barricading and safety measures shall be provided and ensured to protect from dust pollution and noise impacts on sensitive receptors like schools and religious places etc., due to vehicle movement prior to the start of work and their effectiveness shall be checked during construction.		
B 3.12	Occupational health and safety workers	• The contractor shall prepare and follow the OHS plan, including provisions for emergency response plan • All workers shall be provided with requisite personal protective equipment. • Emergency Telephone Numbers shall be displayed at camp and plant site. • Medical facilities shall be provided for workers at Labour camp and plant site	Contractor	Authority Engineer /PIU
B 4 Pollution				
B.4.1.1	Water Pollution from Construction Wastes	• The major nalla is crossing the project road at km 139+480 and at km 147+970. Besides, large number of streams and road side tanks are present along the project road. Only seasonal flow is observed in all the water bodies. • The contractor shall take all precautionary measures to prevent entering of wastewater into streams, water bodies or the irrigation system during construction. Contractor will avoid construction works close to the Streams or water bodies during monsoon. Contractor shall not wash the construction vehicles in river water and enter riverbed for that purpose. • Any type of construction wastes shall not be disposed in rivers or water bodies.	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
B 4.1.2	Waste water lubicants	• Waste water generated from the sanitary facilities at labour camp shall be treated in septic tank followed by soak pit. • No untreated raw sewage/waste water shall be discharged into any river and water body. • Workers shall not be allowed for open defecation. Proper toilets fitted with septic tank and soak pit shall be provided for workers at camp site. At the bridge construction site portable toilets shall be provided for workers and sewage from portable toilets shall be passed through septic tank followed by soak pit.	Contractor	Authority Engineer /PIU
B 4.2 Air Pollution				
B 4.2.1	Dust Pollution	• Road construction works specially earth work and movement of construction vehicles plying during construction phase shall may add to dust and gaseous air pollution along the project road. • Frequent dust suppression shall be ensured for this stretch of the road by use of water tankers. • The contractor shall procure the construction machineries, which conforms to the pollution control norms specified by the MoEF&CC/CPCB/APPCB. • The excavated earth /construction materials shall be stored properly so that it does not generate fugitive emissions. • Regular maintenance of vehicles to be used for materials transportation and equipment shall be carried and vehicular pollution check should be made mandatory. Mask and other PPE should be provided as a mandatory effort to the construction workers in dust prone areas.	Contractor	Authority Engineer /PIU
B 4.2.2	Emission from Construction Vehicles, Equipment and	• The contractor shall ensure that all vehicles, equipment and machinery used for construction works are regularly maintained and conform that pollution emission levels comply with the requirements of CPCB and/Motor Vehicles Rules. The contractor shall submit	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
	Machineries	Pollution Under Control (PUC) certificates for all vehicles used in the project. • DG set shall be provided with chimney of adequate height as per CPCB guidelines (Height of stack in meter = Height of the building + 0.2 √KVA). • The environmental monitoring shall be conducted as per the monitoring Plan.		
B 4.3 Noise Pollution				
B 4.3.1	Noise Levels from Construction Vehicles and Equipment's	The contractor shall confirm the following: • All construction equipment used in excavation, concreting, etc, shall strictly conform to the MoEF&CC/CPCB/APPCB noise standards. • All vehicles and equipment used in construction works shall be fitted with exhaust silencers/mufflers. • Maintenance and servicing of all construction vehicles and machineries shall be done regularly. • Only acoustic enclosures fitted DG sets shall be allowed at the construction site and labour camp. • At the construction sites within 150 m of the nearest habitation, noisy construction work and use of high noise generation equipment will be stopped during the night time between 10.00 pm to 6.00 am. • Working hours of the construction activities shall be restricted around educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors. • Noise monitoring shall be carried out in construction areas through the approved monitoring agency.	Contractor	Authority Engineer /PIU
B 5 Archaeological Resources and Cultural properties				
	Chance in Finding of Archaeological Property	• All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		with as per provisions of the relevant legislation. • The contractor shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He shall immediately (upon discovery thereof and before removal) acquaint the Environmental Expert of the AE of such discovery and carry out the PIU's instructions for dealing with the same, waiting which all work shall be stopped. • The PIU seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.		
B 5.2	Impacts on Cultural Properties	All necessary and adequate care shall be taken to minimize impact on cultural properties which includes cultural sites and remains, places of worship including mosques, temples, shrines, etc., graveyards, monuments and any other important structures as identified during design stage. • Relocation and enhancement measures shall be taken up as per design and in consultation with local community. Access to such Properties from the road shall be maintained clear and clean.	Contractor	Authority Engineer /PIU
B 6 Personal Safety				
B 6.1	Personal Safety Measures for Labours and Staff	The contractor shall take necessary measures for personal safety of workers: • Protective safety shoes, gum boots, hand gloves, protective goggles, etc (as required) will be provided to the workers employed in excavation, steel rebaring and bending, concrete works, erection of pump station,etc. • Welder's protective eye-shields shall be provided to workers who areengaged in welding works. • Earplugs shall be provided to the workers exposed to high noise levels.	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• Safety vests shall be worn by workers when they work on construction site. • The Contractor shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. • The contractor shall comply with all the precautions as required for ensuring the safety of the workmen as far as those are applicable to this contract. • The contractor shall make sure that during the construction work all relevant provisions of Building and other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996 are adhered to. • The Contractor shall not employ any person below the age of 14 years for any work.		
B 6.2	Traffic and Safety	• The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the traffic control plan/drawings and as required by the Environmental Expert for the information and protection of traffic approaching or passing throughthe section of any existing cross roads. • The Contractor shall ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications. • Before taking up of construction, a Traffic Control Plan shall be devised and implemented to the satisfaction of the Safety Expert of AE	Contractor	Authority Engineer /PIU
B 6.3	Emergency Management	• Emergency numbers shall be displayed at the construction sites and camp site. • First aid boxes shall be made available at construction site and camp site,	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• Fire extinguishers for petroleum oil fire and electrical fire shall be made available at camp site, fuel storage site, construction site etc. • Designated vehicles, which can be used as ambulance shall be available at construction site at all the time.		
B 6.4	Risk force measure	• The contractor shall make required arrangements for prompt first aid treatment to minimise the mishap, if any during the operation of machinery/construction vehicles, dismantling, excavation, concrete pouring, hot asphalt handling and erection of pumps. • Construction Safety Plan for the all the road stretches, embankment development, protection works, longitudinal drains, ancillary sites shall be prepared by the contractor and to identify necessary actions in the event of an emergency	Contractor	Authority Engineer /PIU
B 6.5	First Aid facility	The contractor shall arrange for : • A readily available first aid unit including an adequate supply of sterilized dressing materials, burn ointment and appliances as per the state Factories Rules andshall be maintained at all the time by the contractor. • Availability of first aid trained persons shall be ensured at the project site during construction phase. • Availability of suitable transport shall be ensured at all times to take injured or sick person(s) to the hospital.	Contractor	Authority Engineer /PIU
B 6.6	Informatory signs and hoardings	The Contractor shall provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the Environmental Specialist of AE	Contractor	Authority Engineer
B 7 Labour camp and Project site management				
B 7.1	Accommodation for Laborers	• Contractor shall follow all relevant provisions of the Building and the other Construction Workers (Regulation of Employment and	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		Conditions of Service) Act, 1996 for construction and maintenance of labour camp. • The location, layout and basic facility provision of each labour camp shall be submitted to Environmental Expert of AE prior to their construction. • The construction of labor camp shall commence only upon the written approval of the Environmental Expert of AE. • The contractor shall maintain necessary well ventilated living accommodation, toilets, bath rooms and ancillary facilities in functionaland hygienic manner. • Proper ventilation along with standard exhaust fans shall be provided in labour accommodation rooms. • Regular cleaning and sweeping shall be ensured at the labour camp site. • Systematic waste collection management at labour camp shall be managed as per SWM Rules 2016. Standard First Aid Kits/units including an adequate sterilized dressing Materials shall be maintained.		
B 7.2	HIV/AIDS Prevention Measures	Necessary HIV/AIDS prevention measures shall be taken at labour camp. HIV/AIDS awareness program shall be organized by the Contractor's Environment & Safety Officer.	Contractor	AuthorityEngineer /PIU
B 7.3	Potable Water for Workers	• The contractor shall construct and maintain labour accommodation in such a fashion that uncontaminated clean water is available for drinking, cooking, bathing and washing. The contractor shall also provide potable water facilities within the precincts of workplace/pump stations in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions ofService) Act, 1996. • The contractor shall also provide the following:	Contractor	AuthorityEngineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		a) Supply of sufficient quantity of potable water (as per IS) at construction site/labour camp (site at suitable and easily accessible places and regular maintenance of such facilities). b) If any water storage tank is provided then it shall be kept such that the bottom of the tank at is least 1 meter above the surrounding ground level. c) If water is drawn from any existing well/ hand pump, which is within 30 meters proximity of any toilet, drain or other source of pollution, then the well shall be disinfected before water is used for the drinking. Environmental Expert of PIU shall be required to inspect the labour camp once in a week to ensure the compliance of the EMP.		
B 7.4	Sanitation and Sewage System at Labour Camp	The contractor shall ensure that : • The sewage system for the camp shall be designed, built and operated in such a fashion that no health hazard occurs and no pollution to the air, ground water or adjacent water courses take place, Separate toilets/bathrooms, as required, shall be provided for men and women, marked in vernacular language, • Toilets shall be provided with septic tank followed by soak pit. • Adequate water supply shall be provided in all toilets and urinals, • Night soil shall be disposed of with the help of municipality or disposed of by putting layer of it at the bottom of a permanent pit prepared for such purpose and covered with 15 cm layer of waste or refuse and then covered with a layer of earth for a fortnight.	Contractor	AuthorityEngineer /PIU
B 7.5	Waste disposal	• The contractor shall provide garbage bins in the camp & construction site and ensure that these are regularly emptied and disposed off in a hygienic manner according to Solid Waste Management Plan as per Solid Waste Management Rule 2016. • Burning of wastes at construction site & labour camp and road side shall not be allowed.	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		• Solid waste generated at the construction site & labour camp, shall be collected in covered waste bins and segregated as biodegradable (food waste, paper, etc) and non-biodegradable(plastic, polyethylene bag, etc) wastes. Polyethylene/plastic wastes shall be stored in empty cement bags and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc) solid waste shall be disposed in the compost pit.		
B 8 – Environmental Monitoring				
B 8.1	Environmental Monitoring Construction Stage	Environmental monitoring for ambient air quality, noise levels and waterquality shall be carried out as per environmental monitoring plan and in accordance to instruction of Environmental Specialist of PIU.	Contractor	Authorized Engineer /PIU
B 8.2	Compensatory Plantation	Loss of trees shall be compensated by 1:2 ratio (i.e. for loss of 1 tree, 2 trees shall planted) and transplantation of the same trees may be envisaged wherever applicable. • Regular monitoring shall be carried out for plantation along the project road for cutting of trees	PIU	PMU
C – Contractor's Demobilization				
C.1	Clean-up Operations, Restoration and Rehabilitation	• The contractor shall prepare project and labour camp site restoration plan, which shall be approved by the PIU / Environmental Expert. The clean-up and site restoration operations are to be implemented by the contractor prior to demobilization from construction site and labour camp. The contractor shall clear all temporary structures, debris, construction wastes, garbage, night soils, etc in environmental sound manner. • All disposal pits or trenches shall be filled in and effectively sealed off. • Construction places including camp and any other area used/affected	Contractor	Authority Engineer /PIU

S.No	Environmental Issues	Environmental Mitigation Measures	Responsibilities	
			Planning & Execution	Supervision/Monitoring
		due to the project operations shall be left clean and tidy at the contractor's expense to the entire satisfaction to the PIU.		
C 2	Land Rehabiliation	• All surfaces hardened due to construction activities shall be ripped &imported materials thereon removed. • All rubbles shall be removed from the site to an approved disposal site. Burying of rubble on site is prohibited. • Surfaces shall be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Engineer. • All embankments shall be trimmed, shaped and replanted to the satisfaction of the PIU. • Borrow pits shall be closed and rehabilitated in accordance with the pre-approved management plan for each borrow pit. The Contractor shall liaise with the PIU regarding these requirements. All surfaces hardened due to construction activities shall be ripped &imported materials thereon removed.	Contractor	Authority Engineer /PIU
D – Post Construction stage				
D 1	Environment Monitoring Post Construction stage	Environmental monitoring for ambient air quality, noise levels and water quality as per environmental monitoring plan and in accordance to instruction of Environmental Specialist of PMU.	PIU	PMU
D 2	Monitoring of Afforested and Landscape areas	Continuous watch and monitoring of plantation and landscape areas shall be done for its performance and survival rate. The plantation shall be properly guarded by watch and ward personnel. Provision shall be made for manure application and watering on schedule.	PIU	PMU
D 3	Soil erosion and monitoring of Borrow areas	Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, shall be carried out once in every three months.	PIU	PMU

8.4 CLAUSE FOR NONCONFORMITY TO ENVIRONMENTAL MANAGEMENT PLAN (EMP) – PROTECTION OF THE ENVIRONMENT

The Contractor shall implement necessary mitigation measures for which responsibility is assigned to him as stipulated in the EMP. Any lapse in implementing the same shall attract the damage clause as detailed below:

Any complaints of public, within the scope of the Contractor, formally registered with the PIU and communicated to the Contractor, which is not properly addressed within the time period intimated by the PIU shall be treated as a major lapse.

Non-conformity to any of the mitigation measures like unsafe conditions, non-collection of excavated material (during laying of drainage pipes) regularly and other unattended Health, Safety & Environment (HSE) issues, as stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.

On observing any lapses, PIU shall issue a notice to the Contractor, to rectify the same.

Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.

If a major lapse is not rectified upon receiving the notice then the PIU shall invoke reduction in the subsequent interim payment certificate.

For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum limit of about 0.5% of the contract value.

If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited immediately.

8.5 ENVIRONMENTAL MONITORING PLAN

The monitoring programme consists of performance indicators, reporting formats and necessary budgetary provisions. The contractors monitoring plan should be in accordance with the baseline environmental monitoring, locations provided in the Environmental impact assessment report.

The monitoring plan has the following objectives:

To ensure effective implementation of EMP
To evaluate the performance of mitigation measures proposed in the EMP
To comply with all applicable environmental, safety, labour and local legislation
To ensure that public opinions and obligations are taken into account and respected to the required satisfaction level
To modify the mitigation measures or implementing additional measures, if required

The monitoring requirement for the different environmental components have been prepared is presented in Table 9.2 below;

8.6 PERFORMANCE MONITORING INDICATORS

Environmental components identified of significance in affecting the environment at critical locations have been suggested as Performance Indicators. For example near the construction site, a thick layer of dust over the nearby vegetation/leaf is an indication that the dust control measures are not effective. The performance indicators will be evaluated under three heads as mentioned below:

Environmental condition indicators to determine efficacy of environmental mitigation measures for controlling air, noise and water pollution.
Environmental management indicators to determine compliance with the suggested environmental management measures.

Operational performance indicators have also been devised to determine efficacy and usefulness of the proposed mitigation measures for the project road.

The performance indicators and monitoring plan prepared for the project road are presented in Table 9-2. Details of the performance indicators parameters for each of the component have to be identified and reported during all stages of the implementation.

Table 9-2: Performance Indicators and Monitoring Plan

S.No	Description of Item	Indicator	Stage	Responsibility
1	Verification and identification of earth borrow areas and stone quarries	Compliance of site selection Criteria	Pre-construction	Contractor
2	Identification of locations for construction camp and construction plant sites	Compliance of site selection Criteria	Pre-construction phase	Contractor
3	Progress on Tree removal	Tree cutting	Pre-construction phase	PIU/PMU
4	Location of the temporary storage areas for excavated materials to be reused in road construction, embankment and sub grade	Storage of excavated materials	Pre-construction phase	Contractor
5	Implementation of mitigation measures specified in the EMP	Prevention/ Control of Pollution	Construction phase	Contractor
6	Environmental monitoring as per the conditions stipulated in the consents / as described in environmental monitoring plan	Environmental Conditions at Construction Sites/Plants/ Camps	Construction phase	Contractor
7	Environmental monitoring in accordance with the frequency and duration of monitoring as well as the ocations as per the monitoring plan. Before the onset of monsoon all the	Ambient Air Quality, Ambient Noise Level, Ground and Surface Water Quality, Silting of Water	Construction phase	Contractor through external agency and will be supervised by the Environment Specialist of Authority

S.No	Description of Item	Indicator	Stage	Responsibility
	debris/excavated materials will be cleaned from the work sites and disposed of temporarily stock piled debris for final disposal properly away from the water bodies.	Bodies.		Engineer /PIU/PMU
8	Monitoring work zone safety	Use of PPE and signages	Construction phase	Contractor and will be supervised by the Environmental Specialist of Authority Engineer / PMC
9	Implementation of the enhancement measures suggested for the pond redevelopment areas, cultural/community properties and oxbow land development	Enhancements/Shiftings	Construction phase	Contractor
10	Reporting of accidents at worksites/road construction sites	Accidents Reporting	Construction phase	Contractor
11	Plantation of shrubs and grass in high embankment/ enhancement sites and incidental spaces	Land scaping	Construction and Defect Liability Period	Contractor
12	Compensatory tree plantation and Reporting of the Survival Rate. The survival rate should be monitored and reported on quarterly basis	Tree Planation and survival rate	Construction and Operation Stage	Forest Department and PIU/PMU
13	Verification of the borrow area redevelopment as specified in the redevelopment plan and Satisfaction of the owners/IRC guidelines	Status borrow area	Construction and operation stage	Contractor and PMU/PIU
14	De-mobilization of Camps and Plant on completion of works	Clean-up and restoration of the site.	De-Mobilization	Contractor and will be supervised by the Environmental Specialist of Authority Engineer / PMC

8.7 MONITORING PLANS FOR ENVIRONMENT CONDITIONS

For each of the environmental components, the environmental monitoring plan specifies the parameters to be monitored; location of the monitoring sites and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for the various environmental condition indicators of the project in construction stages is presented in Table 9-3. Monitoring plan does not include the requirement of arising out of regulation provision such as obtaining Consents for plant site operation.

Table 9-3: Brief Description of Measures

S.No	Locations of worksite	Site safety measures
1	Construction site	Caution boards, Safety Cones, Delineators.
2	Deep cutting	The construction zone shall be barricaded with G.I. Sheet or arrangement to be made as per plan approved by the PIU / PMU. [Provide Safety Sign Boards and Safety Barriers marked with reflective tapes]
3	Temporary diversion (If any)	Diversion Board, Barricading [Provide 'Diversion Ahead' boards at 50m, 100m and 150m ahead of diversions with reflective tape for illumination at night at all diverted locations]
4	Safety of the workers	Helmets, Safety-Shoes, Goggles, Dusk mask. Etc.,

Furthermore, periodical site monitoring shall be carried out by the Environmental Expert of PIU for surveillance & monitoring of road safety during the road construction.
The brief description of measures has been given in Table 9-4.

Table 9-4: Air quality standards

Attribute	Timing	Parameter	Standards	Frequency	Duration	Location	Implemetation
Ambient Air	Construction	PM2.5, PM10, SO2, NO2 & CO	National Ambient Air Quality Standards (NAAQM) 2009	Two samples for one week (on non-consecutive days) for in winter and summer seasons (six monthly)	24 Hours Sampling, 2 Samples in on Week	Construction labour camps, plants sites and settlements along the work zones (Locations will be decided by Environmental Expert of Authority Engineer/PMC	Contractor
Ground water	Construction	Organoleptic and Physical, Chemical & Bacteriological Parameters	Potable Water Standards (IS 10500: 2012)	Winter and Summer Seasons	Grab Sampling Once	Construction labour camp, plants sites, settlements along the work zones (locations will be decided by Environmental Expert of Authority Engineer /PMC)	Contractor
Surface water	Construction	pH, Total Suspended Solids (TSS), Total Dissolved Solids (TDS), BOD, COD, Oil & Grease (O&G) and Turbidit	Indian Standards (IS:2296-1982) for inland surface waters	Winter and Summer Seasons	Grab Sampling Once from	Construction labour camp, plants sites, River and Ponds (locations will be decided by Environmental Expert of Authority Engineer/PMC)	Contractor
Noise	Construction	Level Equivalent Lday and Lnight based on hourly Noise Measurements	Ambient Noise Standards	Winter and Summer Seasons	Hourly noise measurements for one day in winter and summer seasons	Construction labour camp, plants sites, settlements along the work zones (locations will be decided by Environmental Expert of Authority Engineer/PMC)	Contractor

8.8 MONITORING PARAMETERS AND STANDARDS

The environmental monitoring parameters and National Ambient Air Quality Standards are discussed below:

8.8.1 AMBIENT AIR QUALITY MONITORING (AAQM)

The ambient air quality parameters viz: Sulphur Dioxide (SO2), Nitrogen Dioxide (NO2),Carbon Monoxide (CO), Particulate Matter (PM10, PM2.5), shall be monitored once in six months/half yearlyat identified locations from the start of the construction activity. The ambient air quality parameters shall be monitored in accordance with the National Ambient Air Quality Standards as given in Table 9 -5. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

Table 9-5: National Ambient Air Quality Standards

S.No	Pollutant	Time weighed Average	Concentration in Air		
			Industrial, Residential, Rural and others	Ecologically sensitive area	Methods of Measurement
1	Sulphur dioxide (SO2), µg/m3	Annual* 24 hours**	50 80	20 10	-Improved West and Gaeke -Ultraviolet fluorescence
2	Nitrogen Dioxide, (NO2) µg/m3	Annual* 24 hours**	40 80	30 80	-Modified Jacob &Hochhieser (Na-Arsenite) Chemiluminescence
3	ParticulateMatter(size less than 10µm), or PM10 µg/m3	Annual* 24 hours**	60 100	60 100	-Gravemetric -TOEM -Beta attenuation
4	Particulate Matter(size less than 2.5 µm), or PM2.5 µg/m3	Annual* 24 hours**	40 60	40 60	Gravemetric -TOEM -Beta attenuation
5	Carbon Monoxide (CO), µg/m3	8 hours* 1hours**	02 04	02 04	-Non Dispersive Infra Red (NDIR) spectroscopy

***Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals**

****24 hourly or (8 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time,they may exceed the limits but not on two consecutive days of monitoring.**

8.8.2 NOISE QUALITY MONITORING

The noise levels shall be monitored at designated locations in accordance with the Ambient Noise Quality standards given in Table 9-6. The duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan.

Table 9-6: National Ambient Noise Quality Standards

S.No	Category of Zones	Limits of Leq in dB (A} Day*	Night*
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence Zone	50	50

***Daytime shall mean from 6:000m to 10:00 pm and Night shall mean from 10:00 pm to 6:00 am**
****Silence zone is defined as an area up to 100 meters around premises of hospitals, educational institutions and courts, Use of vehicles horns, loud speakers and bursting of crackers are banned in these zones.**

8.8.3 WATER QUALITY MONITORING

Water quality parameters such as pH, BOD, COD, DO coli form count, total suspended solids, total dissolved solids, Hardness, Conductivity etc. shall be monitored at all identified locations during the construction stage as per standards prescribed by Central Pollution Control Board specifications presented in Table 9-7 The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan.

Table 9-7: Surface Water Standards

S.No	Parameters	IS:2296(Class C)	Method adopted
1	pH	6.5-8.5	pH meter
2	BOD (3 day 27oc)	3.0	Do-Azide modification of Wrinklers Method
3	Temparature	NS	Thermometer
4	Dissolved oxygen	4	Azide modification of Wrinklers Method
5	Color Hazen	300	Visual comparasion method
6	Chloride	600	Arganometric Titration
7	Total Dissolved solids	1500	Gravimetric analysis
8	Sulphates(SO4)	400	Barium chloride method
9	Oil and Grease	0.1	Partition-Gravimetric method
10	Total coliform(MPN/100ml)	5000	Multiple tube fermentation technique

NS: Not specified. All the values in mg/l if otherwise mentioned

8.9 ENVIRONMENTAL REPORTING SYSTEM

The environmental reporting system for the suggested monitoring programme will function at two levels:

Reporting for environmental condition indicators and environmental management indicators
Reporting for operational performance indicators at the PMU/PIU level. Environmental monitoring involves of the works. It provides the necessary feedback for the project management to keep the programme on schedule for achieving the expectedoutcomes.

The Contractor, Authority Engineer/PMC and PMU/PIU shall operate the reporting system for environmental conditions and environmental management indicators. The reporting system is presented in Table 9.3. The reporting schedule for contractors and construction supervision consultant have been prepared, which are on the basis of the implementation of EMP by the Contractor and monitoring by the Independent Engineer /PMC and PMU/PIU.The reporting system will start with the Contractor who is the main executor of the implementation EMP activities.

The Contractor will report to the Independent Engineer /PMC, who in turn will report to the PMU/PIU. The reporting system will comprise the following

The contractor shall submit monthly environmental compliance reports along with formal monthly project progress report to the Authority Engineer.

The AuthorityEngineer shall submit separate quarterly environmental monitoring reports to PMU/PIU in addition to submission of the summary of the activities of the month in the formal monthly report including any deviations and corrective actions

PMU/PIU shall be responsible for the preparation of the targets for identified non compliances for the EMP compliance
Solutions for further effective implementation may also emerge as a result of the compliance monitoring reports.

The photographic records shall be kept to provide useful environmental monitoring tools. All material sources points, disposal locations, plants locations, camp locations, crusher locations etc shall be photographed and kept as a record. A full record of construction activities and EMP implementation shall be kept as part of normal contract monitoring system. The Reporting and Monitoring Systems for various stages of construction and related activities have been proposed in Table 9-8.

Table 9-8: Environmental Reporting System

Item	Contractor	Construction Supervision Consultant (Independent Engineer /PMC)		PMU/PIU	
	Implementation and Reporting to Independent Engineer /PMC	Reporting	Reporting to PMU/PIU	Oversee Compliance Monitoring	Report to World Bank
Pre-Construction Stage					
Sites of camps and Plants	Weekly	Weekly	Monthly	Monthly	Quarterly
Location of borrow area	Weekly	Weekly	Monthly	Monthly	Quarterly
Location of stone quarry	Weekly	Weekly	Monthly	Monthly	Quarterly
Shifting of Community/ Cultural Structures	Weekly	Weekly	Monthly	Monthly	Quarterly
Tree cutting and Clearing of	Weekly	Weekly	Monthly	Monthly	Monthly

Item	Contractor	Construction Supervision Consultant (Independent Engineer /PMC)		PMU/PIU	
	Implementation and Reporting to Independent Engineer /PMC	Reporting	Reporting to PMU/PIU	Oversee Compliance Monitoring	Report to World Bank
Vegetation					
Construction Stage					
Monitoring of construction site and construction Camp	Regular	Regular	Monthly	Monthly	Quarterly
Pollution Monitoring	Six Monthly	As required	In Monthly report	In quarterly report	In quarterly report
Monitoring of Enhancement	Weekly	Weekly	Monthly	Monthly	Quarterly
Top soil Preservations	Weekly	Weekly	Monthly	Monthly	Quarterly
Borrow area/ quarry area/ debris disposal area	Weekly	Weekly	Monthly	Monthly	Quarterly
Tree Plantation	Monthly	Monthly	Monthly	Monthly	Quarterly
Demobilization of Plants					
Clean-up of plants & camps sites and Restoration of Sites	Monthly	Monthly	Monthly	Monthly	Quarterly

8.10 INSTITUTIONAL ARRANGEMENTS FOR ENVIRONMENTAL MANAGEMENT

The environmental management requirements/guidelines/plans need to be applied and implemented at all stages of the project. This requires an institutional mechanism to deal with various processes and requirements at each stage. Within the institutional framework proposed for the project, preparation, implementation, supervision and monitoring of environment functions, particularly the Environment Management Plans (EMP), will be carried out at the three levels at National, state and project/Community levelwith an inbuilt mechanism for coordinating activities between the said levels.

Implementation Structure

The ExternallyAided Projects Zone (EAP Zone), MoRTH, supported by a Project Management Consultants (PMC), will have the overall project implementation responsibility. At the central level, the Chief Engineer, Externally Aided Projects (CE, EAP), MoRTH, Govt. of India will be responsible for the over-all implementation of EMF and EMP. The CE, EAP will have all delegated administrative and financial decisions regarding the implementation of the project as well as environment management and safeguard related functions. CE (EAP) will be assisted by a team comprising Executive Engineer (EE) designated as an Environment and Social Officer (ESO) and a suitable number of technical and secretarial staff.

The EE will ensure that all project activities are complied with as per the EMF and EMP. MoRTH will engage a Project Management Consultant (PMC), which will include an Environment Specialist, to work with the CE, EAP's team. The PMC will be responsible for training, guidance, and recommendations for handling policy and implementation issues at the state and sub-project levels to comply with the EMF and requirements laid out in the EMP.

At the State level, MoRTH will be responsible for the project execution. In Project Co-ordination Unit, there will be an Environment Officer who will coordinate the preparation/implementation of EMP. He/she will ensure that these comply with requirements laid out in the EMF for GNHCP and are implemented in accordance to provisions laid out in the contract documents.

Finally, for the project road, a Project Site Team (PST) or Project Implementation Unit (PIU) will be responsible. The PST, to be headed by Executive Engineer, will oversee day to day implementation of environment, health and safety plan, including on issues pertaining to tree cutting, plantation works, utility relocation and worksite safety management.

Authority Engineer to be engaged by MORTH will provide the regular supervision and administration services. The Construction Supervision Consultant/Independent Engineer's team will have Environment and Safety personnel for day-to-day supervision and monitoring. The Environmental and Safety Officer on the Contractor's team must ensure compliance with the environmental contractual clauses and will report on progress or challenges to the Construction Supervisory team, as per the requirements/obligations stated in the Contract Document.

Independent Quality Assurance Consultants (QAC) would be engaged to oversee the quality of the green national highway upgrading contracts, including environment management, health and safety related aspects. This will determine whether the project is complying with regulatory performance standards. It entails a systematic, documented and periodic review of project implementation and could be a useful tool to improve project management performance on EHS aspects.

EPC Contractor will be responsible for the execution of the project by undertaking the survey, investigation, design, engineering, procurement, construction and maintenance of the Project highway including compliance with all Applicable Laws and Applicable Permits (including renewals as required) including the environmental measures as per the requirements/obligations stated in the Contract Document.

8.11 ENVIRONMENTAL MANAGEMENT – BUDGET

Implementation of Environmental Management

The environmental budget for the various environmental management measures proposed for construction and operation of the project road is detailed in Table 9-8. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted for in the engineering cost.

Table 9-9: EMP Budget

EMP BUDGET

A. Construction stage					
S. No.	**Component**	**Item**	**Unit Cost (INR)**	**Quantity**	**Total Cost (INR)**

1	Tree Cutting	Cutting of Road Side Trees for construction of road	Cost to be part of DPR.	2200	500000
2	Environmental Monitoring	Ambient Air Quality noise and surface and ground water Monitoring as per monitoring plan	Lump sum	750000	750000
3	Topsoil Management	To ensure effective preservation of topsoil quality	Lumpsum	1000000	1000000
4	Air	Dust Suppression Measures	Lumpsum	1000000	1000000
5	Personal Protective Equipment's (PPE's)	Personal Protective Equipment's like vest, helmet, safety shoe, hand gloves, gumboots, earplug, Harness belt, Welding Glasses etc.	Incidental to work		
6	First Aid kits	First Aid Kits at the construction site, camp and ancillary sites	Incidental to work		
7	Compensatory plantation	Compensatory plantation of trees in ratio 1:3	1500	23409	1000000
8	Borrow Area Rehabilitation and Quarry Management	Rehabilitation and Restoration	Cost to be part of borrowing of earth		
9	Debris and Waste Disposal	Solid Wastes, Demolition Wastes, Hazardous Wastes	Cost to be part of Contractor's responsibility		
10	Display of Safety Signages and Work Zone Safety	Sign boards, retro reflective tapes, cones, barriers	Part of Contract Agreement		
Total					14370000
Contingency cost @ 5%					718500
Total					**15088500.00 (150.885 Lakhs)**

B – Biodiversity				
11	Compensatory Afforestation	120.12 Ha for the diversion of 60.06 Ha of Forest area		758.70 Lakhs
12	Habitat Improvement activities along with protection and mitigation works for wildlife			286.00 Lakhs
	Total			**1044.70 Lakhs**

The total budget of EMP (A+B)= 1195.585 Lakhs

ANNEXURES

ANNEXURE 1: Guidelines for siting and Layout of Construction Camp /Labour Camp

a) GUIDELINES FOR SITING AND LAYOUT OF CONSTRUCTION CAMP

A. Siting

The following guidelines shall be followed while siting the construction camps:

▪ The construction camps shall be located at least 500 m away from habitation. The living accommodation and ancillary facilities for labour shall be erected and maintained to approved standards and scales.

▪ Non-agricultural land should be used, as for as possible

▪ Not within 1,000 m of either side of locations of Forest areas.

▪ All sites used for camps must be adequately drained. They must not be subject to periodic flooding, nor located within 300 feet of pools, sink holes or other surface collections of water unless such water surface can be subjected to mosquito control measures.

▪ The camps must be located such that the drainage from and through the camps shall not endanger any domestic or public water supply.

▪ All sites must be graded, ditched and rendered free from depressions such that water may get stagnant and become a nuisance.

B. Layout

Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for development and maintenance of construction camp.

A conceptual layout of a typical construction site has been presented in Figure-A.

The contractor during the progress of work shall provide, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labor to standards and scales approved by the Engineer of SC. The site must be graded and rendered free from depressions such that water does not get stagnant anywhere. The entire boundary of the site should be fenced all around with barbed wire so as to prevent the trespassing of humans and animals.

All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing.

Safe drinking water should be provided to the dwellers of the construction camps.

Adequate washing and bathing places shall be provided and kept in clean and drained condition.

Construction camps are to be sited away from vulnerable people and adequate health care is to be provided for the work force.

Vehicle parking area is to be made impervious using 75 mm thick P.C.C. bed over 150 mm thick rammed brick bats. The ground will be uniformly slopped towards to adjacent edges towards the road. A drain will take all the spilled material to the oil interceptor.

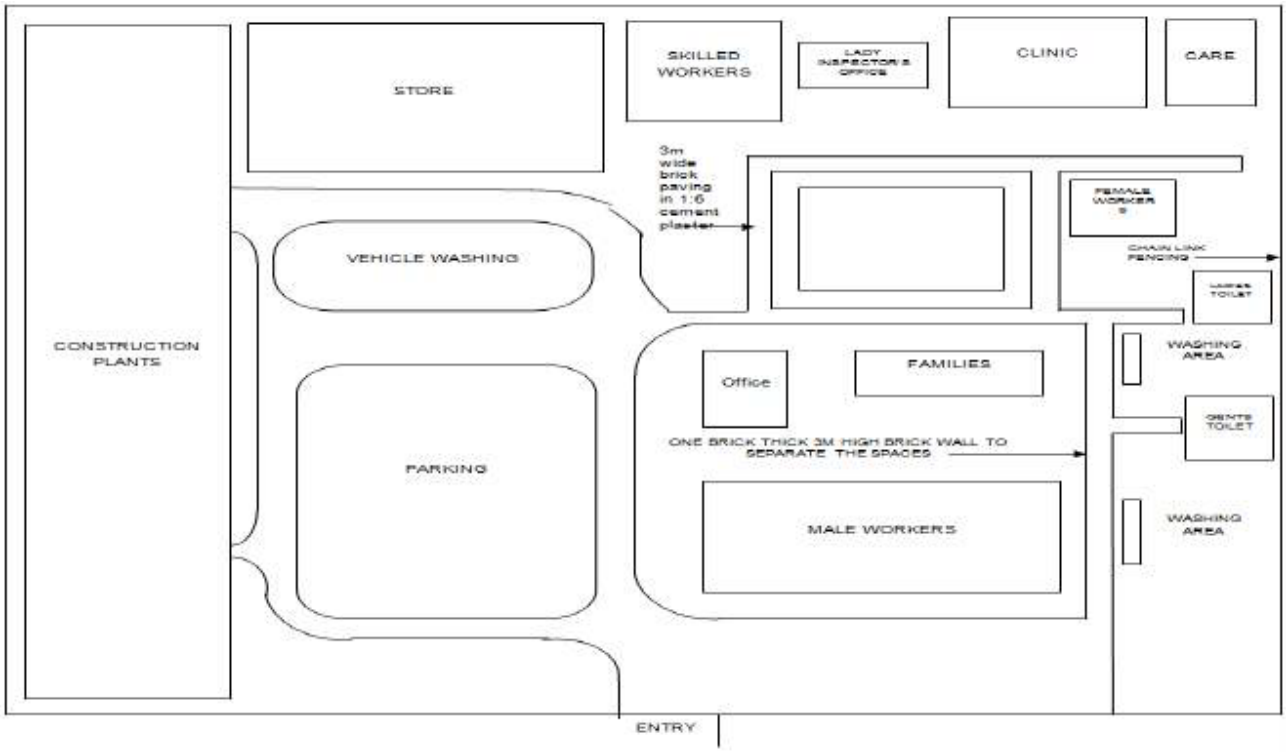


Fig. A: Typical Layout of Construction Camp

b) GUIDELINES FOR SITING, MANAGEMENT AND REDEVELOPMENT OF LABOUR CAMP

A. **Overview:**

Labour camp include accommodation for workers/labourers along with other basic amenities such as kitchen, potable water supply, sanitation (toilets, bathrooms, washing areas and water supply for such needs), first aid room as well as garbage collection and disposal facility. The guidelines outlined here aims to facilitate the contractor in implementing the measures in the EMP there by reducing the impact on the environment.

B. Criteria for Locating the Site

To the extent possible/agriculture fertile land shall be avoided for locating camp site.

C. Finalization of Selected Site

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMP as annexure and submit the same for approval to the Environmental Expert of PIU. The selected site shall be approved by Environmental Expert of PIU, after considering the compliance. No agreements or payments shall be made to the land owner/s prior to receipt of a written approval from the Environmental Expert of PIU. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be restored at his own cost. After obtaining a written approval from the Environmental Expert of PIU for the selected site, the Contractor has to enter into an agreement with the landowner to obtain his/her consent before commencing any operation/activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D. Designing and Setting Up of Labour Camp

The following facilities should be provided in a labour camp to ensure safe, clean and hygienic accommodation for the workers.

(i) Site preparation: The site should be graded and rendered free from depressions such that the water does not get stagnant anywhere. Fencing should be constructed all around the camp to prevent the trespassing of humans and animals. The approved layout plan should be strictly adhered to while setting up the camp.

(ii) Accommodation: Contractor will follow all relevant provisions of the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. The height of the worker's and labour accommodation shall not be less than 3m from floor level to the lowest part of the roof. The camp shall be floored with concrete, shall be kept clean, with proper cross ventilation, and the space provided shall be on the basis of one sqm per head or as per the relevant regulation, whichever is higher. Fire and electrical safety pre- cautions shall be adhered to. Cooking, sanitation and washing areas shall be provided separately. The contractor will maintain necessary living accommodation and ancillary facilities (including provision of clean fuel to prevent damage to forests and to prevent fuel wood cutting and burning by labour) in functional and hygienic manner. The site must be graded and rendered free from depressions such that water does not get stagnant anywhere. The entire boundary of the site should be fenced all around with barbed wire so as to prevent the trespassing of humans and animals.

(iii) Drinking Water: The Contractor should provide potable water within the precincts of every workplace in a cool and shaded area, which is easily accessible as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. All potable water storage facilities will be on a safely raised platform that is at least 1m above the surrounding ground level. Such facilities shall be regularly maintained from health and hygiene point of view. If necessary, water purifier unit shall be installed for providing potable water.

(iv) Sanitation Facilities: Adequate nos. of toilets shall be provided separately for males and females (depending on their strength), with markings for identification in vernacular language. All such facilities must have adequate water supply with proper drainage and disposal facility. They shall be maintained, cleaned and disinfected daily using proper disinfectants. Location and design of soak pit should be in such a way that it doesn't pollute the ground water. Drains and ditches should be treated with bleaching powder on a regular basis. The sewage system for the camp must be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

Portable toilets may be brought to use at construction site and the night soil from such units has to be disposed through designated septic tanks so as to prevent pollution of the surrounding areas. In the main camp, no night soil or sewerage shall be disposed of at any place other than the septic tanks constructed at the site. All these facilities shall be inspected on a weekly basis to check the hygiene standards.

(v) Waste Disposal: The Contractor should provide garbage bins in the camp and ensure that these are regularly emptied and disposed-off in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor. Separate bins shall be provided for biodegradable and non-biodegradable wastes. The disposal of kitchen waste and other biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold/given out for recycling.

(vi) Day Crèche Facility: At construction site, provision of a day crèche shall be made so as to enable women to leave behind their children while going to work. At least one attendant shall be provided to take care of the children at the crèche. At construction site where 20 or more women are employed, there shall be at least one shelter for use of children under the age of 6 years belonging to such women.

Shelters shall not be constructed to a standard lower than that of thatched roof, mud walls and floor with wooden planks spread over mud floor and covered with matting. Such areas shall be safely barricaded (no sharp sheets or barbed wires that may injure a child) from rest of the camp for the safety of children. Shelters shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision to keep the place clean. The size of a crèche may vary according to the number of children on a camp site.

(vii) Mess and Kitchen Facilities: The Contractor shall adhere to the sanitary/hygiene requirements of local medical, health and municipal authorities at all times. Adoption of such precautions as may be necessary to prevent soil and water pollution at the site while operating mess or kitchen facilities.

(viii) First Aid Facilities: At every workplace, a readily available first-aid unit including an adequate supply of sterilized dressing materials and appliances should be provided. Suitable transport should be provided to facilitate taking injured and ill persons to the nearest hospital. Adequate personal protective equipments and fire fighting equipments as detailed out in EMP should be made available in the camp and provided to the staff / workers.

(ix) Health Care Facilities: Health problems of the workers should be taken care of by providing basic health care facilities. If there is no hospital or clinic, which can be accessed in half an hour's time, then a temporary health center should be set up for the construction camp. The health centre should have at least a doctor and a nurse, duty staff, medicines and minimum medical facilities to tackle first aid requirements or minor accidental cases, linkage with nearest higher order hospital to refer patients of major illnesses or critical cases. The health center should carryout quarterly awareness programme of HIV – AIDS with the help of AIDS control society as well as about community living and hygiene practices in day to day living. Posters should be exhibited in the health care clinic.

E. Operation of Labour Camp

Throughout the functioning period of the camp, hygienic environment must be ensured by (i) provision of safe drinking water, (ii) proper maintenance of toilets including daily cleaning and disinfection using proper disinfectants, (iii) regular cleaning of drains by removing the silt and solid waste, (if any) and (iv) appropriate waste management practices. While it is of utmost importance to ensure that fire-fighting equipments like fire extinguishers are in working condition, it should also be monitored that construction workers use the personal protective equipments provided to them and they are replaced when necessary. All these facilities should be inspected on a weekly basis to achieve the desired levels of safety and hygiene standards.

F. Preparation of Labour Camp Management and Re-development Plan

After the site for the labour camp has been finalized and approved by Environmental Expert of PIU, the Contractor should prepare a labour camp management and redevelopment plan to be submitted to PIU for approval prior to setting up of the camp and it should comprise the following details:

Section–1: Details of site: Copy of approved site identification report along with location plan, showing the site, its survey no., access road, project stretch, distance from the project stretch, surrounding features and land use like residences, water bodies etc., photograph of the site showing the topography and other existing features.

Section-2: Site preparation: Activities that should be undertaken for preparing the site based on EMP and this guideline.

Section-3: Arrangements/ facilities within the camp: List of facilities to be provided along with its details like area, no of people to be accommodated and a layout plan showing the plan of the site with all the facilities planned like quarters, labour camp, mess, common facilities, toilet facilities, etc.

Section-4: Mitigation measures that should be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out here.

Sectoin-5: Other details: Any other relevant detail like list of awareness camp to be provided to workers, details of information dissemination etc. should be included.

Section 6: Re-development plan, which should indicate following points: (i) List of structures to be demolished and list of the clean-up activities that needs to be undertaken, (ii) Proposed use of the land in the post construction phase, if it is a public property, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property.

Section-7: Annexure-(a) Working drawings: Electrical plan showing the electrical network planned for the site, location of generators, master switch boards etc. and plumbing drawing showing the network of water supply lines, water tank, drainage facilities etc. (b) Copy of permissions obtained from local governing body/community etc. as applicable, (c) Copy of agreement entered with site owner, in case of leased out site.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The labour camp management plan should be submitted to the Environmental Expert of PIU for a written approval before any physical work is undertaken on a particular site. The Environmental Expert of PIU will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who shall incorporate it in the management plan. Contractor shall be responsible for satisfactory and timely implementation of these EMP requirements.

G. Re-development of the Labour Camp

The Contractor should clear all temporary structures; dispose all building debris, garbage, night soils and any other waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor's expense, to the entire satisfaction of landowner and the Environmental Expert of PIU.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re-developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the Environmental Expert of PIU by the

- Copy of approved site identification report
- Photographs of the concerned site 'before' and 'after' setting up the camp.
- Certificate from the owner stating his/her satisfaction about status of re-development of the site.

ANNEXURE 2: GUIDELINES TO ENSURE WORKER'S SAFETY DURING CONSTRUCTION

GUIDELINES TO ENSURE WORKER'S SAFETY DURING CONSTRUCTION

In order to ensure worker's safety while undertaking various operations/stages of construction many safety measures needs to be followed, which are listed down below:

A. Labour Camp/ Site Office

- Install perimeter fencing.
- Ensure good visibility and safe access at site entrances.
- Provide adequate warning signs at the entrance and exit, as necessary.
- Provide adequate space/area for loading and unloading, storage of materials, equipment and machineries.
- Display emergency procedure and statutory notices at conspicuous locations.
- Provide areas for collecting garbage and other waste material, and also arrange for their regular/periodic disposal.
- Arrange appropriate storage, transportation and use of fuel, other flammable materials and explosives in line with the license requirements obtained from concerned authorities.
- Provide defined access roads and movement areas within the site.
- Ensure availability of first aid facilities and display notices at various work places showing the location of first aid facilities and emergency contact numbers. Provide and enforce use of PPE at construction sites.

B. House Keeping Practices

- Provide proper slope in kitchen, canteens, washrooms, toilets and bathrooms for easy and immediate draining of water.
- Keep all walkways and circulation areas clear and unobstructed at all times.
- Ensure that spillages of oil and grease are avoided and in case of accidental spills, these are immediately collected.
- Use metal bins for collection of oily and greasy rags.
- Do not leave tools on the floor or in any location where they can be easily dislodged.
- Keep windows and light fittings clean.
- Maintain the workplace floors dry and in a non-slippery condition
- Provide and maintain proper drainage system to prevent water logging and unhygienic conditions.
- Ensure that protruding nails in boards or walls are moved or bent over or removed so that they do not constitute a hazard to people.
- Store all flammable materials like HSD in appropriate container with proper cover and labels – as required for various products.
- Display 'no smoking' signs in areas with high risks of fire, (eg. near fuelling areas,

C. Safety during Excavation

- During excavation of foundations, necessary safety measures will be taken by the contractor.
- Excavation of 1.5 meters deep or greater require a sides protection unless the excavation is made entirely in stable rock
- Safe access and egress will be require including ladders, steps, ramps, or other safe means of exit of workers in excavated depth of 4 feet (1.22 meters) or deeper
- Excavated earth will be collected and disposed in pre-identified site with the approval of PIU.

- To ensure elimination of excavation hazards, excavation will be carried in the presence of competent person.
- Suitable barricading will be provided

D. Handling of Cement Bags

- Cement bags will be stored and emptied in covered area to control fugitive dust emissions.
- While handling and empting cement bags, workers will wear mask and goggle and hand gloves.
- Manual transferring of cement bags from one place to another place will not be allowed.

For this purpose, trolley will be used.

E. Steel Bars Reinforcement for foundation and roof

- Manual cutting of steel bars for reinforcement will be discouraged
- Only skilled workers will be deployed by the contractor for steel bar bending and rebaring reinforced structures.
- Correct hand and power tools will be used to tie and cut steel bars.
- Workers engaged in steel bar bending and reinforcement will be provided helmet, suitably strong and flexible leather gloves and safety shoes.
- Workers will take extra caution and attention when walking on steel bar mattes and areas that contain exposed steel bar.
- First aid facilities will be provided at the site to provide first aid in case of cuts or injuries to workers. After providing first aid, injured worker will be taken to hospital for further treatment.

F. Operation of Trucks and Dumpers

- Ensure that only trained, authorized and licensed drivers operate the vehicles.
- Enlist help of another worker before reversing the vehicle.
- Switch-off the engine when not in use to save fuel, prevent accidents and unnecessary noise and air pollution.
- Lower the tipping bodies when the machine is unattended, but if it is necessary to leave them in the raised position they should be blocked to prevent their fall by fixing a sturdy support below.
- Carryout periodic servicing as per the manufacturer's requirements. All records of maintenance and repairs should be in writing and available for verification.
- Keep the vehicle tidy and the cabin free from clumsy utilities, which might obstruct the controls and create hazards.
- Avoid carrying additional passengers in the cabin or on the body of the dumper, while in field operation other than the connected workers.
- Provide stop blocks when the vehicle is tipping into or running alongside excavations or when it is parked.
- Do not overload the vehicle.
- Carry only well secured loads and use proper covers and fasteners.

G. Manual Handling and Lifting

- Avoid manual handling of heavy materials.
- Pre-assess the actual requirement of manpower in case of emergency situations.
- All concerned persons shall be trained in proper methods of lifting and carrying.
- In all manual operations where groups of workers are involved, a team leader with necessary training to handle the entire work force in unison has to be provided for.

- Watch and ward to control/supervise/guide movement of equipments and machineries, loading and unloading operations, stability of the stockpiled materials and irregularly shaped objects have to be provided for safety and security of workers.
- Carriageway used by the workers must be free from objects.
- Loading and unloading from vehicles shall be under strict supervision.

H. Electrical Hazards

- Statutory warning leaflets/posters are to be distributed/displayed by the Contractor in the vicinity of work site for the benefit of all workers, officers and supervisors as well as the public, indicating the do's and don'ts and warning related to electrical hazards associated with operations to be executed/in progress.
- All wires shall be treated as live wires.
- Report about dangling wires to the site-in-charge and do not touch them.
- Only a qualified electrician should attempt electrical repairs.
- Train all workers about electrical safety.
- Shut down the equipment that is sparking or getting over heated or emitting smoke at the time of operation, if it is not the normal way of working of such machines.
- Inform technical person/s for required maintenance.
- Never use damaged wires for electrical connection.

I. Use and Storage of Flammable Gas

- Store filled gas/LPG cylinder in a secure area – mark this as a no smoking area.
- Transport, store, use and secure cylinders in upright position.
- Ensure proper ventilation at the ground level in locations where LPG is in use.
- Avoid physical damage to the cylinders.
- Never weld near the cylinder.
- Store empty cylinders secured and upright.
- Make sure that the cylinder is closed immediately after use.
- Investigate immediately if there is the smell of LPG or gas.
- Never use LPG on site.
- Make sure that there is no other unrelated fire in the vicinity of the cylinder.

J. Gas Welding

The welders and welding unit should follow all the basic principles of welding for safety and security:

- Use face shield to protect the eyes.
- Use goggles, particularly when chipping slag and cutting strips.
- Use gloves long enough to protect wrists and forearms against heat, sparks, molten metal and radiation hazards.
- Use high-top boots/gum boots to prevent sparks, splinters, sharp edges of metal and hot welded strips, welding rods, electric cables etc. from injuring the legs.
- Avoid inhaling the noxious fumes and gasses from burning electrodes by using gas masks and screen of the work area to prevent the glare moving outside it.
- Keep the key hung from the regulator control for split seconds operations to stop the valve in case of any accidental damage or leakage to supply pipeline that may catch fire and cause accidents in case Acetylene or LPG cylinder.

- The welding area should have sufficient openings with fixed exhaust ventilators or adequate air flow openings to remove poisonous fumes and gases.
- Take precautions of wearing hard hats or fiber helmets to prevent injury due to fall of any object and accidental injury from projections while welding.
- Welders operating above ground should have adequate safety belt secured to stable platform to prevent accidental fall or injury from the scaffold. All electrical and gas connection lines up to the welder should be sufficiently insulated and protected from sharp edges and sharp objects. These shall not come into contact with hot metal.
- Do not use gas cylinders for supporting work or as rollers.
- While using LPG cylinders for welding, follow all safety precautions as has been prescribed by the supplier company.
- Avoid fire hazards and accidents by posting safety supervisors to oversee the activities of workers.
- Do not store explosives, high inflammable materials, loose hanging overhead objects, hot welded strips etc. near gas cylinders.
- Close all valves, switches and circuits while leaving the work place under proper lock and key. In case of mobile units, proper carriage procedures have to be followed for safety and security of men and materials.

K. Fire Safety Practices

- Store flammable material in proper areas having adequate fire protection systems.
- Display sufficient warning signs.
- Install fire alarm wherever required and test regularly.
- Inspect fire extinguishers regularly and replace as necessary.
- Train selected personal on use of fire extinguishers
- Fire escape route should be kept clear at all times and clearly indicated
- Display escape route maps prominently on each side.
- Provide sufficient exit signs at prominent locations for directing people to the escape staircases and routes.
- Train workers about the escape route and assembly point/s.
- Carryout fire drill periodically.

L. Noise Hazards and its Control

- Plan camp lay-out in a manner that ensures barriers/buffers between residential/ office units and high noise generating zones.
- Use sound meters to measure the level of noise and if it exceeds 75 dB(A), then ensure preventive measures.
- Make personnel aware of noisy areas by using suitable warning signs and insist on use of ear protectors/ear plugs to prevent excess noise affecting the workmen.
- Reduce noise at source by: use of improved equipments; regular and proper maintenance of the machinery as per the manufacturer's manual; by replacing rickety and noisy equipments and machineries. Screening locations with noise absorbing material; making changes in the process/equipment; controlling machine speeds; ensuring that two noise-generating machines are not running at the same time close to each other at same location; using cutting oils and hydraulic noise breakers; providing vibration and noise absorbing platform and firm embedding of equipments with fasteners.
- Appoint a competent person to: carryout a detailed noise assessment of the site; designate ear protection zone/s; give training/instructions on the necessary precautionary measures to be observed by site personnel including using suitable type of ear protection equipments.

M. Personal Protective Equipment

General

- Provision of personal protective equipment has to be made over and above all measures taken for removing or controlling safety hazards on a work site.
- Ensure that sufficient personal protective equipments are provided and that they are readily available for every person who may need to use them.
- The Contractor's Project Manager shall ensure that all persons make full and proper use of the personal protective equipment provided.
- Provide instruction/s and training for the proper use and care of personal protective equipment.
- Ensure that the personal protective equipments are in good condition.
- Train workers to report unintentional damages for replacement and to always keep the personal protective equipment clean.
- PPE includes, but may not be limited to, hard hats, goggles, ear plugs, gloves, air filters/masks, boots, ropes etc.

Head Protection

- Hard hats are compulsory for all workers, supervisors and managers/officials while working and/or inspecting a work site.
- Hard hat areas shall be demarcated clearly.

Hearing Protection

- Provide ear plugs or ear muffs to the workers and to those who need to get in and out of a high noise area frequently. Use re-usable earplugs when the reduction required (15-25 dBA) is not excessive. Use earmuffs where a large attenuation of upto 40 dBA is demanded.
- Do not use dry cotton wool for hearing protection because it doesn't provide any such protection.
- Provide disposable ear plugs for infrequent visitors and ensure that these are never re- used.
- Replenish ear plugs from time to time for those who need to work continuously for a long period in a high noise area/s.
- Use ear muffs with replaceable ear cushions because they deteriorate with age or may be damaged in use.
- Avoid wearing spectacles with ear muffs.
- Use soap and water or the recommended solvent for cleaning ear muffs.

Respiratory (Protective) Equipment

- Wear suitable mask for protection when there is a potential for small particles entering the lungs, e.g. emptying of cement bags, etc.
- Provide training to all persons using the masks/respirators for their correct fitting, use, limitations and symptoms of exposure.
- Clean and inspect all respirators before and after use.
- Store respirators properly when not in use.

Safety Footwear

- Wear suitable footwear for work
- Use safety footwear on site or in other dangerous areas.

- Wear suitable safety shoes or ankle boots when working anywhere where there is high risk of foot injuries from slippery or uneven ground, sharp objects, falling objects etc.
- All safety footwear, including safety shoes, ankle boots and rubber boots, should be fitted with steel toecaps.
- Avoid wearing flip flops, high heeled shoes, slippers, light sport shoes in situations where there is a risk of foot injury.
- Keep shoelace knots tight.

Hand Protection

- Wear suitable gloves for selected activities such as welding, bending steel bars, cutting and manual handling of materials and equipment.
- Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery.
- Wash hands properly with disinfectant soap and clean water before drinking or eating.
- Wash hands immediately after each operation on site when the situation warrants.

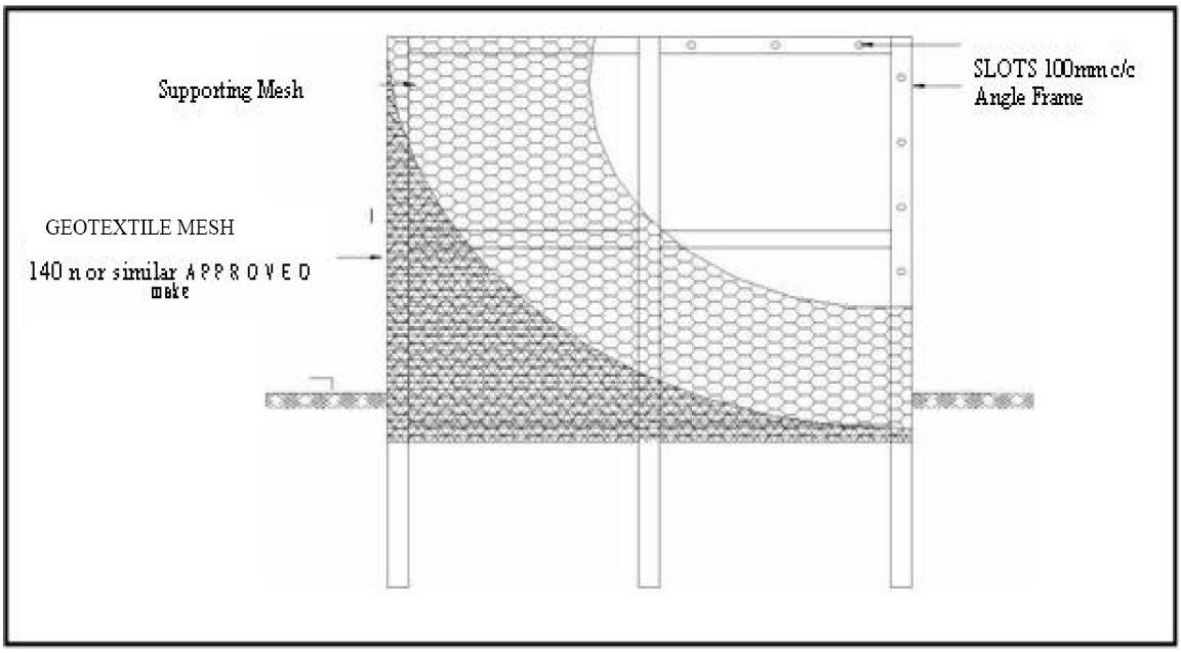
N. First Aid

- Provide first aid boxes at every work site in a cool and shaded place.
- Ensure that training on the use of the first aid box is provided to at least every supervisor on the site.
- Display the list of persons along with their contact numbers who are trained on providing first aid.
- Ensure that every first aid box is marked "First Aid" in English and in local language.
- Check for expiry dates and replace the contents, as necessary.
- Maintain a register on health records including injuries/accidents.

O. Reporting of Accident and Investigations

- Any accident at the site will be reported.
- Carryout the investigation as quickly as possible.
- Investigation should be carried out both internally as well as through third party.
- Conduct interviews with as many witnesses as necessary including the affected persons and supervising officials.
- Do not rely on any one/limited source of evidence.
- Check all the log books, stock registers, issue registers, and movement registers on site
- After completion of the investigation/enquiry, a summary of the facts recorded, sequence of happenings, persons-in-charge, persons examined, equipment's and machineries tested, follow-up of action as per legal requirements, copy of station diary entry, hospital entry, safety regulations etc. to be prepared with a comparative analysis for proper assessment.

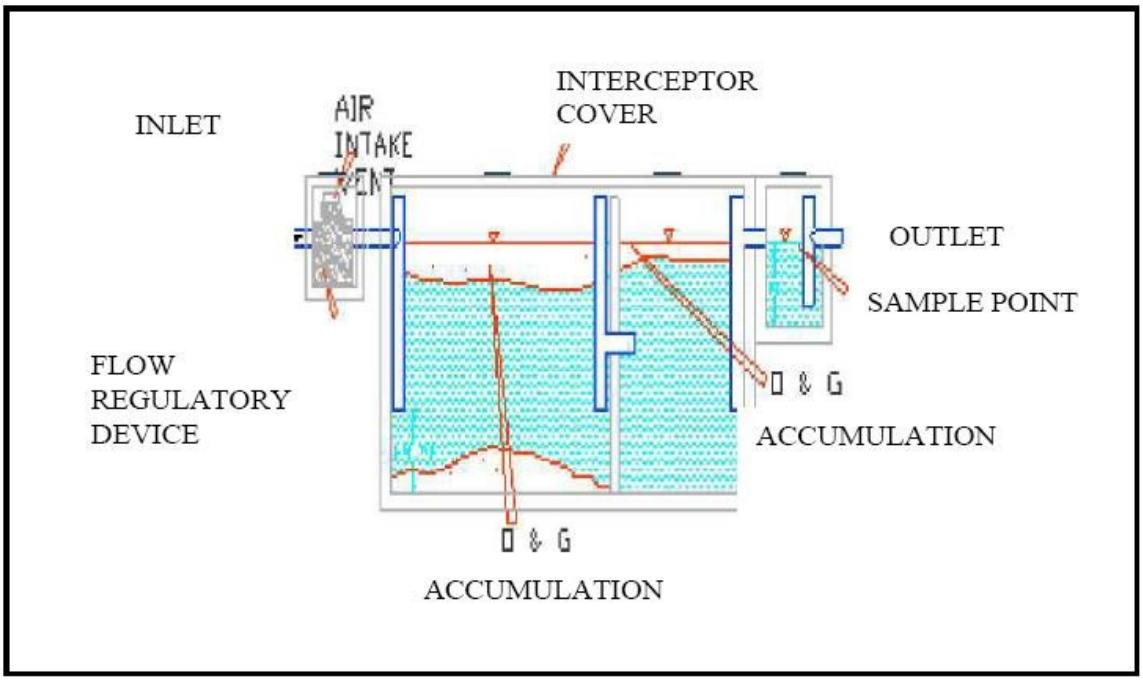
ANNEXURE 3: SILT TRAP



Note:-

Locations of silt traps will depend on Contractor's proposals for site facilities and work sites and should be provided in the Contractor's proposals. This will be checked by the Supervising Consultant and monitored by GEOTEXTILE MESH.

ANNEXURE 4: OIL TRAP



Typical drawing of Oil trap

ANNEXURE 5: LIST OF PERSONAL PROTECTIVE EQUIPMENT

S.No	Part of the Body	Personal Protective Equipment
1	Eye	Safety Glasses, Goggles
2	Face	Face Shields
3	Nose	Nose Masks
4	Head	Helmets
5	Feet	Safety Shoes
6	Hands and arms	Gloves
7	Bodies	Vests
8	Hearing	Earplugs, Earmuffs

ANNEXURE 6: GUIDELINES FOR SITING AND MANAGEMENT OF DEBRIS DISPOSAL SITE

A. Overview Construction of highways generates huge quantity of building debris which needs to be disposed off in previously identified sites suitable for such an activity. This process entails close scrutiny of the sites with respect to their location and this section details out the criteria to be followed in doing so. Moreover, it also guides the contractor as to how to prepare the site without causing much impact on the surrounding environment.

B. Criteria for Locating the Site/s The locations of debris disposal have to be selected such that:

▪ The said site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, top-soil stripping, stacking and preservation should be undertaken prior to initiation of any activities. ▪ Debris disposal site should be at least 200 m away from surface water bodies.

▪ No residential areas should be located downwind side of the site.

▪ The site should be minimum 1000 m. away from ponds / lakes or other water bodies, protected areas, forests, wildlife habitats, ecologically sensitive areas, seasonal streams, rivers, canals, flood plains, educational institutions, medical centers, religious sites, cultural or heritage sites and play grounds.

▪ The local governing body and the community should be consulted while selecting the site.

▪ The selected site should meet with the local regulatory requirements (including those of SPCB, Municipalities etc.).

▪ The site should preferably be owned by government so that there is no need to acquire the land for the same.

▪ After identification of the site the Contractor should fill up the prescribed reporting format and submit the same for approval to the Sr. Environmental Specialist of the Authority Engineer. Any activity on the site can be initiated only after obtaining permission form the IE.

C. Finalization of Selected Site/s: The selected site/s shall be approved by Sr. Environmental Specialist of the Authority Engineer and PIU, after considering compliance with the EMP clauses and this guideline. No agreements or payments shall be made to the land owner/s prior to receipt of a written approval from the AE and PIU. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost.

D. Disposal Site Management Plan: The Contractor after getting approval from the competitive authority for the selected site should submit a detailed Debris Disposal Site Management Plan comprising the following details:

▪ ***Details of site:*** Copy of approved site identification report along with location plan on a village map showing the site, its survey no., access road, project stretch, distance from the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.

▪ ***Arrangements within the Camp:*** A layout plan showing the existing trees, green belt, locations were contour trenches should be dug etc.

▪ ***Mitigation Measures:*** Measures will be undertaken as per the EMP while preparing the site and dumping the waste should be separately listed out.

▪ ***Other details:*** Any other relevant details like copy of approvals / clearances obtained, species wise no. of trees to be cut and the details of top soil to be removed and conserved like quantity, location of storing etc. shall also be provided. All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The debris site management plan should be submitted to the

AE for a written approval before any physical work is undertaken. The AE will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the contractor who will implement it within the stipulated time period.

E. Setting up of Debris Disposal Site

Following steps has to be undertaken while setting up a debris disposal site:

▪ Top soil conservation has to be undertaken as per the guidelines given in EMP.

▪ Considering the topography of the site contour trenches should be made along the site boundary to prevent soil erosion.

▪ Fencing should be provided for the debris disposal site to prevent trespassing of humans and animals into the area as well as to prevent spread of the waste material through action of wind, water, scavengers or rag pickers.

▪ No of trees cut should be recorded and three times the same should be planted as green belt development or elsewhere as part of the project.

▪ Provide proper drainage facility so that the run off from the site doesn't contaminate any nearby surface water sources.

F. Redevelopment of Debris Disposal Site

Along with the format seeking permission / approval for the disposal site / location from the Engineer / Supervision Consultant, the contractor shall also submit a rehabilitation plan for the area. Following points have to be kept in view while undertaking the rehabilitation measure:

▪ The dump sites shall be suitably rehabilitated by planting local species of shrubs and other plants. ▪ Vegetative materials to be used are grasses, legumes, herbaceous or woody plants or a mixture

▪ Plant material must be planted during the first growing season following the reclamation phase

▪ Selection and use of vegetative cover should take into account soil and site characteristics such as drainage, pH, nutrient availability and climate to ensure permanent growth. Choice of plant species for the planting program shall be made in consultation with ecological consultant and local forest department.

▪ The vegetative cover is acceptable if within one growing season of seeding

▪ The planning of trees and shrubs results in a permanent stand or regeneration and succession rate, sufficient to assure a 75% survival rate

▪ The planning results in 90% ground coverage

▪ Rehabilitation can also include conversion into farm land, playground, parking area, block plantation area etc.

▪ Care should always be taken to maintain the hydrological flow in the area.

ANNEXURE 7: TREE PLANTATION STRATEGY

1.0 Introduction

This is the most common impact of any road-widening project. If the location of the project road is in dry areas, the degree of impact is more than in a wet area where the trees can be planted and grown easily. The project road passes through forest areas and plantation exists along the project road. Therefore, plantation should be done along the project road.

2.0 Purpose of Tree Plantation

The objectives of planting trees and shrubs at selected enhancement sites against the felled trees are the following:

- To reduce the impacts of air and dust pollution and act as a natural filter to traffic emissions;
- To provide shade for the traffic as well as the pedestrians;
- To reduce the impact of vehicular noise caused by vehicles;
- To arrest soil erosion on slopes;
- Beautification of sites by planting selective ornamental shrubs, landscaping and turfing with grasses;
- Planting trees on the roadsides is to produce a softer greener landscape;
- To raise social forestry in order to improve the environment;
- To act as a natural filter to the traffic emissions;

3.0 Selection of Trees Species

The selection of the plants for greenery development is to be made as per the following criteria;

- Plants should be tall and fast growing with dense canopy cover;
- Preferably perennial and evergreen with large leaf area index;
- Indigenous plants;
- Resistant to air pollutants involved; and
- Should help to maintain the ecological and hydrological balance of the region.

The plant species that are selected based on the climatic condition, soil characteristics and conditions of the area. The row closest to the main carriage way will be of shade plants. Similarly, subsequent rows will comprise of ornamental and flowering species. Mainly native deciduous species, which retain their foliage longest, with high crown forms, resistant to fungus and insects with rapid growth rate are selected for avenues

4.0 Tree Planting During Construction

4.1 Tree Planting along The roadsides

Tree plantation will be the responsibility of the Forest department. Necessary budget will be allocated for tree plantation and provided in the EMP. The total no of trees to be planted will be triple the number of trees that will be removed from the roadsides for the improvement of the project road.

5.0 Protection Measures

The protection measures are discussed in this section

5.1 Barbed Wire Fencing

Barbed wire fencing around the plantation area will be provided to protect the plants. Angle iron will be fixed at a spacing of 5 m with 3-stands stretched barbed wire.

5.2 Precautionary Measures

• Plantation will be made in the monsoon months (July -August)

• The height of the plants should not be less than 1 ft. and should be supplied in polythene bags which are not to be removed until the moment of planting.

• All plants supplied must be planted within three days of removal from the nursery.

• Arrangements must be made to water in case of insufficient rains after planting

• 2 kgs of compost/manure are suggested for each pit before plantation.

5.2.1 Shrubs

• Prior to planting it is suggested to remove all loose debris, fill up with good soil and level the area. To ensure better growth and survival of grasses and shrubs, the surface should have sufficient layer of good quality soil (up to 45 cms).

• Shrubs which are suggested for the road side and open area spaces where available should be selected from the following and agreed with the Environmental Specialist of the Construction Supervising Consultants Environmental Specialist.

• The Contractor will be responsible for planting of shrubs at enhancement sites and along bridge approaches during construction phase.

5.2.2 Turfing with Grasses

• The Contractor will be responsible for turfing at enhancement sites and along bridge approaches during construction phase.

• The cost for the turfing along the bridge approaches and high embankments are part of the Civil construction contract.

• Grass lines are used to provide a strong surface cover at the slope but it also needs a well- prepared surface. If grass is to be effective, then it must be allowed to establish properly on a slope which is not subject to undue stress from erosion and mass movement in its initial stages.

To ensure this the following measures are suggested for the grass turfing.

• A cover of 25 grams of grass seed per square meter of surface will be prepared

• Bed will be prepared in June. The seed sowing must be carried out before the onset of monsoon so that they yield desired results. Till the onset of the monsoon, watering of the surface to be done by tankers with controlled flow sprinklers.

• After sowing, mulch of prepared and dried out herbs will be laid over the whole seeded area in a thin layer so that the direct sunlight and transpiration loss may not affect the grasses

• Contractor will ensure that the condition of the site is good enough for the successful establishment of grasses and shrubs. They will also supervise all field operations like preparation of surface, sowing of grasses and quality of grass seeds used.

6.0 Maintenance of Trees Planted

The trees planted once will be maintained at any cost for the full growth of at least for a period of three years. A program of compensatory afforestation has been proposed, not only to replace the trees, which must be cut to accommodate road widening and improvements in geometric design, but also to upgrade the condition of adjacent areas. Trees will be re-planted at a rate of two for each one removed depending upon the location. Tree felling in other sites such as borrow areas will be accommodated by the Contractor.

ANNEXURE 8: FORMATS FOR ENVIRONMENTAL MONITORING

EMS 1: CONSTRUCTION CAMP/ PLANT SITE MANAGEMENT PLAN

S.No	Description	Compliance
1	Name of the location	
2	Nearest road chainage.	
3	Name of the owner	
4	Area involved	
5	Arrangements with the owner (agreement with land owner, including the restoration aspects, should be attached as an Annexure)	
6	Existing land use	
7	Photographs depicting the present condition of the construction camp and access road.	
8	Land use of the area surrounding the borrow area including a map	
9	Site layout plan of the construction camp	
10	Establishment and maintenance of demarcated and labeled different areas within the camp	
11	Number of trees to be removed, if any, along with compensation measures	
12	Proposed top soil management	
13	Activities planned in the construction camp	
14	Machinery & equipment to be used on site	
15	Labour camp facilities onsite	
16	Health facilities	
17	Site drainage provisions	
18	Copy of the consents to establish and operate should be attached as an Annexure	
19	Conditions laid down in the clearance / licenses and plans	
20	Staff strength and details such as Contractor staff vs Sub-contractors, women labour, migrant vs local labour and skilled & unskilled labour	
21	Access road condition and proposed maintenance	
22	Safety provision such as fire protection equipment and personal protective measure.	
23	Closure / completion plan Format EMS: 1A	

EMS 1A: CLOSURE PLAN CONSTRUCTION CAMP SITE

S.No	Description	Compliance
1	Name / identity of location	
2	Distance from the Project Road and side	
3	Name of the owner	
4	Details of the Land i. Survey Number ii. Boundaries iii. iii. Other Revenue Details	
5	✓ Details of settlements, sensitive areas, water bodies, wells and bore wells within 500 m Population in Numbers Name of the Village Distance from the construction camp ✓ Details of water bodies/ sensitive areas/ wells/ bore wells	
6	Physical Details ✓ Number of Labour Stationed ✓ Number of Dwellings Constructed Number of toilets provided were dwellings demolished. ✓ Was the wastewater treatment facility demolished and cleared was the solid waste generated cleared and disposed of properly; if yes specify the location and quantity. ✓ Whether any soil was contaminated with oils and waste oils was cleared and disposed safely, if yes specify the location and quantity. Was scrap generated while the construction removed, if yes specify the details such as where, when, to whom and quantity.	
7	Land Use before Establishment Proposed Use after completion of works	

EMS 2: BORROW AREA

S.No	Description	Compliance
1.	Name / identity of location	
2.	Nearest project road chainage	
3.	Name of the owner	
4.	Area involved/capacity/quantity	
5.	Type of material proposed to be taken	
6	Arrangement with the owner including restoration aspect.	
7.	Existing land use	
8.	Land use of the area surrounding the proposed area	
9.	A map of the area	
10.	Number of trees to be removed, if any along with the compensation measure	
11.	Top soil management if required	
12.	Access road condition and proposed maintenance	
13	Photograph depicting the present condition of the proposed area and access road	
14.	Closure / completion plan EMS2A	

EMS 2A: CLOSURE PLAN FOR BORROW AREA

S.No	Description	Compliance
1	Name / identity of location	
2	Nearest Project chainage, distance from the Project Road and side	
3	Name of the owner	
4	Details of the Land i. Survey Number ii. Boundaries Other iii. Revenue Details	
5	Details of settlements, sensitive areas, water bodies within 500 m Population in Number Name of the Village Distance from the borrow area Details of water bodies/ sensitive areas/ wells/ bore wells	
6	Physical Details	
7	Land Use before Opening Proposed Use before opening Details of surroundings	
8	Drawing showing the dimensions of the borrow areas, access roads and features of surrounding	
9	Number of trees removed (girth>300mm), if any along with the compensation measure	
10	Details of top soil Quantity excavated in cum Where was it used	
11	Initial access road condition and final access road condition	
12	Photographs depicting the original condition, during the operation, top soil management, and after closure	
13	Copy of the agreement with the Owner Details of the agreed	
14	Land use after rehabilitation Details should be submitted if the final	
15	Satisfaction certificate from the owner	
16	Details of the practical problems faced and solutions adopted, if	

EMS 3: CONSTRUCTION CAMP AND ENVIRONMENTAL MANAGEMENT

S. No.	Issue	Status	
		Camp -1	Camp -2
1	Drainage System 1 . Closed drainage		
2	Disposal for Wastewater		
	1. Kitchen wastewater 2. Wastewater from water closets 3. Wastewater from bathrooms 4. Wastewater from the vehicular washings.		
3	Collection and Disposal of Solid Waste		
	1. Waste from the office 2. Waste from the kitchen 3. Waste from sweeping		
4	Drinking Water facility		
	1. Source with quantity 2. No of bore wells with capacity 3. Location of the well and bore well 4. Any treatment facility 5. No of overhead tanks 6. Test results of the Drinking Water		
5	First Aid Facility		
6	Roads in Camp Site		
	Type of road Dust suppression practicing or not, if the roads are not tarred. Condition of the road.		
7	Fuel Storage		
	1. Impervious Base 2. Spills and Wastewater will be collected in a sump 3. Number of drums where wastes are collected. 4. Number of drums disposed 5.Garbage and Night Soil 1. Provision of Garbage Bins 2. Separation of Polythene materials 3. Records of solid waste removal from septic tanks		

EMS 4: TOP SOIL MANAGEMENT

S.No	Chainage in Km	Quantity in cum	Whether Preserved in accordance with specifications	Remarks
1				
2				
3				
4				
5				

EMS 5: CONSTRUCTION PLANTS AND POLLUTION CONTROL

S.No	Construction Plant	Locations	Capacity	Description of Pollution Control System/ Equipment	Remarks
1					
2					
3					
4					
5					

EMS 6: MACHINERY/ VEHICLES AND POLLUTION CONTROL

S.No	Machinery/ vehicles with capacity	Diesel consumed during the month	Engine oil consumed during the month	PUC certificate no and validity	Machinery new/ old	Remarks
1						
2						
3						
4						
5						

EMS 7: DETAILS OF THE DG SETS WITH THE POLLUTION CONTROL EQUIPMENT

S.No	Capacity in KVA	Vertical Stack (If provided) height above GL in m	Noise Control System	Remarks
Camp Site				
Crusher				
Plant Site				
Construction Works				

EMS 8: DETAILS OF OIL STORAGE

S.No	Type of Product	Location	Number of Barrels	Capacity of barrels in Liters	Increase/ Decrease in Storage	Stored on Impervious base (Yes/No)	Remarks
1	Diesel						
2	Petrol						
3	Engine Oils						
4	Lubricants						

EMS 9: WORKING AT WATER COURSE AND POLLUTION CONTROL MEASURES

S.No	Location	Type	Stream/ Canal Diversion	Silt Fencing	Remarks

EMS 10: DETAILS OF THE GROUND WATER EXTRACTION

S.No	Location	Capacity of Motor Installed	Quantity of water drawn in Kilolitres			Ground water department	Type of source
			During the month	Up to end of last month	Total		
1							
2							
3							
4							

EMS 11: PERSONAL PROTECTIVE EQUIPMENT

S.No	Details of Equipment	Total Procured in No	Distributed in No	Available in store in No	Remarks
1	Helmets				
2	Safety Shoes				
3	Safety Shoes				
4	Nose Masks				
5	Hand Gloves				
6	Goggles				
7	Safety Belts				
8	Ear Plugs				
9	Reflective Jackets				
10	Gum Boots				

EMS 12: STATUS OF CONSENTS AND PERMISSIONS

Plant	Consent	Number / Status	Validity Date	Remarks
Hot Mix Plants				
Crusher				
Batching Plant				
WMM Plant				
Crusher				
Labour License				

EMS 13: DEVIATIONS WITH CORRECTIVE ACTIONS

S. No.	Deviation	Corrective Actions	Schedule

EMS 14: DETAILS OF TREE AND SHRUBS PLANTATION

S. No.	Location/ Chainage in 'km'	Number of trees planted	Number of shrubs planted	Survival rate in %	Remarks

EMS 15: PLANTATION OF SHRUBS AND GRASS

S. No.	Location/ Chainage	Number of Shrubs planted	Area of grass planted	Survival at 6 months interval	Remarks

EMS 16: IMPLEMENTATION OF ENHANCEMENT MEASURES

S.No	Type of Enhancement	Side of the Road	Progress of Completion		
			Target Date	Actual Completion date	Reasons of delay if any

ANNEXURE 9: REPORTING FORMAT CAMP SITE

S.no	Project Details		Date of Reporting
1.	Name of project		
2.	Name and address of the		

3.	Contract date and duration			
B	Site Details			
1.	Place Name		Landmark	
2.	Area of site		Current land use	
3.	Ownership of the land	Owned / leased	Survey no.	
4.	If leased / rented, name, address and contact details of owner			
5.	Distance from construction site			
6.	Distance from Water Body, Forest (if any)			
7.	Distance from the Populated Area			
8.	No of trees with girth> 0.3m on the site			
9.	No of trees to be cut			
10.	Is top soil conservation required (Yes/ No)			
List of enclosures:	(a) Location map			
	(b) Layout plan			
	(c) Photographs of the site			
	(d) List of machinery, equipments and vehicles to be used			
	(e) List of schools and hospitals with in 200 m distance from the boundary of the camp			
C. Submission Details	Submitted by (Environment& Safety Officer of EPC Contractor)		Approved / Rejected by (Environmental Specialist of AE)	
Signature & Date				
Name				
Designation				

* All distances are to be measured from the boundary of the site.

Note: Contractor has to fill and submit this format to the Environmental Expert of AE upon identification of labour camp site. Subsequently, the Environmental Expert of AE has to visit the site and approve / reject the site with reasons. The Environmental Expert of AE has to give a copy of this format to the contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to Environmental Expert of AE for approval.

ANNEXURE 10: FORMAT OF COMPLAINTS (GRIEVANCE) AND ITS REPORTING

A	**Project Details**		**Information**		
1.	Name of project				
2.	Name and address of the Contractor				
3.	Contract date and duration				
B	Details of Complaint Received			Site Name	
S. No.	Date of Complaint	Name and address of person with contact details	Complaint	Action taken with date	Signature of EO of Contractor
1					
2					
3					
A register in this format shall be maintained at each site office of the Contractor. This same format shall be used to compile and report the details of complaints received at all site to the Environmental Expert of AE along with the Monthly Report of the Contractor. The Environmental Expert of AE has to give instruction to the Contractor, if any further action has to be taken on any complaint.					

ANNEXURE 11: CHECKLIST FOR MONITORING OF LABOUR CAMP MANAGEMENT

A	Project Details	Date of Monitoring:		
1.	Name of project.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Name of Labour Camp			
B	Monitoring Details			
Sl. No.	Environmental Management Measures	Environmental Expert's observation (Yes/ No /Not Applicable)	Corrective Actions Proposed	Remarks
1.	Whether the camp are floored with concrete?			
2.	Are all the first aid facilities provided in the camp?			
3.	Whether the camp is located in such a way that there are no residences, public institutions or bio-sensitive area within a radius of 500 m from the camp?			
4.	Whether the vehicle movement in and out of the camp is in a controlled manner?			
5.	Whether LPG for cooking is provided?			
6.	Whether safe drinking water is provided?			
7.	Whether all the drains and channels are covered?			
8.	Whether a green belt is provided along the periphery of camp?			
9.	Whether day care centers are provided with in the camp?			
10.	Whether sanitation facilities are provided separately for male and female?			
11.	Whether separate garbage bins are provided to collect the garbage?			

12.	Whether septic tanks with soak pits are provided?			
13.	Whether the location of soak pit is in such a way that it does not pollute the ground water?			
14.	Whether a qualified safety officer is appointed for ensuring safety?			
15.	Whether proper fencing of the camp is done?			
16.	Whether the workers are well aware of cleanliness, hygiene, community livings, AIDS etc.?			
17.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Officer (ESO) of the Contractor with date			Signature of Environmental Expert of AE with date	
Note: The Environmental Expert of AE has to use this format to monitor the implementation of Environmental Management Measures for each Labour Camp. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the EO of the Contractor. Environmental Expert of AE has to attach this format to the Quarterly Report, with details of corrective action taken by the Contractor.				

ANNEXURE 12: CHECK LIST FOR MONITORING OF REDEVELOPMENT OF LABOUR CAMP SITE

A	Project Details		Date of Monitoring:	
1.	Name of project			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Name of Labour Camp			
B	Monitoring Details			
Sl. No.	Environmental Management Measures	Environmental Expert's observation (Yes / No /	Corrective Actions Proposed	Remarks
1.	Are all the temporary structures cleared as per the list in the redevelopment plan?			
2.	Are all building debris, garbage, night soils and POL waste disposed off safely?			
3.	Are all disposal pits or trenches filled, disinfected and effectively sealed off?			
4.	Are the facilities that could be put to re-use maintained well?			
5.	Are all the spills within the camp site effectively disposed off the site?			
6.	All the area within the camp site is leveled and spread over with stored top soil.			
7.	Has the residual top soil been utilized effectively?			
8.	Has the entire camp area been made clean and tidy without disturbing the adjacent lands?			
9.	Are the 'before' and 'after' scenarios of the site documented through photographs and submitted to PIU?			
10.	Are the conditions mentioned by the owner in the agreement adhered to?			

11	If not, mention the details of the conditions that are not adhered to and further steps to be taken.			
12.	Can 'works completion' certificate be issued to this site?			
Signature of Environment and Safety Officer (EO) of the Contractor with date			Signature of Environmental Expert of AE with date	
Note: The Environmental Expert of AE has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Labour Camp Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the EO of the Contractor. Environmental Expert of AE has to attach this format to the Quarterly Report, with details of corrective action taken by the Contractor.				

ANNEXURE 13: ENVIRONMENTAL REPORTING FORMAT

A	Project Details		Date of Reporting:	
1.	Name of project.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
B	Implementation Status of Health and Safety Measures			
Sl. No.	Health and Safety Measures		Implementation Status (Yes / No)	Remarks
1	Appointment of qualified Environment and Safety Officer			
2	Approval for Construction Safety Management Plan by the Environmental Expert of PIU.			
3	Provision for flags and warning lights for potential hazards			
4	Provision of adequate staging, form work and access (ladders with handrail) for works at a height of more than 3.0 m			
5	Provision of adequate shoring / bracing / barricading / lighting for all deep excavations of more than 3.0 m depth.			
6	Provision for sufficient lighting especially for night time work			
7	Construction Workers safety – Provision of personnel protective equipment's			
	A. Helmets			
	B. Safety Shoe			
	C. Gumboot			
	D. Dust masks			
	E. Hand Gloves			
	F. Safety Belts			
	G. Reflective Jackets			

	H. Earplugs for labour		
8	Workers engaged in welding work shall be provided with welder protective shields		
9	All vehicles are provided with reverse horns.		
10	All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition		
11	Regular health checkup for labour/ Contractor's personnel		
12	Ensuring the sanitary conditions and all waste disposal procedures & methods in the camp.		
13	Provision for insurance coverage to the workers		
C.	Submission Details		
	Submitted by (Environment & Safety Officer of Contractor)	Approved by (Environmental Specialist of AE)	
Signature &date			
Name			
Designation			
Note: Contractor has to fill and submit this format to the Environmental Expert of AE along with the Monthly Report. The Environmental Expert of AE has to visit the site and verify the details. Further mitigation measures, if required, can be suggested by the Environmental Expert of AE. The Environmental Expert of AE has to give back a copy of this format to the Contractor after his approval with remarks.			

ANNEXURE 14: FORMAT FOR REGISTER OF ACCIDENTS AND ITS REPORTING

A	Project Details	Date of Reporting:
1.	Name of project	
2.	Name and address of the Contractor	
3.	Contract date and duration	
B	Details of Accident and People Involved in Accident	
	Name of site where accident happened	
	Name and address of people involved in the accident	
	Whether Contractor's personnel or General public	
	Details of Injury	
	Details of treatment given	
	Details of compensation given	
C	Type of Accident (√)	
	Fall of person from a height	Explosion
	Slip, trip or fall on same level	Fire
	Struck against fixed objects	Contact with hot or corrosive substance
	Struck by flying or falling objects	Contact with poisonous gas or toxic substances.
	Struck by moving objects	Contact with poisonous gas or toxic substances
	Struck / caught by cable	Hand tool accident
	Stepping on hail etc.	Vehicle / Mobile plant accident
	Handling without machinery	Machinery operation accident
	Crushing / burying	Other (please specify)
	Drowning or asphyxiation	
D	Agent Involved in Accident (√)	
	Machinery	Stair edge
	Portable power appliance	Excavation
	Vehicle or associated equipment /machinery	Ladder
	Material being handled, used or stored	Scaffolding
	Gas, vapor, dust, fume or oxygen	Construction formwork, shuttering and false work.
	Hand tools	Electricity supply cable, wiring switchboard and associated equipment
	Floor edge	Nail or chipping
	Floor opening	Other (Please specify)

	Left shaft	
E	Unsafe Action Relevant to the Accident √)	
	Operating without authority	Failure to use proper footwear
	Failure to secure objects	Failure to use eye protector
	Making safety devices inoperative	Failure to use respirator
	Working on moving or dangerous equipment	Failure to use proper clothing
	Using un-safety equipment	Failure to use warn others or given proper signals
	Adopting unsafe position or posture	Horseplay
	Operating or working at unsafe speed	No unsafe action
	Unsafe loading, Placing, mixing et	Others (please specify)
	Failure to use helmet	
F	Lack of Safety Measures Relevant to the Accident (√)	
	No protective gear	Unsafe layout of job, etc.
	Defective protective gear	Unsafe process of job methods
	Improper dress / footwear	Poor housekeeping
	Improper guarding	Lack of warning system
	Improper ventilation	Defective tool, machinery or materials
	Improper illumination	No unsafe condition
	Improper procedure	Others (please specify)
G	Personal Factor Relevant to the Accident (√)	
	Incorrect attitude /motive	No unsafe personal factor.
	Unsafe act by another person	Other (please specify)
H	Details of Corrective and Preventive action taken	
1		
2		
3		
4		
I	Submission Details	
	Submitted by (Environment & Safety Officer of Contractor)	Verified by (Environmental Specialist of AE)
Signature &date		
Name		

Designation		
Remarks by Environmental Expert of AE		
Note: Contractor has to fill this format as and when an accident happens and submit to the AE as well as PIU along with the Monthly Report. The Environmental Expert of AE has to visit the site and verify the details. Additional safety measures, if required, can be suggested by the PIU. The Environmental Expert of AE has to give back a copy of this format to the contractor after his approval with remarks.		

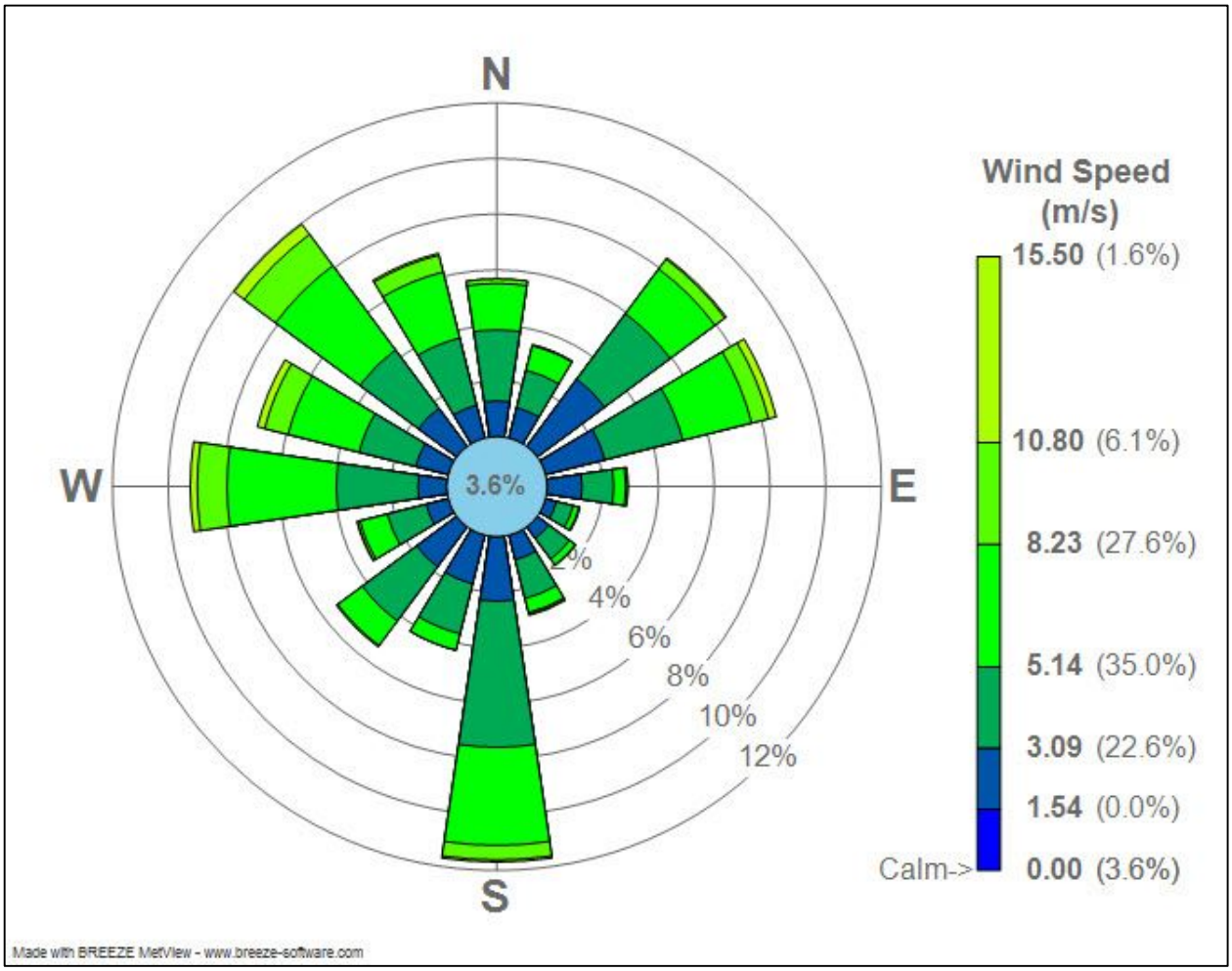
ANNEXURE 15: REPORTING FORMAT FOR ENVIRONMENTAL POLLUTION MONITORING

A	Project Details			Date of Reporting:		
1.	Name of project					
2.	Name and address of the Contractor					
3.	Contract date and duration					
B	Environmental Monitoring Details					
SI. No	Details of Monitoring Location	Period of Monitoring	Details of values exceeding the relevant standards	Reasons for pollution	Details of Corrective actions taken	Remarks
a.	Ambient Air Monitoring					
1.						
2.						
b.	Water Monitoring					
1.						
2.						
c.	Noise Monitoring*					
1.						
2.						
C	Submission Details					
	Submitted by (Environment & Safety Officer of Contractor)			Approved by (Environmental Officer of AE)		
Signature & date						
Name						
Designation						
Remarks by PIU						
Note: The Contractor has to conduct Environmental Monitoring through a NABL accredited Laboratory as per the Environmental Monitoring Plan given in the EMP. EPC Contractor has to fill this format and submit to the AE along with the Monthly Report, if monitoring was due in that month. A copy of the monitoring report given by the Laboratory has to be attached to this format. The AE has to visit the site and verify the details. Additional mitigation measures, if required, can be suggested by the AE as well as PIU. The Environmental Expert of AE has to give back a copy of this format to the Contractor after his approval with remarks.						

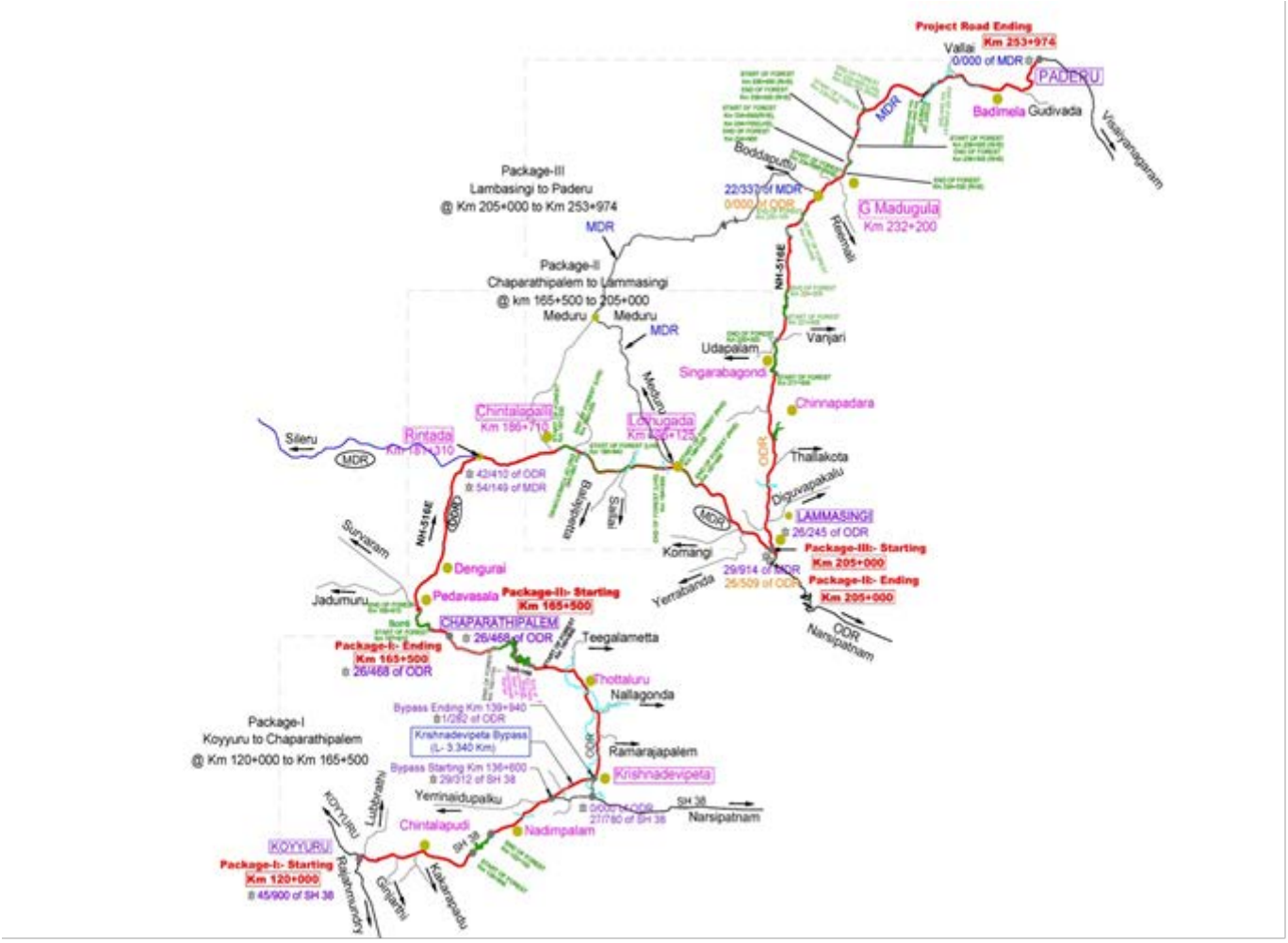
ANNEXURE 16: Monthly Water consumption during the construction phase (Package-wise):

	ABSTRACT	
		Water in KL
1	PACKAGE-1	
2	PACKAGE-2	
3	PACKAGE-3	

ANNEXURE 17: WINDROSE DIAGRAM AT ARAKU



ANNEXURE 18: Strip Plan for Forests in all three packages



ANNEXURE 19: Public Consultations and Minutes of the meeting

Public Consultations and Minutes of the meeting Public consultation has been conducted at Krishnadevipetta, Rampula, Pedavalsa, Nadimpalam, Rinthada, Lambasingi, Tejangi, G.Madugula, Paderu villages, and towns along the project road.
Participants: From the Government Department (Go A.P.): Mr. M.S.V.G Prasad and Mr. Barathwada, Assistant Executive Engineers, APNH Narasipattnam and Chintapalli Division are participated. Public Participated: Potential Project Affected Persons The Village heads, Public Representatives, Shop Owners, Residential House Owners, Land owners, women's self help groups, Dwakra Groups, Retried Government Employs, Housewife's, Widows, Village Youth groups, Agriculture Labours, Businessmen, Private Employs, Government Employs ,Vulnerable People are participated.
The Participants List in the meeting is enclosed with Name of the Person, Designation with Mobile numbers with Signature.
The Public Consultation convened by the Public Representatives and village Heads of the respective panchayats. The APNH Assistant Executive Engineers, Shri. M.S.V Prasad and Mr. Barathwada represent the Chief Guest of the Meeting. The Social and Environmental Experts and Technical Team from Mukesh & Associates Consultants participated. The Village Representatives Baskar Naidu of K.D. Petta Sarpanch, other villagers and women participated in the meeting. M/s. Savithri, G. Nirmala, Kamal self help group workers of Tejangi and Mr. S.G.V.M. Naidu Panchayat Secretary, T. Anandaraman, Merchant association of G. Madugula, A. Venkataraman, Jagirushen along with other shop owners of G. Madugula are participated in the meeting. At Paderu Ex. Sarpanch President, V. Pinayadurai, Shop Owners Association members N. Sreenivasarao, Kottiswaran, Robbi Ramu, Konthili Srinivaslu are participated in the meeting.

The Public Consultation started with the wellcome Speech. The Assistant Executive Engineer and Consultants representative narrated the importance of proposed project corridor to the participants and requested every participants to express their views, opinion, suggestions, and objections regarding the proposed road either social or Detailed Project Report for Koyyuru – Chintapalli – Lambasingi - Paderu section from Km 120+000 to Km 253+430 of NH 516E to Two Lane with paved shoulder configurations in the state of Andhra Pradesh. SIA & RAP Report 103 environmental and other gender based issues.
The Social Environmental and Technical Team of Mukesh & Associates consultants, explained clearly about the project social, environmental issues and nature of affecting of settlements, Road side shops, water bodies, trees, etc.
The Technical Expert informed about the technical specification of proposed road such as existing RoW and proposed RoW, Curves improvements and importance of usage of existing Road and the proposed RoW at village sections in order to reduce the affecting settlement and L A to the participants, resettlements and about the compensation by the government.
The Chair Person requested the participants to respond one by one based on the nature of issues. The participants positively responded and started questioning, expressing their views, suggestions, alternative practices etc. about the proposed Land Acquisition compensation etc.
The entire program was recorded with audio recording, photographs of the programme to the disbursing of participants, and also covered the major Telegu News papers. Issues Discussed in the Public Consultations are:

- **Proposed Bypass at K.D. Peta town.**
- **Brief introduction of the project, importance, implementation and funding agency.**
- **Loss of structure like, Road side shops, Enchrochments, Residential, Commercial, Residential & Commercial shops etc.**

- **Loss of Agriculture Lands.**
- **Compensation of for the affected structures and lands.**
- **Vulnerable Persons**
- **Resettlements and Rehabilitation programs.**
- **Road safety and health (HIV/AIDS).**
- **Water bodies affecting.**
- **Gender issues.**
- **Construction phases, width of proposed road proposed RoW and Land Acquisition.**

Letter for conducting Public

consultation at Koyyur and Golugonda

Lr.No. MA-APL/2017-18/052 07.01.2021

To
The Revenue Divisional Officer / Sub Collector
Paderu Division,
Visakhapatnam District ,
Andhra Pradesh.

Dear Sir/Madam,

Sub: Consultancy Services for preparation of Detailed Project Report of **Koyyuru-Chintapalle-Lambasingi-Paderu section from Km 0/000 to 133/091** of NH 516-E in the State of Andhra Pradesh for up-gradation two lanes with paved shoulder/four lane configurations– **public consultation programme for project affected villages** – Reg.

❁❁❁❁❁

We are planning to organise a public consultation event at Chintapalli & G.K. Veedhi Mandal headquarters on 08.01.2021 for project affected villages.

As a part of public consultation, we would like to invite you and ITDA Official as chief guest for the program, therefore, we are requesting you to address the people of the project-affected villages by sparing your valuable time. In this regard from our office three social team members are facilitating the programme. Schedule of the meeting is as follows:

Schedule of the meeting		
Time	**Activity**	**Officer**
10.00- 10.10 am	Presides the programme	**MRO - Chintapalli**
10.10- 10.30 am	Technical aspects of the Road	MORT&H (Technical person)
10.30 - 10.55 am	Issues in LA activities and compensation	Revenue Divisional Officer
10.55 - 11.15 am	Orientation about Social impacts of LA as per the World Bank norms.	Sociologist-Mukesh & Associates
11.15 – 1.30 pm	Consultation and documenting the public concerns	MORT&H Officers and Representatives of Mukesh & Associates
3.00- 3.10 pm	Presides the programme	**MRO – G.K.Veedhi**
3.10- 3.30 pm	Technical aspects of the Road	MORT&H (Technical person)
3.30 - 3.55 pm	Issues in LA activities and compensation	Revenue Divisional Officer
3.55 - 4.15 pm	Orientation about Social impacts of LA as per the World Bank norms.	Sociologist-Mukesh & Associates
4.15 pm Onwards	Consultation and documenting the public concerns	MORT&H Officers and Representatives of Mukesh & Associates

Yours sincerely,
For **MUKESH - ARTEFACT JV,**

AUTHORIZED SIGNATORY

Copy to:

1. The Regional Officer, Ministry of Road Transport & Highways (MoRTH), Vijayawada, Andhra Pradesh –For kind information.
2. The Project Director, PIU Visakhapatnam Ministry of Road Transport & Highways Government of India Andhra Pradesh –For kind information.

Lr.No. MA-APL/2017-18/055 25.01.2021

To

The Project Officer
Integrated Tribal Development Agency
Paderu, Visakhapatnam District
Andhra Pradesh.

Dear Sir,

Sub: Consultancy Services for preparation of Detailed Project Report of **Koyyuru-Chintapalle-Lambasingi-Paderu section from Km 0/000 to 133/091** of NH 516-E in the State of Andhra Pradesh for up-gradation two lanes with paved shoulder/four lane configurations– **Public Consultation Programme for Project Affected Villages** – Reg.

❁❁❁❁❁

We are planning to organise a public consultation event at G.Madugulla, Koyyuru & Gollugonda Mandal headquarters on **27.01.2021& 28.01.2021** for project affected villages As a part of public consultation, we would like to invite you and Revenue Divisional Officer as chief guest for the program.

Therefore, we are requesting you to address the people of the project-affected villages by sparing your valuable time. In this regard from our office three social team members are facilitating the programme. Schedule of the meeting is enclosed as Annexure -I.

Yours sincerely,
For **MUKESH - ARTEFACT JV,**

AUTHORIZED SIGNATORY

Encl: As above

Copy to:

1. The Regional Officer, Ministry of Road Transport & Highways (MoRTH), Vijayawada, Andhra Pradesh –For kind information.
2. The Project Director, PIU Visakhapatnam Ministry of Road Transport & Highways Government of India Andhra Pradesh –For kind information.

General Schedule of Public Consultation

Annexure -I		
Time	**Activity**	**Officer**
10.00- 10.10 am	Presides the programme	**MRO - G.Madugulla(27.01.2021)**
10.10- 10.30 am	Technical aspects of the Road	MORT&H (Technical person)
10.30 - 10.55 am	Issues in LA activities and compensation	Revenue Divisional Officer
10.55 - 11.15 am	Orientation about Social impacts of LA as per the World Bank norms.	Sociologist-Mukesh & Associates
11.15 Onwards	Consultation and documenting the public concerns	MORT&H Officers and Representatives of Mukesh & Associates
10.00- 10.10 am	Presides the programme	**MRO – Koyyuru (28.01.2021)**
10.10- 10.30 am	Technical aspects of the Road	MORT&H (Technical person)
10.30 - 10.55 am	Issues in LA activities and compensation	Revenue Divisional Officer
10.55 - 11.15 am	Orientation about Social impacts of LA as per the World Bank norms.	Sociologist-Mukesh & Associates
11.15 am -1.30 pm	Consultation and documenting the public concerns	MORT&H Officers and Representatives of Mukesh & Associates
Afternoon Session	Presides the programme	**MRO – Gollugonda (28.01.2021)**
	Technical aspects of the Road	MORT&H (Technical person)
	Issues in LA activities and compensation	Revenue Divisional Officer
	Orientation about Social impacts of LA as per the World Bank norms.	Sociologist-Mukesh & Associates
	Consultation and documenting the public concerns	MORT&H Officers and Representatives of Mukesh & Associates

Proceedings of the public consulations		
Mandal	Venue of the Meeting	Date of Meeting
Paderu	**RDO office.**	**29.12.2020**

Description:

Public consultation meeting was conducted on proposed road project along NH - 516 E at Paderumandal of Paderu division at RDO office / Thasildar office on 29th December, 2020 around 3.00.pm. Opening remarks of the meeting were given by Thahasildhar of Paderumandal explaining in detail about the Land Acquisition procedures and administration rules related to National Hi-way project to the public who were to be affected under the NH - 516 E proposed road.

Taking forward the discussions, Site Engineer explained to the PAFs technical aspects like stone plantation, identification and Survey of boundaries related to this project followed by explanation by Consultant NH - 516E on various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Highlighting the benefits to be accrued through the implementation of the proposed road project along NH – 516 E, Impact Assessment Expert explained in detail to the PAFs the need and impact that would be created by project on the lives of the people in that area. Increased good transportation network to other states, increase in inter district transportation, better roads from village to main road will entail better transportation of the agriculture products / produce to local market yard for sale. This inturn would have ripple effect like decrease in number of road accidents, development of tourism belt in Araku and limbasingi areas, there by improved roads would naturally entail better educational facilities for the children in that region

Mandal	Venue of the Meeting	Date of the Meeting
Chintapalli	MDO Meeting Hall	08.01.2021

Description:

Public consultation meeting was conducted on proposed road project along NH - 516 E at Chintapallimandal MDO office on 08th January, 2021 around 11.00 am. Opening remarks of the meeting were given by Thahasildhar of Chintapallimandal explaining in detail about the Land Acquisition procedures and administration rules related to National Hi-way project to the public who were to be affected under the NH - 516 E proposed road.

Taking forward the discussions, Site Engineer explained to the PAFs technical aspects like stone plantation, identification and Survey of boundaries related to this project followed by explanation by Consultant NH – 516 E on various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Highlighting the benefits to be accrued through the implementation of the proposed road project along NH – 516 E, The Social Impact Assessment Expert explained in detail to the PAFs the need and impact that would be created by project on the lives of the people in that area. Increased good transportation network to other states, increase in inter district transportation, better roads from village to main road will entail better transportation of the agriculture products / produce to local market yard for sale. This inturn would have ripple effect like decrease in number of road accidents, development of tourism belt in Araku and limbasingi areas, there by improved roads would naturally entail better educational facilities for the children in that region.

Mandal .	Venue of the Meeting	Date of the Meeting
G.K. Veedi	mandal, Thahasildar Office.	08.01.2021

Description:

Public consultation meeting was conducted on proposed road project along NH -516 E at G.K. Veedimandal of Paderu division Thahasildar office on 08th January, 2021 around 11.00 am. Opening remarks of the meeting were given by Thahasildhar of G.K. Veedimandal explaining in detail about the Land Acquisition procedures and administration rules related to National Hi-way project to the public who were to be affected under the NH - 516 E proposed road. He also explained the procedure to update the records of existing residents and landholders.

Taking forward the discussions, Site Engineer explained to the PAFs technical aspects like stone plantation, identification and Survey of boundaries related to this project followed by explanation by Consultant NH - 516E on various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Highlighting the benefits to be accrued through the implementation of the proposed road project along NH – 516 E, Social Impact Assessment Expert explained in detail to the PAFs the need and impact that would be created by project on the lives of the people in that area. Increased good transportation network to other states, increase in inter district transportation, better roads from village to main road will entail better transportation of the agriculture products / produce to local market yard for sale. This inturn would have ripple effect like decrease in number of road accidents, development of tourism belt in Araku and limbasingi areas, there by improved roads would naturally entail better educational facilities for the children in that region.

Mandal	Venue of the Meeting	Date of the Meeting
G. Madugula	Thahasildar Office.	27.01.2021

Description:

Conducted Public consultation meetings on the proposed road project along NH - 516 E at G. Madugula Mandal of Paderu division at Thahasildar office on 27th January 2021 around 11.00 am. Opening remarks of the meeting were given by Thahasildhar of G. Madugulamandal, explaining in detail the Land Acquisition procedures and administrative rules related to the National Highway project to the public who were to be affected under the NH - 516 E proposed roads.

Taking forward the discussions, Site Engineer explained to the PAFs technical aspects like stone plantation, identification and Survey of boundaries related to this project followed by an explanation by Social expert-Consultant NH – 516 E on various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Highlighting the benefits to be accrued through the implementation of the proposed road project along NH – 516 E, Social Impact Assessment Expert explained in detail to the PAFs the need and impact that would be created by the project on the lives of the people in that area. Increased good transportation network to other states, increase in inter-district transportation, and better roads from village to the main road will entail better transportation of the agriculture products / produce to the local market yard for sale. This, in turn, would have a ripple effect like a decrease in the number of road accidents and the development of a tourism belt in the Araku and Limmasingi areas; thereby, improved roads would naturally entail better educational facilities for the children in that region.

Mandal	Venue of the Meeting	Date of the Meeting
Koyyuru	Thasildar Office	28.01.2021

Description:

Public consultation meeting was conducted on proposed road project along NH - 516 E at Koyyuru Mandal of Paderu division at Thasildar office on 28th January, 2021 around 11.00 am. Opening remarks of the meeting were given by Thahasildhar of Koyyurumandal explaining in detail about the Land Acquisition procedures and administration rules related to National Hi-way project to the public who were to be affected under the NH - 516 E proposed roads.

Taking forward the discussions, Site Engineer explained to the PAFs technical aspects like stone plantation, identification and Survey of boundaries related to this project followed by explanation by Consultant NH - 516E on various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Highlighting the benefits to be accrued through the implementation of the proposed road project along NH – 516 E, Social Impact Assessment Expert explained in detail to the PAFs the need and impact that would be created by project on the lives of the people in that area. Increased good transportation network to other states, increase in inter district transportation, better roads from village to main road will entail better transportation of the agriculture products / produce to local market yard for sale. This in turn would have ripple effect like decrease in number of road accidents, development of tourism belt in Araku and limbasingi areas, there by improved roads would naturally entail better educational facilities for the children in that

region.

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Mandal	Venue of the Meeting	Date of the Meeting
Golgonda	Golgonda Mandal, Kalyanamandapam, Sri Ramulavari temple premises	28.01.2021

Description:

Public consultation meeting was conducted on proposed road project along NH - 516 E at Golgonda Mandal of Paderu division at Krishna Devipeta (K.D. Peta village) village on 28th January, 2021 around 1.00 pm. Opening remarks of the meeting were given by Thahasildhar of Golgondamandal explaining in detail about the Land Acquisition procedures and administration rules related to National Hi-way project to the public who were to be affected under the NH - 516 E proposed road.

Taking forward the discussions, Site Engineer explained to the PAFs technical aspects like stone plantation, identification and Survey of boundaries related to this project followed by explanation by Consultant NH – 516 E on various aspects like compensation to be paid to the land, houses and other structures that are presumed to be affected due to the proposed road project implementation.

Highlighting the benefits to be accrued through the implementation of the proposed road project along NH – 516 E, Social Impact Assessment Expert explained in detail to the PAFs the need and impact that would be created by project on the lives of the people in that area. Increased good transportation network to other states, increase in inter district transportation, better roads from village to main road will entail better transportation of the agriculture products / produce to local market yard for sale. This inturn would have ripple effect like decrease in number of road accidents, development of tourism belt in Araku and limbasingi areas, there by improved roads would naturally entail better educational facilities for the children in that region.

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Photos of Public consultations

KD Peta – Golgonda Mandal

Future project affected person sharing his concern at KD Peta

Public consultation in GK Veedhi

Site Engineer speaking on Technical aspects

Thasildhar,Koyyuru- briefing to the PAFs

రహదారి విస్తరణకు సహకరించండి

చింతపల్లి గ్రామీణం: రహదారి విస్తరణ పనులకు సహకరించాలని తహసీల్దారు గో
లక్ష్మ కోరారు. సుమారు పది గ్రామాల ప్రజలతో శుక్రవారం అభిప్రాయ సేకరణకు స
వేశం నిర్వహించారు. ఈ సందర్భంగా ఆయన మాట్లాడుతూ రాజమహేంద్రవరం ను
లంబసింగి తాజంగి మీదుగా పాడేరు, ఆరకు కలుపుకుని విజయనగరం వరకు నిర్మి
నున్న జాతీయ రహదారి నిర్మాణానికి కేంద్ర ప్రభుత్వం నిధులు మంజూరు చేసిందన్నా
పది గ్రామాల్లో రహదారికి ఇరువైపులా దుకాణాలు, ఇళ్లు, ఇతర నిర్మాణాలు తొలగించ
లసి ఉంటుందన్నారు. తొలగింపులకు సంబంధించి ప్రభుత్వం బాధితులకు పరిహారం చె
స్తుందని, అభ్యంతరాలు ఉంటే నేరుగా తమకు తెలియజేయాలన్నారు.

News Item regarding consultations with villagers of 10 villages (Chintapally rural edition)

------ end of the report------

ANNEXURE 20: Biodiversity Impact Assessment and Wildlife Mitigation Plan

Attached as separate document.

ANNEXURE 21: Tree Species in Forest area

Species-wise local/scientific names			
S. No.	**Scientific Name**	**Local Name**	**Tree Species**
	In forest Area		**In Revenue land**
1	Misc. Species	Acrocarpus	7 aakula palakula
2	Misc. Species	Adda	Aare
3	Acacia Auricuiformis	Acacia	Acrocarpous
4	Misc. Species	Alli	Anem
5	Misc. Species	Andika	Ankudu Pala
6	Misc. Species	Anisa	Baditha
7	Wrigtria Tingtoria	Ankudupala	Bala
8	Misc. Species	Apple	Bandamanu
9	Misc. Species	Badam	Bandaru
10	Misc. Species	Badidha	Barnika
11	Erythrina Indica	Badisa	Beedi
12	Adina cordifolia	Bandaru	Bharani
13	Misc. Species	Barnika	Billa
14	Misc. Species	Billa	Bodda
15	Misc. Species	Cheepuru	Boorugu
16	Misc. Species	Chesa	Boosi
17	Misc. Species	Chilakadiddumanu	Bothedi
18	Misc. Species	Chinaganneru	Chilaka Dhadhuga
19	Misc. Species	Chinduga	Chilaka Dhoodi
20	Tamarindus Indica	Chinta	Chilaka Rekka
21	Misc. Species	Chiri	Chintha
22	Misc. Species	Chirupudi	Curve
23	Misc. Species	Dadduga	Dadduga
24	Misc. Species	Dakki	Dekki
25	Misc. Species	Dudippa	Dhoodi
26	Misc. Species	Ekodi	Dhoodippa
27	Misc. Species	Elukachevi	Elam
28	Misc. Species	Gaddebettu	Erra Chandanam
29	Misc. Species	Galimanu	Gacha
30	Gannara	Gannara	Galimanu
31	Misc. Species	Ganneru	Ganare
32	Misc. Species	Garbe	Ganari
33	Misc. Species	Garugu	Gannara
34	Misc. Species	Garugudu	Ganneru
35	Moringa Olifera	Garuvu	Garugu
36	Misc. Species	Gatha	Garugumanu
37	Misc. Species	Geesari	Gatha
38	Misc. Species	Galimanu	Geesari

39	Zizyphus Xylopyrus	Gottimanu	Gingode
40	Misc. Species	Gudalam	Goddemkura
41	Gmelin Arborea	Gummadi Teak	Gorreguddu
42	Misc. Species	Gumpena	Gottedu
43	Misc. Species	Gunupala	Gumbi
44	Misc. Species	Gurugudu	Gummadi
45	Misc. Species	Indiga	Gunapave
46	Misc. Species	Isukarasi	Gungudu
47	Misc. Species	Japari	Gukuru
48	Jaru mamidi	Jarumamidi	Gundi
49	Jaru mamidi	Jarumanu	Indika
50	Misc. Species	Jathimanu	Jaamail
51	Misc. Species	Jatra	Jarka
52	Misc. Species	Jeeluga	Jeedi
53	Juvvi	Juvvi	Jeelugu
54	Misc. Species	Kakkurthimanu	Jiguru
55	Pongamia Pinnata	Kanuga	Juvvi
56	Terminalia Chebula	Karaka	Ippa
57	Misc. Species	Kare Nimmachettu	Kadhamba
58	Misc. Species	Kokkitha	Kali
59	Misc. Species	Kolini	Kamu
60	Misc. Species	Kona	Kanche
61	Chukrasia Tabularis	Kondavepa	Kangodi
62	Misc. Species	Konedu	Kanuga
63	Misc. Species	Koriki Busi	Karaka
64	Misc. Species	Korukudumanu	Karukudu
65	Misc. Species	Kovela	Kejaru
66	Misc. Species	Kumbi	Kenasa
67	Kunkudu	Kunkudu	Kinneru
68	Misc. Species	Lavurumanu	Kismiss
69	Misc. Species	Lolika	Kobbari
70	Maddi	Maddi	Kodipurru
71	Mangifera Indica	Mamidi	Korniki
72	Aegle Marmelos	Maredu	Kovvela
73	Ficus Bengalensis	Marri	Kumbi
74	Misc. Species	Miplion	Kundi
75	Misc. Species	Misc	Kunkudu
76	Misc. Species	Mikkamanu	Kunkuma
77	Misc. Species	Musidi	Kurakudu
78	Misc. Species	Muvvachettu	Kutta
79	Misc. Species	Nallagatha	Lolika
80	Semecarpus Anacardium	Nallajeedi	Maddi
81	Misc. Species	Nallakarra	Malabar

82	Albezzia Amara	Nallaregi	Malabar Vepa
83	Misc. Species	Nallangi	Mamidi
84	Acacia Nilotica	Nallathumma	Mandharam
85	Misc. Species	Naramamidi	Manga
86	Misc. Species	Naramanu	Maredu
87	Misc. Species	Narava	Marri
88	Misc. Species	Narlem	Mettanimanu
89	Misc. Species	Navaru	Misa
90	Eucalyptus	Neelagiri	Miscellaneous
91	Holoptelia integrifolia	Nemalinara	Mukeda
92	Misc. Species	Nemali adugu	Mulleru
93	Misc. Species	Olika	Musidi
94	Misc. Species	Paasi	Nalakarda
95	Misc. Species	Pachagatha	Nalla Gatha
96	Misc. Species	Pachari	Nalla Jeedi
97	Misc. Species	Padukumanu	Nalla Maddi
98	Misc. Species	Pala	Nalla Regi
99	Misc. Species	Pampangi	Nalla Thumma
100	Artocarpus Heterophyllus	Panasa	Nallanki
101	Misc. Species	Pandiga	Namali
102	Misc. Species	Panta	Naamari
103	Misc. Species	Papidi	Nara Mamidi
104	Misc. Species	Paradona	Narmadi
105	Misc. Species	Parijatham	Narlangi
106	Misc. Species	Peddabusi	Needa
107	Ailanthus excelsa	Peddamanu	Neelagiri
108	Misc. Species	Pilligatha	Neredu
109	Pine	Pines	Odise
110	Misc. Species	Pisini(Thella pisini)	Oliki
111	Misc. Species	Pittamarri	Ootika
112	Misc. Species	Pothadimanu	Oopilish
113	Misc. Species	Pulagadam	Pachari
114	Misc. Species	Pullabusi	Paditha
115	Misc. Species	Purosalu	Pala
116	Misc. Species	Puthadi	Palava
117	Annona Reticulata	Rambalam	Panasa
118	Ficus Religiosa	Ravi	Pandiga
119	Cassia Fistula	Rella	Panta
120	Dalbergia Latifolia	Rosewood	Papidi
121	Misc. Species	Sampangi	Pedda Papidi
122	Misc. Species	Sennagi	Pedda Paala
123	Misc. Species	Sendagi	Pida
124	Greviia Robusta	Silveroak	Pillimanu

125	Misc. Species	Sindhuga	Pisini
126	Tectona Grandis	Teak	Pittamarri
127	Misc. Species	Tellabusi	Piyyapa
128	Terminalia Arjuna	Tellachettu	Pothade
129	Misc. Species	Tellagatha	Pulaguadam
130	Terminalia Arjuna	Tellamanu	Purrodu
131	Misc. Species	Tellapoliki	Purugudu
132	Misc. Species	Thada	Puttadi
133	Misc. Species	Thadiki	Raavi
134	Misc. Species	Thaduku	Rathika
135	Thapasi	Thapasi	Rella
136	Misc. Species	Thellagatha	Rose Wood
137	Acacia leucophloea	Thumma	Rudharacha
138	Misc. Species	Thummeda	Rudika
139	Misc. Species	Thuniki	Sampangi
140	Ficus Bengalensis	Udalamarri	Sandra
141	Misc. Species	Unduruka	Seepu
142	Misc. Species	Uppa	Seepuru
143	Usiri	Usiri	Silakathathuka
144	Misc. Species	Utika	Silver Oak
145	Misc. Species	Vadisa	Sinduga
146	Misc. Species	Vandanam	Sinnangi
147	Misc. Species	Velamachettu	Sinthaku
148	Misc. Species	Vellangi	Sirimanu
149	Azadirachta Indica	Vepa	Somitha
150	Madhuca indica	Vippa	Teak
151	Misc. Species	Vudippa	Tella Maddi
152	Pterocarpus Marsupium	Yegisa	Thadi
153	Moringa oleifera	Yenugupadam	Thada
154	Misc. Species	Yerragatha	Thande
155	Misc. Species	Methamanu	Thangodu
156	Misc. Species	Anem	Thumma
157	Misc. Species	Arey	Thumpi
158	Misc. Species	Billibithri	Thurai
159	Ficus Racemosa	Bodda	Ummithi
160	Misc. Species	Busi	Uragudu
161	Misc. Species	Chirumanu	Usire
162	Misc. Species	Dhudi chettu	Vandanam
163	Misc. Species	Giduguru	Vense
164	Misc. Species	Giriki	Vepa
165	Misc. Species	Korukodi	Yegisa
166	Misc. Species	Kunkuma	
167	Misc. Species	Naada	

168	Nalla Maddi	Nallamaddi	
169	Syzigium Cumini	Neredu	
170	Misc. Species	Regu	
171	Syzigium Cumini	Simaneredu	
172	Misc. Species	Thadi	
173	Misc. Species	Thangedu	
174	Misc. Species	Thangina	
175	Terminalia bellerica	Thani	
176	Misc. Species	Thodachettu	
177	Misc. Species	Thummi	
178	Misc. Species	Thummika	
179	Misc. Species	Bonkena	
180	Bombax Ceiba	Burugu	
181	Misc. Species	Chennangi	
182	Misc. Species	Chilakarekka	
183	Misc. Species	Chinna Are	
184	Misc. Species	Katiki	
185	Misc. Species	Coffee (APFDC)	
186	Misc. Species	Jafra (APFDC)	
187	Misc. Species	Pepper (APFDC)	

ANNEXURE 22: Trees felling permissions

No. MORTH/PIU/VSKP/P-I/Misc/2022/07
Government of India
Ministry of Road Transport & Highways
Project Implementation Unit, Visakhapatnam
D. No. 1-69/6, Near Sai Baba Temple, Ganesh Nagar, Chinamushidiwada
Visakhapatnam - 530051. Tele: 0891-3512111.

Date: 03.10.2022

To,

The Authorised Signatory,
M/s SRC Infra Developers Private Limited,
#7-272, kakateeya Residency,
Court Road, Anantapuramu,
Andhra Pradesh - 515001

Subject: Rehabilitation and Upgradation to 2-lane with paved shoulder configuration of Koyyuru to Chaprathipalem (Km 120.000 to Km 165.500) of NH-516E in the State of Andhra Pradesh under GNHCP with the loan assistance of World Bank on EPC mode - Tree felling permission - Reg.

Sir,

It is mention that DFO, Narsipatnam has accorded tree felling permission of 468 nos of tree falling in alignment of Koyyuru to Chaprathipalem section (Package-I) of NH 516E in Narsipatnam division of Anakapalli district in the State of Andhra Pradesh. The brief of the trees is as under:

S.No	Government Lands		Private Lands		Total trees	
	No of Trees	Amount in Rs	No of Trees	Amount in Rs	No of Trees	Amount in Rs
1	332	2,52,758	136	89,060	468	3,41,818

2. Further, in accordance with Clause 9.4 of the Contract Agreement, the Contractor is obliged to execute the felling of trees as per the permits obtained with the assistance of Authority. The cost of felling and disposal is included in the Contract Price.

3. In view of the above, this office hereby issues work order to carry out the felling of trees in the subject mentioned stretch as per list at Annexure - I under acceptance of the following conditions of Forest Department:

i. The Contractor shall pay tree valuation amount of Rs.2,52,758/-for the trees (332 nos.) falling in Government lands before felling of the trees as per the permission accorded by the DFO, Narsipatnan through CFMS challan in the head of Account (0406-01-800-00-04-800-000-VN under EFS02-7068) on or before 16.10.2022.

ii. Further, it is requested to pay 10% on the total value of the produce of all categories of trees (i.e.,Rs.34,182/-) in way of Security Deposit in any Nationalized Bank in favor of Divisional Forest Officer, Narsipatnam before felling of trees and produce the security deposit to DFO, Narsipatnam office.

iii. As per A.P. Water Land & Trees Rules Act, 2002 and A.P. Water Land & Trees Rules, 2004, the Contractor shall plant double the number of saplings of the same or

suitable species to be planted on the same site or suitable place within 30 days and maintenance of the same for a period of (05) years.

iv. Further, the extraction and transportation of these trees are to be done by the Contractor as per A.P.Forest Produce Transit Rules, 1970. The details of transportation & storage of felled produce may be intimated to DFO, Narsipatnam office.

v. The Contractor should submit an undertaking before felling stating that they shall not claim any compensation from the Forest Department in case the Forest Department does not give transit permit for the felled trees.

vi. If any irregularities are noticed, action will be taken as per the provisions of the A.P.Forest Act, 1967 and A.P.Forest Produce Transit Rules, 1970.

Yours faithfully,

(Ravishek)
Project Director
Project Implementation Unit, Visakhapatnam

Copy to:

i. The Regional Officer, MoRTH, Vijayawada for kind information
ii. The Divisional Forest Officer, Narsipatnam for kind information.
iii. The Team Leader, M/s LN Malviya Infra Projects Pvt Ltd for kind information.

Annexure-I

Format for tree valuation of trees falling within the Right of Way(ROW) of Koyyuru-

Sl.No	Name of the Tehsil	Name of the Village	Survey .No	Type Of Land(Government/Private/Forest)	Chainage (M)	LHS/ RHS	Offset From PCL(M)	Tree Species	Tree No	Height(M)
1	Golugonda	Chidikada		Government	135+550	LHS	7.1	Thadi	81	8.0
2	Golugonda	Chidikada		Government	135+550	LHS	7.2	Thadi	82	9.0
3	Golugonda	Chidikada		Government	135+600	RHS	10.8	Thadi	83	13.0
4	Golugonda	Chidikada		Government	135+600	RHS	5.0	Thadi	84	14.0
5	Golugonda	Chidikada		Government	135+600	RHS	9.4	Teku	85	5.0
6	Golugonda	Chidikada		Government	135+650	RHS	11.5	Thadi	86	13.0
7	Golugonda	Chidikada		Government	135+650	RHS	11.4	Thadi	87	15.0
8	Golugonda	Chidikada		Government	135+650	RHS	10.6	Thadi	88	15.0
9	Golugonda	Chidikada		Government	135+600	LHS	6.3	Thadi	89	10.0
10	Golugonda	Chidikada		Government	135+600	LHS	10.3	Thadi	90	12.0
11	Golugonda	Chidikada		Government	135+600	LHS	11.9	Thadi	91	11.0
12	Golugonda	Chidikada		Government	135+700	RHS	5.4	Thadi	92	13.0
13	Golugonda	Chidikada		Government	135+700	RHS	11.8	Thadi	93	13.0
14	Golugonda	Chidikada		Government	135+700	LHS	7.4	Thadi	94	10.0
15	Golugonda	Chidikada		Government	135+750	LHS	6.7	Thadi	95	12.0
16	Golugonda	Chidikada		Government	135+750	LHS	6.9	Thadi	96	12.0
17	Golugonda	Chidikada		Government	135+750	LHS	7.2	Thadi	97	11.0
18	Golugonda	Chidikada		Government	135+750	LHS	7.0	Thadi	98	13.0
19	Golugonda	Chidikada		Government	135+750	RHS	5.0	Thadi	99	7.0
20	Golugonda	Chidikada		Government	135+750	RHS	5.2	Thadi	100	13.0
21	Golugonda	Chidikada		Government	135+750	RHS	5.5	Thadi	101	12.0
22	Golugonda	Chidikada		Government	135+750	RHS	5.3	Thadi	102	12.0
23	Golugonda	Chidikada		Government	135+750	RHS	5.4	Thadi	103	12.0
24	Golugonda	Chidikada		Government	135+750	LHS	5.9	Thadi	104	12.0
25	Golugonda	Chidikada		Government	135+750	LHS	7.2	Thadi	105	10.0
26	Golugonda	Chidikada		Government	135+800	LHS	5.2	Thadi	106	13.0
27	Golugonda	Chidikada		Government	135+800	LHS	5.4	Thadi	107	12.0
28	Golugonda	Chidikada		Government	135+800	LHS	5.2	Neredu	108	13.0
29	Golugonda	Chidikada		Government	135+800	LHS	5.5	Thadi	109	11.0
30	Golugonda	Chidikada		Government	135+800	LHS	8.1	Thadi	110	10.0
31	Golugonda	Chidikada		Government	135+800	LHS	8.0	Thadi	111	12.0
32	Golugonda	Chidikada		Government	135+800	LHS	7.4	Thadi	112	13.0
33	Golugonda	Chidikada		Government	135+800	LHS	7.5	Thadi	113	12.0
34	Golugonda	Chidikada		Government	135+800	LHS	8.4	Thadi	114	13.0
35	Golugonda	Chidikada		Government	135+800	LHS	5.4	Thadi	115	13.0
36	Golugonda	Chidikada		Government	135+850	LHS	5.3	Thadi	116	10.0
37	Golugonda	Chidikada		Government	135+850	LHS	5.4	Thadi	117	11.0
38	Golugonda	Chidikada		Government	135+850	LHS	5.2	Thadi	118	12.0
39	Golugonda	Chidikada		Government	135+850	LHS	11.8	Thadi	119	12.0
40	Golugonda	Chidikada		Government	135+900	LHS	7.1	Jamail	120	4.0
41	Golugonda	Chidikada		Government	135+900	LHS	7.1	Jamail	121	2.0
42	Golugonda	Chidikada	138	Government	135+900	LHS	10.9	Mamidi	122	10.0
43	Golugonda	Chidikada		Government	135+900	LHS	11.0	Gunipem	123	7.0
44	Golugonda	Chidikada		Government	135+900	LHS	11.1	Pedda Papidi	124	6.0
45	Golugonda	Chidikada		Government	135+950	LHS	6.7	Namali	125	3.0
46	Golugonda	Chidikada		Government	135+950	LHS	11.6	Gunipem	126	4.0
47	Golugonda	Chidikada		Government	135+950	LHS	7.0	Ootiki	127	2.0
48	Golugonda	Chidikada		Government	135+950	LHS	4.0	Chintha	128	8.0

49	Golugonda	Chidikada		Government	135+950	LHS	4.2	Chintha	129	10.0
50	Golugonda	Chidikada		Government	135+950	RHS	6.7	Oliki	130	3.0
51	Golugonda	Chidikada		Government	135+950	RHS	10.6	Jamail	131	3.0
52	Golugonda	Chidikada		Government	135+950	RHS	8.9	Namali	132	5.0
53	Golugonda	Chidikada		Government	136+000	LHS	5.7	Thadi	133	9.0
54	Golugonda	Chidikada		Government	136+000	LHS	7.8	Musidi	134	7.0
55	Golugonda	Chidikada		Government	136+030	LHS	6.1	Thadi	135	14.0
56	Golugonda	Chidikada		Government	136+030	LHS	11.6	Thadi	136	12.0
57	Golugonda	Chidikada		Government	136+020	RHS	4.9	Thadi	137	13.0
58	Golugonda	Chidikada		Government	136+020	RHS	4.2	Thadi	138	13.0
59	Golugonda	Chidikada		Government	136+022	RHS	3.7	Narlangi	139	10.0
60	Golugonda	Chidikada		Government	136+000	LHS	2.8	Musidi	140	2.0
61	Golugonda	Chidikada		Government	136+000	LHS	2.1	Thadi	141	10.0
62	Golugonda	Chidikada		Government	136+000	LHS	8.6	Thadi	142	8.0
63	Golugonda	Chidikada		Government	136+000	LHS	8.1	Thadi	143	10.0
64	Golugonda	Chidikada		Government	136+000	LHS	7.2	Thadi	144	8.0
65	Golugonda	Chidikada		Government	136+000	LHS	6.1	Thadi	145	6.0
66	Golugonda	Chidikada		Government	136+050	LHS	4.8	Thadi	146	11.0
67	Golugonda	Chidikada		Government	136+050	RHS	4.1	Thadi	147	9.0
68	Golugonda	Chidikada		Government	136+050	LHS	11.5	Thadi	148	9.0
69	Golugonda	Chidikada		Government	136+050	LHS	8.5	Thadi	149	11.0
70	Golugonda	Chidikada		Government	136+050	RHS	10.5	Namali	150	3.0
71	Golugonda	Chidikada		Government	136+050	RHS	9.8	Thadi	151	3.0
72	Golugonda	Chidikada		Government	136+050	LHS	4.4	Thadi	152	10.0
73	Golugonda	Chidikada		Government	136+050	LHS	4.3	Thadi	153	10.0
74	Golugonda	Chidikada		Government	136+050	LHS	6.2	Musidi	154	2.0
75	Golugonda	Chidikada		Government	136+100	LHS	9.4	Bandari	155	4.0
76	Golugonda	Chidikada		Government	136+100	LHS	10.2	Namali	156	2.0
77	Golugonda	Chidikada		Government	136+100	LHS	10.3	Oliki	157	4.0
78	Golugonda	Chidikada		Government	136+100	LHS	4.6	Neredu	158	15.0
79	Golugonda	Chidikada		Government	136+100	LHS	7.2	Neela Neredu	159	5.0
80	Golugonda	Chidikada		Government	136+100	LHS	7.3	Pachar	160	2.0
81	Golugonda	Chidikada		Government	136+100	LHS	7.0	Pachar	161	6.0
82	Golugonda	Chidikada		Government	136+100	LHS	7.1	Pachar	162	2.0
83	Golugonda	Chidikada		Government	136+100	LHS	7.6	Thadi	163	4.0
84	Golugonda	Chidikada		Government	136+100	LHS	7.1	Neela Neredu	164	4.0
85	Golugonda	Chidikada		Government	136+100	LHS	10.4	Thadi	165	3.0
86	Golugonda	Chidikada		Government	136+100	LHS	8.5	Thadi	166	4.0
87	Golugonda	Chidikada		Government	136+100	LHS	9.3	Thadi	167	6.0
88	Golugonda	Chidikada		Government	136+100	LHS	5.9	Neela Neredu	168	6.0
89	Golugonda	Chidikada		Government	136+100	RHS	9.1	Thadi	169	6.0
90	Golugonda	Chidikada		Government	136+150	LHS	6.2	Neela Neredu	170	10.0
91	Golugonda	Chidikada	136	Government	136+150	LHS	7.4	Musidi	171	13.0
92	Golugonda	Chidikada		Government	136+150	LHS	6.2	Namali	172	4.0
93	Golugonda	Chidikada		Government	136+150	LHS	5.3	Thadi	173	5.0
94	Golugonda	Chidikada		Government	136+150	LHS	4.9	Neela Neredu	174	4.0
95	Golugonda	Chidikada		Government	136+150	RHS	4.1	Namali	175	4.0
96	Golugonda	Chidikada		Government	136+250	LHS	4.1	Chintha	176	9.0
97	Golugonda	Chidikada		Government	136+250	RHS	7.3	Thadi	177	3.5
98	Golugonda	Chidikada		Government	136+250	RHS	7.4	Thadi	178	2.5
99	Golugonda	Chidikada		Government	136+250	RHS	11.9	Thadi	179	5.0
100	Golugonda	Chidikada		Government	136+250	RHS	9.1	Pedda Papidi	180	3.0
101	Golugonda	Chidikada		Government	136+250	LHS	4.7	Chintha	181	8.0
102	Golugonda	Chidikada		Government	136+250	LHS	9.2	Thadi	182	5.0
103	Golugonda	Chidikada		Government	136+250	LHS	4.1	Namali	183	4.5
104	Golugonda	Chidikada	131	Government	136+250	RHS	7.4	Namali	184	2.0

105	Golugonda	Chidikada		Government	136+250	RHS	7.3	Musidi	185	2.0
106	Golugonda	Chidikada		Government	136+250	RHS	11.5	Thadi	186	6.0
107	Golugonda	Chidikada		Government	136+250	RHS	8.8	Thadi	187	2.5
108	Golugonda	Chidikada		Government	136+250	RHS	6.8	Bandari	188	1.5
109	Golugonda	Chidikada		Government	136+300	RHS	10.1	Namali	189	2.0
110	Golugonda	Chidikada		Government	136+300	LHS	4.4	Namali	190	1.5
111	Golugonda	Chidikada	24	Government	136+300	LHS	4.7	Thadi	191	5.0
112	Golugonda	Chidikada	26	Government	136+300	RHS	9.5	Thadi	192	2.0
113	Golugonda	Chidikada		Government	136+300	RHS	7.3	Ootiki	193	2.0
114	Golugonda	Chidikada	24	Government	136+300	LHS	4.2	Thadi	194	5.0
115	Golugonda	Chidikada		Government	136+300	LHS	4.2	Thadi	195	5.0
116	Golugonda	Chidikada		Government	136+350	LHS	6.2	Jamail	196	4.0
117	Golugonda	Chidikada	23	Government	136+400	LHS	11.7	Teku	197	4.5
118	Golugonda	Chidikada		Government	136+400	LHS	11.6	Teku	198	6.0
119	Golugonda	Chidikada		Government	136+400	LHS	11.7	Teku	199	4.5
120	Golugonda	Chidikada		Government	136+400	LHS	9.9	Teku	200	4.0
121	Golugonda	Chidikada		Government	136+400	LHS	11.5	Teku	201	5.5
122	Golugonda	Chidikada		Government	136+400	LHS	7.9	Teku	202	4.0
123	Golugonda	Chidikada		Government	136+400	LHS	10.6	Teku	203	4.0
124	Golugonda	Chidikada		Government	136+400	LHS	11.8	Teku	204	2.0
125	Golugonda	Chidikada		Government	136+400	LHS	10.3	Teku	205	3.0
126	Golugonda	Chidikada		Government	136+400	LHS	11.6	Teku	206	2.0
127	Golugonda	Chidikada	22	Government	136+450	LHS	2.9	Thumma	207	7.0
128	Golugonda	Chidikada		Government	136+450	LHS	10.9	Thadi	208	6.0
129	Golugonda	Chidikada		Government	136+450	LHS	11.5	Thadi	209	5.0
130	Golugonda	Chidikada		Government	136+450	LHS	11.3	vepa	210	2.0
131	Golugonda	Chidikada	27	Government	136+450	RHS	11.6	Thadi	211	4.5
132	Golugonda	Chidikada	22	Government	136+450	LHS	3.1	Jamail	212	2.5
133	Golugonda	Chidikada		Government	136+450	LHS	3.6	Jamail	213	3.5
134	Golugonda	Chidikada		Government	136+500	LHS	3.8	Jamail	214	2.0
135	Golugonda	Chidikada		Government	136+500	LHS	3.8	Jamail	215	3.0
136	Golugonda	Chidikada		Government	136+500	LHS	3.9	Jamail	216	3.0
137	Golugonda	Chidikada		Government	136+500	LHS	4.1	Jamail	217	2.0
138	Golugonda	Chidikada	28	Government	136+500	RHS	4.4	Thadi	218	8.0
139	Golugonda	Chidikada	22	Government	136+500	LHS	4.5	Jamail	219	2.0
140	Golugonda	Chidikada		Government	136+500	LHS	4.1	Jamail	220	3.0
141	Golugonda	Chidikada		Government	136+500	LHS	4.0	Jamail	221	2.0
142	Golugonda	Chidikada		Government	136+500	LHS	4.1	Jamail	222	2.0
143	Golugonda	Chidikada		Government	136+500	LHS	4.1	Jamail	223	1.5
144	Golugonda	Chidikada		Government	136+500	LHS	9.6	Teku	224	11.0
145	Golugonda	Chidikada		Government	136+500	LHS	5.6	vepa	225	2.5
146	Golugonda	Chidikada	17	Government	136+550	LHS	8.3	Thadi	226	8.0
147	Golugonda	Chidikada	28	Government	136+500	RHS	11.8	Jamail	227	3.5
148	Golugonda	Chidikada		Government	136+550	RHS	11.9	Thadi	228	7.0
149	Golugonda	Chidikada		Government	136+550	RHS	9.8	Thadi	229	8.0
150	Golugonda	Chidikada		Government	136+550	RHS	10.3	Thadi	230	6.0
151	Golugonda	Chidikada		Government	136+550	LHS	10.3	Mamidi	231	15.0
152	Golugonda	Chidikada	16	Government	136+650	RHS	4.1	Thadi	232	4.0
153	Golugonda	Chidikada		Government	136+650	RHS	4.6	Thadi	233	6.0
154	Golugonda	Chidikada		Government	136+650	RHS	4.3	Thadi	234	8.0
155	Golugonda	Chidikada		Government	136+650	RHS	5.1	Thadi	235	8.0
156	Golugonda	Chidikada		Government	136+650	RHS	7.9	Thadi	236	9.0
157	Golugonda	Chidikada		Government	136+650	RHS	7.8	Thadi	237	10.5
158	Golugonda	Chidikada		Government	136+650	RHS	7.9	Thadi	238	10.5
159	Golugonda	Chidikada		Government	136+700	RHS	8.2	Thadi	239	10.0
160	Golugonda	Chidikada		Government	136+700	RHS	8.1	Thadi	240	6.5

161	Golugonda	Chidikada		Government	136+700	RHS	8.2	Thadi	241	10.0
162	Golugonda	Chidikada		Government	136+700	RHS	10.9	Thadi	242	10.0
163	Golugonda	Chidikada		Government	136+700	RHS	10.9	Thadi	243	9.0
164	Golugonda	Chidikada		Government	136+700	RHS	11.2	Thadi	244	7.5
165	Golugonda	Chidikada		Government	136+700	RHS	11.1	Thadi	245	4.0
166	Golugonda	Chidikada		Government	136+800	RHS	10.4	Thadi	246	6.5
167	Golugonda	Chidikada	15	Government	136+800	RHS	8.6	Thadi	247	8.5
168	Golugonda	Chidikada		Government	136+800	RHS	3.9	Thadi	248	4.0
169	Golugonda	Chidikada		Government	136+800	RHS	1.6	Thadi	249	4.5
170	Golugonda	Chidikada	17	Government	136+800	RHS	1.1	Thadi	250	7.0
171	Golugonda	Chidikada		Government	136+800	RHS	11.8	Thadi	251	5.0
172	Golugonda	Chidikada	7	Government	137+100	RHS	10.4	Thadi	252	5.0
173	Golugonda	KD Peta	108	Government	137+500	LHS	14.0	Thadi	1	4.5
174	Golugonda	KD Peta		Government	137+600	LHS	7.0	Thadi	2	6.0
175	Golugonda	KD Peta	120	Government	137+600	LHS	5.0	Thadi	3	5.0
176	Golugonda	KD Peta		Government	137+600	LHS	1.5	Thadi	4	6.5
177	Golugonda	KD Peta	121	Government	137+750	LHS	2.0	Thadi	5	4.5
178	Golugonda	KD Peta		Government	137+750	RHS	14.0	Thadi	6	4.0
179	Golugonda	KD Peta		Government	137+800	LHS	5.8	Thadi	7	5.0
180	Golugonda	KD Peta		Government	137+800	LHS	3.8	Thadi	8	4.5
181	Golugonda	KD Peta	118	Government	137+800	LHS	2.3	Thadi	9	5.0
182	Golugonda	KD Peta		Government	137+800	RHS	5.5	Thadi	10	6.0
183	Golugonda	KD Peta		Government	137+800	RHS	12.9	Thadi	11	4.0
184	Golugonda	KD Peta		Government	137+900	RHS	6.2	Vepa	12	4.5
185	Golugonda	KD Peta		Government	137+900	LHS	8.7	Thadi	13	5.5
186	Golugonda	KD Peta		Government	137+950	LHS	13.9	Thadi	14	6.0
187	Golugonda	KD Peta		Government	137+950	LHS	13.7	Thadi	15	6.0
188	Golugonda	KD Peta		Government	138+050	LHS	11.2	Thadi	16	7.0
189	Golugonda	KD Peta	117	Government	138+050	LHS	9.4	Thadi	17	3.0
190	Golugonda	KD Peta		Government	138+050	LHS	7.3	Namali	18	5.0
191	Golugonda	KD Peta		Government	138+050	LHS	2.8	Vepa	19	6.0
192	Golugonda	KD Peta		Government	138+050	RHS	6.5	Thadi	20	2.0
193	Golugonda	KD Peta		Government	138+050	RHS	9.3	Thadi	21	10.0
194	Golugonda	KD Peta		Government	138+050	RHS	10.9	Thadi	22	5.0
195	Golugonda	KD Peta	96	Government	138+100	LHS	8.4	Thadi	23	7.0
196	Golugonda	KD Peta		Government	138+100	LHS	9.7	Vepa	24	3.5
197	Golugonda	Laxmipur		Government	138+100	LHS	9.4	Thadi	25	8.0
198	Golugonda	Laxmipur		Government	138+100	LHS	6.9	Chintha	26	5.5
199	Golugonda	Laxmipur		Government	138+100	LHS	1.3	Thadi	27	7.0
200	Golugonda	Laxmipur		Government	138+100	RHS	4.0	Thadi	28	8.0
201	Golugonda	Laxmipur		Government	138+100	RHS	6.2	Thadi	29	8.5
202	Golugonda	Laxmipur		Government	138+100	RHS	9.9	Thadi	30	6.0
203	Golugonda	Laxmipur	96	Government	138+100	RHS	10.6	Thadi	31	6.5
204	Golugonda	Laxmipur		Government	138+200	LHS	14.8	Thadi	32	5.0
205	Golugonda	Laxmipur		Government	138+250	RHS	13.2	Thadi	33	6.0
206	Golugonda	Laxmipur		Government	138+250	LHS	0.7	Thadi	34	4.0
207	Golugonda	Laxmipur		Government	138+250	LHS	6.7	Thadi	35	7.0
208	Golugonda	Laxmipur		Government	138+250	LHS	7.9	Thadi	36	4.0
209	Golugonda	Laxmipur		Government	138+250	LHS	10.3	Thadi	37	5.0
210	Golugonda	Laxmipur		Government	138+250	LHS	10.8	Thadi	38	5.0
211	Golugonda	Laxmipur		Government	138+300	LHS	4.7	Thadi	39	5.0
212	Golugonda	Laxmipur	94	Government	138+300	LHS	7.7	Thadi	40	6.0
213	Golugonda	Laxmipur		Government	138+300	LHS	8.5	Thadi	41	6.0
214	Golugonda	Laxmipur		Government	138+300	LHS	9.1	Thadi	42	5.5
215	Golugonda	Laxmipur	96	Government	138+250	LHS	14.5	Thadi	43	5.0
216	Golugonda	Laxmipur		Government	138+350	RHS	11.0	Thadi	44	5.0

217	Golugonda	Laxmipur		Government	138+350	RHS	7.9	Thadi	45	5.5
218	Golugonda	Laxmipur		Government	138+350	RHS	5.1	Thadi	46	5.5
219	Golugonda	Laxmipur		Government	138+350	LHS	0.8	Thadi	47	5.0
220	Golugonda	Laxmipur		Government	138+350	LHS	8.2	Thadi	48	6.0
221	Golugonda	Laxmipur		Government	138+350	LHS	13.9	Thadi	49	7.0
222	Golugonda	Laxmipur		Government	138+350	LHS	14.6	Thadi	50	2.0
223	Golugonda	Laxmipur		Government	138+350	LHS	14.8	Thadi	51	6.0
224	Golugonda	Laxmipur		Government	138+350	LHS	13.8	Thadi	52	5.0
225	Golugonda	Laxmipur		Government	138+350	LHS	11.0	Thadi	53	5.0
226	Golugonda	Laxmipur		Government	138+350	LHS	7.0	Thadi	54	5.0
227	Golugonda	Laxmipur		Government	138+350	LHS	4.0	Thadi	55	5.0
228	Golugonda	Laxmipur	94	Government	138+400	RHS	6.0	Thadi	56	6.0
229	Golugonda	Laxmipur		Government	138+400	RHS	6.7	Thadi	57	5.5
230	Golugonda	Laxmipur		Government	138+400	RHS	7.0	Thadi	58	6.0
231	Golugonda	Laxmipur		Government	138+400	RHS	10.1	Thadi	59	4.5
232	Golugonda	Laxmipur		Government	138+400	RHS	10.3	Thadi	60	6.0
233	Golugonda	Laxmipur		Government	138+400	RHS	11.6	Thadi	61	6.5
234	Golugonda	Laxmipur		Government	138+550	LHS	6.0	Thadi	62	5.5
235	Golugonda	Laxmipur		Government	138+550	LHS	4.2	Thadi	63	6.0
236	Golugonda	Laxmipur		Government	138+550	LHS	2.1	Thadi	64	5.5
237	Golugonda	Laxmipur		Government	138+550	RHS	2.8	Thadi	65	5.0
238	Golugonda	Laxmipur		Government	138+550	RHS	4.6	Thadi	66	5.0
239	Golugonda	Laxmipur		Government	138+550	LHS	1.7	Ootika	67	3.0
240	Golugonda	Laxmipur		Government	138+550	LHS	6.2	Ootika	68	2.5
241	Golugonda	Laxmipur		Government	138+550	RHS	2.3	Ootika	69	3.0
242	Golugonda	Laxmipur		Government	138+550	RHS	0.8	Thadi	70	5.0
243	Golugonda	Laxmipur		Government	138+600	RHS	0.5	Thadi	71	1.5
244	Golugonda	Laxmipur		Government	138+600	LHS	0.7	Thadi	72	1.5
245	Golugonda	Laxmipur	80	Government	138+600	LHS	4.9	Thadi	73	3.5
246	Golugonda	Laxmipur		Government	138+600	LHS	10.1	Thadi	74	5.5
247	Golugonda	Laxmipur		Government	138+600	LHS	13.8	Thadi	75	5.5
248	Golugonda	Laxmipur		Government	138+600	LHS	14.2	Vepa	76	4.5
249	Golugonda	Laxmipur		Government	138+700	LHS	8.1	Thadi	77	6.0
250	Golugonda	Laxmipur		Government	138+700	LHS	8.9	Thadi	78	5.0
251	Golugonda	Laxmipur	81	Government	138+750	RHS	4.2	Thadi	79	5.0
252	Golugonda	Laxmipur		Government	138+750	RHS	7.0	Thadi	80	5.0
253	Golugonda	Laxmipur		Government	138+750	RHS	6.8	Thadi	81	5.0
254	Golugonda	Laxmipur		Government	138+750	RHS	1.2	Chintha	82	2.0
255	Golugonda	Laxmipur		Government	138+800	RHS	4.1	Thadi	83	5.0
256	Golugonda	Laxmipur		Government	138+800	RHS	3.7	Thadi	84	6.0
257	Golugonda	Laxmipur		Government	138+900	LHS	0.7	Thadi	85	3.0
258	Golugonda	Laxmipur		Government	138+900	LHS	1.8	Thadi	86	2.5
259	Golugonda	Laxmipur		Government	138+900	LHS	13.1	Thadi	87	6.0
260	Golugonda	Laxmipur		Government	138+900	LHS	12.6	Thadi	88	6.0
261	Golugonda	Laxmipur		Government	138+900	LHS	12.6	Thadi	89	5.5
262	Golugonda	Laxmipur		Government	138+900	LHS	9.2	Thadi	90	5.5
263	Golugonda	Laxmipur		Government	138+900	LHS	9.2	Thadi	91	6.0
264	Golugonda	Laxmipur	74	Government	138+900	LHS	6.4	Thadi	92	6.0
265	Golugonda	Laxmipur		Government	138+900	LHS	6.2	Thadi	93	5.5
266	Golugonda	Laxmipur		Government	138+900	LHS	5.9	Thadi	94	5.5
267	Golugonda	Laxmipur		Government	138+900	LHS	5.7	Thadi	95	6.0
268	Golugonda	Laxmipur		Government	138+900	LHS	4.2	Thadi	96	6.0
269	Golugonda	Laxmipur		Government	138+900	LHS	2.1	Thadi	97	7.0
270	Golugonda	Laxmipur		Government	139+000	RHS	0.9	Thadi	98	7.0
271	Golugonda	Laxmipur		Government	139+000	RHS	1.2	Thadi	99	7.0
272	Golugonda	Laxmipur		Government	139+000	RHS	1.7	Thadi	100	7.0

273	Golugonda	Laxmipur		Government	139+000	RHS	2.8	Thadi	101	6.5
274	Golugonda	Laxmipur		Government	139+000	RHS	3.6	Thadi	102	7.0
275	Golugonda	Laxmipur		Government	139+000	RHS	7.9	Thadi	103	6.5
276	Golugonda	Laxmipur	74/1B	Private	139+000	RHS	12.1	Thadi	104	6.0
277	Golugonda	Laxmipur		Private	139+000	RHS	12.9	Thadi	105	5.5
278	Golugonda	Laxmipur		Private	139+000	RHS	11.2	Thadi	106	5.0
279	Golugonda	Laxmipur		Private	139+000	RHS	11.9	Thadi	107	5.5
280	Golugonda	Laxmipur		Private	139+000	RHS	13.4	Thadi	108	4.5
281	Golugonda	Laxmipur		Private	139+000	RHS	14.8	Thadi	109	6.0
282	Golugonda	Laxmipur		Private	139+000	RHS	14.8	Thadi	110	7.5
283	Golugonda	Laxmipur		Private	139+000	RHS	13.2	Thadi	111	7.5
284	Golugonda	Laxmipur	74/2B	Private	139+000	RHS	13.4	Thadi	112	4.5
285	Golugonda	Laxmipur		Private	139+000	RHS	13.9	Thadi	113	7.5
286	Golugonda	Laxmipur		Private	139+000	RHS	9.7	Thadi	114	8.0
287	Golugonda	Laxmipur		Private	139+000	RHS	8.3	Thadi	115	8.0
288	Golugonda	Laxmipur		Private	139+000	RHS	11.9	Thadi	116	5.5
289	Golugonda	Laxmipur		Private	139+000	RHS	11.2	Thadi	117	5.0
290	Golugonda	Laxmipur		Private	139+000	RHS	13.4	Thadi	118	4.5
291	Golugonda	Laxmipur		Private	139+000	RHS	14.7	Thadi	119	6.0
292	Golugonda	Laxmipur		Private	139+000	RHS	14.9	Thadi	120	6.0
293	Golugonda	Laxmipur		Private	139+000	RHS	14.6	Thadi	121	6.0
294	Golugonda	Laxmipur		Private	139+000	RHS	13.6	Thadi	122	6.0
295	Golugonda	Laxmipur		Private	139+000	RHS	10.1	Thadi	123	6.0
296	Golugonda	Laxmipur		Private	139+000	RHS	7.1	Thadi	124	6.5
297	Golugonda	Laxmipur		Private	139+000	RHS	7.3	Thadi	125	6.5
298	Golugonda	Laxmipur		Private	139+000	RHS	6.4	Thadi	126	2.0
299	Golugonda	Laxmipur		Private	139+000	RHS	6.7	Thadi	127	6.5
300	Golugonda	Laxmipur		Private	139+000	RHS	6.4	Thadi	128	6.5
301	Golugonda	Laxmipur		Private	139+000	RHS	6.4	Thadi	129	2.0
302	Golugonda	Laxmipur		Private	139+000	RHS	5.9	Thadi	130	5.5
303	Golugonda	Laxmipur		Private	139+000	RHS	5.2	Thadi	131	5.5
304	Golugonda	Laxmipur		Private	139+000	RHS	4.9	Thadi	132	6.0
305	Golugonda	Laxmipur		Private	139+000	LHS	4.7	Thadi	133	3.5
306	Golugonda	Laxmipur	99/2	Private	139+000	LHS	1.7	Thadi	134	5.0
307	Golugonda	Laxmipur		Private	139+000	LHS	3.1	Thadi	135	5.0
308	Golugonda	Laxmipur		Private	139+000	LHS	3.1	Thadi	136	5.0
309	Golugonda	Laxmipur		Private	139+000	LHS	4.3	Vepa	137	4.0
310	Golugonda	Laxmipur		Private	139+000	LHS	5.1	Thadi	138	4.5
311	Golugonda	Laxmipur		Private	139+000	LHS	8.9	Thadi	139	4.0
312	Golugonda	Laxmipur		Private	139+000	LHS	9.9	Thadi	140	4.0
313	Golugonda	Laxmipur		Private	139+000	LHS	9.8	Thadi	141	4.0
314	Golugonda	Laxmipur		Private	139+000	LHS	13.9	Thadi	142	5.5
315	Golugonda	Laxmipur		Private	139+000	LHS	12.6	Thadi	143	4.5
316	Golugonda	Laxmipur		Private	139+000	LHS	4.7	Thadi	144	3.5
317	Golugonda	Laxmipur		Private	139+100	LHS	10.1	Theku	145	6.0
318	Golugonda	Laxmipur		Private	139+100	LHS	5.3	Thumma	146	6.0
319	Golugonda	Laxmipur		Private	139+100	RHS	4.2	Gunpave	147	2.5
320	Golugonda	Laxmipur		Private	139+100	RHS	4.9	Theku	148	7.0
321	Golugonda	Laxmipur		Private	139+100	RHS	7.0	Vepa	149	6.0
322	Golugonda	Laxmipur		Private	139+200	LHS	14.2	Thadi	150	6.5
323	Golugonda	Laxmipur		Private	139+200	LHS	13.1	Thadi	151	5.5
324	Golugonda	Laxmipur		Private	139+200	LHS	10.9	Thadi	152	5.0
325	Golugonda	Laxmipur	99/1	Private	139+200	LHS	7.7	Thadi	153	5.0
326	Golugonda	Laxmipur		Private	139+200	LHS	6.9	Thadi	154	6.5
327	Golugonda	Laxmipur		Private	139+200	LHS	6.3	Thadi	155	6.0
328	Golugonda	Laxmipur		Private	139+200	LHS	6.1	Thadi	156	5.0

329	Golugonda	Laxmipur		Private	139+200	LHS	8.3	Thadi	157	5.5
330	Golugonda	Laxmipur		Government	139+200	LHS	10.7	Thadi	158	5.0
331	Golugonda	Laxmipur	117	Government	139+200	LHS	11.7	Thadi	159	4.5
332	Golugonda	Laxmipur		Government	139+200	LHS	12.9	Thadi	160	5.0
333	Golugonda	Laxmipur		Private	139+200	LHS	6.4	Thadi	161	7.0
334	Golugonda	Laxmipur		Private	139+200	LHS	3.7	Thadi	162	7.0
335	Golugonda	Laxmipur		Private	139+200	LHS	1.9	Thadi	163	6.0
336	Golugonda	Laxmipur		Private	139+200	RHS	3.1	Thadi	164	6.0
337	Golugonda	Laxmipur	99/1	Private	139+200	RHS	3.5	Thadi	165	5.0
338	Golugonda	Laxmipur		Private	139+200	RHS	4.7	Thadi	166	7.0
339	Golugonda	Laxmipur		Private	139+200	RHS	5.9	Thadi	167	7.0
340	Golugonda	Laxmipur		Private	139+200	RHS	10.9	Thadi	168	7.0
341	Golugonda	Laxmipur		Private	139+200	RHS	7.2	Thadi	169	5.0
342	Golugonda	Laxmipur		Government	139+200	RHS	8.4	Thadi	170	6.0
343	Golugonda	Laxmipur		Government	139+250	LHS	14.7	Thadi	171	5.0
344	Golugonda	Laxmipur		Government	139+250	LHS	13.4	Thadi	172	5.0
345	Golugonda	Laxmipur		Government	139+250	LHS	11.6	Thadi	173	4.5
346	Golugonda	Laxmipur		Government	139+250	LHS	9.0	Thadi	174	5.0
347	Golugonda	Laxmipur		Government	139+250	LHS	2.1	Thadi	175	6.0
348	Golugonda	Laxmipur		Government	139+250	LHS	0.4	Chintha	176	2.0
349	Golugonda	Laxmipur		Government	139+250	LHS	0.4	Vepa	177	2.8
350	Golugonda	Laxmipur		Government	139+250	RHS	1.0	Thadi	178	6.0
351	Golugonda	Laxmipur		Government	139+250	RHS	4.2	Thadi	179	6.5
352	Golugonda	Laxmipur		Government	139+250	RHS	1.3	Chintha	180	2.0
353	Golugonda	Laxmipur	117	Government	139+250	RHS	6.0	Thadi	181	6.5
354	Golugonda	Laxmipur		Government	139+250	RHS	8.1	Thadi	182	6.5
355	Golugonda	Laxmipur		Government	139+250	RHS	10.8	Chintha	183	2.0
356	Golugonda	Laxmipur		Government	139+250	RHS	10.4	Thadi	184	6.5
357	Golugonda	Laxmipur		Government	139+250	RHS	13.0	Vepa	185	2.5
358	Golugonda	Laxmipur		Government	139+250	RHS	13.1	Thadi	186	6.0
359	Golugonda	Laxmipur		Government	139+300	RHS	10.9	Mamidi	187	7.0
360	Golugonda	Laxmipur		Government	139+300	LHS	2.1	Mamidi	188	7.0
361	Golugonda	Laxmipur		Government	139+350	LHS	13.3	Mamidi	189	12.0
362	Golugonda	Laxmipur		Government	139+350	LHS	4.3	Theku	190	2.0
363	Golugonda	Laxmipur		Government	139+350	LHS	14.1	Thadi	191	6.0
364	Golugonda	Laxmipur		Government	139+400	RHS	0.3	Thadi	192	6.5
365	Golugonda	Laxmipur		Government	139+400	RHS	14.1	Thadi	193	6.5
366	Golugonda	Laxmipur		Private	139+450	LHS	0.7	Thadi	194	5.5
367	Golugonda	Laxmipur		Private	139+450	RHS	4.7	Theku	195	3.5
368	Golugonda	Laxmipur		Private	139+450	RHS	2.7	Thadi	196	5.5
369	Golugonda	Laxmipur		Private	139+450	RHS	8.7	Theku	197	4.0
370	Golugonda	Laxmipur		Private	139+450	LHS	6.0	Thadi	198	5.0
371	Golugonda	Laxmipur		Private	139+450	RHS	4.7	Thadi	199	4.0
372	Golugonda	Laxmipur		Private	139+450	RHS	2.1	Thadi	200	5.0
373	Golugonda	Laxmipur	75/GP	Private	139+450	RHS	2.7	Theku	201	2.5
374	Golugonda	Laxmipur		Private	139+450	LHS	3.1	Theku	202	3.4
375	Golugonda	Laxmipur		Private	139+450	RHS	5.1	Theku	203	4.0
376	Golugonda	Laxmipur		Private	139+450	LHS	7.2	Thadi	204	5.0
377	Golugonda	Laxmipur		Private	139+450	LHS	12.1	Thadi	205	5.0
378	Golugonda	Laxmipur		Private	139+450	RHS	10.7	Theku	206	5.5
379	Golugonda	Laxmipur		Private	139+450	RHS	8.3	Vepa	207	4.0
380	Golugonda	Laxmipur		Private	139+450	LHS	3.9	Thadi	208	2.5
381	Golugonda	Laxmipur		Private	139+450	LHS	5.7	Theku	209	3.0
382	Golugonda	Laxmipur		Private	139+450	RHS	3.9	Theku	210	2.0
383	Golugonda	Laxmipur		Private	139+450	LHS	2.0	Theku	211	2.5
384	Golugonda	Laxmipur		Private	139+450	LHS	0.7	Vepa	212	4.0

385	Golugonda	Laxmipur		Private	139+450	LHS	4.2	Thadi	213	4.0
386	Golugonda	Laxmipur		Private	139+450	LHS	12.9	Theku	214	5.5
387	Golugonda	Laxmipur		Private	139+450	RHS	5.1	Thumma	215	6.0
388	Golugonda	Laxmipur		Private	139+450	RHS	3.2	Theku	216	7.5
389	Golugonda	Laxmipur	112/1	Private	139+450	RHS	2.1	Vepa	217	4.0
390	Golugonda	Laxmipur		Private	139+450	LHS	12.9	Thadi	218	4.0
391	Golugonda	Laxmipur		Private	139+450	LHS	11.6	Thadi	219	19.0
392	Golugonda	Laxmipur		Private	139+450	LHS	2.9	Thadi	220	2.5
393	Golugonda	Laxmipur		Private	139+450	LHS	9.1	Thadi	221	2.5
394	Golugonda	Laxmipur		Private	139+550	LHS	7.1	Thadi	222	2.0
395	Golugonda	Laxmipur		Private	139+550	LHS	7.1	Thadi	223	2.0
396	Golugonda	Laxmipur		Private	139+550	LHS	11.7	Thadi	224	5.0
397	Golugonda	Laxmipur		Private	139+600	LHS	12.9	Thadi	225	4.0
398	Golugonda	Laxmipur		Private	139+600	LHS	12.6	Thadi	226	5.0
399	Golugonda	Laxmipur		Private	139+600	LHS	13.0	Thadi	227	5.5
400	Golugonda	Laxmipur		Private	139+600	LHS	14.0	Thadi	228	5.5
401	Golugonda	Laxmipur		Private	139+600	LHS	5.7	Thadi	229	5.0
402	Golugonda	Laxmipur		Private	139+600	RHS	4.2	Nerodu	230	10.0
403	Golugonda	Laxmipur		Private	139+600	RHS	5.7	Vepa	231	4.5
404	Golugonda	Laxmipur		Private	139+600	LHS	3.5	Thadi	232	3.0
405	Golugonda	Laxmipur		Private	139+600	RHS	4.2	Namali	233	3.5
406	Golugonda	Laxmipur		Private	139+600	RHS	10.2	Nerodu	234	12.0
407	Golugonda	Laxmipur		Private	139+600	RHS	11.9	Billa	235	3.0
408	Golugonda	Laxmipur		Private	139+600	LHS	13.9	Theku	236	3.0
409	Golugonda	Laxmipur		Private	139+600	RHS	1.7	Narmadi	237	2.5
410	Golugonda	Laxmipur		Private	139+650	RHS	2.3	Theku	238	2.5
411	Golugonda	Laxmipur		Private	139+650	LHS	2.6	Theku	239	2.5
412	Golugonda	Laxmipur		Private	139+650	RHS	2.3	Theku	240	3.0
413	Golugonda	Laxmipur		Private	139+650	LHS	5.9	Ootika	241	4.0
414	Golugonda	Laxmipur		Private	139+700	RHS	0.9	Ootika	242	2.5
415	Golugonda	Laxmipur		Private	139+700	LHS	14.1	Thumma	243	10.0
416	Golugonda	Laxmipur		Private	139+700	LHS	7.2	Thumma	244	10.0
417	Golugonda	Laxmipur	112/2	Private	139+700	RHS	0.7	Namali	245	5.0
418	Golugonda	Laxmipur		Private	139+700	LHS	13.3	Namali	246	2.0
419	Golugonda	Laxmipur		Private	139+700	LHS	14.8	Thumma	247	4.0
420	Golugonda	Laxmipur		Private	139+700	RHS	0.7	Namali	248	3.5
421	Golugonda	Laxmipur		Private	139+700	LHS	11.8	Narlingi	249	4.0
422	Golugonda	Laxmipur		Private	139+700	RHS	10.7	Alli	250	5.0
423	Golugonda	Laxmipur		Private	139+700	RHS	11.5	Ootika	251	4.0
424	Golugonda	Laxmipur		Private	139+700	RHS	11.9	Ootika	252	3.5
425	Golugonda	Laxmipur		Private	139+700	RHS	6.2	Sandara	253	2.0
426	Golugonda	Laxmipur		Private	139+700	RHS	7.4	Namali	254	2.5
427	Golugonda	Laxmipur		Private	139+700	RHS	14.2	Namali	255	6.0
428	Golugonda	Laxmipur		Private	139+700	RHS	11.2	Namali	256	6.0
429	Golugonda	Laxmipur		Private	139+700	RHS	10.2	Ootika	257	2.0
430	Golugonda	Laxmipur		Private	139+750	RHS	9.7	Vepa	258	4.4
431	Golugonda	Laxmipur		Private	139+750	RHS	12.9	Billa	259	2.5
432	Golugonda	Laxmipur		Private	139+750	RHS	10.2	Vepa	260	3.5
433	Golugonda	Laxmipur		Private	139+750	RHS	5.7	Vepa	261	4.0
434	Golugonda	Laxmipur		Private	139+750	RHS	2.2	Vepa	262	5.0
435	Golugonda	Laxmipur		Private	139+750	LHS	3.1	Pachari	263	3.0
436	Golugonda	Laxmipur		Private	139+750	LHS	3.1	Vepa	264	6.0
437	Golugonda	Laxmipur		Private	139+750	LHS	4.9	Papidi	265	2.0
438	Golugonda	Laxmipur		Private	139+750	LHS	9.3	Billa	266	3.5
439	Golugonda	Laxmipur		Government	139+800	RHS	4.0	Ootika	267	2.0
440	Golugonda	Laxmipur		Government	139+800	RHS	4.9	Namali	268	2.0

441	Golugonda	Laxmipur	119	Government	139+850	LHS	2.6	Thumma	269	4.0
442	Golugonda	Laxmipur		Government	139+850	RHS	14.7	Thadi	270	6.0
443	Golugonda	Laxmipur		Government	139+850	RHS	14.2	Thadi	271	8.0
444	Golugonda	Laxmipur		Government	139+850	RHS	13.0	Thadi	272	8.0
445	Golugonda	Laxmipur		Government	139+850	RHS	12.1	Papidi	273	2.5
446	Golugonda	Laxmipur		Government	139+850	RHS	12.0	Namali	274	5.0
447	Golugonda	Laxmipur		Government	139+850	RHS	11.2	Thadi	275	8.0
448	Golugonda	Laxmipur		Government	139+850	RHS	10.3	Thadi	276	8.0
449	Golugonda	Laxmipur		Government	139+850	RHS	9.9	Thadi	277	4.0
450	Golugonda	Laxmipur		Government	139+850	RHS	10.1	Vepa	278	2.0
451	Golugonda	Laxmipur		Government	139+850	RHS	8.9	Gunpave	279	3.0
452	Golugonda	Laxmipur		Government	139+850	RHS	13.7	Namali	280	3.0
453	Golugonda	Laxmipur		Government	139+850	RHS	8.3	Thadi	281	7.0
454	Golugonda	Laxmipur		Government	139+850	RHS	7.1	Thadi	282	5.0
455	Golugonda	Laxmipur		Government	139+850	RHS	7.0	Gunpave	283	3.0
456	Golugonda	Laxmipur		Government	139+850	RHS	6.7	Namali	284	3.0
457	Golugonda	Laxmipur		Government	139+850	RHS	6.2	Vepa	285	3.0
458	Golugonda	Laxmipur		Government	139+850	RHS	6.6	Thadi	286	8.0
459	Golugonda	Laxmipur		Government	139+850	RHS	5.9	Thadi	287	8.0
460	Golugonda	Laxmipur		Government	139+850	RHS	5.0	Thadi	288	5.5
461	Golugonda	Laxmipur		Government	139+850	RHS	4.4	Thadi	289	8.0
462	Golugonda	Laxmipur		Government	139+850	RHS	3.1	Thadi	290	7.0
463	Golugonda	Laxmipur		Government	139+850	RHS	3.1	Thadi	291	5.0
464	Golugonda	Laxmipur		Government	139+850	RHS	1.9	Thadi	292	7.0
465	Golugonda	Laxmipur		Government	139+850	RHS	3.2	Namali	293	3.0
466	Golugonda	Laxmipur		Government	139+850	RHS	3.2	Thadi	294	7.0
467	Golugonda	Laxmipur		Government	139+850	LHS	2.1	Thadi	295	6.0
468	Golugonda	Laxmipur		Government	139+850	LHS	1.9	Thadi	296	6.0

No. MORTH/PIU/VSKP/P-I/Misc/2022/09
Government of India
Ministry of Road Transport & Highways
Project Implementation Unit, Visakhapatnam
D. No. 1-69/6, Near Sai Baba Temple, Ganesh Nagar, Chinamushidiwada
Visakhapatnam - 530051. Tele: 0891-3512111.

Date: 11.11.2022

To,

The Authorised Signatory,
M/s SRC Infra Developers Private Limited,
#7-272, kakateeya Residency,
Court Road, Anantapuramu,
Andhra Pradesh - 515001

Subject: Rehabilitation and Upgradation to 2-lane with paved shoulder configuration of Koyyuru to Chaprathipalem (Km 120.000 to Km 165.500) of NH-516E in the State of Andhra Pradesh under GNHCP with the loan assistance of World Bank on EPC mode - Tree felling permission - Reg.

Reference:-

i. This office letter no MORTH/PIU/VSKP/P-I/Misc/2022/08 dated 08.10.2022

Sir,

Please ignore this office letter dated 08.10.2022 mentioned under reference vide which tree falling permission was conveyed.

2. It is to mention that DFO,Chintapalli has conveyed tree felling permission of 257 nos of tree falling in alignment of Koyyuru to Chaprathipalem section(Package-I) of NH 516E in Alluri Sitarama Raju district of State of Andhra Pradesh. The brief details of the trees is as under:

S.No	Tree Category	No. of Trees	Value in Rs.
Government lands			
1	Reserved trees > 120cm girth	134	22,55,823
2	Exempted trees	107	17,90,661
	Total	241	40,46,484
Privates lands			
1	Reserved trees > 120cm girth	3	85,556
2	Exempted trees	13	3,54,342
	Total	16	4,39,898
Grand Total		257	44,86,382

3. It is further mentioned that in accordance with Clause 9.4 of the Contract Agreement, the Contractor is obliged to execute the felling of trees as per the permits obtained with the assistance of Authority. The cost of felling and disposal is included in the Contract Price.

4. In view of the above, this office hereby issues work order to carry out the felling of trees in the subject mentioned stretch as per list at Annexure - I under acceptance of the following conditions of Forest Department:

i. The Contractor shall pay tree valuation amount of Rs.40,46,484/-for the trees (241 nos.) falling in Government lands before felling of the trees as per the permission conveyed by the DFO, Chintapalli through CFMS challan in the head of Account (0406-01-800-00-04-800-000-VN under EFS02-7068) on or before 30.11.2022.

ii. Further, it is informed that the Treasury code of Sub-Treasury Officer, chintapalli is 6404 and the DDO code of Divisional Forest officer, chintapalli is 64040402001.

iii. Further, it is requested to pay 10% on the total value of the produce of all categories of trees (i.e.,Rs.4,48,639/-) in way of Security Deposit in any Nationalized Bank in favor of Divisional Forest Officer, Chintapalli before felling of trees and produce the security deposit to DFO, Chintapalli office.

iv. As per A.P. Water Land & Trees Rules Act, 2002 and A.P. Water Land & Trees Rules, 2004, the Contractor shall plant double the number of saplings of the same or suitable species to be planted on the same site or suitable place within 30 days and maintenance of the same for a period of (05) years.

v. Further, the extraction and transportation of these trees are to be done by the Contractor as per A.P.Forest Produce Transit Rules, 1970. The details of transportation & storage of felled produce may be intimated to DFO, Chintapalli office.

vi. The Contractor should submit an undertaking before felling stating that they shall not claim any compensation from the Forest Department in case the Forest Department does not give transit permit for the felled trees.

vii. If any irregularities are noticed, action will be taken as per the provisions of the A.P.Forest Act, 1967 and A.P.Forest Produce Transit Rules, 1970.

Yours faithfully,

(Ravishek)
Project Director
Project Implementation Unit, Visakhapatnam

Copy to:

i. The Regional Officer, MoRTH, Vijayawada for kind information
ii. The District Collector, ASR district for kind information.
iii. The Divisional Forest Officer, Chintapalli for kind information.
iv. The Team Leader, M/s LN Malviya Infra Projects Pvt Ltd for kind information.

No. MORTH/PIU/VSKP/P-II/Misc/2022/04
Government of India
Ministry of Road Transport & Highways
Project Implementation Unit, Visakhapatnam
D. No. 1-69/6, Near Sai Baba Temple, Ganesh Nagar, Chinamushidiwada
Visakhapatnam - 530051. Tele: 0891-3512111.

Date: 11.11.2022

To,

The Authorised Signatory,
M/s SRC Infra Developers Private Limited,
#7-272, kakateeya Residency,
Court Road, Anantapuramu,
Andhra Pradesh - 515001

Subject: Rehabilitation and Upgradation to 2-lane with paved shoulder configuration of Chaprathipalem to Lammasingi (Km 165.500 to Km 205.000) of NH-516E in the State of Andhra Pradesh under GNHCP with the loan assistance of World Bank on EPC mode - Tree felling permission - Reg.

Sir,

It is mention to that DFO,Chintapalli has conveyed tree felling permission of 1145 nos of tree falling in alignment of Chaprathipalem to Lammasingi section(Package-II) of NH 516E in Allurisitarama Raju district of State of Andhra Pradesh. The brief details of the trees is as under:

S.No	Tree Category	No. of Trees	Value in Rs.
Government lands			
1	Reserved trees > 120cm girth	844	1,32,95,460
2	Exempted trees	255	27,05,110
	Total	1099	1,60,00,570
Privates lands			
1	Reserved trees > 120cm girth	7	1,08,090
2	Exempted trees	39	95,254
	Total	46	2,03,344
Grand Total		1145	1,62,03,914

2. It is further mentioned that in accordance with Clause 9.4 of the Contract Agreement, the Contractor is obliged to execute the felling of trees as per the permits obtained with the assistance of Authority. The cost of felling and disposal is included in the Contract Price.

3. In view of the above, this office hereby issues work order to carry out the felling of trees in the subject mentioned stretch as per list at Annexure - I under acceptance of the following conditions of Forest Department:

i. The Contractor shall pay tree valuation amount of Rs.1,60,00,570/-for the trees (1099 nos.) falling in Government lands before felling of the trees as per the permission conveyed by the DFO, Chintapalli through CFMS challan in the head of Account (0406-01-800-00-04-800-000-VN under EFS02-7068) on or before 30.11.2022.

ii. Further, it is informed that the Treasury code of Sub-Treasury Officer, chintapalli is 6404 and the DDO code of Divisional Forest officer, chintapalli is 64040402001.

iii. Further, it is requested to pay 10% on the total value of the produce of all categories of trees (i.e.,Rs.16,20,391 /-) in way of Security Deposit in any Nationalized Bank in favor of Divisional Forest Officer, Chintapalli before felling of trees and produce the security deposit to DFO, Chintapalli office.

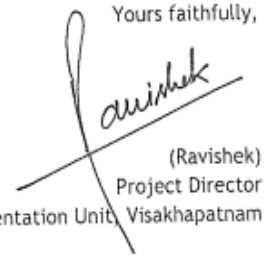
iv. As per A.P. Water Land & Trees Rules Act, 2002 and A.P. Water Land & Trees Rules, 2004, the Contractor shall plant double the number of saplings of the same or suitable species to be planted on the same site or suitable place within 30 days and maintenance of the same for a period of (05) years.

v. Further, the extraction and transportation of these trees are to be done by the Contractor as per A.P.Forest Produce Transit Rules, 1970. The details of transportation & storage of felled produce may be intimated to DFO, Chintapalli office.

vi. The Contractor should submit an undertaking before felling stating that they shall not claim any compensation from the Forest Department in case the Forest Department does not give transit permit for the felled trees.

vii. If any irregularities are noticed, action will be taken as per the provisions of the A.P.Forest Act, 1967 and A.P.Forest Produce Transit Rules, 1970.

Yours faithfully,



(Ravishek)
Project Director
Project Implementation Unit, Visakhapatnam

Copy to:

i. The Regional Officer, MoRTH, Vijayawada for kind information
ii. The District Collector, ASR district for kind information.
iii. The Divisional Forest Officer, Chintapalli for kind information.
iv. The Team Leader, M/s LN Malviya Infra Projects Pvt Ltd for kind information.

ANNEXURE 23: Forest area details

Forest area details of Koyyuru - Paderu NH-516E under PIU, Visakhapatnam											
S.No	Package	Division	Range	Stretch	Chainage		Length in 'm'	Side	Area in 'Ha'	Approx width in 'm'	Remarks
					From	To					
1	P-I	Narsipatnam	KD Peta	S-1	128.800	132.100	3300	Both Sides	6.58	20	Existing road is included for forest diversion
2				S-2 (Part)	150.900	160.150	9250	Both Sides	18.49	20	Existing road is included for forest diversion
3	P-I, II, III		Chinthapalli	S-2 (Part)	160.150	162.700	2550	Both Sides	5.09	20	Existing road is included for forest diversion
4				S-3	167.610	169.610	2000	Both Sides	4.02	20	Existing road is included for forest diversion
5				S-4	187.230	188.300	1070	Both Sides	1.51	14.1	Existing road is not included for diversion. Only extra width required from the shoulder to Proposed RoW is taken.
6				S-5	189.250	190.700	1450	Both Sides	6.3	14.6	Existing road is not included
7					190.700	192.550	1850	LHS		7.3	

Forest area details of Koyyuru - Paderu NH-516E under PIU, Visakhapatnam											
S.No	Package	Division	Range	Stretch	Chainage		Length in 'm'	Side	Area in 'Ha'	Approx width in 'm'	Remarks
					From	To					
8					192.550	194.100	1550	Both Sides		14.6	for diversion. Only extra width required from the shoulder to Proposed RoW is taken.
9					194.100	194.900	800	LHS		7.3	
10				S-6	196.330	197.900	1570	RHS	1.08	6.9	Existing road is not included for diversion. Only extra width required from the shoulder to Proposed RoW is taken.
11				S-7	217.400	220.300	2900	Both Sides	9.9	34.1	Existing road is included for forest diversion
12				S-8	221.900	224.200	2300	Both Sides	6.85	29.8	Existing road is included for forest diversion
13	P-III	Paderu	Paderu	S-9	238.600	238.700	100	Both Sides	0.24	24	Existing road is included for forest diversion
								Total	**60.06**		

ANNEXURE 24: Online proposal for allocation of Fresh Forest Land

11/30/22, 12:05 PM List of Proposals Submitted by Online

List of Proposals Submitted Online by User Agencies

Help

Using this report, you can view details of proposals . Click on Proposal no to view detail of FORM-A part I. Click on to print

◉ **Allocation of fresh forest land (Form-A)** ○ **Application Under Section 2(iii)** ○ **Renewal of lease (Fo**

Proposal Year : -All Years-

Region : Select

Category : -Select All-

Enter value for Search : FP/AP/ROAD/49639/2020

SEARCH

Note :-All areas are in Hectares(ha.)

Sno.	State Name	Proposal No.	RO/Ministry File Number	Proposal Name	Category	User Agency Name	Area (ha.)	Proposal Status	Propos receiv electro on
1	Andhra Pradesh	FP/AP/ROAD/49639/2020	NA	Rehabilitation and Upgradation to two lane with paved shoulder configuration of Koyyuru to Paderu section from Km 120/000 to Km	Road	REGIONAL OFFICER,MINISTRY OF ROAD TRANSPORT AND HIGHWAYS, VIJAYAWADA	60.06	Pending at Nodal Officer	16 Sep

ANNEXURE 25: Environmental Monitoring Reports

PRAGATHI LABS & CONSULTANTS PVT.LTD.

(LAB RECOGNISED BY MINISTRY OF ENVIRONMENT & FORESTS, GOVT. OF INDIA)

(ISO 9001:2015, OHSAS 18001:2007)

Plot No.B15 & 16, Industrial Estate, Behind Pollution Control Board, Opp. Dena Bank, Sanath Nagar, Hyderabad – 500 018, Tele Fax : 040-23717213

E-mail:info@pragathilabs.com Website: www.pragathilabs.com

TEST REPORT

Issued to

Mukesh & Associates Consultants & Engineers
Ranganathar Avenue, Perumalmalai
Main Road ,Narasodhipatty
Salem -636004
Tamilnadu

Date of Monitoring	09th March, 2021	Date of test performed	09th -15th March, 2021
Date of Reporting	16th March, 2021	Report No.	PLCPL/21/24
Your Ref No.	MA-APL/2017-2018/001		
Sample particulars	Noise, No. of samples: 5 (Five)		
Instruments used	Sound Level Meter		
Test required	Recording Noise Levels	Method of analysis	IS: 4758-1968 (RA-2002)

Discipline: Chemical Testing
Group: Atmospheric air Pollution

RESULTS

S. No	Locations	Equivalent Levels dB (A) Leq	
		Day Time (L_d) (6 am to 10pm)	Night Time (L_n) (10 pm to 6 am)
1	PADERU	53	44
2	G MADUGULA	52	43
3	LAMBASINGI Village	49	40
4	BOINTI FOREST	47	38
5	KD PETA BYEPASS	51	41

AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

Category of Area	Limits in dB(A) Leq	
	Day Time	Night Time
Industrial Area	75	70
Residential Area	55	45

P. Pradeep Reddy
Analyst Signatory
(Pradeep Reddy)

Authorized Signatory
(M. Ravi Kiran)

PRAGATHI LABS & CONSULTANTS PVT.LTD.

(LAB RECOGNISED BY MINISTRY OF ENVIRONMENT & FORESTS,GOVT.OF INDIA)

(ISO 9001:2015, OHSAS 18001:2007)

Plot No.B15 & 16, Industrial Estate, Behind Pollution Control Board, Opp. Dena Bank, Sanath Nagar, Hyderabad – 500 018, Tele Fax : 040-23717213

E-mail:info@pragathilabs.com Website: www.pragathilabs.com

Issued to

TEST REPORT

Mukesh & Associates Consultants & Engineers
Ranganathar Avenue, Perumalmalai
Main Road ,Narasodhipatty
Salem -636004
Tamilnadu

Date of Monitoring	09th March, 2021	Date of test performed	09th -15th March, 2021
Date of Reporting	16th March, 2021	Report No.	PLCPL/21/23
Your Ref No.	MA-APL/2017-2018/001		
Sample particulars	Ambiant Air, No. of Samples : 03 (Three)		
Instruments used	5 No. PM 2.5 FDS, Make: Instrumex, 5 No RDS, Make: Aero Vironment Engineers INC., Calibration Due date : 01.12.2021		
Test required	PM_{10}, $PM_{2.5}$, SO_2,NO_x & CO		

Discipline: Chemical Testing
Group: Atmospheric air Pollution

Ambient Air Quality

Location	Concentration, µg/m³				mg/m3
	PM_{10}	$PM_{2.5}$	SO_2	NO_2	CO
PADERU	54	22	13	17	0.21
G MADUGULA	51	20	12	15	0.19
LAMBASINGI Village	48	18	10	14	0.15
BOINTI FOREST	46	17	09	12	0.12
KD PETA BYEPASS	50	19	11	16	0.16

Prescribed Limits

Pollutants	Units	NAAQS Industrial Limit (µg/m³)	Method of Analysis
Sulphur dioxide (SO_2)	µg/m³	80	IS 5182 (Part 2)
Nitrogen Oxide (NO_2)	µg/m³	80	IS 5182 (Part 6)
Particulate Matter (PM_{10})	µg/m³	100	IS 5182 (Part 23)
Particulate Matter ($PM_{2.5}$)	µg/m³	60	IS 5182 (Part 24)
Carbon monoxide (CO)	mg/m³	2.0	IS 5182(P10)

P. Pradeep Reddy
Analyst Signatory
(Pradeep Reddy)

Authorized Signatory
(M. Ravi Kiran)

PRAGATHI LABS & CONSULTANTS PVT.LTD.

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Issued to

Mukesh & Associates Consultants & Engineers
Ranganathar Avenue, Perumalmalai
Main Road ,Narasodhipatty
Salem -636004, Tamilnadu

TEST REPORT

Date of Sampling	09th March, 2021	Date of Receipt	10h March, 2021
Date of Test performed	10th – 15th March, 2021	Date of Reporting	016th March, 2021
Report No.	PLCPL/21/618/335	ULR No.	ULR-TC5741210000000058F
Your Reference No.	MA-APL/2017-2018/001	Method of Sampling	IS: 3025 (P 1)
Sample Particulars	Bore Well Paderu (W1), No. of samples: 01 (One), packed in one PVC container of Two liter qty.		
Test required	Odour, Color , pH, EC, TDS, T. Hardness, T. Alkalinity , Ca, Mg , SO_4, Fe, Cl, Cr, Cd, Pb, Cu, Zn, Ni, F, Al, B, Mn, NH_3, Na, K , P & PO_4		
Sample Collected By	PLCPL	Sample Condition	Good

Discipline: Chemical Testing
Group: Water

TEST RESULTS

Parameter	Unit	Method	Results	IS: 10500 Limits	
				Acceptable	Permissible
Odour		IS:3025(P05)	Agreeable	Agreeable	Agreeable
color	Hazen	IS:3025(P04)	<1.0	5	15
pH	--	IS:3025(P11)	6.9	6.5 to 8.5	6.5 to 8.5
Electrical Conductivity	µmhos/cm	IS:3025(P14)	378	NS	NS
Total Dissolved Solids	mg/L	IS:3025(P16)	227	500	2000
Total Hardness as $caco_3$	mg/L	IS:3025(P21)	125	200	600
Total Alkalinity as $caco_3$	mg/L	IS:3025(P23)	110	200	600
Calcium as Ca	mg/L	IS:3025(P40)	40	75	200
Magnesium as Mg	mg/L	IS:3025(P46)	6	30	100
Sulphate as SO_4	mg/L	IS:3025(P24)	19	200	400
Iron as Fe	mg/L	IS:3025(P53)	0.3	0.3	0.3
Chlorides as Cl	mg/L	IS:3025(P32)	47	250	1000
Chromium as cr	mg/L	IS:3025(P52)	0.01	0.05	0.05
Cadmium as Cd	mg/L	IS:3025(P41)	0.001	0.003	0.003
Lead as Pb	mg/L I	IS:3025(P47)	0.01	0.01	0.01
Copper as Cu	mg/L	IS:3025(P42)	0.02	0.05	1.5
Zinc as Zn	mg/L	IS:3025(P49)	1.1	5.0	15
Nickel as Ni	mg/L	IS:3025(P54)	0.01	0.02	0.02
Fluorides as F	mg/L	IS:3025(P60)	1.0	1.0	1.5
Aluminum as Al	mg/L	IS:3025(P55)	0.01	0.03	0.2
Boron as B	mg/L	IS:3025(P57)	0.002	0.5	1.0
Manganese as Mn	mg/L	IS:3025(P59)	0.1	0.1	0.3
Ammonical Nitrogen as NH_3	mg/L	IS:3025(P34)	0.02	0.5	No relaxation
Sodium as Na	mg/L	IS:3025(P45)	29	NS	NS
Potassium as K	mg/L	IS:3025(P45)	1.0	NS	NS
Phosphate as PO_4	mg/L	IS:3025(P11)	03	NS	NS

BDL: Below Detectable Limit; NS: Not Specified in IS:10500

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

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Issued to
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Main Road ,Narasodhipatty
Salem -636004, Tamilnadu

TEST REPORT

Date of Sampling	09th March, 2021	**Date of Receipt**	10th March, 2021
Date of Test performed	10th – 15th March, 2021	**Date of Reporting**	16th March, 2021
Report No.	PLCPL/21/619/336	**ULR No.**	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	**Method of Sampling**	IS: 3025 (P 1)
Sample Particulars	Open Well madugula (W2) , No. of samples: 01 (One), packed in one PVC container of Two liter qty.		
Test required	Odour, Color , pH, EC, TDS, T. Hardness, T. Alkalinity , Ca, Mg , SO_4, Fe, Cl, Cr, Cd, Pb, Cu, Zn, Ni, F, Al, B, Mn, NH_3, Na, K , P & PO_4		
Sample Collected By	PLCPL	**Sample Condition**	Good

Discipline: Chemical Testing
Group: Water

TEST RESULTS

Parameter	Unit	Method	Results	IS: 10500 Limits	
				Acceptable	Permissible
Odour		IS:3025(P05)	Agreeable	Agreeable	Agreeable
color	Hazen	IS:3025(P04)	<1.0	5	15
pH	--	IS:3025(P11)	5.8	6.5 to 8.5	6.5 to 8.5
Electrical Conductivity	µmhos/cm	IS:3025(P14)	104	NS	NS
Total Dissolved Solids	mg/L	IS:3025(P16)	49	500	2000
Total Hardness as $caco_3$	mg/L	IS:3025(P21)	30	200	600
Total Alkalinity as $caco_3$	mg/L	IS:3025(P23)	25	200	600
Calcium as Ca	mg/L	IS:3025(P40)	9.0	75	200
Magnesium as Mg	mg/L	IS:3025(P46)	2.0	30	100
Sulphate as SO_4	mg/L	IS:3025(P24)	09	200	400
Iron as Fe	mg/L	IS:3025(P53)	0.2	0.3	0.3
Chlorides as Cl	mg/L	IS:3025(P32)	15	250	1000
Chromium as cr	mg/L	IS:3025(P52)	0.02	0.05	0.05
Cadmium as Cd	mg/L	IS:3025(P41)	0.001	0.003	0.003
Lead as Pb	mg/L l	IS:3025(P47)	0.01	0.01	0.01
Copper as Cu	mg/L	IS:3025(P42)	0.03	0.05	1.5
Zinc as Zn	mg/L	IS:3025(P49)	1.3	5.0	15
Nickel as Ni	mg/L	IS:3025(P54)	0.01	0.02	0.02
Fluorides as F	mg/L	IS:3025(P60)	1.2	1.0	1.5
Aluminum as Al	mg/L	IS:3025(P55)	0.01	0.03	0.2
Boron as B	mg/L	IS:3025(P57)	0.001	0.5	1.0
Manganese as Mn	mg/L	IS:3025(P59)	0.2	0.1	0.3
Ammonical Nitrogen as NH_3	mg/L	IS:3025(P34)	0.01	0.5	No relaxation
Sodium as Na	mg/L	IS:3025(P45)	09	NS	NS
Potassium as K	mg/L	IS:3025(P45)	1.2	NS	NS
Phosphate as PO_4	mg/L	IS:3025(P11)	05	NS	NS

BDL: Below Detectable Limit; NS: Not Specified in IS:10500

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

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TEST REPORT

Issued to

Mukesh & Associates Consultants & Engineers
Ranganathar Avenue, Perumalmalai
Main Road ,Narasodhipatty
Salem -636004, Tamilnadu

Date of Sampling	09th March, 2021	Date of Receipt	10th March, 2021
Date of Test performed	10th – 15th March, 2021	Date of Reporting	016th March, 2021
Report No.	PLCPL/21/620/337	ULR No.	ULR-TC574121000000000058F
Your Reference No.	MA-APL/2017-2018/001	Method of Sampling	IS: 3025 (P 1)
Sample Particulars	Thajangi reservoir Surface water , No. of samples: 01 (One), packed in one PVC container of One liter qty.		
Test required	Color, PH, EC, TDS, DO, BOD, Cl, SO_4, NO_3, Fe, F, Pb, Cu, Zn, Cd, Cr & Oil & Grease		
Sample Collected By	PLCPL	Sample Condition	Good

Discipline: Chemical Testing
Group: Water

TEST RESULTS

Parameter	Unit	Method	Results	IS: 2296 Limits Class C Norms
color	Hazen	IS:3025(P04)	02	300
pH	--	IS:3025(P11)	6.7	6.5-8.5
Electrical Conductivity	µmhos/cm	IS:3025(P14)	90	NS
Total Dissolved Solids	Mg/L	IS:3025(P16)	46	NS
DO	Mg/L	IS:3025(P44)	06	4.0
BOD,3 days @27°c	Mg/L	IS:3025(P44)	03	03
Chlorides as Cl	Mg/L	IS:3025(P32)	15	600
Sulphate as SO_4	Mg/L	IS:3025(P24)	07	400
Nitrate as NO_3	Mg/L	IS:3025(P34)	0.8	50
Iron as Fe	Mg/L	IS:3025(P53)	0.1	50
Fluorides as F	Mg/L	IS:3025(P60)	1.0	1.5
Lead as Pb	Mg/L	IS:3025(P47)	0.01	0.1
Copper as Cu	Mg/L	IS:3025(P42)	0.01	1.5
Zinc as Zn	Mg/L	IS:3025(P49)	0.2	1.5
Cadmium as Cd	Mg/L	IS:3025(P41)	0.001	0.01
Chromium as Cr	Mg/L	IS:3025(P52)	0.01	0.05
Oil & Grease	Mg/L	IS:3025(P39)	05	0.1

NS: Not Specified in IS: 2296 Class C

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

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TEST REPORT

Date of Sampling	09th March, 2021	Date of Receipt	10th March, 2021
Date of Test performed	10th – 15th March, 2021	Date of Reporting	016th March, 2021
Report No.	PLCPL/21/821/338	ULR No.	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	Method of Sampling	IS: 3025 (P 1)
Sample Particulars	Katragadda Wear Bointi Forest (W4) , No. of samples: 01 (One), packed in one PVC container of Two liter qty.		
Test required	Odour, Color , pH, EC, TDS, T. Hardness, T. Alkalinity , Ca, Mg , SO_4, Fe, Cl, Cr, Cd, Pb, Cu, Zn, Ni, F, Al, B, Mn, NH_3, Na, K , P & PO_4		
Sample Collected By	PLCPL	Sample Condition	Good

Discipline: Chemical Testing
Group: Water

TEST RESULTS

Parameter	Unit	Method	Results	IS: 10500 Limits	
				Acceptable	Permissible
Odour	-	IS:3025(P05)	Agreeable	Agreeable	Agreeable
color	Hazen	IS:3025(P04)	<1.0	5	15
pH	--	IS:3025(P11)	6.7	6.5 to 8.5	6.5 to 8.5
Electrical Conductivity	µmhos/cm	IS:3025(P14)	191	NS	NS
Total Dissolved Solids	mg/L	IS:3025(P16)	103	500	2000
Total Hardness as $caco_3$	mg/L	IS:3025(P21)	55	200	600
Total Alkalinity as $caco_3$	mg/L	IS:3025(P23)	40	200	600
Calcium as Ca	mg/L	IS:3025(P40)	14	75	200
Magnesium as Mg	mg/L	IS:3025(P46)	04	30	100
Sulphate as SO_4	mg/L	IS:3025(P24)	19	200	400
Iron as Fe	mg/L	IS:3025(P53)	0.1	0.3	0.3
Chlorides as Cl	mg/L	IS:3025(P32)	25	250	1000
Chromium as cr	mg/L	IS:3025(P52)	0.02	0.05	0.05
Cadmium as Cd	mg/L	IS:3025(P41)	0.001	0.003	0.003
Lead as Pb	mg/L	IS:3025(P47)	0.01	0.01	0.01
Copper as Cu	mg/L	IS:3025(P42)	0.03	0.05	1.5
Zinc as Zn	mg/L	IS:3025(P49)	1.5	5.0	15
Nickel as Ni	mg/L	IS:3025(P54)	0.01	0.02	0.02
Flucrides as F	mg/L	IS:3025(P60)	1.3	1.0	1.5
Aluminum as Al	mg/L	IS:3025(P55)	0.04	0.03	0.2
Boron as B	mg/L	IS:3025(P57)	0.002	0.5	1.0
Manganese as Mn	mg/L	IS:3025(P59)	0.2	0.1	0.3
Ammonical Nitrogen as NH_3	mg/L	IS:3025(P34)	0.04	0.5	No relaxation
Sodium as Na	mg/L	IS:3025(P45)	18	NS	NS
Potassium as K	mg/L	IS:3025(P45)	1.1	NS	NS
Phosphate as PO_4	mg/L	IS:3025(P11)	1.2	NS	NS

BDL: Below Detectable Limit; NS: Not Specified in IS:10500

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

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Salem-636004, Tamilnadu

TEST REPORT

Date of Sampling	09th March, 2021	Date of Receipt	10th March, 2021
Date of Test performed	10th – 15th March, 2021	Date of Reporting	16th March, 2021
Report No.	PLCPL/21/622/339	ULR No.	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	Method of Sampling	IS: 3025 (P 1)
Sample Particulars	Laxmipuram Bore Well Near KD Peta Byepass, , No. of samples: 01(One), packed in one PVC Container of 2 liter qty		
Test required	Odour, Color , pH, EC, TDS, T. Hardness, T. Alkalinity , Ca, Mg , SO_4, Fe, Cl, Cr, Cd, Pb, Cu, Zn, Ni, F, Al, B, Mn, NH_3, Na, K , P & PO_4		
Sample Collected By	PLCPL	Sample Condition	Good

Discipline: Chemical Testing
Group: Water

TEST RESULTS

Parameter	Unit	Method	Results	IS: 10500 Limits	
				Acceptable	Permissible
Odor		IS:3025(P05)	Agreeable	Agreeable	Agreeable
color	Hazen	IS:3025(P04)	<1.0	5	15
pH	--	IS:3025(P11)	7.5	6.5 to 8.5	6.5 to 8.5
Electrical Conductivity	µmhos/cm	IS:3025(P14)	1210	NS	NS
Total Dissolved Solids	mg/L	IS:3025(P16)	767	500	2000
Total Hardness as $CaCO_3$	mg/L	IS:3025(P21)	405	200	600
Total Alkalinity as $CaCO_3$	mg/L	IS:3025(P23)	345	200	600
Calcum as Ca	mg/L	IS:3025(P40)	90	75	200
Magnesium as Mg	mg/L	IS:3025(P46)	43	30	100
Sulphate as SO_4	mg/L	IS:3025(P24)	56	200	400
Iron as Fe	mg/L	IS:3025(P53)	0.1	0.3	0.3
Chlorides as Cl	mg/L	IS:3025(P32)	142	250	1000
Chromium as Cr	mg/L	IS:3025(P52)	0.04	0.05	0.05
Cadmium as Cd	mg/L	IS:3025(P41)	0.002	0.003	0.003
Lead as Pb	mg/L l	IS:3025(P47)	0.01	0.01	0.01
Copper as Cu	mg/L	IS:3025(P42)	0.04	0.05	1.5
Zinc as Zn	mg/L	IS:3025(P49)	2.0	5.0	15
Nickel as Ni	mg/L	IS:3025(P54)	0.02	0.02	0.02
Fluorides as F	mg/L	IS:3025(P60)	1.4	1.0	1.5
Aluminum as Al	mg/L	IS:3025(P55)	0.01	0.03	0.2
Boron as B	mg/L	IS:3025(P57)	0.001	0.5	1.0
Manganese as Mn	mg/L	IS:3025(P59)	0.2	0.1	0.3
Ammonical Nitrogen as NH_3	mg/L	IS:3025(P34)	06	0.5	No relaxation
Sodium as Na	mg/L	IS:3025(P45)	91	NS	NS
Potassium as K	mg/L	IS:3025(P45)	1.0	NS	NS
Phosphate as PO_4	mg/L	IS:3025(P11)	1.1	NS	NS

BDL: Below Detectable Limit; NS: Not Specified in IS:10500

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

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TEST REPORT

Date of Sampling	09th March, 2021	Date of Receipt	10th March, 2021
Date of Test performed	10th – 15th March, 2021	Date of Reporting	16th March, 2021
Report No.	PLCPL/21/622/339	ULR No.	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	Method of Sampling	IS: 3025 (P 1)
Sample Particulars	Chinthapalli , No. of samples: 01 (One), packed in one PVC Container of two liter qty		
Test required	Odour, Color , pH, EC, TDS, T. Hardness, T. Alkalinity , Ca, Mg , SO_4, Fe, Cl, Cr, Cd, Pb, Cu, Zn, Ni, F, Al, B, Mn, NH_3, Na, K , P & PO_4		
Sample Collected By	PLCPL	Sample Condition	Good

Discipline: Chemical Testing
Group: Water

TEST RESULTS

Parameter	Unit	Method	Results	IS: 10500 Limits	
				Acceptable	Permissible
Odor		IS:3025(P05)	Agreeable	Agreeable	Agreeable
color	Hazen	IS:3025(P04)	<1.0	5	15
pH	–	IS:3025(P11)	7.2	6.5 to 8.5	6.5 to 8.5
Electrical Conductivity	µmhos/cm	IS:3025(P14)	982	NS	NS
Total Dissolved Solids	mg/L	IS:3025(P16)	625	500	2000
Total Hardness as $CaCO_3$	mg/L	IS:3025(P21)	320	200	600
Total Alkalinity as $CaCO_3$	mg/L	IS:3025(P23)	250	200	600
Calicum as Ca	mg/L	IS:3025(P40)	82	75	200
Magnesium as Mg	mg/L	IS:3025(P46)	28	30	100
Sulphate as SO_4	mg/L	IS:3025(P24)	53	200	400
Iron as Fe	mg/L	IS:3025(P53)	0.14	0.3	0.3
Chlorides as Cl	mg/L	IS:3025(P32)	132	250	1000
Chromium as Cr	mg/L	IS:3025(P52)	0.02	0.05	0.05
Cadmium as Cd	mg/L	IS:3025(P41)	0.002	0.003	0.003
Lead as Pb	mg/L l	IS:3025(P47)	<0.01	0.01	0.01
Copper as Cu	mg/L	IS:3025(P42)	0.03	0.05	1.5
Zinc as Zn	mg/L	IS:3025(P49)	3.2	5.0	15
Nickel as Ni	mg/L	IS:3025(P54)	<0.01	0.02	0.02
Fluorides as F	mg/L	IS:3025(P60)	1.1	1.0	1.5
Aluminum as Al	mg/L	IS:3025(P55)	<0.01	0.03	0.2
Boron as B	mg/L	IS:3025(P57)	0.001	0.5	1.0
Manganese as Mn	mg/L	IS:3025(P59)	0.11	0.1	0.3
Ammonical Nitrogen as NH_3	mg/L	IS:3025(P34)	Nil	0.5	No relaxation
Sodium as Na	mg/L	IS:3025(P45)	78	NS	NS
Potassium as K	mg/L	IS:3025(P45)	1.2	NS	NS
Phosphate as PO_4	mg/L	IS:3025(P11)	0.5	NS	NS

BDL: Below Detectable Limit; NS: Not Specified in IS:10500

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

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TEST REPORT

Issued to

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Ranganathar Avenue, Perumalmalai
Main Road, Narasodhipatty
Salem -636004
Tamilnadu

Date of Sampling	09th March, 2021	Date of Receipt	10th March, 2021
Date of Test performed	10th – 15th March, 2021	Date of Reporting	16th March, 2021
Report No.	PLCPL/21/623/340	ULR No.	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	Method of Sampling	IS: 3025 (P 1)
Sample Particulars	Soil Paderu (S1), No of Samples One Packed in Plastic Cover In 1 Kg		
Test required	Moisture, Organic Matter, Bulk Density, PH, EC, Ca, Mg, Texture, SO_4		
Sample Collected By	PLCPL		

Discipline: Chemical Testing
Group: Soil

TEST RESULTS

No.	Parameters	Units	Result
1	Moisture	%	05
2	Organic Matter	%	1.65
3	Bulk Density	(g/cc)	1.43
4	PH	--	5.5
5	EC	µmhos/cm(1:5)	172
6	Calcium as Ca	mg/100g	540
7	Magnesium as Mg	mg/100g	190
8	Texture	--	Clay
9	Sulphates as SO_4	mg/100g	180

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

PRAGATHI LABS & CONSULTANTS PVT.LTD.

(LAB RECOGNISED BY MINISTRY OF ENVIRONMENT & FORESTS,GOVT.OF INDIA)

(ISO 9001:2015, OHSAS 18001:2007)

Plot No.B15 & 16, Industrial Estate, Behind Pollution Control Board, Opp. Dena Bank, Sanath Nagar, Hyderabad – 500 018, Tele Fax : 040-23717213

E-mail:info@pragathilabs.com Website: www.pragathilabs.com

TEST REPORT

Issued to

Mukesh & Associates Consultants & Engineers
Ranganathar Avenue, Perumalmalai
Main Road ,Narasodhipatty
Salem -636004
Tamilnadu

Date of Sampling	09th March, 2021	Date of Receipt	10th March, 2021
Date of Test performed	10th – 15th March, 2021	Date of Reporting	16th March, 2021
Report No.	PLCPL/21/624/341	ULR No.	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	Method of Sampling	IS: 3025 (P 1)
Sample Particulars	Soil G. Madugula (S2), No of Samples One Packed in Plastic Cover In 1 Kg		
Test required	Moisture, Organic Matter, Bulk Density, PH, EC, Ca, Mg, Texture, SO_4		
Sample Collected By	PLCPL		

Discipline: Chemical Testing
Group: Water

TEST RESULTS

No.	Parameters	Units	Result
1	Moisture	%	04
2	Organic Matter	%	0.5
3	Bulk Density	(gm/cc)	1.48
4	pH	--	5.3
5	EC	µmhos/cm(1:5)	160
6	Calcium as Ca	mg/100g	520
7	Magnesium as Mg	mg/100g	170
8	Texture	--	Clay Loam
9	Sulphates as SO_4	mg/100g	140

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
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TEST REPORT

Issued to

Mukesh & Associates Consultants & Engineers
Ranganathar Avenue, Perumalmalai
Main Road ,Narasodhipatty
Salem -636004
Tamilnadu

Date of Sampling	09th March, 2021	**Date of Receipt**	10th March, 2021
Date of Test performed	10th – 15th March, 2021	**Date of Reporting**	016th March, 2021
Report No.	PLCPL/21/625/342	**ULR No.**	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	**Method of Sampling**	IS: 3025 (P 1)
Sample Particulars	Soil Near Lambasingi Village (S3), No of Samples One Packed in Plastic Cover In 1 Kg		
Test required	Moisture, Organic Matter, Bulk Density, P^H, EC, Ca, Mg, Texture, SO_4		
Sample Collected By	PLCPL		

Discipline: Chemical Testing
Group: Soil

TEST RESULTS

No.	Parameters	Units	Result
1	Moisture	%	06
2	Organic Matter	%	0.4
3	Bulk Density	(gm/cc)	1.44
4	pH	-	6.0
5	EC	µmhos/cm(1:5)	1350
6	Calcium as Ca	mg/100g	840
7	Magnesium as Mg	mg/100g	260
8	Texture	-	Silty Loam
9	Sulphates as SO_4	mg/100g	190

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

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TEST REPORT

Issued to

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Ranganathar Avenue, Perumalmalai
Main `Road, Narasodhipatty
Salem -636004
Tamilnadu

Date of Sampling	09th March, 2021	Date of Receipt	10th March, 2021
Date of Test performed	10th – 15th March, 2021	Date of Reporting	16th March, 2021
Report No.	PLCPL/21/626/343	ULR No.	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	Method of Sampling	IS: 3025 (P 1)
Sample Particulars	Soil `Bointi Forest (S4), No of Samples One Packed in Plastic Cover In 1 Kg		
Test required	Moisture, Organic Matter, Bulk Density, PH, EC, Ca, Mg, Texture, SO_4		
Sample Collected By	PLCPL		

Discipline: Chemical Testing
Group: Soil

TEST RESULTS

No.	Parameters	Units	Result
1	Moisture	%	05
2	Organic Matter	%	1.26
3	Bulk Density	(gm/cc)	1.5
4	pH	-	6.2
5	EC	µmhos/cm(1:5)	179
6	Calcium as Ca	mg/100g	750
7	Magnesium as Mg	mg/100g	190
8	Texture	-	Silty Loam
9	Sulphates as SO_4	mg/100g	140

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

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Main Road, Narasodhipatty
Salem -636004
Tamilnadu

Date of Sampling	09th March, 2021	**Date of Receipt**	10th March, 2021
Date of Test performed	10th – 15th March, 2021	**Date of Reporting**	016th March, 2021
Report No.	PLCPL/21/627/344	**ULR No.**	ULR-TC574121000000058F
Your Reference No.	MA-APL/2017-2018/001	**Method of Sampling**	IS: 3025 (P 1)
Sample Particulars	Soil K.D Peta Bye Pass Near Bhivaram (S5), NO: Of Samples One Packed in Plastic Cover In 1 Kg		
Test required	Moisture, Organic Matter, Bulk Density, PH, EC, Ca, Mg, Texture, SO_4		
Sample Collected By	PLCPL		

Discipline: Chemical Testing
Group: Soil

TEST RESULTS

No.	Parameters	Units	Result
1	Moisture	%	04
2	Organic Matter	%	0.5
3	Bulk Density	(gm/cc)	1.48
4	pH	-	7.8
5	EC	µmhos/cm(1:5)	514
6	Calcium as Ca	mg/100g	560
7	Magnesium as Mg	mg/100g	170
8	Texture	---	Clay Loam
9	Sulphates as SO_4	mg/100g	120

Analyst Signatory
(Shrutika Bhute)

Authorized Signatory
(M. Ravi Kiran)

ANNEXURE 26: Details of Cross-drainage Structures

Package-1

S. No	Chainage	Span (m)	Type of Structure	Remarks
1	120+149	1 x 2 x 4	Box culvert	
2	120+650	1x1.2	HPC	Cross road
3	121+187	2 x 1.2	Pipe culvert	
4	121+280	2 x 1.2	Pipe culvert	
5	121+828	1 x 5 x 4	Box culvert	
6	122+091	1 x 3 x 3	Box culvert	
7	122+511	2 x 1.2	Pipe culvert	
8	122+711	2 x 1.2	Pipe culvert	
9	122+878	1 x 2 x 1.5	Box culvert	
10	123+343	1 x 3 x 1.5	Box culvert	
11	123+702	2 x 1.2	Pipe culvert	
12	124+048	1 x 2 x 2	Box culvert	
13	124+443	1 x 2 x 3	Box culvert	
14	124+891	1 x 2 x 4	Box culvert	
15	125+037	2 x 1.2	Pipe culvert	
16	125+444	1 x 22.2m	Minor Bridge	Widening on LHS
17	125+636	1 x 1.2	Siphon(Pipe)	
18	126+000	2 x 1.2	Pipe culvert	
19	126+540	1 x 2 x 1.5	Box culvert	
20	126+767	1 x 2 x 3	Box culvert	
21	127+217	1 x 2 x 4	Box culvert	
22	127+268	1x1.2	HPC	Cross road
23	127+379	1 x 2 x 2	Box culvert	
24	127+950	2 x 1.2	Pipe culvert	
25	128+178	2 x 1.2	Pipe culvert	
26	128+678	1 x 2 x 4	Box culvert	
27	129+426	1 x 2 x 2	Box culvert	
28	129+537	1 x 2 x 3	Box culvert	
29	129+721	1 x 2 x 3	Box culvert	
30	130+120	1 x 2 x3	Box culvert	

31	130+538	1 x 2 x 2	Box culvert	
32	131+494	1 x 4 x 4 x 5	Box culvert	
33	132+039	1 x 2 x 1.5	Box culvert	
34	132+400	1 x 2 x 2	Box culvert	
35	132+760	2 x 1.2	Pipe culvert	
36	133+092	1 x 2 x 3 x 3	Box culvert	
37	134+134	1 x 2 x 2	Box culvert	
38	134+515	3 x 8.5m	Minor Bridge	Widening on RHS
39	134+905	2 x 1.2	Pipe culvert	
40	135+422	1 x 2 x 3	Box culvert	
41	135+629	1 x 2 x 2	Box culvert	
42	135+758	2 x 1.2	Pipe culvert	
43	135+936	1x1.2	HPC	Cross road
44	135+947	2 x 1.2	Pipe culvert	
45	136+233	1 x 4 x 3	Box culvert	
46	136+865	1 x 2 x 2	Box culvert	
47	136+950	1x1.2	HPC	Cross road
48	137+050	1 x 3 x 3	Box culvert	
49	137+326	1 x 3 x 3	Box culvert	
50	137+660	1 x 3 x 1.5	Box culvert	
51	137+866	1 x 2 x 1.5	Box culvert	
52	138+450	1 x 3 x 3	Box culvert	
53	138+850	1 x 2 x 1.5	Box culvert	
54	139+220	1 x 3 x 3 x 3	Box culvert	
55	139+455	3x20m	Major Bridge	New
56	139+760	2x8m	Minor Bridge	New
57	139+845	1x1.2	HPC	Cross road
58	140+389	2 x 1.2	Pipe culvert	
59	141+232	1 x 2 x 3	Box culvert	
60	141+412	3 x 10.5m	Minor Bridge	Widening on LHS
61	142+410	1 x 2 x 4	Box culvert	
62	142+735	1x1.2	HPC	Cross road
63	144+083	1 x 2 x 1.5	Box culvert	
64	144+398	3 X 19.0m	Minor Bridge	Re-Construction

Package-2

65	145+250	1 x 2 x 1.5	Box culvert	
66	145+901	3 x 16.0m	Minor Bridge	Re-Construction
67	146+365	1 x 2 x 1.5	Box culvert	
68	147+441	1x1.2	HPC	Cross road
69	147+446	1 x 2 x 1.5	Box culvert	
70	147+935	4 x 25.4m	Major Bridge	Widening on RHS
71	148+241	2 x 1.2	Pipe culvert	
72	148+455	1 x 2 x 3	Box culvert	
73	149+010	1 x 2 x 3	Box culvert	
74	149+735	1 x 2 x 1.5	Box culvert	
75	150+130	2 x 1.2	Pipe culvert	
76	150+204	1 x 18.0m	Minor Bridge	Re-Construction
77	150+683	1 x 2 x 4	Box culvert	
78	150+920	1 x 2 x 1.5	Box culvert	
79	150+980	1 x 2 x 1.5	Box culvert	
80	151+431	1 x 2 x 3	Box culvert	
81	151+855	1 x 2 x 2	Box culvert	
82	152+460	1 x 2 x 2	Box culvert	
83	152+590	1 x 2 x 1.5	Box culvert	
84	152+983	1 x 2 x 3	Box culvert	
85	153+119	1 x 2 x 2	Box culvert	
86	153+357	1 x 2 x 1.5	Box culvert	
87	153+473	1 x 2 x 1.5	Box culvert	
88	153+660	1 x 2 x 1.5	Box culvert	
89	153+770	1 x 2 x 1.5	Box culvert	
90	153+942	1 x 2 x 2	Box culvert	
91	154+045	1 x 2 x 1.5	Box culvert	
92	154+248	1 x 2 x 1.5	Box culvert	
93	154+324	1 x 2 x 3	Box culvert	
94	154+470	1 x 2 x 3	Box culvert	
95	154+550	1 x 2 x 1.5	Box culvert	
96	154+755	1 x 2 x 3	Box culvert	
97	154+900	1 x 2 x 1.5	Box culvert	
98	155+010	1 x 2 x 1.5	Box culvert	

99	155+127	1 x 2 x 2	Box culvert	
100	155+180	1 x 2 x 2	Box culvert	
101	155+362	1 x 2 x 3	Box culvert	
102	155+417	1 x 2 x 2	Box culvert	
103	155+540	1 x 2 x 3	Box culvert	
104	155+650	1 x 2 x 1.5	Box culvert	
105	155+785	1 x 2 x 1.5	Box culvert	
106	155+862	1 x 2 x 3	Box culvert	
107	156+213	1 x 2 x 2	Box culvert	
108	156+463	1 x 2 x 1.5	Box culvert	
109	156+758	1 x 2 x 1.5	Box culvert	
110	156+910	1 x 2 x 2	Box culvert	
111	157+179	1 x 2 x 3 x 2	Box culvert	
112	157+560	1 x 2 x 2	Box culvert	
113	158+064	1 x 2 x 1.5	Box culvert	
114	158+277	1 x 2 x 1.5	Box culvert	
115	158+861	1 x 2 x 4	Box culvert	
116	159+123	1 x 2 x 1.5	Box culvert	
117	160+228	1 x 2 x 4	Box culvert	
118	161+024	1 x 2 x 2	Box culvert	
119	161+187	1 x 2 x 2	Box culvert	
120	161+688	1 x 2 x 3 x 3	Box culvert	
121	161+920	1 x 2 x 4	Box culvert	
122	162+460	1 x 2 x 3	Box culvert	
123	163+245	1 x 2 x 3 x 2	Box culvert	
124	163+700	1 x 2 x 3	Box culvert	
125	164+140	1 x 2 x 1.5	Box culvert	
126	164+276	1 x 2 x 4	Box culvert	
127	165+287	1 x 5 x 3	Box culvert	

S. No	Design Chainage	Type of Structure	Treatment	Design Span/Opening Width & Height	Remark's
1	166+739	Minor Bridge	New construction	1 x 10.00	
2	167+468	Box culvert	Re-Construction	1 x 4 x 3	
3	167+564	Pipe culvert	Re-Construction	2 x 1.2	
4	167+661	Pipe culvert	Re-Construction	2 x 1.2	

5	167+942	Pipe culvert	Re-Construction	2 x 1.2	
6	168+092	Pipe culvert	Re-Construction	2 x 1.2	
7	168+246	Pipe culvert	Re-Construction	2 x 1.2	
8	168+382	Pipe culvert	Re-Construction	2 x 1.2	
9	168+550	Pipe culvert	Re-Construction	2 x 1.2	
10	168+660	Box culvert	New	1 x 2 x 3	
11	168+883	Pipe culvert	Re-Construction	2 x 1.2	
12	169+209	Box culvert	Re-Construction	1 x 3 x 4	
13	169+571	Pipe culvert	Re-Construction	2 x 1.2	
14	170+545	Pipe Culvert	Cross road	1 x 1.2	
15	170+646	Box culvert	Re-Construction	1 x 5 x 2	
16	170+907	Box culvert	Re-Construction	1 x 2 x 2	
17	171+570	Box culvert	New	1 x 2 x 3	
18	172+313	Box culvert	Re-Construction	1 x 3 x 2	
19	172+490	Box culvert	Re-Construction	1 x 2 x 3	
20	173+160	Box culvert	New	1 x 2 x 3	
21	173+723	Box culvert	Re-Construction	1 x 5 x 5	
22	174+128	Pipe culvert	Re-Construction	2 x 1.2	
23	175+040	Box culvert	New	1 x 2 x 1.5	
24	175+700	Pipe Culvert	Cross road	1 x 1.2	
25	175+780	Box culvert	New	1 x 2 x 3	
26	176+330	Box culvert	Re-Construction	1 x 2 x 1.5	
27	176+426	Box culvert	Re-Construction	1 x 2 x 1.5	
28	176+799	Box culvert	New	1 x 4 x 3	
29	177+286	Pipe culvert	Re-Construction	2 x 1.2	
30	177+421	Pipe culvert	Re-Construction	2 x 1.2	
31	177+820	Pipe Culvert	Cross road	1 x 1.2	
32	178+171	Box culvert	Re-Construction	1 x 4 x 5	
33	178+385	Pipe culvert	Re-Construction	2 x 1.2	
34	178+944	Box culvert	Re-Construction	1 x 2 x 1.5	
35	179+107	Pipe culvert	Re-Construction	2 x 1.2	
36	179+490	Box culvert	New	1 x 2 x 2	
37	179+880	Box culvert	New	1 x 4 x 3	
38	179+971	Pipe culvert	Re-Construction	2 x 1.2	
39	180+470	Box culvert	New	1 x 2 x 3	
40	181+000	Box culvert	New	1 x 2 x 1.5	
41	181+310	Pipe Culvert	Cross road	1 x 1.2	
42	181+331	Box culvert	Re-Construction	1 x 2 x 1.5	
43	181+697	Box culvert	Re-Construction	1 x 2 x 2	
44	181+917	Box culvert	Re-Construction	1 x 2 x 1.5	

45	182+618	Minor Bridge	Widening (LHS)	1 x 17.00	
46	182+802	Pipe culvert	Re-Construction	2 x 1.2	
47	182+954	Pipe culvert	Re-Construction	2 x 1.2	
48	183+650	Pipe Culvert	Cross road	1 x 1.2	
49	183+668	Pipe culvert	Re-Construction	2 x 1.2	
50	183+778	Box culvert	New	1 x 2 x 3	
51	183+968	Pipe culvert	Re-Construction	2 x 1.2	
52	184+360	Minor Bridge	New construction	1 x 16.00	
53	184+719	Box culvert	Re-Construction	1 x 2 x 3	
54	184+968	Box culvert	Re-Construction	1 x 3 x 3	
55	185+221	Pipe culvert	Re-Construction	2 x 1.2	
56	185+600	Pipe Culvert	Cross road	1 x 1.2	
57	185+696	Box culvert	Re-Construction	1 x 2 x 2	
58	185+800	Box culvert	Re-Construction	1 x 2 x 1.5	
59	186+245	Box culvert	Re-Construction	1 x 2 x 1.5	
60	186+397	Box culvert	Re-Construction	1 x 2 x 2	
61	186+710	Pipe Culvert	Cross road	1 x 1.2	
62	187+686	Box culvert	Re-Construction	1 x 2 x 2	
63	187+840	Pipe culvert	Re-Construction	2 x 1.2	
64	188+135	Pipe Culvert	Cross road	1 x 1.2	
65	189+133	Minor Bridge	New construction	1 x 16.00	
66	189+400	Box culvert	Re-Construction	1 x 2 x 2	
67	190+166	Pipe culvert	Re-Construction	2 x 1.2	
68	190+612	Box culvert	Re-Construction	1 x 2 x 3	
69	191+074	Pipe culvert	Re-Construction	2 x 1.2	
70	191+251	Pipe culvert	Re-Construction	2 x 1.2	
71	191+839	Pipe culvert	Re-Construction	2 x 1.2	
72	192+240	Box culvert	New	1 x 2 x 3	
73	192+550	Box culvert	New	1 x 2 x 3	
74	192+817	Minor Bridge	Widening (RHS)	1 x 20.00	
75	193+652	Pipe culvert	Re-Construction	2 x 1.2	
76	194+587	Box culvert	Re-Construction	1 x 2 x 3	
77	195+015	Minor Bridge	Widening (RHS)	1 x 17.40	
78	195+680	Box culvert	New	1 x 2 x 1.5	
79	196+125	Pipe Culvert	Cross road	1 x 1.2	
80	196+630	Box culvert	Re-Construction	1 x 2 x 3	
81	197+002	Pipe culvert	Re-Construction	2 x 1.2	
82	197+182	Box culvert	Re-Construction	1 x 2 x 3	
83	197+344	Box culvert	Re-Construction	1 x 2 x 2	
84	197+786	Box culvert	New	1 x 2 x 2	

85	197+984	Box culvert	New	1 x 2 x 3	
86	198+512	Box culvert	Re-Construction	1 x 2 x 4	
87	199+180	Minor Bridge	Widening (LHS)	1 x 17.00	
88	199+564	Pipe culvert	Re-Construction	2 x 1.2	
89	200+545	Pipe culvert	Re-Construction	2 x 1.2	
90	201+735	Minor Bridge	Re-Construction	2 x 14.00	
91	201+935	Pipe Culvert	Cross road	1 x 1.2	
92	202+081	Pipe culvert	Re-Construction	2 x 1.2	
93	202+202	Pipe culvert	Re-Construction	2 x 1.2	
94	202+545	Pipe Culvert	Cross road	1 x 1.2	
95	202+617	Box culvert	New	1 x 2 x 1.5	
96	202+790	Pipe Culvert	Cross road	1 x 1.2	
97	203+107	Pipe culvert	Re-Construction	2 x 1.2	
98	203+480	Box culvert	New	1 x 2 x 3	
99	204+081	Box culvert	New	1 x 3 x 3	
100	204+610	Box culvert	New	1 x 5 x 5	
101	204+880	Box culvert	New	1 x 3 x 4	

Package 3

Existing culverts to be reconstructed as new culverts are:

S. No.	Design Chainage (Km)	Span/Opening width & Height (m)	Type
1	**205+345**	**2 x 1.2m Dia**	**Pipe culvert**
2	**205+989**	**2 x 1.2m Dia**	**Pipe culvert**
3	**206+699**	**1 x 2 x 3**	**Box culvert**
4	**208+537**	**2 x 1.2m Dia**	**Pipe culvert**
5	**208+720**	**2 x 1.2m Dia**	**Pipe culvert**
6	**210+461**	**2 x 1.2m Dia**	**Pipe culvert**
7	**210+829**	**1 x 1.2m Dia**	**Siphon (Pipe)**
8	**211+218**	**1 x 2 X 1**	**Box culvert**
9	**211+510**	**2 x 1.2m Dia**	**Pipe culvert**
10	**212+551**	**1 x 4 x 2**	**Box culvert**

11	213+437	2 x 1.2m Dia	Pipe culvert
12	213+561	2 x 1.2m Dia	Pipe culvert
13	214+628	1 x 2 x 1.5	Box culvert
14	214+711	1 x 2 x 2	Box culvert
15	215+068	2 x 1.2m Dia	Pipe culvert
16	21S+356	1 x 2 x2 x 0.8	Box culvert
17	215+802	2 x 1.2m Dia	Pipe culvert
18	217+872	1 x 2 x 1.5	Box culvert
19	215+974	1 x 2 x 1.5	Box culvert
20	216+115	2 x 1.2m Dia	Pipe culvert
21	216+515	1 x 2 x 3	Box culvert
22	217+129	1 x 2 x 3 x 5	Box culvert
23	217+162	1 x 2 x 3 x 5	Box culvert
24	217+211	1 x 1.2m Dia	Pipe culvert
25	218+758	2 x 1.2m Dia	Pipe culvert
26	218+889	2 x 1.2m Dia	Pipe culvert
27	219+326	2 x 1.2m Dia	Pipe culvert
28	220+120	2 x 1.2m Dia	Pipe culvert
29	220+550	2 x 1.2m Dia	Pipe culvert
30	221+342	2 x 1.2m Dia	Pipe culvert
31	222+753	2 x 1.2m Dia	Pipe culvert
32	223+739	1 x 4 x 4	Box culvert
33	224+365	2 x 1.2m Dia	Pipe culvert
34	224+510	2 x 1.2m Dia	Pipe culvert
35	227+368	2 x 1.2m Dia	Pipe culvert
36	229+717	2 x 1.2m Dia	Pipe culvert
37	230+140	1 x 3 x 3 x 4	Box culvert

38	230+175	1 x 2 x 3 x 4	Box culvert
39	230+491	1 x 4 x 1.5	Box culvert
40	231+658	1 x 5 x 4	Box culvert
41	232+692	1 x 2 x 1.5	Box culvert
42	232+945	1 x 3 x 2	Box culvert
43	233+883	1 x 4 x 4	Box culvert
44	234+874	1 x 4 x 4 x 4	Box culvert
45	236+203	1 x 3 x 4 x 4	Box culvert
46	238+892	1 x 5 x 4	Box culvert
47	238+980	2 x 1.2m Dia	Pipe culvert
48	240+486	1 x 4 X 1.5	Box culvert
49	241+096	2 x 1.2m Dia	Pipe culvert
50	241+131	1 x 2 x 2	Box culvert
51	241+346	1 x 4 x 2	Box culvert
52	241+899	1 x 4 X 2	Box culvert
53	242+060	1 x 2 x 3	Box culvert
54	242+462	2 x 1.2m Dia	Pipe culvert
55	243+482	1 x 2 x 3	Box culvert
56	243+744	1 x 2 X 1.5	Box culvert
S7	245+067	1 x 3 x 3	Box culvert
58	245+447	1 x 2 x 1.5	Box culvert
S9	245+558	2 x 1.2m Dia	Pipe culvert
60	246+491	1 x 2 x 1.5	Box culvert
61	246+656	1 x 2 x 3 x 3	Box culvert
62	247+539	2 x 1.2m Dia	Pipe culvert
63	247+903	1 x 2 x 3 x 3	Box culvert
64	248+345	1 x 2 x 2	Box culvert
65	249+873	1 x 3 x 1.5	Box Culvert
66	250+210	1 x 2 x 3	Box culvert
67	250+717	1 x 4 x 1.5	Box Culvert
68	251+213	1 x 2 x 4	Box culvert
69	251+506	1 x 2 x 4	Box culvert
70	251+791	1 x 2 x 1.5	Box culvert
71	252+595	1 x2 x 2	Box culvert
72	252+833	1 x 2 x 2	Box culvert
73	252+988	1 x 2 x 1.5	Box culvert
74	2S3+246	2 x 1.2m Dia	Pipe culvert
75	253+575	1 x 2 x 3	Box culvert

76	253+748	1 x 2 x 3	Box culvert
77	253+847	1 x 2 x 2	Box culvert

Note: In box culvert, the fourth dimension (wherever applicable) denotes the cushion above the box.

Additional new culverts to be constructed are:

S. No.	Design Chainage (Km)	Type of Culvert	Span / Opening Width & Height (m)
1	205+660	Pipe culvert	2 x 1.2m Dia
2	207+340	Pipe culvert	2 x 1.2m Dia
3	209+760	Pipe culvert	2 x 1.2m Dia
4	213+639	Box culvert	2 x 2 x 2
5	216+247	Pipe culvert	2 x 1.2m Dia
6	217+640	Box culvert	1 x 2 x 3 x 5
7	222+940	Box culvert	1 x 3 x 4 x 4
8	223+460	Box culvert	1 x 2 x 3 x 4
9	226+200	Box culvert	1 x 2 x 3 x 2
10	226+860	Pipe culvert	2 x 1.2m Dia
11	228+485	Box culvert	2 x 3 x 3
12	228+770	Box culvert	2 x 3 x 2
13	230+037	Box culvert	2 x 3 x 3
14	231+100	Pipe culvert	2 x 1.2m Dia
15	235+400	Box culvert	1 x 2 x 1.5
16	235+880	Pipe culvert	2 x 1.2m Dia
17	236+920	Pipe culvert	2 x 1.2m Dia
18	238+530	Box culvert	1 x 2 x 1.5
19	243+030	Box culvert	1 x 2 x 3 x 2
20	246+920	Pipe culvert	2 x 1.2m Dia
21	248+935	Box culvert	1 x 4 x 4

ANNEXURE 27: Financial plan for Habitat Improvement Activities

S. No.	Management intervention in the core area	Estimated cost(Rs.in lakh)
1	Raising Avenue plantations/ Greenbelt plantations along the road.	It is a part of scope of work and to be taken up by EPC Contractor of MoRTH.
2	Underpasses and Rumble strips on the road to be constructed by User Agency in Consultation with DFO.	
3	Hoardings and signage's (Animal crossing, Don't feed animals, No horn zone etc.,) in every 400 m (at straight path) and in every 100 m (at the turns) on the road where it passes through forest.	
4	Wildlife Conservation plan for Schedule –I fauna observed in the Study area. (Habitat improvement)	200.00
5	Wildlife Mitigation works proposed within project area. (Protection and Mitigation)	86.00
	Total	**286.00**

Wildlife Conservation Plan for Schedule-I Fauna observed in the Study Area.

S.No	Particulars	Nos	Unit cost (Rs in Lakhs)	Total amount (Rs in Lakhs)
1	Conservation and Management of Langurs	LS	LS	10.00
2	Habitat improvement works in the forest areas	LS	LS	20.00
3	Solar based automatic water filling system with borewell and storage pit	10	5.00	50.00
4	Establishing Salt licks	LS	LS	4.00
5	Detailed study to understand the long-term impact on wildlife due to expansion of project	LS	LS	25.00
6	Ecological monitoring at a gap of every 4 to 5 years to understand the wildlife population and effectiveness of mitigation.	3 times	2.00	6.00
7	Soil and moisture conservation measures in RF areas in Zone of influence a) CCTs b) RFDs Small Check dams	LS	LS	50.00
8	Equipment for wildlife monitoring and research	LS	LS	10.00
9	Development of Waterholes/ small ponds in RF areas	30 No	0.50	15.00

10	Water storage and retention structure / Saucer pits	20	0.50	10.00
	Grand total			**200.00**

Note: Part of the above Conservation plan amount will be utilized at Indira Gandhi Zoological Park, Visakhapatnam which is nearest Zoo Park for conservation of Schedule –I fauna in consultation with the Chief Wildlife Warden, Andhra Pradesh.

Wildlife Mitigation works proposed within project area. (Protection and Mitigation)

S.No	Particulars	Total amount (Rs in Lakhs)
1	Cost of drones 2 no. for monitoring wild animal movement @ 3,00,000/ drone	6.00
2	For protection and anti-depredation activity in Chinthapalli Forest Division with 2 no of squads with 10 persons.	70.00
3	Corpus fund/ emergency fund	10.00
	Grand total	**86.00**

Note: The entire mitigation plan amount will be utilized on the impacted areas in and around the project area for mitigation offauna.

Table: 6.2 YEAR WISE FINANCIAL PLAN* (Rs. In Lakhs)

Year	1	2	3	4	5	6
	2022-2023 (Rs in Lakhs)	2023-2024 (Rs in Lakhs)	2024-2025 (Rs in Lakhs)	2025-2026 (Rs in Lakhs)	2026-2027 (Rs in Lakhs)	Total (Rs in Lakhs)
Conservation and Management of Langurs	5.00	3.00	2.00	0.00	0.00	10.00
Habitat improvement works	5.00	5.00	5.00	5.00	0.00	20.00
Solar based automatic water filling system with borewell and storage pit	20.00	20.00	10.00	0.00	0.00	50.00
Establishing Salt licks	1.00	1.00	1.00	1.00	0.00	4.00
Detailed study to understand the long-term impact on wildlife due to expansion project	5.00	5.00	5.00	5.00	5.00	25.00
Ecological monitoring at a gap of every 4 to 5 years to understand the wildlife population and effectiveness of mitigation.	2.00	1.00	1.00	1.00	1.00	6.00
Soil and moisture conservation measures in RF areas in Zone of influence c) CCTs d) RFDs Small Check dams	10.00	10.00	10.00	10.00	10.00	50.00

Contd.

Equipment for wildlife monitoring and research	2.00	2.00	2.00	2.00	2.00	10.00
Development of Waterholes/ small ponds in RF areas	3.00	3.00	3.00	3.00	3.00	15.00
Water storage and retention structure / Saucer pits	2.00	2.00	2.00	2.00	2.00	10.00
Cost of drones 2 no. for monitoring wild animal movement @ 3,00,000/ drone	6.00	0.00	0.00	0.00	0.00	6.00
For protection and anti-depredation activity in Chinthapalli Forest Division with 2 no of squads with 10 persons.	14.00	14.00	14.00	14.00	14.00	70.00
Corpus fund/ emergency fund	10.00	0.00	0.00	0.00	0.00	10.00
Grand total	**115**	**46**	**45**	**43**	**37**	**286.00**