



NATIONAL HIGHWAY AUTHORITY OF INDIA

Rehabilitation and Up-gradation from existing 2 lane to 4 lane from Solapur to Yedeshi section of NH-211 from Km 0.000 to Km 100.000 and from Km 249.000 to Km 255.00 of NH-9 in the state of Maharashtra.

SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DISTRICT - OSMANABAD

For

Public Hearing of Left Section of NH-211
from Km 85.000 to Km 100.000 in
Osmanabad District



Rehabilitation and Up-gradation from existing 2 lane to 4 lane from Solapur to Yedeshi section of NH-211 from Km 0.000 to Km 100.000 and from Km 249.000 to Km 255.00 of NH-9 in the state of Maharashtra.

SUMMARY EIA REPORT

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SUMMARY ENVIRONMENT IMPACT ASSESSMENT

The Environment Impact Assessment study has been conducted for the present project to investigate and assess the principal environmental concerns associated with the proposed project of Rehabilitation and Up-gradation from existing 2 lane to 4 lane from Solapur (Km 0.00) to Yedshi (Km 100.00) section of of NH-211 and from Km 249.000 to Km 255.000 of NH-9 in the state of Maharashtra. The Environmental Impact Assessment (EIA) study covers Design & Preconstruction Phase, Construction Phase and the Operational Phase investigating and analyzing the potential impacts of the project on different components of environment including physical, ecological and socio-economic environment within the project influence area and providing measures to offset or minimise the potential adverse impact and enhance the positive impact as well as effective implementation and monitoring plan the environmental safeguard measures during different stages of the project.

1. PROJECT DESCRIPTION

The project includes sections of two National Highways, Namely NH-211 and NH-9 which converge at Solapur town in the state of Maharashtra. The proposed project is widening of highway section from existing 2 lane to 4-Lane dual carriageway configuration from Km 0.000 to Km 100.00 of NH-211 and from Km 249.000 to Km 255.000 of NH-9 covering a total length of 106 Kms. The proposed project also includes 2 bypasses and 7 major realignments which are listed below in Table 1:

Table 1: Proposed Major Realignments and Bypasses

Bypass	Existing Chainage		Length (Km)
	From (Km)	To (Km)	
1. Solapur District			
Ule Re-alignment	9.380	11.030	1.630
2. Osmanabad District			
Suratgaon Realignment	22.700	23.900	0.985
Curve Improvement at Suratgaon	24.125	24.650	0.547
Mulumbra Re-alignment	29.080	30.000	0.844
Tuljapur Bypass	39.620	44.000	3.437
Kawaldara Re-alignment	47.585	48.766	0.950
Curve Improvement at Osmanabad	66.825	67.250	0.824
Shingoli Re-alignment	68.105	69.820	1.795
Yedeshi Bypass	80.500	82.800	2.130

The entire project is located in the state of Maharashtra. The project stretch pass through two districts namely Solapur (From Km 249.000 to Km 255.000 of Nh-9 and from Km 0.000 to Km 16.400 of NH-211).



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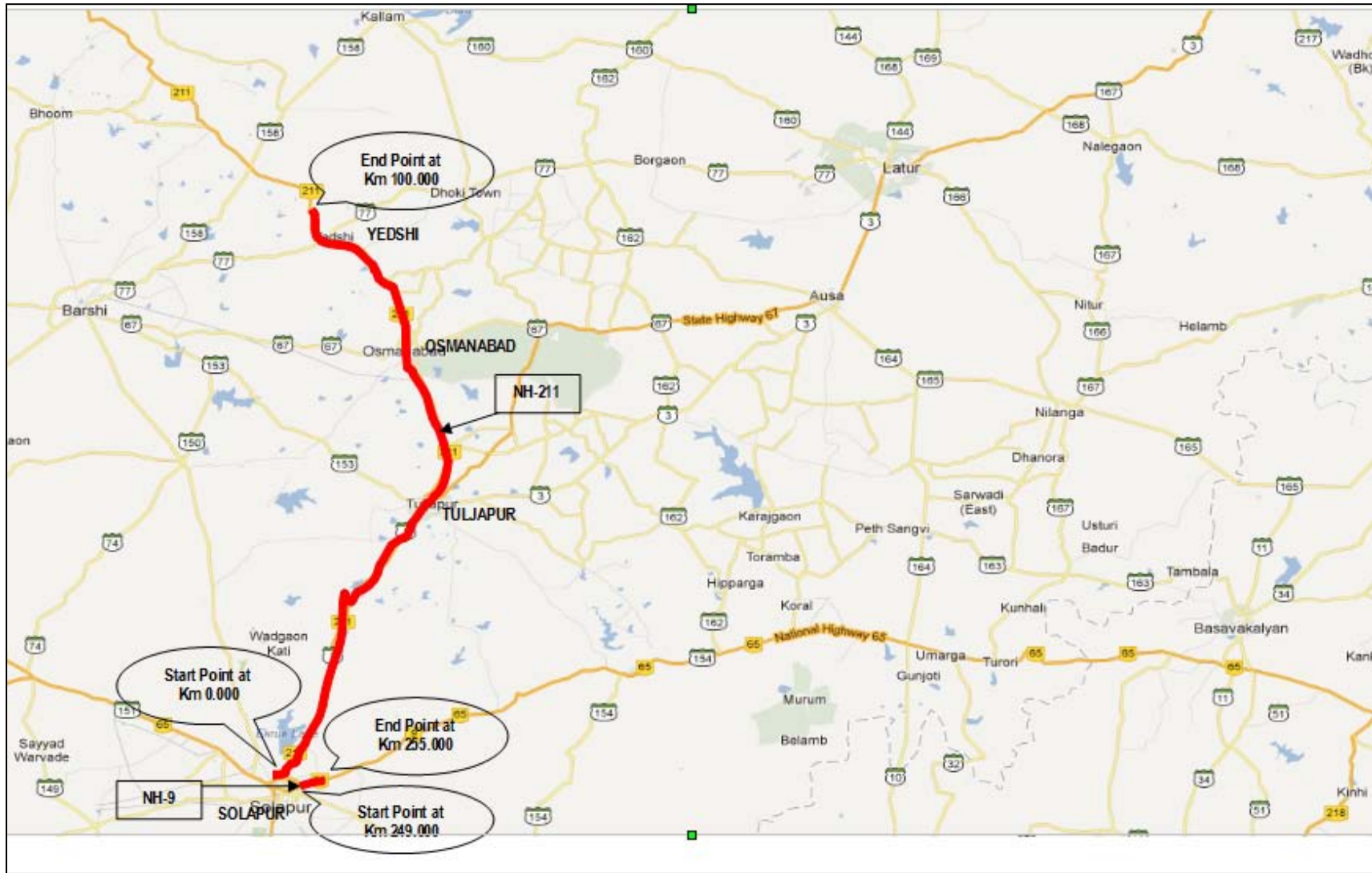


Figure 1: Project Location



1.1 Salient Features of Project:

The new 4-Lane facility would be partial access controlled corridor through provision of service roads, pedestrian and cattle underpass, vehicular underpasses, grade separators, exit/entry ramps etc. The objective is to enhance operational efficiency of highway and safety of the traffic & the road users. The salient feature of the project is presented in **Table 2**.

Table 2: Salient Features of the Project

Sl. No	Project Components	Details
A. General Information		
1.	Location of Project	From Km 249.000 to Km 255.000 of NH-9 at Solapur and from Km 0.000 at Solpaur to Km 100.000 section of NH-211 near Yedshi in the State of Maharashtra including realignments at Ule, Suratgaon, Mulumbra, Kawaldara and Singoli and Bypasses at Tuljapur and Yedshi.
2.	Administrative locations	North Solapur and South Solapur Taluka of Solapur District (From Km 0.000 to Km 16.400 of NH-211 and From Km 249+000 to Km 255.000 of NH-9) and Tuljapur, Osmanabad and Kalamb Taluka of Osmanabad district (16.400 to Km 100.000)
3.	State	Maharashtra
4.	Terrain	Virtually plain
5.	Major Settlement along the Project Stretch	Solapur, Tamalwadi, Suratgaon, Malumbri, Sangi Mardi, Tuljapur, Osmanabad, Yedshi and Yermala
6.	Rivers/streams/Nallah	Daddi River crosses the alignment at Km 255.00 of NH-9 and is seasonal river.
7.	Forest area	The project stretch doesnt pass through any forest area and no acquisition of forest land is involved.
8.	Wildlife Sanctuary	The project road does not pass through any ecological sensitive area / National Park / Sanctuaries etc. However, two (2) nos. of Wildlife Sanctuaries, namely The Great Indian Bustard Wildlife Sanctuary and Yedshi Ramling Wildlife Sanctuary boundaries are falling within 10 Km radius of the project section. The project road is located outside the Wildlife Sanctuaries and does not involve any kind of land acquisition.
9.	No. of affected trees	Total 13315 No. (9784 in project section from Km. 0.000 to Km 85.000 of NH-211 and section from Km 249.000 to Km 255.000 of NH-9 ; total number of 3530 trees in left section of Km 85.000 to Km 100.000 of Nh-211)
10.	Proposed land acquisition	341.995 ha (68.095 in Solapur district 228.995 ha in Osmanabad district from Km 16.400 to Km 85.000; 45.00 ha for left section between Km 85.000 to Km 100.00 in Osmanabad District.



B. Other Salient Features

S.No.	Items	Solapur-Yedshi section of NH-211 from Km 0.000 to Km 85.000 and NH-9 section from Km 249.000 to Km 255.000		Left section from Km 85.000 to Km 100.00 of NH-211 (Osmanabad District)	
		Existing	Proposed	Existing	Proposed
1.	ROW	30 m	60 m rural and open area and 50 in urban area	30 m	60 m rural and open area and 50 in urban area
2.	Carriageway	2 lane carriageway of 7.0 m without paved shoulder 4 lane in some habitation area	The paved carriage way shall be 8.75 x 2=17.50 m.	2 lane carriageway of 7.0 m without paved shoulder	The paved carriage way shall be 8.75 x 2=17.50 m.
3.	Median width	Nil	4.5 m	Nil	4.5 m
4.	Design Speed	40-60 kmph	80/100 kmph	40-60 kmph	80/100 kmph
5.	Major Bridges	Solapur District: Nil Osmanabad District: 2 nos.	Solapur District: Nil Osmanabad District: Improvement / Reconstruction / Widening / Retain: 2 nos.	Nil	Nil
6.	Minor Bridge	Solapur District: 8nos. Osmanabad District: 18 nos.	Solapur District: Improvement / Reconstruction / Widening / Retain: 8 nos. New : 1 on service Road Osmanabad District: Improvement / Reconstruction / Widening / Retain: 16 nos. New: 2 nos. On service roads	Nil	Nil
7.	Culverts	Solapur District: 40 nos. Osmanabad District: 76 nos.	Solapur District: Improvement / Reconstruction / Widening / Retained: 34 nos. New: 5 nos. Osmanabad District: Improvement /	16	Improvement / Reconstruction / Widening / Retain: 16 New: 4



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			Reconstruction / Widening / Retain: 69 nos. New: 14 nos.		
8.	Railway Over Bridge	Solapur District: Nil. Osmanabad District: 1 no.	Solapur District: Nil. Osmanabad District: 1 no.	Nil	Nil
9.	Vehicular Underpass/ Flyover	Nil	Solapur District: Nil. Osmanabad District: 4 nos.	1	2
10.	Cattle/Pedestrian Underpass	Nil	Solapur District: 3 no. Osmanabad District: 8 nos.	Nil	Nil
11.	Bus bays	Nil	Solapur District: 6 nos. Osmanabad District: 18 nos.	Nil	6 Nos
12.	Truck Laybys	Nil	Solapur District: Nil. Osmanabad District: 2 locations on either side of the road	Nil	Nil
13.	Bypass/major Realignment	Solapur District: Nil. Osmanabad District: 1 no. under construction	Solapur District: 1 no. Osmanabad District: 8 nos.	Nil	Nil
14.	Toll plaza	Nil	Solapur District: Nil. Osmanabad District: 2 nos.	Nil	Nil
15.	Service lane	Nil	Solapur District: 6 locations (18.224 Km) Osmanabad District: 12 locations (21.708 Km)	Nil	2 locations (5.28 Km)
17.	High mast lighting	Nil	Solapur District: 1 location Osmanabad District: 10 locations	Nil	Nil
18.	Street lighting	Nil	Solapur District:	Nil	2 Locations



			5 locations for 9.117 Km Osmanabad District: 9 locations for 11.819 Km		(2.640Km)
19.	Rest Area	Nil	Solapur District: Nil. Osmanabad District: 2 locations (1 on LHS and 1 on RHS of the road).	Nil	Nil
20.	Total Project Cost	-	Rs. 972.5 Crores	-	Rs. 143.69 Crores

2. POLICIES, LEGAL AND ADMINISTRATIVE FRAMEWORK

The project has been examined with respect to various legislations, policies and statutes pertaining to various aspects of environment. Review of the existing legislation, institutions and policies relevant to the Environmental Impact Assessment at the National and State levels has been done and clearance requirements for the project at various stages of the project have been identified.

The present highway project attracts the provision of Environmental Impact Assessment Notification, 2006 since the project section is greater than 30 Km and would involve additional RoW greater than 20m at many locations. Moreover the proposed project has been classified as Category A project, and hence the project requires prior Environmental Clearance from the Central Government in the Ministry of Environment and Forest (MoEF), Govt. of India.

The widening of project section will involve cutting of roadside trees, and hence a permission for cutting of trees from respective forest Department would be required.

The project stretch falls within 10 Km radius from the boundaries of Wildlife Sanctuaries, namely The Great Indian Bustard Wildlife Sanctuary in Solapur district and Yedshi Ramling Wildlife Sanctuary of Osmanabad district. Although, The project stretch is located outside the boundary on these Wildlife Sanctuaries and does not involve any kind of land acquisition, still the wildlife clearance would be required by the National Board for wildlife (NBWL) as per condition stipulated by the MoEF for the project requiring prior environmental clearance from MoEF.

During construction period the concessionaires will have to obtain NOC from respective Pollution Control Board under Air and Water Act for establishing and operating their stone crushers, Hotmix Plant and batch mix plant; Explosive license for storing oils, Permission for storage of hazardous chemicals, Quarry lease and quarry license for opening and operating stone and sand quarry, Permission for extraction of ground water for use in road construction activities from Central Ground Water Authority, Permission for use of surface water for construction purpose from line department; Labour license, etc. as applicable.



DESCRIPTION OF THE ENVIRONMENT

As defined in the Terms of Reference (TOR), baseline data on various physical, biological and social aspects has been collected, analyzed and compiled in order to get the picture of the existing environment condition in the project area. The data on different environmental components were collected and collated based on secondary data from authentic sources, ground truthing followed by actual field surveys. All the data have been collected and collated to identify a general environmental condition within the project catchment area and major environmental issues to be taken care off during the design as well project implementation phase. Scope of this exercise was 15 kilometres on both sides from the centre of the road as per guidelines of Ministry of Environment and Forests, Government of India. However, the focus of the study was on the areas within and directly adjacent to the corridor of impact and ROW.

3.1 Physical Resources:

Physiography and Soil:

The geographical extension of the project road section is between 17° 41' 35" N 18°18'50" N latitude and 75°54'49" E & 75°57'52" E Longitude between Solapur to Yedeshi in the state of Maharashtra. The project road is located over flat to rolling terrain mean elevation varying between 534 m to 622 m. The entire area normally shows a general slope from right to left. The project road intersects a number of rivers, nallas, local streams and canals. The prominent rivers crossing the project stretch are Doddi river, Kerul river, Bori river, Dastapur Nallah and Umerga nallah. Most of these rivers and nalla are rainfed and seasonal except for Kerul and Bori river which are perennial in nature. All the drains and River flow from right to left of the project corridor.

The project area falls under Seismic Zone-III, moderately active in nature. A few earthquakes being reported in the area in past but the intensity remained below rector scale 6-7.

In the study area the major soil met is Black, Coarse Gray and Reddish. . The soil is medium to deep black and of rich quality. In the project area of Osmanabad district are medium deep Soils varying from dark grey brown to very dark grey. They are clayey in texture.

Climate:

The climate of the Osmanabad district is characterized by a hot summer and general dryness throughout the year except during the south-west monsoon season, i.e., June to September. The mean minimum temperature is 8.5°C and mean maximum temperature is 42.5°C. The normal annual rainfall is 730 mm. Though annual rainfall is low, it is spread over a period of 6 months i.e. June to November. September is the highest rainy month with 27% rainfall.

The air is highly humid during South West Monsoon (June to September) and mostly dry during rest of the year. The driest part of the year is the summer season when the humidity is between 20 to 25% in the afternoons.

Winds are light to moderate in force with some strengthening during the period May to August. In the south-west monsoon season winds are mainly from directions between south-west and north west. In the period October to December winds blow from directions between north-west and



south-east in the mornings and between north and east in the afternoons. In the next four months winds are variable in direction. In May winds are mostly from directions between west and north.

Ambient Air Quality:

To study the baseline ambient air quality scenario within the project corridor the ambient air quality was measured at 6 locations, at Solapur and Ule in Solapur District and Mardi Sangavi Village, Osmanabad Bypass, Yedshi and near Tarkheda village. The monitoring stations were selected considering the spatial relationship of various land uses along the project road, and CPCB guidelines. The average concentration of Particulate Matters of $< 10\mu$ size (PM_{10}) in the ambient air varied between $24.6 \mu\text{gm}^{-3}$ to $167 \mu\text{gm}^{-3}$ whereas the concentration of $PM_{2.5}$ ranged between $12.3 \mu\text{gm}^{-3}$ to $108 \mu\text{gm}^{-3}$. Except for the Air monitoring station near tarkheda Village all area showed higher concentration of PM_{10} and $PM_{2.5}$ in the air than the standard limit stipulated by CPCB. The dryness of the areas, semi arid conditions and loose dust particles along the project corridor, traffic congestion and dilapidated earthen shoulders are the main reason for the higher concentration of particulate matter in the air. The other gaseous pollutants monitored in the ambient air were well within the National Ambient Air Quality Standard at all the locations.

There is no significant air polluting industry is located along the project corridor.

Water Resources:

The major surface water bodies located in the project corridor include dodi river, Ekruk lake, water tank at Tamalwadi, and water tank at Km 75.600 in near Singoli village. The Dodi River, which crossed the project road section of NH-9 at Km 255.000, is seasonal in natures and carries water only during monsoon. The Water tanks contain water only for about 3-4 months except for the Ekruk Lake which stores water throughout the year. There will not be any encroachment in water tanks or Lake situated along the ROW. The physico-chemical analysis of water samples was compared with surface water quality standards as per IS: 2296. The data analysed revealed that general quality of water in all the locations are good and the water quality conforms to the Criteria C of Surface water quality as prescribed by the Central Pollution Control Board. All the measured parameters were observed well within the prescribed limit of water quality standards.

The water table varies between 5 m to 20m below ground level along the project area. There are some ground water resources identified in the project corridor. A few numbers of tube wells, open wells and hand pumps are located along the project roads within corridor of impact. These are used for drinking, domestic and commercial purposes. Water samples from Surface water source and ground water source at different locations were monitored along the project. The ground water quality survey conducted by the Central Ground Water Board reveal that shallow aquifer potability of ground water is affected mainly by localised nitrate contamination whereas deeper aquifer is affected by fluoride contamination around the study areas. However overall the groundwater quality is good for irrigation purpose.



The ground water samples were taken from hand pumps and borewell 5 locations along the project alignment at Solapur in Solapur District and Tuljapur, Osmanabad, Yedshi and near Tarkheda village in Osmanabad District, to assess the groundwater quality within the project area.

The physico-chemical analysis of water samples was compared with water quality standards as per BIS (IS:10500:1991). The result shows that the total dissolved solid varies from 142 mg/l to 1100 mg/l, whereas the total hardness ranged between 55.0 mg/l to 460 mg/l, which is within the permissible desirable limits as per drinking water standard (IS-10500). The other parameters also meet the permissible limits along the project alignment.

Noise Level:

To determine the ambient noise pollution level along the project road six monitoring locations were identified considering the equal distribution of project road length and land use pattern along the project road. These locations are Solapur Urban and Huglur in Solapur District and Tamalwadi, Tuljapur bypass, Osmanabad, Yedshi Bypass and near Chorkhali village of Osmanabad District. The noise level monitored along the highway at major settlements exceeded the maximum permissible noise level for residential areas except for the alignment at proposed Yedshi bypass but were within the permissible level for industrial and mixed areas. The daytime equivalent noise level varied between 53.4 Leq dB(A)- 72.6 Leq dB(A) during daytime and 44.2 to 63.2 Leq dB(A) during nighttime along Solapur-Yedshi section of NH-211. The congested urban builtup area experience high noise level due to commercial activities of the area and traffic congestion.

3.2 Natural Environment

Forests & WildLife Sanctuary

Generally open shrubs are present apart from the agriculture fields along the project stretch. The Few pockets of reserve forests are located along the project corridor near Km 14.000 to Km 15.000 at Gangewadi in Solapur district and near Km 80- Km 85 near Yedshi in Osmanabad District, however the project doesnot involve acquisition of forest area Plantation has been done in these forest area and the predominant species in the forest stretch are Eucalyptus, Neem, Babool and *Gliricidia*.

The project alignment falls in 10 km radius of the boundary of two Wildlife Sactuary namely Great Indian Bustard Wildlife Sactuary in Solapur District and Yedshi-Ramling Wildlife Sanctuary near Yedshi in Osmanabad District.

The GIB Wildlife Sanctuary is the habitat for critically endangered species called Great Indian Bustard, and other near threatened Painted stork, Darter, Oriental White Ibis and Pallid Harrier. The Kumbhari reservoir situated in the area adjoining Gangewadi has breeding colonies of Painted stork, Eurasian Spoon-bill, Little Cormorant and Oriental White Ibis. The percolation tank inside Gangewadi is a foraging site for these birds during breeding. Apart from these ten species of mammals like wolf, Indian fox, jackal, Black-naped hare, Jungle cat, blackbuck, antelope, common mongoose, Indian pangolin, wild boar and squirrel have been found here. In the reptile category, seven species include Fan-throated lizard, common garden lizard, common skink, common rat snake, Rusell's viper, Indian monitor lizard, have also been found here.



The Yedshi-Ramling Wildlife Sanctuary provides habitat for Chinkara, Hyena, Wolf, Wild bear, Fox, Black duck, Hares and Peacock.

Since the project stretch under proposal is already existing highway and in use since long and human settlement all around the highway have come up due to which these wild animals are not spotted around the highway section.

Other than wild animals of the forest pockets, the faunal population in the project area is mainly constituted by domesticated animals like cows, ox, buffalo, goats, sheep, pigs, dogs, etc. There is no any endangered plant or animal species reported from the project area.

The project doesnot pass through any wildlife sanctuary, national parks, tiger reserves or notified ecologically sensitive area.

Road Side Plantation:

Mainly single row of tree plantation is observed all along the project road. The predominant tree species are *Babool (Acacia nilotica)*, *Neem (Azadirachta indica)*, *Siris (Albizia lebbeck)*, *Goldmolar (Delonix regia)* and *Shisam (Dalbergia sissoo)*, etc. A total number of 13315 trees of variable girth class are located within the proposed ROW of the project stretch. These trees are likely to be affected will require to be felled due to the proposed project. Effort will be made to minimise the tree felling by restricting tree felling within the formation width only.

3.3 Socio-economic Environment

The project section passes through two districts namely Solapur and Osmanabad district in the state of Maharashtra. This section traverses 51 villages out of which 26 villages are in Solapur district and rest 40 villages in Osmanabad district.

Land Use Pattern

The land use pattern of the project area is mainly agricultural land followed by settlements, commercial and industrial area.

Agriculture Pattern

The predominant landuse along the project stretch is agriculture. Both Kharif and Rabi agriculture is practiced in both the districts. The early monsoon crops are called kharif and the late monsoon crops as rabi. The kharif season starts in June-July and ends in September-October. The rabi season opens in November and ends in March. Both the district have more cultivated land under kharif than rabi crops. The kharif crops grown comprise mainly kharif millet, groundnut, tur and mung while rabi Crops include the cultivation of wheat, rabi jowar, gram and linseed. Thus jowar is grown in both the seasons. The major cash crop grown in the study area are cotton and sugarcane.



Industries

The project districts have medium scale as well as small-scale industries. Along the project stretch 6 industrial units have been recorded. These are bidi factory and cement roof industry on NH-9 section and Cement pipe factory, Spinning mill, Chemical (Amine) factory and Sugar Factory at Chorkali.

Protected Monuments and Properties of Archaeological Value

No historical monuments or Archaeological sites are located in the vicinity of the project.

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Since the project is widening and strengthening of already existing road, the potential for the negative impacts is relatively small as compare to new alignment. Most of the negative environmental impacts are related to construction works which are inevitable. The impacts during construction phase are mainly temporary or short term, whereas the impacts during operation stage will have long term effects. Most of these negative environmental effects can be 'design out' at an early stage through proper engineering designs, which will emphasize the contractors to follow environmentally friendly construction methodology and by applying proper environmental safeguard measures at site.

4.1 Impacts during Preconstruction Phase:

The environmental impacts associated with the pre construction stages mainly include impacts due to design and location of the project as well as site preparation for construction. The main issues involve in the preconstruction stage are acquisition of land and properties, tree felling, diversion of forest land, encroachment of water tanks & ponds, acquisition of common property resources, relocation of public utilities etc. Most of the impacts of preconstruction stage are permanent in nature. The anticipated impacts associated with the preconstruction stage and their mitigation measures have been presented in the **Table 3**:

Table 3: Anticipated Environmental Impacts due to the Proposed Project and their Mitigation Measures during Pre-construction Stage:

Sl. No.	Environmental Components/ Issues	Impacts	Mitigation Measures
1.	Acquisition of Land	A total area of 341.995 Ha of land will be required for acquisition to accommodate proposed widening beyond existing ROW as well as the proposed bypasses/realignments.	The acquisition of land and private properties will be carried out in accordance with the RAP and entitlement framework for the project. Early identification of entitlement



Sl. No.	Environmental Components/ Issues	Impacts	Mitigation Measures
2.	Acquisition of Properties	<p>Solapur Yedshi Section of Nh-211 A total number of 1194 structures (314 structures in Solapur District and 817 structures in Osmanabad District for the section from Km 0.000 to Km 85.000 of Nh-211 and Km 249.00 to Km 255.000 of Nh-9. For the left section from Km 85.000 to Km 100.000 of Nh-211 a total number of 109 structures would be affected due to proposed widening.)</p>	<p>for Compensation and Advance planning of Resettlement And Rehabilitation Action Plan to Compensate the Losses.</p> <p>The Compensation will be paid in accordance with the NH Act and Policy Govt of India and will be decided by the Competent Authority of the State Government appointed by the NHAI.</p>
3.	Resettlement and Rehabilitation of People	A total population of 4427 persons will be affected due to acquisition of properties due to proposed widening of this section	All the affected people will be compensated as per NH Act before commencement of Construction works
4.	Cutting of Roadside Trees	A total number of 13315 trees will required to be felled due to the proposed widening.	<p>All efforts will be made to preserve trees by restricting tree cutting within the formation width only. Special attention will be given for protecting giant trees, and locally important trees (having cultural importance).</p> <p>Compensatory plantation will be carried out within available space within the ROW as per Forest Act by following NHAI Plantation Strategy.</p> <p>Additional Plantation at in median and available space in ROW will be planted as per NHAI Plantation Strategy</p>
5.	Forest Area	No direct impact on forest area is envisaged	The forest area acquisition has been avoided by selecting widening option on one side of the forest stretch or by making suitable adjustment in the alignment depending upon the technical feasibility.
6.	Religious/Cultural Features	A total number of 67 structures are likely to be affected due to proposed widening of this section out of which 45 such structures are from Solapur district and rest 22 from Osmanabad district	<p>Relocation of religious structures will be ensured.</p> <p>The relocation site will be decided with the consultation with local population and the related community users.</p> <p>Preference of the local community using the structure will be addressed during relocation/</p>

Sl. No.	Environmental Components/ Issues	Impacts	Mitigation Measures
			renovation of such affected features.
7.	Severance	Severance Problem	A total number vehicular and Pedestrian/cattle underpasses have been provided for crossing the road for pedestrians, local traffic and cattle to avoid severance problem.
8.	Traffic Safety	Accident Hazards	The Adequate number of Vehicular underpasses, Pedestrian/cattle under passes, service roads, geometric corrections, scientifically designed bus stand, traffic signals, zebra crossings, junction improvements, bus bays and truck laybys, traffic lightings and caution, regulatory and informative signboards have been provided in the project as per IRC codes. During operation there will be provision of highway patrolling, ambulance and recovery vans to deal with emergency situations.

4.2 Impact during Construction and Operation Phase:

During construction period the major environmental issues will be related to dust generation, emission of gaseous emissions, borrow area and quarry operations, pollution due to operation of plants and equipments, contamination of land and soil, contamination of water bodies and public as well as workers health and safety. These anticipated impacts will mainly temporary and localised in nature and are likely to persist for short duration till the construction activities are over in a particular area. However there are some long term adverse impacts due to construction. These impacts however can be mitigated effectively through proper planning, scheduling and by application of environmental friendly construction practices. The likely impacts due to construction activities and operation of the project are explained along with the mitigation measures and institutional responsibility of implementation of environmental safeguards measures have been presented in the **Table 4**.


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Table 4: Matrix of Potential Environmental Impacts and Mitigation Measures during Construction and Operation Stage

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Loss of Top Soil	Excavation will be done only to the pegged area for constructing the road.	Throughout the stretch	Concessionaire	IE and PIU, NHAI
	Agricultural areas will be avoided for borrowing of materials, unless requested by the land owner.	Borrow Sites	Concessionaire	IE and PIU, NHAI
	The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles of height not exceeding 2m.	Borrow sites, Quarry , Plant site and construction zone	Concessionaire	IE and PIU, NHAI
	The stored topsoil will be spread back to maintain the soil physico-chemical and biological Characteristics.	Borrow areas, Quarry, Plant site and construction zone	Concessionaire	IE and PIU, NHAI
Compaction of Soil	Construction vehicles, machinery and equipment will move, or be stationed in the designated area, to avoid compaction of soil.	Construction site and all ancillary sites	Concessionaire	IE and PIU, NHAI
	If operating from temporarily hired land, it will be ensured that the topsoil for agriculture remains preserved & not destroyed by storage, material handling or any other construction related activities.	Construction site and all ancillary sites	Concessionaire	IE and PIU, NHAI
Borrowing of Earth	No earth will be borrowed from within the RoW	Borrow Areas	Concessionaire	IE and PIU, NHAI
	Non-productive, barren lands, raised lands, river beds, waste lands are recommended for borrowing earth.			
	If new borrow areas are selected, it will be ensured that there is no loss of productive soil, and environmental considerations will be met with.			
	If vehicles carrying materials from borrow areas are pass through villages, the excavation and carrying of earth will be done during day time only.			
	The unpaved surfaces used for the haulage of borrow materials will be maintained properly			
	Precautionary measures as the covering of vehicles will be taken to avoid spillage during transport of borrow materials.			
	To avoid any embankment slippages, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the Engineer			



Rehabilitation and Up-gradation from existing 2 lane to 4 lane from Solapur to Yedeshi section of NH-211 from Km 0.000 to Km 100.000 and from Km 249.000 to Km 255.00 of NH-9 in the state of Maharashtra.

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Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	Borrow pits will be redeveloped by filling and providing 150 mm thick layer of preserved top-soil; or by creating a pond for fisheries, etc; or by levelling an elevated, raised earth mound and covering it with 150 mm thick preserved top-soil Replantation of trees in borrow areas will be carried out			
Stone Quarry	The quarry material will be obtained from licensed sites only, which operate with proper environmental clearances, including clearances under the Air Act or if Concessionaire wants to open a new Quarry he shall take all the requisite license from Dept. of Mines and Geology.	Quarry sites	Concessionaire	IE and PIU, NHAI
Soil Contamination from Fuel and lubricants	Impervious platform and oil and grease trap for collection of spillage from construction equipment vehicle maintenance platform will be appropriately provided at construction camp, servicing area and liquid fuel and lubes at storage areas.	Construction Camp, Vehicle and Equipment Servicing Centre and Construction site	Concessionaire	IE and PIU, NHAI
Soil Contamination from Construction waste and spoils	All spoils will be disposed off as desired and the site will be fully cleaned before handing over. The non-usable bitumen spoils will be disposed off in a deep trench providing clay lining at the bottom and filled with soil at the top (for at least 0.5m)	Construction site throughout the project stretch	Concessionaire	IE and PIU, NHAI
Community water Source	Any community water source as wells, tube-wells, etc., lost incidentally will be replaced immediately	Throughout the project stretch	Concessionaire	IE and PIU, NHAI
Drainage and run off	Earth, stones, wastes and spoils would be properly disposed off, to avoid blockage of any drainage channel. All necessary precautions will be taken to construct temporary or permanent devices to prevent inundation or ponding.	Throughout the project stretch	Concessionaire	IE and PIU, NHAI
Contamination of water from construction and allied activities	All necessary precautions will be taken to construct temporary or permanent devices to prevent water pollution due to increased siltation and turbidity. All wastes arising from the project will be disposed off, as per SPCB norms, so as not to block the flow of water. Wastes must be collected, stored and taken to approved disposal site.	Throughout the project stretch and allied sites including Construction camp and labour camp	Concessionaire	IE and PIU, NHAI
Sanitation and waste disposal in construction	Garbage tanks and sanitation facilities will be provided at camps	Construction Camp	Concessionaire	IE and PIU, NHAI



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camps	The construction camps will be located away from water sources.			
	Efforts will be made to provide good sanitary and sewage disposal facilities at camp to avoid epidemics			
	The workplace will have proper medical approval by local medical, health or municipal authorities.			
Use of water for construction	The Concessionaire will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected.	Campsites and Plant sites	Concessionaire	IC and PIU, NHAI
	If a new tube-well is to be bored, prior sanction and approval by the Ground Water Department will be obtained			
	Wastage of water during construction will be minimized.			
Emissions from Vehicles and Equipments	All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the SPCB norms.	Plant sites	Concessionaire	IE and PIU, NHAI
	The asphalt plants, crushers and the batching plants will be sited at least 0.50 km in the downwind direction from the nearest human settlement.			
Dust Generation	The hot-mix plants, crushers and batching plants will be sited at least 1.0 km downwind from the nearest habitation. The hot mix plant will be fitted with dust suppression system.	Plant sites and Construction site	Concessionaire	IE and PIU, NHAI
	Water will be sprayed in the lime/cement and earth mixing sites, asphalt mixing site and temporary service and access roads.			
	After compacting, water will be sprayed on the earthwork regularly to prevent dust.			
	Vehicles delivering material will be covered.			
	Vehicles and machinery will be regularly checked to conform to the CPCB and NAAQ Standards			
	Mixing equipment will be well sealed and equipped with dust control removal devices			
	Workers at mixing sites will wear masks to reduce the chances of exposure to fine dusts (PM10 & PM2.5)			



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Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	Regular monitoring of PM10, PM2.5, SO ₂ , NO ₂ , CO and /HC will be carried out as mentioned in the Environmental Monitoring Plan			
Noise Pollution from Construction vehicles and Machinery	The plants and equipment used for construction will strictly conform to CPCB noise standards.	Plant sites and Construction site	Concessionaire	IE; PIU, NHAI, Maharashtra Pollution Control Board,
	Vehicles and equipments used will be fitted with silencer and maintained accordingly.			
	Noise standards of industrial enterprises will be strictly enforced to protect construction workers from severe noise impacts.			
	Noise to be monitored (for 24 hrs.) as per monitoring plan			
Noise Pollution from Blasting Operation	Blasting as per Indian Explosives Act will be adopted.	Quarry site	Concessionaire	IE; PIU, NHAI, Maharashtra Pollution Control Board,
	People living near such blasting sites will have prior information of operational hours.			
	Workers at blasting sites will be provided with earplugs			
Loss or Damage to Vegetation	Apart from trees earmarked for felling, no additional tree clearing within the RoW will be carried out.	Throughout the stretch	Concessionaire	IE; PIU, NHAI and Forest Dept.
	Area of tree plantation cleared will be replaced according to compensatory Afforestation Policy under Forest Conservation Act-1980.			
	Replantation of tree species along new ROW.			
	Plantation of shrubs and under trees in the median.			
	Effort will be made to save giant trees with girth size more than 2.5 m.			
Compaction of Vegetation	Construction vehicles, machinery and equipment will move or be stationed in the designated area only (RoW or Col, as applicable), to prevent compaction of vegetation outside the RoW	Throughout the stretch	Concessionaire	IE and PIU, NHAI
	While operating on temporarily acquired land for traffic detours, storage, material handling or any other construction related or incidental activities, it will be ensured that the trampling of soil and damage to naturally occurring herbs and grasses is avoided.	Throughout the stretch		
Occupational Health & Safety	Adequate drainage, sanitation and waste disposal will be provided at workplaces.	Throughout the stretch	Concessionaire	IE and PIU, NHAI
	Proper drainage will be maintained around sites to avoid water logging leading to various diseases.			



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	<p>Adequate sanitation and waste disposal facilities will be provided at construction camps by means of septic tanks, soakage pits etc.</p> <p>A health care system will be maintained at construction camp for routine check up of workers and avoidance of spread of any communicable disease</p>			
Traffic Safety	To ensure safe construction in the temporary accesses during construction, lighting devices and safety signal devices will be installed.	At Concreting and plant sites	Concessionaire	IE and PIU, NHAI
	Traffic rules and regulations will be strictly adhered to.			
	Safety of workers undertaking various operations during construction will be ensured by providing helmets, masks, safety goggles, etc			
	The electrical equipment will be checked regularly			
	At every work place, a readily available first aid unit including an adequate supply of dressing materials, a mode of transport (ambulance), nursing staff and an attending doctor will be provided.			
	Road safety education will be imparted to drivers running construction vehicles.			
	Adequate signage, barriers and persons with flags during construction to control the traffic will be provided.			
	If any valuable or invaluable articles such as fabrics, coins, artefacts, structures, or other archaeological relics are discovered, the excavation will be stopped and Archaeology Department, Assam. will be intimated.			
Construction camps blasting sites and all allied construction activities will be located at least 1.0 Km away from the cultural property.				
Operation Phase				
Contamination of Surface Water due to Traffic Movement & Accidents	Contingency Plans will be developed for clean up of oil spills, fuel and toxic chemicals	Throughout the project stretch	PIU, NHAI	PIU, NHAI
Air Quality Deterioration	Provision of Vegetative Screens		PIU, NHAI, State Forest Department	PIU, NHAI, State Forest Department
	Control of Vehicular emissions through law enforcement		Department of Transport	Department of Transport
	Truck parking, lay-byes to be provided in suitable areas		PIU, NHAI	PIU, NHAI



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			Implementation	Supervision
	Regular Monitoring			
Noise Pollution	Noise attenuating Tree Species to be planted along the road Posting of signs prohibiting the use of horns at settlement areas.	Specially inhabitant location	PIU, NHAI	PIU, NHAI
Accident Hazard and Safety	Provision of elaborate system of sign boards and road markings along the whole stretch Provision of suitable lighting arrangement at required locations Development of Emergency Response and Contingency Plan for accidents	Throughout the Project Stretch	PIU, NHAI and State Police and Traffic Department	PIU, NHAI and State Police and Traffic Department



5. ENVIRONMENTAL MONITORING PROGRAMME

Monitoring of environmental quality during construction and operation stages reflects the success of implementation of the mitigation measures. Also it provides a chance to review the suggested measure and improve upon the measures. To ensure the effective implementation of the Environmental Management Plan (EMP), it is essential that an effective monitoring plan be designed and carried out. The environmental monitoring plan covering various performance indicators, frequency and institutional arrangements for the project in the construction and operation stages has been formulated for the project. Environmental Monitoring of performance indicators will be conducted by the project authority. The monitoring plan has been suggested with performance indicators to be monitored, locations, frequency and timeframe of monitoring. Periodical monitoring of air, water, noise quality and survival rate of plantations also has been suggested.

6. ANALYSIS OF ALTERNATIVES

An analysis of "With" and "Without" Project scenario reveals that the positive impacts outnumbered the negative impacts due to the proposed development. The negative impacts are envisaged only during the construction period which will be temporary in nature and of short duration. Further mitigation measures will be adopted to limit the impacts during the construction phase. The proposed expansion will aid in infrastructure development and will act as a catalyst to boost the economic progress. It was revealed during discussions with various stakeholders that safety is a major concern along the existing highway section. The safety aspect will be enhanced considerably with the provision of service lanes, pedestrian crossings, street lights, additional systematically designed bust stands, rest areas, bus bays and truck lay byes, service roads which are the significant part of the project. The will ensure smooth traffic, it is envisaged that commercial establishments will revive their business and this will inturn boost the economic development.

7. ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) is the key to ensure effective implementation of environmental safeguard measures during different stage of the project. The desired results from the environmental mitigation measures proposed in the project may not be obtained without proper planning of the implementation of mitigation measures. The project specific EMP has been formulated for mitigating of offsetting the anticipated adverse impacts arising out of the project activities. Environmental Management Plan includes EMP Implementation Framework, supervision monitoring and reporting requirements.

During Preconstruction stage the responsibility of the implementation of mitigation measures is mainly Project Implementation Unit of NHAI which is the Project Proponent for the project. During Construction the primary responsibility of implementing environmental safeguards measures is with Concessionaire which will design, construct and own the project till concession period. The NHAI will be overall responsible for EMP implementation.

A budgetary cost estimated for environmental management activities is Rs. 9.65 Crores for the project, which includes various mitigation costs during preconstruction, construction and operation stages, environmental enhancement measures, Corporate Social Responsibility as well as environmental monitoring cost.



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