EXECUTIVE SUMMARY

For

Construction of Eight lane road (newly declared NH 148N) from Kajaliya village in Ratlam district in the state of Madhya Pradesh to Dodka village in Vadodara district in the state of Gujarat from CH: 181+000 to 392+492 under Bharatmala Pariyojana (Lot-4/Package-5)

Project Proponent:

NATIONAL HIGHWAYS AUTHORITY OF INDIA
(Ministry of Road Transport & Highways, Government of India)

Environmental Consultant:

ENVIRO INFRA SOLUTIONS PVT. LTD.

Accredited by NABET (Quality Council of India)
for EIA studies as 'A' Category Consultant
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EXECUTIVE SUMMARY

1. INTRODUCTION

The National Highways Authority of India (NHAI) has been entrusted by Ministry of Roads Transport & Highways, Government of India with the assignment of preparation of Feasibility study / Detailed Project Report and implementation of road stretches selected for Delhi-Mumbai corridor under Bharat Mala Scheme – road from Kajaliya village in Ratlam district in the state of Madhya Pradesh to Dodka village in Vadodara district in the state of Gujarat from CH: 181+000 to 392+492 (Length=211.492Km).

Chaitanya Projects Consultancy Pvt. Ltd, have been appointed as Consultants by NHAI to carry out the preparation of Feasibility study / Detailed Project Report of road stretches selected for Delhi-Mumbai corridor under Bharat Mala Scheme – Eight lane road (newly declared NH 148N) from Kajaliya village in Ratlam district in the state of Madhya Pradesh to Dodka village in Vadodara district in the state of Gujarat from CH: 181+000 to 392+492. Further, Chaitanya Projects Consultancy Pvt. Ltd, has assigned Enviro Infra Solutions Pvt. Ltd. a NABET accredited consultant to prepare the Environmental Impact Assessment report including Environmental Management Plan for the above referred project.

2. BRIEF ABOUT THE PROJECT AND ITS LOCATION

Proposed expressway is mostly Green field alignment project and proposed for 8 lane with capacity of up gradation to 12 lane. The project road starts from Kajaliya village Ratlam district in the Madhya Pradesh state and ends at Dodka village in Vadodara in the state of Gujarat from CH: 181+000 to 392+492 having a total length of 211.492 Kms. The proposed access controlled expressway project has been envisaged through an area which shall have the advantage of simultaneous development as well as shall result in a shorter distance to travel.

The salient features of the proposed project have been presented below:

Salient features of the project

1.	Project Road	Construction of Eight lane road (newly declared NH 148N) from Kajaliya village in Ratlam district in the state of Madhya Pradesh to Dodka village in Vadodara district in the state of Gujarat from CH: 181+000 to 392+492 under Bharatmala Pariyojana (Lot-4/Package-5)
2.	Type of PPP	EPC Model
3.	Location of the proposed project	The project road starts from Kajaliya village Ratlam district in the Madhya Pradesh state and ends at Dodka village in Vadodara in the state of Gujarat from CH: 181+000 to 392+492 having a total length of 211.492 Kms.
4.	No, of affected villages by Land acquisition	125
5.	Total Length of the proposed project	211.492 km

6.	Total Area of Land Acquisition	Total Land Acquisition: 2450 Ha. Forest Land: 260 Ha.
7.	Terrain	Mainly plain and rolling area.
8.	Seismic Zone	Zone II & Zone III
9.	Geographical Location	Start Location : 23°18'8.26"N 74°51'26.61"E End Location: 22°27'36.85"N 73° 6'59.70"E
10.	Proposed Bridges	Major Bridges - 44Nos. Minor Bridges - 119Nos.
11.	Proposed Underpasses / Flyover including Pedestrian underpass	VUP: 20 LVUP:50 SVUP:71 Flyovers: Nil
12.	Culverts	221 Nos
13.	Right of Way	100 m
14.	Design Speed	120 km/hr for plain terrain and 100 km/hr for rolling terrain
15.	Carriageway	3.75 m Lane width
16.	Embankment	3 m to 5 m (average)
17.	Proposed Toll Plazas	6 Nos Ramp toll plaza at interchange
18.	Safety Measure	Crash Barriers
19.	Lighting	Lighting all along including High Masts at Toll plazas, interchanges, major bridges / ROB's and Amenities and Truck Parking Areas
20.	No of Structures Affected	405
21.	Total Cost (Civil)	6345 Cr (approx.)
Environmental & Social Features		
22.	Forest Land Diversion	260 Ha.
23.	Water bodies Impacted	15 Rivers, 28 Canals, 04 Dam, 01 check Dam, 51 Drains, 11 Pond and 01 other water bodies
24.	Existing trees within ROW	35409
25.	Compensatory plantation	1,26,600 nos of trees shall be planted (3 rows plantation on either sides)
26.	Green belt development	As per IRC SP 21:2009 /MoRTH Code/Guidelines
27.	No. of project affected persons (PAFs) & (PAPs)	Total PAFs – 3250 Total PAPs – 19500
28.	Resettlement Action Plan (RAP) including Land Acquisition Budget	Rs. 1351.5Crores.

3. ANALYSIS OF ALTERNATIVES

Three alternative alignments have been considered:

i) **Option 1:** Option 1 is passing more close to the Sailana Kharmour WLS and starts at 164.500 km near Amarpura village in Ratlam and ends at km 392.492 at Dodka village in Gujarat.

ii) **Option 2:** Option 2 Construction of Eight lane road (newly declared NH 148N) from Kajaliya village in Ratlam district in the state of Madhya Pradesh to

Dodka village in Vadodara district in the state of Gujarat from CH: 181+000 to 392+492 under Bharatmala Pariyojana (Lot-4/Package-5)

iii) **Option 3:** Option 3 starts at 169.00 km near Mangrol village in Ratlam and ends at km 392.492 at Dodka village in Gujarat.

Keeping in view of having less/minor effect on environmental and social components, alignment Option 2 has been fixed and it seems more feasible as compared to the other option. It also provides better alternative from Ratlam to Vadodara district. It also provides quicker alternative to traffic coming from Delhi, Haryana, Rajasthan & Madhya Pradesh and going towards Gujarat & Mumbai (Maharashtra). It will lead to less impact on Environment & Social components than other three.

4. DESCRIPTION OF ENVIRONMENT

Study Area: The base-line data has been collected for Core Zone [Corridor of Impact (COI)], an area covering 500 m on both side of the proposed alignment and 10 km buffer zone for prominent environmental attributes like ambient air quality, noise level, water quality and soil profile. Primary and Secondary data has also been collected for other environmental attributes for the preparation of EIA/EMP report. The baseline study for the project was conducted during April 2018 to June 2018.

Baseline Study: The findings of the baseline environmental status on land (topography, geology, soil quality, land use pattern), meteorology (Temperature, Relative Humidity, rainfall, wind speed, wind rose), air (ambient air quality- PM_{10}, $PM_{2.5}$, SO_2, NO_X. and CO), water (surface & ground water), noise level, ecological environment (terrestrial and aquatic flora & fauna), socio-economic conditions (demographic profile and households condition) were presented and interpreted with reference to environmental standards.

- **Meteorology:** The study area is located in Ratlam and Jhabua districts in the state of Madhya Pradesh and Dahod, Panchmahal and Vadodara districts of Gujarat. A hot summer and general dryness characterize the climate of study area, except during the southwest monsoon season. The year can be divided into four seasons. The winter commences from middle of November and lasts till the end of February. The period from March to about middle of June is the hot summer season. May is the hottest month of the year. The southwest monsoon starts from middle of June and lasts till end of September. October and middle of November constitute the post monsoon or retreating monsoon season.

The meteorological study has been done from Ratlam IMD, Dohad IMD and Vadodara IMD station.

- **Air Environment:** Ambient air quality monitoring has been done at 12 locations. Specific station-wise Ambient Air Quality (AAQ) data for PM_{10}, $PM_{2.5}$, SO_2, NO_X. and CO as recorded during the study period i.e. from April 2018 to June 2018**.** All the parameters have been analyzed and show that all the parameters are well below the National ambient air quality standards, 2009.

- **Water Environment:** The development of any region is based on the availability of sufficient water resources, as developmental activities require water for irrigation, domestic and other purposes. The water resources in the area broadly fall into following categories:

  - **Ground Water resources: Borewells and Handpump**
  - **Ground water**: Ground water sampling has been taken for 8 locations. The pH varies from 7.60- 8.27, TDS varies from 404.54-458.23mg/L, Conductivity varies from 628.32 to 713.45 uS/cm and Hardness varies from 236.10– 302.32mg/L.

- **Noise Environment**

  Ambient noise level monitoring has been done at 12 locations. The hourly recorded noise level at various locations in the study area shows fluctuations because of change in traffic movement, construction activities and other man-made sources. The equivalent values of noise levels varies from 50.1dB (A) to 64.4 dB (A) during daytime which are within the prescribed norms of CPCB whereas during night time the noise level varies from 39.8dB (A) to 53.5dB (A), which reveals that all values are below the national standard.

- **Soil Environment**

  Soil sampling has been done at three locations. The soil pH ranges from 7.21 to 7.80, thereby indicating the soils are neutral to slightly alkaline. The texture of the soil is clay loam and Sandy Clay loam. Soils are good in available nitrogen content, have low available phosphorus, potassium content and have high organic carbon.

ECOLOGICAL ENVIRONMENT

The major forest types found along the study area are: Tropical dry deciduous forest and Depositional saline plains with grassland, Saline-alkaline scrubs. The natural vegetation present within the study area is in the form of shrubs, herbs, grasses and climbers with fewer naturally growing trees. The dominant tree/shrub species present along the study area are *Acacia catechu (*Khair*), Acacia nilotica* (Babul), Aegle marmelos (Bel), *Albizzia lebbek (*Kala siris*), Ailanthus excels* (Maharukh)*, Ficus bengalensis* (Bar), *Ficus religiosa* (Pipal), *Tamarindus indica (*Imli), *Bombax ceiba (*Semal*), Butea monosperma (*Palas*), Zizyphus jujube (*Ber*), Zizyphus xylopara (*Ghot*), Azadirachta indica (*Neem*), Soymida febrifuga* (Rohan), *Sterculia urens (*Salai*) etc*. The common shrub species were *Adhatoda vasica* (Adusa), Calotropis procera (Madar), *Capparis spp.(*kareel), Cassia tora (Banar), *Ricinus communis* (Arandi), *Asparagus recemosus (*Satavar) etc. The common herbs species were Achyranthus aspera (Latjeera), *Brassica* spp., *Tribulus terrestris (*Gokhru), *Parthenium* sp. (Congress grass), *Sonchus asper*, *Evolvulus* etc.

The proposed alignment does not pass through any Wildlife Sanctuary/National Park and its eco sensitive zone.

SOCIO ECONOMIC ENVIRONMENT

The primary purpose of socio-economic analysis is to provide an overview of the State's, socio-economic status and the relative status of the Project Influence Area (PIA) within the State.
The proposed project passes through Madhya Pradesh & Gujarat, the Project Influence State and Ratlam, Jhabua, Dohad, Panchmahal and Vadodara district. The demographic profile and socio-economic status of the people in the project affected district and state as per census 2011 are as follows:

Items	Madhya Pradesh	Ratlam	Jhabua
Total Population	72,626,809	1,455,069	1,025,048
Rural Population	52,557,404	1,020,038	933,065
Urban Population	20,069,405	435,031	91,983
Male	37,612,306	738,241	515,023
Female	35,014,503	716,828	510,025
Gender Ratio	931	971	990
SC Population	11,342,320	198,612	17,427
% SC	15.62	13.65	1.70
ST Population	15,316,784	409,865	891,818
% ST	21.09	28.17	87.00
Density of Population (per sq. Km)	236	299	285

(Source: Census of India, 2011)

Items	Gujarat	Dohad	Panchmahal	Vadodara
Total Population	60,439,692	2,127,086	2,390,776	4,165,626
Rural Population	34694609	1,935,461	2,055,949	2,099,855
Urban Population	25745083	191,625	334,827	2,065,771
Male	31,491,260	1,068,651	1,226,961	2,153,736
Female	28,948,432	1,058,435	1,163,815	2,011,890
Gender Ratio	920	990	949	934
SC Population	4074447	41,444	100,446	221629
% SC	6.74	1.95	4.20	8.49
ST Population	8917174	1,580,850	721,604	1149901
% ST	14.75	74.32	30.18	18.87
Density of Population (per sq. Km)	258	584	457	552

5. IMPACTS AND MITIGATION MEASURES

The potential impact and their mitigation measures have been presented below :

S. No.	Parameters	Potential Impact	Mitigation Measures Suggested
1.	Topography and Soil	• Cut and fill operations during road construction	• The alignment passes through plain terrain and no substantial cut and fill operations are planned.
		• Borrow earth	• Borrow soil will be procure from approved quarry. • IRC guidelines will be followed during excavation
		• Quarries	• Operational and government licensed quarry have been identified, which will be used to procure the material
2.	Air environment	• Generation of Dust	• Sprinkling of water • Earth handling site • Borrow area • Road construction site • Air pollution control at stone crusher • PPE for workers • Stone crushing units environment compliance • Regulation of construction timings near sensitive receptors and settlements
		• Gaseous Pollution	• Vehicles and machineries will be regularly maintained to conform to the emission standards. • Asphalt mixing sites should be 1 km away from residential area. • Asphalt plant will be equipped with pollution control equipment • Use of PPE by workers engaged in construction and application of asphalt mix on road surface. • Responsibility of contractors and supervising officers to ensure that the workers use the PPE
3.	Noise environment	• Noise level may likely to increase during construction phase	• Properly maintained equipment's to be used • Noise levels of machineries used shall conform to relevant standard prescribed in Environment (Protection) Rules, 1986. • Ear plugs and muffs will be used by workers as per requirement during construction activities.

S. No.	Parameters	Potential Impact	Mitigation Measures Suggested
			• Regulation of timing of construction work generating noise pollution near the residential areas
4.	Water environment	• Drainage pattern 15 Rivers, 28 Canals, 04 Dam, 01 check Dam, 51 Drains, 11 Pond and 01 other water bodies will be impacted due to the proposed expressway.	• Provision of proper drainage through culverts along the proposed expressway. • All the water bodies will be crossed by bridges and structures without affecting their original course and flow • Stabilization and turfing of slopes along the water bodies.
		• Siltation of water bodies	• Silt fencing around water bodies during construction to avoid silt laden runoff entering water body • Turfing or pitching of embankments of water bodies affected will be done where possible to prevent erosion that causes siltation. • No solid waste will be dumped in or near the water bodies or rivers.
		• Flooding due to siltation of drainages channel	• Excavated earth and other construction materials should be stored away from water bodies
		• Water for construction	• Water source would be selected so that local availability is not affected
		• Rainwater harvesting	• Rainwater harvesting drains will be provided along the road side
		• Contamination from wastes	• Provision of septic tanks to prevent any untreated sewage discharge from construction workers camps • Oil interceptors at construction machine maintenance yards
		• Contamination from fuel and wastes	• Vehicle maintenance will be carried out in a confined area, away from water sources, and it will be ensured that used oil or lubricants are not disposed to water courses
		• Sanitation and water use in construction camps	• Construction camp will be organized in a planned manner. • Proper sanitation facilities will be provided including toilets. • Camps will have separate water supply facilities so that local water sources are not affected
5.	Land environment	• Loss of topsoil	• Topsoil on stripping shall be removed and stockpiled on sides to be used on the side slopes, for top cover of borrow areas and for plantation in pits

S. No.	Parameters	Potential Impact	Mitigation Measures Suggested
		• Loss of topsoil from borrowing	Arable lands will be avoided for earth borrowing. If needed, topsoil will be separated and refilled after excavation
		• Borrowing of fill materials	Excavation from pre-selected locations. After excavation, the borrow pits will be dressed to match with the surrounding.
		Loss of Land • As per available data, it is observed that total land acquisition is 2450 ha.	The compensation to project affected persons will be paid as per the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, National Highways Act (NH Act), 1956 and relevant Acts and guidelines of Government of India.
		Loss of structures So far as the type of dwelling structures is concerned 405 nos. Structures coming under within alignment.	
		Loss of Common Property Resources (CPRs) A total of 95 CPRs (temple, well and ponds) fall within proposed alignment.	Relocation of CPRs will be done in consultation with the locals and relocation will be completed first before dismantling the existing structures of CPRs.
6.	Ecological resources	• Loss of trees	Approx. 35409 no. of trees are likely to be felled. At least, thrice numbers of trees for each tree to be cut will be planted as a part of compensatory afforestation. Green belt development along proposed expressway. Plantation of about 1,26,600 trees (three row plantations on either sides of the proposed expressway) proposed. Shrub plantation and grass carpeting in median is also proposed.
7.	Impacts on wildlife	• Loss of Habitat and Defragmentation	• Plantation will be done along the expressway to compensate the loss of vegetation • The strips of vegetation will be planted on either side of the linear clearing to provide attractive corridors for animals movement.
		• Degradation of Habitat	• Precautions will be taken to avoid leakage of chemicals, any hazardous materials due

S. No.	Parameters	Potential Impact	Mitigation Measures Suggested
		Quality	to construction activities. • Labour camps will be located far from habitat of any fauna • Invasive alien species will be removed from time to time
		• Noise Induced physiological and Behavioral Changes	• Dense vegetation along the expressway may be provided for attenuation of noise. • Silence zone will be marked and provided with sign boards to alert drivers • Noise buffers using diversity of tree species, with a range of foliage shapes and sizes, combination of shrubs and trees and evergreen species will be provided. • Noise wall will be provided
		• Impacts of Headlights Glare on Wildlife	• Hedges along both sides of expressway will be provided to lower the intensity of lights
		• Avoidance of Road by Animals • To avoid Injury and Mortality of animals	• Animal underpasses are proposed to be constructed for animals to cross the expressway. • Different types of underpasses like Box culverts, pipe culverts, and culverts with furniture will be constructed for passage of herpetofauna, amphibians etc. • Fences will be provided in combination with underpasses to direct animals away from the expressway. • 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. • The plantation and lighting systems along the expressway should be made less attractive to birds to avoid collision of birds with vehicles.
		• Reduce access to saltlicks and waterholes	• Creation or improvement of water bodies will be done so that the animals have access to water. • Plantation along the water body will be done to attract the animals towards it. • The saltlicks areas will be protected from reach of human beings.
		• Discontinuity of Canopy	• The width of the linear clearing may be kept small in the area having dense canopy to maintain the continuity above the clearing.

S. No.	Parameters	Potential Impact	Mitigation Measures Suggested
		• Disruption of Processes that maintain regional wildlife populations	• The breeding sites of animals/amphibians, nesting sites of birds, thermoregulation surface sites of snakes will be avoided for any type of construction. • Construction/modification of ponds will be done to provide breeding sites to amphibians. • The construction of strips of surfaces (next to road where high mortality of snakes are reported) that may attract snakes for thermoregulation will be done.
		• Increased Human Pressure and Human-Wildlife Conflict	• Caution signs will be provided to alert drivers about wildlife • Speed limit will be restricted in and around dense habitation area to avoid any collision of animal. • Parking shall be restricted to avoid any encounter of humans with animals. • Temporary warning signs may be provided to warn drivers during specific time like breeding periods of animals or animal movement. • Animal Detection Systems may be provided for detection of any animal near expressway. • Poachers will be warned through sign boards
8.	Public health and occupational safety	• Safety to public	• Signs will be posted on expressway before construction areas informing public about the work and safety provisions.
		• Restriction to Access	• Safe and convenient passage for vehicles, pedestrians and live stocks will be arranged during construction work
		• Occupational safety for workers	• Contractor will arrange all safety measures for workers as per factories act.
		• Occupational safety for asphalt plant workers	• All worker employed on mixing asphaltic material, cement, lime mortars, concrete etc. will be provided with protective footwear and protective goggles

6. ENVIRONMENTAL MONITORING PROGRAMME

The Environmental Monitoring Programs are also suggested to provide information on which management decisions may be taken during construction and operational phase. The objective of this program is to evaluate the efficiency of mitigation and enhancement measures, updating the actions & impacts of baseline data and adaptation of additional mitigation measures. Total cost for environment monitoring plan is Rs 3,82,68,000 /-.

7. ADDITIONAL STUDIES

Public Consultation & Public Hearing

The public consultations were carried out in nearby villages of the project corridors. These consultations were taken up by environmental and social experts. Details are incorporated in EIA/EMP report.

In consonance with the EIA notification dated 14th September 2006, vide section 7(f) related to public hearing, the draft report shall be submitted to the Madhya Pradesh Pollution Control Board (MPPCB) and Gujarat Pollution control board for conducting public hearing in Ratlam, Jhabua, Dohad, Panchmahal AND Vadodara district.

Social Impact Assessment

The proposed expressway will pass through Ratlam and Jhabua districts in the state of Madhya Pradesh and Dahod, Panchmahal and Vadodara districts of Gujarat. There are 405 structures recorded within the corridor of impact the proposed expressway. However, the proposed project will definitely have some positive impact on the socio-economic environment of the people of surrounding villages experiencing development in the area in specific and state and nation as a whole. The demographic profile and socio-economic status of the people in the project affected district are presented in EIA/EMP report.

Road Safety Features

The proposed road would act as the prime artery for the economic flow to this region. It will enhance economic development, provide employment opportunities to locals, strengthen tourist development, ensure road safety and provide better transportation facilities and other facilities such as way side amenities.
The proposed project is mostly green field access control expressway. However, provision of diversions with direction signs, speed breakers and other safety requirements followed as per IRC & MoRTH guidelines. Provision for accident emergency assistance and medical care to accident victims have also been considered as road safety measures.

8. PROJECT BENEFITS

The proposed expressway will provide better, fast, safe and smooth connectivity for the commuters of Madhya Pradesh, Gujarat state and especially in Ratlam, jhabua, Dohad, Panchmahal and Vadodara region. Smooth and fast-moving traffic will cause only lower emissions thereby reducing pollution levels. Accident rates are also expected to come down substantially. Development of the proposed project road will improve the local agriculture and

enable farmers to realize better value for their products as well as attract more investment to that region, thus boost economy of the area, state and nation as a whole. The vehicle operating and maintenance cost is expected to go down substantially. The proposed road alignment will also include general amenities like bus bays, truck lay byes, rest areas, service road at built-up locations, pedestrian and cattle underpasses, landscaping and tree plantation, traffic aid post, emergency telecom system, emergency medical aid post, street light at built ups etc. and thus overall facilities to the road users shall improve. People will have increased access to better social and health infrastructure and other services located outside the project area. This will in turn lead to overall improvement of the quality of life of the people residing in the project zone in terms of their economic, social and health status. Growth of local tourism and resultant boost to local economy is also expected due to proposed project.

9. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The Environmental Management Plan is prepared for avoidance, mitigation and management of the negative impacts of the project. It also covers remedial measures require to be taken EMP includes the list of all the project related activities, their impacts at different stages of project during pre-construction phase / design phase, construction phase and operational phase on environment and remedial measures to be undertaken to mitigate these impacts.

Total cost for environment management plan (including environmental monitoring plan) for the project is **approx. 32.2 Crores.**

10. FINDINGS & CONCLUSSION

The EIA/EMP report was prepared after thorough interaction with the engineering section of the consultants so that the negative impacts on the environment and human population could be avoided as far as possible. Some of the important findings of the study are as follows: -

1. There will be insignificant loss of bio-diversity as no rare plant or animal species are going to be affected by the present project.
2. The proposed alignment is not passing through any Sanctuary or National Park.
3. Precautionary measures such as underpass, pipe culverts and chain link fences etc. have been suggested to mitigate the likely impacts if any, on the wild life present in study area.
4. No monuments protected by the Archaeological Survey of India (ASI) are located within the ROW of expressway.
5. The most important factors, which need continuous attention and assessment during the construction phase, are the ambient air quality, the water quality and the noise level. The ambient air quality of the study area is good. A noise level in the area is also below the limit.

6. Approximately 35409 numbers of trees are recorded in corridor of impact of the proposed expressway. However, avenue plantation and compensatory afforestation will enhance the environmental condition of the area.

7. There are 405 structures recorded within the corridor of impact the proposed expressway. However, the proposed project will definitely have some positive impact on the socio-economic environment of the people of surrounding villages experiencing development in the area in specific and state and nation as a whole.