Initial Environmental Examination

March 2015

IND: Madhya Pradesh District Connectivity Sector Project

Bandri – Jaruwakheda Road

Prepared by Madhya Pradesh Road Development Corporation for the Asian Development Bank

CURRENCY EQUIVALENTS

(as of 31 March 2015)

Currency unit	–	Indian rupees (INR/Rs)
Rs1.00	=	$ 0.016
$1.00	=	Rs 62.5096

ABBREVIATIONS

AAQ	–	ambient air quality
AAQM	–	ambient air quality monitoring
ADB	–	Asian Development Bank
APHA	–	American Public Health Association
BGL	–	below ground level
BOD	–	biological oxygen demand
BOQ	–	bill of quantity
CO	–	carbon monoxide
COD	–	chemical oxygen demand
CPCB	–	Central Pollution Control Board
CSC	–	construction supervision consultant
MPRDC	–	Madhya Pradesh Road Development Corporation
DG	–	diesel generating set
DO	–	dissolved oxygen
DPR	–	detailed project report
E&S	–	environment and social
EA	–	executing agency
EAC	–	Expert Appraisal Committee
EIA	–	environmental impact assessment
EMP	–	environmental management plan
EMOP	–	environmental monitoring plan
GHG	–	greenhouse gas
GIS	–	geographical information system
GOM	–	Government of Madhya Pradesh
GRC	–	grievance redress committee
GRM	–	grievance redress mechanism
HFL	–	highest flood level
IEE	–	initial environmental examination
IMD	–	Indian Meteorological Department
IRC	–	Indian Road Congress
LHS	–	left hand side
LPG	–	liquefied petroleum gas
Max	–	Maximum
Min	–	Minimum
MJB	–	major bridge
MNB	–	minor bridge
MORT&H	–	Ministry of Road Transport and Highways
MOEF	–	Ministry of Environment and Forests
MPRSD	–	Master Plan Road Sector Development
N, S, E, W,	–	Wind Directions (North, South, East, West or
NE, SW, NW	–	combination of two directions like South West, North West)
NGO	–	nongovernmental organization

NH	–	national highway
NIC	–	National Information Centre
NOC	–	No Objection Certificate
NOx	–	oxides of nitrogen
OBC	–	other backward classes
PCC	–	Portland Cement Concrete
PCU	–	Passenger Car Units
PD	–	Project Director
PFR	–	project feasibility report
PIU	–	project implementation unit
PPE	–	personal protective equipment
PPT	–	parts per trillion
PWD	–	Public Works Department
RCC	–	reinforced cement concrete
REA	–	rapid environmental assessment
RHS	–	right hand side
ROW	–	right of way
RSPM	–	respiratory suspended particulate matter
SH	–	state highway
SOI	–	Survey of India
SO2	–	Sulphur Dioxide
SPCB	–	State Pollution Control Board
SPL	–	sound pressure level
SPM	–	suspended particulate matter
SPS	–	ADB Safeguard Policy Statement, 2009
TA	–	technical assistance
UT	–	Union Territories
WHC	–	Water holding capacity

WEIGHTS AND MEASURES

dB (A)	–	A-weighted decibel
ha	–	Hectare
km	–	Kilometer
km2	–	square kilometer
KWA	–	kilowatt ampere
Leq	–	equivalent continuous noise level
µg	–	Microgram
m	–	Meter
MW	–	Megawatt
$PM_{2.5}$ or $_{10}$	–	Particulate Matter of 2.5 micron or 10 micron size

NOTE:

In this report, "$" refers to US dollars.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

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2. Madhya Pradesh Road Development Corporation Ltd (MPRDC), the Government of Madhya Pradesh, has started the improvements of State highway and Major District Roads network for meeting the supply demand gap of the traffic in near future. As a part of this strategy MPRDC has taken up the up-gradation of Bandri to Jaruwakheda (MDR) Road.

3. The main objectives are to improve the regional as well as inter and intra state transport flows and in doing so improving access to services and making the State attractive to developers and investors. To fulfil the above objectives and due considerations to environmental feasibility of above road section, Initial Environmental Examination (IEE) was carried out for this section.

4. Since the project is following the sector loan modality four subprojects were selected as sample roads .The present report pertains to **Bandri-Jaruwakheda** Road sub-project, which is one of the sample roads. This subproject is categorized as Category „B" and hence, an initial environmental examination (IEE) has been undertaken. The IEE is carried out in accordance applicable laws and regulations of the Government of India and in ADB"s Safeguard Policy Statement (SPS), 2009. The report is also consistent with the requirements of the Environment Assessment and Review Framework (EARF) which was prepared for the sector loan. Since the project road will be upgraded within existing available ROW, no Environmental Clearance is required for the proposed road widening project as per EIA Notification 2006.

B. Description of Project

5. The **Bandri-Jaruwakheda** road with a length of 24.2 Km and starts @ Km 0.00 near Bandri and ends at Jaruwakheda @ Km 24.2 km. The actual length of the project road is about 24.2Kms. It starts from Bandri Village at T-Junction at Sagar-Jhansi(NH-26) and passes through Pithoriya, Semara,Basiyagaon, Mudra and Jaruwakheda. At present the road is in bad condition and needs up-gradation. Improvement of this road section will connect the interior rural areas and thereby bring people nearer to district headquarters.

6. The project involves widening & Strengthening of existing roads within available ROW to in 2-lane carriageway (7.0 m wide with 3.5 m width of each lane and 2.5m earthen shoulder either side) & Intermediate lane (5.50m wide with 2.25m earthen shoulder both side). The total length of the project road is 22.6 km. This road will provide better connectivity to Bandri to Jaruwakheda.

C. Description of Environment

7. The proposed project road between **Bandri to Jaruwakheda (MDR) Road** situated on the Central plateau & hill region agro climate zone and forms Gird sub-group. The soil type in

the area is mainly Medium Black alluvial.. The land use pattern in the project section is agricultural with intermittent semi urban/rural stretches.

8. Study area has a sub-tropical climate with hot summers from late March to early July, the humid monsoon season from late June to early October, and a cool dry winter from early November to late February. The highest recorded temperature was 47 °C and the lowest was −1 °C.

9. Baseline data on ambient air quality was found to meet the national air quality standards for rural and residential area along the project road. Similarly measured noise levels were found to be below the noise limit stipulated for residential and commercial areas.

10. There is no forest land involved in the project road. The project road does not pass through any protected area, such as, wildlife sanctuary, national park or bio-reserve neither it is located within 10 km from the project road. Approximately 46 trees may need to be cut within ROW for up-gradation of the project road. No rare or endangered species found in the area along the project road.

11. There is no mining activity along the project road. Water Quality along the project is good and meeting the Standards of drinking water quality as per IS 10500.

12. No archaeological and historical monument is located along the project road. However, small religious structures are located within the existing RoW, of which, only few religious structures will be affected during widening of the project road.

D. Anticipated Environmental Impacts and Mitigation Measures

1. Design and Construction Phase

a. Impact on Physiography and Topography

13. Since proposed project is only widening of existing road within available ROW without any land acquisition, impact on the physiography of the area is not significant. The design will consider the improvement of roadside drainage conditions through the improvement of cross-drainage structures. Design of the cross drainage structures will follow IRC Guidelines (IRC, 1995).

b. Potential Environmental Impacts on Soil

14. **Loss of Productive Soil**. All activities will occur within the available RoW, no adverse environmental impact is anticipated on the productive soil. Lands taken on lease for access road and for construction camp will be restored its original land use.

15. **Soil Erosion**. Land clearing and grubbing will remove vegetation and soil cover which may cause some soil erosion during monsoon. Excavations in borrow pits may lead to loss of top soil and soil erosion. The risks of stream and river bank erosion near bridges and cross drainage works are significant. To avoid or minimize erosion, land clearing and grubbing will be conducted during dry season, productive top soils from borrow pits will be stored and reused in road embankment slope protection. Erosion control measures like silt screens will be installed along rivers and nallahs.

16. **Contamination of Soil.** There is the risk of contamination of soil from construction material and oil spills. Contractors are required to ensure proper handling materials and able to implement spills containment. Oil contaminated waste will be properly collected, stored disposed through 3rd party service providers. All fuel and lubricant storage and handling areas will be located at least 500 meters from the nearest water body and provided with perimeter interceptor drains.

c. Impact on Water Resources and Drainage

17. Deterioration of water quality may occur near the construction camp and active construction camps. This will be minimized by timing land clearing and earthmoving during the dry season; proper handling of materials including oil, and lubricants; prohibiting the disposal of untreated sewage; and proper erosion control near rivers and nallahs.

d. Impact on Ambient Air Quality

18. Significant amount of dust will be generated during project construction. The following mitigation measures will also be undertaken:

(i) Asphalt and hot-mix plants will be located at least 1 km away from any inhabited urban and rural stretches along the road with the clearance from MP Pollution Control Board.
(ii) Sprinkling of water on the active construction fronts and construction yard.
(iii) Regular maintenance of machinery and equipment.

19. Substantial noise will be generated from the use of heavy equipment and processing of rocks and asphalt. Adequate distance separating the rock crusher and hotmix plants will be required and the sourcing of “ready made” gravel and asphalt will be promoted to avoid the establishment of these plants. Along the road particularly near sensitive sites like schools and hospitals, the use of less noisy equipment, scheduling of noisy activities, and provision of noise barriers will be implemented by the contractor to minimize disturbance

e. Flora, Fauna and Ecosystem

20. Clearing and grubbing activities will result to the removal of shrubs, grasses, and 46. trees along the RoW. All cut trees will be compensated at the rate of 1:10 with preference to fast growing local species that are more efficient in absorbing carbon emissions.

f. Construction Workers’ Camp

21. As the Contractor are required to source labor from the local communities along the subproject road, the size of the construction camps will be relatively small. It is the contractual responsibility of the Contractors to maintain a hygienic camp with adequate water and electric supply; toilet facilities located away from the water bodies and wells; proper disposal of domestic refuse; temporary medical facilities; pest control; clean and adequate food; and security.

g. Impacts on Social Environment

22. Construction and operation phases of project road will have some beneficial impact on social environment. Some increase in income of local people is expected as local unskilled,

semiskilled and skilled persons may gain direct or indirect employment during construction phase. Since the immigration of work force during construction phase is likely to be very small, the social impacts on literacy, health care, transport facilities and cultural aspects are expected to be insignificant.

2. Operation Phase

23. Increase in vehicular emissions, noise level, road crashes due to higher speed vehicular speed, and oil contaminated road surface runoff will occur during project operation phase. The impact on air quality is not expected to be significant given the low projected traffic. Community safety is enhanced through the crash barriers, speed brakes, traffic signs, and pavement markers. Oil contamination will occur but expected to be in trace amounts based on the low level vehicular traffic. To control the anticipated increase in noise level the following measures will be implemented; good road surface will reduce the road-tire noise, prohibition of horns along sensitive areas, road widening will increase capacity and decrease congestion of vehicles, and compensatory tree plantation will be located near sensitive areas

E. Public Consultation and Information Disclosures

24. Public consultations have been carried out in the project area during the feasibility as well as detailed design stage. Key issues raised during the consultations were on:

(i) Provision of suitable drainage in the settlements areas
(ii) Provisions of safety measures in school and settlement areas
(iii) Suitable mitigation measures to address air and noise pollution
(iv) Provision of safety signage near school.
(v) Avoid sourcing water for construction from public water sources.
(vi) Minimize the cutting of trees.
(vii) Construction labour camps should not be located near settlements area.
(viii) Avoid borrow of earth near settlement and schools.
(ix) Start tree plantation during construction phase.

F. Environmental Management Plan and Grievance Redress Mechanism

1. Environmental Management Plan

25. The B-J Road specific Environment Management Plan has been formulated which consists mitigation and monitoring measures, and clear definition of roles and responsibilities. The project will have one grievance redress mechanism for social and environment issues comprising a village level and district level committee. The nodal officer under the PIU will be the key person to coordinate the receiving of complaints and addressing them.

2. Environmental Monitoring Program (EMoP)

26. A comprehensive monitoring plan has been prepared for all stages of the project. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibility for implementation and supervision. Construction Stage Monitoring to be carried out by contractor under supervision of construction supervision consultant (CSC).

27. Monitoring will focus on air, water, noise, soil erosion, drainage congestion and compensatory tree plantation. For tree plantation, the 75% survival rate of re-plantation shall be monitored for three years of the operation phase.

3. Institutional Arrangement and Capacity Building

28. The implementation arrangements basically follow the ongoing MPSRSP-II with the following improvements: i) expansion of the Environmental and Social cell (ESC) staff from 1 to with the recruitment of two social safeguard and one environmental safeguard officers; ii) MPRDC ten division offices acting as Project Implementation Units (PIUs) will appoint a social and environment safeguards focal person; and iii) Construction Supervision Consultant's environmental specialist from the CSC will provide technical support to MPRDC and the PIU for implementation of environment safeguards.

29. To enable MPRDC officials to implement for environmental safeguard requirements effectively, a training programme will be conducted for the EA and IA of the sector loan to improve environmental awareness, construction practices, legislative compliance requirements, EMP and EMoP implementation requirements, and roles and responsibilities.

G. Conclusion and Recommendations

30. The findings of the IEE show that overall the project has limited and short term environmental impacts. Effective EMP implementation will ensure elimination and minimisation of identified adverse impacts. MPRDC shall ensure that EMP and EMoP is included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. If there is any change in the project design the EMP and EMOP will accordingly. MPRDC needs capacity building and practical exposure. Adequate training shall be imparted as proposed under environmental management plan to enhance the capability of concerned EA and IA officials.

I. INTRODUCTION

A. Project Background

1. The Madhya Pradesh District Connectivity Sector Project will improve transport connectivity in the state by rehabilitating and upgrading Major District Roads (MDRs). The Project constitutes (i) rehabilitating and upgrading about 2,200 km of MDRs (ii) improving road maintenance and asset management and (iii) developing an efficient accident response system. MPRDC specifically targets MDRs to form key linkage between rural, semi urban and urban areas and complete the state roads connectivity.

2. Government of Madhya Pradesh has been using a combination of budgetary, PPP, and ADB financing, to improve state highways. Rural roads are specifically addressed through MPRRDA and funds are made available from the Pradhan Mantri Gram Sadak Yojana (PMGSY) which is the national rural roads plan. ADB's funds are made available to the rural roads in the state through past loans to the central line ministry. However the intermediate tier – MDRs – has not been specifically targeted for improvement. MDRs form the key linkage between rural, semi urban and urban areas and have to be essentially developed to complete state road connectivity. In this background, GoMP has now proposed to improve the MDRs through the plan indicated in Table 1.

Table 1: Proposed Improvement Plan for MDRs

Total MDRs in Madhya Pradesh	**(Km) 19,574**
Under construction by MPPWD (Under Central Road Fund Scheme)	5,398
Under Major District Roads Scheme	1,134
Under Construction by MPRDC (Under build operate transfer (BOT) Toll + Annuity & Annuity Scheme)	1,992
Total Under Construction	8,524
Balance to be constructed	11,050
Proposed under the Project[a]	2,200

[a] The actual estimates will depend on the assessment from the DPRs.
Source: MPRDC

3. Madhya Pradesh Road Development Corporation Ltd (MPRDC), the Government of Madhya Pradesh, has started the improvements of State highway and Major District Roads network for meeting the supply demand gap of the traffic in near future. As a part of this strategy MPRDC has taken up the up-gradation of following five roads in **Sagar Division**:

(i) Bandri-Jaruwakheda
(ii) Nirtala-Mandi Bamora
(iii) Prithvipur-Nimari
(iv) Damoh-Hindoriya-Patera
(v) Shahnagar-Hardua

4. The present report focuses on preparation of IEE of **Bandri-Jaruwakheda Road** only. IEE of other roads are being prepared separately**.**

5. The main objectives are to improve the regional as well as inter and intra state transport

flows and in doing so improving access to services and making the State attractive to developers and investors. To fulfil the above objectives and due considerations to environmental feasibility of above road section, Initial Environmental Examination (IEE) was carried out for this section.

B. Nature, Size and Location of the Project

6. The project activities involve widening of existing road within available ROW. The length of **Bandri-Jaruwakheda Road** is 24.2 Km long for which widening and up-gradation have been proposed. The road widening activities primarily will comprise of raising the embankment at certain locations and its stabilization including construction of retaining wall if required especially near water bodies, overlay on the existing carriageway, junction improvement, and construction of minor bridges, culvert and RCC drain in built-up section. The location of state road networks, sector roads and **Bandri-Jaruwakheda Road** is shown in Figure-1.1

C. Purpose and Scope of the Study

7. This IEE report documents the environmental assessment of the **Bandri-Jaruwakheda Road (BJR)** Road Subproject and identifies the environmental issues to be considered at project planning and design stage. In this report the different activities that are likely to take place to achieve the project objectives have been analyzed and the potential impacts that may accompany them have been discussed. The IEE addresses the environmental management requirements of the Government of India (GoI); (ii) the donor, Asian Development Bank (ADB), and (iii) the Project. In general IEE addresses the following:

(i) Provides information about the baseline environmental setting of the subproject;
(ii) Provides information on potential environmental impacts of the proposed subproject activities with its magnitude, distribution and duration.
(iii) Provides information on required mitigation measures with cost to minimize the impacts.
(iv) Analyses the alternatives options considering alternative locations, designs, management approaches for selection of most feasible and environmental acceptable options.
(v) Provides details of stakeholder's consultations.
(vi) Suggest environmental management and monitoring plan with institutional measures for effective implementation of mitigates measures proposed and addressing grievances.

8. Initial Environmental Examination has been prepared based on proposed alignment. It covers all activities viz. site clearance (tree cutting, shifting of utilities etc.), construction activities including material sourcing (borrowing, quarrying, and transportation) and operation (traffic movement). The corridor of impact is taken as 10 meters either side of the alignment. However, the study area impact zone is considered up to 5 km on both sides of road alignment to allow for coverage of indirect and induced impacts and a larger analysis of land use and other environmental features. Assessment is carried out on the following environment components: terrestrial and aquatic ecology, soil, water, air, noise, and socio economic aspects.

9. This IEE report is presented in eight chapters listed below:

Chapter 1 - Introduction
Chapter 2 - Policy, Legal and Administrative Framework

Chapter 3 - Description of Project
Chapter 4 - Description of Environment
Chapter 5 - Anticipated Impacts and Mitigation Measures
Chapter 6 - Information Disclosure, Consultation, and Participation
Chapter 7 - Environment Management Plan and Grievance Redress Mechanism
Chapter 8 - Conclusion and Recommendation

D. Methodology

10. The methodology for IEE has been adopted to accomplish the study in line with ADB Safeguard Policy Statement (SPS) 2009. The study was carried out using reconnaissance survey, field visits, consultation with stakeholders, review of existing data, identification of adverse impacts and preparation of EMP and post-project Environmental Monitoring Programme. The stepwise activities include:

(i) Review of legal requirements
(ii) Review of feasibility study
(iii) Reconnaissance survey for identification of key issues data requirement and preliminary consultation
(iv) Primary and secondary data collection
(v) Consultation with stakeholders
(vi) Identification of impacts and mitigation measures

1. Data Collection

11. Data pertaining to all facets of environment viz. physical, ecological and socioeconomic environment both through primary and secondary sources were collected. The objective of data collection was to provide a database on existing conditions that can be used for predicting the expected changes and for monitoring such changes. For preparation of IEE the key relevant information sources have been summarized in Table 2.

Table 2: Primary and Secondary Information Sources

Information	Sources
Technical information on existing road features and proposed rehabilitation work. Inventorisation of road features; viz. water bodies community structures, environmental sensitive location areas, congested locations, etc.	MPRDC Design Consultant Ground physical surveys and graphics consultants
Climatic Condition	Indian Meteorological Department (IMD), ENVIS Website, NIC, primary data collection
Geology, Seismicity, Soil and Topography	Geological survey of India, SOI Topo-sheets, Primary data collection
Land Use/Land Cover	Survey of India (SoI) Topo-sheet, Observation during survey
Drainage Pattern	Survey of India Topo-sheet and field observation
Status of forest areas, Compensatory aforestation norms etc.	Divisional Forest Office, Sagar District
Status of Fishing Activity	District Fisheries Offices at Sagar District
Air quality Noise, Soil and Water Borrow Areas, Quarries and other construction material source	Onsite monitoring and Analysis of Field samples Design consultant and public consultation during field visit

Information	Sources
River geo-morphology, hydrology, drainage, flood patterns. Socioeconomic Environment	Feasibility report, field observations Primary Census Abstract of Sagar District 2011. Official websites maintained by state Govt., and Public Consultation during the Field survey

2. Public Consultation

12. Extensive consultations were held during different stages (reconnaissance, detailed design and design review) with all stakeholders that includes local and beneficiary population, government departments/agencies, road users and project-affected persons. This was done with intent to collect baseline information, for better understanding of the potential impacts and appreciate the perspectives/concerns of the stakeholders. Information gathered was used for integration in project design and formulating mitigation measures and environmental management plan. Detailed description of public consultation has been presented in Chapter VI.

E. Organizational Setting of Implementing Agency

13. Madhya Pradesh Road Development Corporation, Government of Madhya Pradesh is the organization responsible for construction and maintenance of roads on behalf of Government of Madhya Pradesh. MPRDC is the executing agency (EA) for this project. PIU is created within MPRDC at headquarter which is primarily the responsible unit for all ADB funded road projects. The EA capability for effective implementation of Environmental Management Plan (EMP) has been assessed and the same is presented in Chapter 7.

Figure 1: Location Map

II. POLICY AND LEGAL FRAMEWORK

14. India has well defined institutional and legislative framework. The legislation covers all components of environment viz air, water, soil, terrestrial and aquatic flora and fauna, natural resources, and sensitive habitats. The environmental legislations in India are framed to protect the valued environmental components and comply with its commitment to international community under various conventions and protocols as well. Asian Development Bank has also developed interventions to guide social and environment safeguards, in their Safeguard Policy Statement, 2009. This assessment is about the applicability of above laws and regulations, and safeguards. This chapter summarizes the following:

(i) Applicability of various National and local laws and regulations at different stages of project implementations
(ii) Applicability of ADB safeguards policies and categorization of the project.

A. Country's Legal Framework and Regulatory Requirements for the Project

15. The legal framework of the country consists of several acts, notifications, rules, and regulations to protect environment and wildlife. Review of Indian legal system has been carried out to identify its applicability to the project.

Table 3: Summary of Relevant Environmental Legislation

Act	Objective	Responsible Institution
Environment (Protection) Act (1986) and Rules (1986)	To protect and improve the overall environment	MoEF
Environmental Impact Assessment (EIA) Notification under Environmental Protection Rules (2006, 2009, 2011) and relevant Office Memorandums (OM)	To provide guidance on environmental clearance requirements and clarification on related specific technical issues	MoEF
Wildlife Protection Act (1972 and amended in 1993)	To protect wild animals and birds through the creation of National Parks and Sanctuaries	MoEF
The Water (Prevention and Control of Pollution) Act 1972 (Amended 1988) and Rules 1974	To provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.	CPCB
The Air (Prevention and Control of Pollution) Act, 1981 (Amended 1987) and Rules 1982	To provide for the prevention, control and abatement of air pollution, and for the establishment of Boards to carry out these purposes.	CPCB and Road Authorities
Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules 2008 (Amended 2009),	To protection the general public against improper handling, storage and disposal of hazardous wastes	State Pollution Control Board
The Forest (Conservation) Act 1980 (Amended 1988) and Rules 1981 (Amended 2003)	To protect and manage forests	MoEF

Act	Objective	Responsible Institution
Central Motor Vehicle Act (1988) and Rules (1988)	To control vehicular air and noise pollution. To regulate development of the transport sector, check and control vehicular air and noise pollution.	State Transport Department
Ancient Monuments and Archaeological Sites and Remains Act (1958)	Conservation of Cultural and historical remains found in India.	Archaeological Dept. GOI
Building and Other construction workers (Regulation and the Employment and conditions of service) Act, 1996	To regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures	Ministry of Labour and Employment
Child labour (Prohibition and Regulation) Act, 1986	To regulate the employment of children including age limits, type of employment, timing of work, information disclosure and health and safety.	Ministry of Labour and Employment

1. Requirement of Environmental Clearance

16. As per provisions of Environmental Impact Assessment Notification 2006 amended 2009), and its amendments, vide notification S.O.3067(E), dated the 1st December 2009 all State Highway expansion projects, except those in hilly terrain (above 1000 m AMSL) and ecologically sensitive areas, have been exempted from Environmental Clearances.

17. Since, the project road will be upgraded within existing available RoW, the above EIA Notification, 2006 (amended till date) promulgated under Environment (Protection) Act 1986 is not applicable for the project road and hence no Environmental Clearance is required for the proposed road widening project.

2. Forests Clearance

18. As per Indian Forests Conservation Act (1980), any project requiring diversion of frosts land for non-forestry purposes require forest clearance from MoEF for the same. The forestry clearance is granted through two stages process. Since no diversion of forestland is involved in B-J Road, no forest clearance is required for this road.

3. Permission to Withdraw Ground Water

19. As per the power Granted under Environmental Protection Act, 1986, Permission from Central Ground Water Authority is required for extracting ground water for construction purposes, from areas declared as critical or semi critical from ground water potential prospective.

4. Required Clearances/Permissions

20. For up-gradation of the project road, required clearances/ permissions related to environment has been summarized in Table 4.

Table 4: Permissions/Clearances Required for the Subproject

Sr. No.	Permissions/ Clearances	Acts/ Rules/ Notifications/Guidelines	Concerned Agency	Responsibility
A.	**Pre-construction Stage**			
1	Permission for cutting of trees	Forest Conservation Act (1980)	District Forest Office/State Forest Department for trees felling in forest areas and District Authorities in non-forests Areas	MPRDC
		Procedural Guidelines developed by the Department of Environment, Government of M.P. under the orders of the Honourable High Court Tree removal will be guided as per state government rules.	Compulsory tree plantation to be made at 1:3 to 1:10 as per the permission granted	
B.	**Implementation Stage**			
2	Consent to operate hot mix plant, Crushers, Batching plant	Air (Prevention and Control Pollution) Act of 1981	M.P. State Pollution Control Board (To be obtained before installation)	Contractor
3	Authorization for Disposal of hazardous waste	Hazardous Waste (Management and Handling) Rules 1989	M.P. State Pollution Control Board (To be obtained before generation)	Contractor
4	Consent for Disposal of sewage from labour camps	Water (Prevention and Control of Pollution) Act 1974	M.P. State Pollution Control Board (Before setting up the camp)	Contractor
5	Pollution Under Control Certificate	Central Motor and Vehicle Act 1988	Department of Transport, Government of M.P. authorized testing centres	Contractor
6	Employing Labour/Workers	The Building and Other Construction Workers (Regulation and Employment Conditions of Service) Act, 1996	District Labour Commissioner	Contractor

B. International Agreements

21. India has been playing an active role in environmental conservation since the first United Nations (UN) conference on Human Environment in Stockholm in 1972 and recognizes that protection of environment is closely linked to combating poverty. Key international agreements that India is signatory to and relevant for the project are provided below:

(i) Convention Relative to the conservation of Flora and Fauna in their Natural State (1933)
(ii) International Plan Protection Convention (1951)
(iii) Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (Ramsar,1971)
(iv) Convention concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972)
(v) Convention in International Trade in Endangered Species of Wild Fauna and Flora (Washington, 1973)
(vi) Convention on Migratory Species of Wild Animals (Bonn, 1979)
(vii) Convention on the Prior Informed Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC or Rotterdam, 1990)
(viii) United Nations Framework Convention on Climate Change (Rio De Janeiro, 1992)
(ix) Convention on Biological Diversity (Rio De Janeiro, 1992)
(x) Protocol to the United Nations Convention on Climate Change (Kyoto, 1997)

C. Asian Development Bank Safeguard Policies

22. The Asian Development Bank has defined its Safeguard requirements under its "Safeguard Policy Statement 2009" (SPS). The prime objectives of these safeguard policies are to (i) avoid adverse impacts of projects on the environment and affected people, where possible; and (ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible. Since B-J Road project is likely to have potential environmental risks and impacts and requires complying with the safeguard requirement of SPS and project categorization.

D. Category of the Project as per SPS

23. The project road has been evaluated considering outcome of latest ADBs Rapid Environmental Assessment Checklist (Appendix 1) for Roads and Highways. The B-J Road subproject neither passes through nor is located within 10 km from any Wildlife Sanctuary, National Park, or any other environmentally sensitive or protected areas. It traverses predominantly through agricultural land and follow existing alignment. All widening is also confined to existing ROW. The majority of the activities have short-term minor, negligible, or no residual impacts. Hence, the project is categorized as Category "B" in accordance with ADBs Safeguard Policy Statement 2009.

III. PROJECT DESCRIPTION

A. Rational and Project Settings

24. The project road forms a major link between NH-26, Jhansi-Sagar-Narsinghpur Road and NH-939, Bina-Khurai-Sagar Road in Sagar District. The project road is single and the same need to be made intermediate lanes and improvement of shoulder and provision of drains. The up-gradation of the project road will improve and enhance the road conditions and usability. It will increase travel speeds and reduce travel time. Better road conditions after up-gradation will reduce the accidents and vehicle emissions.

25. The **Bandri-Jaruwakheda road** with a length of 24.2 Kms starts @ Km 00.000 near Bandri and ends at Jaruakheda @ Km 24.2km. The actual length of the project road is about 24.2Kms. It starts from Village Bandri and passes through Pathoriya, Semra, Basiya Gaur, Mudra, & terminates at Jeruakheda. At present the road is in bad condition and needs up-gradation. Improvement of this road section will connect the interior rural areas and thereby bring people nearer to district headquarters.

26. The project involves widening & Strengthening of existing roads within available ROW. This road will provide better connectivity to villages falling on this road and they will be connected to District Headquarter as well.

27. The salient Features of the Bandri-Jaruwakheda Road is given in Table 5.

Table 5: Summary Road Components and Design Standard

Road Components	
Road Length	24.2 Km length
Alignment	Follow the exits road alignment. All construction even for approach to new bridge is within existing ROW.
Flyovers/overpasses/ ROB	There is no flyovers/overpasses/ ROB in the alignment.
Major Bridges	No major bridges
Other Structures	6 minor bridges & 39 culverts and 1 VCW (Replacement of existing structures wherever required, provision of new structure alongside existing structures wherever required)
Embankment Design	Embankment height established for 1m free board on 20 years frequency HFL
	Embankment height up to 3.0 m with 2H: 1V for Embankment height from 3.0 m to 6.0 m with 2.5H: 1V. Construction of embankment of height more than 3.0 m, using borrow soil is recommended. However high embankment have been restricted within Row providing returning walls
Vertical Controls	Grade break of 0.5%, vertical curves will be provided. Length of vertical curve will be restricted to minimum 60 M
Cross-Section Elements	Carriage way: 7 m, 5.50m, Cross fall will be 2.5%. for pavement and 3 % for earthen Shoulder
Speed	80Km/hr/Permissible 50Km/hr
Horizontal Controls	As per IRC: 38 / IRC SP-48, Maximum value of 5% for super elevation and 15% for side friction factor, the minimum radius for horizontal curves 15 m. Design Speed: 20 km/h
Structural design standards	As per IRC Codes and MORSTH Guidelines. Vertical Clearance 0.60 m above HFL for bridges upto 30 m length 0.90m above HFL for bridges above 30 m length

	The discharges for which the bridge has been designed are maximum flood discharge on record for a period of 100 years for major bridges and 50 years for minor bridges.

Source: Detailed Project Report, 2014

B. Characteristics of the Existing Road

28. The entire length of the project road runs through plain terrain and passing across several agricultural land, villages, and towns. The pavement is of flexible bituminous for the whole stretch and the visually observed condition of the pavement is fair to poor. The existing carriageway is generally 3.0 m to 3.5 m with bituminous pavement. The condition of the project road is generally poor to distress. The carriageway is mostly of bituminous type, except at end where rigid pavement is noticed in village portion. The section of the road has granular shoulder of fair condition with width varying 1.0 m to 1.5 m. Table 6 presents a summary of the road configuration.

Table 6: Existing Road Configuration and Condition

Sr. No.	Design Chainage (Km.)		Length	Villages/Town
	From	To		
1	0+000	0+600	600	Bandri
2	6+600	7+500	900	Pithoriya
3	11+600	11+880	280	Semara
4	17+100	17+400	300	Basiyagaon
5	18+300	18+500	200	Basiyagaon
6	23+100	23+400	300	Mundra
7	23+800	24+400	600	Mundra-Jaruakheda
8	24+900	25+000	100	Jaruakheda

Source: Detailed Project Report, 2014

C. Current and Projected Daily Traffic

29. The current traffic is thin on this road, which is expected to rise substantially once better road, and connectivity is provided. The current and projected average daily traffic on the project road is given current traffic is thin on this road, which is expected to increase substantially once better road, and connectivity is provided. The current average daily traffic on the project road is given in **Tables 7 and 8.**

Table 7: Average Daily Traffic

Sr. No.	Survey Location	Fast Moving Vehicles	Slow Moving Vehicles	Total Veh/day	Total PCUs/ day
1	Bandri-Jaruakheda road at Km 4	515	260	775	975

Table 8: Average Daily Traffic (ADT) at Count Location

VEHICLE TYPE	UP	DN	TOTAL
Car / Jeep / Vans	47	35	82
Two Wheeler	116	106	222
Three Wheeler	2	3	5
Mini Bus	12	13	25
Bus	8	8	16
Tempo/LCV	17	19	36
2 - Axle Truck	5	6	11
3 - Axle Truck	5	6	11
Multi Axle Truck	2	3	5
Tractor	11	15	25
Tractor with Trailer	40	37	77
Cycle	125	135	260
Cycle Rickshaw	-	-	-
Hand Cart	-	-	-
Arrival Drawn	-	-	-
Total All Vehicles	-	-	-
PCUs			**975**

Source: Detailed Project Report, 2014

Table 9: Projected Traffic (AADT)

Year	Car	TW	Three Wheeler	Mini Bus	Bus	LCV	2A	3A	MA	Tractor	Tractor wt Trolley	Total Fast Moving Vehicles	Cycle	Cyc Ric	Hand Cart	Animal Cart	Total Slow Moving Vehicles	PCU
Traffic Growth	**6.50%**	**6.50%**	**6.50%**	**6.50%**	**6.50%**	**6.50%**	**6.50%**	**6.50%**	**6.50%**	**6.50%**	**6.50%**		**3%**	**3%**	**3%**	**3%**		
Location 1 AADT	**84**	**226**	**5**	**26**	**16**	**37**	**11**	**11**	**5**	**26**	**79**	525	**265**	**0**	**0**	**0**	265	**995**
2014	84	226	5	26	16	37	11	11	5	26	79	525	265	0	0	0	265	**995**
2015	89	241	5	27	17	39	12	12	5	27	84	559	273	0	0	0	273	**1055**
2016	95	257	6	29	19	42	13	13	6	29	89	596	281	0	0	0	281	**1118**
10% increase Due to Diverted/Generated traffic																		
2017	119	321	7	36	23	52	16	16	7	36	111	745	352	0	0	0	352	**1398**
2018	126	342	8	39	25	55	17	17	8	39	119	793	362	0	0	0	362	**1483**
2019	135	364	8	41	26	59	18	18	8	41	126	845	373	0	0	0	373	**1573**
2020	143	388	9	44	28	63	19	19	9	44	135	900	384	0	0	0	384	**1668**
2021	153	413	9	47	30	67	20	20	9	47	143	958	396	0	0	0	396	**1770**
2022	162	440	10	50	32	71	22	22	10	50	153	1020	408	0	0	0	408	**1878**
2023	173	468	11	53	34	76	23	23	11	53	162	1087	420	0	0	0	420	**1993**
2024	184	499	11	56	36	81	25	25	11	56	173	1157	433	0	0	0	433	**2115**
2025	196	531	12	60	38	86	26	26	12	60	184	1233	446	0	0	0	446	**2245**
2026	209	566	13	64	41	92	28	28	13	64	196	1313	459	0	0	0	459	**2383**
2027	223	603	14	68	43	98	30	30	14	68	209	1398	473	0	0	0	473	**2530**
2028	237	642	14	72	46	104	32	32	14	72	223	1489	487	0	0	0	487	**2686**
2029	252	684	15	77	49	111	34	34	15	77	237	1586	501	0	0	0	501	**2852**
2030	269	728	16	82	52	118	36	36	16	82	252	1689	516	0	0	0	516	**3029**
2031	286	775	17	87	56	126	38	38	17	87	269	1799	532	0	0	0	532	**3217**
2032	305	826	19	93	60	134	41	41	19	93	286	1915	548	0	0	0	548	**3417**
2033	325	879	20	99	63	143	44	44	20	99	305	2040	564	0	0	0	564	**3629**
2034	346	936	21	105	67	152	46	46	21	105	325	2173	581	0	0	0	581	**3855**
2035	368	997	22	112	72	162	49	49	22	112	346	2314	599	0	0	0	599	**4096**

D. Proposed Improvement

1. Alignment and Geometry

30. The entire length of the project road runs through plain and rolling terrain cutting across several agricultural land, villages and towns and the existing horizontal alignment has number of sub-standard curves which qualifies for improvement based on IRC guidelines. However these curves shall be improved following the adopted standards to the extent possible within the available ROW. Besides, the horizontal geometric design has been envisaged for maximum usage of exiting pavement in rural stretches. Vertical Alignment has been designed with respective existing road conditions.

Table 10: Existing Carriageway and Shoulder

From (m)	To (m)	Land Use (Built up/ Agrt./Forest/Industrial/Barren)	Name of Village/Town	Formation Width (m)	CARRIAGEWAY			SHOULDER*		
					Type* (BT/CC/GR/ER)	Width (m)	Condition** (G/F/P/VP)	Type* (BT/CC/GR/ER)	Width (m)	Condition** (G/F/P/VP)
0	600	BUILT UP	Bandri	15	BT	7.0	G	GR	1.5	P
600	1000	Forest	-	-	BT	3.5	P	GR	1	P
1000	2000	Forest	-	-	BT	3.1	P	GR	1	P
2000	3000	Forest	-	-	BT	3.0	P	-	1	P
3000	4000	Forest	-	-	BT	3.0	P	-	1	P
4000	4400	Forest		-	BT	3.0	P	-	1	P
4400	5000	AGRT.		1.5	BT	3.0	P	GR	0.5	P
5000	6000	AGRT.		1.5	BT	3.0	P	GR	0.5	P
6000	6900	AGRT.		1.5	BT	3.0	P	GR	0.5	P
6900	7700	R/S FOREST L/S BUILT UP	PITHORIYA	1.8	BT	3.0	P	GR	0.6	P
7700	8000	FOREST		2.17	BT	3.1	P	GR	0.7	P
8000	9000	FOREST	-	2.1	BT	3.0	P	GR	0.7	P
9000	10000	FOREST	-	2.7	BT	3.0	P	GR	0.9	P
10000	11000	FOREST	-	1.8	BT	3.0	P	GR	0.6	P
11000	11100	FOREST		1.8	BT	3.0	P	GR	0.6	P
11100	11700	AGRT.		2.1	BT	3.0	P	GR	0.7	P
11700	11900	BUILT-UP	SEMRA	2.4	BT	3.0	P	GR	0.8	P
11900	12000	R/S FOREST L/S AGRT.		-	BT	3.0	P	GR	0.5	P
12000	13000	R/S FOREST L/S AGRT.	-	-	BT	3.0	P	GR	0.5	P
13000	13100	R/S FOREST L/S AGRT.		-	BT	3.0	P	GR	0.5	P
13100	13600	FOREST		-	BT	3.0	P	GR	0.5	P
13600	14000	R/S AGRT. L/S FOREST		2.4	BT	3.0	P	GR	0.8	P
14000	14800	R/S AGRT. L/S FOREST	-	2.4	BT	3.0	P	GR	0.8	P
14800	15000	FOREST	-	2.1	BT	3.0	P	GR	0.7	P
15000	16000	FOREST		2.1	BT	3.0	P	GR	0.7	P
16000	17000	FOREST	-	1.55	BT	3.1	P	GR	0.5	P
17000	17100	FOREST		1.55	BT	3.1	P	GR	0.5	P
17100	17400	BUILT UP	BASIYA GAON	2.24	BT	3.2	P	GR	0.7	P
17400	18000	AGRT.		2.24	BT	3.2	P	GR	0.7	P
18000	18300	AGRT.		2.24	BT	3.2	P	GR	0.7	P
18300	18500	BUILT UP	BASIYA GAUD	2.24	BT	3.2	P	GR	0.7	P
18500	19000	R/S FOREST L/S AGRT.		1.5	BT	3.0	P	GR	0.5	P

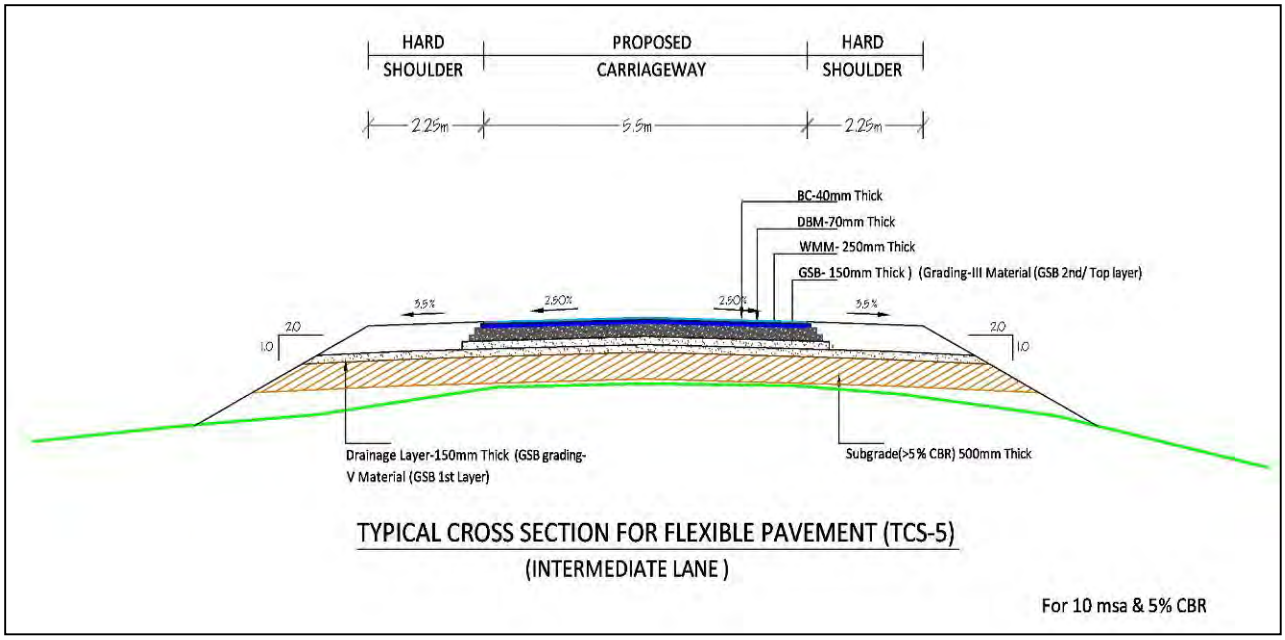
From (m)	To (m)	Land Use (Built up/ Agrt./Forest/Industrial/Barren)	Name of Village/Town	Formation Width (m)	CARRIAGEWAY			SHOULDER*		
					Type* (BT/CC/GR/ER)	Width (m)	Condition** (G/F/P/VP)	Type* (BT/CC/GR/ER)	Width (m)	Condition** (G/F/P/VP)
19000	19500	R/S FOREST L/S AGRT.	-	1.5	BT	3.0	P	GR	0.5	P
19500	20000	FOREST		1.6	BT	3.2	P	GR	0.5	P
20000	21000	FOREST	-	1.6	BT	3.2	P	GR	0.5	P
21000	22000	FOREST	-	-	CC	3.1	P	-	0.5	P
22000	22400	FOREST	-	-	BT	3.2	P	-	0.5	P
22400	23000	AGRT.					P		0.5	P
23000	23100	AGRT.	-	3.5	BT	3.5	P	GR	1.0	P
23100	23400	BUILT UP	MUDRA	3.5	BT	3.5	P	GR	1.0	P
23400	23800	AGRT.		3.5	BT	3.5	P	GR	1.0	P
23800	24000	BUILT UP	MUDRA	3.5	BT	3.5	P	GR	1.0	P
24000	24300	BUILT UP	MUDRA-JARUWAKHEDA	3.5	BT	3.5	P	GR	1.0	P
24300	24880	AGRT.		3.5	BT	3.5	P	GR	1.0	P
24880	25000	BUILT UP	JARUWAKHEDA	-	CC	5.5	P	GR	0.5	P

2. Proposed ROW

31. As the up-gradation / rehabilitation of the project road have been envisaged within the available ROW. The ROW is available more than the required minimum ROW of 14m throughout the road alignment. The existing ROW is largely 14m in rural stretches and about 10 m in built-up areas. In built up sections, construction will be done only within in the available actual width at site.

3. Cross Sectional Details

32. The proposed road will be upgraded to intermediate lane with 5.5 m carriage width and earthen shoulder of 2.25 m width either side. In built-up stretches where considerable commercial activity is noticed, 1.0 m wide footpath is proposed on both sides. The side drain in such stretches will be accommodated under the footpath. Minimum width of utility corridor will be 2.0 m. The provision of retaining wall is made where water pond is located next to road to minimize the requirement of ROW as well impact on water pond. The typical cross section (TCS) in built-up area, rural areas, near water pond locations, and high embankment locations are shown in Figure 2.



Source: Detailed Project Report for the Project Road, 2014

Figure 2: Typical cross sections (TCS) to be followed in the project stretch

4. Widening Scheme

33. The widening is largely proposed to be concentric. However, widening is made right or left aligned as well depending on the availability of land and location of any religious/socially sensitive structures. Proposed reconstruction is either overlaying from minimum sub grade level after dismantling the existing blacktop. The existing pavement crust is in fair condition in some stretches but the ponding of water was observed frequently.

5. Pavement Design

34. Pavement composition thickness for up gradation of flexible road pavement varies in different sections and it is given in Table 11.

Table 11: Proposed Crust Thickness for Existing Lane

Homogeneous Section	Bandri-Jaruwakheda(MDR) (Km 0.0 – Km 24.2) for flexible pavement	
Design Period	10 Year	15 Year
ESAL (million)	1.05	1.89
Deign MSA	10	
Design CBR (%)	5	
BC (mm)	40	-
Dense Bituminous Macadam (mm)	70	-
Wet Mix Macadam (mm)	-	250
Granular Sub-base (mm)	-	300
Sub grade (mm)	-	500

Source: Detailed Project Report, 2014

6. Junctions Design

35. There are 2 major and 6 minor existing junction throughout the length of the road. Crossroads with paved carriageway are only considered for development of the junction

36. Major and minor junction improvements are kept at Grade as per the standard specification (IRC SP: 41:1994 - Guidelines on Design of At-Grade Intersections in Rural and Urban Roads).

Table 12: Major and Minor Junction

Sr. No.	Existing Chainage (Km)	Major/ Minor	Destination		Surface Type	Width (m)	Type of Road (NH/SH/ MDR/ ODR/VR)	Remarks
			Left	Right				
1	0	**Major**	Sagar	Jhansi	BT	7	NH-26	The road joining to a Village Road
2	580	Minor	Bandri Village	Malthon	BT	3.5	VR	-
3	5000	Minor	Nayakheda		GR	5	VR	-
4	9150	Minor		Hanmat Padahi	GR	5	VR	-
5	13100	Minor	Parashri		GR	5	VR	-
6	13630	Minor		Kanera	GR	5	VR	-
7	18300	Minor		Dharampur - Chauka Pathari	GR	5	VR	-
8	25000	**Major**	Sagar	Bina	CC	5.5	NH-26A	-

7. Improvement of Bridges

37. There are only 6 minor bridges throughout the road alignment details of existing bridges with nature of improvement on the project road are given in Tables 13 and 14.

Table 13: Improvement of Existing Bridge on the Project Road

Type of Structure	Major Bridges	Minor Bridges	Vented Causeway	Flush Causeway	Slab culvert	Hume Pipe Culvert
Existing Structure 46 Nos.	0	6	1	10	11	18

Table 14: Details of Minor Bridge (Retained + Repairing and Strengthens)-06Nos.

Details of Existing Culvert					
Sr. No	Existing Chainage	Design Chainage	Type of Existing Structure	No. of Span/ Pipe x Length Span / dia	Existing Width (m)
					Over all
1	8/2	7150	ARCH	5 x 5.0 m	-
2	12/2	11040	ARCH	3 x 6.10	-
3	12/8	11670	SC	2 x 4.0 m	8.6
4	18/2	17020	ARCH	3 x 4.30 m	6.6
5	18/8	17690	SC	2 x 3.50 m	6.5
6	25/10	24840	SC	1 X 7.2	7.8

Source: Detailed Project Report, 2014

8. Culverts

38. In the project road, 6 culverts will be widened and 46 new culverts will be reconstructed in the project road. The summary of development of culverts is shown in Table 15.

Table 15: Summary of Development of Culverts

Improvement proposed	Type of Structure					
	Pipe Culvert	Slab/Box Culvert	Minor Bridges	Major Bridges	Vented Causeway	Remarks
Widening + Repair & Strengthening	3					
Retained with Repair and strength	5	8	6		1	
Reconstruction	10	3				
New Construction						
Existing Causeway reconstructed as culvert/Slab Culvert/Pipe Culvert	10	-	-	-	-	
Existing slab culvert is reconstructed as Pipe Culvert	-	-	-	-	-	
Existing Pipe Culvert is reconstructed as Slab Culvert	-		-	-	-	
Existing Minor is reconstructed as Major bridge	-	-	-	-	-	
Existing culvert is reconstructed as Minor bridge	-	-		-	-	
Total	**28**	**11**	**6**		**1**	
Grand Total	**46**					

Source: Detailed Project Report, 2014

9. Roadside Drainage

39. Based on the hydraulic study and site conditions unlined drains are proposed in the rural section, RCC rectangular drains are proposed in the built-up section and hut drains are proposed in the high embankment section.

10. Road Furniture and other Features

40. The road furniture, traffic safety features and other facilities included in the design are as given below:

(i) **Road Markings:** Road markings perform the important function of guiding and controlling traffic on a highway. The markings serve as psychological barriers and signify the delineation of traffic paths and their lateral clearance from traffic hazards for safe movement of traffic. Road markings are therefore essential to ensure smooth and orderly flow of traffic and to promote road safety. The Code of Practice for Road Markings, IRC: 35-1997 has been used in the study as the design basis. The location and type of marking lines, material and colour is followed using IRC: 35-1997 – “Code of Practice for Road Markings”. The road markings were carefully planned on carriageways, intersections and bridge locations.

(ii) **Cautionary, Mandatory and Informatory Signs: Cautionary, mandatory and informatory** signs have been provided depending on the situation and function they perform in accordance with the IRC: 67-2001 guidelines for Road Signs.

(iii) **Crash Barrier:** Metal Beam Crash Barrier is proposed at locations where the embankment height is more than 3.0m, at horizontal curves of radius less than 161m and also at major bridge approaches.

(iv) **Road Humps and Rumble Strips:** The Road Humps are formed by providing rounded hump of 3.7m width (17m radius) and 0.10m height for the preferred advisory crossing speed of 25 kmph for general traffic as per the IRC: 99–1988 guidelines. Road humps are located at T-intersections (and cross road intersections) on minor roads or perpendicular arms about 25 m away from the inner edge of the carriageway. Proper signs boards and markings are provided to advise the drivers in advance of the situation. Road humps are extended across carriageway up to the edge of paved shoulder. Rumble Strips are formed by a sequence of transverse strips laid across a carriageway. Maximum permitted height of 15mm, provided no vertical face exceeds 6mm. These rumble device produce audible and vibratory effects to alert drivers to take greater care and do not normally reduce traffic speeds in themselves. Proper signboards and marking are proposed to advise the drivers in advance of the situation.

E. Borrow and Quarry Materials Sourcing

41. Potential sources of earth for the construction of embankment and subgrade have been identified on either side of Bandri-Jaruwakheda (MDR) Road. The borrow earth, sand and quarry material will be sourced locally within a distance of about 25-30 Km from the road. (Guidelines for Borrow Area Management are given in Appendix 2) and Table 16.

Table 16: Borrow Soil and Aggregate Source

Type of Material	Location	Side	Approximate Lead distance (km)
Borrow Soil (Sub-grade)	KM 6 – Near Pathori Village, 2 km away from road	RHS	2
Aggregate	Km 18.9 – Basiya gaon	LHS	1

F. Water for Construction

42. Water for construction of the project road will be taken from ground water and surface water sources after obtaining necessary permissions. No public water sources will be used for road construction.

G. Construction Camps

43. One construction camp shall be set up by the contractor at a suitable location along the project corridor which will be set up in consultation with the Project Director and M. P. State Pollution Control Board.

H. Construction Schedule

44. The road up-gradation work is planned to be completed within 18 months from the construction start date.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Introduction

45. The collection of baseline information on biophysical, social and economic aspects of the project area is the most important reference for conducting Initial Environmental Examination (IEE) study. The description of environmental settings includes the characteristic of area in which the activity of the project road would occur and cover area affected by all impacts. The existing baseline line conditions has been analysed based on primary data collection with regard to air quality, water quality, noise, soil, biodiversity and socio- economic aspects and secondary data collection from published source and various government agencies.. Efforts have been made to collect the latest information both at regional as well as local level especially along the project roads alignment. The primary survey for water, air, noise and soil was carried out during July 2014. The sampling has been done along the project alignment. The existing baseline data and analysis around B-J Road is presented in the following sections.

B. Physical Environment

1. Topography, Geology & Soil

46. Madhya Pradesh the second largest state of the country has a geographic area of 30.82 million hectare, which constitutes 9.37% of the land area of the country. “Madhya Pradesh” by virtue of its geographical location can be termed as “Heart of India”. The project roads starts from 00.00 km at Bandri village at T-Junction at Sagar - Bina (NH-26) Road ((24° 2'47.51"N Latitude, 78°37'51.72"E Longitude and ends at T Junction of Sagar-Jhasi (NH 26) Road at Km 24.7 Latitude 23°58'28.92"N, 78°28'57.03"E Longitude). Bandri-Jaruwakheda road (“The Project Road”) is situated in Central part of Madhya Pradesh State having a total length of 24.2 Kms.

47. The soils of state are rich and fertile. The state has a variety of soils ranging from rich clayey to gravely. The major groups of soils found in the state can be divided into following four categories i.e. alluvial, medium & deep black; shallow & medium black; and mixed red & black. Categorically state has two agro-climatic zones namely (i) Central Plateau & Hill Region and (ii) Western Plateau & Hill Region. These two zones have been further sub-grouped and the description regarding area and its soil & geological features is given in Table 17 below:

Table 17: Geological Features of the State

Zones	Sub-group (Region)	District covered	Rainfall (mm)	Climate	Type of Soil
Central Plateau and Hill Region	1. Bundelkhand	Chatterpur, Datia, Tikamgarh	700	Dry sub humid	Mixed red & Black
	2. Madhya Pradesh Hills	Mandla, Dindori	1570	Moist sub humid	Red & Yellow
	3. Keymore Plateau & Satpura Hills	Jabalpur, Panna, Satna, Rewa, Sidhi, Seoni, Katni, Balaghat, Shahdol, Anooppur, Umariya	1100	Dry sub humid	Medium Black
	4. Vindhya Plateau	Bhopal, Damoh, Raisen, Sagar, Sehore, Vidisha	1130	Dry sub humid	Shallow to Medium Black
	5. Satpura Plateau	Betul, Chhindwara, Narsinghpur	1220	Dry sub humid	Shallow to Medium Black
	6. Central Narmada Valley	Hosangabad, Harda	1300	Dry subhumid	Deep Black

Zones	Sub-group (Region)	District covered	Rainfall (mm)	Climate	Type of Soil
	7. Gird	Morena, Bhind, Gwalior, Guna, Shivpuri, Ashoknagar, Sheopur	670	Semi-arid	Medium Black alluvial
Western Plateau and Hill Region	8. Jhabua Hills	Jhabua	988	Semi-arid	Medium to deep black
	9. Malwa & Nimar Plateau	Indore, Dhar, Ujjain, Ratlam, Dewas, Mandsaur, Rajgarh, Shajapur, Khandwa, Khargone, Neemuch, Badwani, Burhanpur	874	Semi-arid	Medium to deep black

48. Figures 3 and 4 show the geological and soil map of MP.

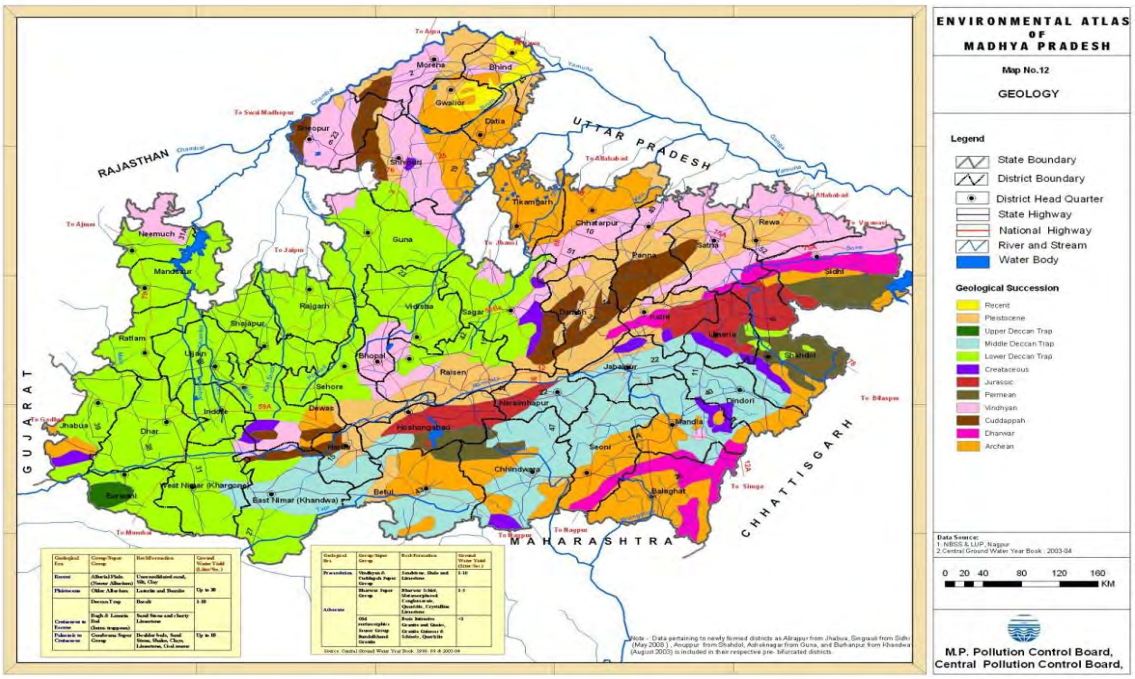


Figure 3: Geological Map of MP

49. The proposed project road between Bandri-Jaruakheda situated on the Central plateau & hill region agro climate zone and forms Vindhya Plateau. The soil type in the area is mainly shallow to Medium Black. The soil samples have also been collected from Semra & Mudra along the project corridor and results are presented in Table 18.

Table 18: Soil Quality along the Project road

S.No	Parameters	Unit	Near Semara Village, km 12	Mundra, km 23
1	Moisture	%	4.2	4.4
2	Nitrogen as N	%	22.5	21.3
3	Potassium as K	%	13.2	15.7
4	Phosphorus as P	%	20.2	19.2

50. The results shows available N P K Status of soils has medium Nitrogen level, low in Phosphorous and high in Potassium.

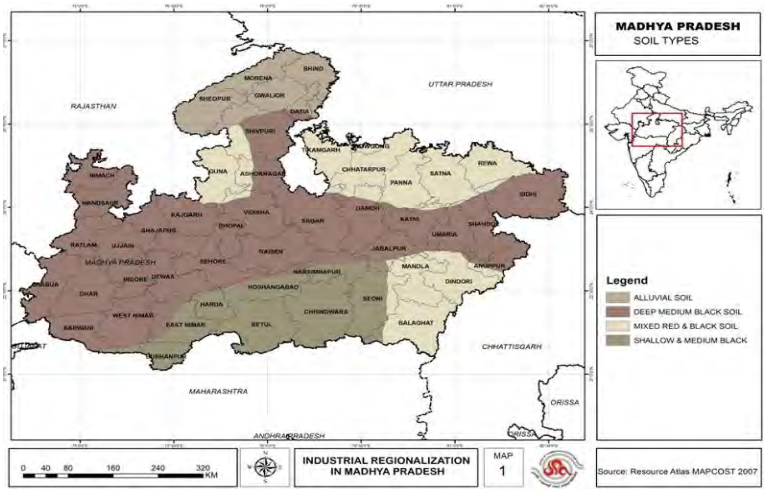


Figure 4: Soil Map of MP

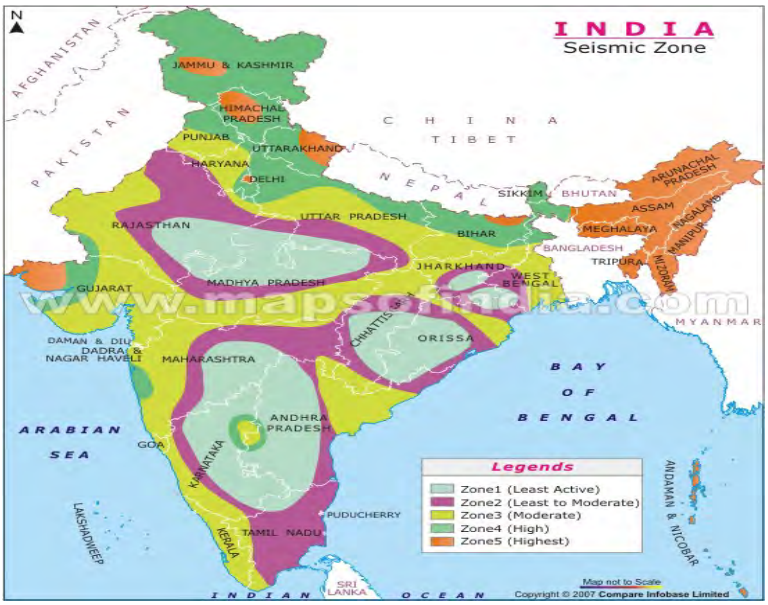


Figure 5: Seismic Zone Map of India

2. Seismicity

51. Madhya Pradesh falls under zone least active to moderate zone as per seismic map of India. Figure 5 shows the seismic Zone map of India.

3. Climate

52. The climate of Sagar district can be classified mainly into three seasons. Winter season starts from middle of November to end of February. March to May constitute summer season and the monsoon season starts from second week of June to end of September. During winter season, January is the coldest month with the temperature falling as low as 11.20°C and max up to 24.50°C. During the month of May, temperature goes up to 40.60°C (max.).

Table 19: Climate of Sagar District

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Ave. Max Temperature °C (°F)	24.5 (76.1)	26.7 (80.1)	32.2 (90)	37.8 (100)	40.6 (105.1)	37.2 (99)	30.2 (86.4)	28.6 (83.5)	30.4 (86.7)	31.6 (88.9)	28.7 (83.7)	25.1 (77.2)	31.1 (88)
Average Temperature °C (°F)	17.9 (64.2)	19.9 (67.8)	25.3 (77.5)	30.6 (87.1)	33.5 (92.3)	31.4 (88.5)	26.7 (80.1)	25.6 (78.1)	26.3 (79.3)	25.9 (78.6)	22.4 (72.3)	18.8 (65.8)	25.4 (77.7)
Average Min Temperature °C (°F)	11.2 (52.2)	13 (55.4)	18.3 (64.9)	23.3 (73.9)	26.3 (79.3)	25.4 (77.7)	23.2 (73.8)	22.5 (72.5)	22.1 (71.8)	20.2 (68.4)	16 (60.8)	12.5 (54.5)	19.5 (67.1)

53. The average annual rainfall for the state is 1160 mm. Rainfall is heaviest in the south-eastern parts of the state and it decreases as one move towards the north-west. Balaghat in the south receives the maximum rains; where average rainfall is above 1600 mm. The other southern districts of Mandla, Dindori and Anuppur receive between 1200-1400 mm of rain. The rainfall drops to the 1000-1200 mm as one move further north and west. Western districts in MP including most of those in the Malwa plateau and Sheopur and Shivpuri in the north receives 800-1000 mm of rain. Average annual rainfall is below 800 mm in the south-western tip of the state, including southern half of Jhabua and western half of Barwani district. The rainfall is below 800 mm in the districts lying in the north most part of the state including Morena, Datia, Gwalior and Bhind. Most of the rainfall in the state is received from the south-west monsoon during June to September. In Sagar that falls under Bundelkhand agro climatic zone, average rainfall ranges between 800 to 1400 mm. (Source: Madhya Pradesh State Action Plan on Climatic Change, 2012).

4. Surface and Ground Water Hydrology

a. Surface Water Hydrology

54. The project area crosses a number of tributaries, streams, canal and nallahs. With the increase in the paved area, the surface runoff shall increase; thereby affecting the local drainage of the region Since Soil erosion is associated with concentrated flow of water, it is imperative to prevent any increased diversion of runoff into the drainage channels.

55. There are 6 minor bridges, 18 Hume pipe culverts, 11 slab culverts, 10 FCW and 1 VCW on the project road.

56. The details of water bodies located along the project road are given in Table 20.

Table 20: Detail of Water bodies

Sr.	Chainage in (km)	Distance from CL	L/R/ Crossing	Type
1	6.00	15	L	HP
2	7.19		Crossing	Nalla/Stream
3	11.75	14.86	R	HP
4	13.90	8.63	R	HP
5	17.07		Crossing	Nalla/Stream
6	17.27	6.45	L	HP
7	18.45	9.00	R	HP
8	23.77	17.52	L	HP

9	24.14	4.58	R	HP
10	24.55	7.34	L	HP

Note: No hand pump will be affected

b. Ground Water Hydrology

57. Ground water is the major water source in the area for drinking purpose. The source of recharging of ground water is mostly from precipitation (rainfall) & canals. Hand pumps are commonly used to draw the water from ground in the villages. Static water levels vary along the stretch of project road.

5. Water Quality

58. Water quality along the project road has been analyzed for assessing the water environment and to evaluate anticipated impact of the project road. Ground and surface water sources along the road alignment were examined for physico-chemical characteristics. 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). These water samples were taken as grab samples and were analyzed for various parameters and compared with the standards for drinking water as per IS:10500. Ground water samples were collected from most commonly used hand pumps along the project road. Analysis results for ground water samples is given in Table 21.

Table 21: Water Quality in the Project Road Area as per IS: 10500

S. No	Parameter	Unit	Method No.	Requirement as per IS-10500-2012		Semra, km 11.6 (Surface Water)	Mundra, km 23.1 (HP)
				Desirable Limit	Permissible Limit		
1	pH	-	4500	6.5-8.5	No relaxation	8.14	7.17
2	Turbidity	NTU	2130	5	10	2.1	1.8
3	Conductivity	µmhos/cm	2510	-	-	602	523
4	Alkalinity	mg/lit	2320	200	600	378	320
5	Total Dissolved Solid	mg/lit	2540	500	2000	405	486
6	Total Hardbess as CaCO3	mg/lit	2340	300	600	211	280
7	Ca Hardness as CaCO3	mg/lit	3500	-	-	161	172
8	Mg Hardness as CaCO3	mg/lit	2340	-	-	59	108
9	Chlorides as Cl	mg/lit	4500	250	1000	74.14	30
10	Sulphates as SO4	mg/lit	4500	200	400	3.22	5.77
11	Iron as Fe	mg/lit	3500	0.3	1	0.57	0.24
12	Nitrates as NO3	mg/lit	4500	45	100	13.82	17.21
13	Fluorides as F	mg/lit	4500	1.0	1.5	0.11	1.16
14	Phosphates as P	mg/lit	3500	-	-	2.17	1.12
15	Coliforms	No. per 100 ml	IS:1518 5	Absent	10	0.8	1.9

59. The water quality meets the permissible limit of water quality as per IS: 10500 except for bacteriological parameters in surface water.

6. Ambient Air Quality

60. Ambient air quality with respect to area along the project road form baseline information. The Study area represents mostly rural/residential environment. The sources of air pollution in the region are vehicular traffic; dust arising from unpaved road and domestic fuel burning. The prime objective of the baseline air quality study is to establish the existing ambient air quality along the project road. This will also be useful for assessing the conformity to standards of the ambient air quality specified by CPCB due to the construction and operation of the project road. The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network. The Ambient Air Quality (AAQ) has been monitored at 2 locations (Pithoriya and Mundra) along the project road for Particulate Matter ($PM_{2.5}$), Particulate Matter (PM_{10}),Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_X); and Carbon monoxides (CO) using standard analysis technique (Table 22).

Table 22: Techniques Used for Ambient Air Quality Monitoring

Sl. No.	Parameter	Technique	Minimum Detectable Limit ($\mu g/m^3$)
1	Particulate Matter ($PM_{2.5}$)	Gravimetric Method	1.0
2	Particulate Matter (PM_{10})	Gravimetric Method	1.0
3	Sulphur dioxide	Modified West and Gaeke	5.0
4	Nitrogen Oxide	Modified Jacob & Hochheiser	5.0
5	Carbon Monoxide	Non Dispersive Infrared Spectroscopy (NDIR)	1.0

61. Ambient air quality monitoring results for $PM_{2.5}$, PM_{10}, SO_2, NOx and CO concentrations are given in Table 23 and summarized below. The monitored values are compared with National Ambient Air Quality Standards prescribed by Central Pollution Control Board (CPCB) for residential, rural and other areas. The Ambient air quality levels meet the National air quality standards for rural, residential and industrial area all along the project road.

(i) **$PM_{2.5}$**: The mean $PM_{2.5}$concentration at ambient air quality monitoring locations varies from **22 to 31** $\mu g/m^3$.

(ii) **PM_{10} :**The mean PM_{10}concentration at ambient air quality monitoring locations varies from 63 to 71$\mu g/m^3$. The values are within the permissible limit at all the stations.

(iii) **SO_2:** The mean concentrations of SO_2at all ambient air quality monitoring locations varies from 8to 9 $\mu g/m^3$. The values are within the permissible limit at all the stations.

(iv) **NOx:** The mean concentrations of NOx at all AAQM locations range from 13 to 15 $\mu g/m^3$. The values are within the permissible limit at all the stations.

(v) **CO:** The mean concentrations of CO at all AAQM locations range from 896 to 927 $\mu g/m^3$. The values are within the permissible limit at all the stations.

Table 23: Ambient Air Quality along the Project Road

Locations	Period	PM2.5 ug/m^3	PM10 ug/m^3	SO_2 ug/m^3	NO_x ug/m^3	CO ug/m^3
A. Prescribed Standard		60	100	80	80	2000
B. Monitored Results						
Pithoriya	July 2014	31	71	9	15	927
Mundra	July 2014	22	63	8	13	849

7. Noise Measurements

62. During the study period, preliminary reconnaissance survey was undertaken to identify the major noise generating sources in the area. The noise at different noise generating sources has been identified based on the Industrial, commercial and residential activities, traffic and noise at sensitive areas. Sound Pressure Level (SPL) measurements were undertaken at all locations, with an interval of about 5 seconds over a period of 10 minutes per hour for 24 hr. The day noise level has been monitored during 6 AM to 10 PM and night levels during 10 P.M. to 6 AM at all locations. On the spot measurement device manufactured by Cygnet was used and day and night Noise level measures. Day and night-time Leq have been calculated from hourly Leq values and compared with the stipulated standards**.** Table 24 gives the day and night-time Leq noise levels.

63. Measured Leq noise levels are within the limit stipulated for residential area at all the locations.

Table 24: Day and Night Time Leq in the Area

Locations	Day Time	Night Time	Prescribed Standards dB(A)	
	dB(A)	dB(A)	Day Time	Night Time
Pithoriya	44.3	39.1	55	45
Mundra	41.1	38.7	55	45

Source: Field monitoring, July 2014

C. Ecological Resources

1. Forest

64. There is forest land involved in the project road.

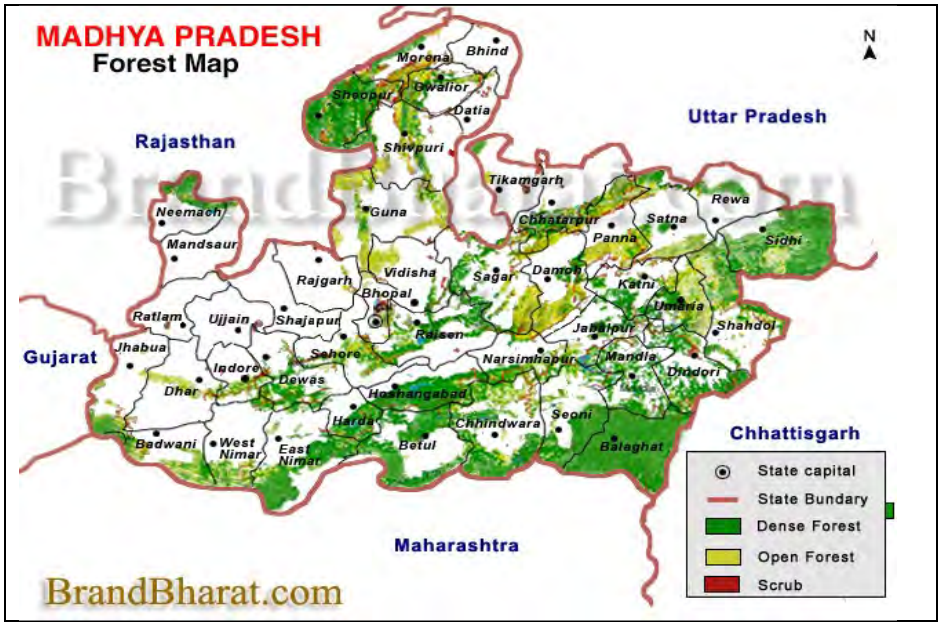


Figure 6: Forest Map of MP

2. Trees Along the Project Road

65. Trees exist within the ROW and some of them are likely to be cut during up-gradation of the project road. Approximately 255 trees are within ROW of project road and only 46 trees need to be cut for up-gradation of the project road.(Table 4.8 & 4.9) The commonly found tree species in the area along the road are Babul (***Acacia nilotica***), Neem (***Azadirachitaindica***), Palas (***Buteamonosperma***), Aam (***Mengiferaindica***), Pipal (***Ficusreligiosa***), etc. are found in abundance.

Table 25: Details of tree inventory list

Sl. No.	Chainage (Km)		Distance from Centre of the Road	Local Name of Tree	Botanical Name of tree	Grith size of tree (1.37m above G.L.)	Condition of tree (D&G	No. of Trees	
	From	To						Left Side	Right Side
1	280.000	2900.00	4.67	Neem	***Azadirachata indica***	G1	G		1
2	360.000	370.000	3.67	sagoan	***Tectona grandis***	G1	G		1
3	380.000	390.000	9.57	Sagoan	***Tectona grandis***	G1	G	1	
4	400.000	420.000	11.79	Chirul	***-***	G1	G		1
5	420.000	440.000	6.20	Sagoan	***Tectona grandis***	G1	G	1	
6	500.000	510.000	6.13	Tendu	***Diospyros melanoxylon***	G1	G	1	
7	540.000	550.000	7.76	Sagoan	***Tectona grandis***	G1	G	1	
8	560.000	570.000	6.13	Sagoan	***Tectona grandis***	G1	G	1	
9	580.000	590.000	10.73	Sagoan	***Tectona grandis***	G1	G	1	
10	750.000	770.000	6.53	Sagoan	***Tectona grandis***	G1	G	3	
11	780.000	810.000	8.93	Tendu	***Diospyros melanoxylon***	G1	G	3	
12	850.000	860.000	6.23	Tendu	***Diospyros melanoxylon***	G1	G	1	
13	890.000	900.000	5.59	Sagoan	***Tectona grandis***	G1	G	1	
14	930.000	940.000	5.28	Mahua	***Madhuca longifolia***	G1	G		1
15	1270.00	1280.000	4.11	Aam	***Mangifera indica***	G1	G		1
16	1280.00	1290.000	7.97	Aam	***Mangifera indica***	G1	G	1	
17	1330.00	1340.000	5.78	Mahua	***Madhuca longifolia***	G1	G		1
18	1350.00	1360.000	5.12	Mahua	***Madhuca longifolia***	G1	G	1	
19	1370.00	1380.000	3.66	Sagoan	***Tectona grandis***	G1	G		1
20	1420.00	1440.000	4.35	Aam	***Mangifera indica***	G1	G	1	1
21	1470.00	1480.000	5.12	Sagoan	***Tectona grandis***	G1	G	1	
22	1510.00	1520.000	6.24	Sagoan	***Tectona grandis***	G1	G	1	
23	2540.00	2550.000	4.27	Sagoan	***Tectona grandis***	G1			1
24	2600.00	2610.000	5.61	Sagoan	***Tectona grandis***	G1			1
25	2610.00	2620.000	3.74	Sagoan	***Tectona grandis***	G1		1	
26	3170.000	3180.000	6.15	Sagoan	***Tectona grandis***	G1		1	
27	3210.000	3220.000	8.20	Mahua	***Madhuca longifolia***	G1			1
28	3740.000	3750.000	10.72	Sagoan	***Tectona grandis***	G1		1	
29	5310.000	5320.000	5.56	Aam	***Mangifera indica***	G1	G		1
30	5730.000	5740.000	7.56	Aam	***Mangifera indica***	G1	G	1	

Sl. No.	Chainage (Km)		Distance from Centre of the Road	Local Name of Tree	Botanical Name of tree	Grith size of tree (1.37m above G.L.)	Condition of tree (D&G	No. of Trees	
	From	To						Left Side	Right Side
31	6200.000	6210.000	7.56	Mahua	***Madhuca longifolia***	G1	G	1	
32	6230.000	6240.000	6.00	Bamboo	***Dendrocalamus strictus***	G1	G	1	
33	6680.000	6690.000	6.45	Mahua	***Madhuca longifolia***	G1	G		1
34	6970.000	6980.000	16.22	Mahua	***Madhuca longifolia***	G1	G	1	
35	7060.000	7070.000	11.78	Mahua	***Madhuca longifolia***	G1	G	3	
36	7320.000	7330.000	8.01	Mahua	***Madhuca longifolia***	G1	G		1
37	7360.000	7370.000	3.47	Mahua	***Madhuca longifolia***	G1	G	1	
38	7530.000	7540.000	9.01	Mahua	***Madhuca longifolia***	G1	G		2
39	8200.000	8210.000	5.97	Mahua	***Madhuca longifolia***	G1	G		1
40	8230.000	8240.000	3.16	Tendu	***Diospyros melanoxylon***	G1	G	1	
41	8250.000	8260.000	6.11	Tendu	***Diospyros melanoxylon***	G1	G		1
42	8760.000	8770.000	6.41	Mahua	***Madhuca longifolia***	G1	G		1
43	8780.000	8790.000	6.24	Mahua	***Madhuca longifolia***	G1	G	1	1
44	8820.000	8830.000	6.12	Mahua	***Madhuca longifolia***	G1	G		1
45	8840.000	8850.000	6.42	Mahua	***Madhuca longifolia***	G1	G		1
46	8990.000	9000.000	7.99	Palash	***Butea monosperma***	G1	G	1	1
47	9140.000	9150.000	7.65	Palash	***Butea monosperma***	G1	G		1
48	9300.000	9310.000	5.98	Jamun	***Syzygium cumini***	G1	G	1	
49	9360.000	9370.000	3.49	Babul	***Acacia nilotica***	G1	G	1	
50			11.60	Babul	***Acacia nilotica***	G1	G		1
51	9390.000	9400.000	4.36	Babul	***Acacia nilotica***	G1	G	1	1
52	9410.000	9420.000	7.24	Neem	***Azadirachata indica***	G1	G	1	
53			4.11	Mahua	***Madhuca longifolia***	G1	G		1
54	9940.000	9950.000	5.41	Babul	***Acacia nilotica***	G1	G		1
55	9950.000	9960.000	4.44	Babul	***Acacia nilotica***	G1	G	1	
56	10090.000	10100.000	5.54	Babul	***Acacia nilotica***	G1	G		1
57	10210.000	10220.000	8.04	Mahua	***Madhuca longifolia***	G1	G		1
58	10280.000	10290.000	23.91	Mahua	***Madhuca longifolia***	G1	G	1	
59	10520.000	10530.000	11.45	Mahua	***Madhuca longifolia***	G1	G		1
60	10540.000	10550.000	6.41	Babul	***Acacia nilotica***	G1	G	1	
61	10800.000	10810.000	9.61.	Babul	***Acacia nilotica***	G1	G	1	
62	10810.000	10820.000	16.78	Babul	***Acacia nilotica***	G1	G		1
63	10880.000	10890.000	12.82	Babul	***Acacia nilotica***	G1	G	1	
64	10890.000	10900.000	4.21	Babul	***Acacia nilotica***	G1	G		1
65	12470.000	12480.000	6.39	Sagoan	***Tectona grandis***	G1	G	1	1
66	12510.000	12520.000	8.21	Aam	***Mangifera indica***	G1	G		1
67	12650.000	12660.000	7.39	Babul	***Acacia nilotica***	G1	G	2	

Sl. No.	Chainage (Km)		Distance from Centre of the Road	Local Name of Tree	Botanical Name of tree	Grith size of tree (1.37m above G.L.)	Condition of tree (D&G	No. of Trees	
	From	To						Left Side	Right Side
68			16.41	Babul	***Acacia nilotica***	G1	G		2
69	12660.000	12670.000	8.94	Aam	***Mangifera indica***	G1	G	2	1
70	12680.000	12690.000	18.89	Aam	***Mangifera indica***	G1	G	2	2
71	12890.000	12900.000	14.57	Mahua	***Madhuca longifolia***	G1	G		2
72	13020.000	13030.000	6.39	Babul	***Acacia nilotica***	G1	G		1
73	13100.000	13110.000	12.33	Madina	***Albizialebbeck***	G1	G		1
74	13110.000	13120.000	14.72	Pipal	***Ficusreligiosa***	G1	G	1	
75	13190.000	13200.000	21.45	Aam	***Mangifera indica***	G1	G	1	1
76	13200.000	13210.000	5.71	Aam	***Mangifera indica***	G1	G		1
77	13240.000	13250.000	15.88	Aam	***Mangifera indica***	G1	G		1
78	13290.000	13300.000	17.35	Aam	***Mangifera indica***	G1	G	1	
79	13350.000	13360.000	6.97	Aam	***Mangifera indica***	G1	G	1	1
80	13400.000	13410.000	21.04	Aam	***Mangifera indica***	G1	G		2
81	13430.000	13440.000	6.23	Babul	***Acacia nilotica***	G1	G	1	1
82	13450.000	13460.000	13.42	Sagoan	***Tectona grandis***	G1	G	1	
83	13460.000	13470.000	7.01	Sagoan	***Tectona grandis***	G1	G		3
84	13490.000	13500.000	7.46	Mahua	***Madhuca longifolia***	G1	G	1	
85	13500.000	13510.000	7.12	Sagoan	***Tectona grandis***	G1	G	1	2
86	14190.000	14200.000	7.45	Sagoan	***Tectona grandis***	G2	G	1	1
87	14200.000	14210.000	8.35	Sagoan	***Tectona grandis***	G2	G	1	
88	14210.000	14220.000	8.39	Babul	***Acacia nilotica***	G2	G	1	
89	14390.000	14400.000	4.78	Babul	***Acacia nilotica***	G1	G		1
90	14620.000	14630.000	8.51	Babul	***Acacia nilotica***	G1	G	1	
91	15040.000	15050.000	11.10	Babul	***Acacia nilotica***	G1	G		1
92	15050.000	15060.000	10.45	Bair	***Ziziphusmauritiana***	G1	G		2
93	15080.000	15090.000	9.78	Babul	***Acacia nilotica***	G1	G		1
94	15100.000	15110.000	8.47	Sagoan	***Tectona grandis***	G1	G	1	
95			5.47	Sagoan	***Tectona grandis***	G1	G		1
96	15130.000	15140.000	8.41	Jamun	***Syzygium cumini***	G1	G	1	
97	15140.000	15150.000	7.21	Tendu	***Diospyros melanoxylon***	G1	G		1
98	15170.000	15160.000	8.64	Palash	***Butea monosperma***	G1	G	2	3
99	15180.000	15190.000	8.63	Sagoan	***Tectona grandis***	G1	G	1	1
100	15220.000	15230.000	5.57	Sagoan	***Tectona grandis***	G1	G	1	1
101	15230.000	15240.000	5.57	Sagoan	***Tectona grandis***	G1	G		1
102	15240.000	15250.000	6.48	Sagoan	***Tectona grandis***	G1	G	1	1
103	15260.000	15270.000	7.41	Sagoan	***Tectona grandis***	G1	G	1	
104	15270.000	15280.000	6.72	Sagoan	***Tectona grandis***	G1	G	1	1
105	15280.000	15290.000	6.24	Sagoan	***Tectona grandis***	G1	G	1	

Sl. No.	Chainage (Km)		Distance from Centre of the Road	Local Name of Tree	Botanical Name of tree	Grith size of tree (1.37m above G.L.)	Condition of tree (D&G	No. of Trees	
	From	To						Left Side	Right Side
106	15290.000	15300.000	6.95	Mahua	***Madhuca longifolia***	G1	G	3	2
107	15310.000	15320.000	6.31	Mahua	***Madhuca longifolia***	G1	G	2	
108	15470.000	15480.000	6.34	Sagoan	***Tectona grandis***	G1	G		2
109	15480.000	15490.000	6.2200	Sagoan	***Tectona grandis***	G1		1	
110	15870.000	15880.000	9.9400	Palash	***Butea monosperma***	G1			1
111	15920.000	15930.000	7.4500	Mahua	***Madhuca longifolia***	G1		1	1
112	15950.000	15960.000	7.8900	Sagoan	***Tectona grandis***	G1		1	1
113	15960.000	15970.000	7.4900	Sagoan	***Tectona grandis***	G1		1	
114	16020.000	16030.000	5.01	Sagoan	***Tectona grandis***	G1		1	1
115	16060.000	16070.000	7.0100	Sagoan	***Tectona grandis***	G1		2	
116	16070.000	16080.000	7.7000	Sagoan	***Tectona grandis***	G1		1	
117	16090.000	16100.000	7.1200	Mahua	***Madhuca longifolia***	G1		1	
118	16120.000	16130.000	8.1400	Mahua	***Madhuca longifolia***	G1		2	
119	16160.000	16170.000	5.40	Mahua	***Madhuca longifolia***	G1		1	
120	16260.000	16270.000	7.0600	Sagoan	***Tectona grandis***	G1			1
121	16370.000	16380.000	8.0400	Sagoan	***Tectona grandis***	G1			3
122	16450.000	16460.000	7.1200	Sagoan	***Tectona grandis***	G1			1
123	16460.000	16470.000	7.2400	Sagoan	***Tectona grandis***	G1			2
124	16470.000	16480.000	7.3500	Sagoan	***Tectona grandis***	G1			1
125	16480.000	16490.000	7.3200	Sagoan	***Tectona grandis***	G1			1
126	16520.000	16530.000	10.8700	Sagoan	***Tectona grandis***	G1			2
127	16630.000	16640.000	10.8700	Palash	***Buteamonosperma***	G1			2
128	16640.000	16650.000	12.5300	Sagoan	***Tectona grandis***	G1			2
129	16650.000	16660.000	12.4100	Sagoan	***Tectona grandis***	G1			1
130	16660.000	16670.000	12.7400	Sagoan	***Tectona grandis***	G1			2
131	16680.000	16690.000	12.4000	Sagoan	***Tectona grandis***	G1			2
132	16690.000	16700.000	9.0000	Sagoan	***Tectona grandis***	G1			2
133	16700.000	16710.000	8.6500	Sagoan	***Tectona grandis***	G1			2
134	16740.000	16750.000	8.3500	Sagoan	***Tectona grandis***	G1			1
135	16760.000	16770.000	5.48	Sagoan	***Tectona grandis***	G1		1	
136			10.35	Sagoan	***Tectona grandis***	G1			2
137	16770.000	16780.000	7.59	Sagoan	***Tectona grandis***	G1		2	1
138	16880.000	16890.000	6.57	Sagoan	***Tectona grandis***	G1		1	
139	16920.000	16930.000	11.35	Sagoan	***Tectona grandis***	G1			1
140	16940.000	16950.000	12.41	Sagoan	***Tectona grandis***	G1			2
141	16950.000	16960.000	10.42	Sagoan	***Tectona grandis***	G1		1	1
142	16960.000	16970.000	10.12	Sagoan	***Tectona grandis***	G1		2	
143	17000.000	17010.000	3.63	Aam	***Mangifera indica***	G2		1	

Sl. No.	Chainage (Km)		Distance from Centre of the Road	Local Name of Tree	Botanical Name of tree	Grith size of tree (1.37m above G.L.)	Condition of tree (D&G	No. of Trees	
	From	To						Left Side	Right Side
144			10.45	Aam	***Mangifera indica***	G2		1	
145	17130.000	17140.000	7.62	Sagoan	***Tectona grandis***	G1			1
146	17790.000	17800.000	6.12	Babul	***Acacia nilotica***	G2		1	
147	17850.000	17860.000	7.64	Sagoan	***Tectona grandis***	G1		1	
148	17850.000	17860.000	3.64	Sagoan	***Tectona grandis***	G1			1
149	18080.000	18090.000	4.91	Sagoan	***Tectona grandis***	G1			1
150	18120.000	18130.000	6.14	Aam	***Mangifera indica***	G1			1
151	18150.000	18160.000	5.21	Bamboo	***Dendrocalamus strictus***	G1		1	
152	18360.000	18370.000	10.41	Sagoan	***Tectona grandis***	G1			1
153	19170.000	19180.000	7.28	Sagoan	***Tectona grandis***	G1		2	
154	19570.000	19580.000	5.32	Sagoan	***Tectona grandis***	G1		1	
155	20020.000	20030.000	1.05	Sagoan	***Tectona grandis***	G1		1	
156			1.15	Sagoan	***Tectona grandis***	G1		2	
157	20040.000	20050.000	6.39	Sagoan	***Tectona grandis***	G1		1	1
158	20050.000	20060.000	6.91	Sagoan	***Tectona grandis***	G1			2
159	20100.000	20110.000	6.9	Karanj	***Pongamia pinnata***	G1		1	
160	20150.000	20160.000	6.21	Sagoan	***Tectona grandis***	G1			1
161	20160.000	20170.000	6.23	Mahua	***Madhuca longifolia***	G1			1
162	20250.000	20260.000	4.71	Sagoan	***Tectona grandis***	G2			1
163	20440.000	20450.000	8.5	Sagoan	***Tectona grandis***	G1		3	
164	20450.000	20460.000	7.09	Sagoan	***Tectona grandis***	G1			2
165	20610.000	20620.000	6.29	Sagoan	***Tectona grandis***	G1			1
166	20700.000	20710.000	7.98	Sagoan	***Tectona grandis***	G1			2
167	20720.000	20730.000	6.05	Tendu	***Diospyros melanoxylon***	G1			3
168	20890.000	20900.000	6.38	Sagoan	***Tectona grandis***	G1			1
169	20950.000	20960.000	5.88	Palash	***Butea monosperma***	G1			2
170	20970.000	20980.000	4.48	Khagad	***-***	G1		1	
171	21140.000	21150.000	5.92	Sagoan	***Tectona grandis***	G1		1	1
172	21350.000	21360.000	8.21	Babul	***Acacia nilotica***	G1		1	
173	21390.000	21400.000	5.14	Babul	***Acacia nilotica***	G1		1	
174	21450.000	21460.000	5.74	Kat-hal	***Artocarpus heterophyllus***	G1		1	
175	22120.000	22130.000	9.32	Babul	***Acacia nilotica***	G1		1	
176	24090.000	24100.000	5.74	Aam	***Mangifera indica***	G1		1	
177	24150.000	24160.000	8.37	Aam	***Mangifera indica***	G1		1	1
178	24300.000	24310.000	4.47	Aam	***Mangifera indica***	G1			1
179	24540.000	24550.000	7.89	Mahua	***Madhuca longifolia***	G1		1	
180	24800.000	24810.000	6.64	Bair	***Ziziphusmauritiana***	G1		1	

Table 26: Summary of tree list

S.No.	Trees	Botanical Name	No. of Trees
1	Aam	***Mangifera indica***	30
2	Babul	***Acacia nilotica***	28
3	Bair	***Ziziphusmauritiana***	3
4	Bamboo	***Dendrocalamus strictus***	2
5	Chirul	**-**	1
6	Jamun	***Syzygium cumini***	2
7	Karanj	***Pongamia pinnata***	1
8	Kat-hal	***Artocarpus heterophyllus***	1
9	Khagad	**-**	1
10	Madina	***Albizialebbeck***	1
11	Mahua	***Madhuca longifolia***	42
12	Neem	***Azadirachata indica***	2
13	Palash	***Butea monosperma***	13
14	Pipal	***Ficusreligiosa***	1
15	Sagoan	***Tectona grandis***	116
16	Tendu	***Diospyros melanoxylon***	11
		Total	**255**

3. Tree Cutting

66. There were 255 trees identified at the alignment from the center line of the both side. During construction assume that the tree loss will be from the center line to 5.56 cm area were loss. Wherever the no. of assume tree loss will be 46 which will compensate with the compensatory plantation along the road. Before the tree cutting contractor should take official permission from the concern forest department.

Table 27: Chainage wise tree loss

Sl. No	Chainage (m)		Distance from CL of the Road	Local Name of Tree	Botanical Name	Grith size of tree *(1.37m above G.L.)	No. of Trees			Remarks
	From	To					Left side	Right side	Centre	
1	640	650	5.54	Aam	***Mangifera indica***	G1		1		
2	1860	1870	5.41	Khajoor	***Phoenix dactylifera***	G1	1			
3	2230	2240	3.89	Babul	***Acacia nilotica***	G1	1			
4	3090	3100	4.73	Liptus	***E Citriodora***	G1	1			
5	3390	3400	5.14	Neem	***Azadirachata indica***	G1		1		
6	3720	3730	4.03	Kahua	***Terminalia arjuna***	G1		1		
7	6050	6060	5.01	Neem	***Azadirachata indica***	G1	1			
8	6500	6510	3.54	Neem	***Azadirachata indica***	G1		1		
9	7060	7070	5.24	Pipal	***Azadirachata indica***	G1	1			

10	8000	8010	4.68	Khajoor	***Phoenix dactylifera***	G1		1		
11	8610	8620	4.67	Palash	***Buteamonosperma***	G1	1			
			4.79	Neem	***Azadirachata indica***	G1		3		
12	9720	9730	3.30	Neem	***Azadirachata indica***	G1	1			
13	10860	10870	2.25	Neem	***Azadirachata indica***	G1		1		
14	11020	11030	5.41	Neem	***Azadirachata indica***	G1	1			
15	12300	12310	5.40	Neem	***Azadirachata indica***	G2		1		
16	12320		5.21	Khajoor	***Phoenix dactylifera***	G2		1		
17	16420	16430	4.01	Palash	***Butea monosperma***	G1	1			
18	16440	16450	4.21	Neem	***Azadirachata indica***	G1	1			
19	17050	17060	4.26	Neem	***Azadirachata indica***	G1	2			
20	17170	17180	4.41	Neem	***Azadirachata indica***	G1		1		
21	17840	17850	4.08	Neem	***Azadirachata indica***	G1	1			
22	18420	18430	4.87	Neem	***Azadirachata indica***	G1	1			
23	18470	18480	2.99	Babul	***Acacia nilotica***	G1		1		
24	18710	18720	5.14	Neem	***Azadirachata indica***	G1		1		
25	19120	19130	2.85	Neem	***Azadirachata indica***	G1	1			
26	19430	19440	4.99	Neem	***Azadirachata indica***	G1	2			
27	19460	19470	4.65	Neem	***Azadirachata indica***	G1	1			
28	19470	19480	4.35	Neem	***Azadirachata indica***	G1	2			
29	20630	20640	5.03	Neem	***Azadirachata indica***	G1		1		
30		20740	3.91	Neem	***Azadirachata indica***	G1		1		
31	20770	20780	5.29	Neem	***Azadirachata indica***	G1		1		
32	20840	20850	5.47	Palash	***Butea monosperma***	G1	1			
33	21160	21170	5.21	Aam	***Mangifera indica***	G1		1		
34	21330	21340	3.71	Neem	***Azadirachata indica***	G1		1		
35	21840	21850	4.62	Neem	***Azadirachata indica***	G1	1			
36	21930	21940	4.31	Neem	***Azadirachata indica***	G1				
37	22510	22520	0.00	Aam	***Mangifera indica***	G1			1	
38	22530	22540	0.00	Neem	***Azadirachata indica***	G1			3	
39	22540	22550	0.00	Aam	***Mangifera indica***	G1			1	
TOTAL							22	19	5	**46**

4. Wildlife and Protected Areas

67. The project road does not pass through any protected area, such as, wildlife sanctuary, national park or bio-reserve. There is no wildlife Sanctuary, national park or bio-reserve within 10 km from the project road. Although few animals are found around the road like, Snake, mangoos, rat, fox, etc.

5. Aquatic Ecology and Fisheries

68. Natural drains will be crossed by suitable bridges and natural course of water bodies will not be affected by the widening of the project road. Therefore, aquatic biology is not an issue for the project road.

6. Rare or Endangered Species

69. No rare or endangered species found in the area along the project road.

7. Fauna and Wild life

70. The project road passes mainly through agricultural areas and during field survey no wild animals were spotted. However in discussion with the Forestry Department and during the public consultations, it was found that common fauna in the study area are Cow, Buffalo, wild cow (Terrestrial Fauna), Pigeon, Peacock (Aves species), king cobra (Binoccelate cobra), Toad, Frog (Amphibians), chital or Indian Spotted Deer (Axis axis).

D. Economic Development and Social and Cultural Resources

71. The district of Sagar (previously Saugor) lies in the north central region of Madhya Pradesh. A major road and agricultural trade centre, it has industries such as oil and flour milling, saw-milling, ghee processing, handloom cotton weaving, railway and engineering works. It is known in all over India due to its University named as Dr. Harisingh Gaur University, Army Cantonment and Bhagyodyay.

1. Agriculture and Allied Sector

72. Soybean, wheat, Chickpea, maize, lentil & pea grows abundantly in and around Sagar. Per capita agriculture production of the cereals, pulses, food grains are increasing. Total area of sagar district is 1025200 Hectare & the total population is 2,378,295. The cultivated area is 537400 hectare, forest area is 298000 hectare, land under non agriculture use is 5300 hectare, Permanent pastures area is 85400 hectare, cultivable waste land is 10300 hectare, land under miscellaneous tree crops & groves area is 1300 hectare, barren & uncultivable area is 14600 hectare.

2. Industries

73. Government of MP has kept Sagar in category 'C' of industrial backward districts for industrialization and business purpose District Industry centre is working as Nodal Agency. Main and traditional business of Sagar is Bidi Making and found in whole of Sagar district. After 1978, establishment of District Industry Centre took place and lead to the opening of new industrial units in Sagar. For establishment of Industries following Units are available In the district four main industry of medium category are there. They are Straw Board, Vegetable Oil, refined Oil

and Single Superphosphate Fertilizer. About 15 crores rupees are invested in these industries. About 10,000 Small Scale industries have been registered in the district. The main are Steel Utensils, Plastic Goods, Detergent Cake Powder, Maida, Agriculture Equipments, Welding Electrodes, Alum, Caustic Soda, Solvent Plant, Agarbatti, Granite, Acrylic Sheet, Acrylic Products, Dal Mil, PVC Cable, Pipe etc. In Khurai and Bina Agricultural equipments industry are in working in cluster units.

3. Demography

74. In 2011, Sager had population of 2378295 of which male and female were 1254251 and 1124044 respectively. In 2001 census, Sagar had a population of 2021987 of which males were 1073205 and remaining 948782 were females. Sagar District population constituted 3.27percent of total Maharashtra population. In 2001 census, this figure for Sagar District was at 3.35 percent of Maharashtra population.

4. Population Growth Rate

75. There was change of 17.63 percent in the population compared to population as per 2001. In the previous census of India 2001, Sagar district recorded increase of 22.70 percent to it's Population compared to 1991.

Table 28: Demographic Features of Madhya Pradesh and Country as per 2001 census

S. No.	Feature	All India	Madhya Pradesh	Sagar
1.	Geographical Area (sq.km)	3,287,240	308,144	10,252 km2 (3,958 sq mi)
2.	Total Population	1,028,737,436	60,385,118	273,357
3.	Male Population	532,223,090	31,456,873	142,655
4.	Female Population	496,514,346	28,928,245	130,702
5.	Density	325	196	230/km2 (600/sq mi)
6.	Sex ratio (female/1000 male)	933	920	896/1000
7.	Literacy (%)	64.8	64.08	77.52 per cent

Source: Census Data, Census of India, 2001 (www.censusindia.gov.in); Statistical Abstract of State Government, Directorate of Economics and Statistics

5. Archaeological and Historical Monuments

76. No archaeological and historical monument is located along the project road.

6. Sensitive Receptors

77. During the environmental and social screening survey, it was observed that various structures, schools, temples etc. are located along the project road. No Such Structure Will Be Affected During Widening Process. Details of sensitive receptors along the project road are shown in Table 29.

Table 29: Sensitive Receptors – Bandri-Jaruakheda

Sr. No.	Chainage in (km)	Length of the structure along the road (m)	Distance from the centre of existing road(m)	L/R	Type
1	0.56	10	28	L	HOSPITAL
2	11.77	14	24.65	R	SCHOOL
3	13.10	8	11.41	R	BUS SHELTTER
4	13.90	4	10.11	L	TEMPLE
5	24.15	10	12.24	R	TEMPLE
6	24.15	6	9.40	R	BUS SHELTTER
7	24.30	12	7.05	R	SCHOOL

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

78. Anticipated environmental impacts and mitigation measures of the project area, nature, and extent of the proposed activities. Suitable approach and methodology was adopted to ascertain likely impacts both during design and construction and operation stage. Valued Environmental Components were identified during initial site visit followed by its detailed investigation during later stage of the study.

A. Impact on Physical Environment Design Stage

1. Natural Hazard

79. The entire Madhya Pradesh falls under zone least active to moderate zone as per seismic map of India and therefore the risk of damage to the project road due to earthquake is minimal. Nonetheless, relevant IS codes were adopted in the design the civil structures.

2. Road Widening, Utilities shifting and Safety Planning

80. The entire road section has enough available ROW to accommodate the proposed road improvement works and will be undertaken along the existing alignment. Road widening will result to shifting of utilities and encroaching structures. Poor coordination with local authorities and communities will increase the risk of accidental damage to drainage canals and temporary disruption of water and electric supplies along active construction fronts. The further contraction of the useable carriageway during construction will exacerbate traffic and will hinder direct access across the road by residents along the road. Temporary detention of sewage on depressed areas during the reconstruction of drainage canals may occur.

81. Road formation widening will be made on the basis of minimizing tree cutting, utility shifting, and damage to community properties. Road design has incorporates the drainage system to avoid accumulation of sewage and surface run-off. Temporary pits will constructed side- and cross drains to collect sewage from demolished or damage drainage canals which will either be hauled for off-site treatment through septic tanks prior to disposal or land application.

82. Adequate safety provisions like crash barriers on accident prone areas, rumble strips in community areas to regulate speed, retro-reflective warning sign boards near school, hospital, and religious places are incorporated in the design. All utilities requiring shifting shall be largely made before start of construction. Prior to shifting, the Contractor will coordinate with the concerned agencies regarding the time and extent of shifting and community affected will be informed of potential service disruption at least 1 week in advance.

3. Terrestrial Ecology

83. There are no national parks, wildlife sanctuaries or similar eco-sensitive areas within10 km distance of the subproject road alignment.

84. A total of 46 trees are likely to be cleared along the RoW to accommodate the road widening. Compensatory plantation of 1:10 will be undertaken to address this impact.

B. Construction Stage

1. Air Quality

85. The potential sources of air emission during the construction phase of the project are: (i) dust re-suspension from earthworks including materials loading and unloading; (ii) quarrying and rock crushing; (iii) operation of construction equipment and machines; (iv) fugitive emissions from unpaved road travel; and (v) combustion of fuels from equipment, machineries, and vehicles. Particulate matter, comprising the majority from road construction, Particle size distribution from road construction is dominantly large, with 85.5% > 10um and 55% > 20 um_2 which can settle within close proximity of the source.Hot mix plant will generate carbon monoxide (CO), un-burnt hydrocarbon, sulphur dioxide, particulate matters, and nitrogen oxides (NOx) emissions. This may affect the air quality of nearby areas especially due to emission discharge from low height stack. The deterioration of the air quality within the immediate vicinity of the road construction activities will be significant but temporary.

86. **Mitigation Measures.** Following measures are proposed to minimize the dust and emission generation:

- Vehicles delivering loose and fine materials like sand and aggregates shall be covered.
- Loading and unloading of construction materials in project area or provisions of water fogging around these locations.
- Storage areas should be located downwind of the habitation area.
- Water shall be sprayed on earthworks and unpaved haulage roads Regularly.
- Regular maintenance of machinery and equipment. Vehicular pollution check shall be made mandatory.
- Mixing plants and asphalt (hot mix) plants shall be located at least 1 km downwind of the human settlements. The asphalt plants, crushers and the batching plants shall be sited at least 500m in the downwind direction from the nearest settlement and after securing a No-Objection Certificate (NOC) from the SPCB. Hot mix plant shall be fitted with stack of adequate height as may be prescribed by SPCB to ensure enough dispersion of exit gases.
- Only crushers licensed by PCB shall be used.
- LPG should be used as fuel source in construction camps instead of wood. Tree cutting shall be restricted.
- Mask and other PPE shall be provided to the construction workers.
- Diesel Generating (DG) sets shall be fitted with adequate height as per regulations (Height of stack = height of the building + 0.2 $\sqrt{}$ KVA.
- Low sulphur diesel shall be used in DG sets as well as machineries.
- Air quality monitoring should be carried out during construction phase. If monitored parameters are above the prescribed limit, suitable control measures must be taken.

2. Noise

87. The scale of the construction necessary to upgrade the road and the corresponding slight increase in traffic are not expected to generate adverse impacts. Ambient noise level may increase temporarily in the close vicinity of various construction activities, maintenance workshops and vehicles and earthmoving equipment. These construction activities are expected to generate noise levels in the range of 80 – 95 dB(A) at a distance of about 5 m from the source.

88. Although this level of noise is higher than the permissible limit for ambient noise level for

residential/commercial levels but will occur only intermittently and temporary. This noise level will attenuate with increase in distance from noise source, decreasing by 10dB at a distance of about 55m and 20 dB at 180 meters. Impact due to noise during construction activities will be minimal to communities as construction camps are located at least 50 meters from community areas.

89. Along the project road, a number of noise sensitive places are located which includes schools and temples. Noise impacts during project construction will be significant and temporary.

90. **Mitigation Measures**. Since the baseline noise levels already exceed prescribed standards the target for the operational stage monitoring will be to ensure that the noise levels do not exceed baseline levels.

91. All equipment shall be fitted with silencers and will be properly maintained to minimize its operational noise. Noise level will be one of the considerations in equipment selection, which will favor lower sound power levels.

92. Stationary noise making equipment shall be placed along uninhabited stretches.

93. In addition to preferring less noise generating equipment, the timing of operation can be scheduled to avoid disruption of activities like school and prayer times. Finally, provision of temporary noise barriers will be made near identified sensitive locations or near the noise source during construction.

94. To protect workers operating in noisy environment, ear plugs or ear muffs will be provided by the Contractor to the workers and occupational exposure limits will be strictly implemented.

3. Impact on Land and Soil

a. Loss of Productive Soil and Change in Land Use

95. Borrow areas may lose its productivity if top soil is not preserved. Similarly, land area used for locating construction camp may lose its productivity, if it is not restored to its original stage after disbanding the construction camp.

96. **Mitigation Measures**. The top soil from the productive land shall be preserved and reused for plantation purposes. It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. It shall be ensured that the land taken on lease for access road and construction camp is restored back to its original land use before handing it over back to land owner.

b. Soil Erosion

97. Soil erosion may take place at locations of sharp bend near bridge construction locations, along steep and uncompact embankment slope, and wherever vegetation is cleared. Soil erosion may have cumulative effect ***viz.*** siltation, embankment damage, and drainage problem. Loss of soil due to run off from earth stock-piles may also lead to siltation of nearby water bodies. The intensity of soil erosion at different locations will be influenced by the lithology, topography, soil type and climatic condition (mainly rainfall) and drainage pattern.

98. **Mitigation Measures.** Following mitigation measures are proposed for prevention of soil erosion:

- Bank protection measures shall be taken at erosion prone areas to include the use of geo-textiles matting and turfing
- Provision of side drain to guide the water to natural outfalls.
- Stone pitching wherever necessary.
- When soil is spread on slopes for permanent disposal, it shall be buttressed at the toe by retaining walls.
- Side slopes of the embankment shall not be steeper than 2H:1V and turfing of embankment slopes shall be done along the stretch.
- Shrubs shall be planted in loose soil area.
- In rural stretches, longitudinal side drains shall be intercepted by drains serving as outlet channels to reduce the erosion.
- IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration.
- Soil erosion shall be visually checked on slopes and high embankment areas. In case soil erosion is found, suitable measures shall be taken to control the soil erosion further including bio-turfing.
- While planning or executing excavations, the Contractor will take all adequate precautions against soil erosion as per MoRTH 306.
- The earth stockpiles to be located downwind and provided with gentle slopes to prevent soil erosion.

4. Borrow Areas and Quarries

99. The project area is flat terrain. Farmers are willing to provide earth from their field up to certain depth on adequate compensation, it is recommended that borrowing from agricultural land shall be minimized to the extent possible.

100. Borrow areas if left un-rehabilitated may pose risk to people, particularly children and animals of accidentally falling into it as well as become potential breeding ground for mosquitoes and vector born disease

101. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, air and noise pollution. Opening of new quarries is not envisaged due to the proposed project. Quarry material will be sourced from existing nearby quarries.

102. **Mitigation Measures**. Borrow pits shall be selected from barren land/wasteland to the extent possible. Borrow areas should not be located on cultivable lands except in the situations where land owners desires to level the land. The top soil shall be preserved and depth shall be restricted to the desired level.

103. Borrow areas should be excavated as per the intended end use by the owner. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed.

104. The depths in borrow pits to be regulated so that the sides shall not be steeper than 25%. To the extent possible, borrow areas shall be sited away from inhabited areas. Borrow areas shall be leveled with salvaged material or other filling materials which do not pose

contamination of soil. In addition, it shall be converted into fishpond in consultation with fishery department and if desired by land owner/community. The borrow shall be rehabilitated following the broad guidelines given at Appendix 2**.**

105. Aggregates will be sourced from existing licensed quarries. Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be submitted to EO, PIU. The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy of the approval to EA if new quarries are opened.

5. Compaction and Contamination of Soil

106. Soil in the adjoining productive lands beyond the ROW, haulage roads, and construction camp area may be compacted due to movement of construction vehicles, machineries and equipment, and due to sitting of construction camps and workshops. Approach road either paved or unpaved is available for most the bridge approaches. However, for some bridges approach road has to be constructed.

107. Soil may be contaminated due to inappropriate disposal of liquid waste, (lubricating oil and fuel spills, waste oil and lubricant and vehicle/equipment washing effluent) and solidwaste (fuel filters, oily rags) likely to be generated from repair and maintenance of transport vehicles, construction equipment and machinery. Soil may be contaminated due to inappropriate disposal of domestic solid waste and sewage from construction camps.

108. **Mitigation Measures.** Fuel and lubricants shall be stored at the predefined storage location and away from drainage channels. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil.

109. All efforts shall be made to minimize the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fuelling areas, oil interceptors shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labeled containers (Labeled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized Waste Oil Recycler.

110. To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route.

- Approach roads shall be designed along the barren and hard soil area to reduce the compaction induced impact on soil.
- The productive land shall be reclaimed after construction activity.
- Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp.
- Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. The non-biodegradable and recyclable waste shall be sold off.
- Efforts shall be made that biodegradable waste shall be composted in the mechanized and movable composter by the contractor. Non bio-degradable and non-saleable waste shall be disposed off to authorized land fill site.

Nonbituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of top soil observed from opening the pit.

- Bituminous wastes will be disposed off in an identified dumping site approved by the State Pollution Control Board

111. Construction waste constitutes debris, which are generated due to dismantling of pavement (though involved only for few kilometers in B-J Road), quarry dust and unused iron bars or damaged support structures. Uncontrolled disposal of these wastes may affect soil and even receiving water bodies may cause contamination of soil, and landscape of the area.

112. **Mitigation Measures.** Construction waste shall be disposed of in environmentally acceptable manner. Some of the measures are as follows:

- The existing bitumen surface can be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes. All excavated materials from roadway, shoulders, drains, cross drainage should be used for backfilling embankments, filling pits, and landscaping. Unusable debris material should be suitably disposed off at pre designated disposal locations, with approval of the concerned authority.
- The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal MoRTH guidelines should be followed.
- The locations of dumping sites should be selected with following considerations.
- Unproductive/wastelands shall be selected for dumping sites.
- Away from residential areas and located at least 1000 m downwind side of these locations,
- Dumping sites do not contaminate any water sources
- Dumping sites have adequate capacity equal to the amount of debris generated.
- Public perception and consent from the village Panchayats about the location of debris disposal site shall be obtained before finalizing the location.

6. Groundwater

113. Contamination of groundwater is not envisaged since construction camps will have septic tanks or mobile toilets depending on the number of workers in each camp.

114. **Mitigation Measures.** Requisite permission as applicable shall be obtained for abstraction of groundwater. The contractor shall make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected. Water intensive activities shall not be undertaken during summer season.

7. Surface Water Bodies

115. Temporary pollution of water bodies may occur due to spillage of chemicals and oil at construction sites and disposal of waste from construction camps. Installation of a haul road or temporary access across the river/nala maybe required while construction work is ongoing in the existing minor bridges and culverts. This may cause sedimentation and other disturbances to the water body.

116. **Mitigation Measures.** To prevent siltation of road side ponds, provision of retaining wall

is made along the road for the ponds located next to the road. As enhancement measures, efforts shall be made to increase the water holding capacity of the ponds (other than those affected) in the region by using the bed material as borrow earth. Following measures shall be followed additionally:

- Bridge construction activity including piling is recommended during non monsoon (October to End of May) period.
- Check dams must be created during construction to catch the silt or debris generated from construction activities across the water channels
- All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection.
- All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.
- Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors.
- Silt fencing and/or brush barrier shall be installed along drainage path, erosion prone areas for collecting sediments before letting them into the water body. Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated.
- All wastes arising from the construction should be disposed in an environmentally accepted manner so as not to block the flow of water in the channels. The wastes should be collected, stored and transported to the approved disposal sites.
- No vehicles or equipment should be parked or refueled near water bodies, so as to avoid contamination from fuel and lubricants
- Substructure construction should be limited to the dry season.
- Construction camps shall be located away from habitation (at least 1 Km Away) and water bodies. Sewage from labour camps will be treated through septic tanks. No untreated/treated sanitary wastewater shall be discharged into surface water bodies as these are used for bathing and washing purpose.
- The borrow areas may also be converted into ponds with the concurrence of the land owners. Fisheries activity can be encouraged in such ponds through institutional support from concerned department

8. Hydrology and Drainage

117. Construction material and waste may contaminate or clog the small drains if stored or disposed close to water body.

118. **Mitigation Measures**. Adequate cross drainage structures shall be provided. Additional balancing culverts shall be provided in flood prone areas. The embankment height shall be designed consistent with the existing topography of the region and shall be higher than the HFL. Elaborate drainage system shall be provided to drain the storm water from the roadway and embankment and to ensure minimum disturbance to natural drainage of surface and subsurface water of the area.

119. The design of drainage system such as surface and sub-surface drainage shall be carried out as per IRC: SP: 42 and IRC: SP: 50. Surface runoff from the main highway, embankment slopes and the service roads shall be discharged through longitudinal drains,

designed for adequate cross section, bed slopes, invert levels and the outfalls. If necessary, the walls of the drains shall be designed to retain the adjoining earth. 122. IRC: 34-1970: Recommendations for road construction in waterlogged area and IRC: 75 and MORT&H guidelines for Design of High Embankments shall be referred. No construction material will be stored or disposed near any water body except for reusing it for enhancement measures such as embankment raising.

9. Impact on Biological Environment

a. Terrestrial Ecology

120. There is no national park, wildlife sanctuaries or any other similar eco-sensitive areas within 10 km distance of the project area. However, some trees are likely to be affected. The impact and mitigation due to tree cutting has been discussed in following paragraphs.

121. One month before the construction starts, clearing and grubbing will be performed by the contractor. All trees within the ROW with 300 mm diameter at 1m above the ground will be cut, including the removal of stumps. A total of 46 trees are likely to be affected due to the proposed project. The cutting of trees will have minor to negligible impact on local environment.

122. **Mitigation Measures.** Requisite permission from Forest Department shall be obtained for cutting of roadside trees located in forest land otherwise; permission will be taken from district commissioner.

123. The project envisages plantation of approximately 460 trees along both sides of road as per IRC SP: 21 specifications. This will include the compensatory plantation as per prevailing guidelines of States forest department on 1:10 basis replacement rate or as per permission granted by district authorities for cutting of tree located on non-forest land, which vary 1;10. Besides, additional plantation shall be done on banks of water bodies near bridge sites to enhance the aesthetics and check soil erosion. All tree plantations will be carried out through forest department, local community or the civil works contractor. Tree species selected for plantation must be suitable for local climatic conditions and be equal to or better in sequestering carbon than the trees removed/be good for sequestering carbon (only for roads where there is no tree cutting). Necessary advise maybe sought from the local Forestry office in the selection of tree species.

124. A range of 10-15 m centre-to-centre is recommended for spacing of trees (parallel to the road). Setback distance of trees in different situations shall be based on IRC: SP: 21 and IRC: 66. The distance between the kerb, if any, and the nearest edge of tree trunk shall be at least 2 m. The plantation in median shall comprise shrubs whose height would normally not exceed 1 - 1.5 m and shall be as per IRC SP: 21.

125. For safe traffic operation, vertical clearance between the crown of the carriageway and lowest part of overhang of the tree available across the roadway shall conform to the standards laid down in IRC: SP: 21. The pit size, fencing, watering, and manuring requirements shall also conform to the above standard. The use of pesticides shall be avoided or minimized to the extent possible. Planting shall be such that it does not obstruct the visibility of traffic from any side and shall be pleasing in appearance.

b. Aquatic Ecology

126. Temporary sedimentation and water quality deterioration is expected from the project during the construction stage. Accidental spill of materials, chemicals, and fuels may also deteriorate receiving water quality and hence the aquatic ecology.

127. **Mitigation Measures**. It is proposed to undertake construction activities near water bodies during summer season when most of water bodies are practically dry. Best construction practices shall be adopted to prevent increase in siltation level of the water. All precautionary efforts shall be taken as given under surface water section to prevent accidental damage of water quality.

10. Socio-Economic Impact

128. B-J Road project will have both positive and negative impact on socioeconomic aspects as narrated below.

a. Positive Impacts

129. Economic activities supporting transport like fuel stations, automotive repair shops, lodging, and restaurants are expected to increase with increase of traffic and induced development of the area. The improved road will provide better connectivity which will result in (i) Reduction in travel time (ii) better mode and frequency of transport (iii) access to quality health care facilities, educational and other infrastructural facilities (iv) enhanced tourism activities in the area and state which in many terms will boost the local economy (v) better investment climate for industries creating more employment opportunities to local people.

b. Anticipated Negative Impacts

130. The other impacts are expected due to sitting and operation of construction camp during construction.

11. Labor and Construction Camp

131. Construction workers expected to be about 150 per day per package are likely to be employed during construction. Most of the workers will be employed locally. However, some may be from nearby areas. This will cause additional burden on local resources. However, this impact will be temporary and will not have the potential for changes in the demographic scenarios of the area. The outside workers will be housed at the construction camp, which is expected to one per package. Poor sitting and improper management of construction camp may lead to several adverse impacts on environment viz. (i) loss of vegetation due to use of wood as fuel source for cooking (ii) deterioration in nearby surface water bodies" quality (iii) compaction and contamination of soil due to uncontrolled disposal of solid waste (iv) Poor sanitation may result to transmission of communicable diseases among the workers and the host communities. This includes the possible spread of sexually transmitted disease, diseases from improper handling and supply of foodstuffs, poor water supply, and insect-borne diseases.

132. **Mitigation Measures**. Construction camp shall be sited at such locations so as to utilize the existing infrastructure. No productive land should be utilized for construction camp. All sites must be graded, ditched and rendered free from depressions to avoid water stagnation. Accommodation and ancillary facilities including recreational facility for workers shall be erected

and maintained to standards and scales approved by the resident engineer. All camps should maintain minimum distance of 1000 m from habitation and water bodies.

133. All construction camps shall be provided sanitary latrines and urinals with provision of septic tanks attached with soak pits or mobile toilets fitted with anaerobic digestion system. Storm water drains shall be provided for the flow of used water outside the camp. Drains and ditches shall be treated with bleaching powder on a regular basis. Garbage bins must be provided in the camp and regularly emptied and disposed of in a hygienic manner. LPG cylinders shall be provided as fuel source for cooking to avoid any tree cutting.

134. The Contractor will ensure the following:

(i) The good health and hygiene of all workers to prevent sickness and epidemics. These include the HIV/AIDS prevention program to reduce the risk and transfer of HIV virus between and among the workers and community, promote early diagnosis and assist affected individuals. Activities under the program include monthly information, education, and consultation communication campaigns to workers, drivers, delivery crew, and communities on the risk, dangers, and impacts of STD and HIV/AIDS. Contractor will also provide first aid facilities at the camp and organize regular health check-up camps as well
(ii) Availability of safe drinking water and sufficient supply of suitable and hygienically prepared food at reasonable price is available to the workers.
(iii) Adoption of all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides, which should comply with local regulations.
(iv) Prohibition on supply or availability of alcoholic liquor or prohibited drugs at the camp.
(v) Regular health check-up and immunization camps shall also be organized for the workers and nearby population.

12. Safety

135. The road construction activities may create various unsafe situations. This will require attention to the following safety aspects viz. (i) safety of construction workers, (ii) safety of road users including pedestrians and cyclists (iii) safety to cattle; (iv) safety of local community (iv) unsafe/ hazardous traffic conditions due to construction vehicle movement need to be considered during design and construction stage and (v) conduct of safety audit.

136. **Mitigation measures.** During the construction phase, contractors shall be required to adopt and maintain safe working practices. Internationally accepted and widely used safety procedures should be followed during (i) road works (ii) handling of large construction equipment and machineries, (iii) handling of chemicals and hazardous materials and inflammable substances (iii) welding and (iv) electrical works. Contractor shall also arrange required PPEs for workers, first aid and firefighting equipment at construction sites. Contractor will also prepare an emergency preparedness plan, which shall be duly approved by EA to respond to any emergency and unsafe conditions. To avoid disruption of the existing traffic due to construction activities, comprehensive traffic management plan shall be drawn up by the contractor.

137. Retro-Reflectorized traffic caution signs shall be used during construction. Regular safety audit or periodic review shall be made to assess the effectiveness of safety measures

adopted during construction.

138. Adequate caution signage near school, sensitive locations, speed control, caution notes shall be fixed at appropriate locations. These shall be preferably of PCC with Retroreflective paints. Steel base signage shall be avoided to prevent theft of the same. Crash barrier shall also be installed at appropriate locations particularly near school to provide safety to school children. Provision of sped breakers shall be made near schools and religious places.

C. Impacts during operation stage

139. The subproject road is located in vast open agricultural land, which will provide adequate dispersion of gaseous emission from vehicle. Further, proposed plantation will ameliorate/enhance the micro climate. No adverse climatic changes/impacts are anticipated during operation stage other than GHG (CO2) emission due to increased traffic, which would be largely offset with better fuel efficiency and reduced vehicle idling due to improved road conditions.

1. Air Quality

140. Vehicular emissions will be the principle source of pollution during operation stage. The subproject road is mostly located in vast open agricultural land, which will provide adequate dispersion dynamics of gaseous pollutants. Moreover, majority of the traffic on the subproject will be diverted traffic from the existing highways.

141. **Mitigation Measures.** Plantation is one of the preferred solutions to check air pollution. Plants serve as a sink for pollutants, reduce the spread of dust. Tree plantation along roadsides and other places shall include pollution absorbent species. Awareness signboards shall be installed at prominent location to educate drivers for good driving and vehicle maintenance practices.

2. Noise

142. During the operational Stage, movement of traffic will be the prime source of noise. Traffic congestion and pedestrian interferences increase the use of horns. This may result in increased noise levels at nearby schools and religious places.

143. **Mitigation Measures.** Effective traffic management and good riding conditions shall be maintained to reduce the noise level throughout the stretch. Speed limitation and honking restrictions may be enforced near sensitive locations. Increased plantation along the road and boundary wall will also work as noise barrier. Since most of the schools buildings are away from the road, therefore impact of noise is expected to be insignificant. Since improved road conditions and multi-layered plantation will be helpful in attenuation of noise levels, the effectiveness of these measures shall be monitored. If noise levels are still found higher than the prescribed ambient noise standards at these sensitive receptors, adequate noise barrier shall be fixed.

3. Land and Soil

144. The better access can lead to conversion of agriculture land for residential and commercial purposes close to roads and especially in rural and urban area.

145. **Mitigation Measures.** The EA may explore the feasibility of restricting about 30 m area either side of the road as no development zone on the line restriction are imposed for National Highways authority of India.

4. Soil Erosion

146. No impact on soil is anticipated during operation phase of the project except bridge approaches where unexpected rainfall may erode the embankment formation and deterioration of borrow areas if not rehabilitated properly.

147. **Mitigation measures.** Embankment stabilization shall be check periodically during operation stage and suitable stabilization measures shall be taken wherever any erosion is identified. Borrow areas will also be rehabilitated following the guidelines given at Appendix 2.

5. Groundwater

148. No impact is anticipated on groundwater due to the project during operation phase of the project hence, no specific mitigation measure is proposed.

6. Surface Water Bodies

149. No major or long-term impact is anticipated during the operation phase on the surface water bodies due to the project implementation activities. Oil contaminated runoff from the road during monsoon will have minimal impacts considering their low concentration.

7. Hydrology and Drainage

150. Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions will be regularly conducted.

8. Impact on Biological Environment

a. Terrestrial ecology

151. Positive impacts on terrestrial ecology are expected during the project operation stage due to the increase in vegetation and landscaping along the road. The project will coordinate with the local communities to maintain and enhance the trees planted along the state road. ”No adverse impact is anticipated during operation stage except accidental damages or absence of proper tree management.

152. **Mitigation Measures.** Arrangement shall be made to ensure survivability of the tree plantation. The tree survivability audit shall also be conducted at least once in a year to assess the effectiveness of the programme.

b. Aquatic Ecology

153. No impact is envisaged during operation phase of the project and hence no mitigation proposed. However, periodic surveillance shall be conducted to check erosion and siltation in major water bodies.

9. Community Health and Safety

154. During operation phase, the projected increase in the number of motorized road users traveling at higher speeds also increases the chances of injuries and fatalities from road crashes.

155. **Mitigation Measures.** Adequate caution signage near school, sensitive locations, speed control, caution notes shall be fixed at appropriate locations. These shall be preferably of PCC with Retro-reflective paints. Steel base signage shall be avoided to prevent theft of the same. Crash barrier shall also be installed at appropriate locations particularly near school to provide safety to school children. Provision of speed breakers shall be made near schools and religious places

D. Climate Change Impacts and Risks

1. Climate Change Mitigation

156. The Transport Emissions Evaluation Model for Projects (TEEMP)[1] developed by Clean Air Asia[2] was utilized to assess the CO2 gross emissions with and without the project improvements. The main improvement from the project that was considered for the model is better surface roughness which was translated into impacts on traffic speed and hence fuel consumption. The model also allows for the inclusion of impacts related to traffic congestion with and without project through provisions for inserting data on the traffic numbers, lane width, number of lanes and volume/capacity saturation limit.

157. Information that was fed into the model for projecting the CO2 emissions was:

(i) The road will strengthen 24.2 km stretch of the project road connecting with major district roads;
(ii) The existing road having 4 lane with a 3.5 m carriageway width will be improved and maintained to the same number of lanes and carriageway width with asphalt concrete surface;
(iii) Road roughness will decrease from the general condition of 16 m/km to 2.5 m/km;
(iv) Construction will take place over a period of 12 months in 2015 and road operations will begin in 2016.
(v) The design life of the road is 20 years. Hence the midpoint of the design life is after 10 years or 2025.
(vi) Other improvements include the repair or reconstruction of damaged culverts, introduction of lined longitudinal and cross drains for the road and removal of irregularities on the existing vertical profile and road safety appurtenances.

158. The traffic forecast data was taken from the traffic studies and economic analysis for the road disaggregated into vehicle types and annual average daily traffic. Key vehicle

[1] TEEMP is an excel-based, free-of-charge spreadsheet models to evaluate emissions impacts of transport projects.
[2] A network of 250 organizations in 31 countries established by the Asian Development Bank, World Bank, and USAID to promote better air quality and livable cities by translating knowledge to policies and actions that reduce air pollution and greenhouse gas emissions from transport, energy and other sectors.

categories considered for the road and the annual average daily traffic in 2014 (baseline scenario) without project and in 2035 with the project is given in Table 30.

Table 30: Annual Average Daily Traffic for different vehicle categories

Vehicle category	2014 (without the project)	2014 (with project)
2-wheeler	226	997
3-wheeler/auto rickshaw	5	22
Car/jeep/taxi/van	84	368
Light Commercial Vehicle	37	162
Minibus and standard bus	42	184
Heavy commercial vehicle	132	578
TOTAL	**526**	**2311**

159. The volume/capacity saturation limit was taken at 2.0 or twice the designed road capacity and beyond which traffic congestion will result to less than optimum travel speed and increase in fuel consumption. Emission factors were taken from the CBCB/MOEF (2008) Draft Report on Emission Factor Development for Indian Vehicles, the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and Health Relevant Emissions from in-Use Indian for three-wheelers rickshaw as follows:

Table 31: CO2 Emission Factors

Vehicle Type	Gas/Petrol	Diesel
2-Wheel	2.28 kg/l	
3-Wheel		2.63 kg/l
Cars/bus/bus	2.59 kg/l	2.68 kg/l
LCV		3.21 kg/l
Bus		3.61 kg/l
HCV		3.50 kg/l

160. Emissions from road construction were also calculated using estimates of the total quantity of materials that will be used to rehabilitate the road which is 140 tons of steel, 1180 tons of cement and 1440 tons of bitumen.

161. **Estimated carbon emissions**. The proposed road upgrading resulting to surface roughness and road capacity improvements have implications in CO2 emissions. Improved roughness results to higher speed and lesser emissions while increase road users increases emissions. These factors are further affected by traffic congestion once the volume/capacity saturation limit.

162. CO2 emissions will also result from the processing and manufacturing of raw materials needed to upgrade the road and in the case of Bandri Jaruwakheda Road, a total of 1,180 tons of cement, 140 tons of steel, and 1,440 tons of bitumen will be needed. These construction materials will produce an estimated 1,561 tons of CO2.

163. The Figure below presents the impacts on emissions due to road improvements. Total CO2 emission at business-as-usual scenario was estimated at 32,924 tons for the entire project life and without- and with- induced traffic are 30,684 and 35,766 tons respectively. These values are below the 100,000 tons per year threshold set in the ADB SPS 2009. Therefore it is not necessary to implement options to reduce or offset CO2 emissions under

the project.

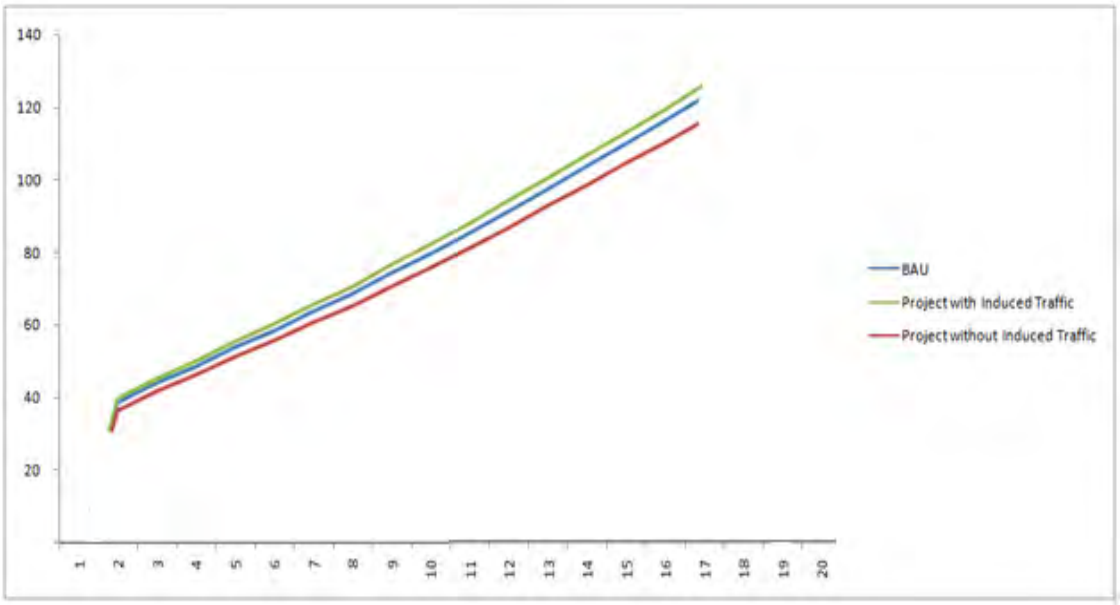


Figure 7: Plot of CO2 Emissions Considering Improvement in Surface Roughness and Road Capacity

164. The design life of the roads is 20 years. The project's CO2 emission intensity indicators are provided in the succeeding Table.

Table 33: Project CO2 Emissions Intensity Indicators

Details	CO2		
	Business-As-Usual	Project (without Induced Traffic)	Project (with Induced Traffic)
tons/km	4,008.05	3,993.05	4,311.36
tons/year	4,718.57	4,700.91	5,075.65
tons/km/year	182.18	181.50	195.97
g/pkm	57.86	57.64	57.54
g/tkm	268.21	267.21	266.87

2. Climate Risks and Adaptation needs

165. Climate risks were identified following both top down and bottom up approaches. Under the top down approach changes of key climate parameters, mainly temperature and precipitation were projected for 2050 using an ensemble of Global Climate Models (GCMs). Given the projected variations of temperature and precipitation the project roads were screened for 9 types of climate risks:

(i) Landslide triggered by increased precipitation
(ii) Fire
(iii) Flood
(iv) Drought
(v) Tsunami
(vi) Cyclone wind
(vii) Cyclone surge

(viii) Sea level rise
(ix) Coastal erosion

166. Climate risk maps based on information from the GCMs were created for the project area using Geographic Information System (GIS) maps. After overlaying the road locations on the climate risk maps low to medium risks identified for the project roads were flooding, landslides triggered by precipitation, coastal erosion and tsunami.

167. The overall climate change risk level identified from the above exercise is low. The key risk identified is flooding (increased storminess). Bridges and road embankments are the main project components that will be prone to flooding. Increase in temperature may also affect road safety.

168. Under the bottom up approach the flood prone areas in the project road were identified based on field surveys for the engineering design. Key engineering measures taken to address the risk of flooding in the design are: increase in road embankment height in flood prone areas/sections, improvement and provision of lined longitudinal and cross drains and new culverts, improvement and new construction of minor and major bridges. Bridge heights have been designed to have a height of 0.6m above HFL for minor bridges and 0.9m above HFL for major bridges. Flood return period of 50 years for minor bridges and 100 years for major bridges have been considered.

E. Cumulative and Induced Impacts

169. According to the ADB Environment Safeguards Sourcebook[3] cumulative impact is described as: “The combination of multiple impacts from existing projects, the proposed project, and anticipated future projects that may result in significant adverse and/or beneficial impacts that cannot be expected in the case of a stand-alone project.” The sourcebook also describes induced impacts as: “Adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused by a project, which may occur at later or at a different location.

170. Economic activities supporting transport like fuel stations, automotive repair shops, lodging, and restaurants are expected to increase with increase of traffic and induce development in the project area. The improved road will provide better connectivity and result in (i) Reduction in travel time (ii) better mode and frequency of transport (iii) access to quality health care facilities, educational and other infrastructural facilities (iv) enhanced tourism activities in the area and state which in many terms will boost the local economy (v) better investment climate for industries creating more employment opportunities to local people.

171. In terms of environment safeguard issues the improved road surface is expected to result in less dust and noise due to traffic plying on the damaged roads. However, the increased traffic due to the improved road will generate more air pollution due to vehicle exhaust and noise. The smoother road conditions will also result in increase of traffic speeds, hence creating more risks for accidents amongst traffic users as well as the local communities in the project area.

172. For addressing the impacts of air pollution and noise, regular maintenance of the road

[3] Environment Safeguards, A Good Practice Sourcebook, Draft Working Document, December 2012.

surface, maintenance and monitoring of newly planted trees and installation of noise barriers where necessary have been included in the EMP for implementation during operation stage. For addressing safety related impacts, regular maintenance of the road furniture include safety related furniture, enforcing rules against encroachment of structures and sensitive structures (schools, temples etc.) inside the ROW and implementation of the emergency response system has been included in the EMP for implementation during operation stage.

173. Information on future development projects along the project road was not available. Hence, it is difficult to assess cumulative impacts from other projects which may get implemented in the project area.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

174. Meaningful consultations were held early and throughout the project development stage to allow the incorporation of relevant views of the stakeholders in the final project design, mitigation measures, implementation issues, and enhance the distribution of benefits. All the five principles of information dissemination, information solicitation, integration, coordination, and engagement into dialogue were incorporated in the consultation process. The analysis of environmental impacts likely from the project was strengthened and modified based on opinions of all those consulted, especially in the micro level by setting up dialogues with the village people from whom information on site facts and prevailing conditions were collected. The requirement of public consultation during the implementation of the project has been proposed as part of the mitigation plan.

A. Objectives of the Public Consultation

175. Stakeholder's consultations were held with intent to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design and implementation. Informal meetings, interviews were organized covering the entire project design stage. Consultations provide affected people a platform to ensure incorporation of their concerns in the decision making process and foster co-operation among officers of MPRDC, the community and the stakeholders to achieve a cordial working relationship for smooth implementation of the project. It inculcates the sense of belongingness in the public about the project.

176. The discussions were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the sub-project. They were given the brief outline of the project to which their opinions was required particularly in identifying and mitigating any potential adverse impact.

B. Methodology for Consultations

177. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questionnaires. Questionnaire survey/ discussions were designed to obtain background information and details of general environmental issues that concern people in the project area. In addition, environmental issues were discussed with relevant organizations, government officials, beneficiaries, community leaders and experts. In addition, personal discussions with officials, on site discussion with affected stakeholders, and reconnaissance visits have also been made to the project area. Public consultations have been carried out at three locations during initial surveys as shown in table 32. The total numbers of participants in the consultations are 53 out of which 39% are women.

Table 32: List Public Consultation and Date

Sr. No.	Village/Town of Consultation	Date of Consultation	No. of Participants		
			M	F	T
1	Pithoriya	08/07/2014	-	14	14
2	Mudra Village	08/07/2014	17	7	24
3	Basiya gaud	08/07/2014	15	-	15
		TOTAL	32	21	**53**

1. Project Stakeholders

178. All types of stakeholders were identified to ensure as wide coverage as possible.

(i) Residents, shopkeepers and businesspeople who live and work along the road specially the project affected persons
(ii) All type of road users/commuters
(iii) Executing Agency, Construction Supervision Consultant and Implementing NGOs
(iv) Other government institutions whose remit includes areas or issues affected by the project (state environment and forest department, Pollution Control Board (PCB), Irrigation Department, Public Health Engineering (PHED) Department
(v) The beneficiary community in general

2. Consultation with Government Departments

179. Various officials consulted during IEE preparation included PWD Officials, State pollution control board for Air, Noise and Water quality information, IMD for the climatic data, statistical officer for Population and demographic profile, Panchant department for village level information, Survey of India for the top sheet requirement, Revenue department for the land record information, PHQ officers for hand pump relocation and quality assessment, MPSEB offices for electric pole shifting etc.

180. These departments helped to provide various project related data and information which helped preparation of reports and data analysis.

3. Consultation with Local People and Beneficiaries

181. The informal consultation generally started with explaining the project, followed by an explanation to potential impacts. Participant's views were gathered with regard to all aspects of the environment which may have direct or indirect impact on local people. Key Issues discussed are:

(i) Awareness and extent of the project and development components;
(ii) Benefits of the project for the economic and social upliftment of community;
(iii) Labour availability in the project area or requirement of outside labour involvement;
(iv) Local disturbances due to project construction work;
(v) Necessity of tree felling etc. at project sites;
(vi) Impact on water bodies, water logging and drainage problem if any;
(vii) Environment and health
(viii) Flora and fauna of the project area
(ix) Socio-economic standing of the local people

182. The project has immense acceptability among the local people. They perceive that in addition to providing all weather connectivity, the subproject road will bring positive socioeconomic changes in the area. Local people mainly discussed on the issues related to flooding, rehabilitation, resettlement, and road safety issues. The list of participants views, and outcome of the consultations have been summarized in Table 33.

183. The Details of Participants and Public Consultation photographs are attached in

Appendix 8. In addition information on the GRM procedures and formats in local language i.e. Hindi was shared with the local people as provided in Appendix 9.

Table 33: Outcome of the Consultations

Sr. No.	Date and Location	Issues Discussed	Measures Taken	Total Participants
1	**Date** 08/07/2014 **Village**: Pithoriya	• Road Safety is the major issue among local population. They feel speed breakers need to be constructed in all villages particularly in front of schools. Some feel that there should be fencing between carriageway and shoulder in order to segregate motorized traffic and local movement of children, elders and animals. • Tree cutting and plantation • Roads need to be designed taking care of hydrological aspects as during rainy season, some sections of road get submerged. In all villages, people emphasized for provision of concrete drains and cement concrete road in village portion. • Road condition is very bad that results in delay, uncomfortable drive, wear and tear of vehicles. • Villagers also want that cutting of trees need to be minimized, minimum loss of structures, plantation along the road, adequate rehabilitation and resettlement measures including provision of jobs for land losers. • Proper measures to be adopted to avoid drainage problem during construction of road	• Proposed widening and strengthening of road will provide better level of service in terms of improved riding quality and smooth traffic flow. • There will be considerable reduction in terms of pollution and accidents. • Accessibility to health and education will increase. • Employment will be generated for local population during construction. • The discussion generated awareness among local population. • Better road will improve public transportation system and reduce congestion. • Non-title holders will also be compensated as per ADB guidelines. • Drainage is proposed in built up as well as rural area. • Road safety features like signages, delineators, pavement markings, road illumination have been incorporated in design. • Proper rehabilitation measure will be taken and compensation as per market rate.	14
2	**Date:** 08/07/2014 **Village**: Mudra			24
3	**Date:** 08/07/2014 **Village** Basiya gaod			15

184. Most of the people interviewed were well aware of the environmental conditions in and around their villages. A major percentage was ignorant about any deterioration in the air and noise quality due to expansion of existing highway. However, their major concern was related to the loss of fertile agricultural land. The villagers are quite enthusiastic about the proposed project as it will give fillip to rural economy and present them many employment opportunities during construction of project road. Overall positive approach towards the project is observed.

C. Results of Consultation with Local People

185. Most of the people interviewed strongly support the project. The people living in the entire project area expect the different project elements to facilitate transport, employment, tourism, boost economic development and thereby provide direct, or indirect, benefits to them. In order to access the existing environment and likely impacts on surrounding population, an interview survey was carried out. A sample of the population was interviewed through a designed questionnaire. Precaution has been exercised during the survey to ensure that the sample interviewed is truly representative of the affected groups and the questions are worded so as not to generate a bias response.

186. It is observed from the interview survey that there is increased environmental awareness among the people. It can also be seen from Table 6.3 that about most of the persons are in the opinion that an environmental condition of the area is not good due to bad conditions of road specifically for air & noise. Poor road condition and vehicular emissions are the major sources they feel responsible for this. People are not fully aware about presence of archaeological, historical and cultural sites. There is no major history of natural disasters in the region and local people have mixed response about natural disasters. Overall, the general environmental awareness in the region are good and people have increased environmental awareness. Table 34 shows the result of public opinion survey carried out in the region.

Table 34: Peoples' Perception about Environmental Scenario

Sr. No.	Question asked about	No. of people interviewed	Positive response (%)	Negative response (%)	No response (%)
1	Water quality of rivers, ponds, wells, and canals	53	68	20	12
2	Noise quality of the area	53	53	17	30
3	Air quality of the area	53	77	16	7
4	Archaeological sites	53	40	55	5
5	Natural disaster	53	15	75	10
6	Rare species of animals and birds found	53	32	45	23
7	Cultural sites i.e. market, melas	53	80	14	6

Note: Positive response shows that the people have awareness regarding environmental scenario

D. Conclusion and Recommendation

187. Overall, most of the people interviewed strongly support the project. The people living in the entire project area expect the different project elements to facilitate transport, employment, tourism, boost economic development and thereby provide direct, or indirect, benefits to them. Construction camps may, however, put stress on local resources and the infrastructure in nearby communities. In addition, local people raised construction-process related grievances with the workers. This sometimes leads to aggression between residents and migrant workers. To prevent such problems, the contractor should provide the construction camps with facilities such as proper housing, health care clinics, proper drinking water and timely payment. The use of local laborers during the construction will, of course, increase benefits to local peoples and minimize these problems. Wherever possible, such people should be employed.

188. The following are the Consultants' initial findings in regard to likely positive and negative impacts.

1. Positive Impacts

(i) The improved road: will reduce travel times, fuel consumption and emissions
(ii) from base traffic volumes
(iii) Drainage conditions will be considerably improved: this because of the
(iv) provision of improved side drains, culverts and causeways;
(v) Economic development and access will be stimulated
(vi) Health, Agricultural and Education facility will improve

2. Negative Impacts

(i) Few tree loss which reduce the green cover but simultaneously plantation will take place to improve the green cover.
(ii) Minor deteriorations in the present minimum levels of air, water and noise quality may be expected during construction- but this should be short-term and localized – in order to minimize the impacts, the mitigation measures recommended
(iii) During construction the traffic will slow and messy.

189. On the basis of available information, field visits over the entire length of the project road, discussions with the project authorities; other discussions amongst the project team, NGOs, local people and various governmental officials, it has been concluded that overall:

(i) All elements of the projects will be beneficial;
(ii) All negative impacts, during and post construction, including those deemed “significant” can be properly mitigated; and
(iii) No comprehensive, broad, diverse or irreversible adverse impacts have been identified.

VII. ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM

190. The environmental impacts associated with any development project are eliminated or minimized to an acceptable level through development of appropriate mitigation measures based on most suitable techno-economic options. The Environmental Management Plan (EMP) is a well-established tool to ensure effective implementation of the recommended mitigations measures throughout the subsequent project development stages. The EMP also ensures that the positive impacts are conserved and enhanced. An EMP provides location and time specific actions to be taken with defined responsibility. It also provides measures for institutional strengthening and effectiveness assessment through defined monitoring plan, reporting and corrective & preventive action planning.

A. Environmental Management Plan

191. The B-J Road specific Environment Management Plan has been formulated which consists of a set of mitigation; monitoring and institutional measures applicable to design, construction and operation stages of the project (Appendix 3). The components of this EMP includes (i) mitigation of potentially adverse impacts (ii) monitoring of impacts and mitigation measures during project implementation and operation (iii) institutional capacity building and training (iii) compliance to statutory requirements (iv) integration of EMP with project planning, design, construction and operation.

B. EMP Implementation Schedule

192. The EMP provided at Appendix 3 provides measures. However, specific mention is made for location specific measures. The package specific EMP costs are separately assessed. These EMP will form part of bidding document as well. The construction period for B-J Road is considered as 18 months from the date of start of construction.

C. Emergency Response Plan

193. Assessment of nature, type and extent of project activities establishes that this project may have only one environmental emergency i.e. accidents on paved roads and consequent spillage due to damage of oil tank of the vehicle. It is suggested to develop a communication and response system to minimize the response time. The project authorities shall be prepared to counteract against such emergency either by developing in-house capabilities or by associating with any competent agency.

D. Environmental Monitoring Plan (EMoP)

194. The purpose of the environmental monitoring program is to ensure that the envisaged objectives of the project are achieved and result in desired benefits. To ensure the effective implementation of the mitigation measures and Environmental Management Plan (EMP), it is essential that an effective monitoring program be designed and carried out. The board objectives of environmental monitoring plan are:

(i) To evaluate the performance of mitigation measure proposed in the EMP,
(ii) To evaluate the adequacy of Environmental Assessment
(iii) To suggest improvements in management plan, if required,
(iv) To assess change in environmental quality,

195. A comprehensive monitoring plan has been prepared for all stages of the project and provided as Appendix 4. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibility for implementation and supervision. The monitoring programme is designed focusing monitoring during construction and operation stage both with following monitoring and budgeting responsibility:

(i) Construction Stage: (three years of construction period)
(ii) Monitoring to be carried out by construction supervision consultant (CSC). The costs to form part of CSC budget.
(iii) Six Monthly monitoring by external agency to be arranged by PIU ADB from Project cost budget. This report will be directly submitted by agency to MPRDC.

196. Monitoring Programme and schedule for Key Performance Indicators (Physical, biological and environmental management components identified as of particular significance) are given at the following section:

1. Ambient Air Quality (AAQ) Monitoring

197. Ambient air quality parameters recommended for road transportation developments are Fine Particular Matter (PM2.5), Respirable Particular Matter (PM10), Carbon Monoxide (CO), Oxide of Nitrogen (NOx) and Sulphur Dioxide (SO2). These are to be monitored at designated locations starting from the commencement of construction activities. Data should be generated twice in a week at all identified locations in accordance to the National Ambient Air Quantity Standards (Appendix 5). The locations and environmental parameters to be monitored are detailed out in the Environmental Monitoring Plan (Appendix 4).

2. Water Quality Monitoring

198. The physical and chemical parameters recommended for analysis of water quality relevant to road development project are pH, total solids, total dissolved solids, total suspended solids, and oil & grease. The monitoring of the water quality is to be carried out at all identified locations in accordance to the Indian Standard Drinking Water Specification – IS 10500 (Appendix 6). The locations, duration and the pollution parameters to be monitored are detailed in the Environmental Monitoring Plan (Appendix 4).

3. Noise Levels Monitoring

199. The measurements for monitoring noise levels would be carried out at designated locations in accordance to the ambient Noise Standards formulated by Ministry of Environment and Forests (MoEF) as given (Appendix 7). Noise level would be monitored on twenty-four hours basis. Noise should be recorded at “A” weighted frequency using a slow time response mode of the measuring instrument. The measurement location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan (Appendix 4).

4. Tree Plantation

200. The 75% survival rate of re-plantation shall be monitored on the first year of the operation phase. If the survival rate is found below 70%, additional compensatory plantation shall be carried out by agency responsible for plantation and maintenance. The survival rate

monitoring shall be again taken up after 1 year again. This cycle should continue until the 70% survival rate is achieved. Since tree plantation would be made through forest department, monitoring would be carried out through MPRDC.

5. Soil Erosion and Drainage Congestion

201. No significant soil erosion problem is anticipated due to the project either in the construction phase or in the operation phase. However, in the construction phase, some localized soil erosion may be noticed owing to construction activities. However, if soil erosion is noticed during construction and operation phase, the corrective action shall be initiated and frequency of check be increased to assess the tendency of occurrence.

E. Institutional Setting and Proposed Implementation Arrangement

202. The Executing Agency for the project will be GoMP through MPRDC. MPRDC is wholly owned by GoMP and has been equipped with adequate capacity to implement the project. The implementation arrangements basically follow the ongoing MPSRSP-II. A General Manager (GM) at MPRDC headquarter has been designated as person in charge for project implementation. The Environmental and Social cell at MPRDC headquarters, reporting to the General Manager, will be responsible for ensuring compliance with environmental and social safeguards of project roads. MPRDC has seven division offices (Bhopal, Jabalpur, Sager, Gwalior, Ujjain, Indoor, and Rewa) acting as Project Implementation Units (PIUs), each headed by a Divisional Manager (Tech.) will be responsible for project road implementation in the field. Each PIU will be responsible for one to two contracts depending on the location of the sub projects, and one project manager will be assigned for each contract package. The project manager will be delegated adequate technical and administrative authority for expeditious project implementation. MPRDC will engage Construction Supervision Consultants to act as the engineer for the construction contracts. An environmental specialist from the CSC will provide technical support to the environment expert. An external monitor will conduct periodic external monitoring of EMP implementation. Environmental awareness and EMP implementation training will be held for MPRDC staff, contractors and CSC.

203. The six monthly monitoring proposed to be arranged through external agency will also relate to compliance with construction contracts, effectiveness of mitigation measures, and complaints (also known as project performance monitoring), and the state and health of nearby environmental resources (also known as ambient environmental monitoring).

204. Monitoring during operation shall be conducted for initial three years (once a year basis) as part of CSC contract and budget. Thereafter it will be done on an as-needed basis depending on the design or change in project activity.

1. MPRDC’s Responsibilities

- Ensure that Project complies with ADB's SPS and GOI’s laws and regulation
- Ensure that the project complies with all environment safeguard requirements as given in this EARF
- Prepare IEE reports including EMP as may be required and hire an environmental consultant as required
- Prepare the Rapid Environmental Assessment screening checklist and forward this checklist to ADB for evaluation and confirmation of the project category;

- Based on the confirmation of the environmental categorization of the subprojects, prepare TORs to conduct IEE studies including preparation of EMP and Environmental Monitoring Plan in accordance with the environmental policy principles and safeguard requirements under the ADB SPS;
- Ensure that the preparation of environmental studies will be completed with meaningful consultations with affected people and other concerned stakeholders, including civil society throughout the project preparation stages as required by the ADB SPS
- Undertake initial review of the IEE and EMP reports to ensure its compliance with the Government's and ADB's requirement;
- Review the budgetary needs for complying with the Government's and ADB's requirements on environment safeguards
- Obtain necessary consents or permissions (e.g. environment permission, forest clearance) from relevant Government Agencies to minimize risks to the environment and mitigate environmental impacts associated. Also ensure that all necessary regulatory clearances will be obtained prior to commencing any civil work of the subproject;
- Submit to ADB the final IEE including EMP reports with consent letter for disclosure of the report on the ADB website
- Ensure that the EMP which includes required mitigation measures and monitoring requirements forms part of bidding document after seeking concurrence from ADB. EMP items may be included in the Bill of Quantities (BOQ) as necessary. For example if a subproject is required to construct noise barriers, the costs will need to be included in the BOQ;
- Ensure that contractors have access to the IEE report including EMP of the subprojects;
- Organize training and awareness programs on implementation of environment safeguards for relevant staff of MPRDC, PIU, CSC and contractors
- Ensure that contractors understand their responsibilities to mitigate environmental problems associated with their construction activities
- Ensure and Monitor that the EMP including Environmental Monitoring Plan will be properly implemented;
- In case of unanticipated environmental impacts during project implementation stage arrange to prepare and implement an updated EMP to account for such impacts after seeking concurrence from ADB. The updating shall be carried out after due consultation with the stake holders;
- In case during project implementation a subproject needs to be realigned, review the environmental classification and revise accordingly, and identify whether supplementary IEE study is required. If it is required, prepare the TOR for undertaking supplementary IEE and hire an environment consultant to carry out the study;
- Ensure that construction workers work under safe and healthy working environment in accordance with the World Bank EHS guidelines relating to occupational health and safety;
- Ensure effective implementation of Grievance Redress Mechanism to address affected people's concerns and complaints, promptly, using understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people;
- Submit semi-annual monitoring reports for all sub-projects on the implementation of EMPs to ADB for disclosure on the ADB website.

- Ensure proper implementation of corrective action plan if identified in the monitoring report; and
- Disclose information as defined in this EARF.

2. PIU Responsibilities

- Ensure that Project complies with ADB's SPS and GOI's laws and regulations
- Ensure that the project complies with all environment safeguard requirements as given in this EARF
- Obtain necessary consents or permissions (e.g. forest clearance, no objection certificate) from relevant Government Agencies. Also ensure that all necessary regulatory clearances will be obtained prior to commencing any civil work of the subproject;
- Ensure that contractors have access to the IEE report including EMP of the subprojects;
- Ensure that contractors understand their responsibilities to mitigate environmental problems associated with their construction activities
- Participate in training and awareness programs on implementation of environment safeguards and organize further on the job or subject specific training for the contractor during project implementation as necessary with the support of the CSC environmental specialist;
- Conduct regular on site monitoring to ensure proper implementation of the EMP including Environmental Monitoring Plan;
- Verify and approve monitoring checklists and/or reports that will be prepared and submitted by the CSC;
- In case of unanticipated environmental impacts during project implementation stage, identify the need to prepare and implement an updated EMP to account for such impacts after seeking concurrence from ADB;
- Ensure that construction workers work under safe and healthy working environment in accordance with the World Bank EHS guidelines relating to occupational health and safety;
- Ensure effective implementation of Grievance Redress Mechanism in accordance with the steps given in figure 1 to address affected people's concerns and complaints, promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people;
- Ensure timely submission of semi-annual monitoring reports for all sub-projects on the implementation of EMPs to MPRDC for further submission to ADB for disclosure on the ADB website; and
- Ensure proper implementation of corrective action plan if identified in the monitoring report.

3. CSC Responsibilities

- Ensure that Project complies with ADB's SPS and GOI's laws and regulations;
- Ensure that the project complies with all environment safeguard requirements as given in this EARF;
- Provide necessary technical advice and support to the PIU and/or contractor to obtain consents or permissions (e.g. forest clearance, no objection certificate)

from relevant Government Agencies. Also ensure that all necessary regulatory clearances will be obtained prior to commencing any civil work of the subproject;

- Ensure that contractors have access to the IEE report including EMP of the subprojects;
- Ensure that contractors understand their responsibilities to mitigate environmental problems associated with their construction activities;
- Closely coordinate and communicate with the contractor to facilitate implementation of all mitigation measures identified in EMP;
- Conduct training and awareness programs on implementation of environment safeguards for MPRDC, PIU and the contractors during the pre-construction stage and further organize on the job or subject specific training for the contractor during project implementation as necessary;
- Conduct regular on site monitoring to ensure proper implementation of the EMP including Environmental Monitoring Plan;
- Prepare monitoring checklists and/or reports based on the site monitoring and submit them to the PIU for approval;
- In case of unanticipated environmental impacts during project implementation stage, upon the advice from the PIU and/or MPRDC prepare an updated EMP to account for such impacts after seeking concurrence from ADB;
- Ensure that construction workers work under safe and healthy working environment;
- Facilitate effective implementation of the Grievance Redress Mechanism in accordance with the steps given in figure 1 to address affected people's concerns and complaints, promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people;
- Prepare semi-annual monitoring reports for all sub-projects on the implementation of EMPs for submission to PIU and MPRDC and further submission to ADB for disclosure on the ADB website.

4. Contractor's Responsibilities

- Ensure that adequate budget provisions are made for implementing all mitigation measures specified in the EMP;
- Participate in training and awareness programs on implementation of environment safeguards;
- Identify further needs for conduction of on the job or subject specific training during project implementation by the CSC or MPRDC or PIU;
- Obtain necessary environmental permission etc. from relevant agencies as specified by EARF for project road works, quarries, hot-mix plant etc. prior to commencement of civil works contracts;
- Implement all mitigation measures as given in the EMP in the contract documents;
- Ensure that all workers, site agents, including site supervisors and management participate in training sessions organized by the PIU, MPRDC or CSC;
- Ensure compliance with environmental statutory requirements and contractual obligations;
- Respond promptly to grievances raised by the local community or any stakeholder and implement environmental corrective actions or additional

environmental mitigation measures as necessary;
- Based on the results of EMP monitoring, cooperate with the PIU and CSC to implement environmental corrective actions and corrective action plans, as necessary.

5. ADB's Responsibilities

- Review REA checklist and endorse or modify the project classification proposed by the MPRDC;
- Review IEE reports, including this environmental assessment and review framework, and disclose draft and final reports through ADB's website as required;
- Issue subproject's approval based on the respective IEE reports;
- Monitor implementation of environment safeguard requirements under the project through due diligence missions;
- Provide assistance to MPRDC, if required, in carrying out its responsibilities for implementing environment safeguards and for building capacity for safeguard compliance;
- Review and approve semi-annual environmental monitoring reports submitted by MPRDC and disclose them on the ADB website;
- Monitor MPRDC's commitments under EARF

F. Institutional Capacity Building

205. Training and Awareness: MPRDC have been managing its environmental and social obligation through Sr manager (environment & social) who report to GM .Following training and awareness programme is proposed:

(i) Awareness programme on environmental issues associated with construction and improvement of road projects and legislative compliance requirements.
Target audience: designated engineers from field units, contractor's
Faculty: Environmental Expert and Environment Expert of CSC.
No of Programmes: Minimum one per contract package

(ii) EMP and EMoP implementation requirements, its benefits and roles of different level and functions.
Target audience: designated engineers from field units, contractor's officials, and key workers, other officials of MPRDC associated for the project.
Faculty: EE and Environment Expert of CSC.
No of Programmes: Minimum one per contract package

G. Grievance Redress Mechanism

206. Grievances related to the implementation of the project, particularly regarding the environmental management plan will be acknowledged, evaluated, and responded to the complainant with corrective action proposed. The outcome shall also form part of six monthly compliances report to ADB. Complaints maybe lodged verbally directly to the contractor or CSC or PIU at the site level. To the extent possible efforts will be made by the contractor, CSC or PIU to address these complaints immediately on site. Only those complaints that cannot be addressed immediately at the site level will be submitted to the Grievance Redress Committee

(GRC). Necessary assistance for completing the complaint form or lodging a written complaint will be made to illiterate complainants by the respective receiver of the complaint. Grievance Redress Committee (GRCs) should be established at the MPRDC state level and PIU level to assure accessibility for APs .The GRCs are expected to resolve the grievances of the eligible persons within a stipulated time. The decision of the GRCs is binding, unless vacated by the court of law. The GRC will be constituted at MPRDC level and at the PIU level.

207. The State level GRC will comprise of the:

(i) General Manager, MPRDC, Bhopal
(ii) Superintended Engineer, PWD, Bhopal
(iii) DGM, MPRDC, Bhopal
(iv) Manager (Environment & Social), MPRDC, Bhopal

208. The PIU level GRC will comprise of the:

(i) Divisional Manager
(ii) A representative from local NGOs or a local person of repute and standing in the society, elected representative from Zila Parisad /District Council.
(iii) Two representatives of affected persons including vulnerable groups and women in the committee.

209. The GRC will continue to function, for the benefit of the APs, during the entire life of the project including the five year maintenance period. The following flow chart defines the process of GRM. The details of GRM, procedures and formats in local language i.e. Hindi are provided in Appendix-9.

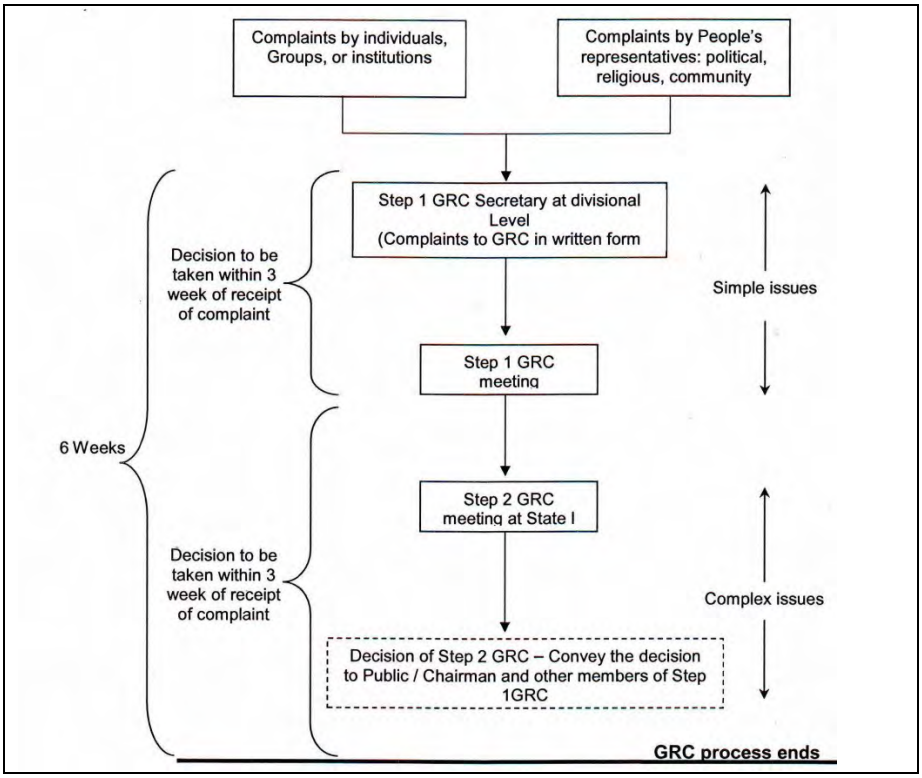


Figure 8: GRM Process

H. Cost for Environmental Management Plan, Training and Environmental Monitoring

210. The cost of environment management, monitoring & training programme is given below.

Table 35: Environment Management, Monitoring and Training Programme Costs

S. No.	Parameters / Components	Parameter to be monitored	Guidelines	Unit Cost	Total Cost (Rs.)
1	Ambient Air Monitoring: 3 times in a year for 3 years or construction period at 3 sites	PM10, PM2.5, SO2, NOx & CO	High Volume samplers to be used and located 50 m from the construction site	9000/-	243000/-
2	Water Monitoring: 3 times in a year for 3 years or construction period At 3 locations	PH, BOD, COD, DO, TDS, MM, NO3 and Coliform	Analyse as per the standard methods for examination of water and waste water	5000/-	135000/-
3	Noise Monitoring: 3 times in a year for 3 years or construction period, 3 locations	Noise levels on dB (A) scale	Using an integrated noise level meter kept at a distance of 15 m from the construction site	3000/-	81000/-
	Total Monitoring Cost				**459000/-**
4.	Opening, running and restoration of stone quarry/sand extraction pits along the entire project length		IRC Code of Practice and MoSRT&H manual	LS	Engineering cost
5.	Gabion walls (above height 4 m) along elevated embankment		IRC Code of Practice and MoSRT&H manual	LS	Engineering cost
6.	Dust Suppression along the entire project length Two tankers in a days for 240 Days		IRC Code of Practice and MoSRT&H manual	Rs2000/- per day per tanker	960000/-
7.	Solid Waste management during entire project period		As per MoEF guidelines	3000/ month	108000/-
8.	Erosion Control Measures (Turfing / Pitching / Seeding & Mulching) Provision of Cross drainage & side drainage structures General Borrow area management and maintenance of haul roads related to borrow areas Air/noise pollution control measures in construction equipment Management and disposal of scarified waste bituminous material Provision of Informatory Signs Bus shelters Construction of Speed Humps Management of quarries Redevelopment of Borrow Areas Construction Camp Management Costs Safety measures for workers		As per IRC Guidelines	Shall be included in contractor's quoted rates	Engineering cost
	Total Mitigation Cost (B)				**1068000/-**
9.	Training, Three training sessions during construction period.		As per modules developed by MPRDC	50000 per session	150000/-
	Total Training Cost (C)				**150000/-**
	Total Environmental Cost (A+B+C)				**1677000/-**

VIII. CONCLUSIONS AND RECOMMENDATIONS

211. The assessment of environment impacts for the sub-project shows that there are no significant, long term impacts. Most impacts are short term and limited to the construction stage. Key conclusions on the environmental implications of the project are given in the paras below.

A. Environmental Gains Due to Proposed Work Justifying Implementation

212. The project entails various impacts on the project setting. There are many impacts bearing benefits to the area against the limited number and magnitude of negative impacts. These include the following: (i) the project will substantially improve the transport efficiency on the roads. (iii) the project once implemented will improve the overall environmental conditions with better roads, fuel efficiency and environmental protection measures (iv) will reduce traffic congestion particularly at junctions hence, air pollution due to idling of the vehicles.

B. Potential Impacts and Mitigation

213. The finding of IEE indicates that project is unlikely to cause any significant adverse environmental impacts. While some of the impacts are negative, there are many bearing benefits to the area. Most of the impacts are likely to occur during construction stage and are temporary in nature. Anticipated minor impacts will be mitigated through the implementation of mitigation measures summarized in the Environmental Management Plan.

214. Factors contributing to minimal impacts include, widening of the project road confined within the available RoW, presence of no sensitive environmental issue like wildlife sanctuary, national park, bio reserve, with 10 km from the project road and most of water body crossed by the road are non-perennial in nature except one which is already bridged. However, some of the impacts are unavoidable. These impacts with mitigation measures are indicated below:

(i) About 46 trees need be cut with prior permission of district or forest authorities. Compensatory Tree plantation on the basis of 1:10 will be made to compensate this loss. Preventive measures shall be taken into consideration during construction phase especially in rainy months, to prevent soil erosion because of tree cutting and alteration of ground flora.

(ii) Air Pollution due to construction activities and operation of hot mix plant will be controlled through adoption of dust suppression measures and provision of high stack for good dispersion of gaseous emission from hot mix plant.

(iii) Noise levels may increase during the construction phase due to operation of construction machineries. All the construction equipment and DG set will be well maintained and fitted with silencers.

(iv) Waste materials generated during construction phase may contaminate soil, surface and ground water resources. Waste shall be segregated and reused or disposed off in environmentally acceptable manner.

(v) Along the project stretch, few religious structures are located. Appropriate design options are exercised to minimize the loss of such structures.

(vi) The social issues are addressed through Social management plans as per SPS of ADB.

C. Irreplaceable Resources

215. The project does not pass through any protected areas, or eco sensitive areas. The construction material will also be sourced from identified and approved sources. As such, there are no environmental sensitive resources found in the project area, which is likely to be affected due to the project.

D. Post IEE Surveillance and Monitoring

216. While an IEE is meant to provide a comprehensive understanding of the environment status of the area under the study, post IEE surveillance is the means to ensure that the significant impacts identified are adequately mitigated as per the proposed mitigation plan. A detailed monitoring plan has been provided as part of the Environmental Management Plan. Air, water quality, noise, soil erosion, and tree survival rate monitoring and reporting along with the follow up actions in case of deviation from the norms have been detailed out. The frequency has been set in consideration of the likely impacts.

E. Public Consultations

217. The project received support and consent from most of local people. The local people did not perceive any adverse impact due to the proposed project. Environmental awareness and likewise concern were found generally low. People, however expressed the desire of minimizing the tree cutting.

F. Recommendations

218. Effective EMP implementation is essential for elimination or minimization of the identified impacts. The MPRDC shall ensure that EMP and EMoP is included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. The same shall be revised if necessary during project implementation or if there is any change in the project design.

219. MPRDC needs capacity building and practical exposure. Adequate training shall be imparted as proposed under environmental management plan to enhance the capability of concerned EA office.

APPENDIX 1: RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country / Project Title:	India: Madhya Pradesh District Connectivity Sector Project: **Subproject : Bandri-Jaruwakheda (MDR) Road**
Sector Division:	South Asia Transport and Communications Division

Screening questions	Yes	No	Remarks
A. Project Siting			
Is the project area adjacent to or within any of the following environmentally sensitive areas?			
Cultural heritage site		X	No archaeologically protected monument or cultural heritage site is located within the road.
Protected Area		X	No protected area is located close to roads and nearby.
Wetland		X	No protected or classified wet land is located close to the Project area.
Mangrove		X	Project road is not located in Coastal areas.
Estuarine		X	No Estuarine is located in the Project area.
Buffer zone of protected area		X	No such area is located in the Project vicinity.
Special area for protecting biodiversity		X	No such area is located in the project vicinity.
B. Potential Environmental Impacts			
Encroachment on historical/cultural areas; disfiguration of landscape byroad embankments, cuts, fills, and quarries?		X	The topography of project road is mainly plain. There is no encroachment of historical places. However, some small temples exist along the project road which may get impacted. Since road widening will be confined to available ROW, no change in landscape is expected. Opening of new Quarries is not envisaged. Only operational and licensed quarry will be used for road construction. Earth material will be sourced from pre identified areas (located within 25 to 30 Km from the road) and with the consent of landowner. All borrow areas will be suitably rehabilitated.

Screening questions	Yes	No	Remarks
Encroachment on precious ecology (e.g. Sensitive or protected areas)?		X	There is no National Parks, Wild Life sanctuaries or any other similar eco-sensitive areas in and around the project area. Only cutting of 46 roadside trees is involved. Attempts have been made to minimising the cutting of trees while finalising the road widening options.
Alteration of surface water hydrology of waterways crossed byroads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		X	The proposed alignment is crossing only small natural drains. All drainage courses will be maintained to avoid alteration in surface water hydrology so that water courses are not affected. The temporary soil stockpiles will be designed so that runoff will not induce sedimentation of waterways. Silt fencing during construction will be provided.
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		X	Adequate sanitary facilities including Soak pits treatment facilities will be provided at construction camps, which will be set-up away from habitat and water bodies. No harmful ingredients are likely to be used in the construction activities. Surface water quality is not impacted due to construction. Measures like embankment slop stabilisation, RCC retaining walls are proposed to prevent siltation of ponds located next to the road due to surface runoff.
Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	X		Localised air pollution level is likely to increase for short duration during construction period due to construction vehicle movement and asphalt processing. The asphalt mixing plant (hot mix plant) will be located away from habitat areas with adequately high stack for effective dispersion of likely emissions. Dust separation measures like spraying of water on unpaved vehicle movement areas are proposed to minimise the dust generation.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical biological and radiological hazards during project construction and operation?	X		Workers may get exposed to dust and noise during construction activities. However the exposure levels are likely to be short and insignificant. Workers will be provided requisite PPEs to minimise such exposure and associated harmful occupational health effects. Traffic on the road is expected to below and as such, no occupational health hazard is anticipated during operation phase.
Noise and vibration due to blasting and other civil work?		X	No blasting is involved. No significant noise generation is expected during construction activities except normal construction equipment operational noise. These noise levels will be impulsive in nature and its impact will be confined within few meters of either side of the road. All stationary noise making sources equipment like DG set, compressors will be installed with acoustic enclosures. There are few noise sensitive locations especially schools close to the alignment where noise level may increase due to increased traffic during operation stage. Provision of no horn zone will be made wherever noise level is likely to increase beyond the prescribed ambient noise levels.

Screening questions	Yes	No	Remarks
Dislocation or involuntary resettlement of people		X	The project road will be widened within existing Row. The project affected persons are also expected to be very less. This aspect will be addressed as per Government rules and ADB's Social Safeguard Policies (SPS09) separately in a Resettlement Plan.
Dislocation and compulsory resettlement of people living in right-of- way?		X	No displacement of people involved.
Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	No such impact is anticipated.
Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	X		No such social concern is expected. Concern may arise during construction stage due to increase in ambient air pollution level, which is expected to be localised and temporary in nature. This aspect will be effectively controlled with the proposed dust suppression and other mitigation measures. As such people at large are supportive of project and are least bothered about above air pollution concern as well.
Hazardous driving conditions where construction interferes with existing roads?	X		Hazardous driving condition may arise around bridge construction areas and at locations of road interface with non-project roads. To minimize the impact, suitable traffic management plan will be designed and implemented by the contractor to prevent any hazardous driving condition in above situations.
Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	X		Proper provisions for sanitation (sewage treatment), health care (drinking water supply) and periodic health check-ups) and solid waste disposal (through composting) facilities will be made at each construction camp. Awareness will be created amongst the workers about hygiene and health protection.
Creation of temporary breeding habitats for mosquito vectors of disease?		X	No such condition is anticipated. Each borrow area will be rehabilitated as per pre agreed used and rehabilitation plan
Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic material sand loss of life?	X		Adequate safety measures will be adopted to avoid accidents during construction and operation stages. Measures, like signage, speed control, crash barriers will be taken close to sensitive locations such as schools, temples or hospitals.
Increased noise and air pollution resulting from traffic volume?	X		Increase in noise and air pollution is expected during construction phase but is likely to be confined within few meters of either side of the road. Adequate mitigation measures will be adopted to minimise the same. During operation phase vehicular traffic will be the main source of air and noise pollution. Improved road conditions, extensive plantation including multi-layered plantation along the road will reduce the noise and air pollution impact. Moreover, most of the road stretch passes through open agricultural land, which will provide adequate dispersion to vehicular emission.

Screening questions	Yes	No	Remarks
Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	X		This possibility is minimal but cannot be ruled out. Controlled construction activities and proper drainage system will reduce this possibility. Provision is made for adequate signage and crash barriers near water bodies, which will minimise the possibilities of accidental water pollution.
Social conflicts if workers from other regions or countries are hired?		X	Most of the workers will be hired locally.
Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and Sanitation systems)?		X	Most of the workers will be hired locally. One construction camp is proposed per package with expected workers population of only 60-70. This is unlikely to cause any significant burden on social infrastructure and services.
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		X	The construction material (aggregate from approved quarries, borrow earth, bitumen) will be sourced from nearby and approved sources. No explosive or chemicals are likely to be used. Bitumen waste if any generated during construction will either recycled or disposed off in controlled manner.
Community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning		X	No such impacts are anticipated. Adequate awareness will be created amongst people and workers through information disclosure, safety signage and public consultation about safety aspects.
Based on above assessment and the project is **categorized as 'B'**			

APPENDIX 2: GUIDELINES FOR BORROW AREAS MANAGEMENT

A. Selection of Borrow Areas

1. Location of borrow areas shall be finalized as per IRC: 10-1961 guidelines. The finalization of locations in case of borrows areas identified in private land shall depend upon the formal agreement between landowners and contractor. If, agreement is not reached between the contractor and landowners for the identified borrow areas sites, arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environment requirements in respect of excavation and borrow areas as stipulated from time to time by the Ministry of Environment and Forests, Government of India, and local bodies, as applicable shall be the sole responsibility of the contractor. The contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations.

(i) The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available.
(ii) The borrow pits preferably should not be located along the roads.
(iii) The loss of productive and agriculture soil should be minimum.
(iv) The loss of vegetation is almost nil or minimum.
(v) The Contractor will ensure that suitable earth is available.

B. Contractor's Responsibility

2. The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer. It shall be ensured that the sub-grade material when compacted to the density requirements shall yield the design CBR value of the sub-grade. Contractor shall begin operations keeping in mind following;

(i) Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plants is operating at the place of deposition.
(ii) No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from the site to suit his operational procedure, then shall make consequent deficit of material arising there from.
(iii) Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.
(iv) The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants are siting of temporary buildings or structures.

C. Borrowing From Different Land-Forms

1. Borrow Areas located in Agricultural Lands

(i) The preservation of topsoil will be carried out in stockpile.
(ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
(iii) Borrowing of earth will be carried out up to a depth of 1.5m from the existing ground level.
(iv) Borrowing of earth will not be done continuously throughout the stretch.
(v) Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
(vi) Small drains will be cut through the ridges, if necessary, to facilitate drainage.
(vii) The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).
(viii) The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

2. Borrow Areas located in Elevated Lands

(i) The preservation of topsoil will be carried out in stockpile.
(ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
(iii) At location where private owners desire their fields to be levelled, the borrowing shall be done to a depth of not more than 1.5m or up to the level of surrounding fields

3. Borrow Areas near River Side

(i) The preservation of topsoil will be carried out in stockpile.
(ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
(iii) Borrow area near to any surface water body will be at least at a distance of 15m from the toe of the bank or high flood level, whichever is maximum.

4. Borrow Areas near Settlements

(i) The preservation of topsoil will be carried out in stockpile.
(ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
(iii) Borrow pit location will be located at least 0.75 km from villages and settlements. If un-avoidable, the pit will not be dug for more than 30 cm and drains will be cut to facilitate drainage.
(iv) Borrow pits located in such location will be re-developed immediately after borrowing is completed. If spoils are dumped, that will be covered with a layers of stockpiled topsoil in accordance with compliance requirements with respect MOEF/SPCB guidelines.

5. Borrow Pits along the Road

2. Borrow pits along the road shall be discouraged and if deemed necessary and permitted by the Engineer; following precautions are recommended

(i) The preservation of topsoil will be carried out in stockpile.
(ii) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
(iii) Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
(iv) Small drains shall be cut through the ridges of facilitate drainage.
(v) The depth of the pits shall be so regulated that there bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of bank, the maximum depth of any case being limited to 1.5m.
(vi) Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10m.

6. Rehabilitation of Borrow Areas

(i) The objective of the rehabilitation programme is to return the borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit floor to approximately the access road level.
(ii) Re-development plan shall be prepared by the Contractor before the start of work in line with the owners will require and to the satisfaction of owner. The Borrow Areas shall be rehabilitated as per following;
(iii) Borrow pits shall be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation sloped will be smoothed and depression will be filled in such a way that it looks more or less like the original round surface.
(iv) Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such borrow area will be photographed after their post use restoration and Environment Expert of Supervision Consultant will certify the post use redevelopment.
(v) The Contractor will keep record of photographs of various stages ***i.e***., before using materials from the location (pre-project), for the period borrowing activities (construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.

APPENDIX 3: ENVIRONMENTAL MANAGEMENT PLAN

Environmental Issue/	Remedial Measure	Reference to laws	Location	Time Frame	Mitigation Costs	Implementation	Supervision
A. Pre-construction and Design Stage							
1. Alignment							
1.1 Pavement damage and inadequate drainage provisions in habitat areas	• Selection of suitable pavement design in habitat areas considering alignment level and drainage. • Raise road level above the nearby areas with provision of adequate side drains to evacuate the rain water and domestic discharges (drained by habitats occasionally) to prevent damage to road and rain water entry to habitats' houses. • Provision of adequate no. of cross drainage structures			During the design stage	Included in construction cost	Design Consultant	MPRDC (SQC)
1.2 Safety along the proposed alignment	• Make provisions of crash barriers at accident prone areas • Provision of rumble strips in habitat areas to regulate speed. • Provision of retro-reflective warning sign boards near school, hospital, religious places and forests areas. • Provision of walk area along the road near habitat areas, school, hospital, religious places and forests. • Compliance with norms specified in IRC codes for state highway for curvature and grading.	Design requirement	All Ghat portions and places where height of embankment is more than 3.0m	During the design stage	Included in construction cost	Design Consultant	MPRDC (SQC)

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
2. Natural Hazards								
2.1 Protection for damage from earthquake	• Design considering relevant IRC guidelines for earthquakes in bridges.		Throughout the stretch	Incorporation of IRC guidelines for earthquake in bridge design	Review of bridge design	Project preparation Cost	Design Consultant	MPRDC (SQC)
2.2 Protection of road embankment in flood prone areas	• Raise embankment height above the HFL levels in the flood prone areas. • Provision of adequate balancing culverts. • Improvement in existing culverts/Bridges to increase the carrying capacity.	IRC:34 Recommendations for road construction in water logged area and IRC:75and MORT&H guidelines for Design of High Embankments	All the existing culverts/ bridges	Design of both cross & side drains, no. of slab/box culverts, no & size of Hume pipes		Included in construction cost	Design Consultant	MPRDC (SQC)
3. Shifting of utility structures								
3.1 Disruption of utility services to local community	• All telephone and electrical poles/wires and underground cables should be shifted before start of construction. • Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services.	Project requirement	Throughout the corridor	Utility shifting plan Complaints from local people	Interaction with concerned utility authorities	Included in construction	Contractor/SQC	MPRDC (SQC)/CSC

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	• Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any.			Status of local utility services	and local public			
B. Construction Stage								
1. Air Quality								
1.1 Dust generation due to construction activities and transport, storage and handling of construction materials	• Transport, loading and unloading of loose and fine materials through covered vehicles. • Paved approach roads. • Storage areas to be located downwind of the habitation area. • Water spraying on earth works, unpaved haulage roads and other dust prone areas. • Provision of PPEs to workers.	MORT&H Specifications for Road and Bridge works Air (P and CP) Act 1974 and Central Motor and Vehicle Act1988	Throughout Project corridor	PM10 level measurements Dust pollution or complain of locals	Standards CPCB methods Observations Public consultation	Included in project cost	Contractor	MPRDC (SQC)/CSC
1.2 Emission of air pollutants(HC, SO2, NOX, CO etc.) from vehicles due to traffic congestion and use of equipment and machinery	• Regular maintenance of machinery and equipment. • Batching, asphalt mixing plants and crushers at downwind (1km) direction from the nearest settlement. • Only crushers licensed by the PCB shall be used • DG sets with stacks of adequate height and use of low sulphur diesel as fuel. • Ambient air quality monitoring. • Follow traffic management plan as given in Section 8.	The Air (Prevention and Control of Pollution) Act, 1981 (Amended 1987) and Rules 1982	Asphalt mixing plants, crushers, DG sets locations	Monitoring of ambient air quality & checking PUC certificates	Standards CPCB methods	Included in project cost	Contractor	MPRDC (SQC)/CSC
2. Noise								
2.1 Noise from construction vehicle, equipment and machinery.	• All equipment to be timely serviced and properly maintained. • Bottle necks to be removed. • Construction equipment and machinery to be fitted with silencers and maintained properly. • Only IS approved equipment shall be used for construction activities. • Timing of noisy construction activities shall be done during night time and weekends near sensitive receptors such as schools and selected suitable times near temples when there are no visitors, concurrent noisy operations may be separated to reduce the total noise generated, and if possible re-route traffic during construction to avoid the accumulation of noise beyond standards. Else provision of temporary noise barrier at sensitive locations or near sources. • Time regulation near residential, built-up and forest areas construction shall be restricted to daylight hours. • Initiation of multi layered plantation, to serve as mitigation option for operation phase. • Honking restrictions near sensitive areas. • PPEs to workers	Legal requirement Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof + Clause No 501.8.6. MORT&H Specifications for Road and Bridge works	Throughout Project section especially at construction sites, residential and identified sensitive locations.	Noise levels Measurements Complaints from local people	As per Noise rule, 2000 Consultation with local people	Included in Project Cost Plantation cost is separate	Contractor	MPRDC (SQC)/CSC

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	• Noise monitoring as per EMoP.							
3. Land and Soil								
3.1 Landuse change and loss of productive/top soil	• Non-agricultural areas to be used as borrow areas to the extent possible. • If using agricultural land, top soil to be preserved and laid over either on the embankment slope for growing vegetation to protect soil erosion.	Project requirement	Throughout the project section and borrow areas	Borrow pit locations Top soil storage area	Review Borrow area plan, site visits	Included in construction cost	Contractor	MPRDC (SQC)/CSC
3.2 Slope failure and soil erosion due to construction activities, earth work, and cut and fill, stock piles etc.	• Bio-turfing of embankments to protect slopes. • Slope protection by providing frames, dry stone pitching, masonry retaining walls, planting of grass and trees. • The side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. Care should be taken that the slope gradient shall not be greater than 2:1. • The earth stockpiles to be provided with gentle slopes to prevent soil erosion.	IRC:56-1974 Recommended practice for treatment of embankment slopes for erosion control Clause No.306 and 305.2.2 MORT&H Specifications for Road and Bridge Works Guidelines IX for Soil erosion	Throughout the entire project road especially along hilly areas	Occurrence of slope failure or erosion issues	Review of design documents and site observation	Included in construction cost	Design consultant and Contractor	MPRDC (SQC)/CSC
3.3 Borrow area management	• Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents. • Depths of borrow pits to be regulated and sides not steeper than25%. • Top soil to be stock piled and protected for use at the rehabilitation stage. • Transportation of earth materials through covered vehicles. • IRC recommended practice for borrow pits (IRC 10:1961). • Borrow areas not to be dug continuously. • To the extent borrow areas shall be sited away from habituated areas. Borrow areas shall be levelled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted in to fish ponding consultation with fishery department and land owner/community. • Rehabilitation of the borrow areas as per Guidelines for development of Borrow Areas.	IRC Guidelines on Borrow areas and for quarries (Environmental Protection Act and Rules,1986; Water Act, Air Act) +Clause No. 305.2.2MORT&H Specifications for Road and Bridge works Guidelines V for Borrow Areas management	Borrow sites location	Existence of borrow areas in inappropriate unauthorized locations. Poor borrow area management practices. Incidents of accidents. Complaints from local people.	Review of design document sand site observation	Included in Construction cost	Design consultant and Contractor	MPRDC (SQC)/CSC
3.4 Quarry Operations	• Aggregates will be sourced from existing licensed quarries. • Copies of consent/approval/ rehabilitation plan for anew quarry or use of existing source will be submitted to EO, MPRDC.	Clause No. 111.3 MORT&H Specifications for Road and Bridgeworks Guidelines VI for	Quarry area locations	Existence of licenses for all quarry areas from which materials are being sourced	Review of design documents, contractor documents and site	Included in Construction cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	• The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy of the approval to EA.	Quarry Areas Management		Existence of a quarry redevelopment plan Complaints from local people	observation			
3.5 Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment	• Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction. • Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce the compaction. • Transportation of quarry material to the dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the village/minor roads. • Land taken for construction camp and other temporary facility shall be restored to its original conditions.	Design requirement	Parking areas, haulage roads and construction yards.	Location of approach and haulage roads Presence of destroyed/ compacted agricultural land or land which has not been restored to its original condition	Site observation	Included in construction cost	Contractor	MPRDC (SQC)/CSC
3.6 Contamination of soil due to leakage/spillage of oil, bituminous and non-bituminous debris generated from demolition and road construction	• Construction vehicles and equipment will be maintained and refuelled in such a fashion that oil/diesels pillage does not contaminate the soil. • Fuel storage and refuelling sites to be kept away from drainage channels. • Unusable debris shall be dumped in ditched sand low lying areas. • To avoid soil contamination Oil-Interceptors shall be provided at wash down and Refuelling areas. • Waste oil and oil soaked cotton/cloth shall be stored in contaners labelled 'Waste Oil' and 'Hazard do us' sold off to MoEF/SPCB authorized vendors. • Unusable and non-bituminous debris materials should be suitably disposed of in an environmentally acceptable manner at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal MOSRTH guidelines should be followed.	Design requirement	Fuelling station, construction sites, and construction camps and disposal location.	Quality of soil near storage area Presence of spilled oil or bitumen in project area	Site observation	Included in Construction cost.	Contractor	MPRDC (SQC)/CSC
4. Water Resources								
4.1 Sourcing of water during Construction	• Requisite permission shall be obtained for abstraction of groundwater from Central Groundwater Authority. • Arrangements shall be made by contractor that the water availability and supply to nearby communities remain unaffected.	-	Throughout the Project section	Approval from competent authority Complaints from local people on water availability	Checking of documentation Talk to local people	Included in construction cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
4.2 Disposal of Water during construction	• Provisions shall be made to manage construction waste water in an environmentally sensitive manner. Waste water will be reused for construction and irrigation purposes only. No-runoff water will be discharged to existing pond used for domestic and recreational purposes.	Clause No. 1010 EP Act 1986 MORT&H Specifications for Road and Bridge Works	Throughout the Project section	Design of road side drains Existence of proper drainage system for disposal of waste water	Standards methods Site observation and review of documents	Included in construction cost	Contractor	MPRDC (SQC)/CSC
4.3 Alteration in Surface water hydrology due to embankment	• Existing drainage system to be maintained and further enhanced. • Provisions shall be made for adequate size and number of cross drainage structures esp. in the areas where land is sloping towards road alignment. • Road level shall be raised above HFL level wherever road level is lesser than HFL.	Design requirement, Clause No 501.8.6. MORT&H Specifications for Road and Bridge	Near all drainage channels, river crossings etc.	Design of road side drains	Review of design documents Site observation	Included in construction cost	Contractor	MPRDC (SQC)/CSC
4.4 Siltation in Water bodies due to construction activities/ earthwork	• Embankment slopes to be modified suitably to restrict the soil debris entering water bodies. • Provision of Silt fencing shall be made at water bodies. • Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated. • Earthworks and stone works to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system.	Design requirement, Clause No 501.8.6. MORT&H Specifications for Road and Bridge works (CP and CP) and worldwide best practices	Near all water bodies, river embankment slopes	Siltation of rivers, streams, ponds and other water bodies in project area	Field observation	Included in construction cost	Contractor	MPRDC (SQC)/CSC
4.5 Deterioration in surface water quality due to leakage from vehicles and equipment's and waste from construction camps.	• No vehicles or equipment should be parked or refuelled near water-bodies, so as to avoid contamination from fuel and lubricants. • Oil and grease traps and fuelling plat forms to be provided at re-fuelling locations. • All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection. • All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors • Construction camp to be sited away from water bodies. • Wastes must be collected, stored and taken to approve disposal site only. • Water quality shall be monitored periodically.	The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof.	Water bodies, refuelling stations, construction camps	Water quality of ponds, streams, rivers and other water bodies in project Presence of oil floating in water bodies in project area	Conduction of water quality tests as per the monitoring plan Field observation	Included in construction cost	Contractor	MPRDC (SQC)/CSC
5. Flora and Fauna								
5.1 Vegetation loss due to site preparation and construction activities	• Minimize tree cutting to the extent possible. • Roadside trees to be removed with prior approval of competent authority. • Compensatory plantation at 1:10 basis and additional plantation as per the IRC Guidelines in consultation with Forest Department.	Forest Conservation Act1980 + IRC SP: 21 and IRC SP:66	Throughout project corridor	ROW width Number of trees for felling Compensatory	Review of relevant documents, tree cutting permit, compensatory	Road side plantation cost is included in project costs.	Relevant agency specialized in afforestation	MPRDC (SQC)/CSC

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	• Regular maintenance of all trees planted. • Provision of LPG in construction camp as fuel source to avoid tree cutting, wherever possible. • Plantation of trees on both sides of the road. Integrate vegetation management (IVM) with the carriageway completely clear of vegetation. From the edge of the road to the boundary of ROW, vegetation structured with smaller plants near the line and larger trees further away to avoid costly and provide habitats for a wide variety of plants and animals. • Additional plantation near river banks to check erosion as part of compensatory plantation. • In the event of design changes during the construction stages, additional assessments including the possibility to save trees shall be made by the EA. • Road side Plantation Strategy as per IRC Specifications including manuring. • Control use of pesticides/fertilizers			plantation plan Number of trees replanted	plantation plan Field observations			
6. Construction Camps								
6.1 Impact associated with location	• The contractor, no later than 30 days after the issuance of the Notice to proceed will prepare and submit a Health and Safety Plan to the Engineer (CSC) for review and approval. This H&S will have the following but not limited to the following measures • All camps should maintain minimum distance from following: # 500 m from habitation	Design Requirement	All construction camps	Location of Camp sites and distance from habitation, forest areas, water bodies, through traffic route and other construction camps	On site observation Interaction with workers and local community	Included in construction cost	Contractor and EO	MPRDC (SQC)/CSC
6.2 Worker's Health in construction camp	• The location, layout and basic facility provision of each labour camp will be submitted to SQC prior to their construction. The construction shall commence only after approval of SQC. • The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner as approved by the EA. • Adequate water and sanitary latrines with septic tanks attached to soak pits shall be provided. • Preventive medical care to be provided to workers including a First-Aid kit that must be available in the camp. • Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste must be carried out. • The Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides which should comply with local regulations.	The Building and other construction workers (Regulation of Employment and Conditions of Service) Act 1996 and The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof	All construction camps	Camp health records Existence of proper first aid kit in campsite Complaints from local people	Camp records Site observation Consultation with local people living nearby	Part of the Contractors costs	Contractor	MPRDC (SQC)/CSC

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	• No alcoholic liquor or prohibited drugs will be imported to, sell, give, and barter to the workers of host community. • Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases. • Good practices in waste minimization and pollution prevention: i) pollution prevention to include: good housekeeping and operating practices; first-in-first-out (FIFO) principle; buy-back by the suppliers of all containers and drums; and waste segregation.							
7. Management of Construction Waste/Debris								
7.1 Selection of Dumping Sites	• Unproductive/wastelands shall be selected for dumping sites. • Away from residential areas and water bodies • Dumping sites have adequate capacity equal to the amount of debris generated. • Public perception and consent/approval from the village Panchayats and other concerned authorities has to be obtained before finalizing the location.	Design Requirement and MORT&H guidelines	At all Dumping Sites	Location of dumping sites Public complaints	Field survey and interaction with local people	Included in construction cost	Contractor	MPRDC (SQC)/CSC
7.2 Reuse and Disposal of construction and dismantled waste	• The existing bitumen surface shall be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes. • All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for back filling embankments, filling pits, and landscaping. • Unusable and non-bituminous debris materials should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in secure and fill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal MOSRTH guidelines should be followed. • Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site in an environmentally accepted manner subject to prior approval by the Panchayat and other concerned authorities.	MORT&H guidelines	Throughout the project corridor	Percentage of Reuse of existing surface material Method and location of disposal site of construction debris	Contractor records Field observation Interaction with local people	Included in construction cost	Contractor	MPRDC (SQC)/CSC
8. Traffic Management and Safety								
8.1 Management of existing traffic and safety	• Temporary traffic diversion shall be planned by the contractor and approved by the Engineer. • The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for night time traffic and precautions for transportation of hazardous materials. Traffic control plans shall be prepared in line with requirements of IRC's SP 55 document. • The Contractor will ensure that the diversion/detour is	Design requirement and IRC SP:55	Throughout the Project corridor especially at intersections	Traffic management plan Safety signs on site Number of traffic accidents	Review traffic management plan Field observation of traffic management	Included in construction cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. • Restriction of construction activity to only one side of the existing road. • The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from Engineer. • Use of adequate signages to ensure traffic management and safety. Conduct of regular safety audit on safety measures.				and safety system Interaction with people in vehicles using the road			
8.2 Pedestrians, animal movement	• Temporary access and diversion, with proper drainage facilities. • Access to the schools, temples and other public places must be maintained when construction takes place near them. • Fencing wherever cattle movement is expected. • To avoid the need for cattle underpasses, some of the proposed culverts near habitations may be widened to facilitate cattle movement.	Design requirement and IRC: SP: 27 - 1984 Report Containing Recommendations of IRC Regional Workshops on Highway Safety IRC:SP: 32 -1988 Road Safety for Children (5-12 Years Old) IRC:SP: 44 -1994 Highway Safety Code IRC: SP: 55 -2001 Guidelines for Safety in Construction Zones The Building and Other Construction Workers Act 1996 and Cess Act of 1996 Factories Act 1948	Near habitation on both sides of schools, temples, hospitals, graveyards, construction sites, haulage roads, diversion sites	Road signage & drainage as per IRC guideline Complaints from local people	Field observation Interaction with local people	Included in construction cost.	Contractor	MPRDC (SQC)/CSC
8.3 Safety of workers and accident risk from construction activities	• Contractors to adopt and maintain safe working practices. • Usage of fluorescent and retroflectory signage, in local language at the construction sites. • Training to workers on safety procedures and precautions. • Mandatory appointment of safety officer. • All regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress shall be		Construction sites	Availability of Safety gears to workers Safety signage Training records on safety Number of safety	Site observation Review records on safety training and accidents Interact with construction	Included in construction cost	Obligation of Contractor	MPRDC (SQC)/CSC

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	complied with. • Provision of PPEs to workers. • Provision of a readily available first aid unit including an adequate supply of dressing materials. • The contractor will not employ any person below the age of 18 years for any work. • Use of hazardous material should be minimized and/or restricted. • Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies. • Good practices in waste minimization and pollution prevention: i) pollution prevention to include: good housekeeping and operating practices; first-in-first-out (FIFO) principle; buy-back by the suppliers of all containers and drums; and waste segregation.			related accidents	workers			
8.4 Accident risk to local community	• Restrict access to construction sites to authorized personnel. • Physical separation must be provided for movement of vehicular and human traffic. • Adequate signage must be provided for safe traffic movement		Construction sites	Safety signs and their location Incidents of accidents Complaints from local people	Site inspection Consultation with local people	Included in construction cost	Contractor	MPRDC (SQC)/CSC
9. Site restoration and rehabilitation								
9.1 Clean-up Operations, Restoration and Rehabilitation	• Contractor will prepare site restoration plans, which will be approved by the Engineer. • The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. • All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, at the contractor's expense, to the satisfaction of the Environmental officer. • All the opened borrow areas will be rehabilitated and Engineer will certify in this regard.	Project requirement	Throughout the project corridor, construction camp sites and borrow areas	Clean and restored camp sites Presence/ absence of construction material/debris after completion of construction works on construction site	Site observation Interaction with locals Issue completion certificate after restoration of all sites are found satisfactory	Included in construction cost	Contractor	MPRDC (SQC)/CSC
C. Operation stage								
1. Air quality								
1.1 Air pollution due to vehicular movement	• Roadside tree plantations shall be maintained. • Regular maintenance of the road will be done to ensure good surface condition • Vehicular air pollution will be managed and monitored. • Ambient air quality monitoring. If monitored parameters are above the prescribed limit, suitable control measures must be taken. • Technological and behavioural changes	Environmental Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981	Throughout the Corridor	Ambient air quality (PM10, CO, NOx) Survival rate of trees planted	As per CPCB requirements Site inspection	Included in Operation/ Maintenance cost	MPRDC (SQC)	

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	• Road signs shall be provided reminding the motorist to properly maintain their vehicles to economize on fuel consumption and protect the environment.							
2. Noise								
2.1 Noise due to movement of traffic	• Effective traffic management and good riding conditions shall be maintained to reduce the noise level throughout the stretch and speed limitation and honking restrictions may be enforced near sensitive locations. • The effectiveness of the multi-layered plantation should be monitored and if need be, solid noise barrier shall be placed • Create awareness amongst the residents about likely noise levels from road operation at different distances, the safe ambient noise limits and easy to implement noise reduction measures while constructing a building close to the road.	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Sensitive receptors	Noise levels	Noise monitoring as per noise rules 2000 Discussion with people in sensitive receptor sites	Included in Operation/ Maintenance cost	MPRDC (SQC)	
3. Land and Soil								
3.1 Soil erosion at embankment during heavy rain fall.	• Periodic checking to be carried to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures etc. • Necessary measures to be followed wherever there are failures.	Project requirement	At bridge locations and embankment slopes & other probable soil erosion areas.	Existence of soil erosion sites Number of soil erosion sites	On site observation	Included in Operation/ Maintenance cost	MPRDC (SQC)	
4. Water resources/Flooding and Inundation								
4.1 Siltation	• Regular checks shall be made for soil erosion and turfing conditions of river training structures for its effective maintenance.	Project requirement	Near surface Water bodies	Water quality	Site observation	Included in Operation/ Maintenance cost	MPRDC (SQC)	
4.2 Water logging due to blockage of drains, culverts or streams	• Regular visual checks and cleaning of drains shall be done along the alignment to ensure that flow of water is maintained through cross drains and other channels/ streams. • Monitoring of water borne diseases due to stagnant water bodies.	Project requirement	Near surface Water bodies	Presence of flooded areas or areas with water stagnation	Site observation	Included in Operation/ Maintenance cost	MPRDC (SQC)	
4.3 Road inundation due to choking of drainage channels	• MPRDC will ensure that all drains (side drains and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding.	Project requirement	Flood prone sections	Incidents of flooding and road inundation with details on chainage	Field observation Interaction with local community	Included in Operation/ Maintenance cost	MPRDC (SQC)	
5. Flora								
5.1 Vegetation	• Planted trees, shrubs, and grasses to be properly maintained. • The tree survivalist audit to be conducted at least once in a year to assess the effectiveness.	Forest Conservation Act1980	Project tree Plantation sites	Minimum of 70% of tree survival	Records and fields observations	Operation and Maintenance Cost	MPRDC (SQC)	

Environmental Issue/	Remedial Measure	Reference to laws	Location	Monitoring indicators	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
6. Maintenance of Right of Way and Safety								
6.1 Accident risk due to uncontrolled growth of vegetation	• Efforts shall be made to make shoulder completely clear of vegetation. • Regular maintenance of plantation along the roadside. • Invasive plant not to be planted near the road.	Project requirement	Throughout the Project route	Presence of and extent of vegetation growth on either side of road Accident data	Visual inspection Accident records	Included in Operation/ Maintenance cost	MPRDC (SQC)	
6.2 Accident risks associated with traffic movement	• Traffic control measures, including speed limits, will be enforced strictly. • Further encroachment of squatters within the ROW will be prevented. • No school or hospital will be allowed to be established beyond the stipulated planning line as per relevant local law. • Monitor/ensure that all safety provisions included in design and construction phase are properly maintained. • Highway patrol unit(s) for round the clock patrolling. Phone booths for accidental reporting and ambulance services with minimum response time for rescue of any accident victims, if possible. • Tow-away facility for the break down vehicles if possible.	IRC:SP:55	Throughout the Project route	Police records on accident Condition and existence of safety signs, rumble strips etc. on the road Presence/ absence of sensitive receptor structures inside the stipulated planning line as per relevant local law	Review accident records Site observations	Included in Operation/ Maintenance cost	MPRDC (SQC)	
6.3 Transport of Dangerous Goods	• Existence of spill prevention and control and emergency responsive system • Emergency plan for vehicles carrying hazardous material		Throughout the project stretch	Status of emergency system - whether operational or not	Review of spill prevention & emergency response system Spill accident records	Included in Operation/ Maintenance cost.	MPRDC (SQC)	

Notes: EA: Executing Agency, MPRDC: Madhya Pradesh Road Development Corporation, SQC: Supervision Quality Controller, EO: Environmental Officer, IRC: Indian Road Congress

a. The “Project engineer” or “the engineer” is the team of Construction Supervision Consultants (CSC) responsible for approving the plans, engineering drawing, release of payments to contractor etc. on behalf of the employer (MPRDC). It is usually the team leader of the CSC that takes the responsibility of signing approval documents on behalf of the CSC team.

b. The “environmental officer” is the environmental specialist under the CSC who is responsible for providing recommendations to the CSC team leader for approving activities specific to environment safeguards on behalf of “the engineer”.

APPENDIX 4: ENVIRONMENTAL MONITORING PROGRAMME

Environmental Components	Monitoring			Location	Frequency	Institutional Responsibility	
	Parameters	Special Guidance	Standards			Implementation	Supervision
Air	$PM_{2.5}$, PM_{10}, SO_2, NO_X, CO	As per CPCB guidelines	The Air (Prevention and Control of Pollution)Rules, CPCB,1982	At sites where hot mix plant/ Batching plant is located	3 times in a year for 3 years or construction period at 5 sites	Contractor through approved monitoring agency	PIU, MPRDC, SC
Water	pH, BOD, COD,TDS, TSS,DO, Total coliform, Conductivity, Oil and Grease	Grab sample collected from source and analyze as per standard methods for examination of water and wastewater	Water quality standards by CPCB	River tributaries, roadside ponds and ground water at construction camp sites	3 times in a year for 3 years or construction period at 5 locations	Contractor through approved monitoring agency	PIU, MPRDC, SC
Noise Levels	Noise level for day and night on dB(A) scale	In free field at 1m distance from the Equipment to be monitored	Noise standard by CPCB	At equipment yards, camp and villages along the alignment.	3 times in a year for 3 years or construction period at 3 locations	Contractor through approved monitoring agency	PIU, MPRDC, SC
Soil quality	Monitoring of NPK & heavy metals and grease		As per IRC code of practice	Ad hock if accident / spill locations involving bulk transport of carrying hazardous materials	-	PIU through an approved agency	PIU, MPRDC
Road side Plantation	Monitoring of felling of trees	It should be ensured that the marked trees are felled only	As given in the IEE report	All along the corridor	During the felling of trees	Forest department	PIU, MPRDC
	Survival rate of trees, success of re-vegetation	The number of trees surviving during each visit should be compared with the number of saplings planted	The survival rate should be at-least 70% below which re-plantation should be done	At locations of compensatory afforestation	Every year for 3 years	PIU	PIU, MPRDC

APPENDIX 5: NATIONAL AMBIENT AIR QUALITY STANDARDS

Sl. No.	Pollutant	Time Weighted Average	Industrial Residential, Rural & Other Areas	Ecologically Sensitive Area (Notified by Central Government)
1	Sulphur dioxide (SO_2)(μg/m^3)	Annual Average*	50	20
		24 Hours**	80	80
2	Oxides of Nitrogen (NOx) (μg/m^3)	Annual Average*	40	30
		24 Hours**	80	80
3	Particulate Matter (Size Less Than 10 μm) or PM_{10} (μg/m^3)	Annual Average*	60	60
		24 Hours**	100	100
4	Particulate Matter (Size Less Than 2.5 μm) or $PM_{2.5}$ (μg/m^3)	Annual Average*	40	40
		24 Hours**	60	60
5	Ozone O_3 (μg/m^3)	8 Hours*	100	100
		1 Hours**	180	180
6	Lead (Pb) (μg/m^3)	Annual Average*	0.5	0.5
		24 Hours**	1	1
7	Carbon Monoxide (CO) (mg/m^3)	8 Hours*	2	2
		1 Hours**	4	4
8	Ammonia (NH_3) (μg/m^3)	Annual Average*	100	100
		24 Hours**	400	400
9	Benzene (C_6H_6) (μg/m^3)	Annual*	5	5
10	Benzo (a) Pyrane (BaP) particulate phase only (μg/m^3)	Annual*	1	1
11	Arsenic (As) (μg/m^3)	Annual*	6	6
12	Nickel (Ni) (μg/m^3)	Annual*	20	20

Note:

* ***Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.***

** ***24 hourly or 8 hourly or 1 hourly monitored values, as applicable shall complied 98% of the time in a year. However 2% of the time, it may exceed but not on two consecutive days.***

APPENDIX 6: STANDARD DRINKING WATER SPECIFICATION-IS 10500:1991

Sr. No	Parameters	Essential Standards	Relaxed Standards
1.0	**Physical Standards**		
1.1	Colour (Hazen units)	10	50
1.2	Taste	Agreeable	Agreeable
1.3	Odour	Unobjectionable	Unobjectionable
1.4	PH	6.5-8.5	6.5-8.5
1.5	Turbidity (NTU)	10	25
1.6	TDS (mg/l)	500(without treatment)	1500(with treatment)
1.7	Total Hardness (mg/l)	300	600
2.0	**Inorganic Parameters**		
2.1	Ca (mg/l)	75	200
2.2	Mg (mg/l)	30	100
2.3	Fe (mg/l)	0.3	1
2.4	Mn (mg/l)	0.1	0.5
2.5	Cl (mg/l)	250	1000
2.6	SO4 (mg/l)	150	400 if Mg<30mg/l
2.7	NO3 (mg/l)	45	45
2.8	F (mg/l)	0.6-1.2	1.5
2.9	Free Cl (mg/l)	0.2	0.5
3.0	**Heavy Metals**		
3.1	Hg (mg/l)	0.001	0.001
3.2	Cd (mg/l)	0.01	0.01
3.3	Se (mg/l)	0.01	0.01
3.4	As (mg/l)	0.05	0.05
3.5	Pb (mg/l)	0.1	0.1
3.6	Zn (mg/l)	5	10
3.7	Cr+6 (mg/l)	0.05	0.05
3.8	Cu (mg/l)	0.05	1.5
4.0	**Other Parameters**		
4.1	Phenolic Compounds	0.001	0.002
	(mg/l) (as C6H5HO)		
4.2	CN (mg/l)	0.05	0.05
4.3	Anionic Detergents	0.2	1.0
	(mg/l) (as MBAS)		
4.4	Mineral Oil (mg/l)	0.01	0.03
4.5	Pesticides	Absent	Absent
5.0	**Microbiological Parameters**		
5.1	Mean Probable Number	50 without treatment	
	Of Total Coliforms	500 outdoor bathing	
	(Number/100 ml)	5000 with treatment	
6.0	**Radiological Parameters**		
6.1	Gross alpha (uc/ml)	10^{-6}	
6.2	Gross beta (uc/ml)	10^{-7}	

Note: ***A – Desirable or essential***
B – Relax able under certain circumstances such as no alternate source being available

APPENDIX 7: AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

Area Code	Category of Area	Leq. Limits in dB(A)	
		Day Time	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Note:

1. ***Day time shall mean from 6.00 a.m. to 10.00 p.m.***
2. ***Night time shall mean from 10.00 p.m. to 6.00 a.m.***
3. ***Silence zone is defined as an area comprising not less than 100 meters around hospitals, educational institutions and courts. The silence zones are zones, which are declared as such by the competent authority.***
4. ***Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.***

APPENDIX 8: PUBLIC CONSULTATION PHOTOS AND DETAILS OF PARTICIPANTS

MudraVillage

FGD-Mudra Village

Basiya Gaud Village

FGD-Pithoriya Village

Details of Participants of Public Consultation/FGD

Village: कुडरा
Block/District: राहतगढ़, सागर
Date:

S.No.	Name	Cast (Gen, OBC, SC, ST)	BPL Card (Y/N)	Signature
	श्री राम सिंह ठाकुर (सरपंच)	OBC		रामसिंह
	" फूलन लाल प्रजापति	"	Yes	फूलनलाल
	" तोलाराम चढ़ार	SC	Yes	तोलाराम
	"रतन पटेल	OBC	Yes	रतन
	" बलभान सिंह ठाकुर	"		बलभान सिंह
	" फूलन पटेल	"		फूलन लाल
	" बद्री पटेल	"		बद्री प्रसाद
	" कैलाश विश्वकर्मा	"		कैलाश
	" नारायण सिंह ठाकुर	"		नारायण सिंह
	" फूलन पटेल	"		फूलन
	" श्रीराम ठाकुर	"		श्रीराम
	" रामसिंह ठाकुर	"		रामसिंह
	" राज कुमार चौबे	OBC		[illegible]
	"अमोला प्रजापति	OBC	Yes	अमोला सिंह
	"जगन्नाथ प्रसाद चौबे			जगन्नाथ प्रसाद
	" जगत सिंह ठाकुर			जगत सिंह
	"राधेश्याम चौबे			RShaukla

Details of Participants of Public Consultation/FGD

Village: मुडरा
Block/District: सागर
Date:

S.No.	Name	Cast (Gen, OBC, SC, ST)	BPL Card (Y/N)	Signature
	श्रीमती कालू बाई - पटेल	OBC	Y	कालू बाई
	" चंदा बाई रैकवार	SC	Y	चन्दा बाई
	" रामरानी पटेल	OBC	Y	राम रानी
	" शांतिबाई बाई पटेल	OBC	Y	
	" गिरजा रैकवार	SC	Y	
	" रामकुमारी	OBC	Y	रामकुमारी
	" प्रीति बाई	"	Y	प्रीति

Details of Participants of Public Consultation/FGD

Village: बसीयागोंड
Block/District: खुरई, सागर
Date:

S.No.	Name	Cast (Gen, OBC, SC, ST)	BPL Card (Y/N)	Signature
	श्री लाल सिंह	Gn	N	[illegible]
	" राम प्रसाद	"	N	[illegible]
	" राजू ठाकुर	OBC	Y	[illegible]
	" बालो केवट	"	Y	—
	" कल्याण सिंह	"	Y	— Kalyan Singh
	" राजेन्द्र मुकेश कुशवाहा	"	Y	— [illegible]
	" कुमरान सिंह	Gn	N	
	" चतुर सिंह	"	Y	
	" कल्याण सिंह	"	Y	चतुरसिंह
	" श्रीराम सिंह	"	Y	कल्याण
	" हनुमत सिंह	"	Y	श्रीराम
	" शिवचरण	OBC	Y	हनुमत सिंह
		Gn	Y	शिवचरण
	" विजय सिंह	"	Y	विजय सिंह
	" गुमान सिंह	"	Y	गुमान सिंह
	" दशरथ सिंह			दशरथ सिंह

Details of Participants of Public Consultation/FGD

Village: पिठौरिया
Block/District: सागर
Date:

S.No.	Name	Cast (Gen, OBC, SC, ST)	BPL Card (Y/N)	Signature
	श्रीमती - राजकुमारी			राजकुमारी
	" " पार्थी बाई			पार्थी बाई
	" " बैजन्ती बाई			
	" " भूरी बाई			
	" " क्रांती बाई			क्रांती बाई
	" " मुला बाई			मुला बाई
	" " अंगूरी बाई			
	" " माकुसन बाई			माकुसन बाई
	" " लक्ष्मी बाई			लक्ष्मी बाई
	" " द्रोपती बाई			
	" " राधा बाई			राधा बाई
	" " सुमत रानी			
	" " गया बाई			गया बाई
	" " गंगा बाई			गंगा बाई

APPENDIX 9: GRM PROCEDURES IN HINDI

सहमति पत्र

(व्यक्तिगत रूप से हस्ताक्षर करने हेतु)

यह सहमति पत्र दिनांक .....2014 को श्री / श्रीमति ..... निवासी .....(जिन्हे बाद में प्रथम पक्ष कहा जायेगा) एवं मध्य प्रदेश रोड डेव्हलपमेंट कारपोरेशन की तरफ से श्री.....(पद) .....(जिन्हे बाद में द्वितीय पक्ष कहा जायेगा) के मध्य हस्ताक्षरित किया गया।

गवाहों / साक्षी की उपस्थिति में यह दस्तावेज निष्पादित किया गया है।

1- यह कि प्रथम पक्ष दुकान का स्वामी / किरायेदार / अतिक्रमणधारी / फेरी वाला है। तथा वह अपना .....व्यवसाय पिछले .....वर्षो से इस स्थान पर चला रहा है। दुकानदार इस दुकान का पट्टेदार है / नही है। प्रस्तावित सड़क के निर्माण के दौरान व्यवसाय का स्वामी / पट्टेदार का व्यवसाय तथा आमदनी सड़क निर्माण के दौरान बाधित होने की आशंका है। यह कालावधी 30 दिन से अधिक नही होगी।

2- यह कि प्रथम पक्ष ने मध्य प्रदेश जिला कनेक्टीविटी क्षेत्र परियोजना (MPDCSP) की आवश्यकताओं के तहत आयोजित सार्वजनिक लोक सहमति में भाग लिया है, रोड निर्माण से प्राप्त होने वाले लाभ को समझ लिया है एवं रोड निर्माण हेतु सहमति दे दी है।

3- यह कि प्रथम पक्ष द्वारा अपनी मर्जी से ग्राम.....तहसील .....में MPDCSP अंतर्गत रोड़ निर्माण विकास हेतु आपनी आजीविका में संभावित अस्थायी व्यवधान को देखते हुये भी सहमति प्रदान की है।

4- यह कि प्रथम पक्ष रोड निर्माण से होने वाले अस्थायी आजीविका व्यवधान के खिलाफ किसी भी प्रकार के मुआवजे का दावा नही करेगा।

5- यह कि द्वितीय पक्ष को अस्थायी आजीविका व्यवधान संबंधित सहमति स्वीकार है।

6- यह कि द्वितीय पक्ष निर्माण कार्य के दौरान रोड के समीप स्थित सभी व्यवसायिक इकाईयों को नुकसान से बचाने के लिये सभी संभव सावधनियां पूर्वक कार्य करेगा।

7- यह कि प्रथम पक्ष द्वारा द्वितीय पक्ष को यह आश्वासन दिया जाता है कि वह MPDCSP अंतर्गत रोड निर्माण को किसी प्रकार का नुकसान नही पहुँचायेगा, ना ही सार्वजनिक वाहनों के आवागमन में व्यवधान पैदा करेगा एवं ना ही ऐसे कार्यो में शामिल होगा।

8- यह कि दोनों पक्ष MPDCSP अंतर्गत प्रस्तावित इस रोड निर्माण हेतु सहमत है।

9- यह कि हस्ताक्षरित किये जाने की तारीख से यह सहमति पत्र प्रभावी होगा।

साक्षी/गवाहों की उपस्थिति में दोनों पक्षों ने उपर लिखित तारीख को इस पत्रक को हस्ताक्षरित किया है।

हस्ताक्षर प्रथम पक्ष	द्वितीय पक्ष की ओर से अधिकृत (मोहर सहित)
गवाह	गवाह
1- हस्ताक्षर.....	1- हस्ताक्षर.....
नाम –.....	नाम –.....
पूरा पता –.....	पूरा पता –.....
2-हस्ताक्षर.....	2. हस्ताक्षर.....
नाम –.....	नाम –.....
पूरा पता –.....	पूरा पता –.....

(गवाह/साक्षी में गांव के सरपंच, ग्राम पंचायत के सदस्य, डी.पी.आर. कंसलटेंट के प्रतिनिधि, गैर शासकीय संगठनों के प्रतिनिधि तथा ग्राम के बुजुर्ग/वरिष्ठ नागरिकों को शामिल किया जा सकता है)

शिकायत निवारण तंत्र

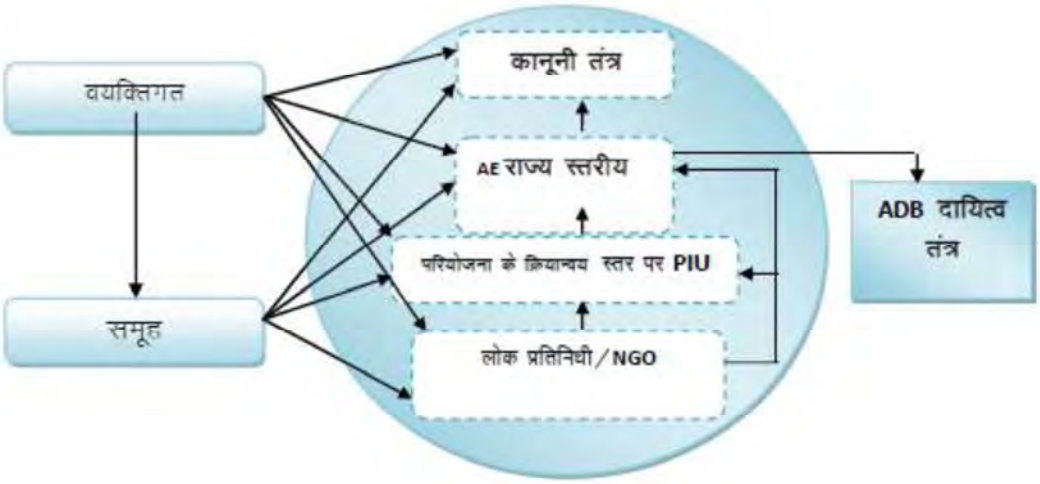
5.1 सड़क निर्माण परियोजना से संबंधित विशेष शिकायत निवारण तंत्र (GRM) स्थापित किया जायेगा जिसके तहत विस्थापित व्यवसायिक इकाईयों, संबंधित शिकायतो, सामाजिक तथा पर्यावरण संबंधित शिकायतों का निराकरण करने की सुविधापरियोजना स्तर पर प्रदान की जायेगी, यह तंत्र सामाजिक तथा पर्यावरण संबंधी समस्या, शिकायत या शकाओं के निवारण में सहायक सिद्ध होगा। यह परियोजना प्रभावित व्यक्तियों की शंकाओं तथा समस्या निराकरण करने के उद्देश्य से निर्मित किया गया है। GRM का उद्देश्य शासन की निवारण प्रक्रिया को नज़र अंदाज करना नही है बल्कि जन साधारण को निर्माण से होने वाले लाभ को बताना तथा पारदर्शिता के साथ समस्या तभा शकाओं का निवारण करना है।

5.2 निवारण प्रक्रिया (RP) यह तंत्र प्रभावी तरीको से जन साधारण/लोक सामान्य को इस कार्य के लाभ बतलाते हुऐ सार्वजनिक सहमति प्राप्त करेगा शिकायत निवारण सहमति (GRC) एक समय सीमा में समस्या निवारण कार्य करेगी। कमेटी का निर्णय मा. न्यायालय के आदेश पूर्व बाहयकारी होगा इस समिति को MPRDC के प्रबंध संचालक की अध्यक्षता में गठित किया जायेगा। PIU स्तर पर प्रबंधक (PM) पुर्नवास अधिकारी, NGO के प्रतिनिधी, समाज के प्रतिष्टित व्यक्ति, जन प्रतिनिधी, जिला परिषद प्रतिनिधी, कमजोर तबके के व्यक्ति तथा 2 महिला प्रतिनिधी शमिल होगे जो परियोजना कार्य पूर्ण होने तक पदस्थ रहेंगे।

5.3 शिकायत निवारण समिति द्वारा शिकायत के 3 सप्ताह के दौरान प्रतिक्रिया करेगी। निर्माण कार्य के पूर्व समस्त शिकायतोंव शंकाओं का समाधान कर लिया जायेगा।

शिकायत निवारण समिति की बैठक 3 सप्ताह में कम से कम एक बार अवश्य होगी, माननीय न्यायालय के तहत स्वामित्व अधिकारी से संबंधित विवादो के अलावा यह समिति समस्त पुर्नवास स्थानांरतण, मुआवजे के भुगतान तथा अन्य सहायता हेतु चरण बद्ध कार्य करेगी।

शिकायत निवारण प्रक्रिया तंत्र



अनुलग्न 1

(A) लोक शिकायत प्रपत्र /प्रलेखन (शिकायत निवारण)

क्र	शिकायत का प्रकार	शिकायत प्राप्ति होने की तारीख	प्रभावित स्थान ग्राम/शहर	चैनेज 0.00 से लैण्ड मार्क	शिकायतकर्ता का नाम	पूरा पता एवं मोबाईल न0	रिमार्क की गई कार्यवाही का संक्षिप्त विवरण	स्थिति		
								निवारण हो गई	कार्य प्रगति पर है।	अपूर्ण लंबित
1										
2										
3										
4										
5										
6										
7										
8										