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ABBREVIATIONS

ASI	Archaeological Survey of India
AADT	Annual Average Daily Traffic
CFE	Consent for Establishment
CFO	Consent for Operation
CoI	Corridor of Impact
CPCB	Central Pollution Control Board
CO	Carbon Monoxide
CSC	Construction Supervision Consultants
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPIU	Environmental Management Plan Implementation Unit
EO	Environmental Officer
EC	Environmental Clearance
EPA	Environment (Protection) Act
EMMP	Environmental Monitoring and Management Plan
FGD	Focus Group Discussion
GoI	Government of India
GM	General Manager
IEE	Initial Environmental Examination
IRC	Indian Road Congress
MoEF	Ministry of Environment and Forests
MFI	Multilateral Financing Institutions
NO ₂	Oxides of Nitrogen
PM	Particulate Matter
PIU	Project Implementing Unit
PHC	Primary Health Centre
PPE	Personnel Protective Equipments
PIs	Performance Indicators
RoW	Right of Way
R&R	Resettlement and Rehabilitation
SPS	Safeguard Policy Statement
SEIAA	State Level Environment Impact Assessment Authority
SEAC	State Level Environmental Appraisal Committee
SO ₂	Sulphur-dioxide
SIA	Social Impact Assessment
WB	World Bank



0 EXECUTIVE SUMMARY

A project specific Environmental Assessment study has been carried out in accordance with the Environmental and Social Management Framework (ESMF) developed for UPCRNDP Projects, guidelines and operational manual of World Bank and guidelines of Ministry of Environment, & Forests and Climate Change (MOEFCC), Government of India. The major objective of this study is to establish present environmental condition along the project corridor through available data and information supported by field studies to evaluate the impacts on relevant environmental attributes due to the construction & operation of the proposed project, to recommend adequate mitigation measures to minimize /reduce adverse impacts and to prepare an Environmental Management Plan (EMP) for timely implementation of the mitigation measures to make the project environmentally sound and sustainable. The EMP will be part of the bid document for construction of the project.

The specific environmental issues considered are Physiography and soils, topography, climate, borrow area and quarry sites, water resources, air, noise, soil quality, biological characteristics social-environment and other sensitive environmental sites.

0.1 Environmental Regulations and Policy

Various environmental regulations and policies of Government of India, state Government as well as World Bank's safeguard policies have been reviewed with respect to the proposed project activities. Based on the study, the requirements of various clearances and permits for different activities have been identified for the project as listed below.

Table 0.1: Summary of Statutory Clearance Requirement of the Project

S. No.	Type of Clearance/ Permits	Applicability	Project Stage	Responsibility
1	Forest Clearance for land diversion	For acquisition of forest land	Pre Construction	PIU, UP PWD
2	Tree felling permission	For roadside tree cutting	Pre construction	PIU, UP PWD
3	NOC (Consent to Establish and Consent to Operate) under Air and Water Act from SPCB	For siting, erection and operation of stone crusher, Hot Mix Plant, batching plant,WMM Plant etc.	Construction Stage	Contractor
4	Explosive License from Chief Controller of Explosives,	For storing fuel oil, lubricants, diesel etc.	Construction stage (Prior to storing fuel, lubricants and Diesel, etc.)	Contractor
5	Permission for storage of hazardous chemical from CPCB	Manufacture storage and Import of Hazardous Chemical	Construction stage (Prior to initiation of any work)	Contractor



S. No.	Type of Clearance/ Permits	Applicability	Project Stage	Responsibility
6	Quarry Lease Deed and Quarry License from State Department of Mines and Geology	Quarry operation	Construction stage (Prior to initiation of Quarrying)	Contractor
7	Environmental Clearance for stone quarry from State environmental Impact Assessment Authority, U.P.	Opening of new Quarry and Borrow area for earth material	Construction stage (Prior to initiation of Quarrying)	Contractor
8	Permission for extraction of ground water for use in road construction activities from State Ground Water board	Extraction of ground water	Construction stage (Prior to initiation of installation of Bore wells and abstraction of water from such source)	Contractor
9	Permission for use of water for construction purpose from irrigation department	Use of surface water for construction	Construction stage (Prior to initiation of abstraction of water from such source)	Contractor
10	Labour license from Labour Commissioner Office	Engagement of Labour	Construction stage (Prior to initiation of any work)	Contractor

0.2 Current Environmental Conditions

The baseline data on various physical, biological and social aspects were collected, analyzed and compiled in order to get the picture of the existing environment condition in the project area. The data on different environmental components were collected and collated based on secondary data from authentic sources, ground verification followed by actual field surveys to identify a general environmental condition within the project catchment area and major environmental issues to be taken care off during the design as well project implementation phase. The focus of the study was on the areas within and directly adjacent to the corridor of impact and ROW.

0.2.1 Physical Environment

Physiography and Soil:

The entire section of the project road lies over flat terrain and the project road passes through mainly agriculture fields and built up areas and commercial establishments. The geographical location of the project stretch is 25°56'7" N latitude and 80°8'34.6" E longitude at Hamirpur and 25°35'20" N Latitude and 79°33.38" E longitude at Rath. General elevation of the area is 150 m above mean sea level. The entire project stretch lies over Bundelkhand plateau & Old Alluvial to recent Alluvial Plain. The area falls in seismic zone-III, which is comparatively stable zone with respect to earth quake. The soil along the project stretch is predominantly entisols and alfisols (Red soil, Black soil and Sandy Loams).

**Climate:**

The Hamirpur district falls in the humid sub-tropical zone. The climate of the district has four broad seasons. The winter generally spread over from December to February. The period from March to June is summer. Hot and rainy season generally extends from July to September. October and November exhibit autumn. The temperature during the winter months is too cold. The maximum rainfall is observed in the district during July to August and minimum in the months of April and October. The hottest month is May and coldest month is January in the district. Maximum and minimum temperatures recorded in the district ranges from 20° to 40°C. Normal rainfall in Hamirpur district is 851 mm. About 90 percent of the rainfall occurs during the southwest monsoon, lasting from about June to September. The relative humidity ranges from 40 % to 90% in the area.

Water Environment:

There is only one River namely Bihuni River crosses the project alignment at Km 59.600. A number of irrigation canals cross the project alignment. A total number of 9 ponds recorded in the proximity of the road section and right of way. The water table along project area ranges between 5m to 10 m. The yield of tube wells in the project area ranges between 35 m³/hr to 70 m³/hr.

Ambient Air Quality:

To study the baseline ambient air quality scenario within the project area, ambient air quality monitoring was carried out in the month of November, 2014 at Pothia, Muskara and Rath with respect to PM_{2.5}, PM₁₀, SO₂, NO_x, Carbon monoxide (CO) and Hydrocarbons (HC). The mean concentration of PM₁₀ in ambient air varied between 84.00 µg/m³ and 140.0 µg/m³ along the project alignment. At two locations the concentration of PM₁₀ were higher than the National Ambient Air Quality Standards i.e. 100 µg/m³. The highest concentration of PM₁₀ was observed at Muskara at Km 51.00 which was 140.00 µg/m³, the higher concentration of PM₁₀ may be attributed to heavy population, junctions and commercial activities and bad road condition. The concentration of PM_{2.5} varied between 47.0 µg/m³ to 70.0 µg/m³. Muskara and Rath showed higher concentration than the National Ambient Air Quality Standards i.e. 60 µg/m³. Both these areas are congested builtup area and traffic congestion and exposed surface of road may be the reason for the higher concentration of PM_{2.5}. Rest of the quality other parameters monitored were found within the National Ambient Air Quality Standards.

Water Quality:

To assess the surface water quality along the project area, water samples were collected from ponds at Kalauli Teer and Pothia, Irrigation canal at Damipura and from Bihuni River. The analysis result reflects that all the surface water bodies from which the water samples were taken, meet the quality criteria for Class C (Drinking water source after conventional treatment and disinfection) and Class D (Propagation of Wildlife and Fisheries) of surface water.

To assess the ground water quality along project area, water samples were collected and analysed from hand pumps at Kalauli Teer, Muskara and Rath. The pH of the water samples



varied between 7.1 to 7.41 which is within the permissible level. The Total dissolve solid varied between 440.0 mg/l to 1060.0 mg/l. The water sample collected from Rath showed TDS in the range of 1060 which is higher than the desirable level but within the maximum permissible level as per IS:10500. The Total hardness (as CaCO_3) ranged from 250.88 mg/l to 670.3 mg/l at different locations along the project road. At Muskara village at Km 51.000, the Total hardness was more than the maximum permissible limit of 600 mg/l as per IS: 10500. The Fluoride (as F) is below the permissible limit in all the samples taken along the project road.

Ambient Noise Levels

To determine the ambient noise level along the project road five monitoring locations were identified considering location of sensitive receptors and land use pattern along the project road. These five areas are Kalauli Teer, Pothia, Channi Buzurg, Muskara and Rath. The average daytime ambient noise level was recorded in the range of 51.8 Leq dB(A) to 68.1 Leq dB(A) whereas the same varied from 42.4 Leq dB(A) to 51.7 Leq dB(A) during night time. At Muskara and Rath, which represent the area of commercial and mixed activities both daytime equivalent noise was above the permissible limit for Residential Area (55 Leq dB(A) during daytime and 45 Leq dB(A) during nighttime) but within the permissible limit for Commercial and mixed area (65 Leq dB(A) during daytime and 45 Leq dB(A) during nighttime). The equivalent noise level at all other locations were within the prescribed limit for residential zone.

0.2.2 Natural Environment

The Project area is devoid of wildlife sanctuary, national park or notified ecologically sensitive areas or any other significant area of ecological interest, neither these features are located within 10 km of radius of the project. There is no reserved forest located along the project corridor. No threatened or endangered flora or fauna exists along the project corridor. About 8476 trees fall within existing ROW which are likely to be affected due to widening. The predominant tree species are Babool, Eucalyptus, Neem, Shisham and Mango.

The roadside tree plantation within ROW is declared as Protected Forest, hence the felling of roadside tree shall attract the provisions of Forest (Conservation) Act and will require forest clearance for diversion of forest area.

Domesticated animals constitute the faunal density in the area surrounding the project road. Among wild animals Neelgai, Foxes and jackals are spotted in the project area. Damages to the crop by Neelgai are reported by the local public. There is no natural habitat of these animals along the project corridor.

0.2.3 Socio-economic Environment

The project stretch is located in Hamirpur district of Uttar Pradesh districts. It crosses 28 villages.

Demographic Profile

As per census of India 2011 the Hamirpur district has a population of 1104285 persons. 81.0 percent to total population is rural population whereas the urban population constitutes only 19



percent of total population of the district. The population density is 257 compared to the State's population density of 829. The sex ratios of Hamirpur district is 861 females for every 1000 males, which is lower than the state's ratio of 912. The literacy rate in the district is mere 59.16 percent which is above the literacy rate in the state of Uttar Pradesh (57.25%). The urban population has literacy rate of 67.44 percent whereas the rural population has literacy rate of 57.22 percent.

Agriculture Pattern

The predominant landuse along the project stretch is agriculture. Both Kharif and Rabi agriculture is practiced in both the districts. Only 27.7% land are irrigated land in Hamirpur. Canals are the main source of irrigation and are constructed by the different rivers like Yamuna, Betwa, Dashan, Barma, Ken, Chandrawal and Pandwaha.

Industries

Hamirpur district is among least industrialized district of Uttar Pradesh. The main occupation in the project area is agriculture. There are no significant industry located along the project road.

Cultural Properties

A total number of 20 religious structures are located along the road, but there is no archaeological structure/monument located in the proximity of project corridor. There are 13 numbers of educational institutions located along the ROW. They constitute sensitive receptor and will require adequate attention during construction. Apart from these a number of other community features such as well, hand pumps, bus shelters, etc. are situated which has been detailed in R&R section.

0.3 Public Consultation

Public consultation has been conducted as an integral part of social and environmental assessment process of the project with an objective to inform and educate stakeholders about the proposed action and to receive the public perception about the project. It assisted in identification of the problems associated with the project as well as the needs of the population likely to be impacted. This participatory process helps in reducing the public resistance to change and enabled the participation of the local people in this development process.

0.4 Potential Environmental Impacts

Sufficient Right of way is available in the entire section of the project road to accommodate the proposed widening of the existing highway section to standard two lane with paved shoulder and the project work would mostly be limited within ROW. Little adverse impacts on environmental components are anticipated due to the project. Most of these adverse environmental impacts are related to construction works which are inevitable but are manageable through certain environmental friendly practices. These negative environmental effects can be taken care of at an early stage through proper engineering designs and through best construction practices.

**A. Impacts during Design/Preconstruction Phase**

The environmental impacts associated with the pre construction stage mainly includes impacts due to design and location of the project as well as site preparation for construction. The main issues involve in the preconstruction stage are acquisition of land and properties, tree felling, diversion of forest land, encroachment of water tanks & ponds, acquisition of common property resources, relocation of public utilities etc. Most of the impacts of preconstruction stage are permanent in nature. The anticipated impacts associated with the preconstruction stage and their mitigation measures have been presented in the **Table 0.2**.

Table 0.2: Anticipated Environmental Impacts and their Mitigation Measures during Design/ Pre-construction Stage

S. No.	Environmental Components/ Issues	Impacts	Mitigation Measures
1.	Acquisition of Properties and Resettlement and Rehabilitation issues	A number of encroachers and squatters have been recorded within the existing Right of Way. The structures will need to be acquire for accommodating the proposed widening.	Acquisition of properties of encroachers and squatters will be carried out in accordance with the World Bank's policy and RAP of the project. Early identification affected persons will be done for Resettlement And Rehabilitation Action Plan to Compensate the Losses. The loss will be compensated in accordance with the R&R Policy adopted for the project. All the compensation/assistance to the affected persons will be paid before commencement of Construction works
2.	Cutting of Roadside Trees	A total number of 8476 trees will required to be felled due to the proposed widening.	All efforts will be made to safe the trees by restricting tree cutting within the formation width only. Compensatory plantation will be carried out within available space within the ROW as per Forest Act .
3.	Diversion of Forest Area	The roadside plantation within ROW has been declared by the state government as Protected Forest, therefore felling of roadside tree will attract the provision of Forest (Conservation) Act.	Forest Clearance for diversion of forest area will be obtained prior to cutting of roadside trees. Compensatory afforestation will be carried out as per stipulation under forest clearance.
4.	Religious/Cultural Features	Out of 20 religious structures, 3 temples are located very close to the road edge are likely to be affected due to proposed widening.	Adjustment in alignment to avoid impact on structure of these temples The safe entry to these structures needs to be provided to avoid accidents and interruption in traffic movement.



S. No.	Environmental Components/ Issues	Impacts	Mitigation Measures
5.	Ponds	A total number of 3 ponds are likely to be impacted partially due to proposed widening	Protection in design to be incorporated to avoid encroachment in the pond.
6.	Flooding	The road section between Km 2.520 to Km 5.420 gets submerged during flood and thereby the road gets damaged frequently.	To improve drainage condition in this stretch, the proposed profile has been raised and additional 6 numbers of balancing culverts have been proposed in order to allow free flow of water during flood.
7.	Traffic Safety	Accident Hazards	<p>The project will comply with the requirements of the EHS Guidelines of the World Bank Group related to safety consideration in design.</p> <p>Geometric corrections, scientifically designed bus stand, traffic signals, zebra crossings, junction improvements, bus bays and truck laybys, traffic lightings and caution, regulatory and informative signboards have been provided in the project as per IRC codes.</p> <p>Traffic calming Measures have been proposed at eight built-up areas along the project road.</p>

B. Impact during Construction and Operation Phase

During construction period the major environmental issues will be related to dust generation, emission of gaseous emissions, borrow area and quarry operations, pollution due to operation of plants and equipments, contamination of land and soil, contamination of water bodies and public as well as workers health and safety. These anticipated impacts will be mainly temporary and localised in nature and are likely to persist for short duration till the construction activities are over in a particular area. However there are some long term adverse impacts due to construction. The likely impacts due to construction activities and operation of the project are explained along with the mitigation measures and institutional responsibility of implementation of environmental safeguards measures in **Table 0.3**.



Table 0.3: Matrix of Potential Environmental Impacts and Mitigation Measures during Construction and Operation Stage

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
A. Construction Phase				
Loss of Top Soil	Excavation will be done only to the pegged area for constructing the road.	Throughout the stretch	Contractor	PMC/ PIU-UPPWD
	Agricultural areas will be avoided for borrowing of materials, unless requested by the land owner.	Borrow areas	Contractor	PMC/ PIU-UPPWD
	The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles of height not exceeding 2m.	Borrow sites, Quarry , Plant site and construction zone	Contractor	PMC/ PIU-UPPWD
	The stored topsoil will be spread back to maintain the soil physico-chemical and biological Characteristics.	Borrow areas, Quarry, Plant site and construction zone	Contractor	PMC/ PIU-UPPWD
Compaction of Soil	Construction vehicles, machinery and equipment will move, or be stationed in the designated area, to avoid compaction of soil.	Construction site and all ancillary sites	Contractor	PMC/ PIU-UPPWD
	If operating from temporarily hired land, it will be ensured by the contractor that the topsoil for agriculture remains preserved & not destroyed by storage, material handling or any other construction related activities.			



Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Borrowing of Earth	<ul style="list-style-type: none"> Finalizing borrow areas for borrowing earth and all logistic arrangements are well as compliance to environmental requirements, as applicable, will be the sole responsibility of the Contractor. The Contractor will not start borrowing earth from select borrow area until the formal agreement is signed between the land owner and the Contractor and a copy is submitted to the PMC/PIU-UPPWD. All the borrow areas will be approved by the Engineer based on both material and environmental considerations. The Contractor will obtain environmental clearance for the borrow area as per MoEF circular and the conditions stipulated under the environmental clearance will be binding on the contractor. The Contractor will submit the copy of clearance letter to the Engineer and PIU before commencement of material extraction. All the borrow area will be operated in accordance with IRC specification and MoEF guidelines. No earth will be borrowed from within the RoW. Non-productive, barren lands, raised lands, river beds, waste lands are recommended for borrowing earth. The unpaved surfaces used for the haulage of borrow materials will be maintained properly To avoid any embankment slippages, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the Engineer. Each borrow area will be rehabilitated within one month after completion of extraction of materials to the satisfactions of the land owner and the Engineer. 	Borrow Areas	Contractor	PMC/ PIU-UPPWD
Stone Quarry	<ul style="list-style-type: none"> The quarry material will be obtained from licensed sites only, which operate with proper environmental clearances, including clearances under the Air Act. If the Contractor wants to open a new Quarry, then he has to obtain necessary environmental clearance from MoEFCC and lease license from Directorate of Geology and Mines. 	Quarry sites	Contractor	PMC/ PIU-UPPWD



Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	<ul style="list-style-type: none"> All the quarries will be approved by the Engineer based on both material and environmental considerations. The quarry operations will be undertaken within the rules and regulations in force. All safety and environmental concerns will be addresses adequately during quarry operations and transportation of materials as per prevailing rules. Only controlled blasting shall be carried out, if necessary for extraction of stone materials in strict compliance with the statutory norms and specification The restoration of Quarry will be done as per the conditions of the owner before handing over the site back to the owner. 			
Soil Contamination from Fuel and lubricants	Impervious platform and oil and grease trap for collection of spillage from construction equipment vehicle maintenance platform will be appropriately provided at construction camp, servicing area and liquid fuel and lubes at storage areas.	Construction Camp, Vehicle and Equipment Servicing Centre and Construction site	Contractor	PMC/ PIU-UPPWD
Soil Contamination from Construction waste and spoils	All spoils will be disposed off as desired and the site will be fully cleaned before handing over.	Construction site throughout the project stretch	Contractor	PMC/ PIU-UPPWD
	The non-usable bitumen spoils will be disposed off in a deep trench providing clay lining at the bottom and filled with soil at the top (for at least 0.5m)			
Community water Source	Any community water source as wells, tube-wells, etc., lost incidentally will be replaced immediately	Throughout the project stretch	Contractor	PMC/ PIU-UPPWD
Drainage and run off	Earth, stones, wastes and spoils would be properly disposed off, to avoid blockage of any drainage channel.	Throughout the project stretch	Contractor	PMC/ PIU-UPPWD
	All necessary precautions will be taken to construct temporary or permanent devices to prevent inundation or ponding.			
Contamination of water from construction and allied activities	All necessary precautions will be taken to construct temporary or permanent devices to prevent water pollution due to increased siltation and turbidity.	Throughout the project stretch and allied sites including Construction camp and labour camp	Contractor	PMC/ PIU-UPPWD
	All wastes arising from the project will be disposed off, as per SPCB norms, so as not to block the flow of water.			
	Wastes must be collected, stored and taken to approved disposal site.			



Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Sanitation and waste disposal in construction camps	Garbage collection and disposal as well as sanitation facilities will be provided at camps	Construction Camp	Contractor	PMC/ PIU-UPPWD
	The construction camps will be located away from water sources.			
	Efforts will be made to provide good sanitary and sewage disposal facilities at camp to avoid epidemics			
	The workplace will have proper medical approval by local medical, health or municipal authorities.			
Use of water for construction	The Contractor will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected.	Campsites and Plant sites	Contractor	PMC/ PIU-UPPWD
	If a new tube-well is to be bored, prior sanction and approval by the Ground Water Department will be obtained			
	Wastage of water during construction will be minimized.			
Emissions from Vehicles and Equipments	All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the statutory norms.	Plant sites	Contractor	PMC/ PIU-UPPWD PMC; UP State Pollution Control Board,
	The asphalt plants, crushers and the batching plants will be sited at least 1.0 km in the downwind direction from the nearest human settlement and forest area			
Dust Generation	The hot-mix plants, crushers and batching plants will be sited at least 1.0 km downwind from the nearest habitation. The hot mix plant will be fitted with dust suppression system.	Plant sites and Construction site	Contractor	PMC/ PIU-UPPWD UP State Pollution Control Board,
	Water will be sprayed in the lime/cement and earth mixing sites, asphalt mixing site and temporary service and access roads.			
	After compacting, water will be sprayed on the earthwork regularly to prevent dust.			
	Material transportation will be carried out in covered vehicles			
	Vehicles and machinery will be regularly checked to conform to the CPCB Standards			
	Mixing equipment will be well sealed and equipped with dust control removal devices			
	Workers at mixing sites will wear nasal masks to reduce the chances of exposure to fine dusts (PM10 & PM2.5)			
	Regular monitoring of PM10, PM2.5, SO ₂ , NO ₂ , CO and /HC will be carried out as mentioned in the Environmental Monitoring Plan			



Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Noise Pollution from Construction vehicles and Machinery	The plants and equipment used for construction will strictly conform to CPCB noise standards.	Plant sites and Construction site	Contractor	PMC/ PIU-UPPWD UP State Pollution Control Board,
	Vehicles and equipments used will be fitted with silencer and maintained accordingly.			
	Noise standards of industrial enterprises will be strictly enforced to protect construction workers from severe noise impacts.			
	Noise to be monitored (for 24 hrs.) as per monitoring plan			
Noise Pollution from Blasting Operation	Blasting as per Indian Explosives Act will be adopted.	Quarry site	Contractor	PMC; PIU-UPPWD, UP State Pollution Control Board,
	People living near such blasting sites will have prior information of operational hours.			
	Workers at blasting sites will be provided with earplugs			
Loss or Damage to Vegetation	Apart from trees earmarked for felling, no additional tree clearing within the RoW will be carried out.	Throughout the stretch	Contractor	PMC; PIU-UPPWD and Forest Dept.
	Area of tree plantation cleared will be replaced according to compensatory Afforestation Policy under Forest Conservation Act-1980.			
Compaction of Vegetation	Construction vehicles, machinery and equipment will move or be stationed in the designated area only to prevent compaction of vegetation outside the RoW	Throughout the stretch	Contractor	PMC/ PIU-UPPWD
	While operating on temporarily acquired land for traffic detours, storage, material handling or any other construction related or incidental activities, it will be ensured that the trampling of soil and damage to naturally occurring herbs and grasses is avoided.	Throughout the stretch		
Occupational Health & Safety	The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and the statutory norms on safety during construction.	At Work sites, camp sites and other allied sites	Contractor	PMC/ PIU-UPPWD
	Adequate drainage, sanitation and waste disposal will be provided at workplaces.			
	Proper drainage will be maintained around sites to avoid water logging leading to various diseases.			
	Adequate sanitation and waste disposal facilities will be provided at construction camps by means of septic tanks, soakage pits etc.			
	A health care system will be maintained at construction camp for routine check up of workers and avoidance of spread of any			



Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	<p>communicable disease</p> <p>Safety of workers undertaking various operations during construction will be ensured by providing appropriate Personnel Protective Equipments (PPEs) such as helmets, masks, safety goggles, safety belts, ear plugs etc</p> <p>The electrical equipment will be checked regularly</p> <p>At every work place, a readily available first aid unit including an adequate supply of dressing materials, a mode of transport (ambulance), nursing staff and an attending doctor will be provided.</p> <p>The Contractor will organize awareness program on HIV/AIDS and sexually transmitted diseases (STDs) for workers on periodic basis.</p>			
Public Safety	<p>The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007 and the statutory norms of safety during construction.</p> <p>To ensure safe construction in the temporary accesses during construction, lighting devices and safety signal devices will be installed.</p> <p>Traffic rules and regulations will be strictly adhered to.</p> <p>Road safety education will be imparted to drivers running construction vehicles.</p> <p>Adequate signage, barriers and persons with flags during construction to control the traffic will be provided.</p> <p>Proper barricading will be provided at all the work sites, borrow areas near habitation areas and camp sites will be</p> <p>At all time safe access for public movement near habitation area will be ensures</p>	At all work zones, borrow areas and other allied sites	Contractor	PMC/ PIU-UPPWD
Clean-up Operations, Restoration and Rehabilitation	<ul style="list-style-type: none"> Contractor will prepare site restoration plans, which will be approved by the Engineer. The cleanup and restoration operations are to be implemented by the Contractor prior to demobilization. The contractor will clear all the debris material at site, temporary structures; dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by the Engineer (PMC). 	Construction zones, Camp and other allied sites After Completion of Construction and before demobilization of Construction Team	Contractor	PMC/ PIU-UPPWD



Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	<ul style="list-style-type: none"> All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by the PMC in a layer of thickness of 75 mm-150 mm. 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 entire satisfaction of the Engineer (PMC). 			
Operation Phase				
Monitoring of Operation Performance	<ul style="list-style-type: none"> The PIU-UPPWD will monitor the operational performance of the various mitigation/enhancement measures carried out as a part of the project. The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision for relocated utilities, hand pumps and other relocated structures if any; status of rehabilitation of borrow areas etc. 	Throughout the project stretch		
Maintenance of Drainage	<ul style="list-style-type: none"> PIU-UPPWD will ensure that all drains (side drains, cross drains etc.) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding. PIU-UPPWD will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every three months. 	Throughout the project Stretch	Contractor till Defect liability period, then PIU-UPPWD	PIU, UPPWD
Pollution Monitoring	<ul style="list-style-type: none"> The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination in the selected locations as suggested in environmental monitoring plan will be the responsibility of Contractor. PIU-UPPWD will appoint MOEFCC/UPPCB approved pollution monitoring agency/Laboratory for this purpose. 	Especially major settlement areas	PIU, UPPWD	PIU, UPPWD
Contamination of Surface Water due to Traffic Movement & Accidents	Contingency Plans will be developed for cleanup of oil spills, fuel and toxic chemicals.	Throughout the Project Stretch	Contractor/PIU, UPPWD	PIU, UPPWD



Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
Noise Pollution	<ul style="list-style-type: none">Noise pollution will be monitored as per monitoring plan at different zones.Noise attenuating Tree Species to be planted along the roadNoise control programs are to be enforced strictly. Monitoring the effectiveness of the pollution attenuation barriers, if there is any, will be taken up.	Specially inhabitant location	Contractor/PIU, UPPWD through approved laboratory	PIU, UPPWD



0.5 Analysis of Alternatives

An analysis of “With” and “Without” Project scenario reveals that the positive impacts outnumbered the negative impacts due to the proposed development. The negative impacts are envisaged only during the construction period which will be temporary in nature and of short duration. Further mitigation measures will be adopted to limit the impacts during the construction phase. The proposed expansion will add in infrastructure development and will act as a catalyst to boost the economic progress. It was revealed during discussions with various stakeholders that safety is a major concern along the existing highway section. The safety aspect will be enhanced considerably with the provision of pedestrian crossings, additional designed bus stands, bus bays and truck lay bays, which are the significant part of the project.

0.6 Environmental Management Plan

Environmental Management Plan (EMP) is the key to ensure effective implementation of environmental safeguard measures during different stage of the project. The project specific EMP has been formulated for mitigating and offsetting the anticipated adverse impacts arising out of the project activities. The EMP also includes provision of environmental enhancement of the proposed project road. The Environmental Management Plan includes implementation Framework, supervision, monitoring and reporting requirements. Based on identified potential environmental impacts due to the projects, a Environmental Management Action plan has been develop for implementing the mitigation measures at different locations as well as different stages of the project. The institutional responsibility and timeframe have also been established in the EMP.

Institutional Arrangement for Implementation of EMP

During Preconstruction stage the responsibility of the implementation of mitigation measures is mainly with Project Implementation Unit of UPPWD. During Construction the primary responsibility of implementing environmental safeguards measures is with Contractor. The PMC’s role is supervisory role and they have to ensure the compliance with the provision of environmental safeguards by the Contractor. The UPPWD will be overall responsible for EMP implementation.

The UPPWD has established at Environmental and Social Development Cell at both PMU and PIU level to deal with environmental issues of the project. The PMU has appointed Project Management Consultant to assist with project preparation and support implementation as Engineer in-charge who will supervise the Contractors activities, compliances and monitor the overall progress of work. There is provision of Environmental Specialist in PMC. The Contractor team will also include Environment and Safety Officer. The Roles and responsibility of implementation and Supervision Agencies at different levels have been defined in table below.

Table 0.4: Roles and Responsibilities of Environmental Personnel at Different Levels

	Roles & Responsibilities
PMU’s Environmental and Social Nodal Officer (ESD Cell)	<ul style="list-style-type: none">• Finalize the EIA and EMP for individual sub-project with inputs from PMC• Confirm integration of EMP provision related to works in the contract documents• Provide guidance on environmental issues to PIUs Environmental and Social officers as requested• Coordinate with regulatory agencies like Forest Departments, and at request of PMC and/or Contractor, UPPCB



	Roles & Responsibilities
	<ul style="list-style-type: none">• Prepare regular reports on progress on EMP implementation across the project with inputs from the PMC's environmental specialist• Document experiences of developing and implementing environmental mitigation measures and convert it into training material for internal and external capacity building• Facilitate interaction between environmental teams of different sub-projects to allow cross-fertilization of ideas, successes and learnings
Environmental and Social Nodal Officer at PIU (Division Office)	<ul style="list-style-type: none">• Coordinate with PMC's environmental specialist to monitor and report on progress on EMP implementation as part of works contracts• Participate in and facilitate consultations with stakeholders• Participate in project meetings and report on the issues related to environmental management to provide for any mid-course corrections that may be required based on situation on the ground• Coordinate on the training and capacity building initiatives
Environmental Specialist, PMC	<ul style="list-style-type: none">• Lead the development of the sub-project specific EIA and EMP for the entire project• Review contract documents to ensure that EMP provisions related to works are included in the contract documents• Assist the Environmental Specialist in the PMU to follow-up with state government departments• Oversee and report to the PMU on implementation of EMP provisions included in the works contract for each sub-project• Act as a resource person in trainings based on experience on implementing this project and previous relevant work
Contractors' Environmental and Safety Officer	<ul style="list-style-type: none">• Lead the implementation of EMP measures included in the Contract• Report on progress and shortcomings of the measures implemented to Environmental Specialist of PMC

Environmental Monitoring Plan

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

Environmental Enhancement

Enhancement measures for community properties located adjacent to the road has been proposed in consultation with the local population. The locations identified for enhancement is at Kalauli Teer at Km 5.300 at primary school, Ponds at Km 5.800 and Km 7.700.

Grievance Redressal Mechanism (GRM)

An integrated system will be established with Grievance Redressal Cells (GRCs), with necessary officers, officials and systems, at the state as well as sub project levels. Grievances if any, may be



submitted through various mediums, including in person, in written form to a noted address, through a toll free phone line or through direct calls to concerned officials, and online. PWD will appoint a person to receive such calls and online messages. A timeframe will be decided for disposal of redressal. A record will be maintained for action taken to resolve the issues.

Environmental Budgeting

A budgetary provision of Rs. 11.44 Crores has been proposed for implementation of EMP in the project, which includes various mitigation costs during preconstruction, construction and operation stages, environmental enhancement measures, as well as environmental monitoring cost.

0.7 Conclusions

The proposed expansion will add in infrastructure development and will act as a catalyst to boost the economic progress of the state. It was revealed during discussions with various stakeholders that after the widening the existing road will ensure smooth flow of traffic thereby will increase the public safety and comfort. Benefits of the project will be the reduction in air pollution due to better service levels of the road, reduction in travel time and accidents and better connectivity. This will definitely encourage the economic along the project stretch, thereby improvement of socio-economic condition of the area along the project corridor.

With best management practices and a proper environmental management & monitoring plan in place during construction and operation stages, the proposed project is not expected to cause any significant adverse effects on the surrounding environment.



1 INTRODUCTION

1.1 Purpose of the Report

Road projects are meant for improving the quality of life for people and developing the country's economy. For all positive impacts of the road projects, there may be also some significant detrimental impacts on nearby communities and natural environment. There may be impact on properties of people, their livelihood and other social components. Similarly, there can be direct or indirect impact on flora, fauna, water resources, land use etc. The environment has a limited carrying capacity and it can only sustain a negative impact up to a level without further degradation. Several systems, however, temporarily disturb it leading to a new balance in order to re-establish the equilibrium between human activity and nature. But sensitive systems are not so resilient to cope up with changes in physical and natural Environment, thus not only leading to negative impact on them but also, socio-economic losses may occur. To account for all these issues, environmental and social impact assessment is utmost necessary. These concerns for environmental and social issues in road projects have also become a part of legal requirements and for obtaining financial support. Environmental considerations are therefore of prime importance in road projects.

The EIA study has been conducted for the project section of Hamirpur-Rath section of state highway no. 42 (SH42) in the district of Hamirpur of Uttar Pradesh in accordance with ESMF prepared for UPCRNDP. The main objective of the study is to incorporate the environmental consideration in project planning and designing and formulating the Environmental Management Plan for implementing the environmental safeguards at different states of the project. The Environmental Management Plan will be part of the bidding document for construction.

1.2 Project Background

The Government of Uttar Pradesh has requested the World Bank through Government of India to provide assistance for improvement of the Core Road Network of the state.

The state has a road network of 299,604 km, out of which 174,451 km are under Uttar Pradesh Public Works Department (PWD). The roads under PWD comprise 7,550 km of National Highways (NHs), 7,530 km of State Highways (SHs), 5,761 km of Major District Roads (MDRs), 3,254 km of Other District Roads (ODRs) and 138,702 km of Village Roads (VRs). Only about 60% of SHs are two-lane (7 m). In the entire state 62% of MDRs and 83% of ODRs have widths less than 7 m.

With a view to improve the transport network system, UPPWD has identified 24,095 km of Core Road Network for the development. This network comprise NH, SH, MDR, ODR and the details are presented in the table below.

Road Category	Length (km)
National Highway (NH)	7,550
State Highway (SH)	7,530
Major District Road (MDR)	5,761
Other District Road (ODR)	3,254
Total	24,095

The Government of Uttar Pradesh has a long-term program to improve the Core Road Network (CRN) and, as part of this program, has applied for a financial assistance from the World Bank for



1.4 Environmental Impact Assessment Study of Project Road

The environmental assessment preparation led to identification of potential environmental hazards and their feasible remedial measures, based on which the environmental mitigation measures have been prepared.

1.5 Objectives of the Study

The major objective of this study is to establish present environmental condition along the project corridor through available data / information supported by field studies to evaluate the impacts on relevant environmental attributes due to the construction & operation of the proposed project; to recommend adequate mitigation measures to minimize / reduce adverse impacts and to prepare an Environmental Management Plan (EMP) for timely implementation of the mitigation measures to make the project environmentally sound and sustainable. An Environmental Impact Assessment (EIA) study basically includes:

- Establishment of the present environmental scenario;
- Study of the specific activities related to the project;
- Evaluation of the probable environmental impacts;
- Recommendations of necessary environmental control measures; and
- Preparation of Environmental Management Plan.

1.6 Scope of the Study

Environmental assessment is a detailed process, which starts from the conception of the project and continues till the operation phase. The steps for environmental assessment are therefore different at different phases. The present report details the environmental setting of the project zone, collects the baseline data and then identifies the anticipated environmental impact and finally suggests appropriate mitigation measures and mechanism for ensuring effective implementation of the environmental safeguard measures at different stages of the project.

1.7 Structure of the Environmental Assessment Report

Chapter 1 Introduction

Chapter 2 Project Description

Chapter 3 Methodology

Chapter 4 Environmental Regulatory Framework

Chapter 5 Current Environmental Conditions

Chapter 6 Environmental Impacts and Mitigation Measures

Chapter 7 Analysis of Alternatives

Chapter 8 Public Consultation

Chapter 9 Environmental Management Plan



2 PROJECT DESCRIPTION

2.1 Introduction

The Government of Uttar Pradesh has requested the World Bank through Government of India (GoI) to provide assistance for improvement of the Core Road Network (CRN) of the state.

The Government of Uttar Pradesh has a long-term program to improve the Core Road Network (CRN) and, as part of this program, has applied for a financial assistance from the World Bank for developing the Uttar Pradesh Core road Network Development Project (UPCRNDP). The Public Works Department (PWD) on behalf of Government of Uttar Pradesh engaged Egis India Consulting Engineers Pvt. Ltd. to carry out Consultancy Services for Uttar Pradesh Core Road Network Development Plan.

The improvement works shall primarily consist of raising the formation level, widening to a full two lanes with paved shoulder from the existing single and intermediate lane widths and/or pavement rehabilitation/ strengthening.. Roads in urban areas may also require further widening for provision for drains, sidewalks, accommodate local traffic and parking where required.

2.2 Need for the Project

Road projects are generally undertaken to improve the economic and social welfare of those using the road or served by it. Increased road capacity and improved pavements can reduce travel times and lower the costs of vehicle use. Benefits include increased access to markets, jobs, education and health services, and reduced transport costs for both freight and passengers, reduce fuel consumption and exhaust emissions from the vehicle plying on the road. It became imperative to improve the connectivity by widening the road section for overall socio-economic growth in the area.

2.3 Project Objective

The key objective of PWD is to improve "Core Road Network" and the consultant's services should deliver and manage the identified road through scientific tools for planning, programming and budgeting; enhancing safety and capacity of existing roads.

On completion and/ or during progress of the proposed services, the UPCRNDP will able to:

- upgrade/ reconstruct/ widen as well rehabilitate selected roads;
- carry out road safety enhancement work;
- do planning, budgeting and programme to strengthen PWD project, asset and financial management;
- use Information Technology and integrated IT systems efficiently and effectively;
- have trained staff for new processes and procedures; and
- improve public and external stakeholder support and awareness.



2.4 Project Approach for Environmental Studies

The basic approach adopted for conducting the environmental study for the project is to strongly pursue the prevailing institutional and legislative setup of the Government of India (GoI) and World Bank Safeguard Policies on this subject. The main approaches for the study are:

- Identification, appraisal and division between positive and negative impacts, direct and indirect impacts, and instant and long-term impacts likely to result from project road;
- Identification of unavoidable or irreversible impacts;
- Identification of un-mitigated negative impacts;
- Exploration towards the opportunities for environmental enhancement; and
- Identification of feasible and cost effective mitigation measures to minimize negative impacts and enhance positive impacts by incorporating in the preliminary engineering design.
- Preparation of Environmental Management Plan for effective implementation of environmental mitigation measures at different stages of the project.

2.5 Project Location

The project road is section of State Highway No. 42 (SH-42) which is located on south side of UP state passing through Hamirpur district of Bundelkhand region. The project road start at Km 2.000 near Hamirpur forming a Y intersection with NH-86 at Km 59+000 of NH-86 and ends at Km 76.500 at Rath . At start, 2 Km road length is overlap with NH-86 hence, the project starts from Km 2+000 of SH-42. The upgradation of proposed project section is from Km 2.000 to Km 76.500 in Hamirpur District. The key location of project road is indicated in **Figure 2.1**.

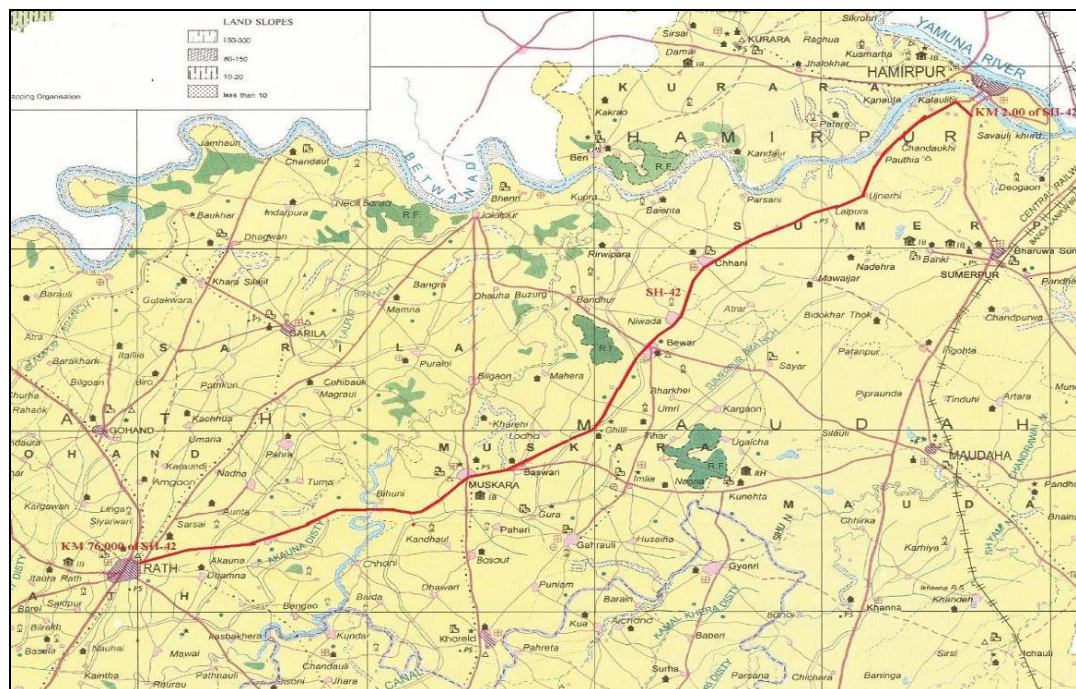


Figure 2.1: Project Location



2.6 Proposed Development

The project is widening to a full two lanes from the existing single and intermediate lane widths and/or pavement rehabilitation/strengthening. Road section will be widened to 10m with 1.5 m full paved shoulders to facilitate motorized and non-motorised users. Roads in urban areas may also require further widening for provision for drains, sidewalks, accommodate local traffic and parking where required.

The objective is to enhance operational efficiency of highway and safety of the traffic & the road users. The salient feature of the project is presented in **Table 2.1**.

Table 2.1: Salient Features of the Project

S. No.	Project Components	Details
A. General Information		
1.	Location of Project	From Km 2.000 to Km 76.500 of SH-42 in Hamirpur District of Uttar Pradesh
2.	Administrative locations	Hamirpur district
3.	State	Uttar Pradesh
4.	Length of the project section	74.50 Km
5.	Terrain	Plain
6.	Major Settlement along the Project Stretch	The major settlement areas along the project road are Pothia, Channi, Bewar, Muskara, Bihuni and Rath
7.	Rivers	Local stream at 59.600 Km, Apart from the a number of irrigation canals cross the project stretch at different locations
8.	Ponds	There are 9 ponds located in project vicinity. All ponds have been saved.
9.	Forest area	Road side plantation declared as Protected Forest (PF) along the project section
10.	Wildlife Sanctuary/ National Park/ Notified Ecosensitive zone within 10 Km from project alignment	Nil

2.7 Project Proposal

2.7.1 Right of Way (ROW)

The ROW details are being furnished as per revenue records/maps for further processing. The average ROW on project road is 30m, with width varying from 20-42m.

2.7.2 Traffic Volume

A detailed traffic surveys and analysis for the project roads have been conducted in the year 2014, hereinafter called, "Base Year". Detailed traffic projections over the design life and growth rates obtained for different types of vehicles are discussed in traffic chapter. For the purpose of pavement design, commercial vehicles of gross vehicle weight more than 3 ton have been considered. Such vehicles consisted of buses, LCVs, 2 axle trucks, 3 axle trucks and multi axle trucks.

From total projected base year AADT and estimated traffic growth rates, vehicle category-wise traffic volume projections have been made for various design periods. **Table 2.2** gives the total projected base year (2014) traffic volumes in terms of AADT for each of the identified traffic homogeneous section and has been used for the estimation of design traffic in terms of MSA for pavement design.


Table 2.2: Base Year Traffic Volumes

Vehicle Type		Near Lalpur at Km 17+000 (Hamirpur-Bewar)	Near Bihunikurd at Km 58+000 (Bewar-Rath)
Two Wheeler		655	1233
Three Wheeler		22	189
Car/Van/Jeep		511	349
Mini Bus		10	5
Standard Bus		52	64
LCV		14	14
2 Axle Truck		199	42
3 Axle Truck		319	43
MAV		22	14
Agricultural Tractor		4	21
Agricultural Tractor & Tractor		14	33
Non Motorised Vehicles	Cycle	121	267
	Cycle Rickshaw	0	0
	Animal Drawn Vehicles	3	0
	Hand Cart	0	0
	Others	0	0
Vehicles	Motorised	1822	2007
	Non Motorised	124	267
	Total	1946	2274
PCU	Motorised	2775	1873
	Non Motorised	73	134
Total		2848	2007

2.7.3 Structures

As per inventory and topographical survey, the project road has 10 bridges out of which 9 are of minor bridges and 1 major bridge and 88 culverts. There are brick arch and solid slab type minor bridges. Similar trend is there for culverts also in addition to pipe culverts. Structure density is low in some stretches where there is no cross drainage structure for more than a km of road stretch.

Based on condition survey, hydraulic studies, size of pipe culverts, revised profile of the road; it is revealed that a few cross-drainage structures (culverts) shall need reconstruction. The summary of existing and improvement proposals is as follows:

Table 2.3: Summary of Culverts

Particulars		Type of Culverts					Total
		Pipe* Culverts	Arch Culverts	Stone Culverts	Slab Culverts	Box Culverts	
Existing culverts		43	14	3	28	-	88
Improvement Proposal							
To be retained with repairs		5	-	-	9	-	14
To be retained with widening		14	5		8	-	27
To be Replaced	Box	-	9	3	11	-	23
	HP	24	-		-	-	24
Additional construction		13	0	0	0	18	31
Total		56	14	3	28	18	119

** All buried / blocked culverts considered as pipe culverts*



Table 2.4: Summary of Bridges

Particulars	Type of Structure							
	Minor Bridge	Major Bridge	ROB	RUB	VUP	PUP	Flyover	Total
Existing Structures	9	1	-	-	-	-	-	10
To be retained with repairs	5	1	-	-	-	-	-	6
To be retained with widening	3	-	-	-	-	-	-	3
To be Replaced with Box type bridge	1	-	-	-	-	-	-	1
New additional construction	-	-	-	-	-	-	-	0
Total	9	1	-	-	-	-	-	10

Improvement proposals category-wise for culverts, minor bridges, major bridges and ROB/RUB are detailed hereunder.

2.7.4 Bus Bays and Bus Shelters

Bus stops with bus shelters would be provided at locations of settlements. Bus lay byes will be provided on both side (LHS & RHS) and the details are provided in **Table 2.5**.

Table 2.5: List of Proposed Bus bays

S. No.	Location of Bus- Bay		Name of the Village
	Existing Chainage (Km)	Proposed Chainage (Km)	
	Left	Left	
1	4+035	4+000	Chandauli
2	9+925	9+900	Pothiya
3	12+545	12+525	
4	13+825	13+800	Ajnedi Sachivalya Gramin
5	16+775	16+750	Lalpura Village
6	20+320	20+300	Swasa Buzurg
7	26+455	26+450	Chaani Village
8	29+890	29+900	Abhinav Pragya College
9	31+080	31+100	Krishan Kant Public School
10	34+325	34+350	Biwar Village
11	41+360	41+400	Chilli Village
12	43+780	43+820	
13	46+205	46+250	Damupur Village
14	48+350	48+450	Baswari Village
15	50+280	50+400	Muskara Village
16	58+270	58+772	Bihuni Village
17	62+280	62+780	
18	70+630	71+200	
19	75+900	76+490	Rath

2.7.5 Truck Lay-byes

The list of proposed truck lay-byes is given **Table 2.6**.



Table 2.6: List of Proposed Truck Lay-byes

S. No.	Location of Truck- Bay		Side	Name of the Village
	Existing Chainage	Proposed Chainage		
1	8+230	8+200	RHS	-
2	12+920	12+900	RHS	-
3	18+725	18+700	LHS	-
4	52+461	52+970	LHS	Muskara

2.7.6 Road Lighting

Road lighting shall be retained on all urban/built-up road sections.

2.7.7 Safety aspects in Project Design

The following safety aspects have been incorporated in project design:

S. No.	Design Aspect	Proposed Locations along the project road		
1.	The toe wall of varying height	From (Km)	To (Km)	
		2+143	2+230	
		3+650	3+670	
		9+790	9+840	
		20+705	20+755	
		58+075	58+105	
		59+400	59+540	
		60+040	60+190	
2.	Crash Barriers (W beam metal crash barrier) provide at curves and at the location where the embankment is greater than 3 meter.	From (Km)	To (Km)	
		Curve section		
		2+577	2+672	
		55+034	55+200	
		57+946	58+068	
		61+433	61+594	
		Embankment Greater than 3m (LHS)		
		2+125	2+515	
		4+665	4+735	
		4+805	4+845	
		4+865	4+915	
		59+225	59+620	
		59+890	60+965	
		61+825	61+855	
		Embankment Greater than 3m (RHS)		
		2+095	2+535	
		2+585	2+665	
		2+895	3+015	
		3+065	3+285	
		4+565	4+605	
		4+675	4+715	
		4+755	4+905	
		9+445	9+495	
		9+545	9+585	
		10+925	10+945	
		12+405	12+425	



S. No.	Design Aspect	Proposed Locations along the project road
		13+235
		13+275
		13+295
		13+315
		13+335
		13+365
		17+035
		17+105
		58+625
		58+645
		59+225
		59+620
		59+890
		60+965
		64+355
		64+385
		At pond location
		5+350
		5+450
		9+790
		9+840
		20+705
		20+755
		At Chanduli Tir Village
		3+380
		3+680
		At Existing Bridge Approaches with Narrow Width
		Design CH
		41+126
		43+356
		45+900
		48+185
		57+930
		59+760
3.	Roadway delineators	<p>(a) Roadway indicators Metal roadway indicators with circular cross-section are proposed. These are generally proposed in non-urban sections especially in curved sections of radius less than 360m.</p> <p>(b) Road Reflector Pavement Markers (RRPM) The road reflective pavement markers (RRPM) i.e. road studs are proposed to improve the visibility in night time and wet weather conditions. Their use is restricted on other locations like on approach to narrow bridge and culverts and adjacent to bridge parapet on traffic side, road embankment exceeding 3m in height and approaches to major intersections.</p> <p>(c) Hazard Markers Type 2 Stripped markers consisting of alternatively black and yellow stripes are proposed where the objects close to the road constitutes an accident hazard. The locations are all bridge and culvert (primarily narrow) abutments.</p> <p>(d) Object Markers Provided at approaches to intersections along the project road</p>
4	Rumble Strips	Rumble strips are proposed in advance of sharp curves, traffic calming zones, and village/urban approaches. These are also provided at some hazard locations or accident black spots like approach to temples/ schools etc. Proper sign boards and marking would be provided to advise the drivers in advance of the rumble strips.



S. No.	Design Aspect	Proposed Locations along the project road									
5	<p>Traffic Calming Measures proposed</p> <ul style="list-style-type: none">• Gateway Signs• Gateway Markings• Speed Calming• Night time Visibility	<p>Traffic calming Measures have been proposed at following eight built-up areas:</p> <table><tr><th>Built-up Area</th></tr><tr><td>Pothiya</td></tr><tr><td>Swasa Buzurg</td></tr><tr><td>Chani</td></tr><tr><td>Biwar</td></tr><tr><td>Chilli</td></tr><tr><td>Damupur and Baswari</td></tr><tr><td>Muskara</td></tr><tr><td>Rath</td></tr></table>	Built-up Area	Pothiya	Swasa Buzurg	Chani	Biwar	Chilli	Damupur and Baswari	Muskara	Rath
Built-up Area											
Pothiya											
Swasa Buzurg											
Chani											
Biwar											
Chilli											
Damupur and Baswari											
Muskara											
Rath											
6	<p>Road Signs: Cautionary, Mandatory and Informatory Signs</p>	<ul style="list-style-type: none">• Provided all along the project section									

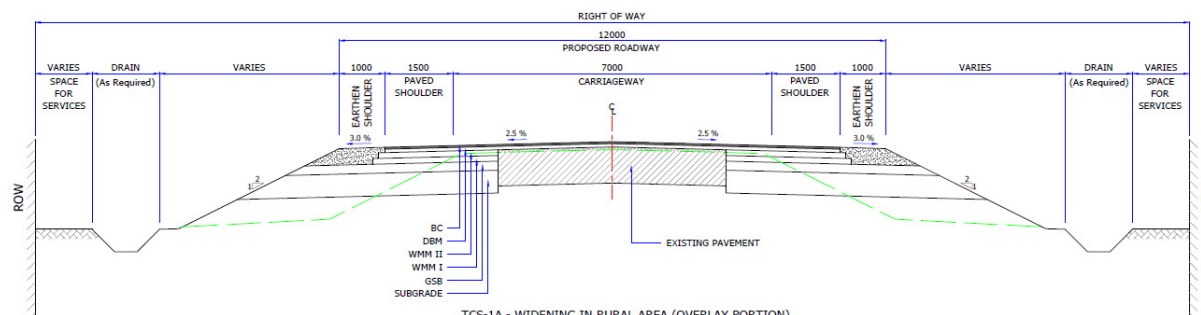
2.8 Typical Cross Section

Drawings of the typical cross sections (TCS) adopted on the project road are included at the end of this Chapter. The details of typical cross-sections are given in **Table 2.7**.

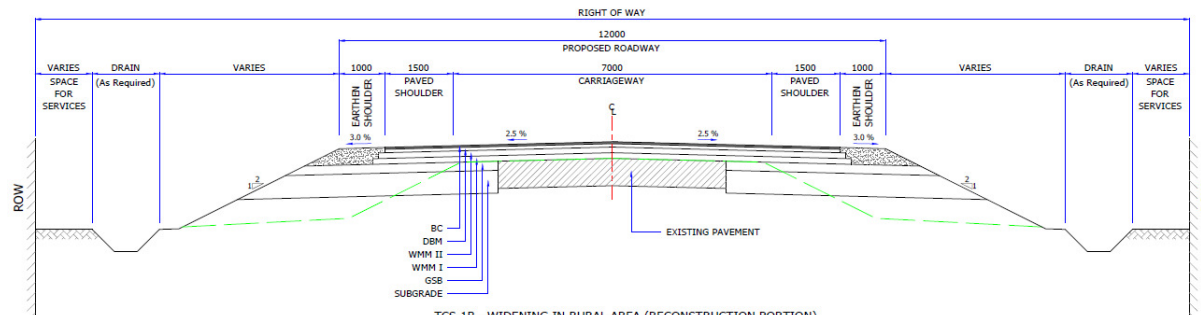
Table 2.7: Details of Typical Cross-sections

S. No.	Cross Section Type	Description
1.	TCS -1A	Widening in rural area (Overlay Portion)
2.	TCS -1B	Widening in rural area (Reconstruction portion)
3.	TCS -1C	Widening in rural area (New Construction due to raising)
4.	TCS -2A	Widening in urban area (Overlay Portion)
5.	TCS-2B	Widening in Urban area (Reconstruction portion)
6.	TCS-3	2 Lane with paved shoulders in Chandauli Teer Village
7.	TCS-4A	Widening in semi-urban area (Overlay portion)
8.	TCS-4B	Widening in semi-urban area (Reconstruction portion)

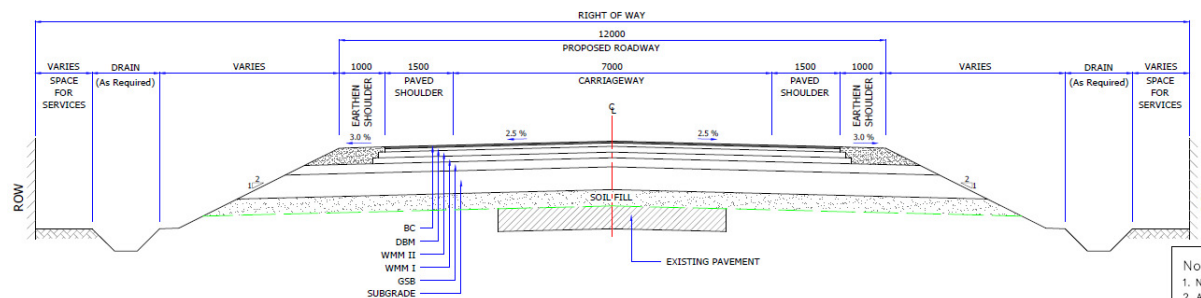
The typical cross-sections are shown in **Figure 2.2**.



TCS-1A - WIDENING IN RURAL AREA (OVERLAY PORTION)



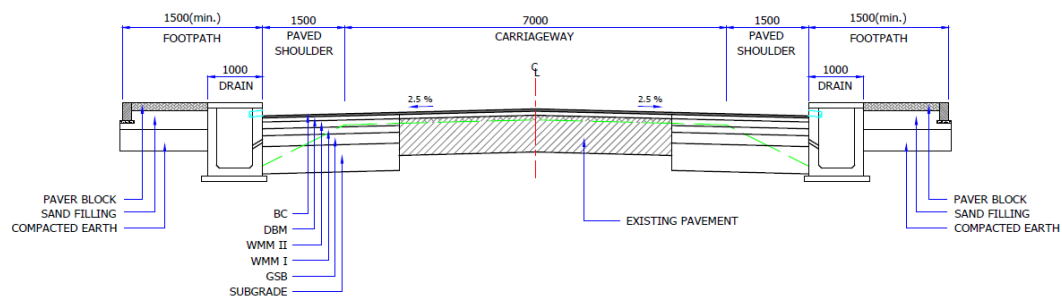
TCS-1B - WIDENING IN RURAL AREA (RECONSTRUCTION PORTION)



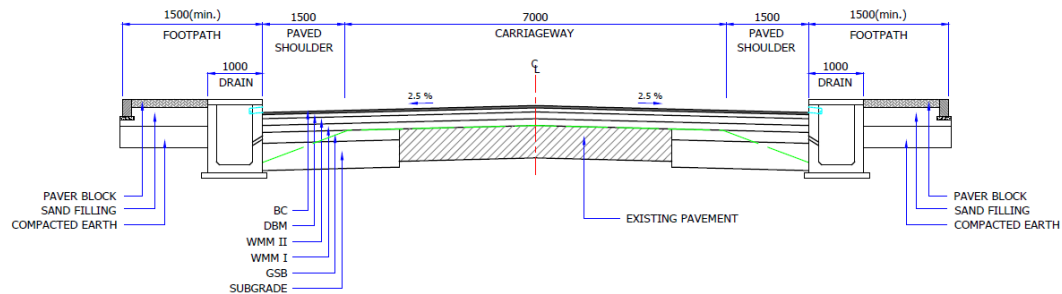
TCS-1C - WIDENING IN RURAL AREA (NEW CONSTRUCTION DUE TO RAISING)

TCS 1 - 2 LANE WITH PAVED SHOULDERS (RURAL SECTION)

Notes & Abbreviation:
 1. Not to Scale
 2. All dimensions are in mm unless otherwise mentioned
 3. BC: Bituminous Concrete
 DBM: Dense Bituminous Macadam
 WMM: Wet Mix Macadam
 GSB: Granular Sub Base



TCS-2A - WIDENING IN URBAN AREA (OVERLAY PORTION)



TCS-2B - WIDENING IN URBAN AREA (RECONSTRUCTION PORTION)

TCS 2 - 2 LANE WITH PAVED SHOULDERS & FOOTPATH CUM DRAIN (URBAN / SEMI URBAN)

Notes & Abbreviation:

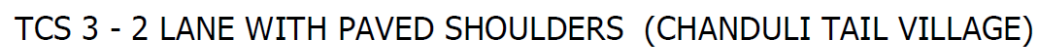
1. Not to Scale
2. All dimensions are in mm unless otherwise mentioned
3. BC: Bituminous Concrete
DBM: Dense Bituminous Macadam
WMM: Wet Mix Macadam
GSB: Granular Sub Base



DETAILED PROJECT REPORT

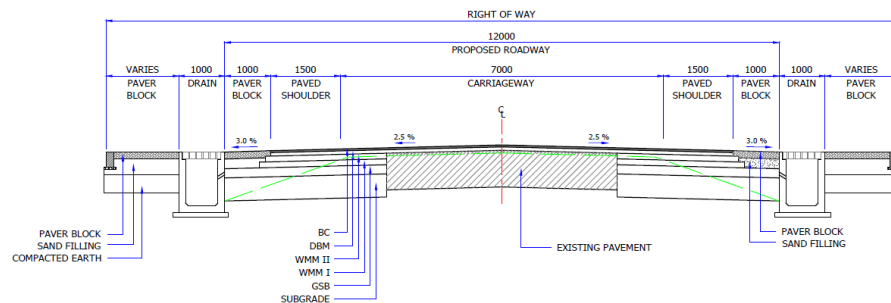
Volume-VIII: Draft EIA and EMP Report

Hamirpur – Rath Road (SH-42)

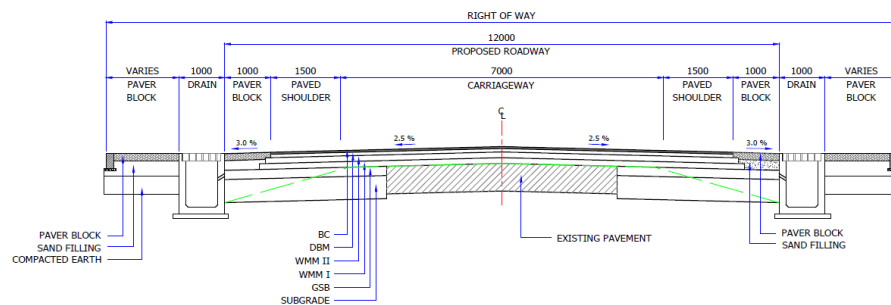


Notes & Abbreviation:

1. Not to Scale
2. All dimensions are in mm unless otherwise mentioned
3. BC: Bituminous Concrete
DBM: Dense Bituminous Macadam
WMM: Wet Mix Macadam
GSB: Granular Sub Base



TCS-4A - WIDENING IN SEMI URBAN AREA (OVERLAY PORTION)



TCS-4B - WIDENING IN SEMI URBAN AREA (RECONSTRUCTION PORTION)

**TCS 4 - 2 LANE WITH PAVED SHOULDERS & LINE DRAIN
(SEMI URBAN)**

Figure 2.2: Typical Cross-section

Notes & Abbreviation:

1. Not to Scale
2. All dimensions are in mm unless otherwise mentioned
3. BC: Bituminous Concrete
DBM: Dense Bituminous Macadam
WMM: Wet Mix Macadam
GSB: Granular Sub Base



3 METHODOLOGY

3.1 Introduction

The approach to carry out site specific EIA study was organized in four tasks and is based on the field investigations and reconnaissance surveys in the project area, collection, collation and analysis of secondary data and discussions with key stakeholders on the potential impacts of the project. Information on various environmental components were collected through survey oriented screening, collection of data using questionnaire, monitoring of air, water and soil quality and collection of secondary data.

The Screening exercise along the existing road pinpointed the environmental constraints. The hot spots identified during the screening exercise were further assessed for their criticality and impacts jointly by teams of environmental specialist, social impact specialist, design engineers and surveyors. The proposed alignment has been examined in detail for any direct, indirect or cumulative impact on environmental characteristics during feasibility report preparation. A variety of mitigation measures have been included in road design to minimise the adverse effects of road widening on environmental components. During screening following screening matrix was used to assess the extent of potential impacts on different environmental components.

Table 3.1: Environmental Screening Matrix for Hamirpur – Rath SH-42 Project

S. No.	Environmental Feature	Category Assigned (High/Medium / Low)	Significance (based on extent of length affected or numbers involved)	Remark/Explanation
A. Physical Environment				
1	Drainage Conditions	Low	Nil	Drainage has been proposed along the project section
2	Surface Water Resources	Low	9 Ponds, 1 River and 11 Irrigation canals are located in the project corridor	3 Ponds located at Km 5.300 (LHS), Km 10.000 (RHS) and Km 20.700 (LHS) are very close to the road edge and likely to be impacted due to widening. Suitable protection measures in design like provision of toe wall/ retaining wall/ widening on opposite side has been recommended.
3	Erosion Prone stretches	Medium	1 location for 500 m near High embankment near bridge across Bihuni River at Km 59.600.	Slope Protection has been recommended.
4	Construction Material	Medium	It has been estimated that due to roadway cutting and drain excavation huge quantity of earth work materials will be generated, which can be reused for sub-grade and earthen shoulder to	Sufficient borrow/quarry areas are available along the project road. Appropriate Mitigation measures will be required during extraction and transportation of materials and rehabilitation of the area to minimise the impact. The Impact will be temporary in nature till material extraction



S. No.	Environmental Feature	Category Assigned (High/Medium / Low)	Significance (based on extent of length affected or numbers involved)	Remark/Explanation
			reduce the additional quantity requirement.	and completion of restoration work.
5	Topography	-	-	No Impact on topography is envisaged.
B. Biological Environment				
1	National Park / Wildlife Sanctuary	Nil	-	There is no Wildlife Sanctuary /National Park or eco-sensitive zone within 10 Km radius of project road
2	Non-NP/WLS areas	Nil	-	-
3	Migratory routes	Nil	-	Not any within the project corridor
4	Reserved Forests	Nil	-	Not any within the project corridor
5	Green Tunnels/ Large Trees	Nil	-	Not any within the project corridor
6	Protected Forests	Medium	Though out the project section (around 9000 trees are located within ROW, which are likely to be impacted)	Road side plantation within existing ROW has been declared as Protected forest throughout the project road.
C. Human Environment				
1	Settlement	Medium	About 746 structures are likely to be affected either partially or fully for widening of SH-42 section from Hamirpur to Rath	The project activities will be confined to the available Right of Way (ROW). As per baseline survey on social features within 10 m corridor, it has been revealed that there are number of squatters and encroachers within the existing ROW. So even though the widening is proposed within the existing ROW, the project envisages acquisition of various commercial and residential structures and displacement of Non titleholders (NTH)
2	Sensitive Receptors	Medium	There are 13 numbers of educational institutions/ hospitals/ health centres located along ROW.	Sensitive receptors are located adjacent to ROW and during construction period there will be temporary impact due to dust emission/noise pollution, which will be minimised with proper mitigation measures. No plant and equipment will be erected in the vicinity of these sensitive receptors. During night time, no construction activity will be performed near sensitive receptors.
3	Drinking Water sources	Low	About 50 hand pumps and 1 water tank is located within ROW.	This is temporary impact on drinking water source, till relocation. The relocation of hand pumps will be ensured with shortest possible time before



S. No.	Environmental Feature	Category Assigned (High/Medium / Low)	Significance (based on extent of length affected or numbers involved)	Remark/Explanation
				commencement of construction activities. Alternative arrangement of drinking water will be made till completion of the relocation of water sources.
4	Physical cultural Resources – Religious	Medium	There are about 20 numbers of religious structures located in the project corridor.	Adjustment in the alignment to avoids impact on religious structures. Wherever it is unavoidable the impacted religious structures will be shifted in consultation with local public before demolition during construction stage of the project road
5	Physical cultural resources – community	Medium	-	Adjustment in the alignment to avoids impact on Community structures. Wherever it is unavoidable the impacted structures will be compensated in accordance with the R&R Policy adopted for the project.
6	Utilities like electricity lines, pipelines for gas, etc	Medium	Water supply line is observed at Pothia, Muskara, Channi Buzurg and Rath.	The impact will be temporary. The water supply lines will be shifted during construction stage of the project road. The relocation of hand pumps will be ensured with shortest possible time before commencement of construction activities. Alternative arrangement of drinking water will be made till completion of the relocation of water sources.

The analysis of location of environmental features with respect to the project alignment and extent of identified impacts due to project, reflect that most of the impacts are of low and medium extent and mainly related to construction activities which are mostly temporary in nature. Based on the environmental screening the project is Classified as Category-B project in accordance with World Bank's Policy (OP 4.01 Environmental Assessment) and therefore it warrants site specific Environmental Impact Assessment.

For Environmental Impact Assessment study the task wise activities undertaken is presented below:

3.2 Task 1: Collection of Baseline Environmental Data

3.2.1 Secondary Baseline Data

Secondary data of the project area were collected from secondary sources like publishes literatures from various government agencies, or institutions on physical, biological and social components of environment. The data were reviewed and verified for establishing existing



environmental and ecological status within the project area. Following documents from different sources were consulted for collection of baseline environmental data.

Table 3.2: Sources of Secondary Data

S. No.	Information	Source
1.	Toposheets, District Planning Maps	Survey of India, Govt. of India
2.	Meteorological data	Directorate of Economics and Statistics, Govt. of Uttar Pradesh, Indian Meteorological Department, Govt. of India
3.	Geological data	Geological Survey of India, Directorate of Mines and Geology, Government of Uttar Pradesh
4.	Reserve Forests, Protected Forests and Wildlife Sanctuaries	Department of Forests, Govt. of Uttar Pradesh and State of Forest report, Forest Survey of India
5.	Landuse Pattern	Department of Economics & Statistics, Government of Uttar Pradesh,
6.	Forests Statistics	Department of Forests, Govt. of Uttar Pradesh
7.	Air & Water Quality	UP Pollution Control Board and MoEF
8.	Wildlife Sanctuary/ National Parks/Tiger Reserves	Wildlife Department/ Forest department, U.P.
9.	Wetland Atlas	MoEF, Govt. of India
10.	Demographic Profile	District Census Handbook, Govt. of India,
11.	Archeological Monuments/Sites	Archaeological Survey of India
12.	Legislative Acts and Rules	Department of Economics & Statistics, Government of Uttar Pradesh, Ministry of Environment and Forest, Govt. of India
13.	Census Data of 2011	Census of India, Government of India
14.	Statistical Abstract of Uttar Pradesh 2012	Government of Uttar Pradesh

3.2.2 Primary Baseline data

The primary baseline information on different environmental components were collected through field survey. Field survey were carried out to collect information on the major environmental features such as settlement facilities, drainage pattern of the area, forest, trees within RoW of the alignment, waterbodies, river crossing, sensitive receptors, air, water, noise and soil quality etc. and were studied in detail, which helped in identifying areas of concern along the stretch and critical issues. Consultation with the local officials and public were carried out also on the salient environmental features of the project area, etc

Further primary samples surveys for the environmental components, such as air, surface water, noise and soil characteristics that are critical in the context of the project were carried out. The post-monsoon sampling was carried out in the month of Nov 2014.

Ambient Air Quality

Ambient air monitoring stations were established at various locations along the project section accessing the ambient air quality in the project area. The air quality parameters considered for the study included Particulate Matter (PM₁₀), Particulate Matter (PM_{2.5}), Nitrogen oxides (NO_x), Sulphur dioxide (SO₂), Carbon Monoxide (CO) and Hydro Carbons (HC). The main criteria for the selection of site were based on type of activity, residential, commercial, traffic congestion, urban centres, , location of sensitive receptors etc. Monitoring was always done 20-30 m away from the central line of the existing road. 24 hourly monitoring was carried out for 3 consecutive days at each locations.



Water Quality

Grab samples from surface water bodies including river, canals and ponds were collected at 4 locations. The water samples from ponds at Kalauli Teer and Pothia, river near Bihuni and Irrigation Canal near Rath to assess the surface water Quality in the project area. Ground water samples were collected from handpumps and borewell at 3 locations at Kalauli Teer, Muskara and Rath. The water samples were tested for different physico-chemical parameters such as dissolved oxygen, total alkalinity, pH, conductivity, TDS, BOD, COD, etc. using standard methods (APHA, 1998). Bacteriological quality of the water was tested using the membrane filter method (APHA, 1998).

Soil Quality

Composite soil samples were collected from 3 locations along the project road. They were analyzed for relevant physico-chemical parameters using standard analytical methods (Allen, 1989; Anderson and Ingram, 1993; Rowell, 1994) to assess the soil quality of the area.

Noise Level

24 hourly ambient noise level was measured using a noise level meter at 5 locations along the entire stretch of road during day and night time. The selection of sampling locations was based of land use. The noise levels have been expressed as an equivalent noise level (Leq), which is the measurement of sound pressure level as the averaging time.

The sampling location for all the above attributes is depicted in **Figure 3.1** and the photo clips of sampling of environmental quality attributes at site is given in **Annexure 5.1**.

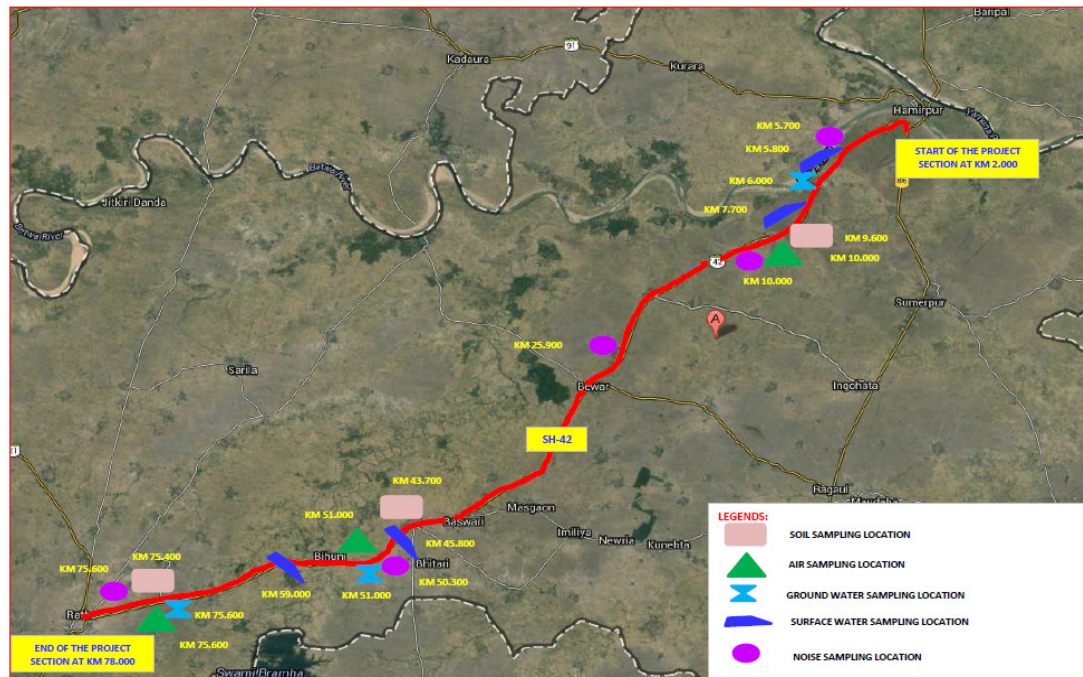


Figure 3.1: Environmental Monitoring Location along Hamirpur-Rath Section of SH-42



3.3 Task 2: Review of Policies, Regulations and Institutional Arrangements

A review of all applicable operational policies / directives of MoEF, State government, the World Bank and environmental laws / regulations in India, were carried out in this task. In addition to the above, the following key environmental regulations / policies in India that may affect / influence the project environment both during preparation and implementation stages were also reviewed.

- World Bank safeguards Policies
- EIA Notification, 2006 and amendment thereafter
- Environment (Protection) Act, 1986
- Water (Prevention & Control) Act, 1974
- Air (Prevention & Control) Act 1981
- Forest (Conservation) Act, 1980
- Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
- The Motor Vehicle Rule, 1983
- The Explosives Act, 1984

3.4 Task 3: Identification of Potential Environmental Impacts

Based on the baseline environmental profile of the project and analysis of the primary and secondary data collected, impacts of the proposed project on various environmental components were identified. The impacts were also analysed with respect to pre-construction, construction and operation phases and were categorised in terms of magnitude and significance.

Potential and significant impacts were identified on the basis of analytical review of baseline data; review of land uses and environmental factors; through assessment of potential impacts for pre construction, construction and operation phases were identified. The environmental impacts identified through the earlier tasks were used in the design formulation process to integrate environmental issues and for early identification of suitable mitigation measures.

Public consultations through informal interviews and focus group discussions were held at various stages of the project to assess community perceptions towards the projects and assess the concerns. These were incorporated in the design of the proposed alignment of the project section and were included in the mitigation measures suggested.

3.5 Task 4: Preparation of Environmental Management and Monitoring Plan

Based on the nature and type of environmental impacts anticipated, mitigation measures for preventing / minimising the same were identified and an Environmental Management Plan was then recommended both for the project execution and operation phases. Monitoring requirements and institutional responsibilities for the implementation of the suggested management plan were also identified as part of this task. The cost for implementing the proposed environmental mitigation measures has been worked out and presented in the report for necessary budgetary allocations as part of the project cost.



4 ENVIRONMENTAL REGULATORY FRAMEWORK

4.1 Introduction

The increase of environmental concerns has necessitated appropriate tools to protect the environment. India has developed a fairly comprehensive regulatory framework to address environmental and social concerns in relation to development projects. Its wide ranging enactments cover almost all major issues that need to be addressed in the course of development of infrastructure from a social and environmental perspective. The following section describes the institutional set-up and key legislation pertaining to environmental issues.

4.2 Institutional Framework

As a result of Stockholm Conference, first exclusive environmental act, Water (Pollution Prevention and Control) Act was enacted in 1974. In accordance with this act Central and State Boards for Prevention and Control of Water Pollution were set up. Later these boards were renamed into Central Pollution Control Board and respective State Pollution Control Boards. Department of Environment was set up in 1980. Subsequently in 1985, it was upgraded to a full-fledged Ministry of Environment and Forest to serve as the focal point in the administrative structure for the planning, promotion and coordination of environmental and forestry programmes. The Ministry of Environment and Forest and Climate Change (MOEFCC) has overall authority for the administration and implementation of government policies, laws and regulations related to the environment, including conservation, environmental assessment, sustainable development and pollution control. MOEFCC identifies the need to enact new laws and amend existing environmental legislation when required, in order to continue to conserve and protect the environment. At the state level, the MOEFCC authority is implemented by the Department of the Environment and the Department of Forest.

In 1976, the 42nd Constitutional Amendment created Article 48A and 51A, placing an obligation on every citizen of the country to attempt to conserve the environment. As a result, a number of laws related to environmental conservation were passed to strengthen existing legislation. Environment (Protection) Act, 1986 is the landmark legislation as it provides for the protection of environment and aims at plugging the loopholes in the other related acts.

The Government of India through specific legislations regulates the environmental management system in India. The Ministries / Statutory Bodies responsible for ensuring environmental compliance by project proponents include:

- The Ministry of Environment & Forests and Climate Change (MOEFCC)
- Central Pollution Control Board (CPCB)
- Uttar Pradesh Pollution Control Boards (UPPCB)
- Ministry / Department of Environment in the States

4.3 Key Environmental Laws and Regulation

Table 4.1 presents Environmental regulations and legislations relevant to this project, which are the responsibility of a number of government agencies.



Table 4.1: Summary of Relevant Environmental Legislations

Acts/Rule/Policy	Year	Objective	Applicability to this project	Responsible Agency
Environmental (Protection) Act	1986	To protect and improve the overall environment.	Yes, all environmental legislation is covered in this umbrella Act	MOEFCC. GoI; CPCB; UP State Pollution Control Board
Environment Impact Assessment Notification	2006	To provide environmental clearance to new development activities following environmental impact assessment	No. Applicable only for State Highways located in Eco-sensitive Zone and hilly terrain above 1000m amsl	State Environmental Impact Assessment Authority(SEIAA)
Indian Forest Act The Forest (Conservation) Act The Forest (Conservation) Rules	1927 1980 1981	To check deforestation by restricting conversion of forested areas into non forested areas.	Yes, Diversion of Protected Forest is required as Roadside Plantation has been declared as Protected Forest	Forest Department, Govt. of UP (for land conversion below 5 hectare & 40% density), MOEFCC, Regional Office and MOEFCC.
WildLife (Protection) Act	1972	To protect wildlife through certain of National Parks and Sanctuaries.	No. Only for the project either located inside the boundary of Wildlife Sanctuary or National Park/Tiger reserves. State Highways passing through Eco-sensitive zone outside the boundary of Wildlife Sanctuary/National Parks will also need recommendation of NBWL.	Chief Conservator. Wildlife, Wildlife Wing, Forest Department, Gov. of U.P. and National Board For Wildlife, GoI.
National Forest Policy National Forest Policy (Revised)	1952 1988	To maintain ecological stability through preservation and restoration of biological diversity.	Yes For clearing of forest/ felling of Trees	Forest Department, GoI and Govt. of U.P.
Water (Prevention and Control of Pollution) Act	1974	To control water pollution by controlling discharge of pollutants as per the prescribed standards.	Yes. Forest establishment and operation of Hot Mix/ Stone crusher/WMM/Batching Plants during construction, etc	UPPCB
Air (Prevention and Control of Pollution) Act	1981	To control air pollution by controlling emission of air pollutants as per the prescribed standards.	Yes. Forest establishment and operation of of Hot Mix/ Stone crusher/WMM/Batching Plants during construction, etc	UPPCB & Transport Department.
Central Motor Vehicle Act Central Motor Vehicle Rules	1988 1989	To check vehicular air and noise pollution.	Yes. For construction vehicles	Motor Vehicle Department,
Ancient Monuments and Archaeological Sites and Remains Act	1958	Conservation of cultural and historical remains found in India.	Yes. For the project located within 300 m from such features	Archaeological Dept. GOI, Indian Heritage Society and Indian National Trust for Art and Culture Heritage (INTACH).



Acts/Rule/Policy	Year	Objective	Applicability to this project	Responsible Agency
Right to fair compensation and transparency in land acquisition, rehabilitation and Resettlement Act	2013	Fair compensation for acquisition of immovable assets; Resettlement of displaced population due to LA and economic rehabilitation of all those who are affected due to land acquisition.	Yes. In case of acquisition of land	Revenue Department. Govt. of U.P.

A brief description of relevant laws is given below:

EIA Notification, 2006

This is the Indian Government's Guidelines for environmental impact assessment governing all of the development interventions that takes place within the boundaries of India. EIA notification was issued by Ministry of Environment, Forests and Climate Change (MOEFCC) in 2006 . Under this EIA Notification, the projects listed in Schedule-1 of the Notification require prior environmental clearance. The objective of the notification is to formulate a transparent, decentralized and efficient regulatory mechanism to:

- Incorporate necessary environmental safeguards at planning stage
- Involve stakeholders in the public consultation process
- Identify developmental projects based on impact potential instead of the
- investment criteria

As per EIA Notification, 2006 and amendment thereafter, the Expansion of State Highway does not require environmental clearance except for the State highways expansion project in hilly terrain (above 1000 m above mean sea level) and/or in eco-sensitive areas . As per Hon'ble Supreme court's direction, 10 km radius from the boundary of wildlife sanctuary will be considered as eco-sensitive zone till the actual radius of the eco-sensitive zone around the wildlife sanctuary boundary is notified by the state government.

The MDR and ODRs do not come in the purview of EIA Notification, 2006.

Forest (Conservation) Act: This Act is of particular significance in case the project corridors require acquisition of forest land outside the RoW of the road corridors as a result of the rehabilitation work proposed.

Forest (Conservation) Act: This Act is of particular significance in case the project corridors require diversion of forest land within RoW or acquisition of forest land outside the RoW of the road corridors as a result of the rehabilitation work proposed.

The Indian Forest Act (1927) was amended in 1980 in an attempt to check the rapid deforestation occurring throughout India and the Forest (Conservation) Act, 1980 came into existence. At the state level, the government was empowered to declare reserves and protected forest and was also given the authority to acquire land for extension and preservation of the forests. An advisory Committee was formed to supervise compliance, within other government



departments. In December 1996, a Supreme Court Judgment further defined the types of forests to be protected. The Ministry of Environment and Forests in their Corrigendum to Part II, Section 3, Sub-section (i) of Forest (Conservation) Amendment Rules, 2004 issued vide G.S.R. 107(E) dated 9th February, 2004, which explains the procedure for application for diversion of forests land depending on the area involved as follows:

- The proposal involving forest land upto 40 hectares shall be forwarded by the concerned State Government alongwith its recommendations, to the Chief Conservator or Forests or the Conservator of Forests of the Regional Office of the Ministry of Environment and Forests Government of India.
- The Chief Conservator of Forests/ Conservator of Forests of the Regional Office shall within a period of 45 days of the receipt of the proposal from concerned, decide the diversion of proposal upto 5 Ha.
- If the forest land is more than 5 and upto 40 hectare, The Chief Conservator of Forests/ Conservator of Forests of the Regional Office proceed, scrutinize and forward diversion proposal along with the recommendations, if any, to Ministry of Environment and Forests, New Delhi for obtaining decision of the Central Government and inform the State Government and the User Agency concerned.
- The proposal involving more than 40 ha of forest area, shall be forwarded by the concerned State Government alongwith its recommendations, to the Ministry of Environment and Forests, New Delhi

Guidelines For Diversion of Forest Land for Widening or Realignment of Road

As per Forest (Conservation) Act, the roadside plantation within the ROW notified as protected forests for management purposes will need approval from the Central Government under Forest (Conservation) Act, 1980.

The Regional Offices shall be competent to finally dispose of all such proposals irrespective of the area, preferably within 30 days from the date of receipt of the proposal. While the approval, in place of normal provisions for compensatory afforestation, the Regional Offices will stipulates a condition that for every tree cut at least two trees should be planted.

However, if the decision is not ordered by the concerned Regional Office within 30 days of the receipt of fully completed application, the Central Government / State may proceed with the widening/modernisation under intimation to the local State Forest Department and Central Government.

All the cases for forest clearance are now required to be applied online on the MoEF website. From there the application will be forwarded to the Nodal Officer of respective state for further processing of application. The user agency will submit the proposal in the prescribed format through the State Forest Department to the concerned Regional Office of the Ministry.

Wild Life Protection Act: The Wildlife Protection Act, **1972** has allowed the government to establish a number of National Parks and Sanctuaries over the past 25 years, to protect and conserve the flora and fauna of the state.



The Water (Prevention and Control of Pollution) Act, 1974 resulted in the establishment of the Central and State level Pollution Control Boards whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of any facility. This will include generation of liquid effluent during construction of road from civil engineering activities or from domestic activities in workers colony. There are specific penalties for violation, which include imprisonment for responsible officials.

The Air (Prevention and Control of Pollution) Act, 1981 empowers Central and State Pollution Control Boards for managing air quality and emission standards, as well as monitoring air quality, prosecuting offenders and issuing licenses for construction and operation of any facility. Air quality includes noise level standards. There are specific penalties for violation, which include imprisonment for responsible officials. This act has notified National Ambient Air Quality Standard for different regions e.g. Industrial, Residential and Sensitive. Air quality during construction and operation phases will be guided by this specific act.

Environment (Protection) Act, 1986: This act was passed as an overall comprehensive act for protection and improvement of environment” Under this act rules have been specified for discharge/emission of effluents and different standards for environmental quality. These include Ambient Noise Standard, Emission from Motor Vehicles, Mass Emission standard for Petrol Driven Vehicles, General Effluent Standards etc. especially important for road project.

U.P. Roadside Land Control Act, 1945: This is intended to regulate the development along the roads/highways in the state of UP. For the road sections 220 ft (67.056 m) either side of the existing National Highways and 55ft (16.76m) has been declared as protected area by the State Government and no further development is allowed after its notification in that area.

4.4 Statutory Clearance for Borrow area and stone quarry

Mining of minor minerals such as sand, gravel, clay, marble and other stones will not be allowed in the country without the approval of the Central government. The Hon'ble Supreme Court, vide its order dated 27.02.2012 in I.A.No.12-13 of 2011 in SLP (C) No.19628-19629 of 2009 titled Deepak Kumar etc. Vs. State of Haryana & Ors. has inter alia ordered that leases of minor mineral including their renewal for an area less than 5 ha be granted by the State / Union Territory only after getting environment clearance (EC) from the Ministry of Environment, Forests and Climate Change (MoEFCC). In order to ensure compliance of the aforesaid order of the Hon'ble Supreme Court, MoEF issued an OM No.L-11011/47/2011-IA.II(M) dated 18.05.2012 stating inter alia that all mining projects of minor minerals including their renewal, irrespective of the size of the lease would require prior EC and that the projects of minor minerals with lease area less than 5 ha would be treated as Category “B” as defined in EIA Notification, 2006 and will be considered by the respective State Environment Impact Assessment Authorities (SEIAAs) notified by MoEF and following the procedure prescribed under the EIA Notification, 2006. The mining projects having more than 5 Ha of lease area will be Categorised as Category A project and will be appraised by Central Committee of MoEFCC.

Regarding the borrow area for ordinary soil, the Contractor has to obtain environmental clearance from State Environmental Impact Assessment Authority (SEIAA) of MoEFCC in compliance to the Supreme Court's order and MoEF conditions vide their circular no. L-11011/47/2011-IA.II(M)



dated 20th June, 2013. If the area of a borrow area is less than 5 Ha then this will be treated as Category-B-2 Project and will be appraised and approved based of only Form-1. No EIA study will be required for such area. However if the size of the borrow area is more than 5 Ha then it will be categorized as "Category-B1" and therefore will require EIA study, based on which the SEIAA will give clearance for the same.

4.5 Other Legislation Applicable to Road Construction Projects

Environmental issues during road construction stage generally involve equity, safety and public health issues. The road construction agencies require complying with laws of the land, which include inter alia, the following:

- **Workmen's Compensation Act 1923** (the Act provides for compensation in case of injury by accident arising out of and during the course of employment);
- **Payment of Gratuity Act, 1972** (gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years);
- **Employees PF and Miscellaneous Provision Act 1952** (the Act provides for monthly contributions by the employer plus workers);
- **Maternity Benefit Act, 1951** (the Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.);
- **Contact Labor (Regulation and Abolition) Act, 1970** (the Act provides for certain welfare measures to be provided by the contractor to contract labour);
- **Minimum Wages Act, 1948** (the employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the);
- **Payment of Wages Act, 1936** (it lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers);
- **Equal Remuneration Act, 1979** (the Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees);
- **Payment of Bonus Act, 1965** (the Act provides for payments of annual bonus subject to a minimum of 83.3% of wages and maximum of 20% of wages);
- **Industrial Disputes Act, 1947** (the Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment);
- **Industrial Employment (Standing Orders) Act, 1946** (the Act provides for laying down rules governing the conditions of employment);
- **Trade Unions Act, 1926** (the Act lays down the procedure for registration of trade unions of workers and employers. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities);
- **Child Labour (Prohibition and Regulation) Act, 1986** (the Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labour is prohibited in Building and Construction Industry);
- **Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979** (the inter-state migrant workers, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home to the establishment and back, etc.);



- **The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996** (all the establishments who carry on any building or other construction work and employs 10 or more workers are covered under this Act; the employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the workplace, etc.);
- **The Building And Other Construction Workers' Welfare Cess Act, 1996**
Under the Act 2% labour cess is applicable in Uttar Pradesh while obtaining Labour License.
- **The Factories Act, 1948** (the Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours and rendering information-regarding accidents or dangerous occurrences to designated authorities);
- **Hazardous Wastes (Management and Handling) Rules, 1989;**
- **Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.**

4.6 World Bank Safeguard Policies

Projects financed with IDA resources normally need to comply with World Bank Operational Policies. The World Bank has Environmental and Social Safeguard Policies to reduce or eliminate the adverse effects of development projects. The safeguard policies of World Bank are provided in the **Table 4.2**.

Table 4.2: Safeguard Policies of World Bank

World Bank Safe Guard Policies	Objective	Applicability	Safeguard Requirements
OP 4.01 Environmental Assessment	The objective of this policy is to ensure that Bank financed projects are environmentally sound and sustainable (Refer analysis part in text below for details)	The environmental issues will be addressed adequately in advance an integrated Environmental Screening and Environmental assessment (EA) with an Environmental Management Plan (EMP) will be developed to manage environmental risks and maximize environmental and social benefits wherever it is applicable.	EIA and/or EMP required.
OP 4.04 Natural Habitats	The policy recognizes that the conservation of natural habitats is essential for long-term sustainable development. The Bank, therefore, supports the protection, maintenance and rehabilitation of natural habitats in its project financing, as well as policy dialogue and analytical work. The Bank supports and expects the Borrowers to apply a precautionary approach to	This policy may be triggered by The Project due to improvement activity of road requiring forest/ wildlife lands, locating close to the natural habitats with the potential to cause significant adverse impact or degradation of natural habitats whether directly (through	EIA and EMP requires specialised surveys, which will be conducted at the locations wherever wildlife sanctuary, national park or any other eco-sensitive area is encountered in the project.



World Bank Safe Guard Policies	Objective	Applicability	Safeguard Requirements
	natural resources management to ensure environmentally sustainable development	construction) or indirectly (through human activities induced by the project).	
OP 4.36 Forests	This policy focuses on the management, conservation, and sustainable development of forest ecosystems and resources. It applies to project that may have impacts on (a) health and quality of forests; (b) Affect the rights and welfare of people and their level of dependence upon forests and projects that aim to bring about changes in the management, protection or utilization of natural forests or plantations, whether they are publicly, privately or community owned. The Bank does not support the significant conversion or degradation of critical forest areas or related critical natural habitats.	Impact of widening /construction activities on Forest areas required to be taken care of.	Forest land diversion Application has to be prepared and submitted to forest department
OP 4.09 Pest Management	The objective of this policy is to promote the use of biological or environmental control methods and to reduce reliance on chemical pesticides.	Pest / Vector management involvement in UPCRNDP is not likely.	Not Applicable
OP 4.12 Involuntary Resettlement	The objective of this policy is to avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs. Furthermore, it intends to assist displaced person in improving their former living standards; community participation in planning and implementing resettlement; and to provide assistance to affected people, regardless of the legality of title of land	No relocation of people is expected due to this project. However, there may be need for limited land acquisition for some project activity under UPCRNDP. (This policy is triggered not only when physical relocation occurs, but also by any loss of land resulting in: relocation or loss of shelter; loss of assets or access to assets; loss of income sources or means of livelihood, whether or not the affected people must move to another location).	Resettlement Action Plan
OP 4.10 Indigenous People	This policy aims to protect the dignity, right and cultural uniqueness of indigenous people; to ensure that they do not suffer due to development; that they receive social and economic benefits	This policy may be triggered if there are indigenous people in the project area; when potential adverse impacts on indigenous people are anticipated; and if indigenous people are among the intended beneficiaries.	Indigenous people development Plan



World Bank Safe Guard Policies	Objective	Applicability	Safeguard Requirements
OP 4.11 Physical Cultural Resources	This policy aims at assisting in the preservation of cultural property, historical, religious and unique natural value-this includes remains left by previous human inhabitants and unique environment features, as well as in the protection and enhancement of cultural properties encountered in Bank-financed project.	This policy may be triggered by sub-projects under UPCRNDP in those areas where cultural property, historical, religious and unique natural value-this includes remains left by previous human inhabitants and unique environment features may be affected during widening and strengthening work of the sub-projects.	Application has to be prepared and submitted to Archeological department

As per the World Bank's Environmental Safeguard policy, the project coordinating entity or implementing institution carries out Environmental Assessment (EA) during the preparation of each proposed subproject according to country requirements and the requirements of this policy. The Bank appraises and recommends to strengthen the capabilities of the coordinating entity or the implementing institution to (a) screen subprojects, (b) obtain the necessary expertise to carry out EA, (c) review all findings and results of EA for individual subprojects, (d) ensure implementation of mitigation measures (including, where applicable, an EMP), and (e) monitor environmental conditions during project implementation. If the Bank is not satisfied that adequate capacity exists for carrying out EA, all Category A sub-projects and, as appropriate, Category B sub-projects -including any EA reports are subject to prior review and approval by the Bank.

The purpose of conducting an environmental assessment (EA) is to identify environmental and social consequences of the proposed sub-projects or components, in order to:

- Ensure the identification of potential environmental issues and social concerns early in the implementation of a proposed project to incorporate necessary safeguards in project design in order to prevent potential adverse impacts by determining appropriate mitigation and compensation measures;
- Minimize risks and enhance positive impacts/benefits;
- Avoid delays and extra costs which may subsequently arise due to unanticipated environmental problems;
- Identify the potential for maximizing environmental resources management and socio-economic benefits to local communities within the scope of the subproject.
- The EA should cover physical-chemical, biological, socio-economic and cultural issues that are likely to arise during upgrading and widening of roads safety risks and appurtenance structures and associated activities as appropriate.

The World Bank has classified the type of projects into following categories depending on the extent of the impact on environment:

- Category A:** A proposed project is classified as Category A, if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. Such project requires full Eas study.
- Category B:** A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas—



including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects.

- (iii) **Category C:** A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.
- (iv) **Category FI:** A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

Thus for Category-A project detail Environmental Assessment would be required. For the project requiring Environmental Clearance from the MOEFCC, detailed Environmental Impact Assessment would be required in accordance with the Environmental Impact Assessment Notification, 2006 and amended thereafter. For Category-B projects site specific EA is required and a generic environmental management plan (EMP) would be required to be prepared for such project. For Category C projects no study beyond environmental screening is required.

4.7 Summary of Statutory Clearance/Permits Requirement

The project requires a number of statutory clearances under different Acts and Rules at different stage of the project. These are listed in **Table 4.3**.

Table 4.3: Summary of Statutory Clearance Requirement of the Project

S. No.	Type of Clearance/Permits	Applicability	Project Stage	Responsibility	Time Required
1	Forest Clearance for diversion of Protected Forest Area	For diversion of Protected Forest area as Roadside Plantation within ROW for the project stretch has been declared as Protected Forest	Pre Construction	PIU, UP PWD	6-8 months
2	Tree felling permission	For roadside tree cutting	Pre construction	PIU, UP PWD	1-2 months
3	NOC (Consent to Establish and Consent to Operate) under Air and Water Act from SPCB	For stone crusher plant, Hot Mix plant, WMM plant and Batching Plant, etc.	Construction Stage	Contractor	2-3 months
4	Explosive License from Chief Controller of Explosives,	For storing fuel oil, lubricants, diesel etc.	Construction stage (Prior to storing fuel, lubricants and Diesel, etc.)	Contractor	2-3 months
5	Permission for storage of hazardous chemical from CPCB	storage and Import of Hazardous Chemical	Construction stage (Prior to initiation of any work)	Contractor	2-3 months
6	Quarry Lease Deed and Quarry License from State Department of Mines and Geology	Quarry operation	Construction stage (Prior to initiation of Quarrying)	Contractor	2-3 months



S. No.	Type of Clearance/ Permits	Applicability	Project Stage	Responsibility	Time Required
7	Environmental Clearance for stone quarry and Soil borrow area from State environmental Impact Assessment Authority, U.P.	Opening of new Quarry and Borrow area for earth material	Construction stage (Prior to initiation of Quarrying)	Contractor	5-6 months
8	Permission for extraction of ground water for use in road construction activities from State Ground Water board	Extraction of ground water	Construction stage (Prior to initiation of installation of Bore wells and abstraction of water from such source)	Contractor	1-2 months
9	Permission for use of water for construction purpose from irrigation department	Use of surface water for construction	Construction stage (Prior to initiation of abstraction of water from such source)	Contractor	1-2 months
10	Labour license from Labour Commissioner Office	Engagement of Labour	Construction stage (Prior to initiation of any work)	Contractor	2-3 months



5 CURRENT ENVIRONMENTAL CONDITIONS

This chapter reviews the existing conditions of the natural, cultural, economic and social environments within the project area. The extent of study is within 10 Km on both sides from the project road. However, the focus of the study was on the areas within and directly adjacent to the corridor of impact and ROW. The review of the environmental status within the project corridor is based on the secondary information collected from various sources followed by field surveys of the project area. All the data have been collected and collated to identify a general environmental condition within the project area and major environmental issues to be taken care off during the design as well project implementation phase.

5.1 Physical Environment

5.1.1 Physiography

The entire project stretch is located in the state of Uttar Pradesh. The project section from Km 2.000 to Km 78.000 is extended between 25°56'7" N latitude and 80°8'34.6" E longitude at Hamirpur and 25°35'20" N Latitude and 79°33.38" E longitude at Rath. The area is comprised of Bundelkhand gneissic complex of archean age and alluvium of recent age. Physiographically, the area can be divided into two units i.e. Southern Bundelkhand Pediplane Province and Northern Highly Eroding Composite Plain Province. Hamirpur is bounded by districts Jalaun (Orai), Kanpur and Fatehpur in north, Banda in east, Mahoba in south and Districts of Jhansi and Jalaun on the West and covers an area of 4,121.9 sq. km.

Hamirpur district is located in Bundelkhand plateau. In the project corridor the relief varies from 150 m to 160 m above mean sea levels.

Physiographic map and Physical map of Uttar Pradesh is given in **Figure 5.1** and **Figure 5.2** respectively.



Figure 5.1: Physiographic Map of Uttar Pradesh

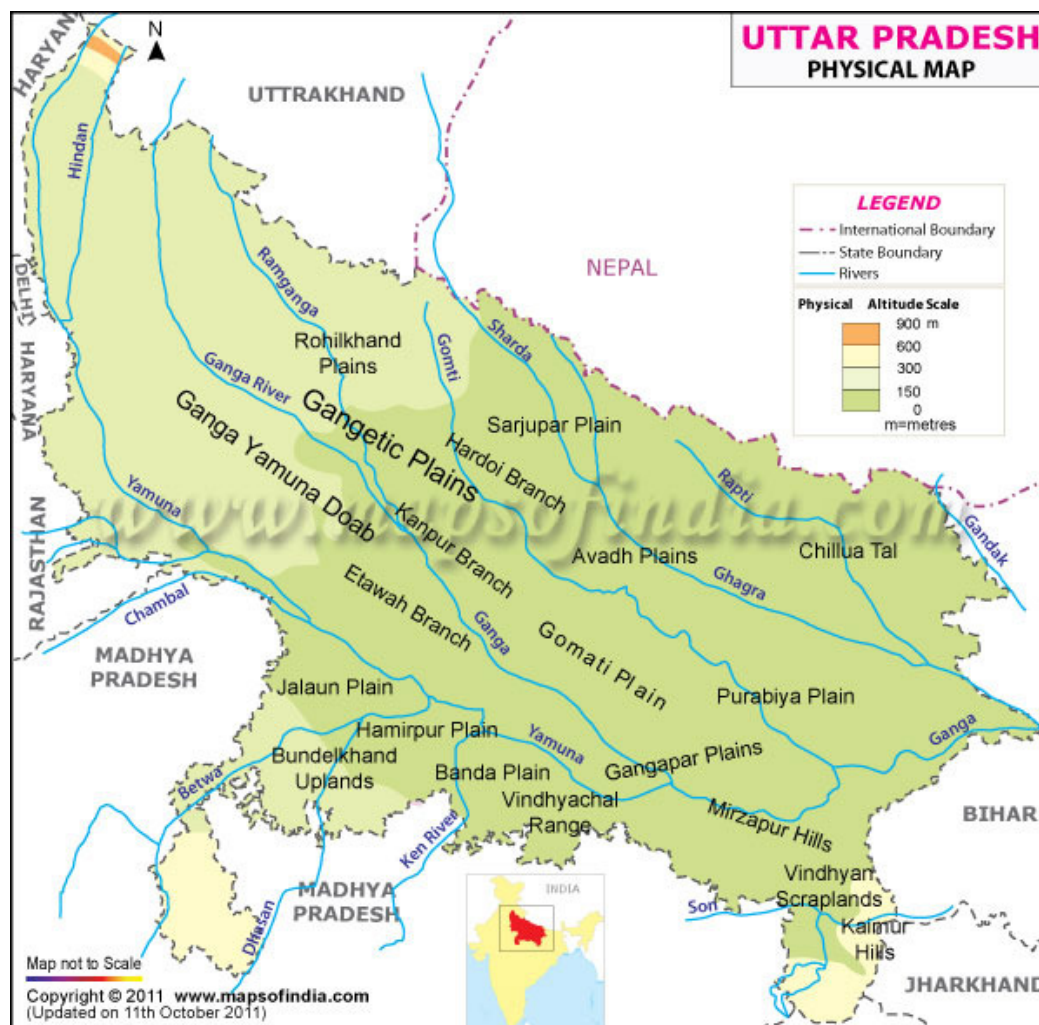


Figure 5.2: Physical Map of Uttar Pradesh

5.1.2 Geology and Seismicity

The area is comprised of Bundelkhand gneissic complex of archean age and alluvium of recent age. Physiographically, the area can be divided into two units i.e. Southern Bundelkhand Pediplane Province and Northern Highly Eroding Composite Plain Province.

The geological formation of the project area is characterised by rock formations ranging in age from the Archean (the Bundelkhand Graniticgneisses) to the Recent (the Ganga alluvium). The southern hilly tract is roughly parallel to the Ganga-Yamuna lineament. The tract is underlain by granitic complex in Bundelkhand region and in Sonbhadra. It is overlain by rocks Mahakoshal (Bijawar). The rock met in the area are mainly unconsolidated sedimentary rocks. The minerals found around the project area is mainly gypsum. The map depicting rocks and minerals within the project area is presented in **Figure 5.3**.

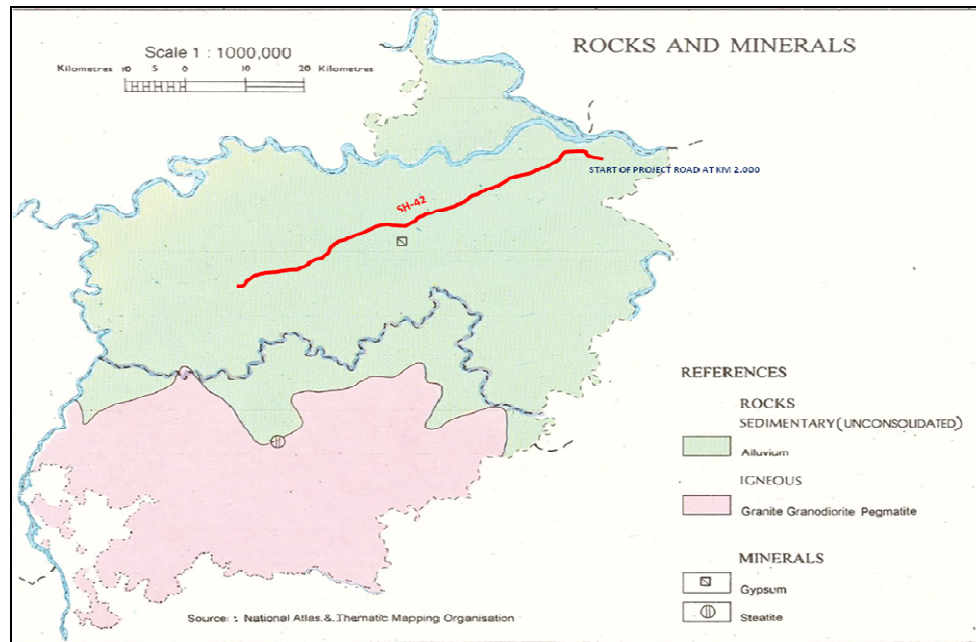


Figure 5.3: Rock & Mineral Map of Hamirpur District

Seismic Zone: According to Global Seismic Hazard Assessment Programme (GSHAP) data, the state of Uttar Pradesh falls in a region of moderate to high seismic hazard. The district of Hamirpur lies in Zone III which is a comparatively stable zone. No earthquake within the district area has been observed during the last 200 years. The district has, however, experienced on few occasions earthquakes originating in the Himalayan boundary fault zone, Moradabad fault zone and Narmada-Tapti fault zone. The seismic hazard zone of Uttar Pradesh is given in **Figure 5.4**.

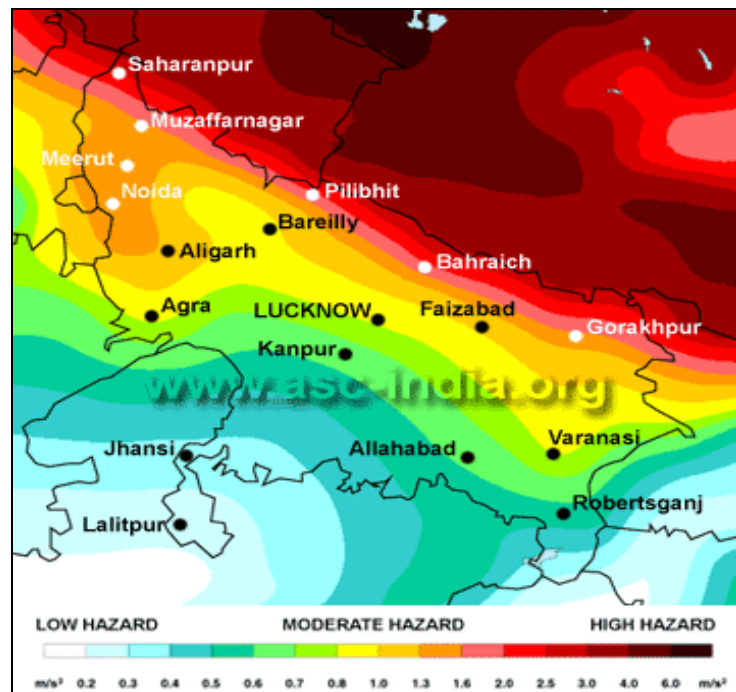


Figure 5.4: Seismic Hazard Zone of Uttar Pradesh



5.1.3 Soils

The soil in the area consists of well known bundelkhand varieties. The soil in the project area is classified as vertisols and Alfisols. The vertisols are formed by deep black soil whereas the alfisols are formed of Mixed red sandy. The type of soils found in the study area known are called Mar, Kabar, Parwa and Rakar. Mar is often called as black soil which is sticky, calcareous and fertile. It expands as it soaks moisture and contracts on drying up. It varies greatly in colour and contains small lumps of kankar. Kabar range from rich dark black to light brown. Its chief characteristics is its extreme adhesiveness, which causes it to quickly dry and cake into hard blocks. Parwa is a light coloured light sandy or sandy-loam found in many forms. It is usually less rich in organic matter but its finer texture makes it more responsive to manure and irrigation. Rakar is refuge soil which occurs on sloppy ground, where the action of water has tended to denude the earth of all its better qualities. Rakar is alkaline. The soil map of the project alignment in Hamirpur district is given in **Figure 5.5**. The soil test of road crust indicate that there is no black cotton soil in existing road formation width.

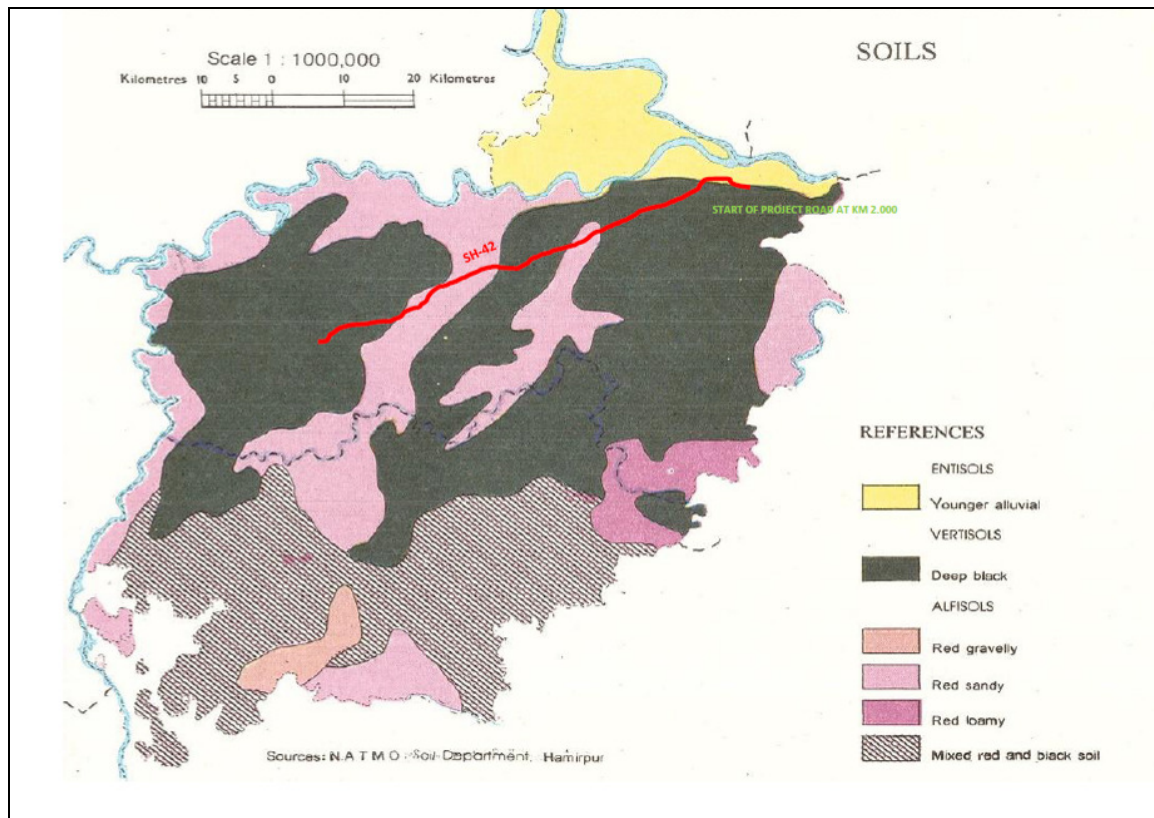


Figure 5.5: Soil Map of Hamirpur District

Soil analysis was carried out for soil samples collected from three locations along the proposed project alignment covering agriculture field and human activities area especially near habitation area to understand the Soil characteristics along the project road. The post monsoon soil samples were collected from fields within 10-15 meter from road edge in the month of November, 2014. The locations for Soil sampling is presented in **Table 5.1**. The physico-chemical characteristics of the soil samples is presented in **Table 5.2**.

**Table 5.1: Identified Soil Sampling Location along the Project Road**

Sample Code	Locations	Chainage (Km)	Description of Site
SQ-1	Pothiya	9+000	Agriculture Land
SQ-2	Muskara	46+000	Agriculture Land
SQ-3	Rath	76+000	Near Habitation area

The soil quality analysis shows that at all the locations soil quality are basic in nature and the moisture retention capacity is less than 11%. The soils ranged between clayey to sandy in nature with good amount of nitrogen content.

Table 5.2: Physico-chemical Characteristics of Soil

S. No.	Parameters	Unit	Value/Concentration		
			SQ-1	SQ-2	SQ-3
1	pH (1:2.5) at26°C		8.45	8.19	8.78
2	Electrical Conductivity at 25°C	μS/cm	205.59	102.31	259.44
3	Sand	% (w/w)	35.6	25.4	23.7
4	Silt	% (w/w)	26.5	18.9	14.9
5	Clay	% (w/w)	37.9	55.7	61.4
6	Texture		Clay loam	Clay	Clay
7	Moisture Retention Capacity	%	4.62	4.87	10.02
8	Infiltration rate	mm/hr			
9	Bulk Density	g/c.c	1.33	1.32	1.29
10	Porosity	%	46.37	46.99	42.92
11	Organic matter	%	0.74	0.4	1.09
12	Nitrogen	mg/kg	158.68	164.77	183.07
13	Phosphorous	mg/kg	8.91	21.79	11.8
14	Potassium	mg/kg	150	150	400
15	Pb	mg/kg	4.8	3	4.6
16	TOC	%	0.43	0.23	0.63
17	Cd	mg/kg	< 0.04	< 0.04	< 0.04
18	Fe	mg/kg	< 1.4	< 1.4	< 1.4
19	TOC	%	0.43	0.23	0.63
20	Mn	mg/kg	237.75	260.3	188.71
21	Cu	mg/kg	13.86	16.06	16.45
22	Zn	mg/kg	30.32	36.28	31.93
23	Co	mg/kg	8.82	9.7	8.99

Source: Primary Data collected from site

5.1.4 Quarry Site and Borrow Areas

Quarry Areas

Road construction requires earth, stones and sand. These raw materials are to be obtained from surrounding areas, which are suitable for the project road. The stone materials including sand and granular ones are needed in large quantities for the pavement construction. The other area of requirement is concrete structures, which call for a good quality stone.

The potential source for stone aggregates, sand and gravels along the project section has been identified. Sufficient quantities of construction materials are available in these quarries. The sand quarries are mainly riverbed sand quarries.

**Borrow Areas**

The soils to be used, as sub-grade, select sub-grade and shoulder materials need to be hauled from designated borrow areas. The borrow area along the project section with relevant consent/NOC from individual land owner will be obtained before operation of borrow area during construction stage. Location Chart from showing Borrow Areas between Km 2+000 to Km 76+500 (Hamirpur-Rath) is shown in **Figure 5.6**.

Table 5.3: Description of Soil Borrow Sources

S. No.	Village Name	Chainage	Lead	Side
1	Bardaha	6+000	2.0	R
2	Pothiya	9+500	1.0	R
3	Kumhaupur	17+000	2.5	R
4	Parsani	19+000	5.0	R
5	Chhani	26+000	1.0	L
6	Bewar	34+200	5.0	R
7	Jalla	36+800	0.5	L
8	Mahera	38+200	4.0	R
9	Mehuna	43+800	7.0	R
10	Baswari	48+000	5.0	R
11	Beoni	58+500	0.5	R
12	Verma River, Beoni	60+000	0.5	L
13	Bihuni Dera	61+700	2.5	R
14	Naveni	65+100	0.5	R
15	Naveni	66+900	2.0	R
16	Chilli	71+000	4.0	R

Table 5.4: Aggregate Quarry Location along the Project Road

S. No.	Source Location	Lead (Km)	Side
1	Kabrai Quarry	57	L
2	Jamala Quarry	63	L

Table 5.5: Natural Sand Location along the Project Road

S. No.	Source Location	Chainage	Lead (Km)	Side
1	Betwa river	38+000	17	R

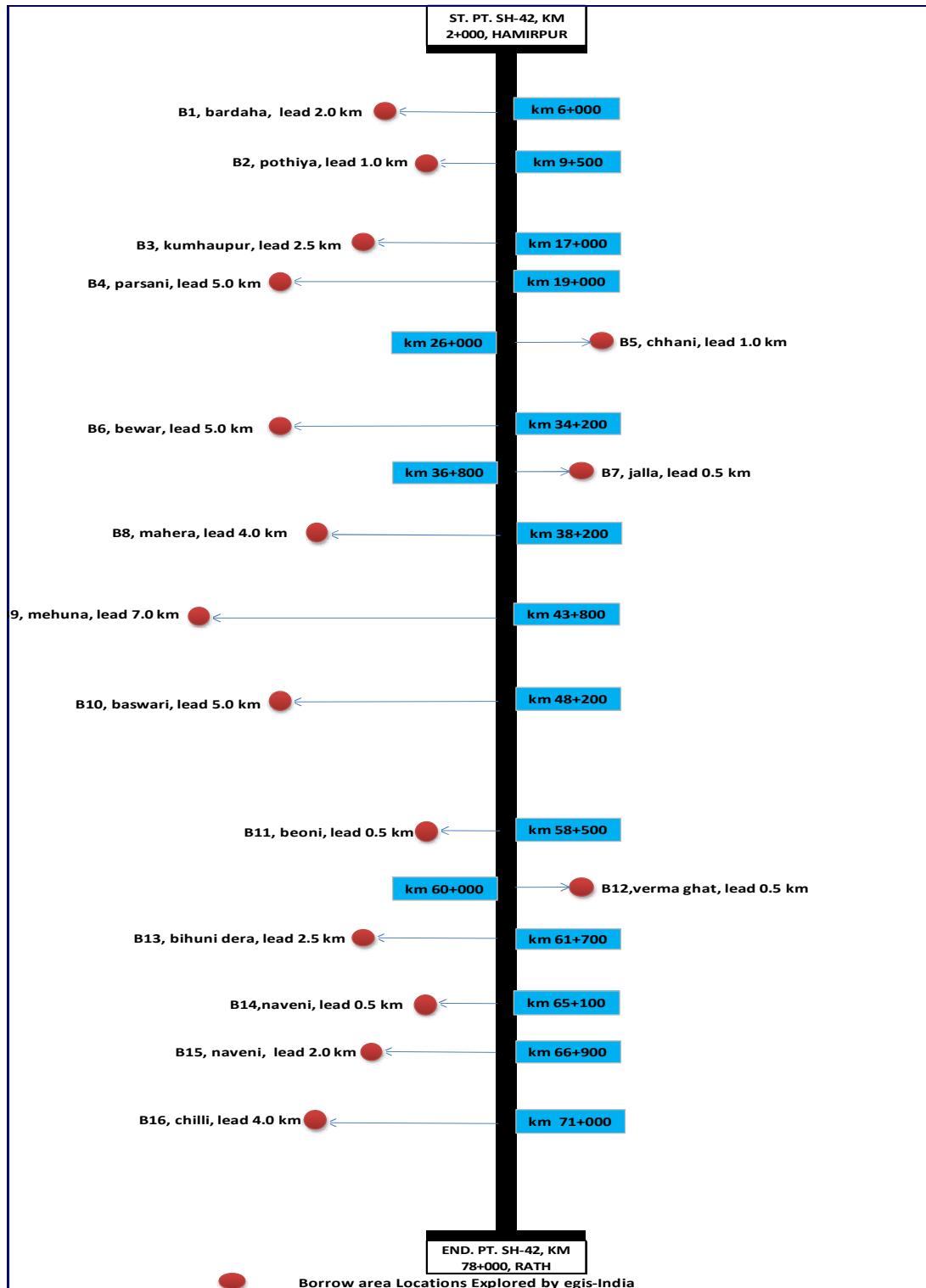


Figure 5.6: Location Chart from Km. 2+000 to Km 76+500 (Hamirpur - Rath) Showing Various Borrow Areas



5.1.5 Climatic Conditions

The Hamirpur district falls in the humid sub-tropical zone. The climate of the district has four broad seasons. The winter generally spread over from December to February. The period from March to June is summer. Hot and rainy season generally extends from July to September. October and November exhibit autumn. The temperature during the winter months is too cold. The district receives the plentiful rains during the monsoon period. During summer the days are extremely hot. The maximum rainfall is observed in the district during July to August and minimum in the months of April and October. The hottest month is May and coldest month is January in the district. Maximum and minimum temperatures recorded in the district ranges from 20° to 40°C.

Normal rainfall in Hamirpur district is 851 mm. About 90 percent of the rainfall occurs during the southwest monsoon, lasting from about June to September. With most of the rainfall concentrated during this four-month period. The average annual rainy days in Hamirpur is 55 days. The relative humidity ranges from 40 % to 90% in the area. The rainfall for last five year from 2009 to 2013 of Hamirpur district is given in **Table 5.6**.

Table 5.6: Monthwise and Annual Rainfall in Hamirpur for Last Five Years

YEAR	Rainfall (mm)												
	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual Total
2009	2.8	1.8	2.0	5.2	31.2	10.7	179.4	204.4	135.1	86.4	17.2	6.8	683
2010	2.2	22.1	0.0	0.0	0.5	14.2	148.8	166.9	139.0	25.0	20.7	0.5	539.9
2011	0.0	2.7	0.0	3.1	19.5	339.4	146.2	172.6	221.6	0.0	0.0	0.0	905.1
2012	54.2	3.7	0.0	2.0	0.0	2.8	211.8	255.3	114.7	0.0	0.0	0.0	644.5
2013	0.0	97.4	1.3	6.0	0.0	240.3	172.0	422.6	84.6	105.9	1.7	4.7	1136.5

Source: <http://www.imd.gov.in/section/hydro/distrainfall/webrain/up/hamirpur.txt>

5.1.6 Land Use Pattern

The landuse along the project corridor is predominantly agriculture. The landuse pattern in Hamirpur district is is presented in following **Table 5.7**.

Table 5.7: Land Use Pattern of Hamirpur District (Area in ` 000 ha)

Land use	Hamirpur District	
	Geographical Area	Percentage
Geographical area	390.9	100
Cultivable area	325.8	83.35
Forest area	24.5	6.27
Land under non-agricultural use	32.9	8.42
Permanent pastures	0.5	0.13
Cultivable wasteland	8.6	2.20
Land under Misc.tree crops and groves	0.7	0.18
Barren and uncultivable land	7.1	1.82
Current fallows	16.9	4.32
Other fallows	5.3	1.36

Source: Agriculture Contingency Plan for District Hamirpur, Ministry of Agriculture, GOI, 2014



The land use pattern along the RoW of the project road in Hamirpur district is presented in **Table 5.8**. The analysis of data clearly reflects that the existing landuse along the ROW is predominantly agriculture (76%) followed by builtup area (22%) and waterbodies (2%).

Table 5.8: Land Use Pattern along the Project Road

S. No.	Chainage (Km)		Terrain	Land Use	Length (Km)
	From	To			
1	2+000	2+400	Plain	Agriculture	0.400
2	2+400	2+600	Plain	Built up	0.200
3	2+600	3+000	Plain	Agriculture	0.400
4	3+000	4+000	Plain	Built up	1.000
5	4+000	5+200	Plain	Agriculture	1.200
6	5+200	5+600	Plain	Built up	0.400
7	5+700	8+300	Plain	Agriculture	2.600
8	8+300	8+400	Plain	Water Body	0.100
9	8+400	10+000	Plain	Agriculture	1.600
10	10+000	11+000	Plain	Built up	1.000
11	11+000	13+600	Plain	Agriculture	2.600
12	13+600	14+000	Plain	Built up	0.400
13	14+000	16+600	Plain	Agriculture	2.600
14	16+600	17+000	Plain	Built up	0.400
15	17+000	20+200	Plain	Agriculture	3.200
16	20+200	21+000	Plain	Built up	0.800
17	21+000	22+650	Plain	Agriculture	1.650
18	22+650	22+750	Plain	Water Body	0.100
19	22+750	25+400	Plain	Agriculture	2.650
20	25+400	26+400	Plain	Built up	1.000
21	26+400	30+400	Plain	Agriculture	4.000
22	30+400	31+400	Plain	Built up	1.000
23	31+400	33+800	Plain	Agriculture	2.400
24	33+800	35+200	Plain	Built up	1.400
25	35+200	35+400	Plain	Agriculture	0.200
26	35+400	35+500	Plain	Water Body	0.100
27	35+500	37+900	Plain	Agriculture	2.400
28	37+900	38+000	Plain	Water Body	0.100
29	38+000	41+100	Plain	Agriculture	3.100
30	41+100	41+200	Plain	Water Body	0.100
31	41+200	41+800	Plain	Built up	0.600
32	41+800	43+300	Plain	Agriculture	1.500
33	43+300	43+400	Plain	Water Body	0.100
34	43+400	45+900	Plain	Agriculture	2.500
35	45+900	46+000	Plain	Water Body	0.100
36	46+000	46+400	Plain	Built up	0.400
37	46+400	47+400	Plain	Agriculture	1.000
38	47+400	47+600	Plain	Built up	0.200
39	47+400	50+000	Plain	Agriculture	2.600
40	50+000	52+000	Plain	Built up	2.000
41	52+000	54+100	Plain	Agriculture	2.100



S. No.	Chainage (Km)		Terrain	Land Use	Length (Km)
	From	To			
42	54+100	54+200	Plain	Water Body	0.100
43	54+200	57+400	Plain	Agriculture	3.200
44	57+400	57+900	Plain	Built up	0.500
45	57+900	58+000	Plain	Water Body	0.100
46	58+000	58+800	Plain	Built up	0.800
47	58+800	59+600	Plain	Agriculture	0.800
48	59+600	59+900	Plain	Water Body	0.300
49	59+900	63+200	Plain	Agriculture	3.300
50	63+200	63+600	Plain	Built up	0.400
51	63+600	64+000	Plain	Agriculture	0.400
52	64+000	64+200	Plain	Built up	0.200
53	64+200	66+600	Plain	Agriculture	2.400
54	66+600	67+400	Plain	Built up	0.800
55	67+500	70+600	Plain	Agriculture	3.100
56	70+600	70+800	Plain	Built up	0.200
57	70+800	75+000	Plain	Agriculture	4.200
58	75+000	78+000	Plain	Built up	3.000

Source: Primary data collection

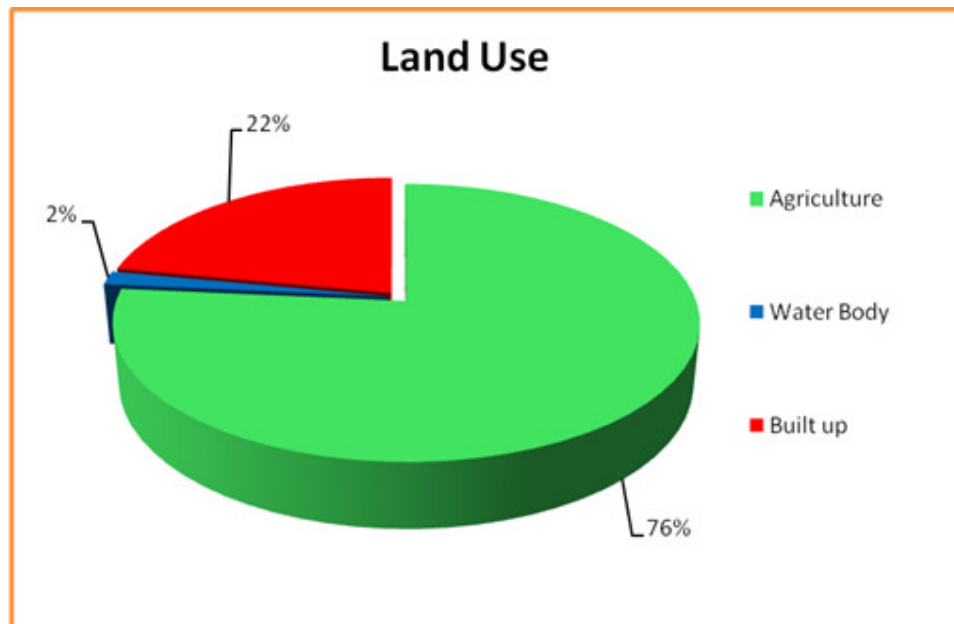


Figure 5.7: Land use Pattern along the ROW of Project Stretch

5.1.7 Surface Water Bodies

Major source of Surface Water in Uttar Pradesh are rivers flowing from northwest to southeast direction. The project district is drained mainly by Betwa, Dhasan and Ken rivers and their tributary. There is only one river called Bihuni river located in the project corridor and crosses the alignment at Km 59.600. A number of irrigation canal constitute source of surface water mainly utilized for irrigation purpose. Apart from the Bihuni River and canals, the area along the



project stretch is dotted with a number of ponds. The list of water bodies along the project corridor is presented in **Table 5.9**.

Table 5.9: Water Bodies along the Project Road

S. No.	Water Bodies	Chainage (Km)	Distance (m)	River/Canal Width (m)	LHS/RHS
1	Pond	5+300	5.5		LHS
2	Pond	6+000	17.500		RHS
3	Pond	7+700	40.000	--	RHS
4	Minor canal	8+300	-	3.0	Crosses
5	Pond	9+800	5.200	-	RHS
6	Pond	11+800	19.500	-	RHS
7	Pond	15+950	18.000	-	RHS
8	Pond	20+750	5.000	-	LHS
9	Irrigation Canal	22+650	-	10.00	Crosses
10	Drain	30+400	-	5.0	Crosses
11	Pond	30+850	19.000	-	LHS
12	Pond	34+400	12.0000	-	LHS
13	Irrigation Canal	35+400	-	17.00	Crosses
14	Drain	37+900	-	5.0	Crosses
15	Irrigation Canal	41+100	-	16.00	Crosses
16	Irrigation Canal	43+300	-	14.00	Crosses
17	Irrigation Canal	45+900	-	21.00	Crosses
18	Irrigation Canal	57+900	-	15.00	Crosses
19	River	59+600	-	113.00	Crosses
20	Drain	71+100	-	5.0	Crosses

Monitoring of surface water quality for different surface water sources including major rivers and ponds are regularly conducted by the U.P. State Pollution Control Board. In Hamirpur district the water quality for Betwa river has been assessed by the state Pollution Control Board. The annual averages surface water quality of Betwa river in the year 2012 for Hamirpur district is presented in **Table 5.10**. The Betwa river water sample shows high biological contamination in terms of Total Coliforms.

Table 5.10: Surface Water Quality of Betwa River in Hamirpur District (Year 2012)

S. No.	Name of District	Name of River	Sample Collection Point	2012		
				DO (mg/l)	BOD (mg/l)	Total Coliform (MPN/100 ml)
1	Hamirpur	Betwa River	Betwa, Hamirpur	6.49	2.56	18250

Source: Central Pollution Control Board

Primary data generation on surface water quality was carried out in the month of November, 2014 in order to assess the surface water quality within the project area. The water samples from the following water sources were collected for assessing the physico-chemical characteristic of water. The list of source of from which the water samples were collected for assessment of their quality is presented in **Table 5.11**. The analysis result of various quality parameters has been presented in **Table 5.12**.

**Table 5.11: Locations of Surface Water Sampling**

S. No.	Sample Code	Sources	Location (Name)	Chainage (Km)
1.	SW-1	Community Pond	Kalauti Teer	6+000 (RHS)
2.	SW-2	Community Pond	Pothia	7.700
3.	SW-3	Irrigation canal	Damipura	45.900
3.	SW-4	River	Near Bihuni	59+600

Table 5.12: Characteristics of Surface Water in the Project Area

S. No.	Parameters	Unit	Concentration			
			S W 1	S W 2	S W 3	S W 4
1	Temperature	° C	22	25	27	24
2	pH at 26°C		7.66	7.47	8.16	7.62
3	Turbidity	NTU	96.0	136.2	2.3	1.2
4	Electrical Conductivity at 25° C	µs/cm	635.0	527	304	406
5	Colour	Hazen	<1.0	<1.0	<1.0	<1.0
6	Total Suspended Solids (TSS)	mg/l	213.2	245.5	4.2	<2.5
7	Total Dissolved Solids (TDS)	mg/l	350	300	172	235
8	Odour		Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
9	Dissolved Oxygen (DO)	mg/l	5.4	4.2	6.2	6.7
10	Biochemical Oxygen Demand (BOD)	mg/l	9	16.09	4	<2
11	Chemical Oxygen Demand (COD)	mg/l	44	112	16	12
12	Total Kjeldahl Nitrogen	mg/l	17.4	24.6	<0.3	<0.3
13	Total Hardness (as CaCO ₃)	mg/l	152.88	109.76	101.92	148.96
14	Sodium (as Na)	mg/l	50	80	31	42
15	Potassium	mg/l	20	12	3.0	3
16	Calcium (as Ca)	mg/l	28.22	20.38	20.38	32.93
17	Magnesium	mg/l	19.75	14.11	12.23	15.99
18	Ammonia	mg/l	9.8	10.4	<0.1	<0.1
19	Chloride (as Cl)	mg/l	64.38	75.42	18.39	22.07
20	Sulfate (as SO ₄)	mg/l	24.8	14.4	<1.0	<1.0
21	Phosphate	mg/l	0.16	<0.15	<0.15	<0.15
22	Fluoride (as F)	mg/l	0.19	2.2	<0.1	<0.1
23	Surfactants	mg/l	<0.02	<0.02	<0.02	<0.02
224	Dissolved Iron	mg/l	1.20	0.8	0.10	<0.05
26	Chromium (as Cr)	mg/l	BDL	BDL	BDL	BDL
27	Phenols	mg/l	BDL	BDL	BDL	BDL
28	Total coliform	MPN/100ml	21	24	Absent	Absent
29	Faecal Coliform	MPN/100ml	6	8	Absent	Absent

The analysis results reflect that all the surface water bodies from which the water samples were taken, meet the quality criteria for Class C (Drinking water source after conventional treatment



and disinfection) and Class D (Propagation of Wildlife and Fisheries) of surface water. The pH is varying from 7.47 to 8.16, Dissolve Oxygen is varying from 4.2 mg/l to 6.7 mg/l and Biological Oxygen Demand (BOD) ranged from <2 mg/l to 16.09 mg/l. All the other measured parameters were observed well within the prescribed limit of water quality standards.

5.1.8 Groundwater Sources

Hydrogeologically, Uttar the project area falls in Southern Peninsular zone. The first one is in the extreme north followed successively by the rest southwardly. The water table along project area as per site verification ranges between 5m to 10 m. The yield of tube wells in the project area ranges between 35 m³/hr to 70 m³/hr.

5.1.8.1 Ground Water Quality

The ground water quality in project area is in general potable in nature, however in Hamirpur the nitrate content in ground water high and reported more than 45 mg/l as reported by the Central Ground Water Board.

The generation of baseline data on groundwater quality within the project area was not possible during the study period due to monsoon season. However post monsoon samples of groundwater will be collected from different source in order to assess the ground water quality along the project road. For this 3 locations have been identified for assessment of quality which is listed in following table. The finding of the same shall be incorporated in the final Environmental Assessment Report. The monitoring locations for assessing the groundwater quality is indicated in **Table 5.13**.

Table 5.13: Locations of Ground Water Sampling

S. No.	Sample Code	Location (Name)	Chainage (Km)	Sources
1.	GW-1	Kalauli Teer	5+400	Hand Pump
2.	GW-2	Muskara	51+000	Handpump
2.	GW-3	Rath	75+000	Hand Pump

Table 5.14: Physico-Chemical Characteristics of Ground Water Samples

S. No.	Parameters	Unit	Sample Locations		
			G W 1	G W 2	G W 3
1	Temperature	° C	28	27	27
2	pH at 25°C		7.1	7.2	7.41
3	Turbidity	NTU	8.8	5.8	2.9
4	Electrical Conductivity at 25° C	µs/cm	814.0	1649	1794
5	Colour	Hazen	<1.0	<1.0	<1.0
6	Total Suspended Solids (TSS)	mg/l	4.8	8.7	<2.5
7	Total Dissolved Solids (TDS)	mg/l	440.00	920	1060
8	Odour		Unobjectionable	Unobjectionable	Unobjectionable
9	Dissolved Oxygen (DO)	mg/l	6.5	6.8	7
10	Biochemical Oxygen Demand (BOD)	mg/l	<4.0	<4.0	<4.0



S. No.	Parameters	Unit	Sample Locations		
			G W 1	G W 2	G W 3
11	Chemical Oxygen Demand (COD)	mg/l	<4.0	<4.0	<4.0
12	Total Kjeldahl Nitrogen	mg/l	<0.3	<0.3	<0.3
13	Total Hardness (as CaCO ₃)	mg/l	266.56	670.3	250.88
14	Sodium (as Na)	mg/l	62	150	360
15	Potassium	mg/l	1	2	1.0
16	Calcium (as Ca)	mg/l	94.08	47.04	26.65
17	Magnesium	mg/l	7.52	132.64	44.22
18	Ammonia	mg/l	<0.1	<0.1	<0.1
19	Chloride (as Cl)	mg/l	22.07	152.67	101.17
20	Sulfate (as SO ₄)	mg/l	5	36	246
21	Phosphate	mg/l	0.17	<0.15	<0.15
22	Fluoride (as F)	mg/l	<0.1	<0.1	<0.1
23	Iron (as Fe)	mg/l	0.08	0.26	0.17
24	Total coliform	MPN/100 ml	Absent	Absent	Absent
25	Faecal Coliform	MPN/100 ml	Absent	Absent	Absent

The test results of the ground water samples along the project road at all the locations reflect that the pH was within permissible limit. The same varied between 7.1 to 7.41. The Total dissolve solid varied from 440.0 mg/l to 1060.0 mg/l at different locations along the project road. The water sample collected from Rath showed TDS in the range of 1060 which is higher than the desirable level but within the maximum permissible level as per IS:10500. The Total hardness (as CaCO₃) ranged from 250.88 mg/l to 670.3 mg/l at different locations along the project road. At Muskara village at Km 51.000, the Total hardness was more than the maximum permissible limit of 600 mg/l as per IS: 10500. The Fluoride (as F) is below the permissible limit in all the samples taken along the project road.

5.1.9 Ambient Air Quality

In general the state, Uttar Pradesh suffers from high dust problem. The state Pollution Control Board conducts regular monitoring of ambient air quality in major towns of the state. Though the data for Hamirpur district is not available, the monitoring of air quality in the nearest major city of Kanpur is carried out on regular basis under National Ambient Air Quality Monitoring Programme, which can be referred here. The annual average ambient air quality in 2012 at different locations in Kanpur is presented in **Table 5.15**. The monitoring results clearly reflect that the concentration of PM₁₀ was higher than the prescribed limit. The concentrations of SO₂ and NO₂ in the air were found within the prescribed limit.

Table 5.15: Average Ambient Air Quality near Hamirpur District in the Year 2012

S. No.	Name of District	Name of Station	Category	Concentration (µg ⁻³)		
				PM ₁₀	SO ₂	NO ₂
1	Kanpur	Darshanpurva	Commercial	212.5	7.5	37.5
		Kidwai Nagar	Residential	203.1	6.8	41.2
		Panki Site-5	Industrial	214.8	7.9	38.7
		Shastri Nagar	Residential	203.1	7.5	37.3



S. No.	Name of District	Name of Station	Category	Concentration (μg^{-3})		
				PM ₁₀	SO ₂	NO ₂
		Awas Vikas Kalyanpur	Residential	200.1	7.3	37.3
		Dada Nagar	Residential	306.5	21.8	33.7
		I.I.T. Campus	Residential	171.2	2.1	10.5
		Ramadevi	Commercial	295.5	2.8	31.6

Source: Central Pollution Control Board, 2012

To study the baseline ambient air quality scenario within the project corridor the ambient air quality of post monsoon air sampling was carried out in the month of November, 2104. To generate post monsoon air quality of the project area, samples of ambient air was collected from three locations covering representative locations with respect to landuse and location of sensitive receptors along the project. The air sampling locations with respect to the proposed project road has been presented in **Table 5.16**. The air quality analysis report is given **Table 5.17**.

Table 5.16: Ambient Air Quality Sample Location

S. No.	Monitoring Station Code	Chainage (Km)	Location (Name)	Justification of Identified Location
1.	AQ-1	5+400	Pothia	Habitation Area/ Primary school
2.	AQ-2	47+200	Muskura	Major settlement and School area
3.	AQ-3	75+000	Rath	Major settlement and congested area with mixed landuse

Table 5.17: Ambient Air Quality at Different Locations along Project Corridor

S. No.	Location	Chainage (Km)	Concentrati on Level	Concentration					
				PM ₁₀ ($\mu\text{g} / \text{m}^3$)	PM _{2.5} ($\mu\text{g} / \text{m}^3$)	SO ₂ ($\mu\text{g} / \text{m}^3$)	NOx ($\mu\text{g} / \text{m}^3$)	CO (mg / m^3)	HC (ppm)
1.	Pothia	10+100	Maximum	90	55	8.3	31.5	0.83	893
			Minimum	75	36	4.7	22.0	0.55	514
			Mean	84	47	6.5	28.9	0.67	695
2	Muskara	51+000	Maximum	170	80	10.3	44.5	0.88	871
			Minimum	115	62	7.5	25.8	0.73	621
			Mean	140	70	9.0	33.7	0.81	731
3	Rath	75+000	Maximum	140	74	9.1	38.6	1.14	1035
			Minimum	112	58	7.3	28.2	0.78	707
			Mean	129	67	8.2	33.7	0.96	873
Standard				100.0	60.0	80.0	80.0	2.0	-

Source: Primary Data collected at site

The test results indicate that 24 hourly mean concentration of PM₁₀ in ambient air varied between 84.00 $\mu\text{g}/\text{m}^3$ and 140.0 $\mu\text{g}/\text{m}^3$ along the project alignment. At two locations the concentration of PM₁₀ were higher than the National Ambient Air Quality Standards i.e. 100 $\mu\text{g}/\text{m}^3$. The highest concentration of PM10 was observed at Muskara at Km 51.00 which was 140.00 $\mu\text{g}/\text{m}^3$, the higher concentration of PM10 may be attributed to heavy population, junctions and commercial activities and bad road condition. The concentration of PM_{2.5} concentrations varied between 47.0 $\mu\text{g}/\text{m}^3$ to 70.0 $\mu\text{g}/\text{m}^3$. Muskara and Rath showed higher higher concentration than the National Ambient Air Quality Standards i.e. 60 $\mu\text{g}/\text{m}^3$. Bothe these area are conjested builtup area and traffic congestion and exposed surface of road may be the reason for the higher concentration of PM2.5



Rest of the quality other parameters monitored were found within the National Ambient Air Quality Standards.

5.1.10 Ambient Noise Level

Noise level monitoring was carried out in the month of November, 2014 at different sensitive locations along the project road to understand the present scenario of noise pollution along the project section at representative locations covering different land use including sensitive sites, residential and commercial areas. The locations for Noise monitoring are given in **Table 5.18**. The Daytime and Nighttime noise level is presented in **Table 5.19**.

Table 5.18: Noise Monitoring Locations

S. No.	Location Code	Chainage (Km)	Location (Name)	Distance from Highway Edge (m)	Direction from Highway	Landuse
1.	NQ-1	5+400	Kalauli Teer	6	Right Hand Side	Sensitive location (School, Temples as well as Residential area located in same place)
2.	NQ-2	10+000	Pothia	7	Left Hand Side	Rural and residential area
3.	NQ-3	25+400	Channi Buzurg	7	Right Hand Side	Rural and residential area
4.	NQ-4	47+000	Muskara	7	Left Hand Side	Sensitive location (School) as well as Habitation Area
5.	NQ-5	75+000	Rath	6	Right Hand Side	Habitation Area with mixed activities

Table 5.19: Noise Level along Project Alignment

Station Code	Place	Equivalent Noise Level (Leq dB(A))			
		Mean Daytime	Mean Nighttime	Max.	Min.
NQ-1	Kalauli Teer	51.8	42.4	56.2	40.6
NQ-2	Pothia	53.7	44.9	59.2	39.1
NQ-3	Channi Buzurg	52.4	44.9	57.1	39.4
NQ-4	Muskara	68.1	51.7	72.0	45.9
NQ-5	Rath	63.6	51.0	70.3	44.6
Permissible Limits as per CPCB in Leq dB(A) Day Time & Night Time			Zone	Day Time	Night Time
			Commercial Zone	65.0	55.0
			Residential Zone	55.0	45.0
			Silence Zone	50.0	40.0

The average daytime ambient noise level was recorded in the range of 51.8 Leq dB(A) to 68.1 Leq dB(A) whereas the same varied from 42.4 Leq dB(A) to 51.7 Leq dB(A) during night time. At at Muskara and Rath, which represent the area of commercial and mixed activities both daytime equivalent noise was above the permissible limit for Residential Area but but within the permissible limit for Commercial and mixed area. The equivalent noise level at all other locations were within the prescribed limit for residential zone.

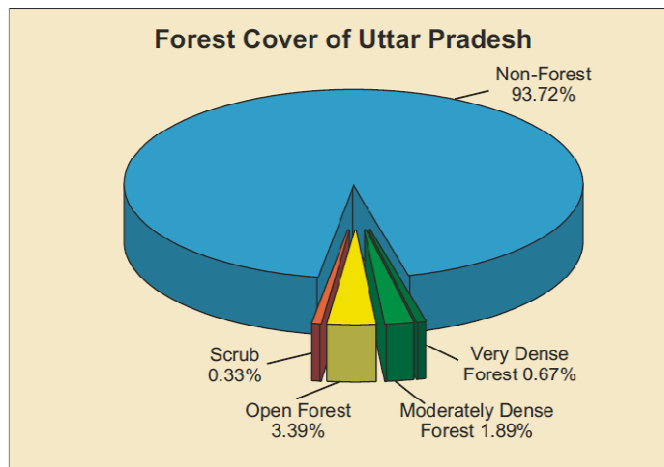
5.2 Biological Environment

The project stretch does not pass through any significant natural vegetation community. The major land use pattern is agriculture followed by builtup area.



5.2.1 Forest Cover

The proposed project road of Hamirpur to Rath section of SH-42 is located in the state of Uttar Pradesh. As per Indian State of Forest Report 2013, the total forest cover in Uttar Pradesh is 14,349 km². Out of which very dense forest is 1,623 km², moderately dense forest covers 4,550 km² and open forest covers 8,176 km². It is 5.96 percent of State geographic Cover. The graphical representation is shown in **Figure 5.8**. The forest cover map of Uttar Pradesh is shown in **Figure 5.9**.



Source: India State Forest Report 2013

Figure 5.8: Forest Cover in the state of Uttar Pradesh

The forest cover in the concerned project district as per India State Forest Report 2013 is given in **Table 5.20**. The report reflects that forest cover in Hamirpur District is only 4.06 percent of total geographical area which is less than the states percentage (5.96). There is no reserved forest area located along the project corridor.

Table 5.20: District-wise Forest Coverage along Project Road

State/ District	Geographical Area	Very Dense Forest	Moderately Dense Forest	Open Forest	Total	Percent of Geographical area
Hamirpur	4282	0	66	108	174	4.06
Uttar Pradesh	240928	1623	4550	8176	14349	5.96

Source: India State Forest Report 2013, Forest Survey of India, MoEFCC

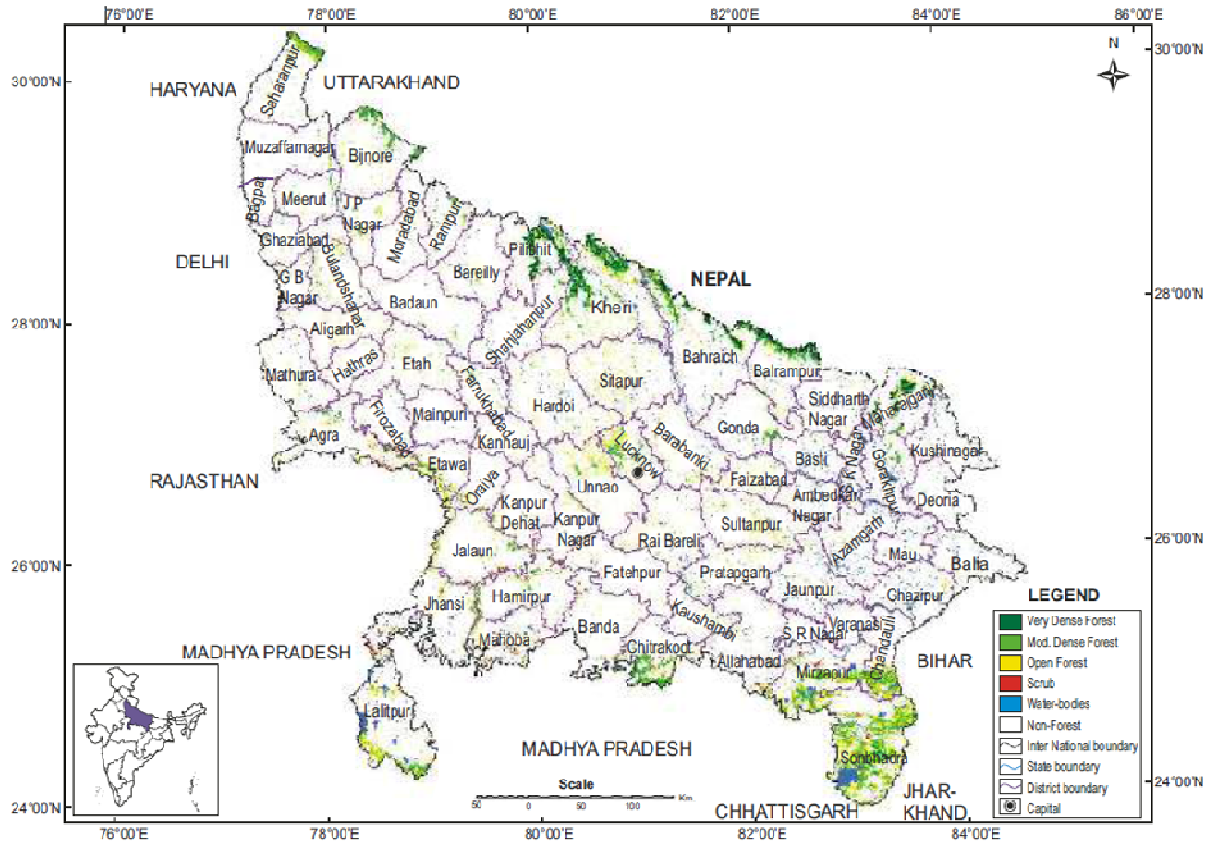


Figure 5.9: Forest Cover Map of Uttar Pradesh

5.2.2 Reserve Forest

The project stretch does not pass through reserve forest. There is no reserve forest or conservation forest within 10 km from both the sides of the project road

5.2.3 Wildlife Sanctuary/ National Park/ Tiger Reserve or Eco-sensitive Zone

Uttar Pradesh has one National Park and 23 Wildlife Sanctuary. There is no wildlife sanctuary or National Park located in Jhansi and Hamirpur districts. The Project stretch does not pass through wildlife sanctuary, national park or notified ecologically sensitive areas or any other significant area of ecological interest, neither these features are located within 10 Km radius on either side of the project road.

5.2.4 Threatened or Endangered Species

No threatened or endangered flora or fauna exists along the project corridor

5.2.5 Wetlands of Ecological Importance

There is no wetland exists in Hamirpur district.

**5.2.6 Protected Forest**

The Right of Way along the Highways in Uttar Pradesh has been declared as Protected Forest by the State's Department of Forest and accordingly the land within the ROW was transferred to the Forest Department after Notification. For the project stretch of SH-42, the roadside plantation within the existing RoW on either side has been declared as Protected Forest. Hence the felling of tree within RoW will attract the provision of Forest (Conservation) Act. The notification of the same is enclosed as **Annexure 5.2**.

5.2.7 Roadside Trees

Plantation of trees along the project section has been recorded within the RoW. The predominant tree species along roads are Babool, Sheesham, Neem, and Eucalyptus. Apart from these Mango, Peepal, Banyan, Palm, etc are also located along the roadside. Mostly single row of linear plantation is located along either side of the road except few locations where plantation in two rows has been observed. Most of the trees are confined within 10 m distance from existing central line of the road.

Kilometer-wise distribution of trees along the project stretch is presented in the **Table 5.21** and girthwise details of trees are provided in **Annexure 5.3**.

Table 5.21: Kilometer wise Distribution of Trees along the Project Road

S. No.	Chainage(Km)		No. of Affected Trees		
	From	To	LHS	RHS	Total
1	2+000	3+000	44	7	51
2	3+000	4+000	28	33	61
3	4+000	5+000	11	9	20
4	5+000	6+000	10	49	59
5	6+000	7+000	84	59	143
6	7+000	8+000	145	18	163
7	8+000	9+000	95	22	117
8	9+000	10+000	25	32	57
9	10+000	11+000	50	48	98
10	11+000	12+000	76	71	147
11	12+000	13+000	121	63	184
12	13+000	14+000	37	34	71
13	14+000	15+000	25	22	47
14	15+000	16+000	49	25	74
15	16+000	17+000	29	78	107
16	17+000	18+000	147	82	229
17	18+000	19+000	157	68	225
18	19+000	20+000	127	58	185
19	20+000	21+000	31	29	60
20	21+000	22+000	60	24	84
21	22+000	23+000	49	34	83
22	23+000	24+000	33	54	87
23	24+000	25+000	35	75	110
24	25+000	26+000	68	42	110
25	26+000	27+000	14	63	77
26	27+000	28+000	84	86	170
27	28+000	29+000	52	67	119



S. No.	Chainage(Km)		No. of Affected Trees		
	From	To	LHS	RHS	Total
28	29+000	30+000	48	108	156
29	30+000	31+000	134	62	196
30	31+000	32+000	57	71	128
31	32+000	33+000	54	70	124
32	33+000	34+000	77	142	219
33	34+000	35+000	63	41	104
34	35+000	36+000	111	57	168
35	36+000	37+000	46	43	89
36	37+000	38+000	79	55	134
37	38+000	39+000	61	128	189
38	39+000	40+000	118	91	209
39	40+000	41+000	37	57	94
40	41+000	42+000	33	3	36
41	42+000	43+000	68	40	108
42	43+000	44+000	101	89	190
43	44+000	45+000	44	51	95
44	45+000	46+000	47	129	176
45	46+000	47+000	46	16	62
46	47+000	48+000	54	49	103
47	48+000	49+000	31	103	134
48	49+000	50+000	46	91	137
49	50+000	51+000	28	51	79
50	51+000	52+000	21	9	30
51	52+000	53+000	82	58	140
52	53+000	54+000	136	61	197
53	54+000	55+000	53	77	130
54	55+000	56+000	73	73	146
55	56+000	57+000	32	15	47
56	57+000	58+000	24	74	98
57	58+000	59+000	43	47	90
58	59+000	60+000	34	52	86
59	60+000	61+000	156	64	220
60	61+000	62+000	66	73	139
61	62+000	63+000	53	53	106
62	63+000	64+000	114	29	143
63	64+000	65+000	36	45	81
64	65+000	66+000	11	15	26
65	66+000	67+000	56	11	67
66	67+000	68+000	39	43	82
67	68+000	69+000	57	43	100
68	69+000	70+000	89	50	139
69	70+000	71+000	93	66	159
70	71+000	72+000	143	91	234
71	72+000	73+000	39	28	67
72	73+000	74+000	21	21	42
73	74+000	75+000	16	23	39
74	75+000	76+000	0	0	0
TOTAL TREES			4556	3920	8476



Species-wise distribution of trees along the project alignment within corridor of impact is presented in the following **Table 5.22**.

Table 5.22: Species-wise Distribution of Trees along the Project Road

S. No.	Name of Tree Species	Scientific Name	LHS	RHS	Total
1	Babool	<i>Acacia arabica</i>	2474	2591	5065
2	Bunyan	<i>Ficus bengalensis</i>	2	12	14
3	Eucalyptus	<i>Eucalyptus hybrid</i>	563	219	782
4	Gamhar	<i>Gmelina arborea</i>	20	12	32
5	Gular	<i>Ficus glomerata</i>	68	27	95
6	Gulmohar	<i>Delonix regia</i>	105	28	133
7	Jamun	<i>Eugenia jambolana</i>	2	2	4
8	Jungle Jalebi	<i>Pithecellobium dulce</i>	10	Nil	10
9	Karanj	<i>Pongamia pinnata</i>	1	1	2
10	Kikar	<i>Acacia nilotica</i>	1	0	1
11	Mango	<i>Mangifera indica</i>	41	42	83
12	Neem	<i>Azadirachta indica</i>	339	201	540
13	Pakar	<i>Ficus infectoria</i>	1	Nil	1
14	Palm	<i>Palmyra palm</i>	15	3	18
15	Peepal	<i>Ficus religiosa</i>	35	55	90
16	Sheesham	<i>Dalbergia sissoo</i>	879	727	1606
			4556	3920	8476

5.2.8 Green Tunnel

There is no green tunnel situated along the project corridor.

5.2.9 Fauna

Domesticated animals constitute the faunal density in the area surrounding the project road. These are cows, buffaloes, goat, etc. Common birds like crow, parrot, sparrow etc. are seen here. No endangered flora and fauna species are spotted within the proposed project corridor. Sometime wild animals like Neelgai, Fox, jackals etc are observed in the project vicinity. There is no natural habitat of these animals along the highway section.

5.3 Social Environment

5.3.1 Demographic Profile

The demographic features of the project district as per 2011 Census are provided in **Table 5.23**. The population density is far lower in the district with respect to the State's population density. The sex ratio reflects the socio-economic and demographic characteristics of the population. It is an important indicator of migration and gender equity (in a developing country context) since it helps to point out the employment opportunity in the districts. There are 912 females for every thousand males in Uttar Pradesh State, while the sex ratios of the project district is 861 females for every 1000 males, which is lower than the state's ratio.

**Table 5.23: District wise Demographic Profile of the Project Area**

District / State	Total Rural Urban	Total No of House Hold	Population			Sex Ratio	Population Density
			Total	Male	Female		
Hamirpur	Total	204863	1104285	593537	510748	861	257
	Rural	166700	894437	481373	413064	858	
	Urban	38163	209848	112164	97684	871	
Uttar Pradesh	Total	33448035	199812341	104480510	95331831	912	829
	Rural	25685942	155317278	80992995	74324283	918	
	Urban	7762093	44495063	23487515	21007548	894	

Source: Census of India, 2011 Census

5.3.2 Schedule Castes and Schedule Tribes

Table 5.24 depicts the population details of Scheduled Castes (SC) Scheduled Tribes (ST) in the concerned districts.

Table 5.24: SC and ST Population of Concern District in Project Area

District/ State	Total Rural Urban	Population					
		SC			ST		
		Total	Male	Female	Total	Male	Female
Hamirpur	Total	241198	130269	110929	474	259	215
	Rural	198693	107472	91221	45	24	21
	Urban	42505	22797	19708	429	235	194
Uttar Pradesh	Total	41357608	21676975	19680633	1134273	581083	553190
	Rural	35685227	18663920	17021307	1031076	526315	504761
	Urban	5672381	3013055	2659326	103197	54768	48429

Source: Census of India, 2011 Census

5.3.3 Literacy Rate

Literacy rate is a significant indicator of any district or state's economic as well as social development status. The higher literacy rate indicates higher awareness and vice versa.

The Literacy rate of the state according to the 2011 Census is 69.70%. With the literacy rate for Males at 79.20%, while it is 59.30% for the Females. While this is still below the national average of 74.04% (82.14% for men, 65.16% for women) Male literacy rate is higher than female literacy rate in the state. Government of Uttar Pradesh has taken several steps to bring awareness about education and thus building a strong foundation for better literacy rate in the state.

Table 5.25 below provides the area wise male and female literacy rates of the state of Uttar Pradesh, and the project districts.

Table 5.25: Literacy Rate

District / State	Total Rural Urban	Population			% age
		Total	Male	Female	
Hamirpur	Total	653299	408125	245174	59.16
	Rural	511783	324610	187173	57.22
	Urban	141516	83515	58001	67.44



District / State	Total Rural Urban	Population			% age
		Total	Male	Female	
Uttar Pradesh	Total	114397555	68234964	46162591	57.25
	Rural	85284680	51793688	33490992	54.91
	Urban	29112875	16441276	12671599	65.43

Source: Census of India, 2011 Census

5.3.4 Employment Pattern

The work participation rate for total workers is defined as the percentage of total workers to total population. In a similar way it is defined for main and the marginal workers. **Table 5.26** & **Table 5.27** illustrate the work participation in the project districts of the state of Uttar Pradesh as a whole for the marginal workers and the main workers respectively. The relative importance of the main spheres of economic activity may be gauged from the pattern of distribution of main workers in cultivation, agricultural labour, household industry and other economic activities.

Table 5.26: Work Participation for the Marginal Workers

District / State	Total Rural Urban	Population		
		Total	Male	Female
Hamirpur	Total	153280	75469	77811
	Rural	137177	65141	72036
	Urban	16103	10328	5775
Uttar Pradesh	Total	21179223	12426463	8752760
	Rural	18412163	10540532	7871631
	Urban	2767060	1885931	881129

Source: Census of India, 2011 Census

Table 5.27: Work Participation for the Main Workers

District / State	Total Rural Urban	Population		
		Total	Male	Female
Hamirpur	Total	290375	233058	57317
	Rural	239077	189723	49354
	Urban	51298	43335	7963
Uttar Pradesh	Total	44635492	37420299	7215193
	Rural	33538817	27812347	5726470
	Urban	11096675	9607952	1488723

Source: Census of India, 2011 Census

5.4 Economic Development

5.4.1 Agriculture Pattern

Agriculture remains the main occupation of the people of the district and about 80% of the population depends on agriculture for its livelihood. Only 27.7% land are irrigated land in Hamirpur. The distribution of area of land irrigated by different sources of irrigation is as under. Canals are the main source of irrigation and are constructed by the different rivers like Yamuna, Betwa, Dashan, Barma, Ken, Chandrawal and Pandwaha. The details sources of irrigation are given in **Table 5.28**.

**Table 5.28: Detail Sources of Irrigation in Hamirpur District**

Sources	Area Irrigated (Hectare)	Percentage Area
Canal	24920	28.7
Tubewells	34049	39.2
Wells	22805	26.3
Ponds	539	0.6
Other Sources	4561	5.2
Total	93302	100.0

Source: <http://hamirpur.nic.in/about/agriculture.html>

There are three harvests, the autumn or Kharif have usually known as siyari, and the spring or Rabi as Unhari. The Ziad or extra harvest is insignificant in this area. Gram, Wheat, Barley, Peas, Arhar and Masoor are the main crops of Rabi. Jowar, Rice, Bajra, Urd, Moong and Moth are the main crops of Kharif. Melon, water-melon, bitter guard, pumpkin are the main crops of Zaid. The details of crop distribution are given in **Table 5.29**.

Table 5.29: Details of Crop Distribution in Hamirpur District

Crop	Area Sown (Hectare)	Percentage Area
Gram	93974	26.5
Wheat	83658	23.6
Masoor	58208	16.4
Jwar	36657	10.3
Urd	23318	6.6
Pea	19558	5.5
Tilhan	15657	4.4
Arhar	12995	3.7
Others	10740	3.0

Source: *Sankhikiya Patrika*

5.4.2 Educational Institutions / Hospitals

The educational institutions and hospital/health centers constitute the sensitive environmental receptors. The list of such features along the ROW along the project roads is presented in **Table 5.30**.

Table 5.30: List of Environmental Sensitive Receptors along ROW of Project Road

S. No.	Institution / Hospitals	Chainage (Km)	Distance from Existing Central Line (m)	Location with Respect to ROW
1	School	5+300	30.0	LHS
2	Primary School	9+900	30.0	LHS
3	School	15+400	19.0	LHS
4	School	20+400	16.0	RHS
5	Inter College	25+900	16.5	RHS
6	Inter College	26+000	10.2	LHS
7	School	31+000	16.0	LHS
8	Inter College	31+700	12.0	LHS
9	Mahavidhyalaya	33+400	17.5	LHS



S. No.	Institution / Hospitals	Chainage (Km)	Distance from	Location with
10	Inter College	40+300	16.0	LHS
11	School	47+200	12.2	LHS
12	Primary School	58+200	10.0	RHS
13	Govt.Primary School	63+900	17.0	LHS

5.4.3 Industries

Hamirpur district is among least industrialized district of Uttar Pradesh. The main occupation in the project area is agriculture. There are no signification industry located along the project road.

5.4.4 Cultural Properties

A number of religious structures are located within the vicinity of project area. Few of these structures are situated close to the existing road edge which may required to be shifted. The list of such features are presented in **Table 5.31**.

Table 5.31: List of Religious Cultural Features along the Project Roads

S. No.	Religious / Cultural Resources	Chainage (Km)	Distance from Existing Central Line (m)	Location with respect to ROW
1	Temple	2+600	13.0	RHS
2	Temple	5+300	16.0	LHS
3	Temple	10+200	4.5	LHS
4	Shiv mandir	16+500	10.2	RHS
5	Temple	20+600	6.2	RHS
6	Temple	21+300	16.4	LHS
7	Temple	25+500	7.0	RHS
8	Temple	26+200	11.0	LHS
9	Temple	41+400	8.5	RHS
10	Temple	41+500	5.8	LHS
11	Temple	41+700	15.5	RHS
12	Temple	46+400	4.1	RHS
13	Temple	50+500	9.5	RHS
14	Temple	51+400	11.0	LHS
15	Temple	51+900	14.5	RHS
16	Temple	58+700	19.0	RHS
17	Temple	62+700	8.5	RHS
18	Temple	70+500	9.5	RHS
19	Temple	71+100	12.5	RHS
20	Temple	74+900	10.5	RHS

5.4.5 Historical Monument/Archeological Site

No Archeological site or historical monument recorded within 500 m of the existing ROW of the project stretch on either side.

A strip plan indicating different environmental features along the project corridor is given in **Annexure 5.4**.



6 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

In this chapter, potential environmental impacts, both bio-physical and socio-economic, are assessed in terms of the direct and indirect nature of the impact, extent, duration and significance. The level of assessment of each potential impact was based on the important environmental issues identified in baseline environmental studies and the proposed improvement and activities of the project.

The impacts of major infrastructure projects can be divided into two principal categories. First direct impacts which result from physical presence of the facilities and the way they are designed, built and operated. Second, indirect impacts, which stem from the construction and economic activities surrounding construction and the induced development resulting from improved access. These impacts occur in two main phases- Construction and operation. Direct environmental impacts are those that are directly caused by road construction or operation. During construction these impacts primarily occur within the road formation area or immediately adjacent to it, and at ancillary sites such as quarries and workforce camp. Direct construction impacts can include the loss of agricultural land damage to ecological features such as land resources and water bodies, damage to manmade structures and resettlement. During road operation direct impacts may include a reduction in air and water quality.

Relatively small potential for negative impacts is generally envisaged for road widening and upgrading project. Most of these negative environmental effects can be 'design out' at an early stage through proper engineering designs, which will emphasize the contractors to follow environmentally friendly construction methodology.

The construction activities will mainly be restricted to the proposed ROW along the entire stretch except for the temporary camp sites, quarry and borrow areas which are the activities associated with the construction and are usually located beyond the right of way. All the proposed construction activities will follow the current Indian standards for highway engineering design. The potential environmental impacts are studied as direct, indirect or cumulative effects on various environmental components.

The improvement of road have positive influence by virtue of better connectivity and accessibility, low vehicle operating cost, quick access to marketing centers, educational and medical facilities, improvement of way side amenities, enhancement of safety for the road users as well as the population living in the vicinity of the highway, etc. and thus provide tremendous opportunities of socio-economic development of the region. Besides these, the negative environmental impacts due to the road development works can be correlated to the loss of land and properties, deterioration of environmental quality (air, water, soil and noise) and ecological degradation during various constructional works as well as during operational phase due to increase in traffic volume, change in land use pattern, landscape deterioration, etc.

The road improvement project may influence various environmental components at different stages of the project viz: Pre-constructional phase Constructional phase and Operational phase. The impacts may be direct or indirect and may be beneficial or adverse with respect to the environment. The major works associated with the construction phase mainly are site clearance, Earth work in embankment, excavation, pavement and cross drainage works, dumping of spoils



and waste materials and other construction activities and associated works like mobilization of constructional equipments, setting up of workforce camps, quarrying, transportation and storage of materials, etc. These activities have potential impacts on physical, biological as well as social environment. The impacts may be of short terms and temporary or long terms and permanent. The likely impacts on various environmental components have been described as follows:

6.1 Impacts During Design/ Pre-constructional Phase

Sufficient Right of way is available in the entire section of the project road to accommodate the proposed widening of the existing highway section to standard two lane with paved shoulder and the project work would mostly be limited within ROW. Little adverse impacts on environmental components are anticipated due to the project.

6.1.1 Impact on People due to Affect of Properties

The project activities will be confined to the available Right of Way (ROW). As per baseline survey on social features within 20 m corridor (10 m either side of central line), it has been revealed that there are number of squatters and encroachers within the existing ROW. So even though the widening is proposed within the existing ROW, the project envisages acquisition of various commercial and residential structures and displacement of Non titleholders (NTH). Altogether 488 structures are likely to be affected either partially or fully for widening of SH-42 section from Hamirpur to Rath. Out of 488 structures, 90 are residential, 194 are commercial, 141 are kiosk, and 29 are residential cum commercial structures, 12 are boundary walls, whereas 22 are other miscellaneous structures. Due to impact on structures 798 families are likely to be affected. These impacts have been described in details under Resettlement and Rehabilitation Report.

Mitigation Measures:

- A separate R&R policy has been framed after identification of different categories of affected persons to address the issues pertaining to the Project Affected People and their rehabilitation & resettlement .
- The acquisition of private properties will be carried out in accordance with the RAP and entitlement framework for the project.
- Early identification of affected persons for compensation and advance planning of Resettlement and Rehabilitation Action Plan to Compensate the Losses.
- All the affected people will be compensated for the loss as per R & R Policy of the project before commencement of Construction works
- PIU-UPPWD has to ascertain that any additional environmental impacts resulting from acquisition of properties are addressed and integrated into the EMP and other relevant documents.

6.1.2 Impacts on Other Assets

In addition to the above features, 46 hand pumps and well and one community water tank are likely to be affected due to the proposed widening in both the project sections.

Mitigation Measures: All the affected hand pumps, well and water tank will be relocated at suitable locations before commencement of construction activities.



6.1.3 Religious, Common and Govt. Property Affected

The baseline study reflects that there are total 20 nos. of religious structures, 13 numbers of bus shelters and 58 numbers of government hand pumps located along the project corridor within 20 m corridor. Out of these 22 religious structures, structure of 3 temples are located very close to the existing road edge. All the temples have been saved by adjustment in the alignment is these stretches. The lists of such structures are given in **Table 6.1**.

Table 6.1: Partially Affected Religious Structure

S. No.	Religious / Cultural Structure	Chainage (Km)	Location with RoW
1	Temple	10+200	LHS
2	Temple	20+500	RHS
3	Temple	46+400	RHS

Mitigation Measures: All religious structures have been saved by slightly shifting the alignment towards the opposite side of the structures.

6.1.4 Impact on Ponds

Baseline study reflects that there are 9 ponds located in project vicinity. Out of these 9 pond, 3 pond are located close to the existing road edge. To avoid impacts due to widening of the road in these sections, toe wall has been provided along the pond. So all the ponds have been saved.

6.1.5 Impact on Utilities

Several types of utilities serving local and regional needs are falling under COI will need to be relocated from their present position due to the proposed widening alignment. These services are mainly electric poles, transformers, OFC lines, wells and bore wells and water supply pipelines which may be required to be relocated at some locations. Such type of impacts due to the widening of highways is inevitable.

Mitigation Measures: All the utilities will be restored in advance prior to the start of construction works. The required mitigation measures would be to instruct in advance the relevant owners of these utilities to shift those before construction starts to avoid disruption of local services. The Contractor will submit the details of such features falling within the alignment and inform the PIU-UPPWD. It will be judicious for the PIU-UPPWD to assist the owners to get land for new locations.

6.1.6 Impact on Roadside Trees

The present project will have varying levels of impact on the roadside plantations throughout the project stretch. This impact is viewed critical due to the duration required for its reversal and sometimes it is irreversible. The roadside trees not only provide a healthy aesthetics to the road users but also provide shade and protect the users from harmful effects of contaminants by absorbing them through vegetation canopy. The cutting of trees along the road will result into reduced buffering of air pollutants, hotter, drier microclimate along the project road.

The tree inventory showed that about 8476 trees of varying girth located within the ROW may be affected due to the proposed widening. The baseline studies showed that there is no any endangered or rare tree species located within the project area. The predominant tree species are Babool, Sheesham, Neem, Eucalyptus, etc.



Effort will be made to minimise the tree felling by restricting tree felling within the formation width only.

Mitigation Measures

- Permission of Roadside cutting will be obtained from the line department, i.e. Forest Department.
- All efforts will be made to preserve trees by restricting tree cutting within the formation width. Special attention will be given for protecting giant trees, and locally important trees (having cultural importance)
- Compensatory plantation will be carried out along the space available within the proposed ROW in the ratio of at least 2 times as much the trees are proposed to cut as per Forest (Conservation) Act
- A general guideline for tree plantation will be followed as per IRC: SP: 21:2009 and as per Tree Plantation Strategy given in **Annexure-9.1**

6.1.7 Legal implications due to Roadside trees declared as Protected Forest

The tree plantation within ROW on both side of project road section of SH-42 from Hamirpur to Rath is declared as protected forest. Due to protected nature of roadside tree plantation, tree felling within 10 m corridor on either of the road from existing centerline, will attract the provision of Forest (Conservation) Act and hence forest clearance would be required for diversion of forest area for non forest purpose, i.e. widening of road. The proposed widening will require diversion of about 58.400 Ha of protected forest lands.

6.2 Impacts during Construction Phase

Most of the adverse environmental impacts are related to construction works which are inevitable but are manageable through certain environmental friendly practices. The negative environmental effects can be taken care of at an early stage through proper engineering designs and through the contract during construction practices.

The standard road construction works involve are site clearance, excavation, filling of earth materials and sub grade materials, laying of bituminous mixtures, handling of hazardous materials like bitumen, diesel, etc, dumping of unusable debris materials, transportation of materials from production site to construction site, and other constructional activities and associated works like mobilization of constructional equipments, setting up of different construction plants, setting up of workforce camps, quarrying, material storage etc. These activities have certain impacts of various magnitudes on different components of environment. The anticipated impacts due to all these activities have been described below:

6.2.1 Impact on Land Resources

Clearing and grubbing and excavation of the land within the extent of formation width of the proposed alignment as well as the proposed bypasses are the primary activity to prepare the bed for road construction. The excavation activity will lead into generation of excavated materials which would mainly soil mixed with pebbles in the project area. The suitable materials will be re-used as fill materials, aggregates. The unsuitable excavated material will need to be disposed off due to non-suitability for use in road fill materials. The disposal of debris materials in haphazard manner will not only hamper the aesthetic look of the area but at the same time they are potential contaminant for the surrounding land.



Some land would be needed to establish site offices and construction camps, worker/labour camps. These will require temporary land acquisition for a short period. Substantial amount of land would also be required for extraction of borrow materials.

For fulfilling the requirement of soil and aggregates certain land acquisition will be required followed by excavation of that land area. Such type of activity can lead into disfiguration of topography of the area. Water stagnation in the borrow pit provides ideal breeding sites for mosquitoes and thereby can spread malaria and dengue if borrow pit is not properly managed. Pits near settlements can pose health risk. As per estimation of quantity of materials for the construction of project road, 5,25,000 m³ of soils and 4,83,010 m³ of coarse and fine aggregates would be required. It has been estimated that due to roadway cutting and drain excavation about 712500 m³ earth work materials will be generated, which can be reused for sub-grade and earthen shoulder. The balance quantity of 2,95,510 cum will be taken from borrow area.

Further haphazard cutting near water courses will result into soil erosion and siltation to the nearby water bodies.

Mitigation Measures

- No Borrow area and quarry will be operated without written agreement of the land owner.
- The Contractor will obtain environmental clearance for the borrow area and quarry as per MoEF circular on environmental clearance for minor minerals and the conditions stipulated under the environmental clearance will be binding on the contractor. The Contractor will submit the copy of clearance letter to the Engineer and PIU before commencement of material extraction.
- All the borrow area will be operated in accordance with IRC specification and MoEF guidelines.
- The earth material generated due to excavation will be used to optimum quantity to reduce impact on land resources.
- The Construction camps will be located preferably on barren land and sufficiently away from settlements and water bodies.
- The Construction camp will be provided with necessary sanitation arrangements and basic facilities.
- After dismantling of Camp the natural condition of the land will be restored.
- No scare will be left unattended after excavation activity.
- The Borrow area will be located preferably on barren land or unirrigated land.
- The Borrow pits will not be dug within 800 m of town or village settlement , within ROW, within 1 km from any forest area.
- After excavation is over, the borrow area will be rehabilitated suitably
- Proper reclamation of pits will be done
- Cut face of the pit will be merged with the slope of the adjoining terrain
- Bottom of the pits will be graded towards natural outfalls to prevent water accumulation
- The reclaimed area will be seeded to provide grass coverage.
- Quarrying of metal will be done only at licensed quarry and the area will be suitable rehabilitated after quarrying is over.



- The borrow areas and stone quarry site should be operated and managed as per guidelines provided in **Annexure 9.3** & **Annexure 9.4**, respectively.

6.2.2 Impact on Soil

The site clearance process includes excavation and vegetation clearance which ultimately induces vegetation loss as well as loss of top soil. Since vegetation clearance shall be confined to the minimum area required for widening activities beyond the ROW, the area affected would be very less. The activities associated with the site preparation and excavation plus movement of vehicles and equipments can disturb the surrounding lands. At the borrow area, temporary camp site or stockyards, workshops, and other ancillary sites there is chance of loss to soil fertility due to various activities.

In order to minimize the impact on soil fertility the top soil will be preserved separately and the top soil will be reused to site restoration work.

6.2.2.1 Contamination of Soil

Contamination of soil during construction stage is primarily due to construction and allied activities. The sites where construction vehicles are parked and serviced are likely to be contaminated because of leakage or spillage of fuel and lubricants. Pollution of soil can also occur in hot-mix plants from leakage or spillage of asphalt or bitumen. Refuse and solid waste from labour camps can also contaminate the soil. Contamination of soil during construction might be a major long-term residual negative impact. Unwarranted disposal of construction spoil and debris will add to soil contamination. This contamination is likely to be carried over to water bodies in case of dumping being done near water body locations. However, by following mitigation measures such as maintenance of vehicles and machines and fuel refilling is carried out in a confined area can avoid contamination of soil to a great extent. The provision for oil interception chamber is suggested in EMP for treating the waste water generated from vehicle washing, refilling and maintenance areas. Fuel storage and refilling sites should be kept away from cross drainage structures and important water bodies. All spoils shall be disposed off as desired and the site shall be fully cleaned before handing over. These measures are expected to minimise the impact on soil contamination.

6.2.2.2 Compaction of Soil

Compaction of soil may be anticipated due to the movement of construction vehicles and heavy machines. Thus regulation of movement of heavy equipments and vehicles shall be essential to prevent this.

Mitigation Measure

- The excavation activities and vegetation clearance will strictly be limited to formation width only.
- All the usable excavated materials will be re-used as fill materials and aggregates.
- The movement of construction vehicles and equipments will be restricted to only designated route.
- Designated storage site for fill materials and adequate stockpiling to prevent erosion and runoff related problem.



6.2.3 Impact on Water Resources

The proposed widening will result into slight increase of surface run-off. The geological studies of the project area show water table 8-10 m below the ground level. As the depth of the ground water table is very high no adverse impact is anticipated on ground water. Laying of pavement within the formation width may lead to reduction in the ground water recharge capacity. But as the area involved in the road construction is very less, the chances of this influence will be non-significant.

6.2.3.1 Water Requirement for Construction

The water demands for the construction work may pose severe stress on the public water supply if the water for construction and allied activities are taken from the same source as the project area is a water stressed area and water supply sources are limited.

The main source of water for construction and other related activities will be a mixture of surface water source and ground water source. Surface water may be used to meet the water requirement for the project. However groundwater may be used by installing bore wells at different locations such as at camp sites and plant sites. Separate water supply arrangement for construction and allied works will be made in from ground water/surface water source away from public water supply source so that there is no interfere with the normal public water supply. The water for the construction will be taken after taking prior permission from Competent Authority and comply with all the requirements of State Ground Water Authority/ Irrigation Department. The Contractor will take all the measures in order to minimize wastage of water during the construction.

The baseline study indicate that the area along the project falls under safe to subcritical zones in terms of ground water availability, usage and water balance and recharging capacity. The estimated water requirement is for the entire project length and the abstraction of water will not be confined to a single location but will be extended at different locations, therefore pressure on a single aquifer will not be significant. The overexploited zone will be avoided for abstraction of water for construction purpose.

The Source of water for construction shall be identified by the Contractor depending upon the location of construction sites, construction camp and plant site locations in consultation with line department and UPPWD and will obtain all necessary statutory permits for usage of water before start of abstraction of water.

Mitigation Measures

- Longitudinal drains of sufficient capacity will be provided on both sides of the road to accommodate increased run-off.
- In urban stretches, the lined drains will be provided with cut in between to facilitate ground water recharging. The cut will be made of granular coarse material, which will increase the infiltration rate.
- Rainwater Harvesting pits will be provided in consultation with Ground Water Boards covering the entire project stretch The recharge pit can only be provided at those locations where the water table is greater than 5 m deep . The schematic plan of rainwater harvesting is presented in **Annexure 9.5**. The Contractor will have to collect the information about the water table and then construct the rainwater harvesting pits



which will be approved by the Engineer and PIU-UPPWD. The Contractor will submit completion after construction of rainwater harvesting pits along with their details duly certified by the Engineer and PIU-UPPWD

- The Contractor will arrange separate water supply arrangement for construction work and will not interfere with the normal public water supply.

6.2.4 Impact on Water Quality

No permanent impact is anticipated on water quality due to the project. Construction activity may temporarily deteriorate surface water quality near the alignment through increase in turbidity as well as in oil and grease. These impacts can be handled through following proposed mitigation measures:

- All water and liquid wastes arising from construction activities will be properly disposed off and will not be discharged into any water body without adequate treatment.
- Littering or unauthorized discharge will not be permitted.
- Permission of the engineer and the concern regulatory authorities will be obtained for disposal of the waste as the designated disposal point.
- The stream course and drain will be kept free from dumping of solid wastes and earth materials.
- The construction materials and debris will be stored away from water bodies or water ways and only on the designated sites along the construction zones.

6.2.5 Impact on Ambient Air Quality

The air quality parameter is the most common environmental feature, which is being affected by any road improvement projects at different stages i.e. during constructional as well as operational phase. The major indicators of Ambient Air Quality relevant to the road project are suspended particulate matters (SPM), Particulate matters of size less than $10\ \mu$ (PM_{10}), particulate matters of size less than $2.5\ \mu$ ($PM_{2.5}$), Sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO) in the atmosphere. Significant amount of dust is likely to be generated due to site clearance and excavation activities, exhaust of mobile and stationary construction equipment, stone crushing plant, batching plant, HMP, demolition, embankment and grading activities, transportation of earth materials and dumping of spoils, which have potential deterioration of air quality during the process. This can increase the localized concentration of fugitive during construction phase. During asphalt preparation, operation of hot mixing plants needs burning of fuels that result into release of significant amount of gaseous pollutants into the atmosphere like oxides of sulfur, hydrocarbons and particulate matters. These are likely to deteriorate the air quality in general and also cause occupational exposure in particular. These impacts are, however, temporary one that will remain only upto the period of clearance and excavation processes. Besides this, air quality deterioration is also expected at deposits and borrows sites, materials treatment areas, quarries, access roads and the site where facilities provided for project workers due to dust generation and gaseous pollutant emission. Additional vehicular emission is expected during the mobilization of construction equipments, transportation of materials, etc. due to the increased vehicular number at the project sites but that will be minor in extent as there will not be significant increase in vehicle numbers.

The improper sanitation at work camps and waste disposal usually lead to odour problem. Foul odour may also cause during laying of pavement. The abovementioned problems related to the deterioration of air quality, however, will be temporal in nature till the construction period only. Further, the activities will not be confined to any one place rather, it will progressively move



along the ROW, so prolonged deterioration in air quality will not occur at any one site. The minor volume of dust generated will cause a short-term localized problem through settlements.

Mitigation Measures

Generation of Dust

- Water will be sprayed during construction phase, in earth handling sites, asphalt mixing sites and other excavation areas for suppressing fugitive dust.
- Water sprinkling and transporting construction materials with tarpaulin coverage during the construction stage.
- During the sub-grade construction, sprinkling of water will be carried out on regular basis during the entire construction period especially in the winter and summer seasons.
- In case fly ash is used, dust emission during its loading and unloading, storage at open place and handling for road construction shall be suppressed by regular water sprinkling.
- Dust emission from stockpiles of excavated material will be controlled either by covering the stockpiled materials or water spraying over it.
- Special attention will be given when working near educational institutions and health centers and settlement areas.
- As soon as construction is over all the surplus earth will be utilized properly all loose earth will be removed from the site.

Mitigation measures for Plants & Equipments:

- The Stone crusher plant, hotmix plant and Wet Mix Plant will be located sufficiently away from settlement towards downwind direction and will conform to the siting and operation requirements under Environmental (Protection) Rules, 1986.
- Proper management of all Plant sites having stone crusher unit, Hotmix plants, Batchmix plant, stockyards.
- All the vehicles used during the construction stage to have valid PUC certificate
- Provision of effective air pollution control systems in stone crushers, Hotmix Plant, Batchmix plants such as Dust containment cum suppression system for the equipment, Construction of wind breaking walls along periphery of plant sites, construction of the metalled roads within the premises, regular cleaning and wetting of the ground within the premises, etc.

Gaseous Pollution

- All the Construction vehicles and machineries will be regularly maintained to conform to the emission standards stipulated under Environment (Protection) Rules, 1986.
- Asphalt mixing /Stone Crusher plants should be located at least 1 Km away from any habitation or sensitive environmental site and at least 250 m away from highway towards downwind direction.
- All the DG sets will conform to the emission standards as stipulated under Environment (Protection) Rules, 1986.
- The workers working at asphalt mixing and subsequent application of asphalt mix on road surface will be provided with heat resistant shoes and masks.

**6.2.6 Impacts on Ambient Noise Level**

Operation of heavy machineries; movement of heavy vehicles, stone crushing aggregate mixing activities generates high noise increasing the ambient noise level in the surrounding. The behaviour of truck drivers also plays roles in increasing the noise level by the injudicious frequent use of blow horns. Especially in the settlement area this can pose a problem.

Workers working near the noise generating equipments and plants are likely to be exposed to high noise level. The acceptable limits (for 8 hour duration) of the equivalent noise level exposure during one shift is 90 dB(A). Hence, noise generated due to various activities in the construction camps may affect health of the workers if they are continuously exposed to high noise level. For reasons of occupational safety, exposure to impulses or impact noise should not exceed 140 dB(A) (peak acoustic pressure). Exposure to 10,000 impulses of 120 dB(A) are permissible in one day. The noise likely to be generated during excavation, loading and transportation of material will be in the range of 90 to 105 dB (A) and this will occur only when all the equipment operate together and simultaneously. This is however, is a remote possibility. The workers in general are likely to be exposed to an equivalent noise level of 80 to 90 dB (A) in an 8-hour shift, for which all statutory precautions should be taken into consideration. However, careful planning of machinery selection, operations and scheduling of operations can reduce these levels. A typical Noise generation due to different activities has been given in the **Table 6.2**.

Table 6.2: Typical Noise Levels of Principal Construction Equipments

Construction Equipments for Different Activities	Noise Level in dB(A) at 50 Feet
CLEARING	
Bulldozer	80
Front end loader	72 - 84
Dump truck	83 - 94
Jack hammer	81 - 98
Crane with ball	75 - 87
EXCAVATION AND EARTH MOVING	
Bulldozer	80
Backhoe	72 - 93
Front end loader	72 - 84
Dump truck	83 - 94
Jack hammer	81 - 98
Scraper	80 - 93
STRUCTURE CONSTRUCTION	
Crane	75 - 77
Welding generator	71 - 82
Concrete mixer	74 - 88
Concrete pump	81 - 84
Concrete vibrator	76
Air compressor	74 - 87
Pneumatic tools	81 - 98
Bulldozer	80
Cement and dump trucks	83 - 94
Front end loader	72 - 84
Dump truck	83 - 94
Paver	86 - 88



Construction Equipments for Different Activities	Noise Level in dB(A) at 50 Feet
GRAND AND COMPACTING	
Grader	80 - 93
Roller	73 - 75
PAVING	
Paver	86 - 88
Truck	83 - 94
Tamper	74 - 77
LANDSCAPING AND CLEAN UP	
Bulldozer	80
Backhoe	72 - 93
Truck	83 - 94
Front end Loader	72 - 84
Dump Truck	83 - 94
Paver	86 - 88

Source: CPCB, Govt. of India

It is evident from the above table that the operation of construction machinery e.g. hot-mixer, bulldozer, loader, backhoes, concrete mixer, etc will lead to rise in noise level to the range between 80-95 dB (A). Vehicles carrying construction materials will also act as the noise sources. The magnitude of impact from noise will depend upon types of equipment to be used, construction methods and also on work scheduling. However, the noise pollution generated due to different construction activities is a temporary affair. Each type of activity can generate different type and levels of noise that continue for a short period during the operations of those activities.

Implementing proper mitigation measures can reduce a lot of problem associated with noise pollution due to construction activities.

Mitigation Measures:

- All noise generating equipments will be installed sufficiently away from settlement areas.
- The main stationary noise producing sources such as generator sets shall be provided with noise shields around them. The noise shields can either be a brick masonry structure or any other physical barrier which is effective in adequate attenuation of noise levels. A three meter high enclosure made up of brick and mud with internal plastering of a non-reflecting surface will be very effective in these regards
- The plants and equipment used for construction will strictly conform to CPCB noise standards.
- Vehicles and equipments used will be fitted with silencer and maintained accordingly.
- Noise to be monitored as per monitoring plan and if the noise level at any time found to be higher than immediate measure to reduce noise in that area will be ensured.
- Noise standards of industrial enterprises will be strictly enforced to protect construction workers from severe noise impacts.
- All the workers working very close to the noise generating machinery shall be provided Earplugs to avoid any ill impacts on their health.



- An awareness programme will be organized for drivers and equipment operators to make them aware of the consequences of noise and to act properly at site

6.2.7 Impact on Ecological Resources

The baseline study within the project area did not show any endangered or significant flora or fauna within the corridor of impact therefore, any potential direct impact on biological environmental characteristics such as, loss of rare or endangered species, habitat fragmentation and wild life migrations is not envisaged. The temporary impact may be in the visual appearance of the trees and shrubs as construction activity may lead to deposition of dust cover over the leaves and foliage. This is limited to construction period and gets washed away with the first monsoon shower.

6.2.8 Impact on Social Environment

6.2.8.1 Impairment of access to the properties

During construction of road, cross water and side drain temporary blockage of access or interference with the access to the properties located along the right of way may occur, causing inconvenience to the road users and enhances the accident risk if not managed properly. Such impact can be avoided through proper planning of works and good engineering practices. Safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road shall be ensured by providing temporary access. Adequate signage and barricades shall be raised at the expected bottlenecks for safe movement of people. The Contractor shall provide early information to the affected people. On completion of the works, all-temporary obstructions to access shall be cleared away, all rubbish and piles of debris that obstruct access should be cleared.

6.2.8.2 Aesthetics

Disturbance of landscape aesthetics due to excavation of borrow pits, extensive quarrying, disposal site of spoils, is expected during the constructional phase. However, it is only temporary one and it can be restored with proper management plans within a short period such as roadside plantation, etc. During operational phase this will be enhanced with the activities associated with the maintenance of landscape such as plantation programme, by providing road side amenities, parks etc.

Mitigation Measures:

- The site will be cleaned immediately after the construction activity is over.
- The debris materials will be disposed off only at identified area for disposal and proper leveling will be done after disposing the materials and shall be covered with top soil and some plantation will be done at the disposal site
- The borrow area will be rehabilitated as per site condition. It can either be developed as ponds, backfilled and leveled matching with the surrounding terrain.

6.2.8.3 Public Health and Safety

Health and safety are of major concern during the construction as well as operational phases. The impact on health and safety can be envisaged for both workers at site and road users as well as inhabitants of nearby areas. The project will comply with the requirements of the EHS Guidelines



of the World Bank Group¹.

Emission of gaseous pollutants and dusts are major result of various processes like material treatment, operation of hot mix plant, stone crushing, and asphalt preparation. This emission effect is only for short term till the construction work is over but the effect may be significant from the point of view that the workers are directly exposed to these emissions. Apart from this, safety risks to road workers, primarily in the areas of storage and handling of dangerous materials, and in operation of heavy machinery close to traffic, slopes, power line and water courses, are also involved during the construction works.

The dust and gaseous pollutant generation within the congested area during the construction works will adversely affect the health of people residing in the close proximity of the road. Excavation of borrow pits on both the sides of roads within and outside the existing ROW can create unhealthy aesthetics and also enhance the risk of malaria. These areas provide ideal breeding zones for flies and insects. Stagnancy of water in borrow pits located nearby settlements during rains may enhance the possibility of spreading of diseases. The vehicles and equipment operation increase the chances of collision with vehicles, pedestrians and livestock. The poor sanitation and poorly manages dispose off the waste may cause increase in communicable diseases.

Mitigation Measures

- The plants and equipments will be installed sufficiently away from the settlement.
- All the construction equipments and vehicles will conform with the emission standards stipulated by the CPCB.
- Safe working techniques will be followed up and all the workers will be trained
- All the workers will be provided with proper personal safety equipments at construction as well as plant site
- Proper caution signage, barricading, delineators etc. will be installed at Construction zone and temporary diversions
- Proper traffic management will be ensured at the Construction zone as per IRC.
- An Emergency Response system in case of any incidence will be developed and implemented
- Periodical health check facility will be provided at camp sites.

6.2.9 Other Environmental Concerns of Construction Phase:

Various other environmental impacts during construction stage include:

6.2.9.1 Diversion of Traffic

Short term impact associated with the project will be traffic diversion and management during construction phase. Construction activities will cause hindrance to the existing traffic flow. There is possibility of accident hazards during construction phase of the widening project. There will be requirement for diversion of existing traffic at various construction sites during construction

¹ Reference: <http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES> and <http://www.ifc.org/wps/wcm/connect/7e4c7f80488554d5b45cf66a6515bb18/Final%2B-%2BToll%2BRoads.pdf?MOD=AJPERES&id=1323162564158>]



phase. It needs to be mentioned that though there are no direct impacts on the natural environment due to disruption/diversion of such services, but diversion can also lead to adverse impacts if not planned properly. Rapid restoration of diverted services can help in minimizing the severity of impacts arising out due to diversions of existing services.

Mitigation Measures

- Proper preventive measures will be taken during the construction activities at the construction sites
- Reduce speed through construction zones.
- Construction of bridges/culverts will be carried out prior to construction of new carriageway at the first stage.
- Strengthening/raising of existing two lanes will be done only after the completion of the first stage.
- Proper warning signs will be displayed at construction sites.

6.2.9.2 Equipment Servicing and Fuelling

On large road projects, thousands of liters of diesel and many other petroleum products are transported and used throughout the work site every day. Construction equipment generates large amount of waste oil, and its proper handling is critical, since improper storage and leakage can result in the contamination of land and water bodies. Even the spillage can affect surface water bodies by the road sector project.

Mitigation Measures

- The vehicle and equipment service centers will be established away from any water body or agricultural land.
- Proper bunding with appropriate Containment will be provided at the equipment and vehicle servicing centers. The spent wash from the service center will be put in separate soak pits and sand pits
- All the fuel and chemical storage will be sited on an impervious base within an embankment and secured by fencing. The storage area will be located away from water course or wetland.

6.2.9.3 Construction Camps

Workers' Camp

Construction workers are a very neglected group in the country. Unless the workers are provided proper amenities to live at the construction site the environmental issues of road construction cannot be properly met. Apart from labour camps, separate construction Camps also established where various plants and equipments as well as offices and residential units for technical and non technical staff are located and often labour camps are also provided in the same premises. Location of the Construction camp also has certain impacts on surrounding environment if not properly managed.

At labour and construction camps lot of wastes are generated. These wastes are refuse from the plants, and equipments, waste water and other domestic waste. These wastes are solid as well as liquid waste mainly refuse water and kitchen waste. The disposal of such waste material to the



surrounding land can potentially damage the land and would generate health risk to not only surrounding area but within the premises itself. Improper drainages system within the premises also creates insanitation condition thereby enhancing health risk.

Mitigation Measures

- The Construction/labour camps will be established only on area approved by Supervision Consultant.
- The worker's/labour camp will be located away from water bodies, schools and residential areas. The camp will be constructed with proper accommodation facilities.
- The workers camp will be provided with drinking water supply system so that local water sources are not disturbed.
- The camp should be provided with fuel for cooking like kerosene and /or LPG to avoid any cutting of trees for fuel wood.
- All camps will be provided with proper sanitation facilities, separate toilets and bathrooms for female and male workers, septic tanks with soak pits of sufficient size, dust bins etc.
- Waste water from domestic uses and solid wastes will be disposed of without violating environmental norms. The measures will be site specific.
- The labour camps will be provided with crèche, first aid facilities, etc as required under Factory Act.
- After completion of construction, the contractor will dismantle the camp and restore it to the original condition of the area before handing over the site to the land owner.

6.2.9.4 Disruption of Services

Local services, including water supply lines, irrigation line, drainage, ditches, streets are commonly cut during road earthworks. These activities are required by the local people for crop production, drinking water supply and access, and have the potential to damage road work too. These services are often either inadequately reconnected or not reins ted at all.

Mitigation Measures

- The Contractor will arrange their own source to cater for their water requirement for construction and other activities and will not interfere with the local water supply system
- All irrigation canals, water supply lines and stand pipes, drainage and streets will be maintained during construction or if necessary, temporary services shall be arranged of the owner/ user's permission for temporary cessation will be gained.
- All the Services will be progressively reinstalled as soon as road excavation has been completed.

6.3 Impacts during Operational Phase

During operation stage, the main sources of environmental impacts are the increased traffic volume and speeds. The increase in traffic volume and speed may enhance the safety risk especially in the rural area. No sudden change in the traffic volume is expected due to this road as the road is already existing one and opened for public traffic. The project also provides the opportunities of the restoration of vegetation around the vicinity of the worksite and roads by implementing the compensatory plantation programme, which will not only enhance the aesthetic



view but can also help in reclamation of soil. During operational phase this will be enhanced with the activities associated with the maintenance of landscape such as plantation programme, by providing roadside amenities, parks etc.

During the operational phase when the plantation works will be adequately implemented will enhance the aesthetic as well as hygienic environment thereby reducing the chances of diseases due to vehicular emission. Widening will ensure smooth plying of the vehicles and also will help in reducing the congested zone and thus will reduce the emission rate of vehicles. Various impacts during operation phase are discussed below:

6.3.1 Impacts on Water Quality and Resources

During the operation phase, the possibility of degradation of water quality is very remote. The impact on the surface water quality during operation can be expected due to accidental spillage. However the probability of such accidents are minimal since enhancement of road safety measures such as improvement of curves and widening of the roads and other pedestrian facilities are taken care of in the design stage.

6.3.2 Impact on Air Quality

The baseline study revealed that the people residing along the road face problem due to high dust along the project section. The dry condition and exposed area, earthen shoulders along the highway sections is the main reason behind the high concentration dust. Improvement in road surface condition such as roughness, pot, patch, congestion, etc., improvement of curves and junctions, provisions of organized parkings will likely to reduce the dust problem in the vicinity of road. Moreover, the project will ensure smooth traffic flow and reduce idling time of engines thus will reduce the emission rate of vehicles thereby reducing the magnitude of air quality degradation. Further, roadside avenue plantation with pollution abating tree species will also help in reducing the ambient pollution levels.

6.3.3 Impact on Noise Quality

Noise level is a matter of concern. Interrupted movement of heavy and light vehicles at high speeds and movement in upward direction increase ambient noise levels along the roadway. Noise produced by vehicles using the road can be attributed to the engine, vibration, friction between tyres and the road, and horns. Increased levels of noise depend upon volume of traffic, road condition, vehicle condition, vehicle speed, congestion of traffic and the distance of the receptor (home, store etc.) from the source. The friction caused due to contact between tires and pavement increases the traffic noise. The proposed work includes smoothening of pavement, reduction of curves at several places that will reduce the overall noise level.

6.3.4 Human Use Values

Both land use and aesthetics are in fact, likely to improve due to afforestation and proper landscaping. Proper engineering design like raising of embankment, provision of sufficient number of culverts will ensure the reduction of the chances frequent road damages due to water logging during rains. The provision of parking space, way side amenities, rest area, toilets and drinking water will also help in smooth and comfortable flow of traffic and better acceptability of the project by the community.

**6.3.5 Impact on Climate Change due to Project**

The implementation of project envisage saving in fuel consumption thereby resulting into reduction in CO₂ emission. The fuel consumption in MT per 1000 Veh-Km has been calculated by using HDM-4 model. It has been calculated for 20 years for the period of 2015 to 2034 considering “with” and “without” project. The calculated fuel consumption “without” and “with” project is 23,95,882 MT per 1000 veh-km and 23,00,357 MT per 1000 veh-km respectively for 20 years. The project road has been divided into two traffic homogeneous sections and fuel consumption has been calculated for different types of vehicles such as motorcycle, 3-wheeler, passenger car, minibus, big Bus, light commercial vehicle (LCV), truck-rigid 2-axle, truck-rigid 3 axle, multi axel vehicle (MAV) and horse & semi-trailer-3 & 4 axles along the project road. The fuel saving is 95,525 MT per 1000 veh-km for Hamirpur-Rath of SH-42. The details of fuel saving due to the project is depicted in following **Table 6.3**.

Table 6.3: Fuel Savings [MT Fuel Consumption per 1000 veh-km] due to Project Road

Project Length (Km)	MT Fuel Consumption per 1000 veh-km (Base Without Project)	MT Fuel Consumption per 1000 veh-km (With Project)	Fuel Savings [MT Fuel Consumption per 1000 veh-km]
76	23,95,882	23,00,357	95,525

Table 6.4: Estimation of Diesel & Petrol Consumption

	Without Project	With Project	Fuel
Assuming 60 % Diesel (Quantity in MT)	14,37,529	13,80,214	57,315
Assuming 40 % Petrol (Quantity in MT)	9,58,353	9,20,143	38,210
Density of Petrol	0.77 Kg/ltr		
Density of Diesel	0.832 kg/l		
Petrol Quantity (ltr)	1,24,46,13,948	1,19,49,90,603	4,96,23,345
Diesel Quantity (ltr)	1,72,77,99,411	1,65,89,11,233	6,88,88,178

The Carbon Dioxide (CO₂) emissions have been calculated using “mobile combustion GHG emission calculation tool, version 2.3” and the summary of Carbon Dioxide (CO₂) emissions is given in **Table 6.5**.

Table 6.5: Emission of Greenhouse Gas due to the Proposed Project

Calculation Method	Greenhouse Gas	Fossil Fuel Emissions	
		Without Project (Metric Tonnes)	With Project (Metric Tonnes)
Fuel Use	CO ₂	7451353.488	7220957.305
Total (metric tonnes CO ₂)		7451353.488	7220957.305

With above details, it shows that there will be fuel saving “with” project and also less Carbon Dioxide (CO₂) emissions (2,30,396 MT) as compared to “without” project.

Integration of climatic change and change in hydrology in cross drain design:

The hydrological regime of the project stretch has been studies and integrated in designing of bridges to counter inevitable climate change. The drainage pattern and hydrology of the area has been assessed and analysed considering the rainfall pattern in the area. The hydrological study



for region has been carried out considering 50 years data of rainfall, temperatures and flood status.

For the calculation of discharge of the stream by Area-Velocity method, topographical survey including levelling surveys have been carried out across and along the watercourses to determine the cross-section and the longitudinal section of stream. A number of cross-sections have been taken at regular intervals on both upstream and downstream side of the structure, including one at the proposed location of the structure in accordance with IRC specifications. The peak discharge and the High Flood Level (HFL) have been calculated. The detailed hydrological calculations have been carried out for all new/reconstruction Bridges.

Based on the study, no impact on hydrology and discharge is envisaged due to proposed project. No additional major or minor bridge is proposed in the project. The project road has 10 existing bridges, out of which 9 are of minor bridges and 1 major bridge. 5 numbers of minor bridges and the major bridge will be retained with repair, whereas 3 minor bridges will be retained with widening and 1 minor bridge will be replaced with box type bridge. There is no new bridge proposed to be constructed. The design discharge has been taken with 50 years prediction of discharge. The design discharge and HFL has been estimated as below and has been integrated in design of cross drain structures:

Table 6.6: The design discharge and afflux HFL at Bridge locations

S. No.	Chainage (Km)	50 Years Design Discharge (Cumec)	Affluxed High Flood Level (HFL) in meter
1	25+600	14.838	124.447
2	47+900	4.044	137.759
3	69+900	7.222	150.550
4	72+550	10.705	151.784

It is proposed to raise the vertical profile of the road and provide 6 new balancing culverts in the overtopping section between Km 2+000 to Km 5+420, These will have positive impacts on drainage in this section.



7 ANALYSIS OF ALTERNATIVES

7.1 Introduction

The existing alignment of project road of SH-42 starts at Km 2.000 near Hamirpur forming Y-intersection with NH-86 (Km 59.000) and ends at Km 76.500 at Rath. The road passes through number of settlement areas like Kalauli Teer, Pathiya, Channi Buzurg, Baswari, Muskara, Bihuni, Rath in Hamirpur district in the state of Uttar Pradesh. The analysis of alternatives has been carried out 'with project' and 'without project' scenarios in terms of potential environmental impacts. The existing road passes through 28 villages, and RoW varies from 20 m to 42 m.

The present alignment has been followed for widening and mainly concentric widening has been proposed except for few locations where eccentric widening is proposed for the purpose of widening of bridge, curve correction or widening of culverts. The alignment is to follow the existing highway section. Therefore the analysis of alternative has been carried out 'with project' and 'without project' scenarios for the only one possible alternative i.e. to follow the existing alignment only.

7.2 "With" and "Without" Project Scenario

The proposed development of project road of SH-42 from Km 2.000 to Km 76.500 in the State of Uttar Pradesh is not only development of surrounding area but will also provide smooth movement of traffic and linking with other roads of the country. Keeping in view, the site conditions and the scope of development of the area, the 'With' and 'Without' project scenarios has been compared for the lone existing alignment and is represented in **Table 7.1**.

Table 7.1: 'With' and 'Without' Project Scenario

With Project		Without Project	
Positive Impacts	Negative Impacts	Positive Impacts	Negative Impacts
<ul style="list-style-type: none"> ❖ The improvement of road surface and bottlenecks will improve, thus reduce the traffic congestion and reduction in wastage of fuel. ❖ Flourish in trade and commerce ❖ Providing better level of service in terms of improved riding quality and smooth traffic flow. ❖ Improvement of drainage condition due to provision of additional balancing culverts at vulnerable area to flood. ❖ Reduction in accident rate ❖ Access to new employment opportunities ❖ Employment of local workers for the execution of project ❖ Better access to health care and other social services ❖ Improved quality of life of the local people 	<ul style="list-style-type: none"> ❖ Increase of traffic will lead to slight increase in air and noise pollution. ❖ Removal of trees and vegetation due to widening and upgradation ❖ Short term Increase in dust pollution and noise pollution during construction period. ❖ Public Safety and Inconvenience due to construction activities till construction period. ❖ Inconvenience due to interference with public utilities during shifting 	<ul style="list-style-type: none"> ❖ No acquisition properties and hence no displacement of families. ❖ No felling of existing trees and vegetation 	<ul style="list-style-type: none"> ❖ Travel time and fuel consumption level will be more due to bottlenecks ❖ Increase in dust pollution and vehicular emission ❖ The accident rate will increase ❖ Road Safety is presently most important concern of the people living along the highway which has not been addressed properly. ❖ Further deterioration of project road. ❖ Submergence of road between Km 2



With Project		Without Project	
Positive Impacts	Negative Impacts	Positive Impacts	Negative Impacts
<ul style="list-style-type: none">❖ Better way side amenities and other facilities like bus bays/shelters❖ Increase of aesthetics and environmental condition due to Avenue Plantation along the project road❖ Provision of systematic utility duct will enhance the road aesthetics as well as reduction in frequent damage of road due to repairing/ up gradation of utilities.❖ Increase in groundwater recharge due to proposed rain water harvesting structures.			to Km 5.000 due to flood in the area

The existing road is having single lane, intermediate lane and two lane carriageway thus posing restriction in smooth plying of traffic as well as increases the risk of accidents. Ad-hoc parking of commercial vehicles often obstructs the free flow of traffic. Major obstructions to free flow of traffic are numerous intersections, narrow settlement areas, sharp curves, non motorised traffic and a variety of road users. In case of "Do Nothing" alternative, the regional development as well as any other developmental activities will be adversely affected due to inadequate service level of the highway. The maintenance of economic stability and growth of the area will be impeded not only in the close proximity of the project area but will have its impacts, far and wide. The quality of life of local people will also be affected as the issues are directly related to the communication systems available to them.

The proposed project road will have standard two lane carriageway of 7.0 m with 1.5 m paved shoulders on either side throughout the project length. Apart from this there is provision of 52 no. of bus shelters, 4 nos. of truck lay byes, curve improvement at 3 locations, facilities for pedestrian movement, traffic signboards which will not only enhance the service level but at the same time will enhance the safety to the highway users and road side communities to a great extent.

Material Requirement

As per estimation of quantity of materials for the construction of project road, 5,25,000 m³ of soils and 4,83,010 m³ of coarse and fine aggregates would be required. There are two alternative for availability of construction materials, one the entire quantity of materials can be taken from different borrow areas and second reuse of excavated materials for construction to optimum level and rest to extract from the borrow area. It has been estimated that the due to roadway cutting and drain excavation about 712500 m³ earth work materials will be generated. It is proposed to reuse this quantity for construction of sub-grade and earthen shoulders. The balance quantity will be obtained from different borrow areas. This will not only reduce the impact on land due to borrowing of earth and at the same time the disposable quantity will also be reduced.

Widening Options

In general concentric widening has been proposed in order to avoid land acquisition and to minimize impacts on roadside trees and settlement. No realignment is proposed in the project.



However at few locations one side widening is proposed for alignment improvement, saving builtup area and trees, and widening of CD structures. Altogether 67.635 Kms will include concentric widening, left widening in 3.480 Kms length and rideside widening in 3.385 Km length.

Table 7.2: Widening options

Chainage		Length (Km)	Widening	Reason
To (Km)	From (Km)			
2+065	3+300	1.235	Right	Built up /Tree line on left side
3+300	3+450	0.15	Left	alignment improvement
3+450	3+500	0.05	Concentric	
3+500	3+600	0.1	Right	alignment improvement
3+600	7+700	4.1	Concentric	
7+700	7+800	0.1	Right	alignment improvement
7+800	25+200	17.4	Concentric	
25+200	25+900	0.7	Left	Widening of bridge at left side
25+900	27+550	1.65	Concentric	
27+550	27+650	0.1	Left	alignment improvement
27+650	30+900	3.25	Concentric	
30+900	31+000	0.1	Right	alignment improvement
31+000	33+750	2.75	Concentric	
33+750	33+850	0.1	Right	alignment improvement
33+850	41+690	7.84	Concentric	
41+690	41+730	0.04	Right	alignment improvement
41+730	42+270	0.54	Concentric	
42+270	42+340	0.07	Left	alignment improvement
42+340	54+790	12.45	Concentric	
54+790	55+070	0.28	Left	Tree line
55+070	57+730	2.66	Concentric	
57+730	57+770	0.04	Left	alignment improvement
57+770	58+040	0.27	Right	alignment improvement
58+040	58+110	0.07	Concentric	
58+110	58+220	0.11	Left	alignment improvement
58+220	60+010	1.79	Concentric	
60+010	60+030	0.02	Right	alignment improvement
60+030	60+300	0.27	Concentric	
60+300	60+470	0.17	Left	alignment improvement
60+470	62+330	1.86	Concentric	
62+330	62+640	0.31	Right	alignment improvement
62+640	64+500	1.86	Left	alignment improvement
64+500	66+380	1.88	Concentric	
66+380	66+630	0.25	Right	alignment improvement
66+630	68+480	1.85	Concentric	
68+480	68+820	0.34	Right	minor bridge
68+820	71+380	2.56	Concentric	
71+380	71+900	0.52	Right	minor bridge
71+900	72+350	0.45	Concentric	
72+350	72+800	0.45	Right	alignment improvement
72+800	76+500	3.7	Concentric	



Drainage conditions

It has been observed that the road section between Km 2.520 to Km 5.420 gets submerged during flood and thereby the road gets damaged frequently. To improve drainage condition in this stretch, the proposed vertical profile of the road has been raised and additional 6 numbers of balancing culverts have been proposed in order to allow passage of water during any flood.

Emission of Greenhouse Gas (CO₂)

A comparative analysis of CO₂ emission has been carried out in both "With" and "Without Project" scenario. The analysis reflect that there will be marked saving in the fuel and thereby reduction in CO₂ emission under "with Project" scenario compared to "Without Project" scenario.

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

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



8 PUBLIC CONSULTATION

8.1 Focus Group Discussion (FGD)

Public participation and community consultation has been taken up as an integral part of social and environmental assessment process of the project. Public participation has been viewed as a continuous two way process, involving promotion of public understanding of the process and mechanism through which developmental problems and needs are investigated and solved. Focus Group Discussion (FGD) was used as a tool to inform and educate stakeholders about the proposed action both before and after the development decision was made. It assisted in identification of the problems associated with the project as well as the needs of the population likely to be impacted. This participatory process helped in reducing the public resistance to change and enabled the participation of the local people in this development process.

8.1.1 Need and Usefulness of Focus Group Discussion (FGD)

Focus Group Discussion (FGD) is useful for gathering environmental data, understanding likely impacts, determining community and individual preferences, selecting project alternatives and designing viable and sustainable mitigation and compensation plan.

8.1.2 Objectives

The objectives of Focus Group Discussion for this project are:

- Awareness of the project to local people, impacts and their suitable mitigation measures;
- Identify alternative design and mitigation measures;
- To improve environmental and social conditions;
- Establish transparent procedures for carrying out proposed projects;
- Create accountability and sense of local ownership during project implementation.

8.1.3 Level of Discussion

The discussion process established for the project has employed a range of formal consultative tools including in depth interviews with key informants and on-site Focus Group Discussion and meetings. The enactment of participation and consultation with villagers en-route has been done at various locations along the project corridor.

8.1.3.1 Local/Village level discussion

These discussions were held along the corridor of impact of the project road to inform people about the purpose and preliminary design of the project. These discussions were carried out to identify:

- Specific social and environmental issues
- Extent of likely impact due to the project
- Expectation and reservations of people towards project; and
- Resettlement and rehabilitation options.



Village/local level Focus Group Discussions were held at selected locations to understand the implication of the project impacts on various groups, especially those with distinct degree of vulnerability. The venues of the meetings were the villages/settlement along the project corridor. At these meetings, the people were invited covering project affected persons, prominent village persons, village panchayat members, teachers, health workers, etc.

Local level consultations meetings were carried out in 3 villages namely at Kalauli Teer, Channi Buzurg and Bihuni Khurd along the project road. For formal consultation, prior intimation was given to the villagers and the local public representatives such as the local Sarpanch for villages and other village elders for the meeting to participate in these consultations. **Table 8.1** presents the location wise output of the issues discussed, suggestions made by the participants.

The general issues discussed in all locations are given below:

- Perception on the existing project road and usage of the road
- Benefits and problems faced if any with the existing road
- Perception on the proposed 2 lane with paved shoulder improvements and alignment options
- Widening options and impact on local properties and business
- Type of environmental enhancement
- Identification of environmental issues

Table 8.1: Outputs of Local Level Consultations

S. No.	Name of the Village	Participants	Suggestions/Observations
FORMAL CONSULTATIONS			
1	Kalauli Teer village Km 5.300	The member of panchayat, teacher / Siksha Mitra, local villagers, roadside residents and probable impacted families, DPR team members and PWD representatives	<ol style="list-style-type: none"> 1. The Participants are mostly engaged in Agriculture and labour activities and some of them are having roadside business establishments which they would lose during road expansion. 2. At present, the roads are damaged, which increase the dust pollution level in the area and rate of accidents are very common and people are facing lot of difficulty to cross the road. So the participants welcomed the proposed project road of 2 laning with paved shoulder, which may decrease the rate of pollution and accidents. 3. The maintenance of the existing road is not satisfactory, as the overloading of the sand mining trucks is the main cause resulting in bad condition of road. Dust and Noise levels area also high due to continuous movement of sand mining trucks both in day & night. 4. The roadside in this area is full of habitation on both sides, so some residential/commercial may fully/partially be affected for the expansion of project road. 5. They also suggested that all mitigation measures to be adopted to reduce the impact on the road. 6. They also desired to know the compensation process and rate to be paid by the project authority if there is any loss. 7. Neelgai is observed in this area, which harm the crops. Sometimes fox, wild Boar & jackal are also observed 8. Head teacher of the primary school in this area insisted



S. No.	Name of the Village	Participants	Suggestions/Observations
			that some barrier should be provided in front of the primary school, so that some dust and noise level may decrease. 9. Villagers also suggested for providing the cemented <i>ghat</i> with stair cases for their community ponds.
2	Channi Buzurg Km 25.000	Village Panchayat members, the local villagers, roadside residents, owners of business roadside business establishment, DPR team members and PWD representatives	1. The Participants are mostly engaged in Agriculture and some of them are having roadside business establishments. 2. The participants are glad to hear about the proposed Project road. 3. Their social & economic income will increase & accidents can be minimized. 4. Few villagers expressed their concern about the increase in accidents if proper care is not taken in design in market area. 5. People from neighboring villages have their shops in this area, so to them road safety is of high importance. 6. The villagers desired to know the compensation process and rate to be paid by the project authority if there is any loss. 7. Some owners of business establishment suggested that the proposed road should be designed in such a way that their commercial set up may not disturbed.
3	Bihuni Khurd Village Km 58.500	Village Panchayat member, the local villagers, local businessman, DPR study team members and PWD representatives.	1. The Participants are mostly engaged in Agriculture and labour activities and some of them are having roadside shops 2. The participants welcomed the project. 3. The roadside activities will increase, travelling will be smooth, social & economic condition will improve. 4. Appropriate compensation should be paid to the affected people. 5. Expansion of road should be to a limited possible extent 6. Neelgai is commonly seen in this area which harms the crops. 7. Sometime jackals and wolfs are spotted observed in this area.

The copy of invitation to villagerss, attendance sheets and photographs of Public Consultations at different locations are provided in **Annexure 8.1**, **Annexure 8.2** and **Annexure 8.3** respectively.



9 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The present chapter details the Environmental Management Plan for the project section of State Highway-42 starting from Km 2.000 near Hamirpur to Km 76.500 at Rath. The Environmental Plan is based on the Environmental Impact Assessment study carried out for the project.

The Environmental Management Plan (EMP) consists of the set of mitigation, monitoring and institutional measures to be taken during the design, construction and operation stages of the project to eliminate adverse environmental impacts, to offset them, or to reduce them to acceptable levels. The plan also includes the actions needed for the implementation of these measures. The EMP will be integrated with the bid document for contractor for construction and the implementation of EMP will become contractual obligation for the contractor.

The major components of the Environmental Management Plan are

- Mitigation of potentially adverse impacts
- Monitoring during project implementation and operation
- Institutional Capacity Building and Training
- Implementation Schedule and Environmental Cost Estimates
- Integration of EMP with Project planning, design, construction and operation.

9.1 Objectives of the EMP

Road strengthening and widening projects generally produce adverse impacts of lower magnitude, which can be prevented or mitigated through proper engineering design and by following environmental friendly construction practices. Environmental management plan is developed for ensuring the most efficient and cost effective way to mitigate the points of environmental concern in the construction contract provisions.

The main aim of the Environmental Management Plan is to ensure that the various adverse impacts are mitigated and the positive impacts are enhanced. The management practices are developed for all the stages of project, i.e., Pre-construction/Design, Construction and Operational stages. The objectives of the EMP at various stages of the project planning and implementation can be summarised as follows:

Design Stage

- To have minimum impact on road side trees,
- To keep land acquisition and building demolition at a minimum
- To provide maximum safety to the highway users and road side communities
- To develop a design that incorporates environmental safeguards and
- To provide mitigation measures to all expected environmental degradation

Construction Stage

- To prevent and reduce the negative environmental impacts of the project by implementable mitigation measures, to be carried out by the Contractor.



- To ensure that the provisions of the EMP are strictly followed and implemented by strengthening implementation arrangements.

Operation Stage

- To prevent deterioration of environment components of air, water, soil, noise etc.
- To improve the safety of the highway users and road side communities

9.2 Critical Environmental Issues

The critical environmental components along the project corridor were identified on the basis of the assessment of the potential impacts. These issues need to be addressed carefully in the Environmental Management Plan. The most critical issues identified at various locations along the project corridor are described in the following **Table 9.1**.

Table 9.1: Critical Environmental Issues to be Addressed

Sl. No.	Critical Environmental Issues	Location
1	Resettlement and Rehabilitation Issue	For squatters/Encroachers within ROW throughout the project stretch in built-up sections
2	Removal of trees	Throughout the project stretch
3.	Diversion of Protected Forest area	Throughout the project stretch as roadside trees declared as Protected Forest.
4.	Impact on Water bodies	9 Ponds located within and adjacent to ROW
5.	Impact of religious features	20 No. of religious structure located in 20 meter road corridor within existing ROW
6.	Ambient Air Quality	Throughout the corridor
7.	Traffic Safety	More pronounced in major settlements

9.3 Environmental Management Action Plan

This section describes the Environmental Management Action Plan during different stages of project. The Environmental mitigation measures have been incorporated at all the stages of the project right from Designing phase to Construction and Operational Phase. All care has been taken to provide mitigation measures for all expected environmental degradation at different stages. The Environmental Management action plan has been formulated for the present project for mitigation/management/avoidance of potential adverse impacts and the enhancement of the various environmental components along with its location, timeframe of implementation, and overseeing/supervising responsibilities. The safeguard measures identified for different phases are tabulated in **Table 9.2**.



Table 9.2: Environmental Management Plan

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
A. PRE-CONSTRUCTION STAGE					
PC.1.1 Loss of Properties	<ul style="list-style-type: none">The acquisition of private properties will be carried out in accordance with the RAP and entitlement framework for the project.Early identification of entitlement for Compensation and Advance planning of Resettlement and Rehabilitation Action Plan to Compensate the Losses.All the affected people will be compensated as per R & R Policy of the Project before commencement of Construction worksPIU has to ascertain that any additional environmental impacts resulting from acquisition of land are addressed and integrated into the EMP and other relevant documents.	Throughout the project stretch	Pre-Construction Stage	PIU-UPPWD, NGOs	PMC/PIU-UPPWD
PC.1.2 Roadside Trees Cutting	<ul style="list-style-type: none">The statutory permission for diversion of protected forest and tree felling will be obtained prior to cutting of trees.All efforts will be made to preserve trees by restricting tree cutting within the formation width.The tree plantation will be carried out the ratio of 1:2 within the ROW along the project highway as compensatory plantation by following Guidelines for Landscaping and Tree Plantation (IRC:SP:21-2009).A general compensatory plantation scheme should be followed by the contractor presented in ANNEXURE 9.1	Through the Project Stretch	Pre-Construction Stage	Contractor & PMC/PIU-UPPWD	PMC/PIU-UPPWD
PC.1.3 Relocation of Community Utilities and Common Property Resources	<ul style="list-style-type: none">All community utilities and properties i.e., water supply lines, hand pumps will be relocated before start of construction.The PIU will relocate these properties in consultation and written agreement with the agency/ owner/community.Environmental considerations with suitable/required actions including health and hygiene aspects will be kept in mind while relocating all community utilities and resources.	Throughout Corridor wherever these features are located	Pre-Construction Stage	PIU-UPPWD, NGOs and R&R unit	PMC/PIU-UPPWD, Line Department



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC.1.4 Relocation of Religious/Cultural Properties	<ul style="list-style-type: none"> Alignment selected to minimize loss of cultural property. Public consultation will be carried out for obtaining opinion for shifting of religious structures. Relocation of religious structures will be ensured. The relocation site will be decided with the consultation with local population and the related community users. Preference of the local community using the structure will be addressed during relocation/ renovation of such affected features. 	Throughout Corridor wherever these features are located	Pre-Construction Stage	PIU-UPPWD, NGOs and R&R unit	PIU-UPPWD, PMC
PC-1.5 Arrangements for temporary land for Establishing Camps/Plants/ Temporary diversions, etc.	<ul style="list-style-type: none"> The Contractor as per prevalent rules will carry out negotiations with the landowners for obtaining their consent for temporary use of lands for workers camp, construction sites/hot mix plants/traffic detours etc. The Contractor will submit the legal agreement/ written Consent letter from the owner of the land for using for specific purpose along with its rehabilitation plan as agreed by the owner. The Contractor will ensure that the site is properly restored to the satisfaction of the land owner prior to handing over to the owner and shall submit satisfactory certificate from the Land Owner. 	At temporary camp site, temporary diversion and plant sites	Pre-Construction Stage and Post utilization of the land	Contractor	PMC/PIU-UPPWD
PC. 1.6 Establishment of Construction/ Workers Camp	<ul style="list-style-type: none"> The locations of construction camp to be identified by the Contractor. Construction camps will not be proposed within 500 m from the nearest settlements to avoid conflicts and stress over the infrastructure facilities with the local community. Location for stockyards for construction materials will be identified at least 1000m from water sources / and 10 Km from Wildlife Sanctuary boundary. The Contractor will submit the legal agreement/ written Consent letter from the owner of the land for using for specific purpose along with its rehabilitation plan as agreed by the owner. The Camp site will be provided with all the necessary facilities as per norms. 	At temporary camp site, temporary diversion and plant sites	Pre-Construction Stage and Post utilization of the land	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC 1.7 Establishment of Stone crushers, hot-mix plants, WMM Plant, Concrete Batching plants etc.	<ul style="list-style-type: none"> Stone crushers, Hot mix plants, WMM Plants and Concrete Batching plants will be sited sufficiently away from settlements, agricultural operations and any commercial establishments. Such plants will be located at least 1000m away from the boundary of the nearest village/settlement and forests towards downwind direction. The Contractor will conform to the siting and operation requirements of stone crusher unit, Hotmix plants, Batchmix plant, WMM Plants as per Environmental (Protection) Rules, 1986. The Contractor shall submit a detailed layout plan for all such sites and approval of the Environmental Expert of PMC shall be necessary prior to their establishment. All plants will be fitted with adequate dust suppression and emission control equipments and facilities. Specifications of crushers and hot mix plants will comply with the requirements of the relevant current emission control legislations and Consent/NOC for all such plants shall be obtained from the State Pollution Control Board. The Contractor shall not operate the plants till the required legal clearance are obtained and submitted. A general guideline given in ANNEXURE-9.2 will be followed for establishing the plants sites, operation and pollution control measures to be adopted at site. 	Plant Site	Pre-Construction Stage	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC.1.8 Borrow Area	<ul style="list-style-type: none"> Finalizing borrow areas for borrowing earth and all logistic arrangements are well as compliance to environmental requirements, as applicable, will be the sole responsibility of the Contractor. The Contractor will not start borrowing earth from select borrow area until the formal agreement is signed between the land owner and the Contractor and a copy is submitted to the PMC/PIU-UPPWD. All the borrow areas will be approved by the Engineer based on both material and environmental considerations. The Contractor will obtain environmental clearance for the borrow area as per MoEF circular and the conditions stipulated under the environmental clearance will be binding on the contractor. The Contractor will submit the copy of clearance letter to the Engineer and PIU before commencement of material extraction. All the borrow area will be operated in accordance with IRC specification and MoEF guidelines. No earth will be borrowed from within the RoW. Non-productive, barren lands, raised lands, river beds, waste lands are recommended for borrowing earth. The unpaved surfaces used for the haulage of borrow materials will be maintained properly To avoid any embankment slippages, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the Engineer. Each borrow area should be rehabilitated within one month after completion of extraction of materials to the satisfactions of the land owner and the Engineer. A general guideline for Borrow area operation and rehabilitation given in ANNEXURE 9.3 will be followed. 	Identified Borrow area	Pre-Construction and Construction Stage	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
PC.1.9 Quarry Area	<ul style="list-style-type: none"> The quarry material will be obtained from licensed sites only, which operate with proper environmental clearances, including clearances under the Air Act. If the Contractor wants to open a new Quarry, then he has to obtain necessary environmental clearance from MoEFCC and lease license from Directorate of Geology and Mines. All the quarries will be approved by the Engineer based on both material and environmental considerations. The quarry operations will be undertaken within the rules and regulations in force. All safety and environmental concerns will be addresses adequately during quarry operations and transportation of materials as per prevailing rules. Only controlled blasting shall be carried out, if necessary for extraction of stone materials in strict compliance with the statutory norms and specification The restoration of Quarry will be done as per the conditions of the owner before handing over the site back to the owner. 	Quarry sites recommended	During construction	Contractor	PMC/ PIU-UPPWD
PC-1.10 Contractor's Environmental and Safety Officer	The Contractor has to appoint one Environmental and Safety Officer having requisite qualification and has sufficient experience in implementation of Environmental safeguards in road projects.	-	During construction	Contractor	PMC/ PIU, UPPWD
B. CONSTRUCTION STAGE					
C.1. Impact on Land and Soil					
C.1.1. Soil Erosion	<ul style="list-style-type: none"> High embankments will be provided with chutes and drains to minimize soil erosion Stone pitching and retaining walls will be made at high embankments in critical areas Turfing of low embankments and plantation of grasses and shrubs will be done in slope stabilisation In borrow pits, the depth of the pit will be regulated that the sides of the excavation will have a slope not steeper than 1: 2, from the edge of the final section of bank. Soil erosion checking measures as the formation of sediment basins, slope drains, etc, will be carried out. 	At all embankment locations, bridge locations and borrow pits	During construction	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.1.2. Loss of topsoil	<ul style="list-style-type: none"> Agricultural areas will be avoided for borrowing of materials, unless requested by the land owner. The topsoil from all areas of cutting and all areas to be permanently covered will be stripped to a specified depth of 150 mm and stored in stockpiles of height not exceeding 2m. The stored topsoil will be spread back to maintain the soil physico-chemical and biological activity. The preserved top soil will be used for restoration of sites, in landscaping and avenue plantation 	Throughout project corridor	During construction	Contractor	PMC/PIU-UPPWD
C.1.3. Compaction of soil	<ul style="list-style-type: none"> Construction vehicles, machinery and equipment will move, or be stationed in the designated area, to avoid compaction of soil. If operating from temporarily hired land, it will be ensured that the topsoil for agriculture remains preserved & not destroyed by storage, material handling or any other construction related activities. 	Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD
C.1.4. Contamination of land from fuel and lubricants	<ul style="list-style-type: none"> Impervious platform and oil and grease trap for collection of spillage from construction equipment vehicle maintenance platform will be appropriately provided at construction camp, servicing area and liquid fuel and lubes at storage areas. 	Construction Camp, Vehicle and Equipment Servicing Centre and Construction site	During Construction	Contractor	PMC/PIU-UPPWD
C.1.5. Contamination of land from construction wastes and spoils	<ul style="list-style-type: none"> All spoils will be disposed off as desired and the site will be fully cleaned before handing over. The non-usable bitumen spoils will be disposed off in a deep trench providing clay lining at the bottom and filled with soil at the top (for at least 0.5m) 	All construction sites, borrow pits camps Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD
C. 2. Impact on Water Resources					
C.2.1. Drainage and run-off	<ul style="list-style-type: none"> The Contractor will always clear all the cross drainage structures and natural drainage before onset of monsoon in order to keep all drainage unblocked Earth, stones, wastes and spoils will be properly disposed off, to avoid blockage of any drainage channel. All necessary precautions will be taken to construct temporary or permanent devices to prevent inundation or ponding. 	At locations of CD structures	During construction	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.2.2 Rainwater Harvesting & Removal of Oil & Grease from Runoff water	<ul style="list-style-type: none"> The Contractor will construct Rain water harvesting pits connected with longitudinal drains The pits should be at least 5 m above the highest ground water table. The Contractor shall submit a detailed layout plan for all such sites in consultation with Central Ground Water Board and approval of the PMC shall be necessary prior to their establishment. The schematic diagram of Rain water harvesting pit is presented as Annexure 9.5. The Contractor will provide oil receptors connected with longitudinal drains in a manner that can regulate the runoff water as well as extract the oil and grease from the runoff water before entering the rainwater harvesting pits or nearby water bodies or agriculture fields. A typical schematic plan may be followed for construction oil receptors at strategic locations as per Annexure 9.6 	Throughout the stretch	Construction Stage	Contractor in consultation with Ground Water Board	PMC/PIU-UPPWD
C.2.3. Contamination of water from construction and allied activities	<ul style="list-style-type: none"> All necessary precautions will be taken to construct temporary or permanent devices to prevent water pollution due to increased siltation and turbidity. The Contractor will take all precautionary measures to prevent the wastewater generated during construction from entering into canals, water bodies or the irrigation system and avoid construction works close to canals or water bodies during monsoon. All wastes arising from the project will be disposed off, as per SPCB norms, so as not to block the flow of water. No construction materials/ spoils will be stored along the water bodies and adequate provision will be made for preventing spillage of materials into these water bodies. Wastes must be collected, stored and taken to approve disposal site. Water quality to be monitored periodically as per Environmental Monitoring Plan. 	Throughout Project Corridor where the Water Bodies located	During construction and after	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.2.4. Contamination of water from fuel and lubricants	<ul style="list-style-type: none"> The Contractor will ensure that all construction vehicle parking location, fuels/lubricants storage sites, vehicles, machinery and equipment maintenance sites are located at least 100m away from any water body. The Contractor will also ensure that spillage of fuels and lubricants do not contaminate the ground. The slopes of embankment leading to water bodies will be modified and re channelised so that contaminants do not enter the water body. Oil and grease traps will be provided at fuelling locations, to prevent contamination of water. The Contractor will arrange for collection, strong and disposal of oily wastes to the pre-identified disposal sites (list to be submitted to PMC/PIU-UPPWD) and approved by the Environmental Expert. All spills and collected petroleum products will be disposed off in accordance with statutory guidelines. 	Throughout Project Corridor and at all locations of water bodies	During construction	Contractor	PMC/PIU-UPPWD
C.2.5. Sanitation and waste disposal in construction camps	<ul style="list-style-type: none"> Garbage tanks and sanitation facilities will be provided at camps. The construction camps will be located away from water sources. Efforts will be made to provide good sanitary conditions at camp to avoid epidemics. The workplace will have proper medical approval by local medical, health or municipal authorities. 	At Construction camp locations, wherever located along the Project corridor	During construction	Contractor	PMC/PIU-UPPWD
C.2.6. Use of water for construction	<ul style="list-style-type: none"> The Contractor will use ground water/surface water as a source of water for the construction after taking prior permission from Competent Authority. The Contractor will provide a list of locations and type of sources from where water for construction will be used. To avoid disruption/disturbance to other water users, the Contractor will extract water from fixed locations. The Contractor will not be allowed to pump water from any irrigation canal and surface water bodies used by the community. The Contractor is required to comply with the requirements of the State Ground Water Department and seek its approval for doing so and submit copies of the permission to Environmental Expert of PMC/PIU-UPPWD. Wastage of water during the construction will be minimized. 	Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.2.7 Community water Source	<ul style="list-style-type: none"> Damage to any community water source such as wells, tube-wells, water supply pipelines etc., due to construction activities in a particular area, will be replaced immediately by the Contractor at their own cost. 	Throughout the Stretch	During construction	Contractor	PMC/PIU-UPPWD
C.3. Impact on Air Environment					
C.3.1. Emission from construction vehicles and machinery	<ul style="list-style-type: none"> All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the SPCB norms. The asphalt plants, crushers and the batching plants will be sited at least 1000 m in the downwind direction from the nearest human settlement (Boundary of town/village). Vehicles transporting earth materials will be covered Mixing equipment will be well sealed and equipped as per PCB norms. 	Throughout Project Corridor at construction sites, hot mix plant, concrete batching plant	During construction and after	Contractor	PMC/PIU-UPPWD
C.3.2 Emission from Construction Vehicles, Equipment and Machineries	<ul style="list-style-type: none"> Contractor will ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm that pollution emission levels comply with the relevant requirements of UPPCB. The Contractor will submit PUC certificates for all vehicles/equipment/machinery used for the project. Monitoring results will also be submitted to 'PIU' through the 'Engineer'. Periodical monitoring of fine Particulate Matters (PM₁₀ and PM_{2.5}) will be carried out as per Environmental Monitoring Plan. Workers at mixing sites will be provided with good quality personal protective equipments (PPE) reduce the chances of ill effect of dust. 	Throughout Project Corridor at construction sites, hot mix plant, concrete batching plant and the equipments and vehicles at sites	During construction	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.3.3 Dust Pollution	<ul style="list-style-type: none"> The Contractor will take every precaution to control dust nuisance at all the construction zones and allied sites where works are under progress. Every equipments and machinery will be fitted with dust suppression devices such as water sprinklers, dust bags, cyclone etc. As appropriate. The Contractor will provide necessary certificates to confirm that all crushers used in construction conform to relevant dust emission control legislation. At all the construction zones and unpaved lead roads, earthen temporary diversions and plant premises periodical water sprinkling will be carried out to suppress dust. Transportation of loose earth, sand will be done in covered vehicles. All equipments and machineries will be maintained properly. Periodical monitoring of fine Particulate Matters (PM₁₀ and PM_{2.5}) will be carried out as per Environmental Monitoring Plan. Workers at mixing sites will wear masks to reduce the chances of exposure to fugitive dusts. 	Throughout the Construction zones, plant sites, borrow area/quarry sites, camp site	During construction	Contractor	PMC/PIU-UPPWD
				Contractor through Approved Monitoring Agency	



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.4. Impact on Noise Pollution					
C.4.1. Noise from vehicles, asphalt plants and equipments	<p>The Contractor will conform with the following measures:</p> <ul style="list-style-type: none">• All plants and equipments used in construction shall strictly conform to the MoEF/CPCB noise standards.• All vehicles and equipment used in construction will be fitted with exhaust silencers.• Servicing of all construction vehicles and machinery will be done for exhaust silences and will be checked and if found defective will be replaced.• All the construction sites within 150m of the nearest habitation, noisy construction work such as crushing, concrete mixing will be stopped during the night time between 10.00 pm to 6.00 am.• No noisy construction activities will be permitted around educational institutions/health centers (silence zones) up to a distance of 100 m from the sensitive receptors.• Monitoring shall be carried out at the construction sites as per the monitoring schedule and results will be submitted to PMC/PIU-UPPWD.• Environmental Expert will be required to inspect regularly to ensure the compliance of EMP.	Throughout Project Corridor and at all construction sites, hot mix plant concrete batching plants	During the construction, till the closure of such sites	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.5. Impact on Flora					
C.5.1. Loss or damage to vegetation	<ul style="list-style-type: none">Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum.Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert.The Contractor, under any circumstances will not cut or damage trees.Trees identified under the project will be cut only after receiving clearance from the Forest Department and after the receipt of written permission from PIU.Vegetation only with girth of over 30 cm measured at a height of 1.0 m above the ground will be considered as trees and shall be compensated.	Throughout Project Corridor	Just after completion of construction activities	Contractor	PMC/PIU-UPPWD
C.5.2. Compaction of vegetation	<ul style="list-style-type: none">Construction vehicles, machinery and equipment will move or be stationed in the designated area only (RoW or CoI, as applicable), to prevent compaction of vegetation outside the RoW.While operating on temporarily acquired land for traffic detours, storage, material handling or any other construction related or incidental activities, it will be ensured that the trampling of soil and damage to naturally occurring herbs and grasses will be avoided.	Throughout Project Corridor	Just before commencement of construction	Contractor	PMC/PIU-UPPWD
C.6. Impact on Fauna					
C.6.1. Loss, damage or disruption to fauna	<ul style="list-style-type: none">Construction workers will be directed not to disrupt or damage the fauna.State rules for hunting (wild life protection) will be adhered and rules for Bird catching (wild life protection) will be adheredConstruction vehicles will run along specified access to avoid accidents to cattle.	Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.7. Safety And Accident Risks					
C.7.1. Accident risks from construction activities	<ul style="list-style-type: none">• To ensure safe construction in the temporary accesses during construction, lighting devices and safety sign boards will be installed.• Traffic rules and regulations will be strictly adhered to.• At blasting sites, the blasting time, signal and guarding will be regulated. Prior to blasting the site will be thoroughly inspected. Blasting will not be carried out during rush hours• Safety of workers undertaking various operations during construction will be ensured by providing helmets, masks, safety goggles, etc• The electrical equipment will be checked regularly• At every camp site, a readily available first aid unit including an adequate supply of dressing materials, a mode of transport (ambulance), para medical staff and an attending doctor will be provided.• Road safety education will be imparted to drivers running construction vehicles. In case of negligent driving, suitable action will be taken.• Adequate signage, barriers and persons with flags during construction to control the traffic will be provided.• Communications through newspaper/announcements/radio/TV about the time frame of the project and the activities causing disruptions on road access and the temporary arrangement made to give relief to the public will be undertaken.	Throughout Project Corridor	During construction	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.7.2 Occupational Health & Safety of Workers	<ul style="list-style-type: none">The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank, April, 2007² and the statutory norms of safety during construction.The Contractor will provide adequate good quality Personal Protective Equipments (PPE) to all the workers working at construction zones and Plant sites and will ensure that these PPEs are used by workers at all time during works.Adequate drainage, sanitation and waste disposal will be provided at workplaces.Proper drainage will be maintained around sites to avoid water logging leading to various diseasesAdequate sanitation and waste disposal facilities will be provided at construction camps by means of septic tanks, soakage pits etc.A health care system will be maintained at construction camp for routine checkup of workers and avoidance of spread of any communicable diseaseReadily available First Aid kit bearing all necessary first aid items will be proved at all the work sites and should be regularly maintained.The Contractor will organize awareness program on HIV aids and sexually transmitted diseases (STDs) for workers on periodic basis.	Workers Camp Site and Construction Zones	During construction	Contractor	PMC/PIU-UPPWD

² Reference: <http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES> and <http://www.ifc.org/wps/wcm/connect/7e4c7f80488554d5b45cf66a6515bb18/Final%2B-%2BToll%2BRoads.pdf?MOD=AJPERES&id=1323162564158>]



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.7.3 Accessibility	<ul style="list-style-type: none"> The Contractor will all time provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property access as connecting the project road. The Contractor will also ensure that the existing accesses are not blocked without providing adequate provisions and to the prior satisfaction of Engineer. The Contractor will take care that the cross roads are constructed in such a sequence so that traffic movement on any given area does not get affected. 	At all Construction Zones Along settlement stretches and at major intersections	During construction	Contractor	PMC/PIU-UPPWD
C.7.4 Planning for Traffic diversion	<ul style="list-style-type: none"> Detailed Traffic Control Plans will be prepared and submitted to the Engineer and PMC/PIU-UPPWD for approval, five days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation hazardous materials and arrangement of flagmen. The Contractor will provide specific measures for safety of pedestrians and workers at night as a part of traffic control plans. The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. The Contractor will also inform local community of changes to traffic routes, conditions and pedestrian access arrangements with assistance from PMC/PIU-UPPWD. 	All the Construction Zones	During Construction	Contractor	PMC/PIU-UPPWD
C.8. Impact Cultural Properties					
C.8.1. Damage or loss of cultural properties	<ul style="list-style-type: none"> Relocation of adversely impacted cultural properties If any valuable or invaluable articles such as fabrics, coins, artefacts, structures, or other archaeological relics are discovered, the excavation will be stopped and Archaeology Department, UP. will be intimated. Construction camps blasting sites and all allied construction activities will be located at least 500 m away from the cultural property 	Throughout Project Corridor at all locations of Cultural Properties	Before construction starts During construction	Contractor and Archaeology Department UP.	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.9 Camp Site Management					
C.9.1 Labour Camp facility	<ul style="list-style-type: none">Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp.The location, layout and basic facility provision of each labour camp will be submitted to the Engineer and PIU prior to their construction.The construction will commence only upon the written approval of the Engineer.• The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner and as approved by the Engineer.Periodical medical checkup will be ensured for all the workers.	Camp Site	Construction Stage	Contractor	PMC/PIU-UPPWD
C.9.2 Potable Water	<ul style="list-style-type: none">The Contractor will provide potable water facilities within the precincts of every workplace in an accessible place.The Contractor will also guarantee the following:Supply of sufficient quantity of potable water (as per IS) in every workplace/labour camp at suitable and easily accessible places and regular maintenance of such facilities.If any water storage tank is provided, the bottom of the tank will be kept at least 1mt. above from the surrounding ground level.If water is drawn from any existing well, which is within 30mt. proximity of any toilet, drain or other source of pollution, the well will be disinfected before water is used for drinking.All such wells will be entirely covered and provided with a trap door, which will be dust proof and waterproof.A reliable pump will be fitted to each covered well. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month.	Camp site and work zones	Construction Stage	Contractor	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.9.3 Sanitation and Sewage system	<ul style="list-style-type: none"> The Contractor will ensure that- The sewage system for the camp will be designed, built and operated in such a fashion that it should not pollute the ground water or nearby surface water. Separate toilets/bathrooms, will be arranged for men and women Adequate water supply is to be provided in all toilets and urinals All toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition Night soil (human excreta) is to be disposed off by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15cm, layer of waste or refuse and then covered with a layer of earth for a fortnight. 	Camp Site	Construction Stage	Contractor	PMC/PIU-UPPWD
C.9.4 Waste disposal	<ul style="list-style-type: none"> The Contractor will provide segregated garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Environmental Expert of PMC/PIU-UPPWD. Unless otherwise arranged by local municipal authority, arrangements for disposal of night soils (human excreta) suitably approved by the local municipal authority or as directed by the Engineer, will be arranged by the Contractor. 	Camp site	Construction Stage	Contractor	PMC/PIU-UPPWD
C.10 Monitoring of Pollution					
C.10.1 Monitoring of Air, Water & Noise Quality Pollution Monitoring	<ul style="list-style-type: none"> The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination in the selected locations as suggested in environmental monitoring plan will be the responsibility of Contractor. PIU will appoint MOEFCC/UPPCB approved pollution monitoring agency for this purpose. 	As per Environmental Monitoring Plan (Construction Zones and Plant/Camp Sites)	During Construction	Contractor through approved laboratory	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C,11 Site Restoration and Rehabilitation					
C.11.1 Clean-up Operations, Restoration and Rehabilitation	<ul style="list-style-type: none">Contractor will prepare site restoration plans, which will be approved by the Engineer.The cleanup and restoration operations are to be implemented by the Contractor prior to demobilization.The contractor will clear all the debris material at site, temporary structures; dispose all garbage, night soils and POL waste as per Comprehensive Waste Management Plan and as approved by the Engineer (PMC).All disposal pits or trenches will be filled in and effectively sealed off. Residual topsoil, if any will be distributed on adjoining/ proximate barren land or areas identified by the PMC in a layer of thickness of 75 mm-150 mm.All construction zones including river-beds, culverts, road-side areas, camps, hot mix plantsites, crushers, batching plant sites and any other area used/affected by the project will beleft clean and tidy, at the contractor's expense, to the entire satisfaction of the Engineer (PMC).	Construction zones, Camp and other allied sites	After Completion of Construction and before demobilization of Construction Team	Contractor	PMC/PIU-UPPWD
C. OPERATION STAGE					
O-1: Monitoring of Operation Performance	<ul style="list-style-type: none">The PIU-UPPWD will monitor the operational performance of the various mitigation/enhancement measures carried out as a part of the project.The indicators selected for monitoring include the survival rate of trees; utility of enhancement provision for relocated utilities, hand pumps and other relocated structures if any; status of rehabilitation of borrow areas; and noise barriers, which are proposed at different locations.	Throughout the project Stretch	Operation stage/	Contractor till defect liability period/ PIU-UPPWD	PMC/PIU-UPPWD
O-2: Maintenance of Drainage	<ul style="list-style-type: none">PIU-UPPWD will ensure that all drains (side drains, cross drains etc.) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding.PIU-UPPWD will ensure that all the sediment and oil and grease traps set up at the water bodies are cleared once in every three months.	Throughout the project Stretch	Operation stage/	Contractor till defect liability period/ PIU-UPPWD	PMC/PIU-UPPWD



Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
O-3: Pollution Monitoring	<ul style="list-style-type: none"> The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination in the selected locations as suggested in environmental monitoring plan will be the responsibility of Contractor. PIU-UPPWD will appoint MOEFCC/UPPCB approved pollution monitoring agency/Laboratory for this purpose. 	As per Environmental Monitoring Plan	Operation stage	Contractor through approved laboratory	PMC/PIU-UPPWD
O-4: Contamination of Surface Water due to Traffic Movement & Accidents	<ul style="list-style-type: none"> Contingency Plans will be developed for cleanup of oil spills, fuel and toxic chemicals. 	Throughout the project stretch	Operation stage	Contractor/ PIU-UPPWD	PIU-UPPWD
O.5: Noise Pollution	<ul style="list-style-type: none"> Noise pollution will be monitored as per monitoring plan at different zones. Noise attenuating Tree Species to be planted along the road Noise control programs are to be enforced strictly. Monitoring the effectiveness of the pollution attenuation barriers, if there is any, will be taken up. 	Specially inhabitant location	Operation stage	Contractor through approved laboratory	PIU-UPPWD
O.6: Accident Hazard and Safety	<ul style="list-style-type: none"> Provision of elaborate system of sign boards and road markings along the whole stretch Provision of suitable lighting arrangement at required locations Development of Emergency Response and Contingency Plan for accidents Regular highway patrolling 	Throughout the project stretch	Operation Stage	Contractor, PMC/PIU-UPPWD	PMC/PIU-UPPWD



9.4 Environmental Enhancement

Enhancement measures for community properties located adjacent to the road has been proposed in consultation with the local population. The locations identified for enhancement is at Kalauli Teer at Km 5.300 at primary school, Ponds at Km 5.800 and Km 7.700. The details of enhancement measures is presented in **Annexure 9.11**.

9.5 Environmental Monitoring Programme

Environmental monitoring provides an essential tool to make necessary recommendations and adopt suitable control strategies so that menace of rising environmental degradation could be minimized and a relief be extended to the people including labours in case of any damage caused under occupational health hazards. The monitoring is necessary for the following reasons:

- To see what impacts have occurred;
- To evaluate the performance of mitigation measures proposed in the EMP;
- To ensure that the conditions of approval are adhered to;
- To suggest improvements in management plan, if required;
- To see that benefits expected from the EA are achieved as the project proceeds; and
- To satisfy the legal and community obligations.

9.5.1 Performance Indicators (PIS)

The physical, biological and social components, which are significant in affecting the environment at critical locations, have been suggested as Performance Indicators. The following specific environmental parameters can be qualitatively measured and compared over a period of time and therefore selected as Performance Indicators for monitoring due to their regulatory importance and the availability of standardized procedures and relevant expertise.

- Soil contamination & Erosion indices
- Air quality
- Water quality
- Noise levels around sensitive locations
- Re-plantation success /survival rate
- Restoration of borrow pits
- Construction camp management
- Sedimentation in the ponds adjacent to road.

9.5.2 Selection of Indicators for Monitoring

The environmental parameters that may be qualitatively and quantitatively measured and compared over a period of time, due to their importance and the availability of standardized procedures and expertise have been selected as Performance Indicators (PIs).

- Ambient Air Quality
- Noise levels
- Water Quality
- Soil Quality
- Flora



9.5.3 Monitoring of Performance Indicators

Ambient Air Quality (AAQ) Monitoring

Ambient air quality parameters which are recommended for monitoring of widening and strengthening of state highway are PM₁₀ (Particulate Matter having less than 10 micron size) or PM_{2.5} (Particulate Matter having less than 2.5 micron size), Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x) and Carbon Monoxide (CO) and Hydrocarbon (HC). These parameters are to be monitored at selected locations such as plant and machinery sites, crusher sites, excavation works, etc. starting from the commencement of construction activity. Data should be generated once in a season at the selected monitoring locations in accordance with National Ambient Air Quality (NAAQ) Standards 2009 (**ANNEXURE-9.7**).

Ambient Noise Monitoring

The measurement for monitoring the noise levels to be carried out at sensitive locations and at construction sites along the project road in accordance to the Ambient Noise Standards formulated by Central Pollution Control Board (CPCB) (**ANNEXURE 9.8**). Sound pressure level would be monitored on twenty-four hourly basis. Noise shall be recorded at "A" weighted frequency using digitized noise monitoring instrument.

Water Quality

Water quality of local water resources that is used by local community shall be monitored. The physical and chemical parameters recommended for analysis of water quality relevant to road project are pH, total solids, total suspended solids, total dissolved solids, COD, BOD, DO, Oil and Grease, Chloride, Iron, etc. The monitoring of the water quality will be carried out at all locations identified along the project road during construction and operation phase. Monitoring parameters will be as per IS-10500 (**ANNEXURE-9.9**) for ground water quality and for surface water quality as per CPCB Guidelines for used based surface water classification (**ANNEXURE-9.10**).

Soil Quality

The soil quality of the surround fields close to the construction site and plant site will be monitored to understand the impact of soil quality. The physic-chemical parameters recommended for analysis are physical Parameter: Texture, Grain Size, Gravel, Sand, Silt and Clay and Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen and Absorption Ratio.

Tree Survival Rate

Roadside plantation of trees and their management will be an important environmental activity for the management group. These activities will include selection of plant, development of nurseries, protection of plant, interaction with roadside communities for plantation management and their maintenance, etc.

The widening and up gradation of the project requires felling of roadside trees. This lost will be compensated by compensatory afforestation. The compensatory afforestation will be done as per Forest (Conservation) Act and policy of Uttar Pradesh Forest Department.



To ensure the proper maintenance and monitoring of the compensatory afforestation, a regular maintenance and monitoring of the survival rate of the planted trees is being proposed up to a period of 3 years from the operation of the project. This will be monitored by implementing agency with the help of Forest Department.

9.6 Environmental Monitoring Action Plan

The monitoring action plan covering various performance indicators, frequency and institutional arrangements of the project in the construction and operation stages is given in **Table 9.3**.

9.7 Environmental Reporting System

Monitoring and evaluation are important activities in implementation of all projects. Monitoring involves periodic checking to ascertain whether activities are going according to the plans. It provides the necessary feedback for project management to keep the programme on schedule.

The reporting system will operate linearly with the Contractor, who will report to Project Management Consultant (PMC), who will in turn report to the Project Implementation Unit (PIU). All reporting by the Contractor and PMC shall be on monthly/quarterly/annual basis. The PIU shall be responsible for preparing targets for each of identified EMP activities.

The compliance monitoring and the progress reports on environmental components may be clubbed together and submitted to the PIU regularly during the implementation period. The operation stage monitoring reports may be annual or biannual. The operation stage monitoring reports will have to be prepared as specified in the said project Environmental Completion Report.

9.8 Environmental Monitoring Cost

A separate budgetary provision has been made for implementation of Environmental Monitoring Plan. The environmental monitoring cost is estimated on the basis of the length and existing environmental scenario of the project road. A budget allocation has been made against environmental monitoring during construction and operation stages of **Rupees 7.68 lakhs** and **Rupees 1.74 lakhs** respectively. The details are provided in **Table 9.3**.



Table 9.3: Environmental Monitoring Plan

Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	Standards	Locations	Frequency	Duration	Action Plan in case criteria exceeds	Implementation	Supervision
Air	Construction	PM ₁₀ µg/m ³ , PM _{2.5} µg/m ³ , SO ₂ , NO _x , CO	National Ambient Air Quality Standard (CPCB, 18 th Nov, 2009)	Plant site, HMP and Stone Crusher (1 location)	Once in 3 month for 2 years excluding monsoon period)	Continuous 24 hours	Check and modify control device like bag filter/cyclones of hot mix plant	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
		PM ₁₀ µg/m ³ , PM _{2.5} µg/m ³ , SO ₂ , NO _x , CO		Along the project road at 2 locations in consultation with PMC.	Once in a season excluding the monsoon for 2 Years	Continuous 24 hours	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
	Operation	PM ₁₀ µg/m ³ , PM _{2.5} µg/m ³ , SO ₂ , NO _x , CO		Along the project road at 2 locations in consultation with PMC	In the interval of 4 months excluding the monsoon for 1 Year	Continuous 24 hours	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
Surface Water Quality	Construction	pH, Temperature, DO, BOD, COD, Oil & Grease, Total Suspended Solid, turbidity, Total Hardness, Chlorine, Iron, Total Coliform	Surface Water Quality Standard	At identified locations (3 locations)	Once in a season excluding monsoon for 2 Years	Grab Sampling	Check and modify Oil interceptors, silt fencing devices	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD



Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	Standards	Locations	Frequency	Duration	Action Plan in case criteria exceeds	Implementation	Supervision
	Operation	pH, Temperature, DO, BOD, COD, Oil & Grease, Total Suspended Solid, turbidity, Total Hardness, Chlorine, Iron, Total Coliform		At identified locations (2 locations)	In the interval of 4 months excluding the monsoon for 1 Year	Grab Sampling	Check and modify petrol interceptors, silt fencing devices	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
Ground Water Quality	Construction	pH, Temperature, TSS, Total hardness, Suspended Solid, Chlorine, Iron, Sulphate, Nitrate	Ground Water Quality Standard as per IS: 10500, 1991	Construction site (2 locations)	Once in 3 months for 2 Years	Grab Sampling	Check and modify petrol interceptors, silt fencing devices	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
Noise Level	Construction	Leq dB (A) (Day and Night) Average and Peak values	Ambient Noise Standard (CPCB, 2000)	At equipment yards and locations as identified along the project road by PMC (3 locations)	In the interval of 3 months for 2 Years	24 hourly recording of Leq	Check and modify equipment and devices used to protect noise level	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD



Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	Standards	Locations	Frequency	Duration	Action Plan in case criteria exceeds	Implementation	Supervision
	Operation	Leq dB (A) (Day and Night) Average and Peak values		Locations as identified by PMC (3 locations)	In the interval of 4 months for 1 Year	24 hourly recording of Leq	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
Soil	Construction	Physical Parameter: Texture, Grain Size, Gravel, Sand, Silt, Clay; Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen, Absorption Ratio		Near Construction sites along the road as identified by the PMC (3 locations)	In the interval of 3 months for 2 Years	-	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD
	Operation	Physical Parameter: Texture, Grain Size, Gravel, Sand, Silt, Clay; Chemical Parameter: pH, Conductivity, Calcium, Magnesium, Sodium, Nitrogen, Absorption Ratio		Along the road (2 locations)	In the interval of 4 months for 1 Year	1 Year	-	Contractor through approved NABL monitoring agency	PMC & PIU-UP PWD



Environment Component	Project Stage	Regular Monitoring Parameters				Institutional Responsibilities			
		Parameters	Standards	Locations	Frequency	Duration	Action Plan in case criteria exceeds	Implementation	Supervision
Tree Plantation/Greenbelt Development	Construction	Tree Survival rate	90% Tree Survival Rate	Throughout the Project in substantially completed section	Once in a month	1 Year	Replacement of dead tree with healthy saplings of same species, repairing of tree guards, fencing etc.	Contractor	PMC, PIU UP PWD
	Operation	Tree Survival rate	80% Tree Survival Rate	Throughout the Project stretch	Once in three months	3 Years	Replacement of dead tree with healthy saplings of same species	Contractor	PMC, PIU UP PWD
Water Bodies	Construction	Turbidity in Storm water Silt load in ponds/Rivers	As specified by the engineer Water quality standards	At the drains, Ponds, Water reservoir and River along the project road	Pre-monsoon and post monsoon seasons for 3 years	3 years	Inspection and modification of silt fencing/ any leakage of drains to these surface water bodies	Contractor	PMC, PIU UP PWD
	Operation	Turbidity in Storm water Silt load in ponds	As specified by the engineer/ Water quality standards	At major water bodies (Pond, within the Proposed ROW and those located at immediate vicinity of the Proposed ROW.	3 Year before onset of monsoon	3 Years	Check and repair catch drains, storm water drains and silt trap	Contractor	PMC till defect liability period, PIU UP PWD



9.9 Institutional Arrangement for Implementation of EMP:

For successful implementation of Environmental safeguards Institutional setup plays a vital role. The Government of Uttar Pradesh has setup Project Management Unit (PMU) for UPCRNDP to streamline decision-making and provide more autonomy for project execution and delivery. The PMU is headed by Chief Engineer, World Bank (Roads) supported by Superintending Engineer (Planning) and Project Director, UPCRNDP at Head Office. The Project Director will have overall responsibility for implementation of projects.

The Superintending Engineer (Planning) is responsible to assist Chief Engineer in ensuring that overall expenditure under each of the agreed component does not exceed the total cost specified in the project document. S/he will also assist Chief Engineer in monthly plan review and monitoring meeting wherein physical and financial review will be done at the level of Chief Engineer and for budget provision/Allotment/ CCL/Assurance/Rules/Draft Para/Audit Para/PAC Para.

An Environmental and Social Development Cell (ESDC) has been set up at PMU. The cell is headed by an Executive Engineer. He is overall responsible for EIA preparation and EMP Implementation, coordinating and liaising with government organization as well as the World Bank with respect to different forest and environmental issues. He will also be responsible for progress monitoring of Environmental safeguards during project execution and submission of quarterly/ annual report on EMP compliance to the funding Agency.

In the field, there is provision of World Bank Circles headed by Superintending Engineers. The Division offices will act as Project Implementation Units (PIUs). Executive Engineers in each World Bank Circle will be responsible to oversee the project progress at site in their respective area. It is proposed to have one Environmental Nodal Officer at Office of each Executive Engineer who will look into the compliance with the safeguards, liaising with local authorities in connection with different permits and licenses, redressing the public complaints on environmental issues, etc.

The PMU has appointed Project Management Consultant to assist with project preparation and support implementation as Engineer in-charge who will supervise the Contractors activities, compliances and monitor the overall progress of work. There is provision of Environmental Specialist in PMC. The PMC's environmental specialist will oversee the implementation of the EMPs by the Contractor and will also provide technical guidance to the Contractor for implementation of the EMP and prepare checklists/formats/reports, etc. for implementing each of the activities as per the EMP. He will prepare periodical monitoring reports on EMP implementation and compliance with environmental clauses of Contract Agreement.

The Contractor team will include Environment and Safety Officers who will be responsible for day-to-day activities that pertain to the works. S/He will ensure compliance of the instructions given by the PMC. S/He will maintain close interaction with PMC and his field representative and seek instructions and guidance from PMC's Environmental Specialist on any issue related to implementation of environment and safety measures. He shall be responsible for record keeping, and reporting to the PMC through PM on actions taken. He will also give in-house training to the workers on environment and safety.



The Roles and responsibility of implementation and Supervision Agencies at different levels have been defined in **Table 9.4**. The proposed Institutional structure for EMP implementation is presented in **Figure 9.1**.

Table 9.4: Roles and Responsibility of Implementing Agency/Organisations

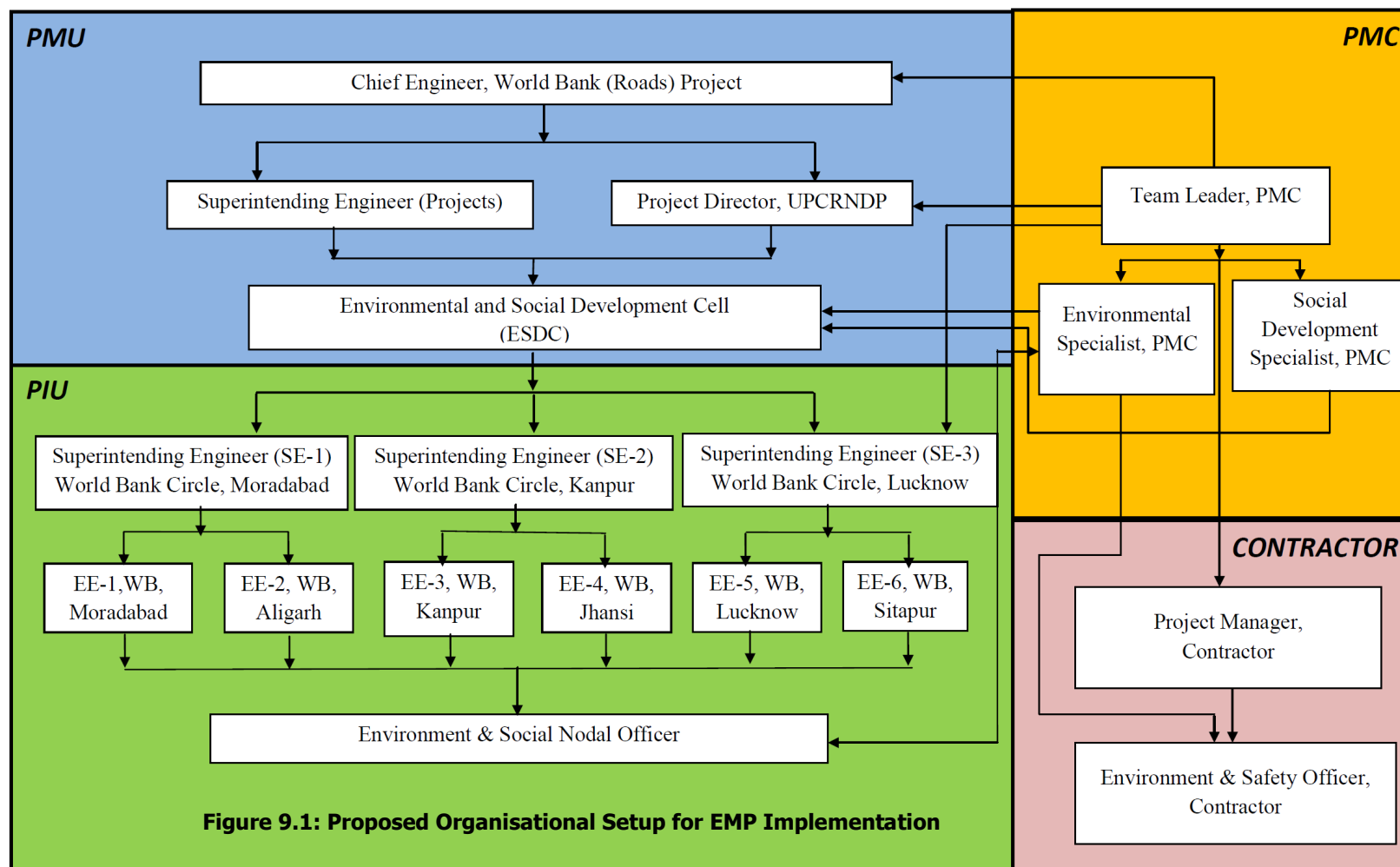
PMU-UPCRNDP	PIU, Site Office	PMC	Contractor
<ul style="list-style-type: none"> Obtain statutory clearances. overall project coordination and management through PIU supported by SC Interaction and Reporting to World Bank Effective implementation of EMP and Monitoring of EMP Compilation of Data relating to implementation of Environment Management Plan. Advising and suggesting corrective measures to adhere to time schedule for implementation of EMP. Carry out verification Exercise for implementation of EMP with respect to modification (if required) for enhancement measures. 	<ul style="list-style-type: none"> Joint verification to be carried out by PMU, PMC, Contractor Env. Officer. Overall Supervision of implementation of EMP Environmental monitoring through approved Laboratory. Consent for opening of Borrow areas, Quarry areas, and Labour camps and supervising its monitoring. Keeping records of all consents obtained by contractor. Compilation of Data relating to implementation of EMP. Filling of Summary Sheets and reporting to PMU. Approval of plans prepared by contractor 	<ul style="list-style-type: none"> Assist and advise the PMU/PIU in matters relating to environment and social matters. Part of Joint Verification Exercise to be carried out by PMU, PIU and Contractor for review of EMP for modification in enhancement measures (if required) Supervise implementation of EMP by contractor Develop Good Practices construction guidelines to assist contractor in implementation of EMP Conduct Consultations programs with the stakeholders on regular basis to get first hand information on the inconvenience caused to contractor's activities such as noise, debris disposal etc. <ul style="list-style-type: none"> maintain Environmental reporting system 	<ul style="list-style-type: none"> Joint Verification Exercise including, PMU/PIU PMC for review of EMP Interaction with ESDC, PIU and PMC Contractor's Env.& Safety officer will be primarily responsible for implementation EMP Filling of Reporting Format and submitting to PMC Monitoring through approved agency. Preparation of various plans for effective implementation of EMP as detailed out in EMP and submitting it for approval to PMC Identification of Sites for Labour camps, Hot mix Plant, Batch Mix Plant, debris disposal etc Day to day monitoring of implementation of Environmental Safeguards

The role and responsibilities of Environmental personnel at different levels will be as follows:

Position	Roles & Responsibilities
PMU's Environmental and Social Nodal Officer (ESD Cell)	<ul style="list-style-type: none"> Finalize the EIA and EMP for individual sub-project with inputs from PMC Confirm integration of EMP provision related to works in the contract documents Provide guidance on environmental issues to PIUs Environmental and Social officers as requested Coordinate with regulatory agencies like Forest Departments, and at request of PMC and/or Contractor, UPPCB Prepare regular reports on progress on EMP implementation across the project with inputs from the PMC's environmental specialist Document experiences of developing and implementing environmental mitigation measures and convert it into training material for internal and external capacity building Facilitate interaction between environmental teams of different sub-projects to allow cross-fertilization of ideas, successes and learnings



Position	Roles & Responsibilities
Environmental and Social Nodal Officer at PIU (Division Office)	<ul style="list-style-type: none">• Coordinate with PMC's environmental specialist to monitor and report on progress on EMP implementation as part of works contracts• Participate in and facilitate consultations with stakeholders• Participate in project meetings and report on the issues related to environmental management to provide for any mid-course corrections that may be required based on situation on the ground• Coordinate on the training and capacity building initiatives
Environmental Specialist, PMC	<ul style="list-style-type: none">• Lead the development of the sub-project specific EIA and EMP for the entire project• Review contract documents to ensure that EMP provisions related to works are included in the contract documents• Assist the Environmental Specialist in the PMU to follow-up with state government departments• Oversee and report to the PMU on implementation of EMP provisions included in the works contract for each sub-project• Act as a resource person in trainings based on experience on implementing this project and previous relevant work
Contractors' Environmental and Safety Officer	<ul style="list-style-type: none">• Lead the implementation of EMP measures included in the Contract• Report on progress and shortcomings of the measures implemented to Environmental Specialist of PMC





9.10 Environmental Training

To enhance the capacity of officials for effective implementation of proposed mitigation measures and monitoring the resultant effect, as well as create awareness amongst workers and supervision staff trainings and awareness programmes have been planned and is given in **Table 9.5**. The institutions/agencies like regional office of MoEF, SPCB/CPCB, Indian Institute of Technologies can be consulted for such trainings. Independent subject's experts/consultants can also be the resource persons to impart trainings. These experts/agencies shall be appointed based on specific need for the training. A budgetary provision of Rs. 4.0 Lakh has been made for imparting Environmental Training.

Table 9.5: Details of Proposed Training Program on Environmental Issues

Module	Title	Objectives	Time of Training	Duration (Day)	Level	Participants
1	Concept of Environmental and Social Management Framework	<ul style="list-style-type: none"> Brief up Bank's safeguard policies and requirements Brief up latest on environmental legislations Implementation, Supervision and Monitoring Mechanism Provision made in Contract Documents 	Before awarding contracts	1	State	PIU (SE and Executive Engg.) PMU, UP PWD
2	Orientation Workshop on ESMF Implementation	<ul style="list-style-type: none"> ESMF requirements Implementation, Supervision and Monitoring Mechanism Roles and Responsibilities of Contractors and UP, PWD Engineer Identification of social issues Addressing social impacts Preparing mitigation plans 	Pre-construction stage (when contractors are substantially mobilized)	1	State	PIU (Executive Engg. /AEE/AE, PMU, Contractors and Third Party Monitoring Agency
3	Focused Training on Specific Issue/s	<ul style="list-style-type: none"> Analyzing problems, referring stipulations in Contract and GEMP and agreed to feasible solution within specified timeframe Issues relating to wage parity, child labor, etc. 	During construction, as and when needed.	0.5	District	PIU, Contractors and Third Party Monitoring Agency
4	Training on HIV AIDS issues	To increase the level of awareness about prevention and control of HIV/AIDS among the different communities' particularly tribal communities in scheduled	During construction	1 day	District	PIU, NGO Contractors



Module	Title	Objectives	Time of Training	Duration (Day)	Level	Participants
		areas abutting project road; Social and Psychological support to AIDS Infected				
5	Road Safety	To raise road safety consciousness among the road users; train drivers and medical aid to the victims of road accidents particularly for special target groups like drivers of heavy vehicles/goods vehicles, etc.	During and pre-construction	0.5	District	PIU, NGO and contractor
6	EMP Implementation during construction stage	To understand the requirement of EMP and its implementation during construction stage of the project road. Good and bad practice of EMP during construction stage of the project	During Construction stage	0.5		Contractor and their staffs.

9.11 Grievance Redressal Mechanism

An integrated system will be established with Grievance Redressal Cells (GRCs), with necessary officers, officials and systems, at the state as well as sub project levels. Grievances if any, may be submitted through various mediums, including in person, in written form to a noted address, through a toll free phone line or through direct calls to concerned officials, and online. PWD will appoint a person to receive such calls and online messages. The person incharge based on nature of complaint, will forward the same to the concerned official. A ticket or a unique number will be generated for all such call and messages. The complainant will follow up based that unique number. All calls and messages will be responded within two weeks. In response is not received within 15 days, the complaint will be escalated to next level.

All local contact information and options for complaint submission will be available on site on local information boards. Moreover, they will be in addition to the PIO officers to be appointed under the RTI Act. A half yearly report on Grievance Redressal by the project will be prepared. The project will abide by the RTI Act of 2005; it will commit itself for proactive disclosure and sharing of information with the key stakeholders, including the communities/beneficiaries. The project will have a communication strategy focusing on efficient and effective usage of print and electronic media, bill boards, posters, wall writing, and adoption of any other method suiting local context, logistics, human and financial resources.

As part of IGRM, a Grievance Redress Cell (GRC) will be set up at the district level. The staffing of GRC will include Environment and Social Nodal Officer of PMU; E&S Officer of PIU; and two representatives from community / beneficiary / affected persons. The head of the cell will be a person of repute but not continuing in the government service. The GRC will have its own bye laws. The functions of the GRC will include: (i) to redress grievances of community / beneficiaries / project affected persons (PAPs) in all respects; (ii) rehabilitation and resettlement assistance and related activities; (iii) GRC will only deal/hear the issues related to R&R and environmental grievance; (iv) GRC will give its decision/verdict within 15 days after hearing the aggrieved



person; (v) final verdict of the GRC will be given by the Chairman/Head of GRC in consultation with other members of the GRC and will be binding to all other members.

9.12 Environmental Budgeting

A budgetary Provision of Rupees 11.44 Crores has been made for the various environmental mitigation measures and monitoring. The detailed break-up of the budgetary provision is given in **Table 9.6**. Some of the provisions of budget for environmental protection measures are the part of engineering cost and Resettlement and Rehabilitation Cost and hence they have not been included here. The cost of diversion of Protected forest area has been calculated based on standard calculation practices of the Forest Department by using current rate of NPV of the forest area, tree felling cost within the proposed forest area, compensatory afforestation cost, protection measures and maintenance cost of tree plantation. This figure is only tentative and may vary after the final demand note received by the Forest Department and as decided by the Forest Task Force during Forest Clearance. The cost as per the Forest Department will be deposited to the concern Forest Department before commencement of any construction works in the forest stretch.


Table 9.6: Proposed EMP Cost for Hamirpur-Rath Section of SH-42

S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
A. Pre-Construction Stage						
1	Forest Clearance	Diversion of forest land for non forest activities (Project road widening)- (a) Total NPV cost/ha (The final cost will be provided by the forest department after joint verification, which is required to be deposited by UP, PWD)	Hect	58.4	9,60,000	5,60,64,000
Total EMP Cost during Pre-Construction Stage (A)						5,60,64,000
B. Construction Stage						
1	Tree cutting along the project road	Clearing of Roadside plantation (from Km 2.00 to Km 78.00-Hamirpur district)-Tree cutting by Forest Dept/Contractor and MoU shall be signed between them				
		Girth 30-60 Cm	No.	3,607	193	6,96,151
		Girth 60-90 Cm	No.	1,716	371	6,36,636
		Girth 90-180 Cm	No.	2774	683	18,94,642
		> Girth 180 Cm	No.	379	1261	4,77,919
2	Tree Plantation along the project road	Compensatory afforestation (minimum of 2 trees planted for every tree cut) including 3 years maintenance	No.	16,952	656	1,11,20,512
		Providing of Half Brick circular tree guard, in 2nd class brick, internal diameter 1.25 metres, and height 1.5 metres, above ground and 0.50 metre below ground, cement mortar 1:6 as per complete design.	No.	16,952	1968	3,33,61,536
3	Proposed Enhancement of School, Temple & Pond at Km 5.300, Village-Kauliteer (LHS)	Tree Plantation including maintenance for 1 year	No.	10	656	6,560
		Tree Guard for tree protection	No.	10	1,968	19,680
4	Enhancement of Pond at Km 5.800 (RHS)	Tree Plantation including maintenance for 1 year	No.	15	656	9,840
		Tree Guard for tree protection	No.	15	1,968	29,520



S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
5	Enhancement of Pond and Temple at Km 7.700 (RHS)	Tree Plantation including maintenance for 1 year	No.	25	656	16,400
		Tree Guard for tree protection	No.	25	1,968	49,200
6	Pond Protection at Km 20.700	Protection by Toe Wall/Retaining Wall of length 50 meter and Height 2 meter (LHS)				Covered in Engineering Cost
7	Environmental Monitoring	(a) Ambient Air Quality monitoring as per Monitoring Plan (3 locations in the interval of 3 months for 2 Years)	No.	24	8,500	2,04,000
		(b) Ambient Noise level monitoring as per Monitoring Plan (3 locations in the interval of 3 months for 2 Years)	No.	24	4,000	96,000
		(c) Water Quality monitoring of surface water as per Monitoring Plan (3 locations in the interval of 3 months for 2 Years)	No.	24	7,500	1,80,000
		(d) Soil Quality monitoring of Agricultural lands as per Monitoring Plan (3 locations in the interval of 3 months for 2 Years)	No.	24	7,000	1,68,000
		(e) Water Quality monitoring of drinking water from construction camp (2 locations in the interval of 3 months for 2 Years)	No.	16	7,500	1,20,000
8	Oil and Grease Interceptor	Near Water body	No.	2	50,000	1,00,000
9	Rain Water Harvesting Structure	Rain Water Harvesting Structure along the project road	No.	32	50,000	16,00,000
10	Environmental Training	EMP Orientation at construction site	Lump Sum			4,00,000
Total EMP Cost during Construction Phase (B)						4,74,81,248



S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
C.	Operation Stage					
11	Environmental Monitoring	(a) Ambient Air Quality monitoring at Residential & Commercial locations along the project road (2 locations in the interval of 4 months for 1 Years)	No.	6	8,500	51,000
		(b) Surface Water Quality monitoring along the project road (2 locations in the interval of 4 months for 1 Years)	No.	6	7,500	45,000
		(c) Ambient Noise monitoring at sensitive receptors (3 locations in the interval of 4 months for 1 Years)	No.	9	4,000	36,000
		(d) Soil Quality monitoring of Agricultural lands (2 locations in the interval of 4 months for 1 Year)	No.	6	7,000	42,000
12	Tree plantation monitoring	Along the project corridor for 2 years	Lump Sum			2,50,000
Total EMP cost during Operation Phase						4,24,000
Total Cost (A+B+C)						10,39,69,248
Contingency (10%)						1,03,96,925
Total EMP Cost						11,43,66,173
Say INR in Crores						11.44