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GOVERNMENT OF UTTAR PRADESH
Public Works Department

Uttar Pradesh Core Road Network Development Program
Part – A: Project Preparation

DETAILED PROJECT REPORT
Volume - VIII: Draft Environmental Impact Assessment Report and Environmental Management Plan
Badaun – Bilsi – Bijnaour Road (SH-51)

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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
NO2	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
SO2	Sulphur-dioxide
SIA	Social Impact Assessment
WB	World Bank

0 EXECUTIVE SUMMARY

A project specific Environmental Assessment study has been carried out for the project "Improvement of Bahjoi-Gajraula section Badaun-Bilsi-Bijnaour road (SH-51) from Km 58.400 to Km 137.820" 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
6	Quarry Lease Deed and Quarry License from State Department of Mines and Geology	Quarry operation	Construction stage (Prior to initiation of Quarrying)	Contractor

S. No.	Type of Clearance/ Permits	Applicability	Project Stage	Responsibility
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 project section from Bahjoi to Gajraula Road is part of section of Badaun-Bilsi Bijnour road, SH-51. The project road starts in the middle from district border of Badaun and Sambhal districts at Km 58+400 and end at Km 137+820 near flyover with NH-24 at Gajraula town. The road section falls in the administrative jurisdiction of two districts namely Sambhal (Km 58.400 to Km 110.000) and Amroha (Joytiba Phule Nagar) (Km 110.000 to Km 137.820) of Western UP region. The project stretch passes through major habitation area of Bahjoi, Pawasa, Hayatnagar, Saraitarin, Saiid Nagli, Sambhal, Hasanpur and Gajraula. The baseline data on various physical, biological and social aspects have been collected, analyzed and compiled in order to get the picture of the existing environment conditions in the project area. The data on different environmental components have been 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. Sambhal district was carved out of Moradabad district recently in September, 2011, so most of the district wise data available are for combined district of Moradabad, which also includes Sambhal district's data and the same has been used in EIA report. 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 extension of the project stretch is 28°20'50.56"N latitude and 78°41'35.69"E longitude at Bahjoi and 28°49'40.98"N Latitude and 78°14'46.86"E longitude at Gajraula. General elevation of the area is 190 m above mean sea level. The entire project area is spread in Gangetic plain. The area falls in seismic zone-IV, with high damage risk at scale MSK VIII. The major and minor soils are Loamy and Silty loam soils respectively.

Climate

Both the concerned district have warm and temperate climate. The entire project area experiences very hot summer in the month of May-June with average maximum temperature varying between 40-45^0 C, however sometimes the temperature shoots up as high as 47^0 C. January being the coldest month when on average the mercury dips as below as 6-8^0 C.

The project districts have three distinct seasons.

1. Summer season - Between March to May.
2. South-west Monsoon – Between June to October
3. Winter Season – Between November to February

The entire project area experiences very hot summer in the month of May-June with average maximum temperature varying between 40-45^0 C, however sometimes the temperature shoots up as high as 47^{0}C. January being the coldest month when on average the mercury dips as below as 6-8^0 C.

In Amroha district, the climate is warm and temperate. In winter there is much more rainfall in Amroha than in summer. The average annual temperature in Amroha is 24.4° C. The average annual rainfall is 990 mm. In combined district of Moradabad & Sambhal the average annual temperature is 24.5°C and average annual rainfall is 976 mm.

The air in the project area is very humid during south-west monsoon season and the rest of the period the humidity is comparatively less. The mean monthly relative humidity in the project districts is 69% and mean monthly evening relative humidity is 51%. Winds are generally light with a little strengthening in the summer and monsoon seasons. The mean wind velocity is 5.1 Kmph.

Water Environment

There is no major river located in the project corridor. River crosses the project alignment. There are two irrigation canals which cross the project alignment at Km 120.460 and Km. in addition there are local nallahs cross the alignment at Km 89.860 and Km 103.450. There are 2 ponds recorded in the proximity of the road section within right of way at 61.500 (RHS) and 78.500 (LHS). In addition to these water bodies a number of abandoned pits are also located along the project stretch which retains water for brief period during rains which are useful for irrigation around the area. In general the water table in the area varies from 3 to 15 mbgl. The water demand for different activities in the project area like irrigation and domestic uses is met mainly from ground water source.

Ambient Air Quality

To study the baseline ambient air quality scenario within the project area, ambient air quality monitoring has been carried out in the month of November, 2014 at Bahjoi, Sambhal and Hasanpur with respect to $PM_{2.5}$, PM_{10}, SO_2, NOx, Carbon monoxide (CO) and Hydrocarbons (HC). The mean concentration of PM_{10} in ambient air varied between 95.00 µg/m^3 and 138.0 µg/m^3 along the project alignment. At one location (Sambhal) the concentration of PM_{10} is higher than the National Ambient Air Quality Standards i.e. 100 µg/m^3. The highest concentration of PM_{10} is observed at Sambhal at Km 89.00, which is 158 µg/m^3, the higher concentration of PM_{10} may be

attributed to heavy population, junctions and commercial activities. The concentration of $PM_{2.5}$ varied between 55 µg/m^3 to 72 µg/m^3. At Sambhal, the higher concentration is 82 µg/m^3, which is higher than the National Ambient Air Quality Standards i.e. 60 µg/m^3. Sambhal has congested built-up 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 is found within the National Ambient Air Quality Standards.

Water Quality

To assess the surface water quality along the project area, water sample has been collected from pond at Wahpurpatti, Bahjoi. The analysis result reflects that pond water, meet the quality of Class C– Drinking water with conventional treatment followed by disinfection and Class D (Propagation of Wildlife and Fisheries) of surface water.

To assess the ground water quality along project area, water samples has been collected and analyzed from hand pumps at Bahjoi, Sambhal and Hasanpur. The pH of the water samples varied between 7.02 to 7.37, which are within the permissible limits. The Total dissolve solid varied between 360.0 mg/l to 972.0 mg/l. The water sample collected from Hasanpur showed TDS in the range of 972 mg/l, which is higher that the desirable level but within the maximum permissible level as per IS:10500. The Total hardness (as $CaCO_3$) ranged from 290.08 mg/l to 635.04 mg/l at different locations along the project road. At Hasanpur village at Km 124.700, the Total hardness is 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 three monitoring locations have been identified considering location of sensitive receptors and land use pattern along the project road. These three areas are Bahjoi, Sambhal and Hasanpur. The ambient noise levels at all the monitoring locations were within the permissible level of commercial and mixed activities zone as stipulated by Central Pollution Control Board. The average daytime equivalent noise levels were recorded in the range of 54.6 Leq dB(A) to 62.4 Leq dB(A), whereas the same varied from 44.0 Leq dB(A) to 52.6 Leq dB(A) during night time. Sambhal, which represent the area of residential, commercial and mixed activities, showed highest noise levels as compared to other monitoring locations. The daytime equivalent noise was above the permissible limit. Biological Environment

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 a pocket of reserved forest located at a distance of about 300 m on western side (LHS) of the project road from Km 133.000 but is away from direct impact corridor. The type of vegetation in the reserve forest open scrubs. No threatened or endangered flora or fauna exists along the project corridor. About 15,667 trees falls within direct impact corridor in ROW which are likely to be affected due to widening. The predominant tree species along roads are Papdi, Eucalyptus, Siris, Shisham, Paakad, Neem and Sagaun. Apart from these Amaltas, Babul, Bakain, Gular, Mango, Peepal, etc are also located along the roadside.

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. There is no natural habitat of these animals along the project corridor.

0.2.2 Socio-economic Environment

The project stretch is located in Sambhal (Moradabad) and Amroha (Joytiba Phule Nagar) district of Uttar Pradesh districts. It passes through 30 villages.

Demographic Profile

The total population of Amroha district as per 2011 census is 1840221 whereas the total population of combined district of Moradabad & Sambhal is 4772006. The population density of Amroha district as per 2011 Census is 818.2 persons per sq Km which is lower lower than State's population density of 829. The Population density in combined district of Moradabad including Sambhal district is 1283.5 persons per sq Km which is higher that the state's population density. The sex ratio of the project concern districts i.e Amroha and combined district of Moradabad are 910 and 906 females for every 1000 males, which is lower than the state's ratio of 912 females for every thousand males in Uttar Pradesh State. The Literacy rate of the both the concerned districts is lower than the state's literacy rate according to the 2011 Census. The literacy rate in Amroha district is 53.42%, whereas the literacy rate of combined district of Moradabad is 47.44 which is far below than the state's ration of 57.25%.

Agriculture Pattern

Uttar Pradesh is a major contributor to the national food grain stock. Partly this is due to the fertile regions of the Indo-Gangetic plain and partly owing to irrigation measures such as the Ganges Canal and tube-wells. Wheat, rice, pulses, oil seeds and potatoes are the major agricultural products. Sugarcane is the most important cash crop throughout the state. Uttar Pradesh is one of the most important state in India so far as horticulture is concerned. Apples and mangoes are also produced in the state.

Project influences Districts (Sambhal and Amroha) are depending mainly on the agricultural and Major crops are Paddy, Wheat, Sugar cane & Mustard in this area.

Industries

Moradabad is renowned for brass work and has carved a niche for itself in the handicraft industry throughout the world. The modern, attractive, and artistic brass ware, jewellery and trophies made by skilled artisans are the main crafts. There are about 600 export units and 5000 industries in the district. The main centre of this industry is in Sambhal, A new district carved from the Moradabad and on the project road. Sambhal is also famous for its own kind of horn and bone craft items which is manufactured in Saraitareen 4 Km away from Sambhal city (but included in Sambhal) which are being exported. Major trades in Sambhal city are Menthol produce and its side products. Amroha district has industries in Joya, Gajraula and Amroha. Major industries along the project alignment are of chemical, fertilizer, brick kiln and sugar factory.

Cultural Properties

There are 40 religious featuress located along the project road. There is no archaeological structure/monument located in the proximity of project corridor. There are 36 numbers of

educational institutions and health centre's/hospitals 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

The existing Right of way is varying from 12 m to 52 m. Mostly the widening of the existing highway section to standard two lane configuration with paved shoulder is proposed within existing ROW. However at few locations marginal land acquisition may be required for accommodating proposed improvements. Little adverse impacts on environmental components are anticipated due to the project especially at bridge approaches. Most of the 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 pre-construction 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 pre-construction 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

S. No.	Environmental Components/ Issues	Impacts	Mitigation Measures
			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 15,667 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.	Common Resource/ Cultural Features	Total 9 Common Resource Properties, out of which 4 religious structure (*Hanuman Temple at Km 64+800, Santosi Mata temple at Km 78+250, Brahma Sthan at Km 80+125 and at Km 87+500*), 4 boundary walls and 1 shop are located very close to the road edge and are likely to be affected due to proposed widening.	The rehabilitation/ relocation of structures will be carried out in consultation with the local community and compensation will be paid in accordance with the R&R Policy of the project. The safe entry to these structures needs to be provided to avoid accidents and interruption in traffic movement.
5.	Ponds	A total number of 2 ponds are located within ROW. In addition to these water bodies a number of abandoned pits are also located along the project stretch which retains water for brief period during rains which are useful for irrigation around the area.	Suitable adjustment in the alignment has been made to avoid encroachment in the pond. Stone pitching for protection of slope at Km 61.470 to Km 61.533 (RHS) and Km 64.830 to Km 64.915 (LHS) have been proposed along the pond. Additional safety measures in the form of metal crash barriers along all the ponds/ abandoned pits have been proposed.
6.	Traffic Safety	Accident Hazards	Geometric corrections, scientifically designed bus stand, traffic signals, zebra crossings, junction improvements, bus bays and truck lay byes, traffic lightings and caution, regulatory and informative signboards have been provided in the project as per IRC codes. Traffic calming Measures have been proposed at fourteen built-up areas along the project road.

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	• 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	• 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
	• 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 0.5 m)			
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 Cotractor 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 (PM_{10} & $PM_{2.5}$)			
	Regular monitoring of PM_{10}, $PM_{2.5}$, 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 Group, April 2007[1] and the statutory norms of safety during construction. The relevant ones are general guidelines available on the internet.	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.			

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

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	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 checkup of workers and avoidance of spread of any communicable disease			
	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			
	The electrical equipment will be checked regularly			
	At every work place, a readily available first aid unit including an adequate supply of dressing materials, a mode of transport (ambulance), nursing staff and an attending doctor will be provided.			
	The Contractor will organize awareness program on HIV aids and sexually transmitted diseases (STDs) for workers on periodic basis.			
Public Safety	The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank Group April, 2007 and the statutory norms of safety during construction.	At all work zones, borrow areas and other allied sites	Contractor	PMC/ PIU-UPPWD
	To ensure safe construction in the temporary accesses during construction, lighting devices and safety signal devices will be installed.			
	Traffic rules and regulations will be strictly adhered to.			
	Road safety education will be imparted to drivers running construction vehicles.			
	Adequate signage, barriers and persons with flags during construction to control the traffic will be provided.			
	Proper barricading will be provided at all the work sites, borrow areas near habitation areas and camp sites will be			
	At all time safe access for public movement near habitation area will be ensures			
Clean-up Operations, Restoration and Rehabilitation	• 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.	Construction zones, Camp and other allied sites After Completion of Construction and before demobilization of	Contractor	PMC/ PIU-UPPWD

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
	• The contractor will clear all the debris material at site, temporary structures; dispose all garbage, night soils and Petroleum Oil & Lubricants (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 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).	Construction Team		
Operation Phase				
Monitoring of Operation Performance	• 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	• 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	• 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

Environmental Issue/Attributes	Mitigation Measures	Location	Institutional Responsibility	
			Implementation	Supervision
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
Noise Pollution	• 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	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 byes, 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)	• 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
	• 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 an 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)	• 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	• 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	• 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 Pond at Km 61.500 (RHS) and Shiv temple at Km 103.300 (LHS) along the project road.

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. 15.85** 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 Bahjoi-Gajraula section of state highway no. 51 (SH-51) in the district of Sambhal and Amroha 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 (7m). In the entire state 62% of MDRs and 83% of ODRs have widths less than 7m.

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 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 UPCRNDP will have three Components:

i) Upgrading/reconstruction/widening as well as rehabilitation of selected roads from the Core Road Network (CRN) including construction of a new Sharda Bridge at Pachpheri Ghat in Lakhimpur district.

ii) Road Safety Component: A comprehensive and coordinated package of road safety sub-components to be delivered by the Transport, Home, Public Works and Health Departments

iii) Road Sector and Institutional Reform Component: This component is likely to include a program to strengthen PWD asset management of SHs, MDRs and ODRs, to support the application of IT systems for human resource management and works budgeting and management across the PWD organization

The improvement works shall primarily consist of raising the formation level, widening to a full two lanes from the existing single and intermediate lane widths, and/or pavement rehabilitation/strengthening. Road sections with high volumes of non-motorised traffic will be widened to 10m with 1.5m full paved shoulders. Roads in urban areas may also require further widening for provision for drains, sidewalks, accommodate local traffic and parking where required.

1.3 The Project Road " Badaun-Bilsi-Bijnaour Road (SH-51)"

The project road section from Bahjoi to Gajraula is part of Badaun-Bilsi-Bijnour road (SH-51). The project road starts from district border of Badaun and Sambhal districts at Km 58+400 and end at Km 137+820 near flyover at NH-24 at Gajraula town. The road section falls in administrative jurisdiction of two districts namely Sambhal (Km 58.400 to Km 110.000) and Amroha (Joytiba Phule Nagar) (Km 110.000 to Km 137.820) of Western UP region. The project stretch passes through major habitation area of Bahjoi, Pawasa, Hayatnagar, Saraitarin, Saiid Nagli, Sambhal, Hasanpur and Gajraula. The entire alignment is spread over plain terrain. The existing road passes through 30 villages. The existing RoW varies from 12 m to 52 m. **Figure 1.1** illustrates start and end point of project road. The project road has existing length of 79.420 Km.

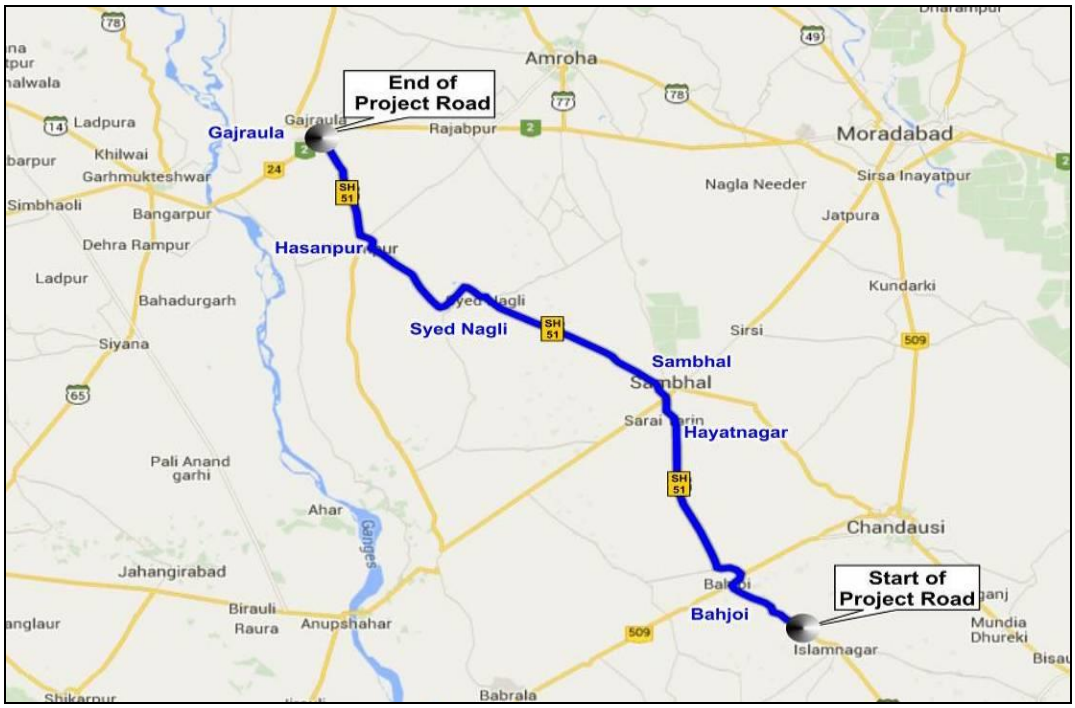


Figure 1.1: Location Map

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. 51 (SH-51), which is located on north side of UP state and passesg through Sambhal and Amroha (Joytiba Phule Nagar) districts. The project road start at Km 58.400 near Bahjoi and ends at Km 137.820 at Gajraula. The Project road has overlapping with NH-93 at Bahjoi at Km 67.000 of SH-51. The upgradation of proposed project section is from Km 58.400 to Km 110.000 in Sambhal District and from Km 110.000 to 137.820 Km in Amroha (Joytiba Phule Nagar) district. The key location of project road is indicated in **Figure 2.1**.

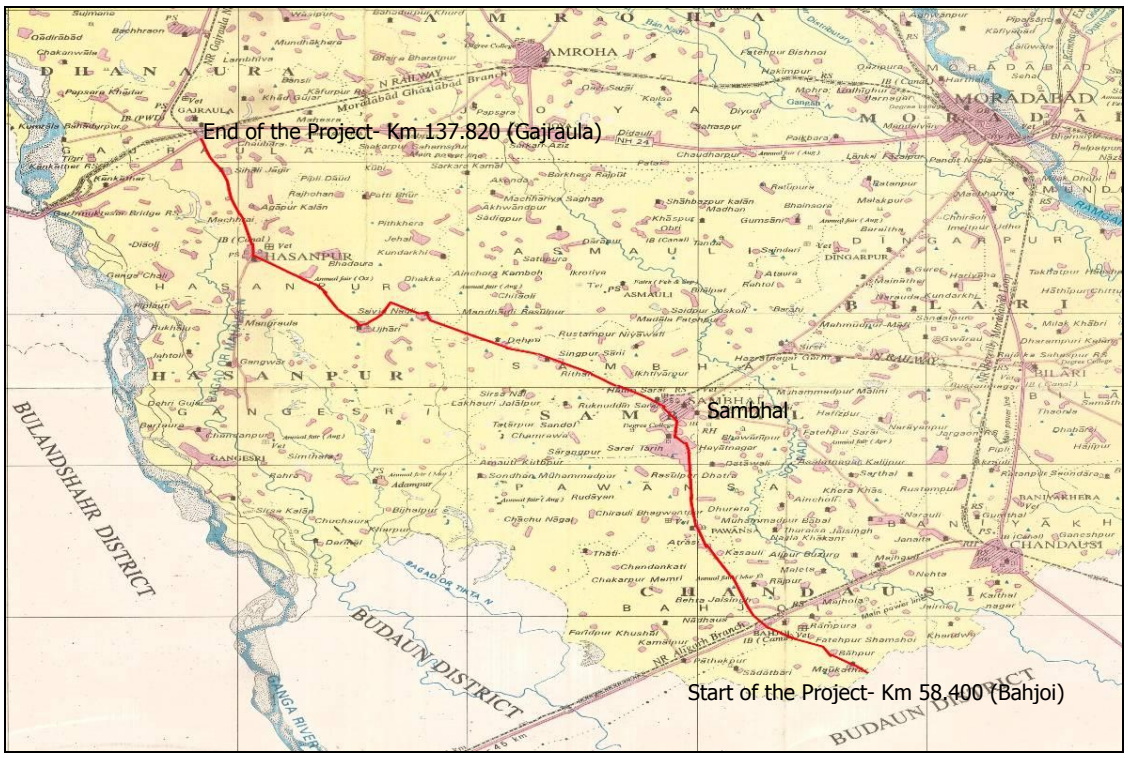


Figure 2.1: Project Location

2.6 Proposed Development

The existing carriageway of the highway section is two lane. The type of pavement is flexible. It is proposed to improve the road to a full two lane configuration with 7.0 m main carriageway and

1.5 m wide paved shoulder on eitherside and at the ending section at Gajraula, it will be 4-lane with paved shoulder for a length of about 900 m. There will be provision for drains, sidewalks in urban areas and parking places 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 58.400 to Km 110.000 of SH-51 in Sambhal district and from Km 110.000 to Km 137.820 in Joytiba Phule Nagar (Amroha) of Uttar Pradesh
2.	Administrative locations	Sambhal district-from Km 58.400 to Km 110.000 and Joytiba Phule Nagar (Amroha)-from Km 110.000 to Km 137.820
3.	State	Uttar Pradesh
4.	Length of the project section	79.420 Km
5.	Terrain	Plain
6.	Major Settlement along the Project Stretch	Bahjoi, Pawasa, Hayatnagar, Saraitarin, Saiid Nagli, Sambhal, Hasanpur and Gajraula.
7.	Rivers	Nil
8.	Ponds	A total number of 6 ponds are located within ROW and all are saved through adjustment/ shifting of alignment.
9.	Forest area	Road side plantation declared as Protected Forest (PF) along the project section
10.	Wildlife Sanctuary/ National Park/ Notified Eco-sensitive 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 ROW varies from 12 to 52 m along the project road.

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 Bhawan at Km 72+800 (Bahjoi-Sambhal)	Near Khaggupura at Km 94+400 (Sambhal - Hasanpur)	Near Hasanpur at Km 126+500 (Hasanpur-Gajraula)
Two Wheeler		3,270	4,596	4,780
Three Wheeler		501	552	1,134
Car/Van/Jeep		605	1,236	2,227
Mini Bus		27	77	71
Standard Bus		86	180	308
LCV		155	468	611
2 Axle Truck		88	195	363
3 Axle Truck		119	252	326
MAV		15	80	89
Agricultural Tractor		43	79	67
Agricultural Tractor & Trailor		109	211	181
Non Motorised Vehicles	Cycle	947	853	504
	Cycle Rickshaw	14	72	154
	Animal Drawn Vehicles	87	99	29
	Hand Cart	0	2	3
	Others	0	0	0
Vehicles	Motorised	5,018	7,926	10,157
	Non Motorised	1,048	1,026	690
	Total	**6,066**	**8,952**	**10,847**
PCU	Motorised	4,516	8,213	11,081
	Non Motorised	850	973	685
Total		**5,366**	**9,186**	**11,766**

2.7.3 Structures

As per inventory and topographical survey, the project road has 4 minor bridges, one level crossing and 84 culverts. The minor bridges are of brick masonry and RCC wall. The culverts are of pipe and slab culverts. Summary of existing & improvement proposals for culverts is given in **Table 2.3** and the Summary of existing & improvement proposals for minor bridges is given in **Table 2.4**.

Table 2.3: Summary of Culverts

Particulars		Type of Culverts					
		Pipe Culverts	Arch Culverts	Slab	Box	Stone Slab	Total
Existing culverts		56	2	26	-	-	84
Improvement proposal							
To be retained with repairs		2	-	5	-		7
To be retained with widening		1	1	10	-		12
To be Replaced with	Box culvert		1	11	-		12
	HP culvert	53	-	-	-		53
Additional Construction		24	-		11		35
Total		80	2	26	11	-	119

Table 2.4: Summary of Bridges

Particulars	Type of Structure			
	Minor Bridge	Major Bridge	Causeways	Total
Existing Structures	4	-	-	4
Improvement Proposal				
To be retained with repairs	1	-	-	1
To be retained with widening	1	-	-	1
To be Replaced with new bridge	2	-	-	2
Total	**4**	**-**	**-**	**4**

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.	Design Chainage (km)	Side	Village Name
1	59+200	LHS	Moi Kata
2	59+450	RHS	
3	59+750	LHS	Majbora
4	59+750	RHS	
5	61+200	LHS	Paheladpatti
6	61+400	RHS	
7	63+650	LHS	Mirjapur
8	63+550	RHS	
9	64+100	LHS	
10	64+000	RHS	
11	64+700	LHS	Rampura
12	64+800	RHS	
13	66+600	LHS	Sasor Colony
14	66+900	RHS	
15	69+400	LHS	Mirjapur
16	69+400	RHS	
17	71+100	LHS	Behta Jaisingh
18	71+100	RHS	
19	72+400	LHS	Bhawan
20	72+500	RHS	
21	75+050	LHS	Kasuli
22	75+100	RHS	
23	78+350	LHS	Pawasa
24	78+350	RHS	
25	79+400	LHS	Dhuratia
26	79+400	RHS	
27	81+300	LHS	Dhuratia
28	81+300	RHS	
29	83+900	LHS	Musalpur
30	83+950	RHS	
31	86+050	LHS	Hayat Nagar
32	86+050	RHS	

S. No.	Design Chainage (km)	Side	Village Name
33	91+100	LHS	Sambhal
34	91+250	RHS	
35	99+350	LHS	Singhpuri sani
36	99+500	RHS	
37	103+200	LHS	Fathepur
38	103+350	RHS	
39	108+800	LHS	Pajira
40	108+700	RHS	
41	109+000	LHS	Sodnagli
42	109+200	RHS	
43	110+050	LHS	Sodnagli
44	110+100	RHS	
45	111+950	LHS	Rakka More
46	111+850	RHS	
47	114+550	LHS	Ujjhari
48	114+700	RHS	
49	118+450	LHS	Ishapur
50	118+550	RHS	
51	121+200	LHS	Kala Kheda
52	121+300	RHS	
53	124+100	LHS	Hasanpur
54	124+300	RHS	
55	125+250	LHS	Hasanpur
56	125+450	RHS	
57	127+800	LHS	Dippur
58	128+000	RHS	
59	129+700	LHS	Agapur Pyau
60	129+550	RHS	
61	131+150	LHS	Manotha
62	131+050	RHS	
63	133+500	LHS	Sihali Jageer
64	13+340	RHS	
65	137+200	LHS	Gajraula
66	137+050	RHS	

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.	Proposed Chainage(Km)	Side	Nearby village
1	85+070	LHS	Before Sambhal
2	92+550	LHS	After Sambhal
3	93+860	RHS	After Sambhal town
4	133+400	LHS	Before Gajraula

2.7.6 Safety aspects in Project Design:

Following safety aspects has been incorporated in project design:

<table>
<tr><th>S. No.</th><th>Design Aspect</th><th>Proposed Locations along the project road</th></tr>
<tr><td>1.</td><td>The toe wall of varying height</td><td>
<table>
<tr><th rowspan="2">S. No.</th><th colspan="2">Design CH. (km)</th><th rowspan="2">Length (m)</th><th rowspan="2">Side</th><th rowspan="2">Height (m)</th><th rowspan="2">Remarks</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td>1</td><td>58+993</td><td>59+023</td><td>30</td><td>RHS</td><td>2</td><td></td></tr>
<tr><td>2</td><td>61+427</td><td>61+537</td><td>110</td><td>RHS</td><td>2.5</td><td>Pond</td></tr>
<tr><td>3</td><td>61+500</td><td>61+549</td><td>49</td><td>LHS</td><td>1</td><td></td></tr>
<tr><td>4</td><td>62+179</td><td>62+276</td><td>97</td><td>RHS</td><td>1</td><td></td></tr>
<tr><td>5</td><td>62+299</td><td>62+430</td><td>131</td><td>LHS</td><td>1</td><td></td></tr>
<tr><td>6</td><td>62+322</td><td>62+420</td><td>98</td><td>RHS</td><td>1</td><td></td></tr>
<tr><td>7</td><td>63+839</td><td>63+900</td><td>61</td><td>LHS</td><td>1</td><td></td></tr>
<tr><td>8</td><td>63+839</td><td>63+955</td><td>116</td><td>RHS</td><td>1</td><td></td></tr>
<tr><td>9</td><td>63+948</td><td>64+010</td><td>62</td><td>LHS</td><td>1</td><td></td></tr>
<tr><td>10</td><td>64+219</td><td>64+305</td><td>86</td><td>RHS</td><td>2</td><td></td></tr>
<tr><td>11</td><td>64+351</td><td>64+447</td><td>96</td><td>RHS</td><td>2</td><td></td></tr>
<tr><td>12</td><td>64+409</td><td>64+491</td><td>82</td><td>LHS</td><td>2</td><td></td></tr>
<tr><td>13</td><td>64+494</td><td>64+580</td><td>86</td><td>RHS</td><td>2</td><td></td></tr>
<tr><td>14</td><td>64+537</td><td>64+619</td><td>82</td><td>LHS</td><td>2</td><td></td></tr>
<tr><td>15</td><td>65+810</td><td>65+861</td><td>51</td><td>RHS</td><td>2</td><td></td></tr>
<tr><td>16</td><td>65+908</td><td>65+960</td><td>52</td><td>RHS</td><td>2</td><td></td></tr>
<tr><td>17</td><td>68+459</td><td>68+521</td><td>62</td><td>RHS</td><td>2</td><td></td></tr>
<tr><td>18</td><td>74+600</td><td>74+691</td><td>91</td><td>LHS</td><td>2</td><td></td></tr>
<tr><td>19</td><td>74+738</td><td>74+830</td><td>92</td><td>LHS</td><td>2</td><td></td></tr>
<tr><td>20</td><td>78+473</td><td>78+522</td><td>49</td><td>LHS</td><td>2.5</td><td>Pond</td></tr>
<tr><td>21</td><td>78+905</td><td>78+930</td><td>25</td><td>RHS</td><td>1</td><td></td></tr>
<tr><td>22</td><td>78+960</td><td>78+990</td><td>30</td><td>LHS</td><td>1</td><td></td></tr>
<tr><td>23</td><td>91+506</td><td>91+628</td><td>122</td><td>RHS</td><td>2</td><td></td></tr>
<tr><td>24</td><td>91+570</td><td>91+647</td><td>77</td><td>LHS</td><td>2</td><td></td></tr>
<tr><td>25</td><td>95+448</td><td>95+505</td><td>57</td><td>LHS</td><td>1</td><td></td></tr>
</table>
</td></tr>
<tr><td>2.</td><td>Crash Barriers (W beam metal crash barrier) provide at curves and at the location where the embankment is greater than 3 meter.</td><td>
<table>
<tr><th>From (Km)</th><th>To (Km)</th><th>Length (m)</th><th>Side</th></tr>
<tr><td>64+530</td><td>64+550</td><td>20</td><td>RHS</td></tr>
<tr><td>69+890</td><td>69+910</td><td>20</td><td>RHS</td></tr>
<tr><td>70+000</td><td>70+050</td><td>50</td><td>RHS</td></tr>
<tr><td>70+150</td><td>70+210</td><td>60</td><td>LHS</td></tr>
<tr><td>91+480</td><td>91+546</td><td>66</td><td>LHS</td></tr>
<tr><td>120+280</td><td>120+446</td><td>166</td><td>LHS</td></tr>
<tr><td>120+491</td><td>120+680</td><td>189</td><td>LHS</td></tr>
<tr><td>129+940</td><td>130+015</td><td>75</td><td>LHS</td></tr>
<tr><td>130+034</td><td>130+100</td><td>66</td><td>LHS</td></tr>
<tr><td colspan="4">Curve<300m</td></tr>
<tr><th>From (Km)</th><th>To (Km)</th><th>Length (m)</th><th>Side</th></tr>
<tr><td>61+149</td><td>61+408</td><td>259</td><td>LHS</td></tr>
<tr><td>61+419</td><td>61+652</td><td>233</td><td>LHS</td></tr>
<tr><td>61+788</td><td>62+076</td><td>287</td><td>LHS</td></tr>
<tr><td>62+134</td><td>62+321</td><td>186</td><td>LHS</td></tr>
<tr><td>67+384</td><td>67+605</td><td>221</td><td>LHS</td></tr>
<tr><td>69+462</td><td>69+489</td><td>28</td><td>RHS</td></tr>
<tr><td>91+546</td><td>91+788</td><td>241</td><td>LHS</td></tr>
<tr><td>95+971</td><td>96+148</td><td>177</td><td>LHS</td></tr>
<tr><td>109+796</td><td>109+925</td><td>129</td><td>LHS</td></tr>
<tr><td>110+569</td><td>110+756</td><td>188</td><td>LHS</td></tr>
<tr><td>113+683</td><td>113+864</td><td>181</td><td>LHS</td></tr>
<tr><td>126+140</td><td>126+198</td><td>58</td><td>RHS</td></tr>
</table>
</td></tr>
<tr><td>3.</td><td>Roadway delineators</td><td>(a) Roadway indicators
Metal roadway indicators with circular cross-section are proposed. These are generally proposed in non-urban sections especially in</td></tr>
</table>

<table>
<tr><th>S. No.</th><th>Design Aspect</th><th>Proposed Locations along the project road</th></tr>
<tr><td></td><td></td><td>curved sections of radius less than 360m.
(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.
(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.
(d) Object Markers
Provided at approaches to intersections along the project road</td></tr>
<tr><td>4</td><td>Rumble Strips</td><td>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.</td></tr>
<tr><td>5</td><td>Traffic Calming Measures proposed
• Gateway Signs
• Gateway Markings
• Speed Calming
• Night time Visibility</td><td>Traffic calming Measures have been proposed at following fourteen built-up areas:
<table>
<tr><th rowspan="2">S. No.</th><th colspan="2">Design Chainage (Km)</th><th rowspan="2">Length (m)</th><th rowspan="2">Name of Village</th></tr>
<tr><th>Start</th><th>End</th></tr>
<tr><td>1</td><td>59+050</td><td>60+300</td><td>1250</td><td>Mau Kather</td></tr>
<tr><td>2</td><td>66+200</td><td>66+960</td><td>760</td><td>Bhajoi</td></tr>
<tr><td>3</td><td>72+270</td><td>73+000</td><td>730</td><td>Bhawan</td></tr>
<tr><td>4</td><td>75+900</td><td>76+700</td><td>800</td><td>Atrasi</td></tr>
<tr><td>5</td><td>77+600</td><td>79+000</td><td>1400</td><td>Pawasa</td></tr>
<tr><td>6</td><td>79+200</td><td>80+600</td><td>1400</td><td>Dhurata</td></tr>
<tr><td>7</td><td>85+300</td><td>92+050</td><td>6750</td><td>Hayat Nagar/ Sambhal</td></tr>
<tr><td>8</td><td>108+500</td><td>110+400</td><td>1900</td><td>Syed Nagli</td></tr>
<tr><td>9</td><td>111+100</td><td>111+500</td><td>400</td><td>Dakka More / Alipur Bhoor Shaark</td></tr>
<tr><td>10</td><td>114+400</td><td>115+500</td><td>1100</td><td>Ujhari</td></tr>
<tr><td>11</td><td>123+700</td><td>126+100</td><td>2400</td><td>Hasanpur</td></tr>
<tr><td>12</td><td>130+600</td><td>131+770</td><td>1170</td><td>Manota</td></tr>
<tr><td>13</td><td>133+100</td><td>134+000</td><td>900</td><td>Sihali Jagar</td></tr>
<tr><td>14</td><td>136+500</td><td>137+525</td><td>1025</td><td>Gajrawa</td></tr>
</table></td></tr>
<tr><td>6</td><td>Road Signs: Cautionary, Mandatory and Informatory Signs</td><td>• Provided all along the project section</td></tr>
</table>

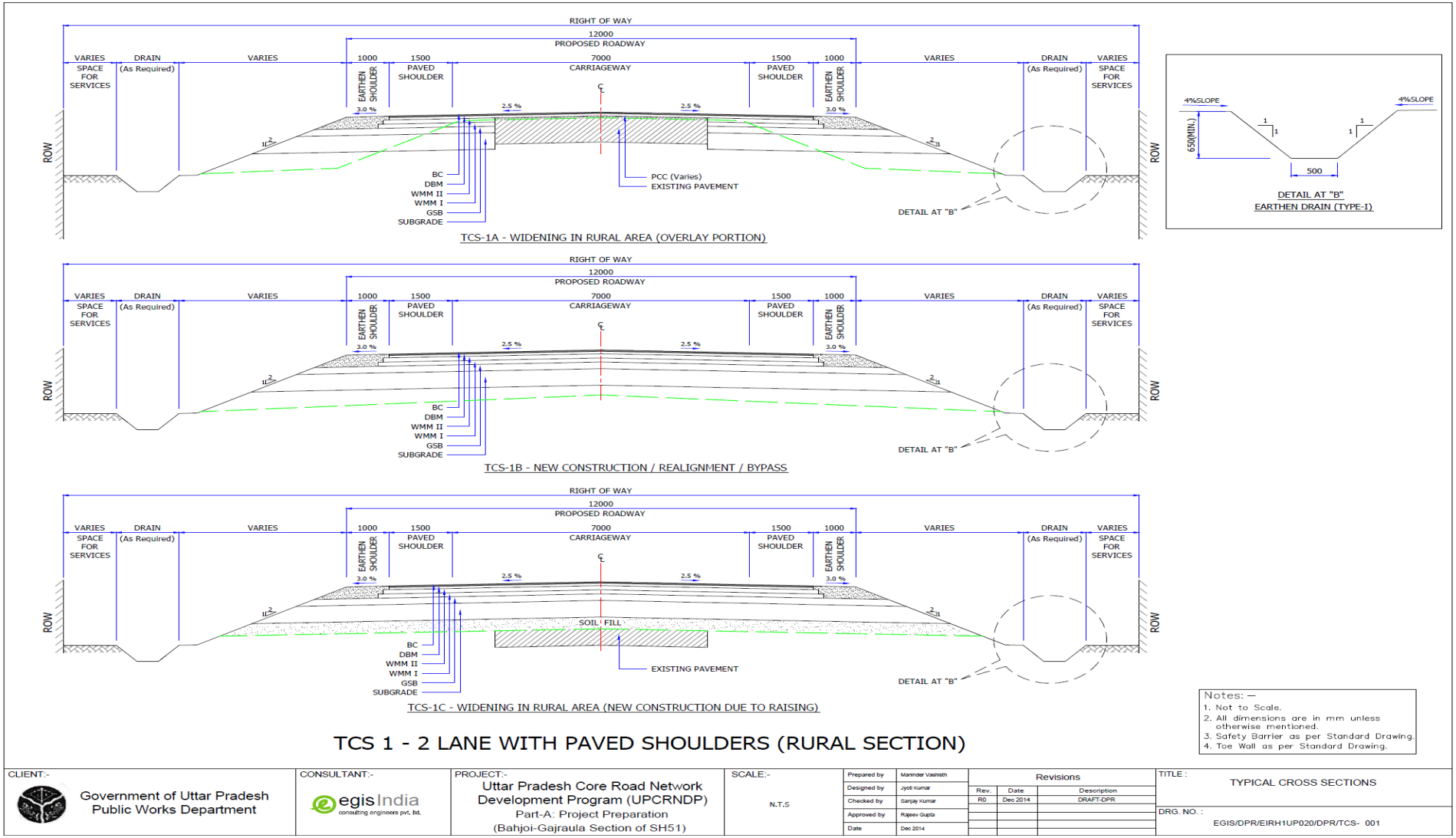
2.8 Typical Cross Section

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: Typical cross-sections

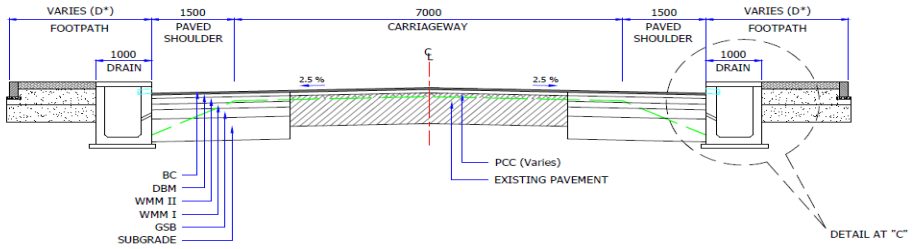
S. No.	Cross Section Type	Description
1.	TCS -1A	Widening in rural area (Overlay portion)
2.	TCS -1B	New construction/Re-alignment/Bypass
3.	TCS-1C	Widening in rural area (New construction due to raising)

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

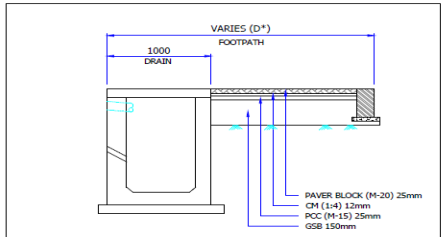


TCS 1 - 2 LANE WITH PAVED SHOULDERS (RURAL SECTION)

CLIENT:- Government of Uttar Pradesh, Public Works Department	CONSULTANT:- egis India consulting engineers pvt. ltd.	PROJECT:- Uttar Pradesh Core Road Network Development Program (UPCRNDP), Part-A: Project Preparation, (Bahjoi-Gajraula Section of SH51)	SCALE:- N.T.S	Prepared by: Maninder Vashisth; Designed by: Jyoti Kumar; Checked by: Sanjay Kumar; Approved by: Rajeev Gupta; Date: Dec 2014	Revisions: Rev. R0, Date Dec 2014, Description DRAFT-DPR	TITLE: TYPICAL CROSS SECTIONS; DRG. NO.: EGIS/DPR/EIRH1UP020/DPR/TCS- 001



(OVERLAY PORTION)

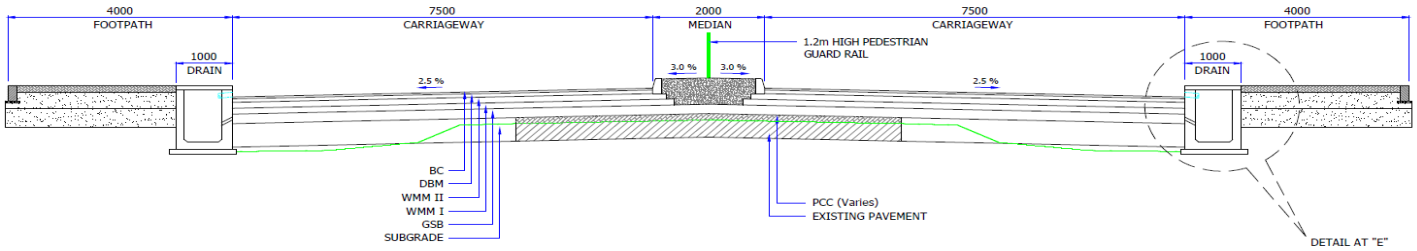


DETAIL AT "C"
(FOR DRAIN DETAILS REFER STANDARD DRAWING)

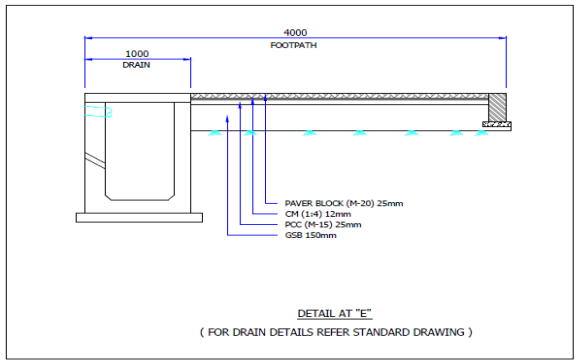
Notes: –
1. Not to Scale.
2. All dimensions are in mm unless otherwise mentioned.
3. D*=varies between 1.5m to 3.0m & Building Line whichever is lesser.
4. Safety Barrier as per Standard Drawing.
5. Toe Wall as per Standard Drawing.

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

CLIENT:-	CONSULTANT:-	PROJECT:-	SCALE:-			Revisions			TITLE :
Government of Uttar Pradesh Public Works Department	egis India consulting engineers pvt. ltd.	Uttar Pradesh Core Road Network Development Program (UPCRNDP) Part-A: Project Preparation (Bahjoi-Gajraula Section of SH51)	N.T.S	Prepared by: Maninder Vashisth Designed by: Jyoti Kumar Checked by: Sanjay Kumar Approved by: Rajeev Gupta Date: Dec 2014		Rev.	Date	Description	TYPICAL CROSS SECTIONS
						R0	Dec 2014	DRAFT-DPR	DRG. NO. : EGIS/DPR/EIRH1UP020/DPR/TCS- 002



(RECONSTRUCTION PORTION)



Notes: –
1. Not to Scale.
2. All dimensions are in mm unless otherwise mentioned.
3. Safety Barrier as per Standard Drawing.
4. Toe Wall as per Standard Drawing.

TCS 2 - 4 LANE WITH PAVED SHOULDERS & FOOTPATH
CUM DRAIN CUM UTILITY DUCT (URBAN / SEMI URBAN)

CLIENT:-	CONSULTANT:-	PROJECT:-	SCALE:-			Revisions			TITLE :
Government of Uttar Pradesh Public Works Department	egis India consulting engineers pvt. ltd.	Uttar Pradesh Core Road Network Development Program (UPCRNDP) Part-A: Project Preparation (Bahjoi-Gajraula Section of SH51)	N.T.S	Prepared by: Maninder Vashisth Designed by: Jyoti Kumar Checked by: Sanjay Kumar Approved by: Rajeev Gupta Date: Dec 2014		Rev.	Date	Description	TYPICAL CROSS SECTIONS
						R0	Dec 2014	DRAFT-DPR	DRG. NO. : EGIS/DPR/EIRH1UP020/DPR/TCS- 002

Figure 2.2: Typical Cross-section

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 Badaun-Bilsi-Bijnour Road (SH-51)

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	2 Ponds and 1 Irrigation canal is located in the project corridor In addition to these water bodies a number of abandoned pits are also located along the project stretch which retains water for brief period during rains which are useful for irrigation around the area.	2 Ponds located at Km 61.500 (RHS) and Km 78.500 (LHS) are very close to the road edge and likely to be impacted due to widening. Toe wall has been suggested to save the pond. Suitable protection measures in design like provision of toe wall/ retaining wall/ widening on opposite side has been recommended.
3	Erosion Prone stretches	Low	Nil	-
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 reduce the additional quantity requirement. Fly ash also	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 and completion of restoration work.

S. No.	Environmental Feature	Category Assigned (High/Medium/ Low)	Significance (based on extent of length affected or numbers involved)	Remark/Explanation
			shall be utilised for construction as two thermal power plants are located within 100 Km radius. This will further reduce required earth quantity.	
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. One pocket of Reserved Forest is located at about 300 meter from Km 133.000 at Sihali Jageer village toward LHS. There will not be any impact on forest land due to the proposed widening.
5	Green Tunnels/ Large Trees	Nil	-	Not any within the project corridor
6	Protected Forests	Medium	Though out the project section (around 15,667 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 25 households and 60 families are likely to be impacted due to acquisition of structures within impact corridor. The affected families are mainly squatters and encroachers.	The project activities will be confined to the available Right of Way (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 36 numbers of educational institutions/ hospitals/ heath 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.

S. No.	Environmental Feature	Category Assigned (High/Medium/ Low)	Significance (based on extent of length affected or numbers involved)	Remark/Explanation
3	Drinking Water sources	Low	About 77 hand pumps are located within ROW, which will likely to be shifted due to proposed widening	This is temporary impact on drinking water source, till relocation. 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.
4	Physical cultural Resources – Religious	Medium	There are 40 religious structures located along the road.	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 along the project road. There are 1117 electrical poles, 77 hand pumps, 38 telephone poles and 36 transformers has been observed with corridor of impact and will likely to be relocated.	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

It is important to note that the Sambhal district was carved out of Moradabad district recently in September, 2011, so most of the district wise data available are for combined district of Moradabad, which also includes Sambhal district's data and the same has been used in EIA report.

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, water bodies, 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 has been 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 (PM_{10}), Particulate Matter ($PM_{2.5}$), Nitrogen oxides (NOx), Sulphur dioxide (SO_2), 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 has been done 20-30 m away from the central line of the existing road. 24 hourly monitoring has been carried out for 3 consecutive days at each location.

Water Quality

Grab sampling from surface water has been collected from 1 pond at Wahpurpatti to assess the surface water quality in the project area. Ground water samples have been collected from handpumps at 3 locations at Bahjoi, Sambhal and Hasanpur. The water samples have been 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 has been tested using the membrane filter method (APHA, 1998).

Soil Quality

The composite soil samples have been collected from 3 locations at Bahjoi, Sambhal and Hasanpur along the project road. It has been 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 have been measured using a noise level meter at 3 locations along the entire stretch of road during day and night time. The selection of sampling locations was based on 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 Bahjoi-Gajraula Section of SH-51

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, establishment and operation of Hot Mix Plant/ Stone crusher Plant /WMM Plant /Batching Plants. etc during construction,	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, establishment and operation of Hot Mix/ Stone crusher/WMM/Batching Plants during construction, etc	UPPCB
Central Motor Vehicle Act Central Motor Vehicle Rules	1988 1989	To check vehicular air and noise pollution.	Yes, For construction vehicles	Transport Department & UPPCB
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 Supermen 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 along with 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 along with 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.

Fly ash Notification, 2009: According to the Notification No. S.O. 763 (E), dated 14.09.1999 and its amendment thereafter on 27.08.2003 and notification S.O. 2804 (E) dated 3rd November 2009 by Ministry of Environment and Forests, it is mandatory to use fly ash within a radius of 100 kilometres of Thermal Power Plant. No agency, person or organization shall within a radius of 100 kilometre of Thermal Power Plant undertake construction or approve design for construction of roads of flyover embankments in contravention of the guidelines/ specification issued by the Indian Road Congress (IRC) as contained in IRC specification No. SP: 58: 2001. Any deviation from this direction can only be agreed to an technical reasons if the same is approved by Chief Engineer (Design) or Engineer-in-chief of the concerned agency or organization or on production of certificate of "Pond ash not available" from the Thermal Power Plant(s) located within 100 kilometres of the site construction. This certificate shall be provided by TPP within two working days from the date of making request for fly ash.

Soil required for top or side cover of embankment of roads or flyovers shall be excavated from the embankment site and it is not possible to do so, only the minimum quantity of the soil required for the purpose shall be excavated from soil borrow area. In either case, the topsoil should be kept or stored separately. Voids created due to soil borrow area shall be filled up with ash with proper compaction and covered with top soil kept separately as mentioned above.

No agency, person or organization shall within a radius of 100 kilometres of coal or lignite based Thermal Power Plant allow reclamation and compaction of low lying areas with soil. Only pond

ash shall be used for compaction. They shall also ensure that such reclamation and compaction is done in accordance with the bye-laws, regulation and specification laid down by Authorities.

All agencies undertaking construction of roads or fly over bridges including Ministry of Shipping Road Transport and Highways (MoSRTH), National Highways Authority of India (NHAI), Central Public Works Department (CPWD), State Public Works Department and other State Government Agencies, shall within three months from the 1st day of September 2003 make provision in their documents, schedules of approved materials and rates as well as technical documents; including those related to soil borrow area or pits.

Make necessary specifications/guidelines for road or fly over embankments that are not covered by the specification laid down by the Indian Road Congress (IRC).

There are two coal based Thermal Power Plant namely NTPC Thermal Power Plant, Dadri at Dadri in Gautam Budha Nagar district and Harduaganj Thermal Power Plant owned by Uttar Pradesh Vidyut Utpadan Nagar Limited (UPVUNL) in Aligarh district located within 100 Km radius of the project road. Therefore use of fly ash in the project is warranted in the project as per above notification.

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 Govemment 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) has been 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 natural resources management to ensure environmentally sustainable development	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 construction) or indirectly (through human activities induced by the project).	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
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:

(i.) **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 EIA study.

(ii.) **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. The Sambhal district is originated from Mordabad district in Sep, 2011, hence the environmental conditions of Moradabad district is given in this section in place of Sambhal district.

5.1 Physical Environment

5.1.1 Physiography

The proposed project alignment is a part of SH-51. The project section starts from Km 58.400 at at Bahjoi and ends at Km 137.820 Gajraula. The entire project stretch is located in the state of Uttar Pradesh. The project alignment falls in administrative jurisdiction of Sambhal District and Amroha district. The Project section from Km 58.400 to Km 110.000 falls in Sambhal district whereas the section from Km 110.000 to Km 137.820 falls in Amroha (Joytiba Phule Nagar) district. The Sambhal district has been formed recently. It was carved out of Moradabad district in September 2011. The district headquarter is located in Sambhal town. The district is bounded on the north by Amroha district, on the northeast by Moradabad, south east by Rampur, north by Badaun and west by Bulandshahr District.

The Amroha district, previously known as Jyotiba Phule Nagar, have district headquarter at Amroha Town. The district is bounded on the north by Bijnor District, on the east and southeast by Moradabad District, on the south by Badaun District, and on the west by the River Ganges, across which lie Bulandshahr, Ghaziabad, and Meerut districts.

The geographical extension of the project section is between 28°20'50.56"N latitude and 78°41'35.69"E longitude at Bahjoi and 28°49'40.98"N Latitude and 78°14'46.86"E longitude at Gajraula. The entire project area is spread in Gangetic plain. General elevation of the project area is 190 m above mean sea level. 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

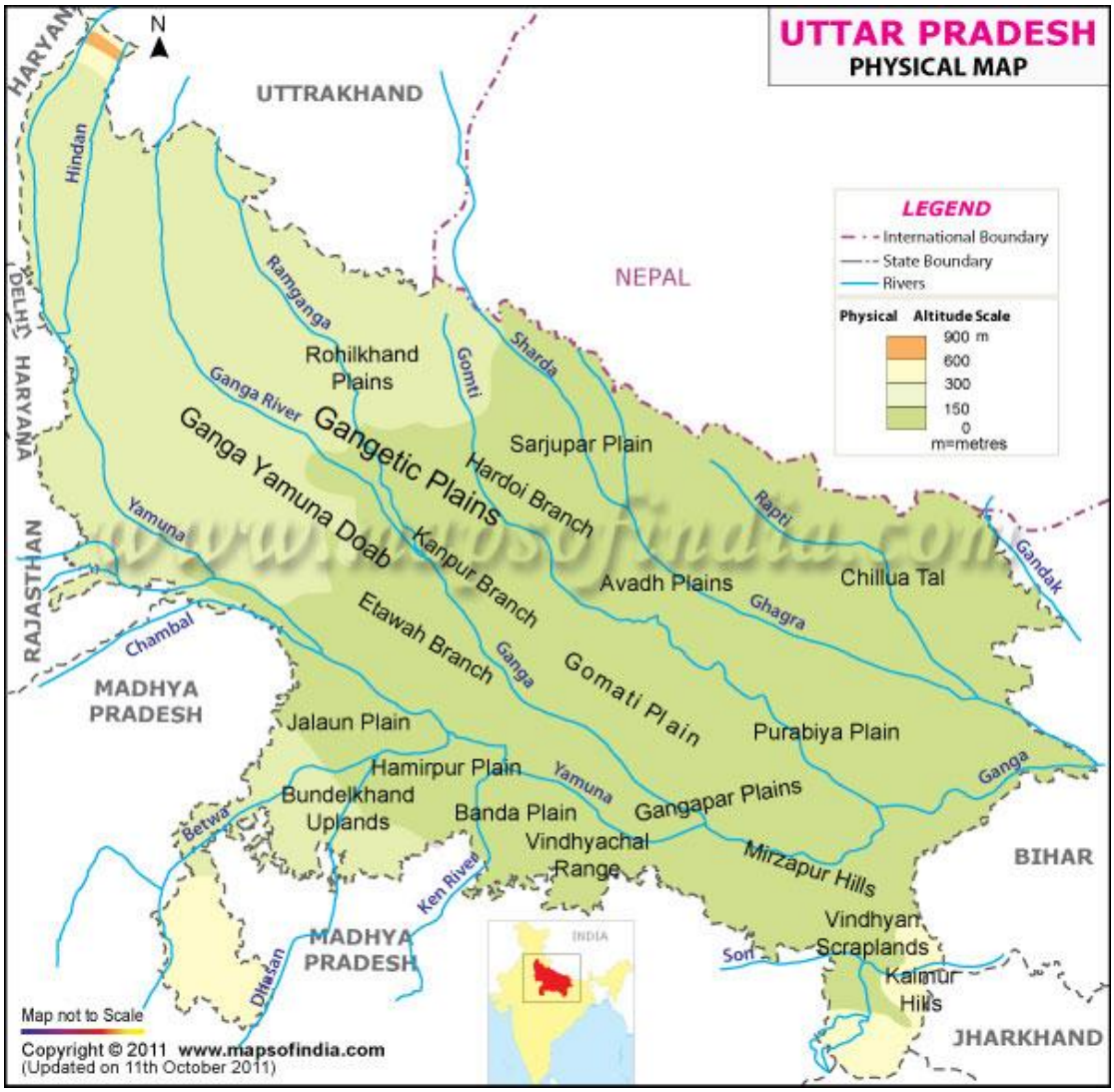


Figure 5.2: Physical Map of Uttar Pradesh

5.1.2 Geology and Seismicity

The entire project area is spread in Gangetic plain. The soil composed of Pleistocene and more recent alluvial sediments transported and deposited by river action from the Himalayan region. These alluvial deposits are unconsolidated. Lithologically, sediments consist of clay, silt and fine to coarse sand. The area is devoid of rocky formation. In the project area only minor minerals are found in the form of gravel and alluvium dun Rock & Mineral map around project section is given in **Figure 5.3**.

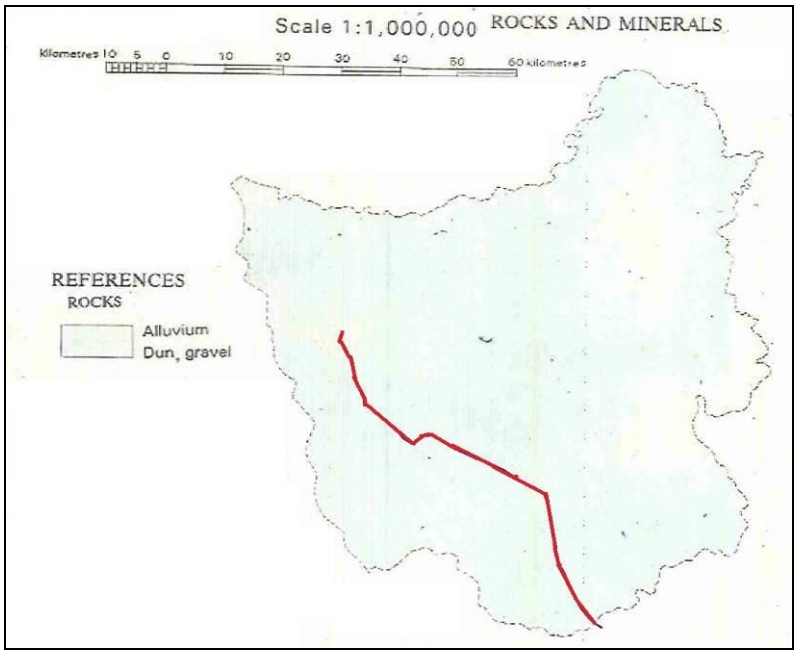


Figure 5.3: Rock & Mineral Map of around Project section

Seismic Zone:

According to *Global Seismic Hazard Assessment Program* (*GSHAP*) data, the state of Uttar Pradesh falls in a region of moderate to high seismic hazard. The districts Amroha and Sambhal lie in Zone IV with high damage risk at scale MSK VIII. The seismic hazard zone of Uttar Pradesh is given in **Figure 5.4**.

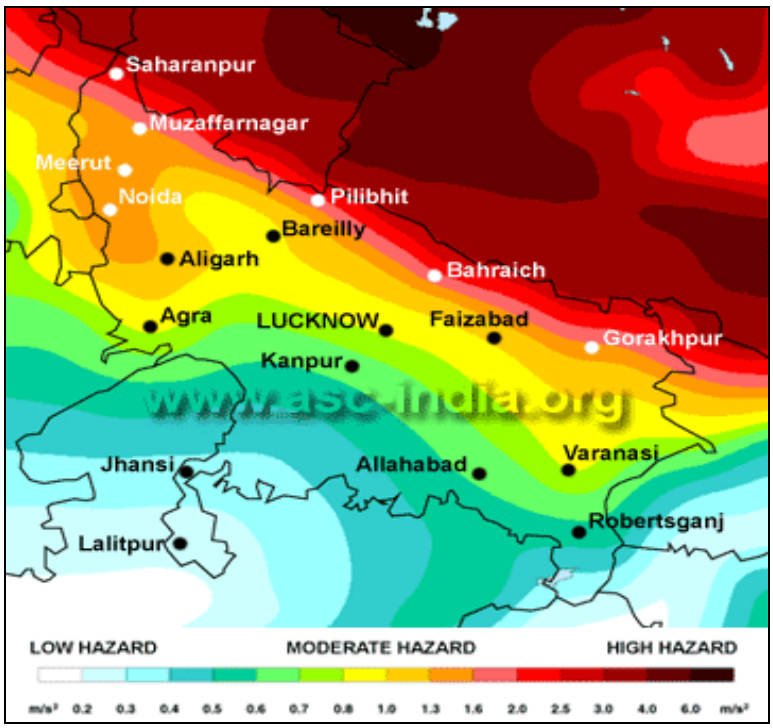


Figure 5.4: Seismic Hazard Zone of Uttar Pradesh

5.1.3 Soils

Land is very fertile in the project area for growing crops. In the project area the soils are predominantly loamy soils. The major soils in the area can be classified as Entisols with younger alluvium., The type of soil in J.P.Nagar district is Sandy loam, Loamy soils, Clay loam and Silty loam soil. The major and minor soils are Loamy and Silty loam soils respectively.

The soil map around project alignment is given in **Figure 5.5**.

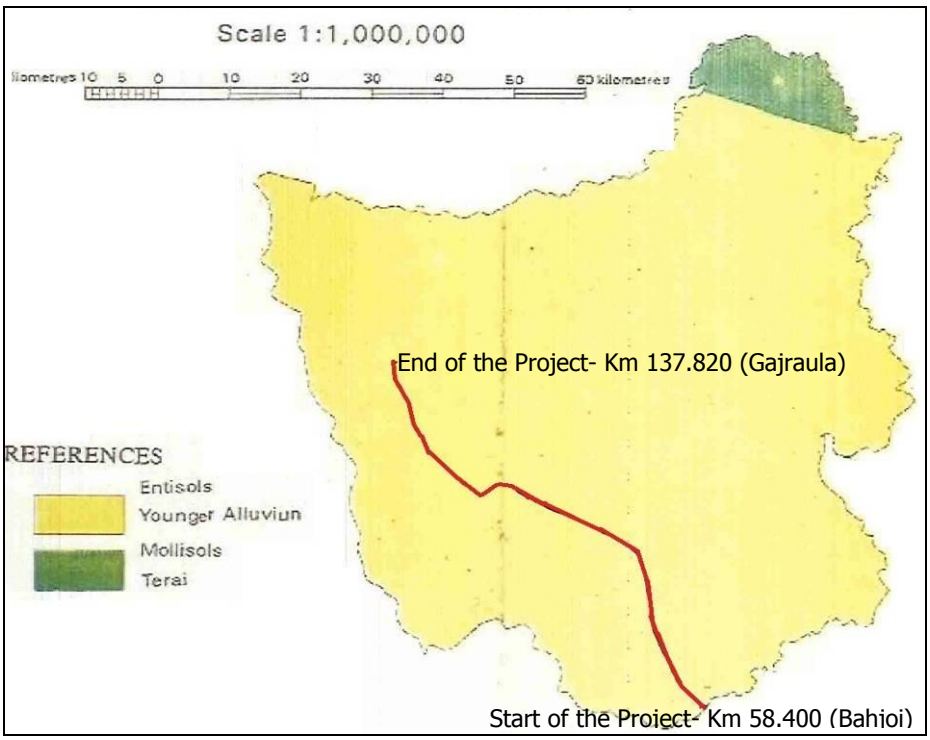


Figure 5.5: Soil Map around Project section

Soil analysis has been 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 15-20 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)	Distance from Highway	Description of Site
SQ-1	Bahjoi	62+500 (LHS)	17 m	Agriculture Land
SQ-2	Sambhal	92+600 (LHS)	20 m	Agricultural & Human habitation area
SQ-3	Hasanpur	125+000 (RHS)	20 m	Agriculture Land

The soil quality analysis shows that at all the locations soil quality are basic in nature at Bahjoi & Sambhal and acidic in nature at Hasanpur 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	Sample Locations		
			S-1	S-2	S-3
1	pH (1:2.5) at26°C		7.58	7.03	6.47
2	Electrical Conductivity at 25°C	µS/cm	99.2	223	91.4
3	Sand	% (w/w)	91.3	70.3	90.2
4	Silt	% (w/w)	4.5	2.9	4.7
5	Clay	% (w/w)	4.2	26.8	5.1
6	Texture		Sand	Sandy Clay Loam	Sand
7	Moisture Retension Capacity	%	7.17	6.75	3.01
8	Bulk Density	g/c.c	1.14	1.18	1.21
9	Porosity	%	52.89	51.04	53.1
10	Organic matter	%	0.81	0.97	0.5
11	Nitrogen	mg/kg	203.8	291.17	133.86
12	Phosphorous	mg/kg	22.6	33.19	15.1
13	Potassium	mg/kg	40	70	20
14	Pb	mg/kg	3.2	8.8	3
15	Fe	mg/kg	<1.4	4.05	<1.4
16	TOC	%	0.47	0.56	0.29
17	Cd	mg/kg	<0.04	<0.04	<0.04
18	Mn	mg/kg	148.86	314.49	175.96
19	Cu	mg/kg	11.97	22.04	5.76
20	Ni	mg/kg	10.99	23.5	5.72
21	Zn	mg/kg	26.81	86.12	23.03
22	Co	mg/kg	5.85	12	3.85

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 calls for a good quality stone.

The potential source for stone aggregates, crushed quarry sand and gravels along the project section has been identified. Sufficient quantities of construction materials are available in these quarries. There is no River sand along the project road and the crushed quarry sand are mainly from identified quarry, which is suitable for road construction.

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 of Borrow Areas between Km. 58+400 to Km 137+500 (Bahjoi-Gajraula) is shown in **Figure 5.6**.

Table 5.3: Soil Borrow Areas around Project Road

S. No.	Chainage	Side	Lead (Km)	Area (Acre)	Village
1	69+000	RHS	0.200	2.5	Partapur
2	71+900	LHS	0.800	2	Partapur
3	75+600	LHS	2.500	5	Ksoli
4	79+800	RHS	1.000	2	Dhuraita
5	85+000	RHS	0.200	10	Hyat Nagar
6	91+050	RHS	0.200	3	Deepsara
7	94+500	LHS	0.800	10	Khagupura
8	100+100	LHS	0.100	5	Gahalua
9	104+850	RHS	0.500	2	Mrzapur-Kakaraua
10	108+800	LHS	0.100	2	Said Nagali
11	115+000	LHS	3.000	3	Ujhari
12	121+200	LHS	2.000	10	Kala Kheda
13	126+500	LHS	3.000	10	Lohari Khadar
14	130+000	LHS	1.000	10	Machharai Farm
15	134+500	LHS	3.000	10	Sahasoli

Table 5.4: Aggregate Quarry Location along the Project Road

S. No.	Source Location	Chainage for lead estimation	Lead (Km)
1	Ramnagar Quarry	98+000	121
2	Haridwar Quarry	98+000	178

Table 5.5: Crushed quarry sand location along the Project Road

S. No.	Source Location	Chainage	Lead (Km)	Side
1	Ramnagar Quarry	98+000	121	Ramnagar Quarry
2	Haridwar Quarry	98+000	178	Haridwar Quarry

Fly Ash

Use of Fly ash in construction of embankment is mandatory as per environmental regulations and Thermal Power Plant producing is situated within 100 km radius of the project road. Fly ash sources at NTPC Thermal Power Plant at Dadri in Gautambudh Nagar district and Harduaganj Thermal Power Plant owned by Uttar Pradesh Vidyut Utpadan Nagar Limited (UPVUNL) in Aligarh district are located within 100 Km range from the project road. Since the existing road is mostly having 7 m carriageway and the improvement is proposed to standard two lanes configuration with paved shoulder along the existing alignment, substantial use of fly ash is not anticipated in this project. Only limited use of fly ash is expected at few locations, where the road profile has been raised due to HFL criteria/ and or approach embankments to structures.

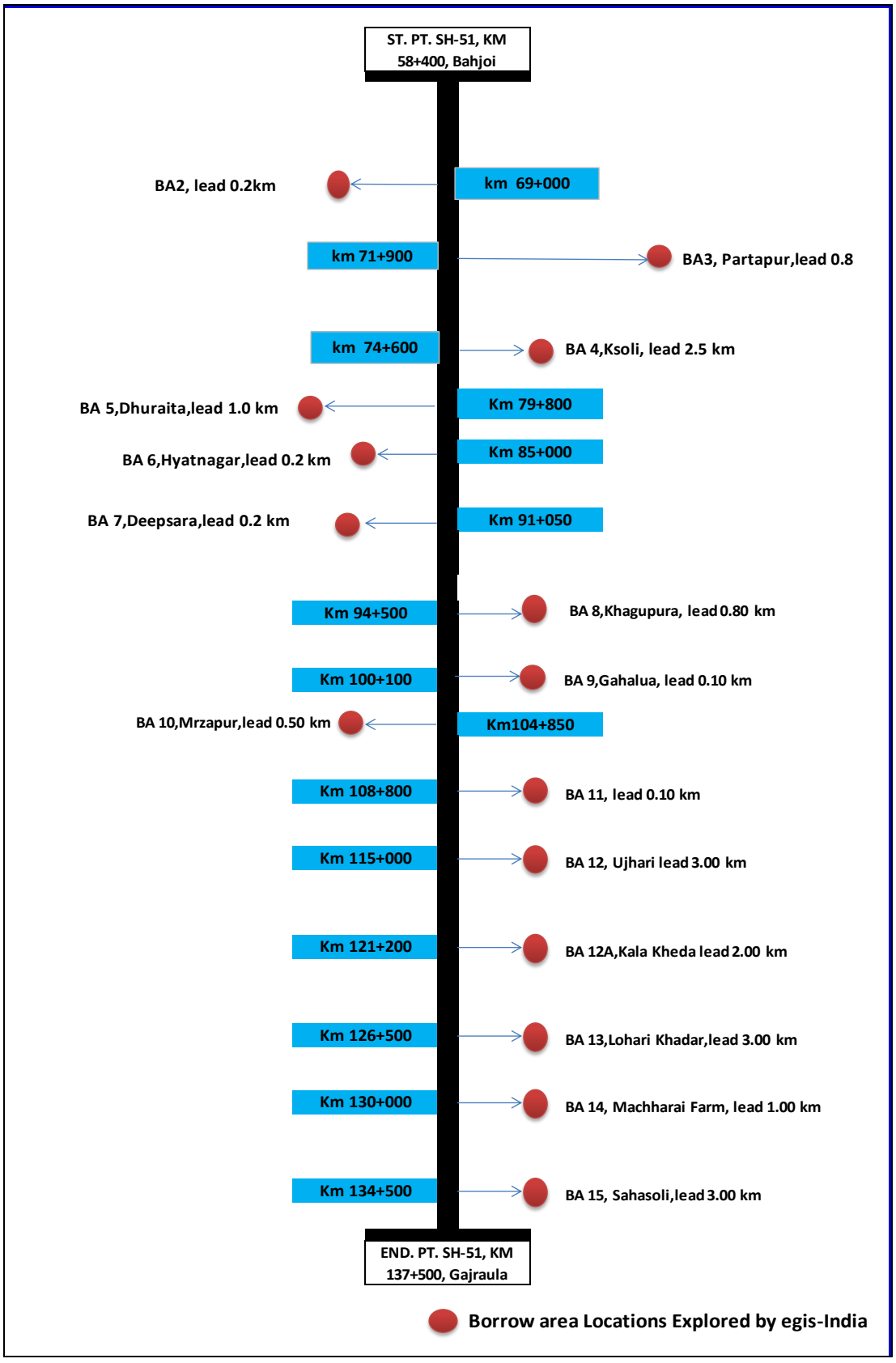


Figure 5.6: Location Chart from Km 58+400 to Km 137+820 (Bahjoi-Gajraula) Showing Various Borrow Areas

5.1.5 Climatic Conditions

Both the concerned district have warm and temperate climate. The entire project area experiences very hot summer in the month of May-June with average maximum temperature varying between 40-45^0 C, however sometimes the temperature shoots up as high as 47^0 C. January being the coldest month when on average the mercury dips as below as 6-8^0 C.

The project area has three distinct seasons.

4. Summer season - Between March to May.
5. South-west Monsoon – Between June to October
6. Winter Season – Between November to February

The average annual temperature in Amroha is 24.4 °C. The average annual rainfall is 990 mm. The average annual temperature in combined district of Moradabad and Sambhal is 24.5°C. The average annual rainfall is 976 mm.

The month wise maximum & minimum temperature and rainfall of Amroha district is presented in Table 5.6. Sambhal district was carved out of Moradabad district recently in in the year of 2011. The districtwise average climatic data is available for combined district of Moradabad and Sambhal. So to represent the climatic details of Sambhal district, monthwise data on combined district of Moradabad and Sambhal is given in Table 5.7.

Table 5.6: Month wise Normal Maximum & Minimum Temperature and Rainfall of Amroha District

Month	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Min Temp (^{0}C)	7.9	9.9	14.6	19.8	24.7	26.7	25.8	25.1	24.0	18.6	11.6	8.4
Max Temp (^{0}C)	20.9	24.1	29.8	35.9	39.7	38.6	33.6	32.2	32.5	31.6	27.5	23.0
Rainfall (mm)	33	16	19	4	11	52	301	274	191	76	5	8

Source: IMD

Table 5.7: Month wise Normal Maximum & Minimum Temperature and Rainfall of Moradabad District

Month	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Min Temp (^{0}C)	8.1	10.1	14.8	20.0	24.7	26.7	25.7	25.2	24.0	18.7	12.0	8.6
Max Temp (^{0}C)	21.1	24.3	30.0	36.2	39.7	38.5	33.4	32.2	32.5	31.6	27.6	23.0
Rainfall (mm)	27	20	16	4	14	86	285	282	170	59	4	9

Source: IMD

The air is very humid during south-west monsoon season and the rest of the period the humidity is comparatively less. The mean monthly relative humidity in the project districts is 69% and mean monthly evening relative humidity is 51%. Winds are generally light with a little strengthening in the summer and monsoon seasons. The mean wind velocity is 5.1 Kmph.

5.1.6 Land Use Pattern

The land use along the project corridor is predominantly agriculture. The districtwise land use pattern with compared to the state's landuse pattern is presented in **Table 5.8**. As mentioned in the earlier section, Sambhal district was carved out of Moradabad district recently, the data on landuse pattern in not available exclusively for Sambhal district. To have an idea of landuse pattern in Sambhal district, the data for combined district of Moradabad and Sambhal (Old Moradabad District) has been used. The map of land use pattern around project section is depicted in **Figure 5.7**.

Table 5.8: Land Use Pattern of UP and Moradabad & Amroha District (Area in '000 ha)

S. No.	Land Classification	Uttar Pradesh		Moradabad		Amroha	
		Area (Thousand Hectares)	Percent (%) of total area for land utilisation	Area (Thousand Hectares)	Percent (%)of total area for land utilisation	Area (Thousand Hectares)	Percent (%)of total area for land utilisation
1.	**Total Area reported for Land Utilization**	**24170**	**100**	**375.979**	**100**	**216.879**	**100**
2.	Forest	1658	5.96	00.064	0.02	20.893	9.63
3.	Barren and Uncultivated land	486	2	3.179	0.85	1.148	0.53
4.	Land under non agriculture uses	2835	12	42.828	11.39	17.439	8.04
5.	Waste land unfit for Agriculture	426	2	1.568	0.42	0.892	0.41
6.	Permanent pastures and grazing land	66	0.27	0.422	0.11	0.196	0.09
7.	Area under trees and grooves	354	1	2.425	0.64	0.215	0.10
8.	Current fallow land	1215	5	8.792	2.34	3.179	1.47
9.	Other than current fallows	538	2	2.024	0.54	1.137	0.52
10.	Net area sown	16592	69	314.677	83.70	171.780	79.21

Source: Statistical Abstract, Uttar Pradesh, 2012, Economics & Statistical Division, Govt. of U.P.

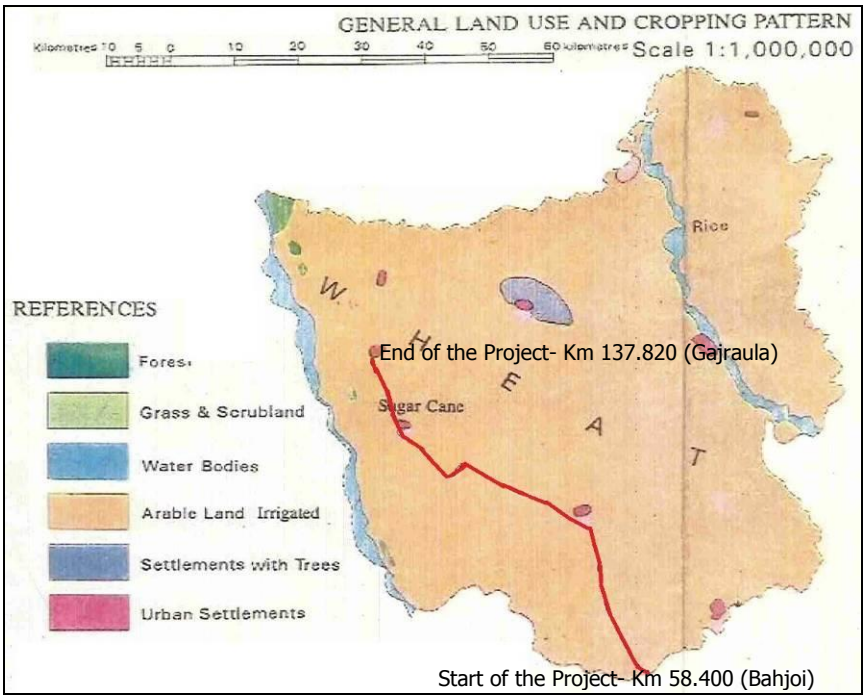


Figure 5.7: General Land Use map around Project section

The inventory of corridor along the project alignment reflects that the land use along the project road is predominantly agriculture (40.5 %) followed by built-up area (38.35%) and water bodies. The land use pattern along the project road is given in **Table 5.9** and **Figure 5.8**.

Table 5.9: Land use along the Project Road

S. No.	Chainage (Km)		Terrain	Land use	Total Length (Km)
	From	To			
1	58+500	59+250	Plain	Agriculture	0.75
2	59+250	60+200	Plain	Built up	0.95
3	60+200	61+400	Plain	Agriculture	1.20
4	61+400	62+000	Plain	Built up	0.60
5	62+000	63+400	Plain	Agriculture	1.40
6	63+400	64+200	Plain	Built up	0.80
7	64200	64+700	Plain	Agriculture	0.50
8	64+700	69+700	Plain	Built up	5.00
9	69+700	72+400	Plain	Agriculture	2.70
10	72+400	73+000	Plain	Built up	0.60
11	73+000	74+800	Plain	Agriculture	1.80
12	74+800	76+800	Plain	Built up	2.00
13	76+800	77+800	Plain	Agriculture	1.00
14	77+800	79+000	Plain	Built up	1.20
15	79+000	79+300	Plain	Agriculture	0.30
16	79+300	80+600	Plain	Built up	1.30
17	80+600	81+100	Plain	Agriculture	0.50
18	81+100	82+200	Plain	Built up	1.10
19	82+200	83+600	Plain	Agriculture	1.40
20	83+600	85+100	Plain	Built up	1.50
21	85+100	85+400	Plain	Agriculture	0.30
22	85+400	93+500	Plain	Built up	8.10

S. No.	Chainage (Km)		Terrain	Land use	Total Length (Km)
	From	To			
23	93+500	94+200	Plain	Agriculture	0.70
24	94+200	95+200	Plain	Built up	1.00
25	95+200	95+800	Plain	Agriculture	0.60
26	95+800	97+000	Plain	Built up	1.20
27	97+000	98+900	Plain	Built up	1.90
28	98+900	99+300	Plain	Built up	0.40
29	99+300	100+650	Plain	Agriculture	1.35
30	100+650	101+300	Plain	Built up	0.65
31	101+300	101+800	Plain	Agriculture	0.50
32	101+800	102+200	Plain	Built up	0.40
33	102+200	102+750	Plain	Agriculture	0.55
34	102+750	103+600	Plain	Built up	0.85
35	103+600	104+500	Plain	Agriculture	0.90
36	104+500	105+300	Plain	Built up	0.80
37	105+300	106+100	Plain	Agriculture	0.80
38	106+100	106+600	Plain	Built up	0.50
39	106+600	107+100	Plain	Agriculture	0.50
40	107+100	107+600	Plain	Built up	0.50
41	107+600	110+300	Plain	Agriculture	2.70
42	110+300	111+750	Plain	Built up	1.45
43	111+750	113+300	Plain	Agriculture	1.55
44	113+300	114+200	Plain	Built up	0.90
45	114+200	116+100	Plain	Agriculture	1.90
46	116+100	117+650	Plain	Built up	1.55
47	117+650	120+600	Plain	Agriculture	2.95
48	120+600	121200	Plain	Built up	0.60
49	121+200	122+400	Plain	Agriculture	1.20
50	122+400	123+700	Plain	Built up	1.30
51	123+700	124+700	Plain	Agriculture	1.00
52	124+700	127+400	Plain	Built up	2.70
53	127+400	132+600	Plain	Agriculture	5.20
54	132+600	133+400	Plain	Built up	0.80
55	133+400	137+500	Plain	Agriculture	4.10

Source: Primary data collection

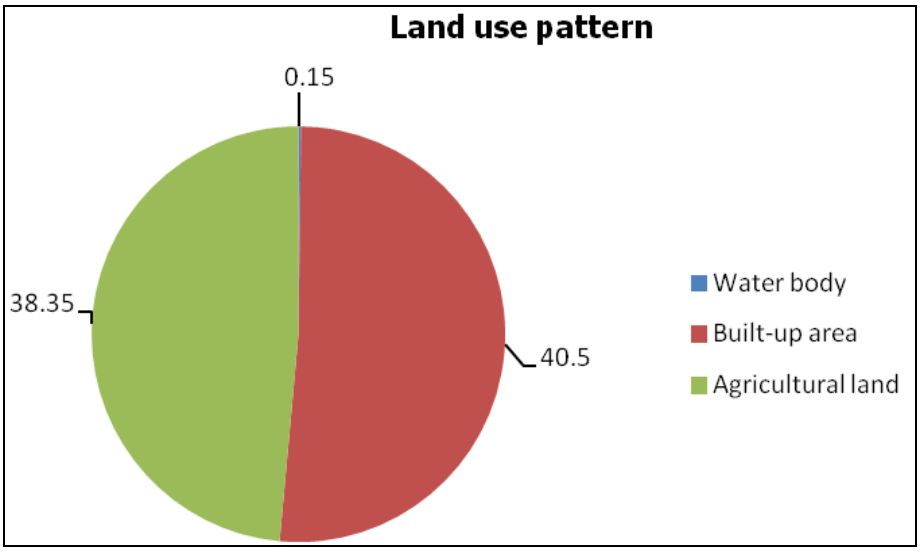


Figure 5.8: Land Use Pattern along the Project Section

5.1.7 Surface Water Bodies

The project districts Sambhal (Moradabad) and Amroha (Joytiba Phule Nagar) is drained by Ganga basin. There is no river located along the project corridor. However few irrigation canals cross the project road. There are two ponds located in the vicinity of the project road within the corridor of 10 m on eitherise of existing centre line of the road. The pond at Wahpurpatti stores contains rain water for around 8 months in a year as per local enquiry. The water from this pond is being used by the local community for bathing, washing of cloths and utensils and cattles. The pond at Pawasa receives waste water discharge from the village settlements. In addition to these water bodies a number of abandoned pits are also located along the project stretch which retains water for brief period during rains which are useful for irrigation around the area. The list of water bodies along the project corridor is presented in **Table 5.10**.

Table 5.10: Water Bodies along the Project Road

S. No.	Water bodies	Chainage (Km)	Distance from CL (m)	Width of River/Stream/ Canal (m)	LHS/RHS
	Ditch	59.280	8.0		RHS
1	Pond	61.500 (Wahpurpatti Village)	5.50		RHS
	Ditch	64.830	8.5		LHS
	Ditch	75.210	9.0		LHS
2	Pond	78.500 (Pawasa Village)	9.00		LHS
3	Nallah	89.860	-	9.6	Crosses
4	Water Channel	103.450	-	6.8	Crosses
5	Irrigation Canal	120.468		44.1	Crosses
6	Ditch	113.700	8.0		RHS
6	Irrigation Canal	130.000	-	16.5	Crosses

Primary data generation on surface water quality has been carried out in the month of November, 2014 in order to assess the surface water quality within the project area. The water sample has been collected from pond at Wahpurpatti to assess the physico-chemical characteristic of water and the details of the same is given in **Table 5.11.** The analysis result of various quality parameters has been presented in **Table 5.12**.

Pond at Km 61+500 (RHS)

Pond at Km 78+500 (LHS)

Table 5.11: Surface Water Sampling along the Project

S. No.	Sample Code	Source	Location (Name)	Chainage (Km)
1.	SW	Community Pond	Wahpurpatti, Bahjoi	61+500 (RHS)

Table 5.12: Characteristics of Surface Water in the Project Area

S. No.	Parameters	Unit	Sample Locations
			SW
1	Temperature	° C	26
2	pH at 26^0C		8.20
3	Turbidity	NTU	16.5
4	Electrical Conductivity at 25° C	µs/cm	1014.0
5	Colour	Hazen	<1.0
6	Total Suspended Solids (as TSS)	mg/l	41.5
7	Total Dissolved Solids (as TDS)	mg/l	580
8	Odour		Unobjectionable
9	Dissolved Oxygen	mg/l	6.9
10	Biochemical Oxygen Demand (for 3 days at 27^0C)	mg/l	5.96
11	Chemical Oxygen Demand	mg/l	27.89
12	Total Kjeldahl Nitrogen	mg/l	3.45
13	Total Hardness (as $CaCO_3$)	mg/l	207.76
14	Sodium (as Na)	mg/l	85
15	Potassium	mg/l	150
16	Calcium (as Ca)	mg/l	42.34
17	Magnesium	mg/l	24.46
18	Ammonia	mg/l	2.15
19	Chloride (as Cl)	mg/l	104.47
20	Sulfate (as SO_4)	mg/l	14.22
21	Phosphate	mg/l	10.6
22	Nitrate (as NO3)	mg/l	4.15
23	Fluoride (as F)	mg/l	0.49
24	Surfactants	mg/l	<0.02
25	Dissolved Iron	mg/l	0.11
26	Copper (as Cu)	mg/l	<0.02
27	Zinc (as Zn)	mg/l	<0.02
28	Manganese (as Mn)	mg/l	0.13
29	Arsenic (as As)	mg/l	<0.01
30	Lead (as Pb)	mg/l	<0.005
31	Mercury (as Hg)	mg/l	<0.001
32	Boron (as B)	mg/l	<0.5
33	Chromium (as Cr)	mg/l	<0.01
34	Phenols	mg/l	<0.001
35	Cadmium (as Cd)	mg/l	<0.001
36	Total coliform	MPN/100ml	<2
37	Faecal Coliform	/100ml	Absent

The analysis result reflects that the pond water meet the quality criteria for Class C and D (Propagation of Wildlife and Fisheries) of surface water. The pH is in basic nature (8.20), Dissolve Oxygen is above 4.0 mg/l (6.9 mg/l) and Biological Oxygen Demand (BOD) is 5.96 mg/l and 27.89 mg/l respectively. All the other measured parameters were observed well within the prescribed limit of water quality standards. The pond is not used for any domestic use, however, it is used for animal bathing/house hold utensil and cloth washing.

5.1.8 Groundwater Sources

The water table varies between 3 m to 15 m below ground level along the project area. The declining trend on ground water regime due to over-exploitation in the project districts has been reported by the Central Ground Water Board, Government of India. The blocks of concerned district of Uttar Pradesh falling in Over-exploited, Critical and Semi-critical categories is given in Table 5.13 along the project corridor Sambhal and Bahjoi blocks fall in over-exploited category and Hasanpur block falls in semicritical zone with respect to extraction of ground water. Rest of the blocks come under safe category. No area along the project corridor is notified for groundwater regulation by the Central Ground Water Board.

Table 5.13: District & Blocks Falling in Over-exploited, Critical and Semi-critical Categories

S. No.	District	Over exploited	Critical	Semi-critical
1	Amroha (Jyotiba Phule Nagar)		Joya	Gangeshwari
				Hasanpur
2	Moradabad (Sambhal)	Sambhal		Dingerpur
		Bahjoi		

Source: http://cgwb.gov.in/nr/gwresource.htm

5.1.8.1 Ground Water Quality

The ground water samples were collected from hand pumps at 3 locations along the project road, which is given in **Table 5.14**. The Physico-Chemical characteristic of ground water samples is presented in **Table 5.15**.

Table 5.14: Locations of Ground Water Sampling

S. No.	Chainage (Km)	LHS/RHS	Location (Name)	Sources
1.	64+100 (GW1)	RHS	Bahjoi	Hand Pump
2.	88+400 (GW2)	RHS	Sambhal	Hand pump
2.	124+700 (GW3)	RHS	Hasanpur	Hand Pump

Table 5.15: Physico-Chemical Characteristics of Ground Water Samples

Parameters	Unit	Concentrations at different Sample Locations			Water Quality Standard as per BIS (IS: 10500:1991)	
		GW 1	GW 2	GW 3	Desirable Limit	Max. Permissible Limits in the absence of alternate source
Temperature	° C	29	28	28		
pH at 25^{0}C		7.37	7.23	7.02	6.5 to 8.5	No relaxation
Turbidity	NTU	<1.0	3.3	<1.0	5	10
Electrical Conductivity at 25° C	µs/cm	667.0	977	1849		
Colour	Hazen	<1.0	<1.0	<1.0	5	25
Total Suspended Solids (as TSS)	mg/l	<2.5	3.1	<2.5		
Total Dissolved Solids (as TDS)	mg/l	360.00	500	972	500	2000

Parameters	Unit	Concentrations at different Sample Locations			Water Quality Standard as per BIS (IS: 10500:1991)	
		GW 1	GW 2	GW 3	Desirable Limit	Max. Permissible Limits in the absence of alternate source
Odour		Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable
Dissolved Oxygen	mg/l	6.2	6	6.4		
Biochemical Oxygen Demand (for 3 days at 27^0C)	mg/l	<2.0	<2.0	<2.0		
Chemical Oxygen Demand	mg/l	<4.0	<4.0	<4.0		
Total Kjeldahl Nitrogen	mg/l	<0.3	<0.3	<0.3		
Total Hardness (as CaCO3)	mg/l	290.08	411.6	635.04	300	600
Sodium (as Na)	mg/l	22	37	150		
Potassium	mg/l	15	6	10.0		
Calcium (as Ca)	mg/l	79.97	98.78	163.07	75	200
Magnesium	mg/l	21.64	39.51	54.57		
Ammonia	mg/l	<0.1	<0.1	<0.1		
Chloride (as Cl)	mg/l	66.48	62.68	170.95	250	1000
Sulfate (as SO4)	mg/l	16.54	67.32	102	200	400
Phosphate	mg/l	<0.15	<0.15	<0.15		
Nitrate (as NO3)	mg/l	21.53	46.08	47.51	45	100
Fluoride (as F)	mg/l	0.51	0.41	0.31	1.0	1.5
Surfactants	mg/l	<0.02	<0.02	<0.02		
Dissolved Iron	mg/l	<0.05	<0.05	0.10	0.3	1.0
Copper (as Cu)	mg/l	<0.02	<0.02	<0.02	0.05	1.5
Zinc (as Zn)	mg/l	1.67	0.06	0.23	5.0	15.0
Manganese (as Mn)	mg/l	0.15	<0.02	0.49	0.10	0.3
Arsenic (as As)	mg/l	<0.01	<0.01	<0.01	0.05	No relaxation
Lead (as Pb)	mg/l	<0.005	<0.005	<0.005	0.05	No relaxation
Mercury (as Hg)	mg/l	<0.001	<0.001	<0.001	0.001	No relaxation
Boron (as B)	mg/l	<0.5	<0.5	<0.5	1.0	5.0
Chromium (as Cr)	mg/l	<0.01	<0.01	<0.01	0.05	No relaxation
Phenols	mg/l	<0.001	<0.001	<0.001	0.001	0.002
Cadmium (as Cd)	mg/l	<0.001	<0.001	<0.001	0.01	No relaxation
Total coliform	MPN/ 100ml	<2	<2	<2		
Faecal Coliform	/100 ml	Absent	Absent	Absent		

The test results of the ground water samples at all the locations reflect that the pH is within permissible limit. The same varied between 7.02 to 7.37. The Total dissolve solid varied from 360.0 mg/l to 972.0 mg/l at different locations along the project road. The water sample collected from Hasanpur showed TDS in the range of 972 mg/l, which is higher that the desirable level but within the maximum permissible level as per IS:10500. The Total hardness (as $CaCO_3$) ranged from 290.08 mg/l to 635.04 mg/l at different locations along the project road. At Hasanpur village at Km 124.700, the total hardness is more than the maximum permissible limit of 600 mg/l as per

IS: 10500. The Fluoride concentration 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 Pardesh suffers from high dust problem. The state Pollution Control Board conducts regular monitoring of ambient air quality in major towns of the state which include the ambient air quality of Gajraula & Moradabad. The annual average of ambient air quality for the Year 2013 as reported by the State Pollution Control Board at these two towns in is given in **Table 5.16**.

Table 5.16: Ambient air quality of Gajraula & Moradabad district (Year 2013)

S. No.	Name of the City	Location	Class	(µg/m^3)		
				PM_{10}	SO_2	NO_2
1.	Gajraula	Raunak Auto	Industrial	131.3	15.5	24.2
		Indra Chowk	Commercial	141.4	17.9	26.5
2.	Moradabad	PTC	Residential	128.8	10.9	17.9
		Buddha Bazar	Commercial	202.1	21.3	23.7

Source: http://www.uppcb.com/ambient_quality.htm

The monitoring results clearly reflect that the concentration of PM_{10} was higher than the prescribed limit at Gajraula and Moradabad. The concentrations of SO_2 and NO_2 in the air were found within the prescribed limit.

To study the baseline ambient air quality scenario within the project area along project road, the ambient air quality of post monsoon air sampling has been carried out in the month of November, 2104. To generate post monsoon air quality of the project area, samples of ambient air has been collected from three locations covering representative locations with respect to land use and location of sensitive receptors along the project. The air sampling locations with respect to the proposed project road has been presented in **Table 5.17.** The air quality analysis report is given **Table 5.18**.

Table 5.17: Ambient Air Quality Sample Location

S. No.	Monitoring Station Code	Chainage (Km)	Location (Name)	Type of Area
1.	AQ-1	64+100	Bahjoi	Habitation Area/ Primary school
2.	AQ-2	89+000	Sambhal	Commercial and mixed Area
3.	AQ-3	124+600	Hasanpur	Residential Area

Table 5.18: Ambient Air Quality at Different Locations along Project Corridor

S. No.	Location	Chainage (Km)	Concentration Level	Concentration					
				PM_{10} (µg /m^3)	$PM_{2.5}$ (µg /m^3)	SO_2 (µg /m^3)	NOx (µg /m^3)	CO (mg /m^3)	HC (ppm)
1.	Bahjoi	64+100	Maximum	105	56	6.3	25.5	0.68	627
			Minimum	88	55	5.5	21.2	0.41	490
			Mean	95	55	5.9	21.8	0.554	573
2	Sambhal	89+000	Maximum	159	82	8.1	28.0	0.77	784
			Minimum	125	65	4.6	22.1	0.60	536
			Mean	138	72	6.1	25.2	0.688	649

S. No.	Location	Chainage (Km)	Concentration Level	Concentration					
				PM_{10} (µg /m^3)	$PM_{2.5}$ (µg /m^3)	SO_2 (µg /m^3)	NOx (µg /m^3)	CO (mg /m^3)	HC (ppm)
3	Hasanpur	124+600	Maximum	105	58	6.2	25.9	0.52	784
			Minimum	89	53	4.6	17.5	0.45	470
			Mean	97	56	5.2	21.7	0.488	597
			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 PM_{10} in ambient air varied between 95.00 µg/m^3 and 138.0 µg/m^3 along the project alignment. At all three locations the concentration of PM_{10} was higher than the National Ambient Air Quality Standards i.e. 100 µg/m^3. The highest concentration of PM_{10} is observed at Sambhal at Km 89.00, which is 159.00 µg/m^3. Higher concentration of PM_{10} may be attributed to heavy population, junctions and commercial activities and bad road condition. The concentration of $PM_{2.5}$ concentrations varied between 56.0 µg/m^3 to 82.0 µg/m^3. Shambal showed higher concentration than the National Ambient Air Quality Standards i.e. 60 µg/m^3. It is congested built-up area and traffic congestion and exposed surface of road may be the reason for the higher concentration of $PM_{2.5.}$ Rest of the other quality parameters monitored have been 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 5.19**. The Day time and Night time noise level is presented in **Table 5.20**.

Table 5.19: Noise Monitoring Locations

S. No.	Location Code	Chainage (Km)	Location (Name)	Distance from Highway Edge (m)	Direction from Highway	Land use
1.	NQ-1	64+100	Bahjoi	12	LHS	Sensitive location (School)
2.	NQ-2	89+700	Sambhal	10	RHS	Residential, Mixed & Sensitive location (School)
3.	NQ-3	121+700	Hasanpur	7	RHS	Residential & Sensitive location (School)

Table 5.20: Noise Level along Project Alignment

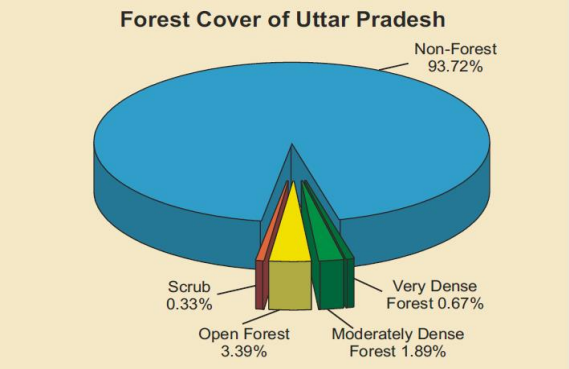
Station Code	Place	Equivalent Noise Level (Leq dB(A))			
		Mean Daytime	Mean Nighttime	Max.	Min.
NQ-1	Bahjoi	54.6	44.0	59.7	40.1
NQ-2	Sambhal	62.4	52.6	69.6	46.9
NQ-3	Hasanpur	57.2	44.8	61.5	40.7
Permissible Limits as per CPCB in Leq dB(A) Day Time & Night Time			**Zone**	**Day Time**	**Night Time**
			Commercial Zone	**65.0**	**55.0**
			Residential Zone	**55.0**	**45.0**
			Silence Zone	**50.0**	**40.0**

The ambient noise levels at all the monitoring locations were within the permissible level of commercial and mixed activities zone as stipulated by Central Pollution Control Board. The average daytime equivalent noise levels were recorded in the range of 54.6 Leq dB(A) to 62.4 Leq dB(A), whereas the same varied from 44.0 Leq dB(A) to 52.6 Leq dB(A) during night time. Sambhal, which represent the area of residential, commercial and mixed activities, showed highest noise levels as compared to other monitoring locations. the daytime equivalent noise was above the permissible limit. Biological Environment

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

5.1.11 Forest Cover

The proposed project road of Bahjoi-Gajraula section of SH-51 is located in the state of Uttar Pradesh. As per Indian State of Forest Report 2013, the total forest cover in Uttar Pradesh is only 5.96 percent of its geographical area. Out of which very dense forest is 1,623 km^2, moderately dense forest covers 4,550 km^2 and open forest covers 8,176 km^2. The graphical representation is shown in **Figure 5.9.** The forest cover map of Uttar Pradesh is shown in **Figure 5.10.**



Source: India State Forest Report 2013

Figure 5.9: 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 5.21**. Due to unavailability of exclusive data on forest cover of Sambhal district, the forest cover of combined district of Moradabad and Sambhal is given below. The report reflects that forest cover in Amroha (Joytiba Phule Nagar) and Moradabad district is only 3.82 percent and 0.70 percent of total geographical area which is less than the state's forest coverage (5.96% of geographical area). There is one pocket of reserved forest located about 300 m away from the project section at Km 133.000 on left hand side at Sihali Jageer village, but is away from the impact corridor. The reserved forest is open shrubs forest.

Table 5.21: District-wise Forest Coverage along Project Road

State/ District	Geographical Area	Very Dense Forest	Moderately Dense Forest	Open Forest	Total	Percent of Geographical area
Amroha (Joytiba Phule Nagar)	2249	0	24	62	86	3.82
Combine district of Moradabad	3718	0	5	21	26	0.70
Uttar Pradesh	**240928**	**1623**	**4550**	**8176**	**14349**	**5.96**

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

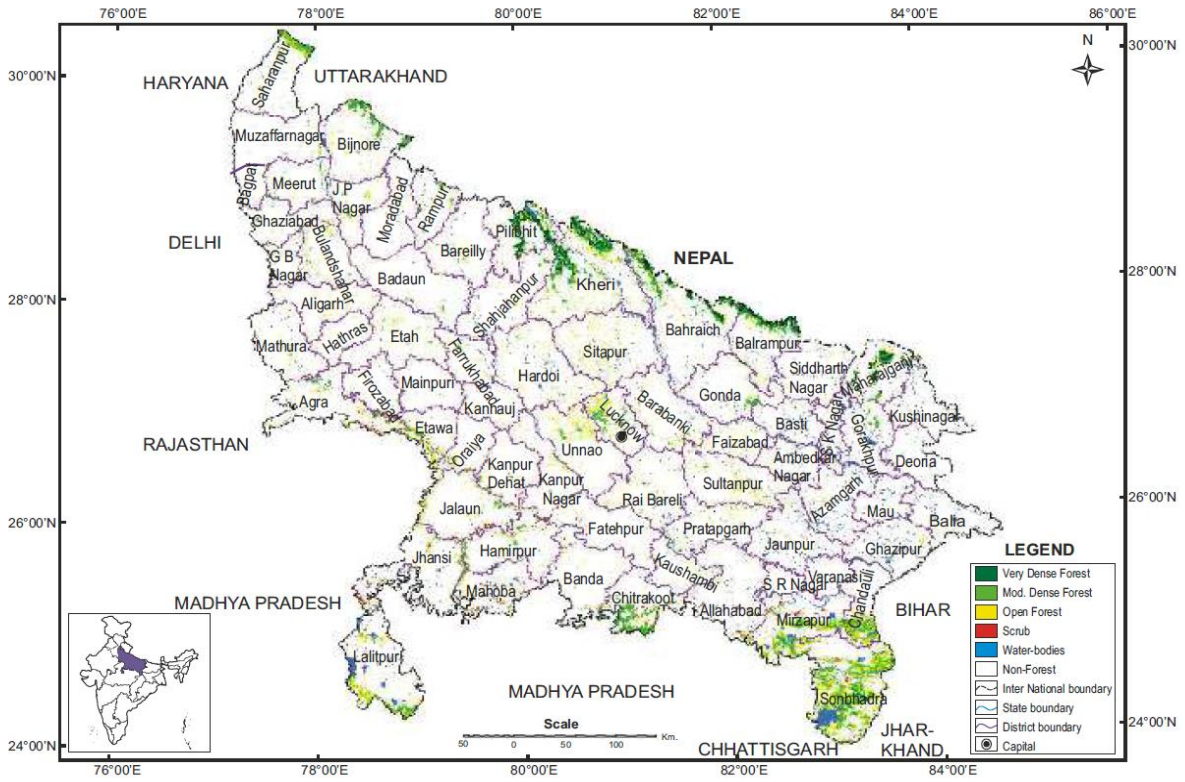


Figure 5.10: Forest Cover Map of Uttar Pradesh

5.1.12 Reserve Forest

The project stretch does not pass through reserve forest. As explained in gthe previous section there is one pocket of reserved forest located about 300 m away from the project section at Km 133.000 on left hand side at Sihali Jageer village, but is away from the impact corridor and no impact on this forest is anticipated due top proposed widening.

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

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.

Uttar Pradesh has one National Park and 23 Wildlife Sanctuary. The nearest wildlife sanctuary is "Hastinapur Wildlife Sanctuary" which is located in Amroha (Joytiba Phule Nagar) district. The boundary of this wildlife sanctuary falls in Meerut, Ghaziabad, Bijnore and Amroha (Jyotiba Phule Nagar) districts. The outer boundary of this wildlife sanctuary is located about 12 Kms away from end of the project.

5.1.14 Threatened or Endangered Species

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

5.1.15 Wetlands of Ecological Importance

The total wetland in Moradabad and Amroha (Joytiba Phule Nagar) district is 7174 ha. and 11026 ha. respectively. Major wetland type of the district is River/Stream and Lake/Ponds[2]. As per

[2] http://envfor.nic.in/downloads/public-information/NWIA_Uttar_Pradesh_Atlas.pdf

Ramsar list of wetlands of international importance, there is no wetland in both the district (Amroha and Moradabad).

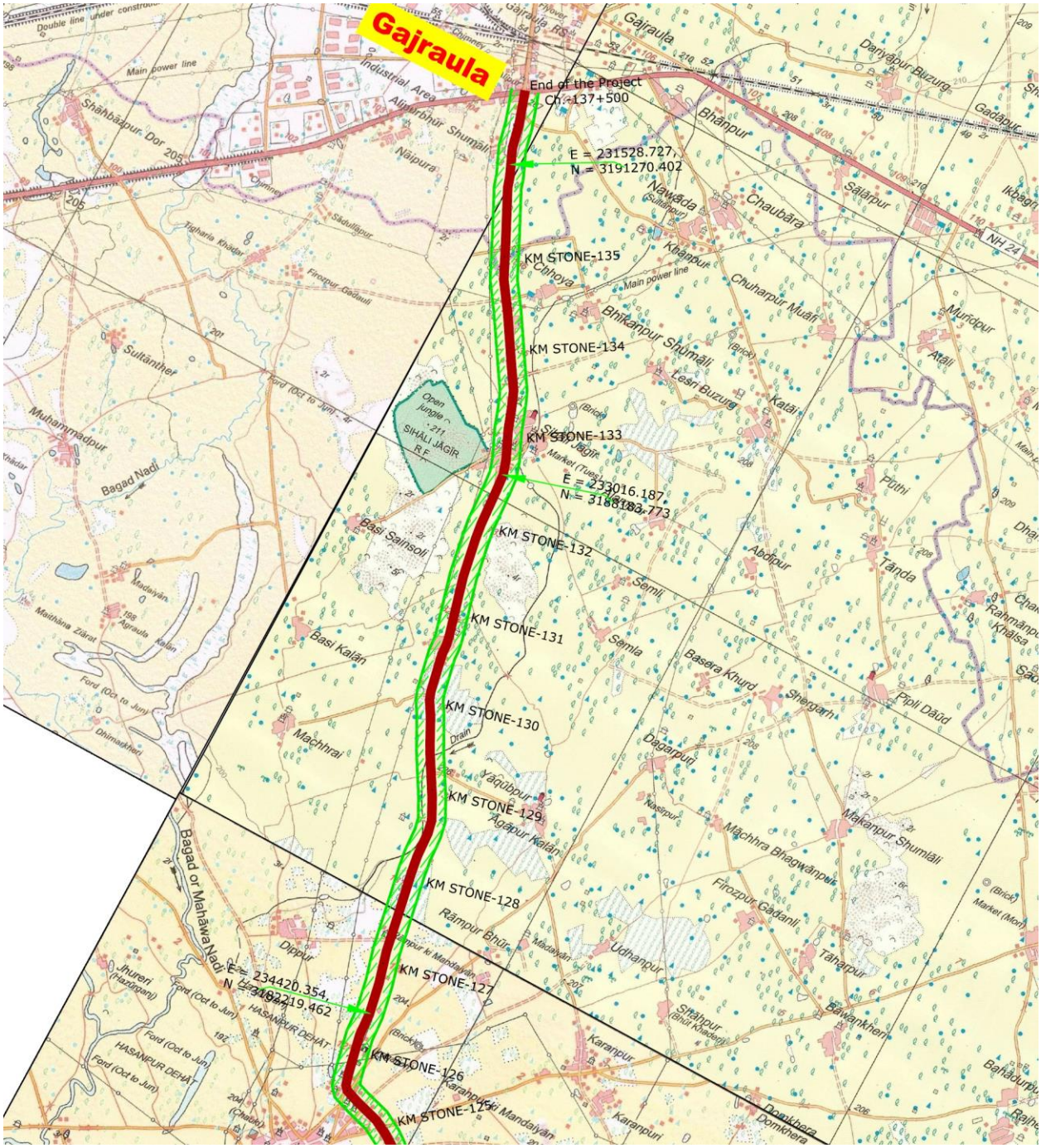


Figure 5.11: Sihali Jageer Reserved Forest along the Project Road

5.1.16 Protected Forest

The Right of Way (ROW) 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-51, 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**.

5.1.17 Roadside Trees

Plantation of trees along the project section has been recorded within the RoW. The predominant tree species along roads are Papdi, Eucalyptus, Siris, Shisham, Paakad, Neem and Sagaun. Apart from these Amaltas, Babul, Bakain, Gular, Mango, Peepal, etc are also located along the roadside. 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 5.22** and girth wise trees are provided in **Annexure 5.3.**

Table 5.22: Kilometer wise Distribution of Trees along the Project Road

S. No.	Chainage (Km)		Number of Trees (LHS)	Number of Trees (RHS)	Total
	From	To			
1	58+400	59+000	47	55	102
2	59+000	60+000	56	35	91
3	60+000	61+000	188	101	289
4	61+000	62+000	52	50	102
5	62+000	63+000	183	127	310
6	63+000	64+000	120	37	157
7	64+000	65+000	91	42	133
8	65+000	66+000	45	42	87
9	66+000	67+000	58	41	99
10	67+000	68+000	145	181	326
11	68+000	69+000	179	80	259
12	69+000	70+000	188	92	280
13	70+000	71+000	260	274	534
14	71+000	72+000	194	151	345
15	72+000	73+000	145	138	283
16	73+000	74+000	154	134	288
17	74+000	75+000	63	65	128
18	75+000	76+000	43	67	110
19	76+000	77+000	41	36	77
20	77+000	78+000	110	74	184
21	78+000	79+000	29	32	61
22	79+000	80+000	107	107	214
23	80+000	81+000	104	35	139
24	81+000	82+000	163	50	213
25	82+000	83+000	214	367	581
26	83+000	84+000	106	108	214
27	84+000	85+000	96	108	204
28	85+000	86+000	17	90	107
29	86+000	87+000	49	40	89
30	87+000	88+000	72	36	108
31	88+000	89+000	24	62	86
32	89+000	90+000	45	64	109
33	90+000	91+000	65	62	127
34	91+000	92+000	39	52	91
35	92+000	93+000	225	100	325
36	93+000	94+000	163	117	280
37	94+000	95+000	74	163	237
38	95+000	96+000	85	158	243
39	96+000	97+000	83	127	210

S. No.	Chainage (Km)		Number of Trees (LHS)	Number of Trees (RHS)	Total
	From	To			
40	97+000	98+000	111	130	241
41	98+000	99+000	136	121	257
42	99+000	100+000	126	94	220
43	100+000	101+000	82	118	200
44	101+000	102+000	106	124	230
45	102+000	103+000	105	65	170
46	103+000	104+000	64	78	142
47	104+000	105+000	86	53	139
48	105+000	106+000	43	91	134
49	106+000	107+000	79	119	198
50	107+000	108+000	212	103	315
51	108+000	109+000	337	71	408
52	109+000	110+000	45	116	161
53	110+000	111+000	74	95	169
54	111+000	112+000	100	44	144
55	112+000	113+000	101	129	230
56	113+000	114+000	96	115	211
57	114+000	115+000	31	53	84
58	115+000	116+000	67	30	97
59	116+000	117+000	50	103	153
60	117+000	118+000	67	180	247
61	118+000	119+000	51	104	155
62	119+000	120+000	89	149	238
63	120+000	121+000	60	155	215
64	121+000	122+000	105	102	207
65	122+000	123+000	154	167	321
66	123+000	124+000	16	10	26
67	124+000	125+000	20	51	71
68	125+000	126+000	63	39	102
69	126+000	127+000	65	86	151
70	127+000	128+000	73	124	197
71	128+000	129+000	163	149	312
72	129+000	130+000	123	156	279
73	130+000	131+000	177	302	479
74	131+000	132+000	67	116	183
75	132+000	133+000	76	79	155
76	133+000	134+000	44	84	128
77	134+000	135+000	49	63	112
78	135+000	136+000	56	71	127
79	136+000	137+000	56	77	133
80	137+000	137+500	42	62	104
Total					**15,667**

Species-wise distribution of trees along the project alignment within corridor of impact is presented in the following **Table 5.23.**

Table 5.23: Species-wise Distribution of Trees along the Project Road

Local Name	Botanical name	Total
Amaltas	*Cassia fistula*	190
Ashok	*Polyalthia longifolia*	8
Babul	*Acasia arabica*	309
Bakain	*Melia azadirach*	152

Local Name	Botanical name	Total
Bel	*Aegle marmelos*	74
Ber	*Ziziphus jujuba*	71
Bunyan	*Ficus benghalensis*	6
Dhak	*Butea monosperma*	65
Eucalyptus	*Eucalyptus hybrid*	3081
Gauva	*Psidium guajava*	16
Gular	*Ficus glomerata*	107
Gulmohar	*Delonix regia*	95
Jamun	*Eugenia jambolana*	108
Jangle Jalebi	*Pithecellobium dulce*	14
Kadam	*Anthocephalus cadamba*	3
Kaner	*Thevetia peruviana*	22
Kanji	*Pongamia pinnata*	6
Khajur	*Phoenix dactylifera*	17
Kikar	*Acacia nilotica*	9
Mahua	*Madhuca lindica*	1
Mango	*Mangifera indica*	191
Morpankhi	*Platycladus orientalis*	57
Mulberry	*Morus alba*	150
Neem	*Azadirachta indica*	808
Paakad	*Ficus infectoria*	1357
Papdi	*Holoptelea integrifolia*	4637
Peepal	*Ficus religiosa*	59
Pilkhan	*Ficus virens*	3
Poplar	*Populus alba*	9
Reetha	*Sapindus mukorossi*	23
Sagaun	*Tectona grandis*	443
Sejhan	*Moringa oleifera*	3
Semal	*Bombax ceiba*	3
Shisham	*Dulbergia sissoo*	1602
Siris	*Albizia lebbeck*	1908
Others		60
Grand Total		**15,667**

5.1.18 Green Tunnel

There is no green tunnel situated along the project corridor.

5.1.19 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 and jackals are observed in the project vicinity. There is no natural habitat of these animals along the highway section.

5.2 Social Environment

5.2.1 Demographic Profile

The demographic features of the project district as per 2011 Census are provided in **Table 5.24.** The total population of Amroha district as per 2011 census is 1840221 whereas the total population of combined district of Moradabad & Sambhal is 4772006. The population density of Amroha district as per 2011 Census is 818.2 persons per sq Km which is lower lower than State's population density of 829. The Population density in combined district of Moradabad including Sambhal district is 1283.5 persons per sq Km which is higher that the state's population density. The sex ratio of the project concern districts i.e Amroha and combined district of Moradabad are 910 and 906 females for every 1000 males, which is lower than the state's ratio of 912 females for every thousand males in Uttar Pradesh State.

Table 5.24: District wise Demographic Profile of the Project Area

District / State	Total Rural Urban	Total No of House Hold	Population			Sex Ratio	Population Density (no. per sq Km)
			Total	Male	Female		
Amroha (Jyotiba Phule Nagar)	Total	314401	1840221	963449	876772	910	818.2
	Rural	235417	1381508	724539	656969	907	
	Urban	78984	458713	238910	219803	920	
Combined district of Moradabad	Total	796170	4772006	2503186	2268820	906	1283.5
	Rural	522763	3198383	1680022	1518361	904	
	Urban	273407	1573623	823164	750459	912	
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

5.2.2 Schedule Castes and Schedule Tribes

Table 5.25 depicts the population details of Scheduled Castes (SC) Scheduled Tribes (ST) in the concerned districts.

Table 5.25: SC and ST Population of Concern District in Project Area

District/ State	Total Rural Urban	Population					
		SC			ST		
		Total	Male	Female	Total	Male	Female
Amroha	Total	318001	166662	151339	164	89	75
	Rural	276283	144700	131583	31	15	16
	Urban	41718	21962	19756	133	74	59
Moradabad	Total	731406	385244	346162	685	377	308
	Rural	582700	306887	275813	171	99	72
	Urban	148706	78357	70349	514	278	236
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

5.2.3 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 57.25%. With the literacy rate for Males at 59.64%, while it is 40.35% 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. Due to unavailability of literacy rate of Sambhal, the literacy rate of Moradabad is given below.

Table 5.26 below provides the area wise male and female literacy rates of the state of Uttar Pradesh and the project districts.

Table 5.26: Literacy Rate

District / State	Total Rural Urban	Population			% age
		Total	Male	Female	
Amroha	Total	983110	600541	382569	53.42
	Rural	729207	456283	272924	52.78
	Urban	253903	144258	109645	55.35
Moradabad	Total	2263848	1357435	906413	47.44
	Rural	1407142	879994	527148	44.00
	Urban	856706	477441	379265	54.44
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

5.2.4 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 5.27** & **Table 5.28** 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. Due to unavailability of employment pattern of Sambhal, the employment pattern of Moradabad is given below.

Table 5.27: Work Participation for the Marginal Workers

District / State	Total Rural Urban	Population		
		Total	Male	Female
Amroha	Total	145522	72466	73056
	Rural	122000	55718	66282
	Urban	23522	16748	6774
Moradabad	Total	312843	204490	108353
	Rural	234415	147771	86644
	Urban	78428	56719	21709

District / State	Total Rural Urban	Population		
		Total	Male	Female
Uttar Pradesh	**Total**	**21179223**	**12426463**	**8752760**
	Rural	**18412163**	**10540532**	**7871631**
	Urban	**2767060**	**1885931**	**881129**

Source: Census of India, 2011 Census

Table 5.28: Work Participation for the Main Workers

District / State	Total Rural Urban	Population		
		Total	Male	Female
Amroha	Total	167051	140658	26393
	Rural	78746	61834	16912
	Urban	88305	78824	9481
Moradabad	Total	492199	435211	56988
	Rural	172812	145774	27038
	Urban	319387	289437	29950
Uttar Pradesh	**Total**	**44635492**	**37420299**	**7215193**
	Rural	**33538817**	**27812347**	**5726470**
	Urban	**11096675**	**9607952**	**1488723**

Source: Census of India, 2011 Census

5.3 Economic Development

5.3.1 Agriculture Pattern

Agriculture remains the main occupation of the people of the project concerned district and about 80% of the population depends on agriculture for its livelihood. The distribution of area of land irrigated by different sources of irrigation is Canals and bore wells. The details area, production and productivity of major crops cultivated in Jyotiba Phule Nagar and Moradabad districts are given in **Table 5.29** and **Table 5.30** respectively. Due to unavailability of agricultural pattern of Sambhal, the agricultural pattern of Moradabad is given below.

Table 5.29: Area, Production and Productivity of Major Crops Cultivated in the Jyotiba Phule Nagar District

S. No.	Crop	Area (000' ha.)	Production (000'T.)	Productivity (Kg/ha.)
1.	Rice	26.586	53.916	2029
2.	Wheat	94.217	297.255	3155
3.	Maize	4.030	3.663	909
4.	Pigeon Pea	0.656	0.690	1052
5.	Mustard	3.494	3.256	932
6.	Lentil	1.342	1.096	817
7.	Sugar cane	76.851	4797.039	62420
8.	Toria	7.998	7.342	918

Source: Dept of Agricultural, Uttar Pradesh

Table 5.30: Area, Production and Productivity of Major Crops Cultivated in Moradabad District

S. No.	Crop	Area (ha.)	Production (Qtl.)	Productivity (Qtl./ha.)
1.	Wheat	205981	605.2	29.38
2.	Lentil	1160	0.7	5.87
3.	Mustard/ Toriya	10235	12.4	12.09
4.	Peddy (Rice)	139065	325.7	23.42
5.	Bajara	31231	38.3	12.27
6.	Urd	11177	9.6	8.60

Source: updes.up.nic.in/district profile/

5.3.2 Educational Institutions /Hospitals

The educational institutions and hospital/health centres constitute the sensitive environmental receptors. The list of such features along the ROW along the project roads is presented in **Table 5.31**. Photographic view of sensitive receptor located along the Project Road is shown in **Figure 5.12**.

Table 5.31: List of Environmental Sensitive Receptors along ROW of Project Road

S. No.	Institution / Hospitals	Chainage (Km)	Distance from CL	Location with PROW
1	Modern Public School	60+080	17	LHS
2	Ramesh Tiwary Devi Saiprultrs College	60+125	12.7	LHS
3	Mirjapur Nasbullapur Primary School	63+800	9.125	RHS
4	Anglo Vedic S.R.SEC School	64+130	18	RHS
5	Primary School	71+550	21.5	RHS
6	Sarbodaya Inter Collage Kisoli	75+120	19.68	LHS
7	Health Centre	75+170	34.9	LHS
8	M.S.Yadab Inter Collage	75+980	11.82	RHS
9	Pamhansha Inter Collage	77+930	11.1	LHS
10	Samudaik Health Centre	78+760	7.06	LHS
11	Sambhal Hospital	87+540	17.2	RHS
12	Fatema Children Home	87+630	10.1	LHS
13	Z.U. Inter College	87+800	12.2	RHS
14	Misson International Academy	88+650	13.2	RHS
15	Maulana National Urdu University	88+700	14.35	RHS
16	M.G.M.P.G Collage	89+200	6.8	LHS
17	Kainat International School	89+880	16.6	LHS
18	Holy Suffah Public School	91+600	14.36	RHS
19	Rajakiya Prashikhan Sangsthan I.T.I	96+500	16.66	RHS
20	Asha Hospital	99+000	13.9	RHS
21	Heritage The Convent School	99+990	18.35	RHS
22	Gitanjali Junior School	100+770	14.3	RHS
23	Mordan Academy	102+000	28.4	LHS
24	Inter Collage Chandawali	102+100	10.5	LHS
25	SMD High Primary School	105+110	14.56	LHS
26	Prince Public JR.High School (Milak)	107+200	16.8	LHS
27	Dayananda Indira Collage Sodnagli	110+775	22.47	LHS
28	Fatema Clinic	110+880	10.44	LHS
29	Subhadra Clinic	110+990	17.85	LHS
30	Musawir Hossan Memo Degree Collage	111+390	10.75	RHS
31	Bhagbat Saran Junior High School	111+400	13.28	RHS
32	Krishna Public School	113+055	18.43	LHS

S. No.	Institution / Hospitals	Chainage (Km)	Distance from CL	Location with PROW
33	Udhari Primary School	116+500	18.1	RHS
34	Primary School	117+880	14.7	RHS
35	Loyals Fateia Academy	123+080	15.53	LHS
36	Rajandra Academy Senior Secondary School	134+450	16.5	RHS

School at Km 105.110

School at Km 102.100

Figure 5.12: Sensitive receptor along the Project road

5.3.3 Industries

The Industrial Scenario of Amroha district and combined district of Moradabad are given in **Table 5.32** and **Table 5.33** respectively.

Table 5.32: Industrial Scenario of Jyotiba Phule Nagar district

S. No	Head	Unit	Particular
1	Registered Industrial Unit	No.	1640
2	Total Industrial Unit	No.	1640
3	Registered Medium and Large Unit	No.	32
4	Estimated avg. no. of daily worker employed in small scale industries	No.	15331
5	Employment in large and medium industries	No.	3558
6	Nos. of industrial Area	No.	2

Source: Ministry of MSME, GoI, J.P.Nagar (Amroha)

Table 5.33: Industrial Scenario of Moradabad district

S. No	Head	Unit	Particular
1	Registered Industrial Unit	No.	9087
2	Total Industrial Unit	No.	20100
3	Registered Medium and Large Unit	No.	10
4	Estimated avg. no. of daily worker employed in small scale industries	No.	110000
5	Employment in large and medium industries	No.	2061
6	Nos. of industrial Area	No.	-

Source: Ministry of MSME, GoI, Moradabad

There are some industrial units observed along the project road. The industrial units along the ROW are predominantly brick kilns. Some oil mills and 3 sugar factories are alo located along the project corridor. The details are provided in **Table 5.34**.

Table 5.34: Industrial Units along the Project Road

S. No	Industrial Unit	Chainage (Km)	Distance from CL (m)	RHS/LHS
1	Oil Mill	59+280	14.5	LHS
2	Brick Kiln	60+650	19	LHS
3	Oil Mill	60+700	15	RHS
4	Brick Kiln	62+475	15	RHS
5	Oil Mill	62+500	13	LHS
6	Brick Kiln	63+250	30	RHS
7	Brick Kiln	66+400	17.7	LHS
8	Brick Kiln	69+250	20	LHS
9	Behta Sugar Factory	69+500	22.3	LHS
10	Brick Kiln	70+750	15	RHS
11	Oil Mill	75+430	20.54	RHS
12	Brick Kiln	81+000	13	LHS
13	Brick Kiln	81+550	13	LHS
14	Brick Kiln	83+200	29.63	RHS
15	Brick Kiln	92+580	22.15	LHS
16	Brick Kiln	92+700	22.26	RHS
17	Brick Kiln	93+100	16.9	LHS
18	Brick Kiln	93+180	16.2	LHS
19	Brick Kiln	93+270	32.8	RHS
20	Brick Kiln	93+510	12	RHS
21	Brick Kiln	93+815	14.1	LHS
22	Brick Kiln	94+700	21.83	RHS
23	Brick Kiln	94+820	18.3	LHS
24	Brick Kiln	96+150	18.6	RHS
25	Brick Kiln	96+220	19	RHS
26	Brick Kiln	96+680	16	LHS
27	Brick Kiln	99+030	19.55	LHS
28	Brick Kiln	99+400	16.64	RHS
29	Brick Kiln	99+590	19.2	RHS
30	Brick Kiln	99+650	17.5	RHS
31	Brick Kiln	99+720	23.7	LHS
32	Sugar Factory	116+400	24.8	RHS
33	The Kishan Sugar Mill Ltd.	123+400	14.4	RHS

5.3.4 Common Resource Properties /Cultural Property

A number of Common Resource Properties /religious structures are located within the vicinity of project area. Few of these structures are situated close to the existing road edge which may require to be shifted. A list of such features is given in **Table 5.35**. Photographic clips of some of the cultural properties along the Project road are shown in **Figure 5.13**.

Table 5.35: List of Impacted Cultural Property/Common Resources Properties (CPR) along the Project Road

S. No.	Religious / Cultural Resources	Chainage (Km)	Location with respect to ROW
1	Temple	57+440	LHS
2	Temple	57+650	LHS
3	Temple	58+180	RHS
4	Temple	59+370	LHS
5	Temple	60+130	LHS
6	Temple	61+720	RHS
7	Temple	64+800	LHS
8	Temple	64+965	RHS
9	Temple	65+680	RHS
10	Temple	66+750	RHS
11	Temple	67+090	RHS
12	Temple	67+190	RHS
13	Temple	67+200	LHS
14	Temple	67+830	LHS
15	Temple	69+060	LHS
16	Temple	72+620	LHS
17	Temple	72+920	RHS
18	Temple	75+520	RHS
19	Temple	75+750	LHS
20	Temple	75+830	RHS
21	Temple	78+010	RHS
22	Temple	78+250	RHS
23	Temple	78+850	RHS
24	Temple	79+500	LHS
25	Temple	80+125	LHS
26	Temple	84+970	RHS
27	Mosque	84+980	LHS
28	Temple	86+210	RHS
29	Mazaar	87+500	LHS
30	Temple	87+800	LHS
31	Mosque	88+890	LHS
32	Temple	89+090	RHS
33	Mosque	89+180	LHS
34	Mosque	90+110	LHS
35	Mosque	106+300	LHS
36	Temple	110+630	RHS
37	Mosque	113+505	RHS
38	Mosque	113+760	RHS
39	Mosque	113+880	RHS
40	Gurudwara	137+500	RHS

Hanuman temple at Km 64+800 (LHS)

Ambedkar park at Km 87+350 (LHS)

Figure 5.13: Common Resource Properties/ Cultural Properties along the Project Road

5.3.5 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 centres, 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 and 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 reveled 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). It has been estimated there due to proposed improvement 9 households will be affected due to project. There are 17 project affected families (PAFs), 37 project affected persons (PAPs),out of which 4 are squatters, 2 are encroachers and rest are kiosks.

The baseline survey reflects that there are 40 numbers of cultural/religious structures and 36 sensitive receptors (Educational institutes/hospitsl/health centres) located along the project road. Out of these features altogether 9 common resources properties (CPRs) are likely to be affected either partially or fully due to proposed widening. The other structures have been saved by design adjustments. Out of 9 affected structures, 4 are cultural properties, 4 are Boundary walla and 1 is commercial (shop). The list of such affected structures are presented in Table 6.1

Table 6.1: List of impacted Cultural Property/Common Resources Properties (CPR) along the Project Road

S. No.	Village	CH (Km)	LHS/ RHS	Distance from CL in (M)	Type of CPRs
1	Yushufpur	64+800	LHS	4.80	Hanuman JeeTemple
2	Pawasa	78+250	RHS	6.10	Santosi Mata Temple
3	Ghuraita	80+125	LHS	4.80	Brahma Sthan Ghuraita
4	Sambhal	86+600	LHS	5.30	Boundary wall of Nagerpalika
5	Sambhal	87+350	LHS	5.70	Boundary wall of Ambedkar park
6	Sambhal	87+500	LHS	5.50	Boundary wall of Majar
7	Sambhal	87+500	LHS	5.20	Shops of Masjid
8	Sambhal	89+000	LHS	5.5	Boundary wall of Mahatma Gandhi Inter College
9	Sambhal	91+000	RHS	5.30	Boundary wall of Puccabagh

These impacts have been described in details under Resettlement & Rehabilitation Report (R&R).

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, 77 hand pumps are likely to be affected due to the proposed widening in both the project sections.

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

6.1.3 Impact on Ponds

Baseline study reflects that there are 2 numbers of ponds located in close vicinity at Km 61.470 and Km 78.500. To avoid direct impacts due to widening of the road in these sections, toe wall has been provided along the pond. So, both the ponds have been saved. Apart from this stone pitching has been proposed for protection of slope toward roadside along the pond. Additional safety measures have been proposed along the road at the locations of pond as well as abandoned pits located in close vicinity in the form of metal crash barrier in order to safeguard the traffic.

6.1.4 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.

6.1.5 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 rod will result into reduced buffering of air pollutants, hotter, drier microclimate along the project road.

The tree inventory showed that about 15667 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 along roads are Papdi, Eucalyptus, Siris, Shisham, Paakad, Neem and Sagaun. Apart from these Amaltas, Babul, Bakain, Gular, Mango, Peepal, etc are also located along the roadside. 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.**

6.1.6 Legal implications due to Roadside trees declared as Protected Forest

The tress plantation within ROW on both side of project road section from Badaun-Bilsi-Bijnaour Road 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 center line, 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 63.200 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 5,48,500 cum of soils and 6,29,000 cum of coarse & fine aggregates would be required. It has been estimated that due to roadway cutting and drain excavation about 7,43,550 cum earth work materials will be generated, out of which 2,73,000 cum can be reused for sub-grade and earthen shoulder. The balance quantity of 2,75,500 cum will be taken from borrow area. About 12,860 cum fly ash will be utilized for embankment construction and will be collected from NTPC Thermal Power Plant, Dadri at Dadri in Gautam Budha Nagar district and Harduaganj Thermal Power Plant owned by Uttar Pradesh Vidyut Utpadan Nagar Limited (UPVUNL) in Aligarh district which are located within 100 Km radius of the project road. The other construction material such as sand, cement and bitumen required for the project will be about 10,700 cum, 8400 tones and 11,900 tonn respectively.

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 extend. 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 6-10 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. Ground water 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 certifies 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 10µ (PM_{10}), particulate matters of size less than 2.5 µ ($PM_{2.5}$), 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 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, hot mix 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 plans should be located at list 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

Construction Equipments for Different Activities	Noise Level in dB(A) at 50 Feet
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
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 levelled 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.

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 project will comply with the requirements of the EHS Guidelines of the World Bank Group, 2007[3]. The relevant ones are general guidelines available on the internet.
- 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

[3] *Reference:(i)http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES and (ii)http://www.ifc.org/wps/wcm/connect/7e4c7f80488554d5b45cf66a6515bb18/Final%2B-%2BToll%2BRoads.pdf?MOD=AJPERES&id=1323162564158]*

- 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 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 centres 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 centres. The spent wash from the service centre 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 refuge 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 parking 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 estimated for 20 years for the period of 2015 to 2034 considering "with" and "without" project. The calculated fuel consumption "without" and "with" project is 947560.37 MT per 1000 veh-km and 1016928.76 MT per 1000 veh-km, respectively for 20 years. The project road has been divided into four 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. There will be slight increase in fuel consumption. This is due to the fact that the existing road is already two lane and the road surface is in good condition. Presently the average speed of vehicles is between 60-80 km per hour. The proposed design is for 100 km speed. It has been assumed that the vehicles will have uniform speed of 100 Km per hour in open areas and 80 Km per hour in built up section. As a result of the higher speeds there will be increase in fuel consumption. So, the rise in fuel consumption may be attributed to rise in average speed of vehicles. The details of change in total fuel consumption including petrol and diesel "with" and "without project" scenario 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]
79.420	947560.37	1016928.76	-69368.39

The estimation of diesel and petrol consumption due to the proposed improvement is given in following **Table 6.4**.

Table 6.4: Estimation of Diesel & Petrol Consumption

	Without Project	With Project	Fuel
Assuming 60 % Diesel (Quantity in MT)	5,68,536	6,10,157	-41,621
Assuming 40 % Petrol (Quantity in MT)	3,79,024	4,06,772	-27,747
Density of Petrol	0.77 Kg/lt		
Density of Diesel	0.832 kg/l		
Petrol Quantity (lt)	49,22,39,153	52,82,74,681	-3,60,35,527
Diesel Quantity (lt)	68,33,36,805	73,33,62,087	-5,00,25,281

The Carbon Dioxide (CO_2) emissions have been calculated using "mobile combustion GHG emission calculation tool, version 2.3" and the summary of Carbon Dioxide (CO_2) 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)
Total (metric tonnes CO_2)		2305.848	2508.707

The analysis of result with the above details, it may in inferred that that there will marginal increase in fuel consumption and thereby increase in Carbon Dioxide (CO_2) emissions in "with" project scenario as compared to "without" project. The marginal increase in fuel consumption and CO2 is because of the existing road is already having 2 lane configuration and in good condition. The proposal is to maintain the two lane configuration with additional paved shoulders on eitherside.

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 4 existing minor bridges, out of which 1 bridge will be retain with repairs, 1 bridge will be widened to two lane and remaining 2 bridges will have to be reconstructed. There is no additional 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):

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	103+400	5.387	196.076
2	120+500	81.129	194.351
3	130+300	15.301	195.060

In addition to existing 84 culverts which will be retained/ widened with repair, a total number of 35 new balancing culverts have also been proposed along the project road to allow passage of water during any flood. This will have overall positive impact on drainage condition along the project corridor.

7 ANALYSIS OF ALTERNATIVES

7.1 Introduction

The existing alignment of project road of SH-51 starts at Km 58.400 near Bahjoi and ends at Km 137.820 at Gajraula. The project stretch passes through major habitat locations viz. Bahjoi, Pawasa, Hayatnagar, Saraitarin, Saiid Nagli, Sambhal, Hasanpur and Gajraula in the district of Sambhal and Amroha 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 30 villages, and RoW varies from 6 m to 26 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-51 from Km 58.400 to Km 137.820 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**
❖ 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	❖ 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	❖ No acquisition properties and hence no displacement of families. ❖ No felling of existing trees and vegetation	❖ Travel time and fuel consumption level will be more due to 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.

With Project		Without Project	
Positive Impacts	**Negative Impacts**	**Positive Impacts**	**Negative Impacts**
❖ 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.			

The existing road is having 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 66 no. of bus shelters and 4 nos. of truck lay byes, 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 5,48,500 cum of soils and 6,29,000 cum of coarse & 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 due to roadway cutting and drain excavation about 7,43,550 cum earth work materials will be generated, out of which 2,73,500 cum can be reused for sub-grade and earthen shoulder. The balance quantity of 2,75,000 cum will be obtained from different borrow areas. So only small part of excavated materials from road cutting and drain excavation will require to be disposed. This will not only reduce the impact on land due to borrowing of earth, but at the same time the disposable quantity will also be reduced.

It is also proposed to use 12860 cum of fly ash in embankment. This will further reduce the requirement of earth for construction thereby reducing the impact on land.

Widening Options

In general concentric widening has been proposed all along the project except at two locations in order to avoid land acquisition and to minimize impacts on roadside trees and settlement. At two locations, realignment has been proposed between the project sections from Km 120.225 to Km 120.750 and from Km 129.715 to Km 130.330 due to bridge construction.

Drainage conditions:

In open areas, unlined drains are proposed near the ROW limits, sufficiently away from the toe of the embankment. Through built up areas to drain off surface run off from the road and to intercept sullage from road side properties, lined drains are proposed along the project road, which is listed in **Table 7.2**.

Table 7.2: Proposed location of lined drain along the project road

S. No.	New Design Chainage (Km)		Length (Km)	Cross section Type	Road way width (m)	Major Built up
	Start	End				
1	59+331	59+820	0.489	2	13	Maukathar
2	66+300	66+970	0.670	2	13	Bhajoi
3	72+364	72+916	0.552	2	13	Bhawan
4	76+164	76+566	0.402	2	13	Atrasi
5	77+864	78+766	0.902	2	13	Pawasa
6	79+864	80+336	0.472	2	13	Dutauta
7	85+714	91+286	5.572	2	13	Hayatnagar/Sambal
8	104+410	104+750	0.340	2	13	Mirzapur Karawa
9	108+764	109+796	1.032	2	13	Syed Nagli
10	111+714	112+326	0.612	2	13	Dakka More
11	114+414	115+416	1.002	2	13	Ujhari
12	124+064	125+066	1.002	2	13	Hasanpur
13	130+864	131+666	0.802	2	13	Manota
14	136+666	137+525	0.859	3 (4 Lane)		Gajraula

35 new balancing culverts have been proposed along the project road in order to allow passage of water during any flood in order to improve dariange conditions of the area.

Emission of Greenhouse Gas (CO_2)

A comparative analysis of CO_2 emission has been carried out in both "With" and "Without Project" scenario. The analysis reflect that there will be marginal increase total fuel consumption thereby slight increase in CO_2 emission under "with Project" scenario compared to "Without Project" scenario. This is due to the fact that the existing road is already two lane and the road surface is in good condition. Presently the average speed of vehicles is between 60-80 km per hour. The proposed design is for 100 km speed. It has been assumed that the vehicles will have uniform speed of 100 Km per hour in open areas and 80 Km per hour in built up section. As a result of the higher speeds there will be increase in fuel consumption. So, the rise in fuel consumption may be attributed to rise in average speed of vehicles.

With the overall 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 Wahpurpatti, Nimbakara and Dehpa village 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	**Wahpurpatti village Km 61.500**	The member of panchayat and local villagers probable impacted families, DPR team members and PWD representatives	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. Villagers also suggested for providing the cemented bhating ghat with stair cases and sitting bench for their

S. No.	Name of the Village	Participants	Suggestions/Observations
			community ponds. They also suggested for pond protection due to road widening.
2	**Nimbakara Km 70.300**	Village Panchayat members, the local villagers, roadside residents, 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	**Dehpa Village Km 103.300**	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. Villagers also suggested for enhancement of Shiv temple. Under the enhancement, existing "Chabutra" is there and they suggested for side wall and ceiling for Shiv Parivar. They also suggested to provide the shade on exiting "Hawan Kund".

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-51 starting from Km 58.400 near Bahjoi to Km 137.500 at Gajraula. 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 summerised 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 have bben 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

S. No.	Critical Environmental Issues	Features/Location
1	Resettlement and Rehabilitation Issue	About 17 project affected families (PAFs), 37 project affected persons (PAPs), 9 households, 4 squatters, 2 encroachers are likely to be affected either partially or fully for widening of project road and the mitigation measures for the same has been addressed in R&R report.
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	2 Ponds (at Km 61.500 and Km 78.500) In addition to these water bodies 4 numbers of abandoned pits are also located along the project stretch.
5.	Impact of Common resource properties/ religious features	9 No. of common resources properties (4 religious structures, 4 boundary wall, 1 shop) and 77 hand pumps shall be rehabilitated due to project road.
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 given in **Table 9.2**.

Table 9.2: Environnemental Management Plan

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
A. PRE-CONSTRUCTION STAGE					
PC.1.1 Loss of Properties	• 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 works • PIU 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	• 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	• 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	• 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.	• 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 fir 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 handling 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	• 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 fir 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-Contruction 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.	• 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	• 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	• 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	• 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 stabilization. • 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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-chanelised 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	• 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	• 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	• 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	• 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	• 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 (PM_{10} 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	• 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 (PM_{10} 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 Contractor through Approved Monitoring Agency	PMC/PIU-UPPWD

Environmental issue/ component	Mitigation Measures	Location	Timeframe	Institutional responsibility	
				Implementation	Supervision
C.3.4 Fly ash Handling and utilization	• The handling and transportation of fly ash will be done as per section 4.6 of IRC: SP:58-2001. • Fly ash from hoppers or silos must be conditioned with water at power plant to prevent dusting enroute. • Fly ash will be transported to the site in covered dump truck to minimise loss of moisture and dust generation. • The quantity of fly ash will be transported based on utilization as per work plan to avoid stockpiling of excees quantity. However if stockpiling is required then Adequate precautions will be taken to prevent dust generation by spraying water on stockpiles at regular intervals. • The stockpile of flyash will be covered with tarpaulins or a thin layer of soil or other granular material to avoid dust generation.	Construction zones and stockyards	During Construction	Contractor	PMC/PIU-UPPWD

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	The Contractor will conform with the following measures: • 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	• 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 that 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	• 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	• 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 adhered • Construction 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	• 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	• The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS), Guidelines of the World Bank Group[4], April 2007 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 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 checkup of workers and avoidance of spread of any communicable disease • Readily 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
C.7.3 Accessibility	• 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

[4] *Reference: (i) http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES and (ii) 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.7.4 Planning for Traffic diversion	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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 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).	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	• 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	• 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	• 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	• 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	• 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	• 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	Thought 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. One Pond at Wahpurpatti at Km 61.500 (RHS) and other Shiv Temple at Dehpa village, Km 103.300 (LHS) has been identified as part of environmental enhancement. The details of existing status of identified sites and proposed 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 PM_{10} (Particulate Matter having less than 10 micron size) or $PM_{2.5}$ (Particulate Matter having less than 2.5 micron size), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NOx) 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 Eenvironmental 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 of environmental monitoring along the project road 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, NOx, CO	National Ambient Air Quality Standard (CPCB, 18th 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, NOx, 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, NOx, 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 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 liasoning 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, liasoning 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
• 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.	• 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	• 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. • maintain Environmental reporting system	• 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)	• 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 an 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 learning

Position	Roles & Responsibilities
Environmental and Social Nodal Officer at PIU (Division Office)	• 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	• 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	• Lead the implementation of EMP measures included in the Contract • Report on progress and shortcomings of the measures implemented to Environmental Specialist of PMC

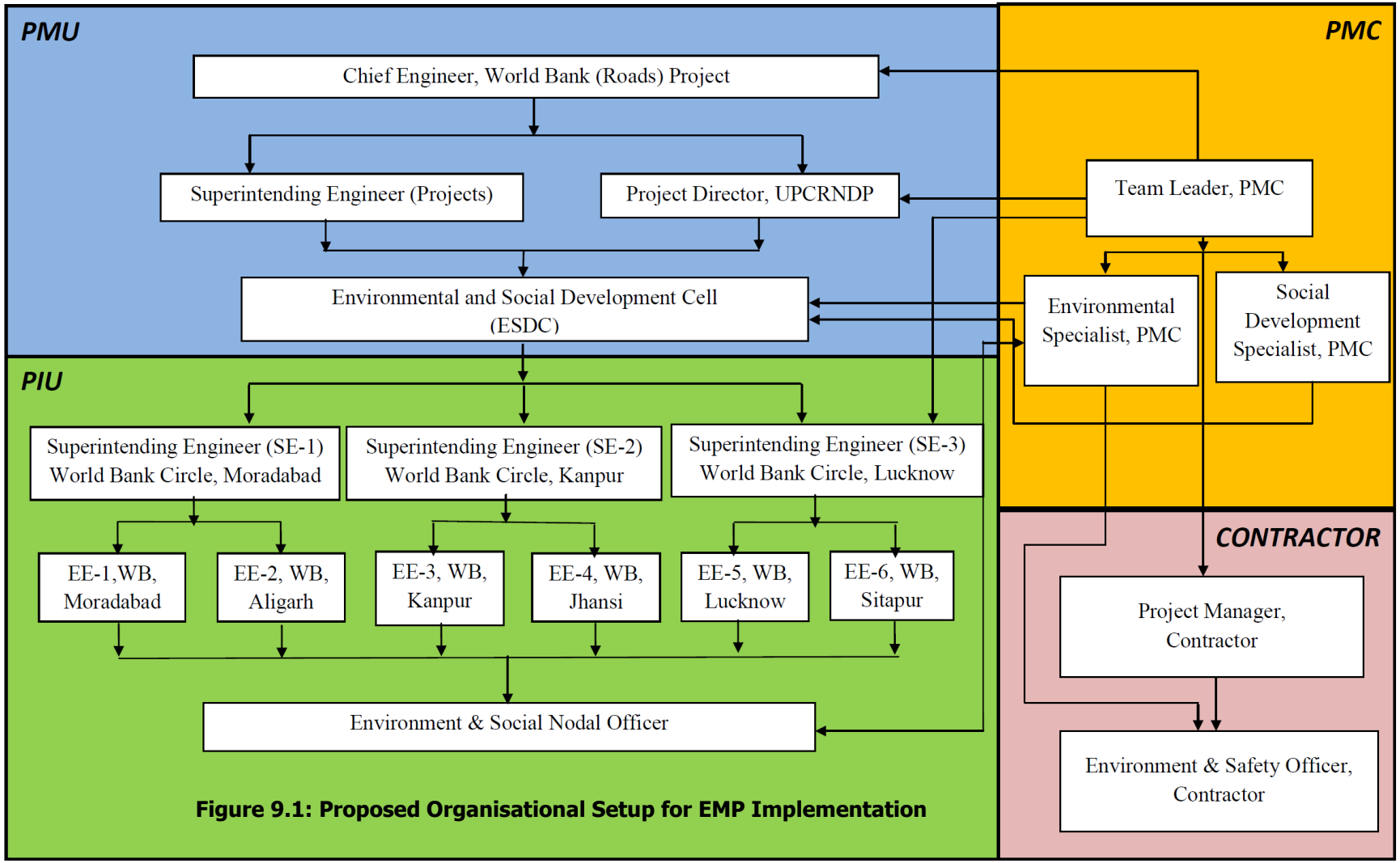


Figure 9.1: Proposed Organisational Setup for EMP Implementation

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	• 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	• 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	• 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 evel.

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 **15.85 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 & 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 "Badaun-Bilsi-Bijnaour Road Section of SH-51

S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
A.	**Pre-Construction Stage**					
A.1	Forest Clearance	Diversion of forest land for non forest activities (Project road widening)-(a)Total NPV cost/hect (The final cost will be provided by the forest department after joint verification, which is required to be deposited by UP, PWD)	Hect	63.2	9,60,000	6,06,72,000
A.2	Tree cutting along the project road	Clearing of Roadside plantation (from Km 58.400 to Km 137.500 in Sambhal and Amroha District)-Tree cutting by Forest Dept/Contractor and MoU shall be signed between them				
		Girth 30-60 Cm	No.	5,965	193	11,51,245
		Girth 60-90 Cm	No.	3,291	371	12,20,961
		Girth 90-180 Cm	No.	5,022	683	34,30,026
		> Girth 180 Cm	No.	1,389	1261	17,51,529
A.3	Tree Plantation along the project road	Compensatory afforestation (minimum of 2 trees planted for every tree cut) including 3 years maintenance	No.	31,334	658	2,06,17,772
		Providing of Half Brick circular tree guard, in 2nd class brick, internal diametre 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.	31,334	1613	5,05,41,742
					Total EMP cost (Rupees) during Pre-Construction Phase	**13,93,85,275**
B.	**CONSTRUCTION STAGE**					
B.1	Proposed Enhancement of Pond at Km 61.500 (RHS), Village-Wahpurpatti	**Bathing Ghat of size 5m x 4m**				
		(a) Excavation	Cum	37.50	56	2,100
		(b) PCC (M15)	Cum	3.00	6,299	18,897
		(c) Brick Work (1:3)	Cum	39.20	5,478	2,14,738
		(d) Tiles	Sqm	37.51	880	33,009
		Siting Bench (4 numbers) at Bathing Ghat	No.	4	4,440	17,760
B.2	Proposed Enhancement at Shiv Temple at Km 103.300 (LHS), Village: Dehpa	(1) Wall and Ceiling at existing Shiv Parivar & Maa Durga Chabutra (2 Nos)				
		(a) Brick Work	Cum	5.76	5,478	31,553
		(b) RCC (M25)	Cum	1.14	7,754	8,840
		(c) Reinforcement (FE 500)	kgs	86.36	62	5,348
		(d) Plaster of 12 mm (1:3)	Sqm	54.6	1,233	67,322
		(e) Plaster of 6 mm (1:3)	Sqm	8	792	6,336

S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
		(f) Enamel Painting	Sqm	62.6	65	4,069
		(2) Sitting Bench (5 numbers)	No.	5	4,440	22,200
		(3) Shade on Hawan Kund with GI sheet and Pipe				
		(a) PIP 101 x 6L	Kgs	466.65	92	42,932
		(b) TUBSOx 25x2.9	Kgs	178.98	92	16,466
		(c) PIP 603L	Kgs	389	92	35,788
		(a) PCC (M15)	Cum	2.4	6,299	15,118
		e) Brick Work (1:3)	Cum	4	5,478	21,912
		f) MS plate 150x150x10	Kgs	28.26	92	2,600
		GI Sheeting				
		(a) Area Including 30% laps	Sqm	81.133	760	61,661
B.3	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
B.4	Oil and Grease Interceptor	Near Water body (Pond at Km 61.500)	No.	1	50,000	50,000
B.5	Rain Water Harvesting Structure	Rain Water Harvesting Structure along the project road	No.	50	50,000	25,00,000
B.6	Environmental Training	EMP Orientation at construction site	Lump Sum			4,00,000
B.7	Rehabilitation of Cultural Properties	Rehabilitation of Impacted Cultural Properties/Common Resource Property	No.	9		Covered in RAP cost
B.8	Hand Pump	Rehabilitation of Impacted hand pump along the project road	No.	77		Covered in RAP cost
					Total EMP cost (Rupees) during Construction Phase	**43,46,648**

S. No.	Component	Item	Unit	Estimated Quantity	Rate (Rupees)	Amount (Rupees)
C.	**OPERATION STAGE**					
C.1	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
C.2	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)	**14,41,55,923**
					Contingency (10%)	**1,44,15,592**
					Total EMP Cost (Rupees)	**15,85,71,515**

ANNEXURES

ANNEXURE 5.1

PHOTO-CLIPS OF SAMPLING OF ENVIRONMENTAL QUALITY ATTRIBUTES AT SITE

Photo-1: Ambient Air Quality Sampling at Hasanpur

Photo 2: Ambient Air Quality Sampling at Sambhal

Photo 3: Ambient Air Quality Sampling at Bahjoi

Photo 4: Surface Water Sampling from Pond at Wahpur Patti

Photo 5: Soil Sampling from Agricultural land, Bahjoi

Photo 6: Soil Sampling from Agricultural land, Sambhal

Photo 7: Noise Level Monitoring at Hasanpur

Photo 8: Noise Level Monitoring at Sambhal

Photo 9: Ground Water Sampling at Bahjoi

Photo 10: Ground Water Sampling at Sambhal

ANNEXURE-5.2

परिशिष्ट – 18.2.1

VAN BIBHAG
MISCELLANEOUS
FEBRUARY 10, 1960.

No. 1155/XIV -331-50-Whereas the Government, Utter Pradesh is of the opinion that making of enquiry and record contemplated under sub-section (3) of section 29 of the Indian Forest Act, 1927 (Act. No.XVI of 1927), will occur such length of time as in the meantime to endanger the right of the State Government. Now, therefore, in exercise of the powers conferred by the proviso to the aforesaid sub-section and by sub-section (1) of the said section, read with section 80-A of the aforesaid Act, The Government of Uttar Pradesh is pleased to declare that pending such enquiry and record the provisions of Chapter IV of the schedule hereto.

SCHEDULE

Serial No.	S. No	Name of road	Mile to be declared as Reserved or protected Forest						Description of Boundary
			M.	Fg.	Ft	M.	Fg.	Ft.	
1	2	3	4			5			6
	XXX	XXXXX							
Moradabad									
	1.	Moradaba-Chandausi Road	0	6	0	36	0	0	The boundary of the land has been demarcated on the ground by stone pillars.
		Belari Feeder	0	0	0	1	2	0	
	2	Belari-Sidhora road	0	0	0	5	0	0	
	3.	Moradabad-Sambhal road	3	0	0	21	4	0	
	4.	Sambhal-Hasanpur road	0	0	0	21	4	0	-do-
	5.	Sambhal-Balgoi Road	3	0	0	13	5	0	-do-
	6.	Gagranla-Dhaniwarpura road	7	0	0	8	3	240	-do-
	7.	Gajraula-Hasanpur road	0	0	0	8	0	0	-do-
	8.	Amraul-Kantha road	0	0	0	3	0	0	-do-
	9.	Amraul-Dhanpura road	0	0	0	3	0	0	-do-
	10.	Amraul-Kalsa road	0	3	260	3	3	260	-do-
	11.	Chandpur-Dhanaura road	7	0	0	12	3	0	-do-
	12.	M.A.B. (Moradahad, Amroha-Bijnor) road	18	6	550	34	0	0	-do-
	13.	Moradabad-Kanth road	1	6	0	18	0	0	-do-
	14.	Moradabad-Kotdwar-Kashipur	5	0	0	35	0	0	-do-

ANNEXURE-5.3

Girth-wise trees details along the project road "Bahjoi-Gajraula of SH-51"

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
58.5	Babul	2	0	1	1	0	0	0	0	0
	Bel	2	0	1	0	0	0	1	0	0
	Ber	1	0	1	0	0	0	0	0	0
	Mango	2	0	0	0	0	0	0	0	2
	Mulberry	1	1	0	0	0	0	0	0	0
	Neem	1	0	1	0	0	0	0	0	0
	Papdi	3	0	2	1	0	0	0	0	0
	Shisham	62	9	26	25	1	1	0	0	0
	Siris	28	1	12	15	0	0	0	0	0
Total		102	11	44	42	1	1	1	0	2
59	Babul	2	0	0	2	0	0	0	0	0
	Bakain	1	0	0	0	1	0	0	0	0
	Dhak	2	1	1	0	0	0	0	0	0
	Eucalyptus	19	0	15	3	1	0	0	0	0
	Mulberry	4	0	1	0	3	0	0	0	0
	Neem	1	0	0	0	0	0	0	1	0
	Paakad	12	0	1	3	1	4	1	1	1
	Papdi	1	0	0	0	0	0	0	1	0
	Peepal	2	0	0	1	0	0	1	0	0
	Semal	2	0	0	2	0	0	0	0	0
	Shisham	18	2	10	4	1	0	0	1	0
	Siris	27	0	4	6	8	2	2	4	1
Total		91	3	32	21	15	6	4	8	2
60	Babul	10	1	5	4	0	0	0	0	0
	Bakain	1	1	0	0	0	0	0	0	0
	Bel	6	4	1	1	0	0	0	0	0
	Ber	2	1	1	0	0	0	0	0	0
	Bhad	1	0	0	0	0	0	0	0	1
	Mulberry	2	1	0	0	1	0	0	0	0
	Neem	20	17	3	0	0	0	0	0	0
	Paakad	9	7	2	0	0	0	0	0	0
	Papdi	17	5	4	6	1	1	0	0	0
	Peepal	1	0	1	0	0	0	0	0	0
	Sagaun	3	2	1	0	0	0	0	0	0
	Shisham	92	37	45	8	1	0	0	1	0
	Siris	125	32	42	22	8	9	1	5	6
Total		289	108	105	41	11	10	1	6	7
61	Babul	7	0	0	6	1	0	0	0	0
	Bakain	2	2	0	0	0	0	0	0	0
	Bel	4	4	0	0	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Ber	1	0	0	0	1	0	0	0	0
	Gulmohar	2	0	0	2	0	0	0	0	0
	Jamun	2	0	0	0	2	0	0	0	0
	Khajur	2	0	0	2	0	0	0	0	0
	Neem	5	0	1	1	2	0	1	0	0
	Paakad	19	3	1	5	6	3	0	0	1
	Papdi	11	0	6	5	0	0	0	0	0
	Peepal	1	0	0	0	0	0	0	0	1
	Shisham	10	1	6	2	0	1	0	0	0
	Siris	36	4	4	8	6	4	0	1	9
Total		102	14	18	31	18	8	1	1	11
62	Babul	5	2	2	1	0	0	0	0	0
	Bel	7	3	3	1	0	0	0	0	0
	Dhak	24	15	5	4	0	0	0	0	0
	Eucalyptus	1	0	0	1	0	0	0	0	0
	Neem	2	1	1	0	0	0	0	0	0
	Paakad	2	1	0	0	0	0	0	1	0
	Papdi	65	15	30	18	1	0	0	0	1
	Peepal	1	0	0	0	0	0	0	0	1
	Sagaun	43	27	12	4	0	0	0	0	0
	Shisham	38	17	13	4	1	2	0	1	0
	Siris	122	16	21	27	23	14	6	7	8
Total		310	97	87	60	25	16	6	9	10
63	Babul	15	3	8	3	1	0	0	0	0
	Dhak	13	11	2	0	0	0	0	0	0
	Gular	2	0	0	0	0	0	0	0	2
	Paakad	12	2	0	0	3	4	1	1	1
	Papdi	17	8	9	0	0	0	0	0	0
	Sagaun	44	27	8	8	1	0	0	0	0
	Shisham	52	40	8	2	2	0	0	0	0
	Siris	2	1	0	1	0	0	0	0	0
Total		157	92	35	14	7	4	1	1	3
64	Amaltas	4	0	2	1	1	0	0	0	0
	Babul	6	3	1	2	0	0	0	0	0
	Bel	1	1	0	0	0	0	0	0	0
	Dhak	1	0	0	1	0	0	0	0	0
	Neem	4	3	1	0	0	0	0	0	0
	Paakad	8	4	1	3	0	0	0	0	0
	Papdi	11	4	5	2	0	0	0	0	0
	Peepal	5	0	0	0	0	0	0	2	3
	Shisham	79	54	10	7	5	2	1	0	0
	Siris	14	0	1	5	7	1	0	0	0
Total		133	69	21	21	13	3	1	2	3

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
65	Bakain	1	0	1	0	0	0	0	0	0
	Bel	3	0	0	2	1	0	0	0	0
	Neem	5	0	2	3	0	0	0	0	0
	Papdi	1	0	1	0	0	0	0	0	0
	Shisham	14	4	3	5	1	0	1	0	0
	Siris	63	0	3	12	14	17	10	4	3
Total		87	4	10	22	16	17	11	4	3
66	Bakain	1	1	0	0	0	0	0	0	0
	Bel	1	0	0	0	1	0	0	0	0
	Belpatra	1	0	1	0	0	0	0	0	0
	Gular	1	0	0	0	0	1	0	0	0
	Jamun	1	0	0	0	1	0	0	0	0
	Mango	1	0	0	0	0	1	0	0	0
	Mulberry	2	0	1	1	0	0	0	0	0
	Neem	4	0	2	1	0	0	0	1	0
	Others	2	0	1	1	0	0	0	0	0
	Paakad	17	1	2	4	4	2	1	2	1
	Papdi	15	2	4	7	1	1	0	0	0
	Peepal	9	0	0	0	0	2	3	0	4
	Shisham	13	0	2	3	5	2	1	0	0
	Siris	31	0	1	4	10	6	3	5	2
Total		99	4	14	21	22	15	8	8	7
67	Amaltas	21	10	7	3	0	1	0	0	0
	Ashok	1	0	1	0	0	0	0	0	0
	Babul	44	13	16	13	2	0	0	0	0
	Bakain	5	1	3	0	1	0	0	0	0
	Bel	2	1	1	0	0	0	0	0	0
	Ber	1	0	1	0	0	0	0	0	0
	Bhad	1	0	0	0	1	0	0	0	0
	Eucalyptus	13	1	3	4	5	0	0	0	0
	Gular	3	1	0	1	1	0	0	0	0
	Gulmohar	1	0	1	0	0	0	0	0	0
	Jamun	8	3	5	0	0	0	0	0	0
	Khajur	3	0	0	0	3	0	0	0	0
	Mango	1	0	0	1	0	0	0	0	0
	Mulberry	4	1	0	2	1	0	0	0	0
	Neem	106	45	53	7	1	0	0	0	0
	Paakad	17	0	1	4	5	4	1	1	1
	Papdi	4	0	2	1	1	0	0	0	0
	Peepal	1	0	0	0	0	1	0	0	0
	Reetha	1	1	0	0	0	0	0	0	0
	Shisham	71	22	22	16	7	4	0	0	0
	Siris	18	1	6	7	4	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
Total		326	100	122	59	32	10	1	1	1
68	Amaltas	15	3	8	4	0	0	0	0	0
	Babul	36	9	10	11	4	2	0	0	0
	Bakain	1	0	1	0	0	0	0	0	0
	Belpatra	1	1	0	0	0	0	0	0	0
	Eucalyptus	4	0	0	0	2	1	1	0	0
	Gauva	1	1	0	0	0	0	0	0	0
	Jamun	1	0	0	1	0	0	0	0	0
	Khajur	4	0	0	4	0	0	0	0	0
	Mulberry	5	2	2	0	1	0	0	0	0
	Neem	72	24	27	18	1	2	0	0	0
	Others	1	0	0	0	0	1	0	0	0
	Papdi	22	10	5	6	1	0	0	0	0
	Shisham	82	21	32	19	7	2	1	0	0
	Siris	14	2	4	5	1	2	0	0	0
Total		259	73	89	68	17	10	2	0	0
69	Amaltas	1	1	0	0	0	0	0	0	0
	Eucalyptus	20	0	2	11	4	1	2	0	0
	Jamun	3	0	2	0	1	0	0	0	0
	Kadam	3	0	2	1	0	0	0	0	0
	Mulberry	1	0	1	0	0	0	0	0	0
	Neem	45	11	24	10	0	0	0	0	0
	Paakad	6	0	2	3	0	0	0	1	0
	Papdi	89	27	32	23	6	1	0	0	0
	Peepal	2	0	0	2	0	0	0	0	0
	Sagaun	6	4	2	0	0	0	0	0	0
	Shisham	89	28	44	14	2	1	0	0	0
	Siris	15	2	4	8	1	0	0	0	0
Total		280	73	115	72	14	3	2	1	0
70	Amaltas	16	2	8	5	1	0	0	0	0
	Babul	5	0	1	4	0	0	0	0	0
	Bakain	1	1	0	0	0	0	0	0	0
	Bel	1	0	0	0	1	0	0	0	0
	Belpatra	1	1	0	0	0	0	0	0	0
	Bhad	1	1	0	0	0	0	0	0	0
	Dhak	19	6	7	6	0	0	0	0	0
	Eucalyptus	1	0	0	0	1	0	0	0	0
	Gular	2	0	0	0	0	0	0	0	2
	Jamun	20	1	5	1	2	1	8	0	2
	Khajur	4	0	0	2	2	0	0	0	0
	Mahua	1	0	0	0	0	0	0	1	0
	Mango	19	0	0	0	2	1	0	1	15
	Mulberry	1	0	1	0	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Neem	11	4	2	2	0	0	0	0	3
	Others	2	0	2	0	0	0	0	0	0
	Paakad	3	0	0	1	0	0	0	0	2
	Papdi	305	89	141	54	16	1	2	2	0
	Peepal	3	0	0	3	0	0	0	0	0
	Reetha	1	0	0	1	0	0	0	0	0
	Sagaun	11	6	4	1	0	0	0	0	0
	Shisham	106	37	43	22	0	1	0	0	3
Total		534	148	214	102	25	4	10	4	27
71	Amaltas	17	2	7	6	2	0	0	0	0
	Gular	1	0	1	0	0	0	0	0	0
	Jamun	6	1	1	1	1	0	1	1	0
	Khajur	1	0	0	1	0	0	0	0	0
	Mango	8	0	0	0	0	3	1	0	4
	Mulberry	1	0	0	0	0	1	0	0	0
	Neem	21	9	9	0	1	1	0	0	1
	Others	2	0	1	1	0	0	0	0	0
	Paakad	7	0	3	2	2	0	0	0	0
	Papdi	120	27	52	39	2	0	0	0	0
	Sagaun	37	17	19	1	0	0	0	0	0
	Shisham	91	42	38	8	0	0	0	0	3
	Siris	33	4	7	11	7	4	0	0	0
Total		345	102	138	70	15	9	2	1	8
72	Babul	2	0	0	1	1	0	0	0	0
	Bakain	1	0	1	0	0	0	0	0	0
	Eucalyptus	3	0	0	1	1	0	1	0	0
	Mango	4	0	0	0	0	3	0	0	1
	Mulberry	2	0	0	2	0	0	0	0	0
	Neem	12	3	0	0	2	0	0	2	5
	Others	1	0	1	0	0	0	0	0	0
	Paakad	31	4	7	11	7	1	0	0	1
	Papdi	144	37	53	44	10	0	0	0	0
	Sagaun	28	17	11	0	0	0	0	0	0
	Shisham	47	10	15	10	3	3	1	2	3
	Siris	8	2	1	2	2	0	0	0	1
Total		283	73	89	71	26	7	2	4	11
73	Babul	3	0	0	2	1	0	0	0	0
	Gular	1	0	0	0	0	1	0	0	0
	Jamun	3	0	0	0	1	0	0	0	2
	Khajur	1	0	0	0	1	0	0	0	0
	Mango	12	0	0	0	0	0	2	3	7
	Mulberry	1	0	1	0	0	0	0	0	0
	Neem	5	0	0	0	0	0	0	2	3

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Others	5	0	1	3	1	0	0	0	0
	Paakad	3	0	0	1	1	0	0	0	1
	Papdi	210	42	87	68	10	1	1	0	1
	Peepal	1	0	0	0	0	0	0	0	1
	Sagaun	12	10	2	0	0	0	0	0	0
	Shisham	29	4	15	6	0	1	0	0	3
	Siris	2	0	0	0	0	1	1	0	0
Total		288	56	106	80	15	4	4	5	18
74	Ber	1	0	0	0	0	0	0	0	1
	Jamun	6	0	0	0	0	2	0	1	3
	Khajur	2	0	0	1	1	0	0	0	0
	Mango	16	0	0	0	0	0	0	0	16
	Neem	6	0	0	0	1	0	0	2	3
	Paakad	1	0	0	0	1	0	0	0	0
	Papdi	81	24	38	16	3	0	0	0	0
	Peepal	1	0	0	0	0	0	0	0	1
	Shisham	14	4	5	5	0	0	0	0	0
Total		128	28	43	22	6	2	0	3	24
75	Eucalyptus	12	0	0	0	0	2	5	2	3
	Jamun	10	0	0	0	1	3	1	1	4
	Mulberry	9	0	1	6	1	1	0	0	0
	Others	3	0	0	1	2	0	0	0	0
	Paakad	2	0	0	0	1	0	0	1	0
	Papdi	68	2	8	24	23	7	4	0	0
	Shisham	5	0	0	1	2	0	1	0	1
	Siris	1	0	0	0	1	0	0	0	0
Total		110	2	9	32	31	13	11	4	8
76	Ber	1	0	0	0	0	0	0	1	0
	Eucalyptus	31	0	0	0	0	31	0	0	0
	Gular	2	0	0	0	0	1	0	1	0
	Paakad	19	1	4	5	3	3	0	1	2
	Papdi	20	0	0	13	6	1	0	0	0
	Shisham	4	0	0	1	0	1	0	1	1
Total		77	1	4	19	9	37	0	4	3
77	Mango	3	0	0	0	1	0	0	0	2
	Neem	4	0	0	1	1	0	0	0	2
	Paakad	99	0	4	34	45	7	5	2	2
	Papdi	76	0	14	33	26	3	0	0	0
	Shisham	2	0	0	0	0	0	0	1	1
Total		184	0	18	68	73	10	5	3	7
78	Ashok	2	2	0	0	0	0	0	0	0
	Bakain	1	0	0	1	0	0	0	0	0
	Eucalyptus	1	0	0	0	0	0	0	1	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Gular	1	0	1	0	0	0	0	0	0
	Mango	8	0	0	1	0	1	0	1	5
	Mulberry	4	1	1	1	0	1	0	0	0
	Neem	6	0	1	0	2	1	0	0	2
	Paakad	36	1	3	16	13	0	0	3	0
	Reetha	1	0	0	0	0	0	0	1	0
	Shisham	1	0	0	0	0	0	1	0	0
Total		61	4	6	19	15	3	1	6	7
79	Babul	1	0	1	0	0	0	0	0	0
	Bakain	1	0	1	0	0	0	0	0	0
	Eucalyptus	3	0	0	0	0	1	1	0	1
	Gulmohar	3	0	0	0	3	0	0	0	0
	Jamun	4	4	0	0	0	0	0	0	0
	Mango	11	0	0	0	3	1	0	0	7
	Morpankhi	1	0	0	1	0	0	0	0	0
	Mulberry	1	0	1	0	0	0	0	0	0
	Neem	2	1	0	0	0	0	0	0	1
	Others	1	0	0	0	1	0	0	0	0
	Paakad	4	2	0	0	0	2	0	0	0
	Papdi	164	24	25	48	55	11	1	0	0
	Peepal	1	0	0	0	0	1	0	0	0
	Pilkhan	1	0	0	1	0	0	0	0	0
	Sagaun	10	8	0	1	1	0	0	0	0
	Shisham	6	3	0	1	1	0	0	1	0
Total		214	42	28	52	64	16	2	1	9
80	Amaltas	3	0	0	0	3	0	0	0	0
	Babul	2	0	1	1	0	0	0	0	0
	Bakain	6	2	3	0	1	0	0	0	0
	Bel	1	0	0	0	1	0	0	0	0
	Eucalyptus	2	0	0	0	1	0	0	1	0
	Gular	1	0	1	0	0	0	0	0	0
	Mulberry	3	0	2	1	0	0	0	0	0
	Neem	12	3	8	0	1	0	0	0	0
	Others	1	0	0	0	0	1	0	0	0
	Paakad	32	3	8	5	13	0	0	2	1
	Papdi	60	2	8	39	8	2	0	1	0
	Peepal	1	0	0	0	0	0	0	1	0
	Sagaun	12	11	1	0	0	0	0	0	0
	Shisham	3	2	0	0	0	0	1	0	0
Total		139	23	32	46	28	3	1	5	1
81	Amaltas	13	0	1	2	10	0	0	0	0
	Babul	4	1	1	0	1	0	1	0	0
	Bakain	4	1	0	2	1	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Ber	6	3	2	1	0	0	0	0	0
	Eucalyptus	48	7	18	23	0	0	0	0	0
	Gulmohar	1	0	1	0	0	0	0	0	0
	Jamun	1	0	0	0	0	0	0	0	1
	Mango	2	0	0	0	0	0	0	0	2
	Morpankhi	2	1	1	0	0	0	0	0	0
	Mulberry	9	3	2	3	1	0	0	0	0
	Neem	3	0	1	0	2	0	0	0	0
	Paakad	13	1	4	4	4	0	0	0	0
	Papdi	53	8	5	13	26	1	0	0	0
	Sagaun	26	26	0	0	0	0	0	0	0
	Shisham	27	10	9	4	1	0	0	3	0
	Siris	1	0	1	0	0	0	0	0	0
Total		213	61	46	52	46	1	1	3	3
82	Amaltas	8	2	2	2	1	0	0	0	1
	Babul	56	10	32	12	2	0	0	0	0
	Bakain	2	0	1	1	0	0	0	0	0
	Bel	1	0	1	0	0	0	0	0	0
	Ber	14	2	6	5	1	0	0	0	0
	Eucalyptus	23	7	5	8	2	0	1	0	0
	Gular	1	1	0	0	0	0	0	0	0
	Gulmohar	14	6	5	3	0	0	0	0	0
	Jamun	9	6	2	0	1	0	0	0	0
	Jangle Jalebi	1	0	1	0	0	0	0	0	0
	Mango	7	0	0	2	1	1	0	1	2
	Morpankhi	1	0	1	0	0	0	0	0	0
	Mulberry	14	5	7	1	0	0	1	0	0
	Neem	37	4	14	14	4	0	1	0	0
	Others	3	2	1	0	0	0	0	0	0
	Paakad	18	5	6	2	5	0	0	0	0
	Papdi	249	56	87	72	20	12	1	1	0
	Sagaun	33	32	0	1	0	0	0	0	0
	Shisham	60	18	28	10	1	1	1	0	1
	Siris	30	3	11	14	2	0	0	0	0
Total		581	159	210	147	40	14	5	2	4
83	Babul	30	12	12	4	2	0	0	0	0
	Bakain	2	0	0	2	0	0	0	0	0
	Ber	1	1	0	0	0	0	0	0	0
	Eucalyptus	8	1	1	2	2	0	1	0	1
	Gauva	2	1	1	0	0	0	0	0	0
	Gular	2	0	1	0	0	1	0	0	0
	Jamun	9	6	1	0	1	1	0	0	0
	Jangle Jalebi	3	0	1	2	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Mango	12	0	1	3	1	0	1	2	4
	Mulberry	3	1	2	0	0	0	0	0	0
	Neem	4	3	0	0	0	0	0	0	1
	Paakad	43	2	11	13	9	2	4	1	1
	Papdi	25	7	11	5	2	0	0	0	0
	Sagaun	18	18	0	0	0	0	0	0	0
	Shisham	45	25	11	7	0	2	0	0	0
	Siris	7	1	2	4	0	0	0	0	0
Total		214	78	55	42	17	6	6	3	7
84	Amaltas	4	0	0	3	1	0	0	0	0
	Babul	13	1	9	2	1	0	0	0	0
	Eucalyptus	34	2	6	10	13	1	1	1	0
	Gular	2	0	0	1	1	0	0	0	0
	Gulmohar	10	1	4	2	2	1	0	0	0
	Jangle Jalebi	1	0	0	1	0	0	0	0	0
	Kanji	5	1	0	0	0	1	3	0	0
	Kikar	7	0	2	3	2	0	0	0	0
	Mango	12	0	0	0	0	2	0	2	8
	Morpankhi	1	0	0	1	0	0	0	0	0
	Neem	8	1	2	1	0	2	1	1	0
	Paakad	32	6	2	12	6	3	0	0	3
	Papdi	28	7	8	9	4	0	0	0	0
	Shisham	38	8	13	9	3	1	0	1	3
	Siris	9	1	5	1	1	0	1	0	0
Total		204	28	51	55	34	11	6	5	14
85	Amaltas	4	0	0	3	1	0	0	0	0
	Babul	1	0	0	1	0	0	0	0	0
	Bakain	2	0	2	0	0	0	0	0	0
	Gular	2	1	0	0	1	0	0	0	0
	Gulmohar	2	0	0	1	1	0	0	0	0
	Jamun	3	0	0	0	1	1	0	1	0
	Mango	1	0	0	1	0	0	0	0	0
	Neem	1	0	0	0	0	1	0	0	0
	Others	1	0	0	0	0	1	0	0	0
	Paakad	29	2	7	9	2	3	3	1	2
	Papdi	22	0	8	12	2	0	0	0	0
	Poplar	1	0	1	0	0	0	0	0	0
	Sagaun	3	0	3	0	0	0	0	0	0
	Shisham	35	2	5	25	0	0	1	0	2
Total		107	5	26	52	8	6	4	2	4
86	Babul	1	0	1	0	0	0	0	0	0
	Bakain	5	0	4	0	0	1	0	0	0
	Eucalyptus	10	10	0	0	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Gular	3	0	2	1	0	0	0	0	0
	Gulmohar	4	0	2	2	0	0	0	0	0
	Jamun	1	0	0	0	0	0	1	0	0
	Jangle Jalebi	1	0	0	0	1	0	0	0	0
	Mulberry	2	1	0	1	0	0	0	0	0
	Others	1	0	0	1	0	0	0	0	0
	Paakad	32	3	5	10	5	2	3	1	3
	Peepal	2	0	0	0	0	0	0	1	1
	Sagaun	20	0	20	0	0	0	0	0	0
	Shisham	7	2	1	1	2	0	0	0	1
Total		89	16	35	16	8	3	4	2	5
87	Babul	7	6	0	1	0	0	0	0	0
	Bakain	5	2	0	3	0	0	0	0	0
	Chameli	1	0	1	0	0	0	0	0	0
	Gular	1	0	0	1	0	0	0	0	0
	Gulmohar	17	1	3	6	7	0	0	0	0
	Jamun	1	0	0	1	0	0	0	0	0
	Kaner	4	2	2	0	0	0	0	0	0
	Mango	1	1	0	0	0	0	0	0	0
	Morpankhi	5	1	1	3	0	0	0	0	0
	Mulberry	4	0	3	1	0	0	0	0	0
	Neem	4	1	1	1	0	1	0	0	0
	Others	2	1	1	0	0	0	0	0	0
	Paakad	12	0	4	1	3	0	0	1	3
	Papdi	35	35	0	0	0	0	0	0	0
	Shisham	9	0	1	2	1	2	0	1	2
Total		108	50	17	20	11	3	0	2	5
88	Amaltas	1	0	0	1	0	0	0	0	0
	Bakain	1	0	0	1	0	0	0	0	0
	Ber	1	0	0	0	1	0	0	0	0
	Gular	18	1	1	14	2	0	0	0	0
	Gulmohar	10	0	3	5	2	0	0	0	0
	Jamun	1	0	0	0	1	0	0	0	0
	Jangle Jalebi	1	0	0	0	0	0	1	0	0
	Kaner	15	14	1	0	0	0	0	0	0
	Mulberry	3	0	2	0	1	0	0	0	0
	Neem	1	0	0	0	0	0	0	1	0
	Others	1	1	0	0	0	0	0	0	0
	Paakad	27	3	4	12	3	2	0	1	2
	Peepal	3	0	0	1	1	0	0	0	1
	Poplar	1	0	0	1	0	0	0	0	0
	Shisham	2	0	0	0	0	0	0	2	0
Total		86	19	11	35	11	2	1	4	3

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
89	Bakain	4	0	1	2	1	0	0	0	0
	Ber	1	0	0	1	0	0	0	0	0
	Eucalyptus	14	0	0	0	2	0	2	10	0
	Gular	2	0	1	0	1	0	0	0	0
	Gulmohar	3	1	0	0	1	1	0	0	0
	Neem	7	0	0	0	4	0	1	2	0
	Others	1	0	0	0	0	1	0	0	0
	Paakad	73	3	17	20	11	9	6	6	1
	Shisham	1	0	0	0	0	1	0	0	0
	Siris	3	0	2	1	0	0	0	0	0
Total		109	4	21	24	20	12	9	18	1
90	Amaltas	22	0	3	18	0	1	0	0	0
	Bakain	2	0	1	1	0	0	0	0	0
	Eucalyptus	5	0	0	0	0	1	1	3	0
	Gauva	10	10	0	0	0	0	0	0	0
	Gular	4	2	0	0	0	2	0	0	0
	Mango	5	0	0	0	0	0	0	2	3
	Mulberry	4	1	1	2	0	0	0	0	0
	Others	1	0	0	1	0	0	0	0	0
	Paakad	50	4	3	15	11	10	3	3	1
	Papdi	1	0	0	1	0	0	0	0	0
	Pilkhan	1	0	0	0	1	0	0	0	0
	Shisham	15	4	8	2	0	1	0	0	0
	Siris	7	1	3	1	1	1	0	0	0
Total		127	22	19	41	13	16	4	8	4
91	Bakain	2	1	0	1	0	0	0	0	0
	Ber	4	2	0	1	1	0	0	0	0
	Eucalyptus	17	0	0	3	3	3	4	1	3
	Gulmohar	1	0	1	0	0	0	0	0	0
	Morpankhi	5	3	2	0	0	0	0	0	0
	Neem	2	2	0	0	0	0	0	0	0
	Paakad	2	0	0	0	0	1	1	0	0
	Papdi	6	0	3	2	0	0	0	1	0
	Shisham	37	8	12	12	5	0	0	0	0
	Siris	15	2	3	6	4	0	0	0	0
Total		91	18	21	25	13	4	5	2	3
92	Amaltas	1	0	0	0	0	1	0	0	0
	Bakain	1	0	0	1	0	0	0	0	0
	Bel	1	0	1	0	0	0	0	0	0
	Ber	8	0	4	0	0	3	1	0	0
	Bhad	2	0	2	0	0	0	0	0	0
	Eucalyptus	257	0	0	3	11	79	66	95	3
	Gulmohar	1	1	0	0	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Jangal Jalebi	1	0	1	0	0	0	0	0	0
	Kanji	1	0	1	0	0	0	0	0	0
	Morpankhi	1	0	1	0	0	0	0	0	0
	Mulberry	1	0	0	1	0	0	0	0	0
	Neem	4	2	1	0	1	0	0	0	0
	Others	2	0	1	1	0	0	0	0	0
	Paakad	3	0	0	2	0	1	0	0	0
	Papdi	3	2	0	1	0	0	0	0	0
	Shisham	15	4	5	4	0	0	2	0	0
	Siris	23	3	6	12	2	0	0	0	0
Total		325	12	23	25	14	84	69	95	3
93	Amaltas	2	0	0	2	0	0	0	0	0
	Bel	3	1	2	0	0	0	0	0	0
	Eucalyptus	121	0	0	0	0	35	30	53	3
	Gulmohar	1	0	1	0	0	0	0	0	0
	Neem	10	2	3	3	2	0	0	0	0
	Others	1	0	0	0	1	0	0	0	0
	Paakad	16	1	3	8	3	1	0	0	0
	Papdi	61	15	32	10	4	0	0	0	0
	Peepal	4	1	3	0	0	0	0	0	0
	Pilkhan	1	0	1	0	0	0	0	0	0
	Sagaun	1	1	0	0	0	0	0	0	0
	Shisham	7	1	1	4	1	0	0	0	0
	Siris	52	9	20	17	5	0	1	0	0
Total		280	31	66	44	16	36	31	53	3
94	Amaltas	15	0	10	5	0	0	0	0	0
	Bakain	1	0	0	1	0	0	0	0	0
	Bel	5	1	2	2	0	0	0	0	0
	Ber	1	0	0	1	0	0	0	0	0
	Eucalyptus	86	0	0	0	3	14	15	17	37
	Gular	8	6	0	1	1	0	0	0	0
	Gulmohar	3	3	0	0	0	0	0	0	0
	Mulberry	2	0	0	2	0	0	0	0	0
	Neem	13	6	5	1	0	0	0	1	0
	Paakad	12	2	3	4	2	0	1	0	0
	Papdi	14	1	3	10	0	0	0	0	0
	Sagaun	16	14	2	0	0	0	0	0	0
	Shisham	26	11	5	7	0	0	3	0	0
	Siris	35	6	10	14	5	0	0	0	0
Total		237	50	40	48	11	14	19	18	37
95	Bakain	2	1	0	1	0	0	0	0	0
	Eucalyptus	111	1	0	0	46	25	31	8	0
	Gular	7	2	1	3	0	1	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Jamun	4	1	0	3	0	0	0	0	0
	Mango	10	0	0	0	4	2	2	2	0
	Mulberry	1	1	0	0	0	0	0	0	0
	Neem	23	0	0	2	0	1	20	0	0
	Paakad	2	1	0	1	0	0	0	0	0
	Papdi	29	4	14	11	0	0	0	0	0
	Peepal	1	1	0	0	0	0	0	0	0
	Sagaun	3	3	0	0	0	0	0	0	0
	Shisham	9	5	2	1	0	0	0	1	0
	Siris	41	3	5	23	8	2	0	0	0
Total		243	23	22	45	58	31	53	11	0
96	Babul	4	1	3	0	0	0	0	0	0
	Bakain	3	1	0	1	1	0	0	0	0
	Bel	1	0	0	1	0	0	0	0	0
	Eucalyptus	36	0	0	0	1	6	6	6	17
	Gular	4	2	1	0	0	1	0	0	0
	Gulmohar	1	0	0	0	1	0	0	0	0
	Jamun	3	0	0	0	1	1	1	0	0
	Jangal Jalebi	1	1	0	0	0	0	0	0	0
	Mango	26	1	0	0	4	16	4	0	1
	Mulberry	2	1	0	1	0	0	0	0	0
	Neem	10	3	4	3	0	0	0	0	0
	Others	2	1	1	0	0	0	0	0	0
	Paakad	18	1	1	8	5	2	1	0	0
	Papdi	38	18	9	6	2	2	1	0	0
	Sejhan	2	0	1	0	1	0	0	0	0
	Shisham	11	1	6	0	1	3	0	0	0
	Siris	48	2	22	13	5	0	6	0	0
Total		210	33	48	33	22	31	19	6	18
97	Amaltas	17	0	0	6	9	2	0	0	0
	Babul	1	0	0	1	0	0	0	0	0
	Bakain	1	1	0	0	0	0	0	0	0
	Bel	2	0	1	1	0	0	0	0	0
	Eucalyptus	76	0	0	0	27	18	6	25	0
	Gauva	1	1	0	0	0	0	0	0	0
	Gular	2	0	1	1	0	0	0	0	0
	Gulmohar	3	1	2	0	0	0	0	0	0
	Morpankhi	6	6	0	0	0	0	0	0	0
	Neem	13	0	3	5	3	2	0	0	0
	Others	12	0	10	2	0	0	0	0	0
	Paakad	24	2	5	3	4	7	2	1	0
	Papdi	23	0	15	8	0	0	0	0	0
	Peepal	2	0	0	1	0	0	1	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Shisham	17	5	1	5	3	3	0	0	0
	Siris	41	5	13	13	5	5	0	0	0
Total		241	21	51	46	51	37	9	26	0
98	Amaltas	1	0	0	0	0	0	1	0	0
	Babul	1	0	0	0	0	1	0	0	0
	Bakain	1	0	0	0	0	0	1	0	0
	Bel	2	0	1	0	0	0	0	1	0
	Ber	1	1	0	0	0	0	0	0	0
	Bhad	1	0	0	1	0	0	0	0	0
	Eucalyptus	10	0	0	0	0	1	0	3	6
	Gauva	2	2	0	0	0	0	0	0	0
	Jamun	5	0	0	2	3	0	0	0	0
	Jangal Jalebi	1	0	1	0	0	0	0	0	0
	Mulberry	3	0	1	0	1	1	0	0	0
	Neem	4	0	1	3	0	0	0	0	0
	Paakad	6	0	1	2	1	0	2	0	0
	Papdi	60	10	14	32	1	0	0	0	3
	Shisham	8	1	2	1	2	2	0	0	0
	Siris	151	7	36	50	25	26	4	2	1
Total		257	21	57	91	33	31	8	6	10
99	Amaltas	12	0	2	4	1	3	2	0	0
	Babul	2	0	1	0	0	0	0	0	1
	Bakain	5	1	2	2	0	0	0	0	0
	Bel	1	1	0	0	0	0	0	0	0
	Ber	4	0	1	3	0	0	0	0	0
	Eucalyptus	9	0	0	0	1	1	2	1	4
	Gular	2	0	0	2	0	0	0	0	0
	Gulmohar	1	0	0	1	0	0	0	0	0
	Jamun	1	0	1	0	0	0	0	0	0
	Mulberry	5	0	2	3	0	0	0	0	0
	Neem	7	0	1	3	2	0	1	0	0
	Paakad	4	0	0	1	2	0	0	1	0
	Papdi	80	7	30	35	2	4	0	0	2
	Peepal	1	0	0	0	1	0	0	0	0
	Reetha	5	1	1	1	0	2	0	0	0
	Sejhan	1	0	0	1	0	0	0	0	0
	Shisham	26	3	5	8	6	4	0	0	0
	Siris	54	13	14	16	8	3	0	0	0
Total		220	26	60	80	23	17	5	2	7
100	Amaltas	10	1	5	4	0	0	0	0	0
	Bakain	8	2	2	2	1	0	1	0	0
	Bel	5	2	3	0	0	0	0	0	0
	Ber	2	1	1	0	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Eucalyptus	56	1	2	1	0	17	7	28	0
	Gular	3	2	1	0	0	0	0	0	0
	Jamun	1	0	1	0	0	0	0	0	0
	Mulberry	8	2	4	1	1	0	0	0	0
	Neem	11	2	3	2	2	1	0	0	1
	Others	1	0	1	0	0	0	0	0	0
	Paakad	6	0	0	1	4	0	1	0	0
	Papdi	56	5	31	17	2	1	0	0	0
	Reetha	1	0	0	1	0	0	0	0	0
	Shisham	13	3	4	5	0	1	0	0	0
	Siris	19	4	11	3	1	0	0	0	0
Total		200	25	69	37	11	20	9	28	1
101	Bakain	17	8	5	3	0	1	0	0	0
	Ber	2	2	0	0	0	0	0	0	0
	Eucalyptus	96	1	1	0	1	23	21	24	25
	Mulberry	5	5	0	0	0	0	0	0	0
	Neem	11	1	2	4	2	1	0	0	1
	Paakad	2	0	1	1	0	0	0	0	0
	Papdi	52	7	10	30	3	1	1	0	0
	Peepal	1	0	1	0	0	0	0	0	0
	Poplar	6	6	0	0	0	0	0	0	0
	Sagaun	1	1	0	0	0	0	0	0	0
	Shisham	19	1	4	8	5	0	0	0	1
	Siris	18	2	4	11	1	0	0	0	0
Total		230	34	28	57	12	26	22	24	27
102	Babul	2	0	1	0	1	0	0	0	0
	Bakain	7	3	4	0	0	0	0	0	0
	Bel	1	0	0	1	0	0	0	0	0
	Eucalyptus	90	0	0	0	2	24	42	13	9
	Jangal Jalebi	2	1	1	0	0	0	0	0	0
	Mulberry	4	1	2	1	0	0	0	0	0
	Paakad	12	2	7	2	1	0	0	0	0
	Papdi	8	1	3	4	0	0	0	0	0
	Shisham	20	9	3	7	0	1	0	0	0
	Siris	24	2	4	8	4	6	0	0	0
Total		170	19	25	23	8	31	42	13	9
103	Amaltas	1	0	0	0	1	0	0	0	0
	Babul	31	12	6	7	3	1	2	0	0
	Ber	3	2	1	0	0	0	0	0	0
	Eucalyptus	21	0	0	1	2	5	8	3	2
	Gular	1	0	0	0	1	0	0	0	0
	Jangal Jalebi	2	2	0	0	0	0	0	0	0
	Mulberry	4	3	0	0	1	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Neem	4	3	0	1	0	0	0	0	0
	Paakad	21	4	0	5	8	2	1	1	0
	Papdi	10	2	1	3	1	2	1	0	0
	Peepal	1	0	1	0	0	0	0	0	0
	Semal	1	0	0	1	0	0	0	0	0
	Shisham	24	8	4	8	1	1	2	0	0
	Siris	18	1	1	10	4	2	0	0	0
Total		142	37	14	36	22	13	14	4	2
104	Babul	5	1	0	3	0	1	0	0	0
	Bakain	4	1	1	2	0	0	0	0	0
	Ber	1	0	0	1	0	0	0	0	0
	Eucalyptus	59	0	0	1	1	31	1	24	1
	Gulmohar	1	0	1	0	0	0	0	0	0
	Mulberry	2	1	0	1	0	0	0	0	0
	Others	1	0	0	0	1	0	0	0	0
	Paakad	40	2	3	18	10	2	1	4	0
	Papdi	19	1	4	11	3	0	0	0	0
	Shisham	6	0	1	3	2	0	0	0	0
	Siris	1	0	1	0	0	0	0	0	0
Total		139	6	11	40	17	34	2	28	1
105	Babul	6	1	2	2	1	0	0	0	0
	Bakain	2	0	0	1	1	0	0	0	0
	Ber	1	0	1	0	0	0	0	0	0
	Eucalyptus	67	0	1	0	4	20	20	13	9
	Neem	2	2	0	0	0	0	0	0	0
	Paakad	4	0	1	2	1	0	0	0	0
	Papdi	13	1	4	6	2	0	0	0	0
	Shisham	13	1	5	5	1	1	0	0	0
	Siris	26	0	3	16	5	2	0	0	0
Total		134	5	17	32	15	23	20	13	9
106	Amaltas	1	0	1	0	0	0	0	0	0
	Ber	3	2	1	0	0	0	0	0	0
	Eucalyptus	102	2	0	1	19	37	12	26	5
	Gulmohar	1	0	0	1	0	0	0	0	0
	Mango	8	0	0	0	3	2	3	0	0
	Papdi	35	6	16	10	2	0	1	0	0
	Shisham	11	4	4	1	2	0	0	0	0
	Siris	37	5	13	13	3	3	0	0	0
Total		198	19	35	26	29	42	16	26	5
107	Eucalyptus	213	0	0	1	24	44	83	31	30
	Neem	3	0	0	1	2	0	0	0	0
	Papdi	74	6	32	23	8	4	1	0	0
	Sagaun	1	1	0	0	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Shisham	3	0	1	2	0	0	0	0	0
	Siris	21	1	3	9	8	0	0	0	0
Total		315	8	36	36	42	48	84	31	30
108	Amaltas	1	0	0	0	0	1	0	0	0
	Bakain	1	0	1	0	0	0	0	0	0
	Bel	3	0	3	0	0	0	0	0	0
	Ber	6	1	4	1	0	0	0	0	0
	Eucalyptus	319	0	0	0	31	69	100	32	87
	Gular	1	0	1	0	0	0	0	0	0
	Gulmohar	1	0	0	1	0	0	0	0	0
	Jamun	1	0	1	0	0	0	0	0	0
	Mulberry	5	1	2	2	0	0	0	0	0
	Neem	2	0	0	0	1	0	1	0	0
	Others	2	0	2	0	0	0	0	0	0
	Paakad	11	0	3	4	2	1	0	0	1
	Papdi	40	2	7	20	6	3	2	0	0
	Peepal	2	1	0	0	1	0	0	0	0
	Shisham	6	1	1	2	2	0	0	0	0
	Siris	7	0	2	3	1	1	0	0	0
Total		408	6	27	33	44	75	103	32	88
109	Ashok	1	0	0	0	1	0	0	0	0
	Bakain	1	0	0	0	1	0	0	0	0
	Bel	1	0	0	0	1	0	0	0	0
	Eucalyptus	70	0	0	0	4	13	30	13	10
	Morpankhi	1	0	1	0	0	0	0	0	0
	Mulberry	4	0	2	0	2	0	0	0	0
	Neem	4	0	0	2	0	0	1	1	0
	Paakad	46	1	7	12	23	0	0	0	3
	Papdi	24	2	16	2	2	1	1	0	0
	Shisham	1	0	0	0	1	0	0	0	0
	Siris	8	7	0	0	1	0	0	0	0
Total		161	10	26	16	36	14	32	14	13
110	Babul	1	0	0	1	0	0	0	0	0
	Bel	1	0	0	1	0	0	0	0	0
	Eucalyptus	65	0	14	2	0	3	19	15	12
	Jamun	1	0	0	1	0	0	0	0	0
	Mango	3	1	0	1	1	0	0	0	0
	Neem	10	5	0	1	2	2	0	0	0
	Papdi	30	0	4	11	7	4	4	0	0
	Peepal	1	0	1	0	0	0	0	0	0
	Sagaun	6	1	5	0	0	0	0	0	0
	Shisham	9	3	0	2	1	3	0	0	0
	Siris	42	21	1	3	5	6	2	4	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
Total		169	31	25	23	16	18	25	19	12
111	Eucalyptus	56	7	0	0	0	5	1	31	12
	Mango	1	0	0	0	1	0	0	0	0
	Neem	26	0	7	8	7	2	1	1	0
	Paakad	58	0	17	9	29	1	1	1	0
	Papdi	1	0	0	0	0	0	1	0	0
	Shisham	2	0	0	2	0	0	0	0	0
Total		144	7	24	19	37	8	4	33	12
112	Babul	1	0	0	1	0	0	0	0	0
	Eucalyptus	16	0	0	1	3	1	11	0	0
	Neem	2	0	2	0	0	0	0	0	0
	Paakad	9	0	3	3	2	1	0	0	0
	Papdi	112	11	27	50	23	0	1	0	0
	Sagaun	4	0	3	0	1	0	0	0	0
	Shisham	19	0	8	6	5	0	0	0	0
	Siris	67	3	33	18	13	0	0	0	0
Total		230	14	76	79	47	2	12	0	0
113	Bakain	2	0	0	0	2	0	0	0	0
	Bel	1	0	1	0	0	0	0	0	0
	Ber	1	0	0	1	0	0	0	0	0
	Eucalyptus	5	0	0	0	4	0	0	1	0
	Neem	13	5	5	3	0	0	0	0	0
	Papdi	82	3	28	5	40	4	2	0	0
	Sagaun	7	2	1	1	3	0	0	0	0
	Shisham	10	2	1	4	2	1	0	0	0
	Siris	90	9	11	22	48	0	0	0	0
Total		211	21	47	36	99	5	2	1	0
114	Eucalyptus	30	0	0	0	0	20	0	10	0
	Morpankhi	1	0	0	0	0	1	0	0	0
	Mulberry	1	0	0	0	1	0	0	0	0
	Paakad	40	4	9	15	11	0	1	0	0
	Papdi	11	0	11	0	0	0	0	0	0
	Siris	1	0	0	0	1	0	0	0	0
Total		84	4	20	15	13	21	1	10	0
115	Bakain	3	0	3	0	0	0	0	0	0
	Eucalyptus	53	0	0	0	10	10	20	3	10
	Kikar	1	0	0	0	1	0	0	0	0
	Mango	1	0	0	1	0	0	0	0	0
	Mulberry	3	3	0	0	0	0	0	0	0
	Neem	2	0	0	2	0	0	0	0	0
	Paakad	16	1	1	1	12	1	0	0	0
	Papdi	9	0	2	1	1	2	1	0	2
	Shisham	5	4	1	0	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Siris	4	1	0	0	1	2	0	0	0
Total		97	9	7	5	25	15	21	3	12
116	Bel	2	2	0	0	0	0	0	0	0
	Ber	1	0	1	0	0	0	0	0	0
	Eucalyptus	45	0	0	0	0	14	10	20	1
	Neem	7	1	1	3	1	1	0	0	0
	Papdi	14	5	0	1	5	3	0	0	0
	Sagaun	31	30	1	0	0	0	0	0	0
	Shisham	4	2	1	1	0	0	0	0	0
	Siris	49	17	25	1	6	0	0	0	0
Total		153	57	29	6	12	18	10	20	1
117	Bakain	2	0	0	0	0	1	0	1	0
	Bel	2	0	1	1	0	0	0	0	0
	Ber	1	1	0	0	0	0	0	0	0
	Eucalyptus	39	0	0	0	5	8	15	11	0
	Neem	39	7	12	10	9	1	0	0	0
	Paakad	1	1	0	0	0	0	0	0	0
	Papdi	49	5	18	1	23	0	2	0	0
	Reetha	1	0	1	0	0	0	0	0	0
	Sagaun	28	18	9	0	0	1	0	0	0
	Shisham	13	0	5	5	1	0	1	1	0
	Siris	72	38	15	15	4	0	0	0	0
Total		247	70	61	32	42	11	18	13	0
118	Bakain	11	0	4	1	6	0	0	0	0
	Eucalyptus	18	0	0	1	1	3	11	2	0
	Neem	7	0	1	0	6	0	0	0	0
	Paakad	14	2	5	2	5	0	0	0	0
	Papdi	35	2	4	12	12	3	2	0	0
	Sagaun	6	3	0	0	2	1	0	0	0
	Shisham	8	3	2	2	1	0	0	0	0
	Siris	56	6	4	30	12	4	0	0	0
Total		155	16	20	48	45	11	13	2	0
119	Bakain	2	2	0	0	0	0	0	0	0
	Eucalyptus	143	0	0	0	38	49	42	14	0
	Mulberry	1	0	1	0	0	0	0	0	0
	Neem	10	0	1	4	4	0	0	0	1
	Paakad	14	1	3	8	2	0	0	0	0
	Papdi	25	4	6	0	3	9	3	0	0
	Peepal	1	0	0	0	0	1	0	0	0
	Shisham	5	0	2	2	1	0	0	0	0
	Siris	37	11	7	3	13	3	0	0	0
Total		238	18	20	17	61	62	45	14	1
120	Eucalyptus	178	0	0	2	65	47	21	27	16

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Neem	4	1	1	0	2	0	0	0	0
	Paakad	30	0	1	5	12	6	3	1	2
	Peepal	1	0	0	0	1	0	0	0	0
	Siris	2	1	1	0	0	0	0	0	0
Total		215	2	3	7	80	53	24	28	18
121	Babul	1	0	1	0	0	0	0	0	0
	Eucalyptus	58	0	0	4	11	14	8	11	10
	Gulmohar	1	0	1	0	0	0	0	0	0
	Neem	7	1	0	2	4	0	0	0	0
	Paakad	12	0	1	1	8	1	0	0	1
	Papdi	112	4	42	16	28	14	7	0	1
	Sagaun	10	10	0	0	0	0	0	0	0
	Shisham	5	1	0	2	2	0	0	0	0
	Siris	1	0	0	1	0	0	0	0	0
Total		207	16	45	26	53	29	15	11	12
122	Bakain	1	0	1	0	0	0	0	0	0
	Eucalyptus	204	0	0	3	41	93	45	22	0
	Gular	1	0	0	1	0	0	0	0	0
	Mango	2	0	0	0	0	2	0	0	0
	Morpankhi	1	0	1	0	0	0	0	0	0
	Mulberry	1	0	1	0	0	0	0	0	0
	Neem	14	0	1	4	5	4	0	0	0
	Paakad	1	0	1	0	0	0	0	0	0
	Papdi	75	0	0	20	44	11	0	0	0
	Peepal	1	0	1	0	0	0	0	0	0
	Sagaun	6	3	3	0	0	0	0	0	0
	Shisham	3	0	0	2	1	0	0	0	0
	Siris	11	4	5	1	0	1	0	0	0
Total		321	7	14	31	91	111	45	22	0
123	Eucalyptus	13	0	0	0	3	10	0	0	0
	Morpankhi	8	5	3	0	0	0	0	0	0
	Neem	3	0	3	0	0	0	0	0	0
	Shisham	1	0	0	0	1	0	0	0	0
	Siris	1	1	0	0	0	0	0	0	0
Total		26	6	6	0	4	10	0	0	0
124	Eucalyptus	8	0	0	0	1	5	2	0	0
	Neem	1	0	0	0	1	0	0	0	0
	Paakad	26	0	3	7	12	2	2	0	0
	Papdi	32	0	17	0	15	0	0	0	0
	Shisham	1	0	1	0	0	0	0	0	0
	Siris	3	0	3	0	0	0	0	0	0
Total		71	0	24	7	29	7	4	0	0
125	Ber	1	0	1	0	0	0	0	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Eucalyptus	24	0	0	24	0	0	0	0	0
	Gulmohar	1	0	0	1	0	0	0	0	0
	Kaner	2	2	0	0	0	0	0	0	0
	Mango	4	0	2	2	0	0	0	0	0
	Neem	4	0	1	1	1	0	1	0	0
	Paakad	61	0	17	20	21	3	0	0	0
	Papdi	2	0	0	0	1	1	0	0	0
	Peepal	1	1	0	0	0	0	0	0	0
	Shisham	1	0	0	0	1	0	0	0	0
	Siris	1	0	0	0	1	0	0	0	0
Total		102	3	21	48	25	4	1	0	0
126	Bakain	1	0	0	0	1	0	0	0	0
	Bel	2	1	0	0	0	1	0	0	0
	Eucalyptus	1	0	1	0	0	0	0	0	0
	Gular	4	3	1	0	0	0	0	0	0
	Mango	3	0	0	0	1	2	0	0	0
	Morpankhi	2	0	0	2	0	0	0	0	0
	Neem	3	1	0	0	1	0	0	0	1
	Paakad	13	2	6	4	1	0	0	0	0
	Papdi	95	6	13	21	32	17	4	0	2
	Peepal	1	0	0	1	0	0	0	0	0
	Sagaun	2	0	2	0	0	0	0	0	0
	Shisham	4	0	3	0	0	0	0	1	0
	Siris	20	1	12	2	2	1	2	0	0
Total		151	14	38	30	38	21	6	1	3
127	Ashok	2	1	0	1	0	0	0	0	0
	Babul	2	0	1	1	0	0	0	0	0
	Eucalyptus	6	0	0	0	2	3	1	0	0
	Gular	13	9	4	0	0	0	0	0	0
	Jamun	2	0	0	2	0	0	0	0	0
	Kikar	1	0	0	0	1	0	0	0	0
	Mango	1	0	0	0	0	0	1	0	0
	Neem	11	0	0	4	4	2	0	0	1
	Paakad	3	0	2	0	0	1	0	0	0
	Papdi	117	0	13	42	24	22	6	7	3
	Sagaun	13	12	0	0	1	0	0	0	0
	Shisham	7	0	1	1	4	1	0	0	0
	Siris	19	0	6	1	7	3	1	1	0
Total		197	22	27	52	43	32	9	8	4
128	Eucalyptus	24	0	1	17	3	3	0	0	0
	Gulmohar	1	0	1	0	0	0	0	0	0
	Neem	19	1	6	10	0	1	0	1	0
	Papdi	237	0	20	96	75	26	18	1	1

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Reetha	2	1	1	0	0	0	0	0	0
	Shisham	3	1	1	0	1	0	0	0	0
	Siris	26	0	2	3	12	8	1	0	0
Total		312	3	32	126	91	38	19	2	1
129	Bel	2	2	0	0	0	0	0	0	0
	Eucalyptus	14	0	0	1	0	11	2	0	0
	Gular	1	1	0	0	0	0	0	0	0
	Gulmohar	1	1	0	0	0	0	0	0	0
	Neem	12	1	3	1	6	1	0	0	0
	Papdi	221	17	55	53	66	4	23	1	2
	Reetha	1	0	1	0	0	0	0	0	0
	Shisham	17	1	7	3	6	0	0	0	0
	Siris	10	0	1	1	4	4	0	0	0
Total		279	23	67	59	82	20	25	1	2
130	Kaner	1	0	1	0	0	0	0	0	0
	Mango	1	0	0	0	0	0	1	0	0
	Neem	2	0	1	0	1	0	0	0	0
	Papdi	456	31	147	128	124	15	8	1	2
	Peepal	1	0	1	0	0	0	0	0	0
	Reetha	2	0	2	0	0	0	0	0	0
	Shisham	12	1	9	1	0	1	0	0	0
	Siris	4	3	0	0	1	0	0	0	0
Total		479	35	161	129	126	16	9	1	2
131	Bakain	8	3	4	1	0	0	0	0	0
	Bel	1	0	0	1	0	0	0	0	0
	Gular	1	0	1	0	0	0	0	0	0
	Gulmohar	1	0	1	0	0	0	0	0	0
	Morpankhi	6	2	3	1	0	0	0	0	0
	Mulberry	4	0	2	1	1	0	0	0	0
	Neem	10	0	0	1	2	2	4	1	0
	Paakad	40	3	7	12	12	1	4	1	0
	Papdi	98	5	31	37	8	2	6	4	5
	Peepal	1	0	0	0	0	0	0	0	1
	Reetha	5	0	1	0	2	1	1	0	0
	Sagaun	1	1	0	0	0	0	0	0	0
	Shisham	3	0	0	0	1	0	1	1	0
	Siris	4	1	2	1	0	0	0	0	0
Total		183	15	52	55	26	6	16	7	6
132	Dhak	1	0	0	1	0	0	0	0	0
	Gular	9	0	9	0	0	0	0	0	0
	Mango	1	0	0	0	0	0	0	0	1
	Neem	16	0	0	1	4	2	2	1	6
	Paakad	4	1	0	0	2	0	1	0	0

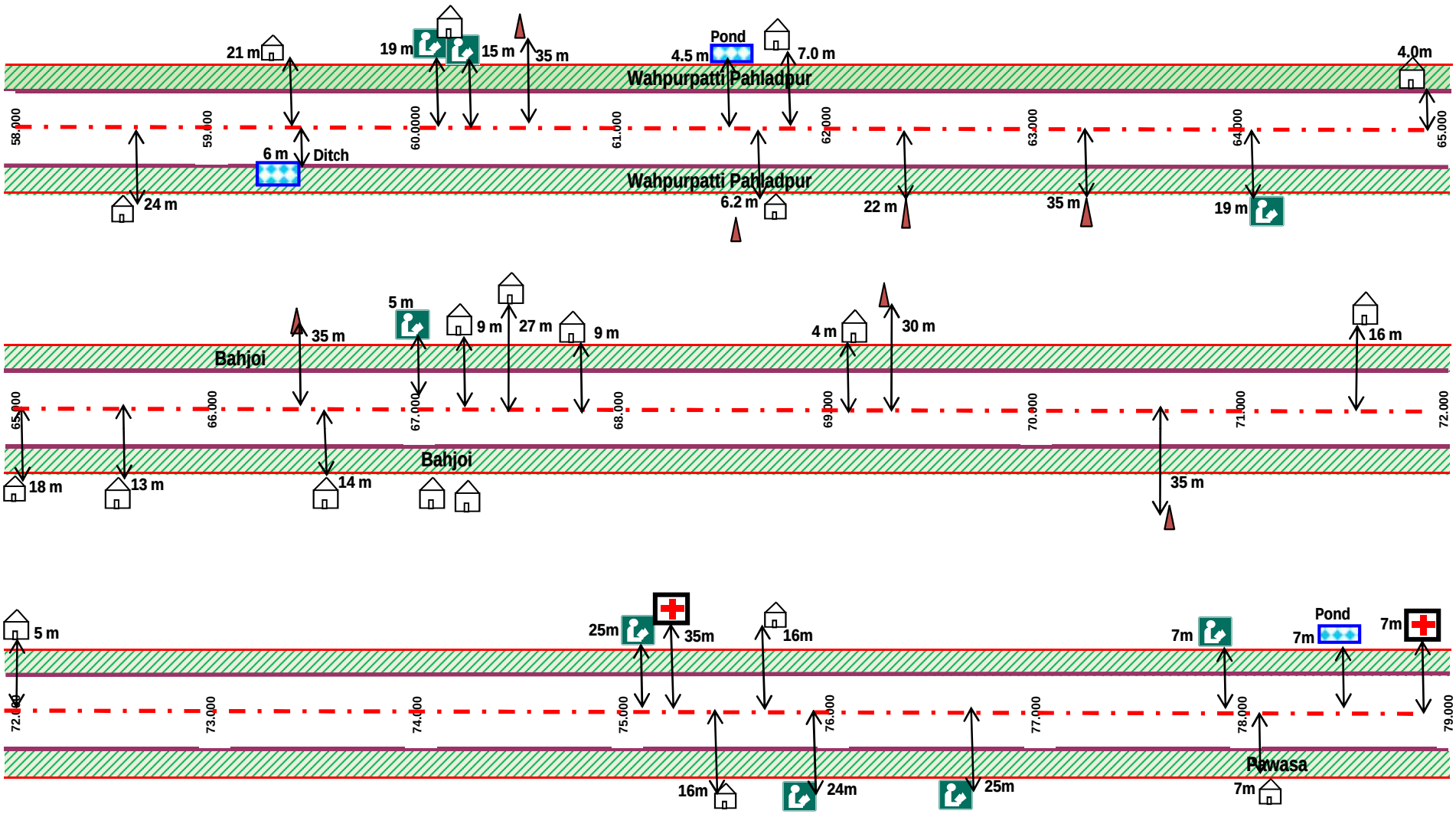
Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Papdi	83	12	17	14	10	13	13	3	1
	Peepal	2	0	0	0	2	0	0	0	0
	Reetha	2	1	1	0	0	0	0	0	0
	Sagaun	1	0	1	0	0	0	0	0	0
	Shisham	8	1	4	3	0	0	0	0	0
	Siris	28	0	10	3	7	5	2	1	0
Total		155	15	42	22	25	20	18	5	8
133	Ashok	2	0	0	0	2	0	0	0	0
	Bakain	3	0	0	1	2	0	0	0	0
	Gulmohar	2	0	1	1	0	0	0	0	0
	Morpankhi	3	0	1	2	0	0	0	0	0
	Mulberry	3	0	1	0	2	0	0	0	0
	Neem	14	1	0	1	2	1	0	0	9
	Paakad	29	1	9	9	7	3	0	0	0
	Papdi	35	12	3	2	10	3	4	0	1
	Shisham	10	2	3	0	0	2	1	0	2
	Siris	27	4	0	0	12	4	5	2	0
Total		128	20	18	16	37	13	10	2	12
134	Bakain	3	0	1	0	2	0	0	0	0
	Ber	1	0	0	1	0	0	0	0	0
	Eucalyptus	4	0	0	0	1	2	0	0	1
	Gular	1	0	1	0	0	0	0	0	0
	Mango	2	0	2	0	0	0	0	0	0
	Mulberry	4	0	0	2	2	0	0	0	0
	Neem	8	0	0	3	0	0	0	1	4
	Others	8	0	7	0	1	0	0	0	0
	Paakad	15	0	3	1	8	1	1	0	1
	Papdi	40	2	17	5	5	9	1	0	1
	Shisham	2	0	1	0	0	1	0	0	0
	Siris	24	1	4	6	10	2	1	0	0
Total		112	3	36	18	29	15	3	1	7
135	Bakain	3	2	0	0	1	0	0	0	0
	Bel	3	1	0	1	1	0	0	0	0
	Dhak	1	0	1	0	0	0	0	0	0
	Eucalyptus	1	0	1	0	0	0	0	0	0
	Gulmohar	5	0	4	1	0	0	0	0	0
	Jamun	1	0	1	0	0	0	0	0	0
	Mango	2	0	0	2	0	0	0	0	0
	Morpankhi	2	0	0	2	0	0	0	0	0
	Neem	11	2	3	0	1	2	0	1	2
	Others	2	1	1	0	0	0	0	0	0
	Paakad	13	1	3	6	1	1	0	1	0
	Papdi	24	1	2	4	10	5	2	0	0

Chainage (KM)	Tree	Total	Girth (cm)							
			<30	30-60	60-90	90-120	120-150	150-180	180-210	>210
	Reetha	1	0	1	0	0	0	0	0	0
	Shisham	7	1	2	1	3	0	0	0	0
	Siris	51	4	7	8	17	11	1	3	0
Total		127	13	26	25	34	19	3	5	2
136	Bel	1	0	1	0	0	0	0	0	0
	Dhak	4	0	3	1	0	0	0	0	0
	Eucalyptus	5	0	1	0	1	2	1	0	0
	Gulmohar	2	1	1	0	0	0	0	0	0
	Mango	1	0	0	0	0	1	0	0	0
	Morpankhi	3	0	3	0	0	0	0	0	0
	Mulberry	2	0	2	0	0	0	0	0	0
	Neem	16	0	0	3	3	2	3	2	3
	Papdi	73	4	6	12	25	11	9	2	4
	Poplar	1	1	0	0	0	0	0	0	0
	Shisham	3	1	1	1	0	0	0	0	0
	Siris	22	3	13	2	4	0	0	0	0
Total		133	10	31	19	33	16	13	4	7
137	Bakain	8	0	2	3	2	1	0	0	0
	Bel	2	0	0	1	1	0	0	0	0
	Eucalyptus	3	0	0	0	0	1	1	1	0
	Morpankhi	8	1	1	5	1	0	0	0	0
	Mulberry	5	1	0	2	2	0	0	0	0
	Neem	5	0	0	0	1	1	0	0	3
	Paakad	61	3	11	16	27	4	0	0	0
	Papdi	7	1	0	2	2	1	1	0	0
	Peepal	3	0	0	2	0	1	0	0	0
	Shisham	1	0	0	0	1	0	0	0	0
	Siris	1	0	0	0	0	0	1	0	0
Total		104	6	14	31	37	9	3	1	3
Grand Total		**15667**	**2433**	**3532**	**3291**	**2463**	**1506**	**1053**	**776**	**613**

Annexure 5.4

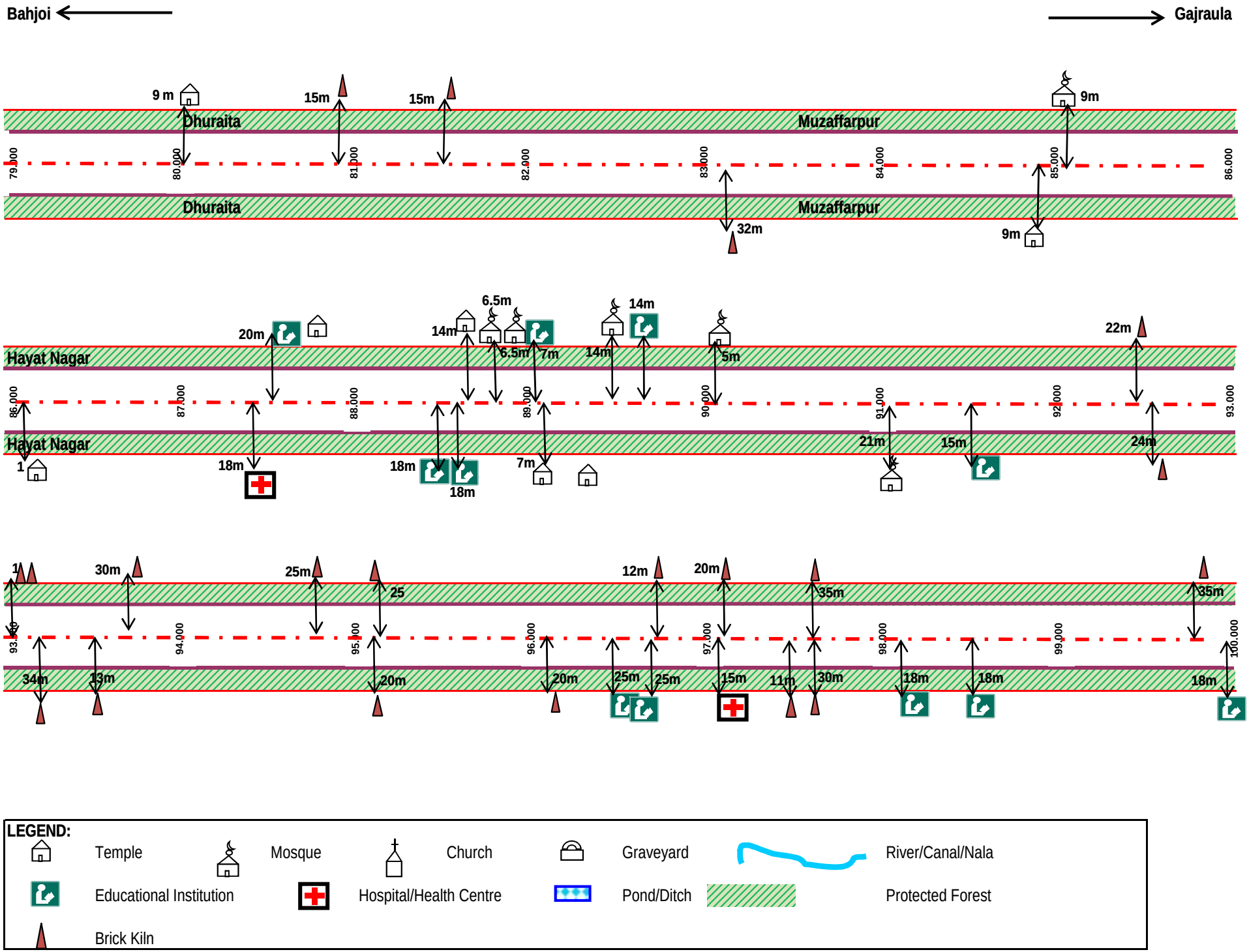
Bahjoi ← → Gajraula

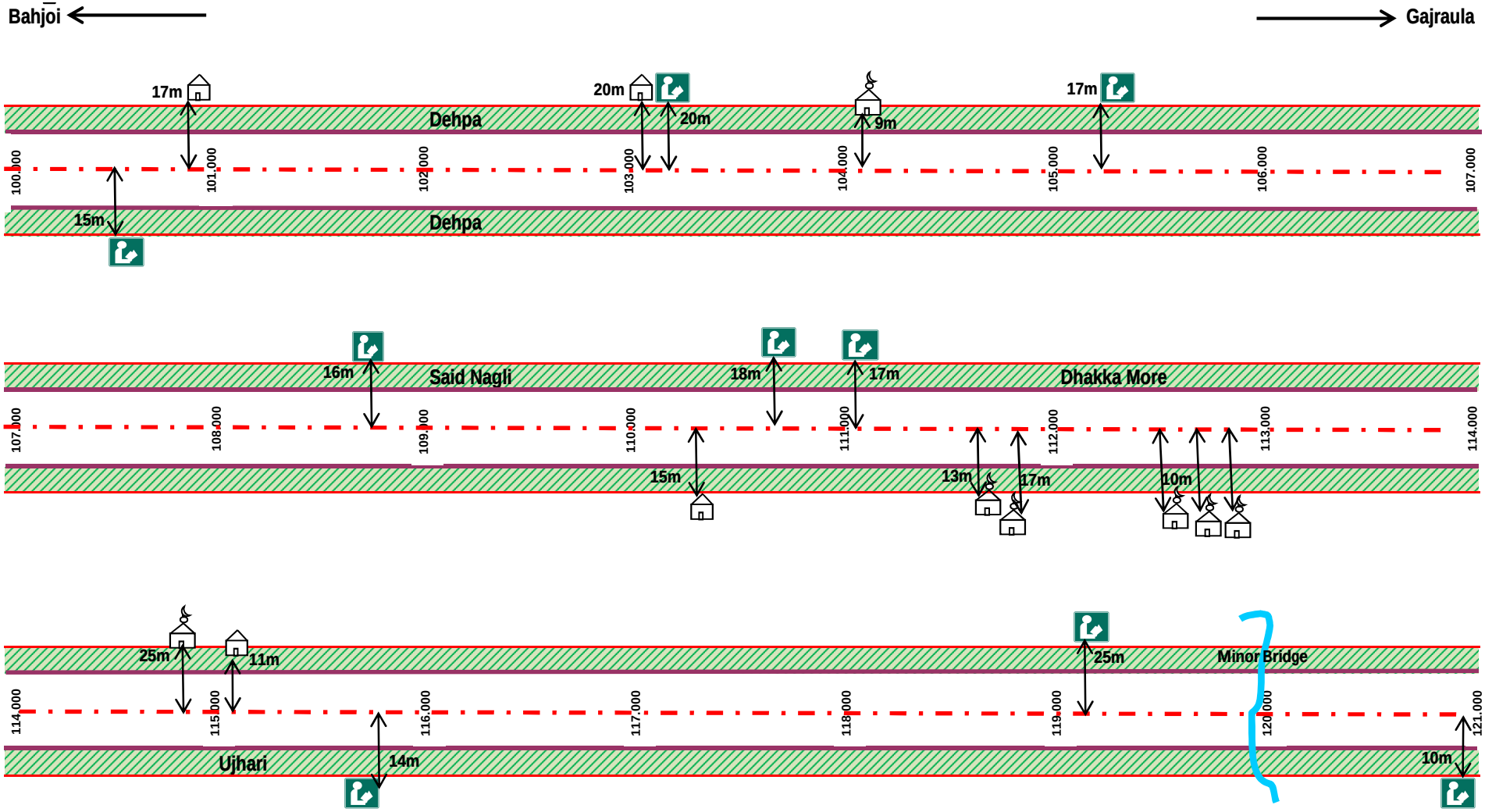
SRTIP-PLAN OF SH-51 SHOWING VARIOUS ENVIRONMENTAL FEATURES



LEGEND:

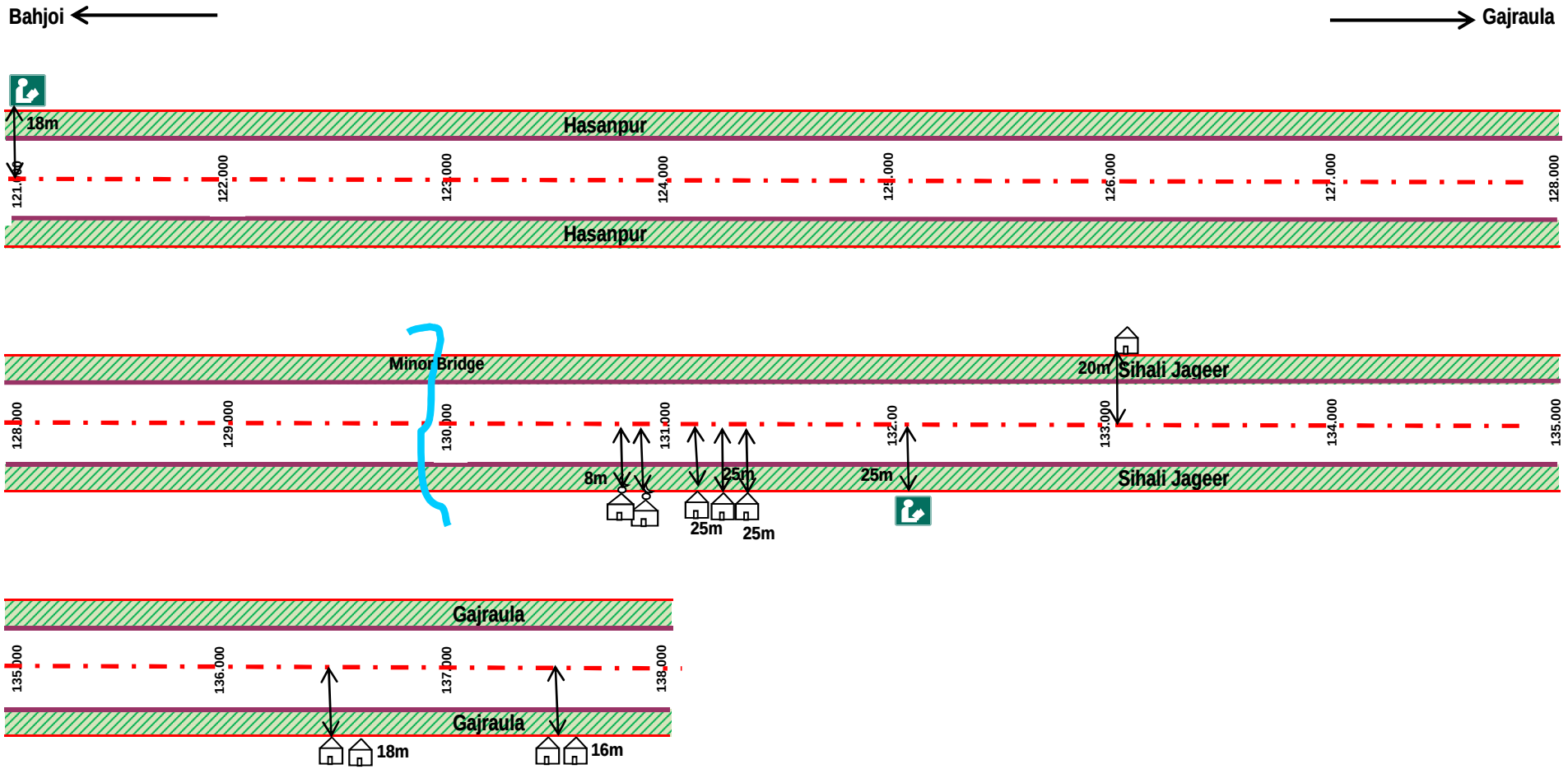
Temple	Mosque	Church	Graveyard	River/Canal/Nalla	
Educational Institution	Hospital/Health Centre	Pond/Ditch	Protected Forest		
Brick Kiln					


Bahjoi
Gajraula
9 m
15m
15m
9m
Dhuraita
Muzaffarpur
79.000
80.000
81.000
82.000
83.000
84.000
85.000
86.000
Dhuraita
Muzaffarpur
32m
9m
6.5m
14m
14m
20m
14m
6.5m
7m
14m
5m
22m
Hayat Nagar
86.000
87.000
88.000
89.000
90.000
91.000
92.000
93.000
Hayat Nagar
1
18m
18m
18m
7m
21m
15m
24m
1
30m
25m
25
12m
20m
35m
35m
93.000
94.000
95.000
96.000
97.000
98.000
99.000
100.000
34m
13m
20m
20m
25m
25m
15m
11m
30m
18m
18m
18m
LEGEND:
Temple
Mosque
Church
Graveyard
River/Canal/Nala
Educational Institution
Hospital/Health Centre
Pond/Ditch
Protected Forest
Brick Kiln



LEGEND:

Temple	Mosque	Church	Graveyard	River/Canal/Nalla	Educational Institution	Hospital/Health Centre	Pond/Ditch	Protected Forest	Brick Kiln



LEGEND:

Temple	Mosque	Church	Graveyard	River/Canal/Nalla
Educational Institution	Hospital/Health Centre	Pond/Ditch	Protected Forest
Brick Kiln

Annexure 8.1

Invitation letter for Public Consultation along the Project Road

कार्यालय अधिशासी अभियन्ता
विश्व बैंक खण्ड, लो० नि० वि०
मुरादाबाद

पत्रांक :- 14/सामान्य/1086 दिनाँक :- 15-9-2014

विषय :- बदायूँ-बिल्सी-बिजनौर मार्ग के किमी० 59 से किमी० 138 तक मार्ग पर पड़ने वाले ग्रामों मे खुली बैठक करने के सम्बन्ध में—

उपर्युक्त विषयक के सन्दर्भ मे अवगत कराना है कि बदायूँ-बिल्सी-बिजनौर मार्ग के किमी० 59 से किमी० 138 तक मार्ग का चौड़ीकरण का कार्य प्रस्तावित है। उपर्युक्त मार्ग पर पड़ने वाले ग्रामों में खुली बैठक करना आवश्यक है, जिसमे ग्रामवासी मार्ग के सम्बन्ध में अपने सुझाव एवं विचार सर्वेक्षण टीम को दे सकें।

अधिशासी अभियन्ता
विश्व बैंक खण्ड, लो० नि० वि०
मुरादाबाद

प्रतिलिपि निम्नलिखित को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित :-

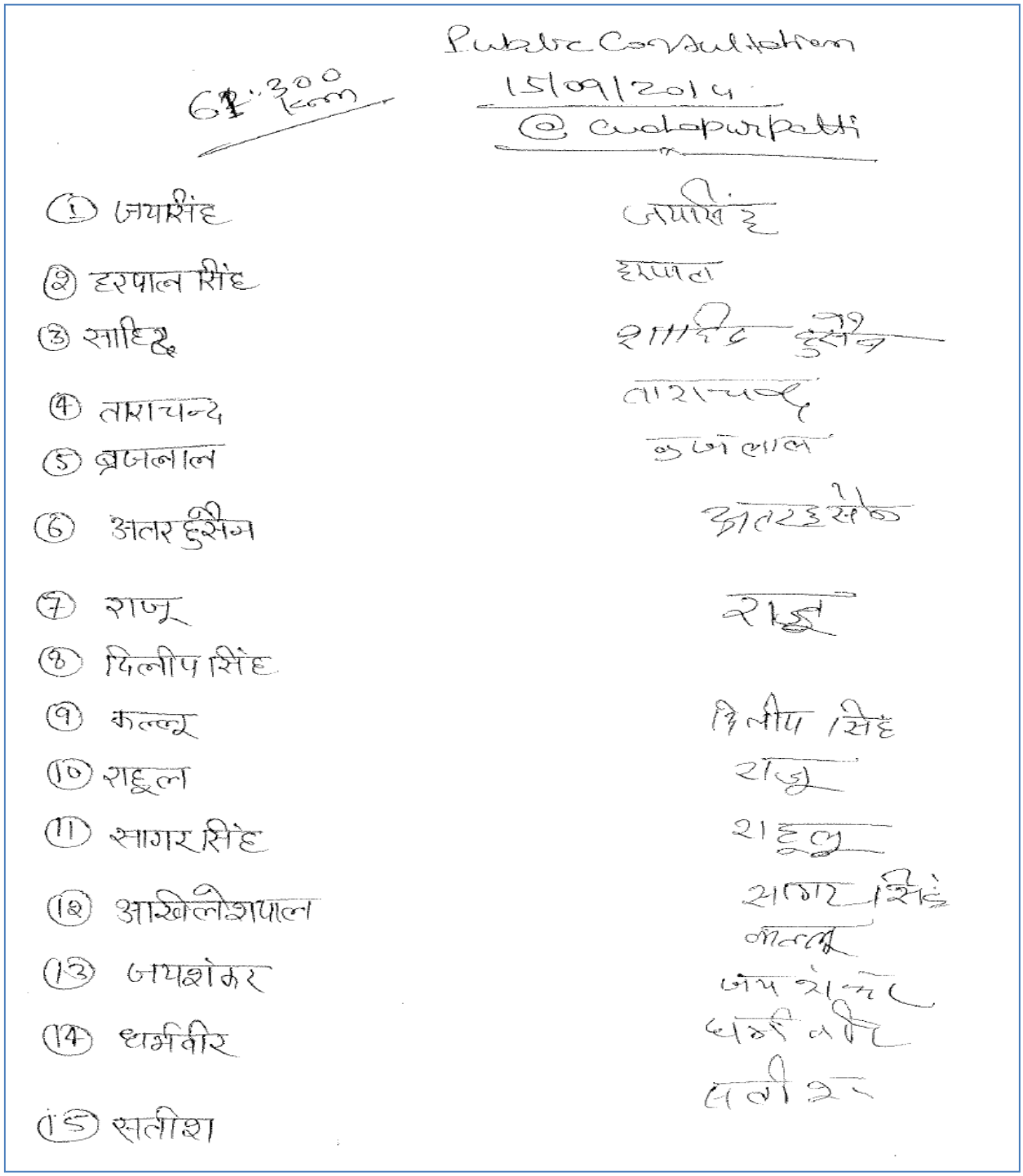
1. श्री राजीव गुप्ता डिप्टी टीम लीडर, एजील इण्डिया
2. कोशियर / आशुलिपिक / अधिष्ठान लिपिक - उक्त

अधिशासी अभियन्ता
विश्व बैंक खण्ड, लो० नि० वि०
मुरादाबाद
15-9-14

Annexure 8.2

ATTENDANCE SHEET OF PUBLIC CONSULTATION

1. Wahpur Patti Village (Km 61.300)

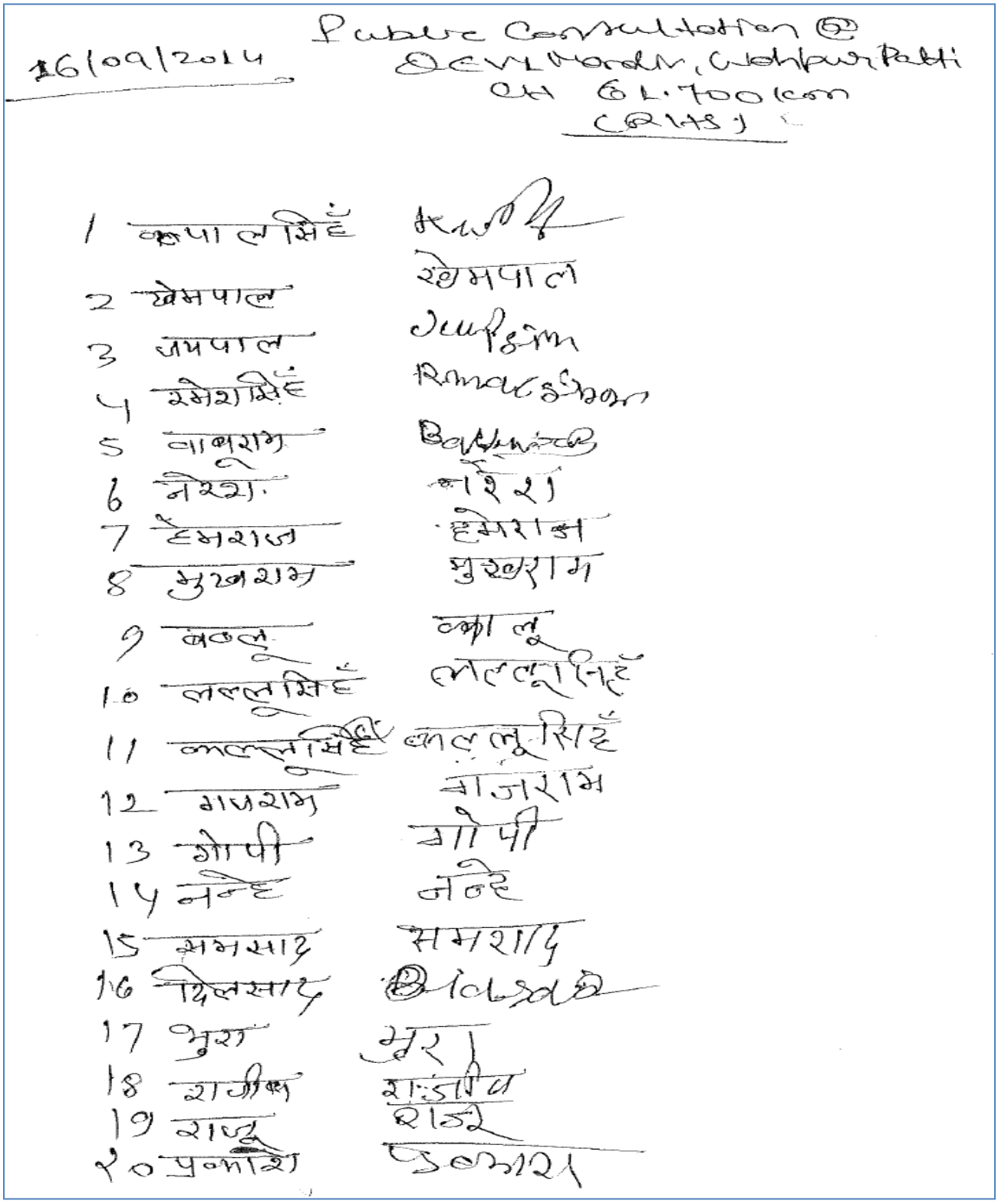


61.300 Km

Public Consultation
15/09/2014
@ Wahapur Patti

(1) जयसिंह	जयसिंह
(2) हरपाल सिंह	हरपाल
(3) साहिब	साहिब हुसैन
(4) ताराचन्द	ताराचन्द
(5) ब्रजलाल	ब्रजलाल
(6) अतर हुसैन	अतरहुसैन
(7) राजू	राजू
(8) दिलीप सिंह	
(9) कल्लू	दिलीप सिंह
(10) राहुल	राहुल
(11) सागर सिंह	राहुल
(12) आखिलेशपाल	सागर सिंह
(13) जयशंकर	कल्लू
(14) धर्मवीर	जयशंकर
(15) सतीश	धर्मवीर
	सतीश

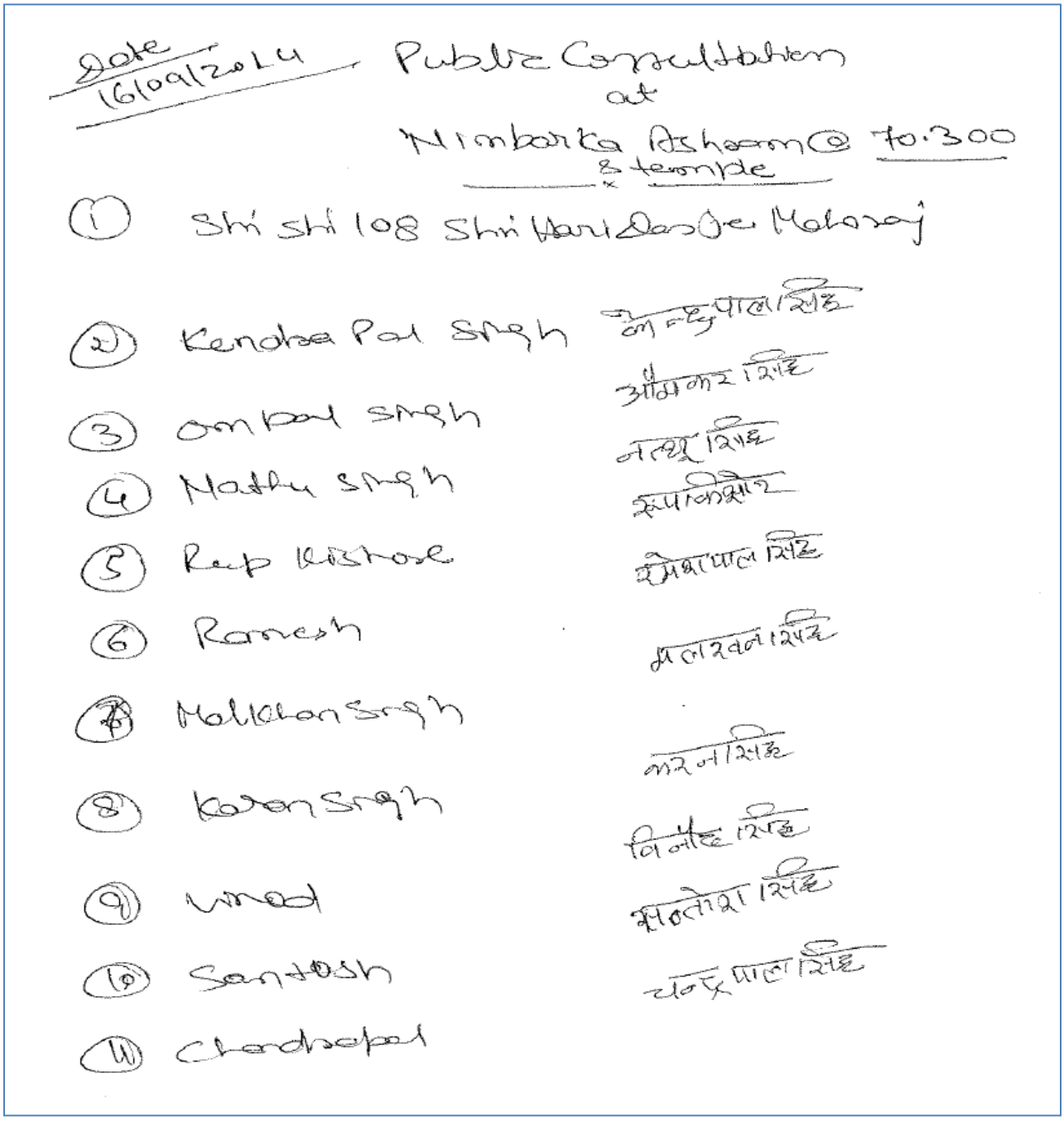
2. Wahpur Patti Village (Km 61.700)



16/09/2014 Public Consultation @ DCVL Mordh, Wahpur Patti on 61.700 km (RHS)

1 कृपाल सिंह
2 खेमपाल खेमपाल
3 जयपाल
4 रमेश सिंह
5 बाबूराम
6 नेत्रा
7 हेमराज हेमराज
8 सुखराम सुखराम
9 बल्लू बल्लू
10 ललित सिंह ललितसिंह
11 ललित सिंह ललितसिंह
12 गजराम गजराम
13 गोपी गोपी
14 नन्हे नन्हे
15 समसाद समसाद
16 दिलसाद
17 भूरा भूरा
18 राजीव राजीव
19 राजू राजू
20 प्रकाश प्रकाश

3. Nimbakara Ashram (Km 70.300)


Date 16/09/2014 Public Consultation at Nimbarka Ashram @ 70.300 & temple

(1) Shri shri 108 Shri Hari Dasji Maharaj

(2) Kendra Pal Singh केन्द्रपाल सिंह

(3) Ompal Singh ओमपाल सिंह

(4) Nathu Singh नत्थू सिंह

(5) Rup Kishore रूपकिशोर

(6) Ramesh रमेशपाल सिंह

(7) Mahkhan Singh मलखान सिंह

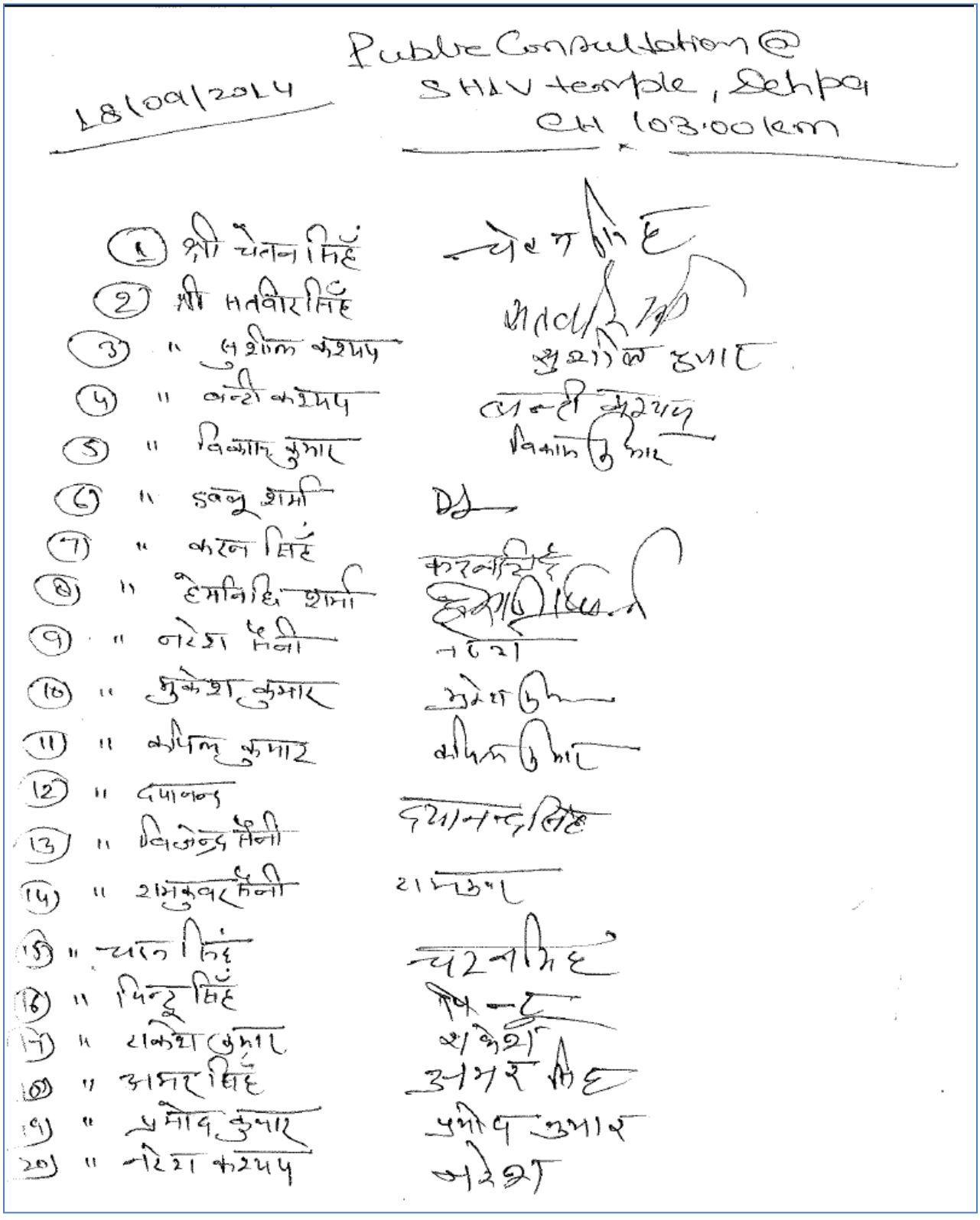
(8) Karan Singh करन सिंह

(9) Vinod विनोद सिंह

(10) Santosh संतोष सिंह

(11) Chandrapal चन्द्रपाल सिंह

4. Dehpa Village (Km 103.300)



Public Consultation @
SHIV temple, Dehpa
CH 103.00 km

18/09/2014

1	श्री चेतन सिंह	चेतन सिंह
2	श्री सतवीर सिंह	सतवीर सिंह
3	" सुशील कश्यप	सुशील कुमार
4	" बन्टी कश्यप	बन्टी कश्यप
5	" विकास कुमार	Vikash Kumar
6	" डब्बू शर्मा	DJ
7	" करन सिंह	करन सिंह
8	" हेमसिंह शर्मा	हेमसिंह शर्मा
9	" नरेश सैनी	नरेश
10	" मुकेश कुमार	मुकेश कुमार
11	" कपिल कुमार	कपिल कुमार
12	" दयानन्द	दयानन्द सिंह
13	" विजेन्द्र सैनी	
14	" रामकुवर सैनी	रामकुवर
15	" चरन सिंह	चरन सिंह
16	" पिन्टू सिंह	पिन्टू
17	" राकेश कुमार	राकेश
18	" अमर सिंह	अमर सिंह
19	" प्रमोद कुमार	प्रमोद कुमार
20	" नरेश कश्यप	नरेश

Annexure 8.3

PHOTOGRAPHS OF PUBLIC CONSULTATION

1. Wahpur Patti Village (Km 61.300 and Km 61.700)

2. Nimbakara Ashram (Km 70.300)

3. Dehpa Village (Km 103.300)

ANNEXURE-9.1

TREE PLANTATION STRATEGY

The sustainable economic development depends on the rational use of environmental resources and minimizing, to the extent possible, adverse environmental impacts through improved project selection and more responsible project planning and design. Under this strategy the development must be environmentally sound in the broadest sense. In highway development, environmental planning is concerned with good blending of improvements of physical, social, and economic parameters. It involves not only the environmental (land, water, and air) but is also concerned with integration to local, regional and national socio-economic development.

Road development can have wide ranging environmental impacts. This is because roads extend over long distance and by promoting rapid communication they can catalyze dramatic changes in land use patterns. Soil degradation, loss of top soil and reduction of the productive capacity of the soil covered by the road, which is significantly reduced further as a result of compaction with heavy machinery during construction, is one of the most immediate effects. Landscape and aesthetic distortions due to road development leads to modifications in the regional landscape and changes in the natural relief and morphology of the, vegetation, inclusive of avenue trees and recreational areas. But these impacts can often be significantly reduced through environmentally-sound construction and operation management practices. Careful consideration and assessment of the surrounding environment in road construction and improvement will reduce disruption costs and harmful effects while increasing usage and benefits. Therefore a proper landscape plan should be made which will protect the road from soil erosion, sinking and also to maintain the aesthetic beauty. It will also reduce land, water, air and noise pollutions as well.

Aim and Objective of Tree Plantation:-

- To create green belt and avenues for meeting aesthetic recreational needs to the people.
- To beautify the areas for scenic beauty.
- To reduce the surface run-off discharge and checking soil erosion along the embankments.
- To reduce the encroachment of road reserve areas.
- To reduce temperature and increase humidity.
- To reduce noise pollution to the neighboring household population.
- To reduce the impacts of air pollution and dust as trees and shrubs are known to be natural sink for air pollutants.
- To provide much needed shade on glaring hot roads during summer.
- Moderating the effect of wind and incoming radiation.
- To define the ROW especially highlight sharp horizontal curves during night.
- To promote road development as eco friendly activity.

Tree Plantation Strategy

Plantation is one of the most important constituents of soft landscaping. Trees, shrubs and climbers have been used to enhance the soft natural ambience against harsh elements in most of the enhancement schemes. The planting species are decided based on the physical growth characteristics of trees, like form and shape, foliage pattern, growth rate, branching pattern, soil characteristics etc. While selecting the species of trees for landscaping a great care should be taken

to choose the species, which already exist on the project corridor. The tree plantation will be carried out in accordance with the IRC: SP: 21:2009 guidelines and specifications.

Plantation Pattern

Depending on the availability of the ROW, plantation pattern is worked out as follows:-

1. The first row along the highway to be planted with small to medium sized ornamental trees.
2. Subsequent rows depending on the availability of land will comprise of ornamental or shade bearing species of more height than those in the first row. Since the proposed Highway section is passing through the rural sections, the last row will always be of shade bearing tall trees. Five rows of trees are proposed to be planted on either side.
3. Planting of shrubs in the median.
4. Planting of herbaceous species as ground cover in the median, special landscapes on embankment slopes.
5. Turfing with grasses in the median and embankment slopes.
6. The last row to be planted with tall shade bearing trees for better road safety and for enhancing aesthetics.

Tree Plantation along the Highway Section

1st Row

The first row of plantation along the highway section should be worked out by ornamental species. Since the proposed highway section is passing through the rural areas, the following species are recommended for the 1st row of avenue plantation.

Table 1.0 Species recommended for 1st row plantation

S. No.	Botanical Name	Local Name
1	*Cassia fistula*	Amaltas
2	*Terminalia arjuna*	Arjun
3	*Delonix regia*	Gulmohar
4	*Bauhinia sps*	Kachnar
5	*Cassia nodusa*	Cassia

2nd Row

The 2nd row of plantation along the Project stretch should be worked out by ornamental species of more height i.e. medium height trees, than the first row. The following species are recommended:-

Table 2.0: Species recommended for subsequent row plantation

S. No.	Botanical Name	Local Name
1	*Melia azadiracta*	Bakain
2	*Pongamia pinnata*	Kanji
3	*Gravillea robusta*	Silver Oak
4	*Albizzia lebbek*	Kala siris
5	*Dalbergia sissoo*	Shisham

Subsequent Rows

The subsequent rows of plantation along the Highway section have been worked out. The tall shade trees like Peepal, Neem, Mango, Shisham etc have high crown and secure better visibility. They have a long gestation period and has rapid growth and capacity to resist disease and pests attack are therefore ideal. These shaded trees should be planted at a spacing of 12m C/C.

The tree species recommended as shade plants for roadside avenues are given the following table:-

Table 3.0: Species recommended for Subsequent rows

S. No.	Botanical Name	Local Name
1	*Ficus religiosa*	Peepal
2	*Ficus infectoria*	Paker
3	*Madhuca indica*	Mahua
4	*Dalbergia Sissoo*	Shisham
5	*Azadirachta indica*	Neem
6	*Mangifera indica*	Mango
7	*Tamarindus indica*	Imli
8	*Syzynium cuminij*	Jamun

Shrub plantation for Median

The species to be planted in median would be of low or medium height with ornamental value to enhance the visual experience of the road corridor. It will also act as a screen to prevent glare from the incoming vehicles. Depending on the width of the median, which is 6.0 m, two rows of flowering shrubs will be provided. Some herbaceous species may also be planted as a ground cover on the median.

Table 4.0: Species recommended for Median

S. No.	Botanical Name	Local Name
1	*Thaventia nerifolia*	Kaner
2	*Bouganvillea sps.*	Bouganvillea
3	*Ipomia*	

Plantation along the Embankments

On the embankment slopes, some herbaceous species followed by grasses turf will be provided. The species proposed for the purpose of turfing are Cynodon dactylon, Cythocline perpurea, Solanum Nigrum, Alternanthera, Chlorophytum, Eupatorium, Wedelia, Duranta, Portulacca, Ipomea, Pelia Cadrii, Asparagus, Opheopogon grass etc.

Technical specifications for planting along the Highway section are as follows:

1. Ornamental plants except last row

- Distance from embankment : 1.0m away from the toe of the embankment
- Spacing between plant to plant : 3m
- Spacing between rows : 3m
- Size of the pits : 60x60x60 cms
- For alkaline soils : By auger
- Water logged areas : mounds with height varying depending on the water level
- Species recommended : Listed in **Table 1.0** and **Table 2.0.**
- No of plants per Km : 333
- Height of plant : 1.5 to 2m

2. Shaded plants (Last row)

- Distance from the preceding row : 3.0m
- Spacing between plant to plant : 12m
- Size of the pits
- Normal size : 60x60x60 cms

- For alkaline soils : By auger
- Water logged areas : mounds
- Species recommended : Listed in **Table 3.0**
- No of plants per Km : 84
- Height of plant : more than 2m

In localities where a really bad patch of USAR occurs recommendations are to be strictly followed for better survival of plants. Deep pits to be dug and soil amender Gypsum 1 Kg to 3 kg with 2 kg compost and sand are to be filled before planting the plants.

For multiple row plantations, five strand barbed wire fencing, with cross strands, stretched on angle iron poles fixed at a distance of 4 meters from one another are to be provided as per recommendations. Live fencing/ bamboo fencing/ thorn fencing may also be used where protection can be ensured through these.

3. Shrubs (For Median/ Embankment)

The surface is to be prepared adequately for shrubs planting or grass sowing. The grasses and shrub planting is done to provide a strong surface cover but needs a well-prepared surface. All masses of loose debris will be removed.

- Size of the pits for planting shrubs : 45x45x45 cms
- Species recommended : Listed in **Table 4.0**
- No of plants per Km : 666 (For two rows in the median)
- Use of compost and manure : 1/3 of volume of pit mixed with soil and refilled

The contractor will be required to water the area in case of insufficient rains after planting.

Plantation at Road Junctions/ Intersection and Traffic Islands

Road intersections are main nodal spaces and are of vital importance in terms of road aesthetics. Proper landscaping of the traffic islands and the surrounding areas shall integrate these features with surrounding landscape. The layout of traffic intersections shall be fixed by the traffic needs of the junction.

Plantation at the Sensitive noise receptors

All along the project corridor were sensitive receptors for noise such as educational institutions, hospitals, religious structure of community importance situated, the trees known for behaving as "noise barrier" will be proposed like- Neem (*Azadirachta indica*), Shisham (*Dalbergia sisso*), Imli (*Tamarindus indica*). Some flowering trees like Amaltas, Gulmohar, Kachnar, Asoka etc. can also done. Tall trees with thick canopies create a wind screen through which the air can be filtered and noise levels be considerably reduced. Some such trees are *Acacia auriculiformis* and *Greavillea Robusta*. At the sensitive noise receptors, tall shrubs of 1.5 – 3 m height like *Cassia biflora*, *Hamelia Patens* etc. can also be provided for maximum possible screening.

ANNEXURE-9.2

PLANT SITE MANAGEMENT

For the construction purpose the major construction plants such as Hot mix plant, Stone Crusher Plants, batch mix plants, etc. will be required to be established. In case the Concessionaire establishes their own plan they have to follow all the applicable statutory norms. The objective of this plan is

- To ensure that statutory / regulatory requirements are complied with
- To ensure that safeguard measures are taken to avoid / mitigate / minimize environmental impacts.

The present section provides general guidelines for siting of plants and environmental safeguard measures based on the statutory requirements:

1. Site selection criteria for Hot Mix Plant/ Stone crusher Plant:

- 1.0 km away from settlement, school, hospital towards downwind directions
- 1.0 km from any archaeological site
- 1.0 km from ecologically sensitive areas i.e. forest, national park, sanctuary etc.
- 1.0 rivers, streams and lakes
- 500 m from ponds
- 500 m from National Highway, 250 m from State Highway, 100 m from District roads and other roads (The distance are to be measured from edge of Road to boundary of site).
- Away from agricultural land
- Preference to barren land

2. Statutory Requirements:

- Obtaining NOC [Consent-to-Establish(CtE) and Consent to Operate(CtO)] under Air and Water Acts from the Uttar Pradesh Pollution Control Board (UPPCB) before start of installation.
- Complying with the terms and conditions laid down in the CtE and CtO, which generally include providing 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 plantation, periodic (monthly) pollution monitoring i.e. ambient air, noise and stack emission
- The suspended particulate matter contribution value at a distance of 40 m from a controlled isolated as well as from a unit located in a cluster should be less than 600 $\mu g/m^3$ or as shall be stipulated by UPPCB.
- Obtain certificates from manufacturer for Type Approval and Conformity of Production for Diesel Generator (DG) set/s. For DG sets of capacity up to 1000 KVA, the noise level at 1m from the enclosure surface shall not exceed 75 dB (A)

3. Pollution control measures

- For HMP, ensure adequate stack height as stipulated in CtE, install emission control devices such as bag house filters, cyclone separators, water scrubbers etc., as attached with the plant by the manufacturer or stipulated in CtE.

- Prefer bulk bitumen storage with mechanized handling facilities that storage in drums with manual operation at HMP to prevent / minimize bitumen spillage and thereby contaminating soil and water.
- Impervious platform for storage of bituminous and other liquid hazardous chemical
- Bag house filter / multi-cone cyclone for emission control. For bag house, cartridge filters reported to be more efficient than fabric filters.
- The stone crusher plants should be installed with operational water sprinklers over jaw crusher, conveyor belts and vibratory screens.
- Pollution control measures for Diesel Generator (DG) set i.e. stack height, acoustic enclosure etc.
- Periodical maintenance of all the plant and equipments to keep the plants in order.
- Damaged bag-house and filters should be immediately replaced.
- All the workers shall use all the time helmets, footwear, earplugs, nasalmasks etc. when the plants are operational. During maintenance of plants also the workers involed in maintenance will not enter the plant premises without PPE.
- No workers should be allowed to work in loose clothes near conveyor belts.
- Proper lighting arrangement shall be made around plant site if the plants are operated during dark hours.
- Provision of readily available first aid kit, fire fighting equipments at the plant site at appropriate location to respond in case of accident.
- Periodical monitoring of air quality and noise levels as per conditions stipulated under the statutory clearance from UPPCB. Whenever the emission exceeds the permissible level the plants should be stopped and necessary repairing works of faults will be done to bring down the emission levels.
- The office complex, residential units shall be constructed on upwind direction from the plant site.

ANNEXURE-9.3

GUIDELINES FOR REDEVELOPMENT OF BORROW AREAS

BACKGROUND

The guidelines provide basic information to the contractor on how to redevelop the borrow areas to ensure compliance with the environmental requirements of MoEFCC, MORTH and as specified in IRC: 10-1961. The following section provides the guidelines to the contractor for the identification, siting of borrow areas and also the enhancement measures to redevelop the areas with community participation.

IDENTIFICATION OF THE BORROW AREAS

Specific locations of borrow areas will be identified by contractor. The selection and recommendations of borrow areas; will be based on environmental as well as civil engineering considerations. Location of source of supply of material for embankment or sub-grade and the procedure for excavation or transport of material shall be in compliance with the environmental requirements of MoEFCC, MoRTH and as specified in IRC:SP10-1961.

Certain precautions have to be taken to restrict unauthorized borrowing by the contractor. No borrow area shall be opened without permission of the Engineer. The borrowing shall not be carried out in cultivable lands, unless and until, it shall be agreed upon by the engineer that there is no suitable uncultivable land in the vicinity for borrowing or private landowners are willing to allow borrowing on their fields.

Borrow Area Identification:

- Identify areas having present land use as barren land, riverside land.
- Prefer areas of highland with respect to surroundings;
- Avoid locating borrow area close to any road (maintain at least 30m distance from ROW and 10 m from toe of embankment, whichever is higher);
- Should be at least 1.0 km away from inhabited areas;
- Minimum distance of about 1.0 km from ecologically sensitive area i.e. Reserve Forest, Protected Forest, Sanctuary, wetland etc.;
- Minimum distance of about 1.0 km from school, hospital and any archaeological sites;
- Having adequate approach road with minimum length of earthen road;
- Ensure that unsuitable soft rock is not prominent within the proposed depth of excavation which will render rehabilitation difficult;
- Controlled operation as per agreed / approved plan
- Prior approval of Rehabilitation Plan considering terrain, land use and local need;
- Restricting operation as agreed by landowner and approved by the

Statutory Clearance for Borrow Area

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.

OPERATION

No borrow area will be operational without written consent of the land owner. To avoid any embankment slippage, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the engineer. The contractor shall evolve site-specific redevelopment plans for each borrows area location, which shall be implemented after the approval of the Supervision /Independent Consultant.

Precautionary measures as the covering of vehicles will be taken to avoid spillage during transport of borrow materials. To ensure that the spills, which might result from the transport of borrow and quarry materials do not impact the settlements, it will be ensured that the excavation and carrying of earth will be done during day time only. The unpaved surfaces used for the haulage of borrow materials will be maintained properly. A general guidelines will be followed in the line of MoEF conditions as follows:

- The borrowing/excavation activity shall be restricted to a maximum depth of 2 m below general ground level at the site.
- The borrowing/excavation activity shall be restricted to 2 m above the ground water table at the site.
- The borrowing/excavation activity shall not alter the natural drainage pattern of the area.
- Appropriate fencing will be provided all around the borrowed/excavated pit made to prevent any mishap.
- Measures shall be taken to prevent dust emission by covering of borrowed/excavated earth during transportation.
- Safeguards shall be adopted against health risks on account of breeding of vectors in the water bodies created due to borrowing/excavation of earth.
- Workers / labourers shall be provided with PPE. The use of PPE at all time during works will be ensured.
- A berm shall be left from the boundary of adjoining field having a width equal to at least half the depth depth of proposed excavation.
- A minimum distance of 15 m from any civil structure shall be kept from the periphery of any excavation area.

Borrowing of earth shall be carried out at locations recommended as follows:

Non- Cultivable Lands: Borrowing of earth will be carried out up to a depth of 2.0 m from the existing ground level. Borrowing of earth shall not be done continuously. Ridges of not less than 8 m width shall be left at intervals not exceeding 300m. Small drains shall be cut through the ridges, if necessary, to facilitate drainage. Borrow pits shall have slopes not steeper than 1 vertical in 4 horizontal.

Productive Lands: Borrowing of earth shall be avoided on productive lands. However, in the event of borrowing from productive lands, under circumstances as described above, top soil shall be preserved in stockpiles. At such locations, the depth of borrow pits shall not exceed 45 cm and it may be dug out to a depth of not more than 30 cm after stripping the 15 cm top soil aside.

Elevated Lands: At locations where private owners desire their fields to be leveled, the borrowing shall be done to a depth of not more than 2m or upto the level of surrounding fields.

Borrow pits along Roadside: Borrow pits shall be located 5 m away from the toe of the embankment. Depth of the pit should be such that the bottom of the pit shall not fall within an

imaginary line of slope 1 vertical to 4 horizontal projected from the edge of the final section of the bank. Borrow pits should not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300m. Small drains should be cut through the ridges to facilitate drainage.

Borrow pits on the riverside: The borrow pit should be located not less than 15m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood.

Community/ Private Ponds: Borrowing will be carried out at locations, where the private owners (or in some cases, the community) desire to develop lands (mostly low-lying areas) for pesciculture purposes and for use as fishponds.

Borrow Area near Settlements: Borrow pit location shall be located at least 0.8km from village and settlements. If unavoidable, they should not be dug for more than 30 cm and should be drained.

BORROW AREA REDEVELOPMENT:

Each borrow area should be rehabilitated immediately after completion of extraction of materials to the satisfactions of the land owner and the Engineer. The borrow area shall be redeveloped appropriately as per approved plan and landowner's requirement. The borrow pits may be developed into pond after leveling the bottom and slope maintenance. The borrow pits may be refilled with earth materials covered with fertile to soil. The upland used as borrow area shall be leveled matching with the level of surrounding area. No scare created due to borrowing of earth should be left unattended. The Contractor should provide completion certificate of redevelopment of each borrow pit issued by the land owner.

ANNEXURE-9.4

QUARRY AREA MANAGEMENT PLAN

Quarries generally required to provide material for road construction sites, can have significant adverse environmental effects, especially on ecologically sensitive areas. Quarries can become environmental hotspots and can significantly affect the visual appearance of an area. Special mitigation and management measures are often required to avoid or minimise the environmental and impacts of due to quarry operations. The EMP stipulations will be applicable for new quarries to be identified and operated by Contractors. In case contractor use the existing licensed quarry a copy of the valid quarry license and lease / sub-lease agreement should be submitted to the Project Proponent. Contractor shall submit a plan delineating how he shall comply with requirements stipulated in this plan and elsewhere in the EMP on quarrying activity.

The guidelines for quarries cover:

- Statutory approvals
- Environmental and social impacts of quarries
- Selection of quarries
- Operation of quarries
- Rehabilitation of quarries

The guidelines seek to ensure that Contractors:

- Comply with the regulatory requirements in force at the time
- Reasonably manage any impacts
- Reinstate and rehabilitate the land appropriately
- Consult with affected communities

Impacts

Some of the potential impacts of quarries are:

- Rock blasting causing air pollution, and noise and vibrations
- Trucks transporting materials to the site causing air pollution, and noise and vibrations
- Ponds of stagnant water forming in excavated areas giving rise to the breeding of
- Mosquitoes and the spreading of malaria and other mosquito-borne diseases
- Aestatics of the landscape being affected by excavations and the removal of vegetation
- natural drainage systems in the area being affected by excavations

The procedure for identification and finalization of quarry site/s shall be as given below:

The quarry area identified during Feasibility study are mainly operational government stone quarry. For using these quarry areas, the Contractor have be obtain necessary statutory permission from the concern department. However, selection of new quarry following guidelines should be followed:

- Only licensed quarry will be used.
- New quarry will be at least 1.5km away from the settlement, forest and other ecologically sensitive areas
- Minimum 500m away from water bodies
- The Contractor shall identify alternative quarry sites along the whole corridor based on required quantity and environmental consideration and obtained approval from the Engineer(PMC) / UPPWD
- The Contractorobtain Quarry Lease Deed / License from the Department of Mines and Geology and provide copy of the same to the PIU-UPPWD prior to start of the material extraction.
- The Contractor shall estimate water requirement for dust suppression at quarry sites during

- operation and for water spraying on *kutcha* (non-metal) haul road and ensure
- availability water by identifying sources and obtaining necessary permission;
- The Contractorshall prepare quarry sites operation and redevelopment plan considering surrounding land uses, local needs and agreement with the landowner;
- Only licensed blaster i.e. short-firer certificate holder will be responsible for quarry Blasting
- Permits for transportation, storage and use of explosive, as will be required, shall be obtained from the Controller of Explosive;
- Whenever so advised by the R&B Engineer, controlled blasting e.g. using less charge, restricting depth and dia or drill holes, cut-off blasting etc., and shall be undertaken.
- Quarry operation will be undertaken in stages with adequate benching

Quarry Operation:

The procedure for environmentally sound operation and management of quarry sites is given below:

- Estimating the quantity of quarry material to be collected from each quarry area;
- Demarcating the entire quarry area by fencing and putting red-flag poles;
- Providing adequate metallic access road;
- Preserving topsoil from the quarry compound, if any, by stripping and stacking aside separately at corners;
- Overburden shall be removed and disposed in environmentally sound manner.
- All workers safety measures such as helmets, footwear, earplugs, facemasks etc. shall be undertaken.
- The contractor shall ensure maintenance of crushers regularly as per manufacture schedule.
- Water sprinkling shall be done to minimize dust generated due to crushing/Vehicle movement.
- Carrying out blasting as per agreed operational plan complying with the requirements of MoRTH Specification (Clause 302 & 303) and Ministry of Environment & Forests (MoEF)
- Maintaining a Quarry Material Collection Register on daily material collection for each of the quarry area, which shall be produced to Engineer's representative as and when requested;
- Redeveloping the area within 2 months (or as will be agreed upon) of completion of quarry material collection;

Redevelopment of Quarry Area:

All the quarries are should be rehabilitated as per approved rehabilitation plan immediately after completion of quarry material extraction. The restoration of Quarry will be done as per the conditions of the owner before handing over the site back to the owner.

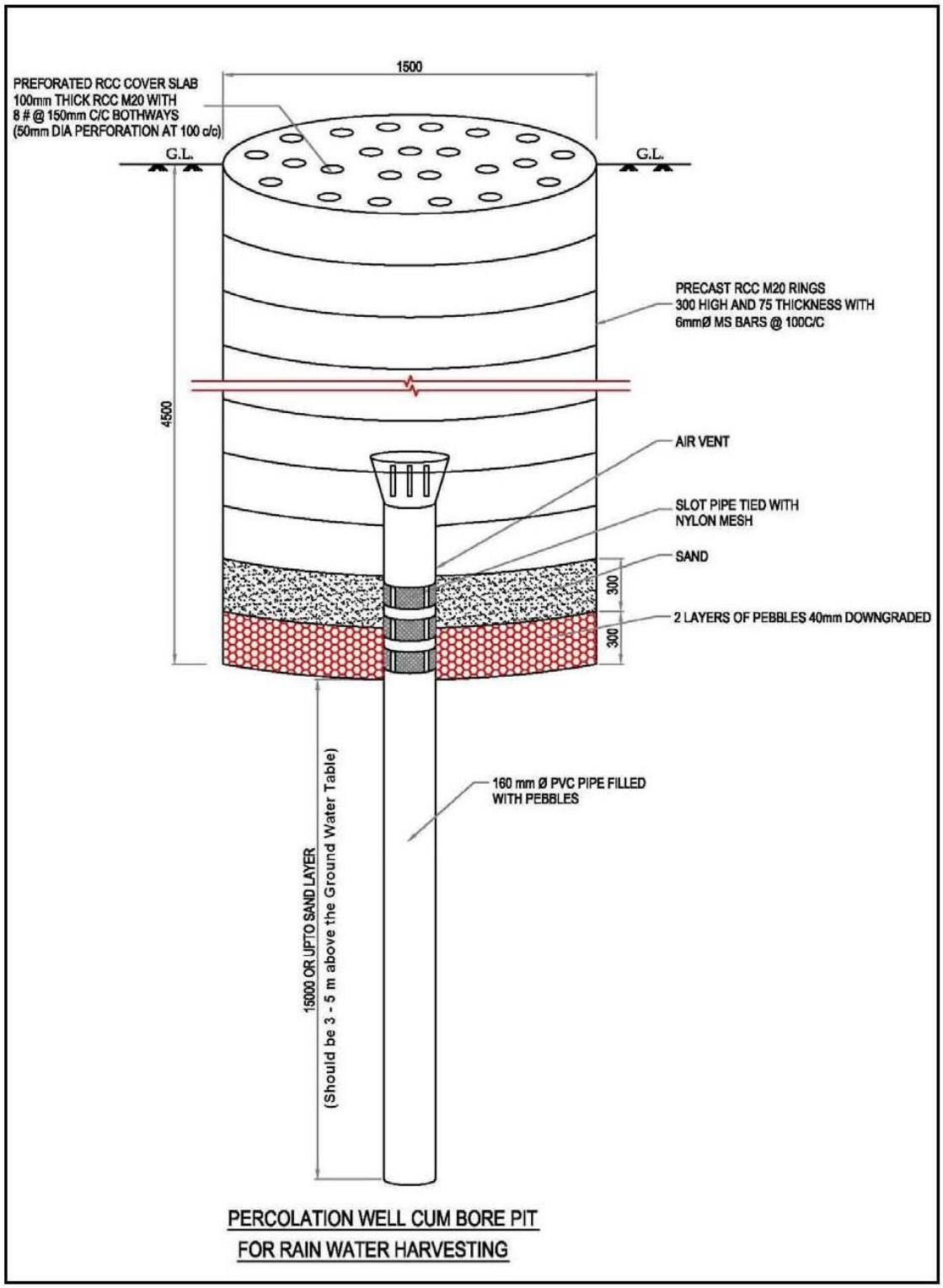
Following rehabilitation works may be taken up with the consent of owner:

Option A: Revegetating the quarry to merge with surrounding landscape. This is done by conserving and reapplying the topsoil for the vegetative growth.

Option B: Development exhausted quarries as water bodies: The pit shall be reshaped and developed into pond, for harvesting rainwater. This option shall only be considered where the location of quarry is at the lowest point, i.e. surrounding area/natural drainage slopes towards it.

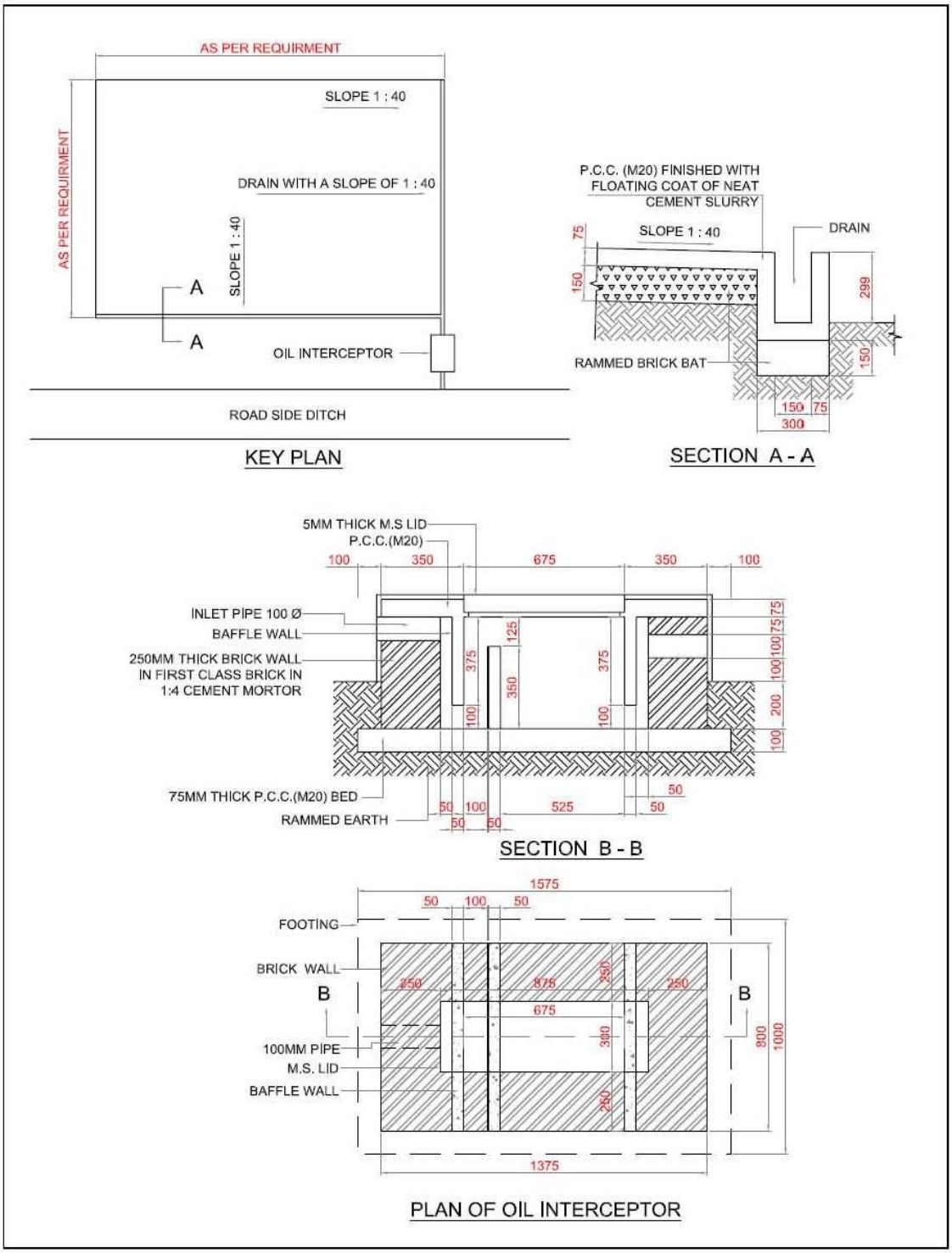
ANNEXURE-9.5

SCHEMATIC PLAN OF RAIN WATER HARVESTING PIT



ANNEXURE-9.6

SCHEMATIC PLAN OF OIL INTERCEPTOR FOR REMOVAL OF OIL & GREASE FROM SURFACE RUNOFF WATER



ANNEXURE 9.7

NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Method of Measurement
(1)	Sulphur Dioxide (SO_2) $\mu g/m^3$	Annual*	50	20	Improved West and Geake Method Ultraviolet Fluorescence
		24 hours**	80	80	
(2)	Oxides of Nitrogen (NO_x) $\mu g/m^3$	Annual*	40	30	Jacob & Hochheiser Modified (Na-Arsenite) Method Chemiluminescence
		24 hours**	80	80	Gas Phase Chemiluminescence
(3)	Particulate Matter (Size less than 10 µm) or PM_{10} $\mu g/m^3$	Annual*	60	60	Gravimetric TOEM Beta attenuation
		24 hours**	100	100	
(4)	Particulate Matter (Size less than 2.5 µm) or $PM_{2.5}$ $\mu g/m^3$	Annual*	40	40	Gravimetric TOEM Beta attenuation
		24 hours**	60	60	
(5)	Ozone (O_3) $\mu g/m^3$	8 hours**	100	100	UV Photometric Chemiluminescence Chemical Method
		1 hour**	180	180	
(6)	Lead (Pb) $\mu g/m^3$	Annual*	0.5	0.5	ASS/ ICP Method after sampling on EPM 2000 or equivalent Filter paper ED – XRF using Teflon filter
		24 hours**	1.0	1.0	
(7)	Carbon Monoxide (CO) mg/m^3	8 hours**	02	02	Non Dispersive Infra Red (NDIR) Spectroscopy
		1 hour**	04	04	
(8)	Ammonia (NH_3) $\mu g/m^3$	Annual*	100	100	Chemiluminescence Indophenol blue method
		24 hours**	400	400	
(9)	Benzene (C_6H_6) $\mu g/m^3$	Annual*	05	05	Gas Chromatography based continuous analyzer Adsorption and Desorption followed by GC analysis
(10)	Benzo (a) pyrene (BaP) – Particulate phase only, ng/m^3	Annual*	01	01	Solvent extraction followed by HPLC/GC analysis
(11)	Arsenic (As) ng/m^3	Annual*	06	06	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
(12)	Nickel (Ni) ng/m^3	Annual*	20	20	AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

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

**24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Source: *National Ambient Air Quality Standards, Central Pollution Control Board Notification No. 29016/20/90/PCI-I dated 18 November, 2009*

ANNEXUREC 9.8

NATIONAL AMBIENT NOISE MONITORING STANDARDS

Area/Class	Noise Level (Leq dB (A))*	
	Day Time	Night Time
Industrial	75	70
Commercial/Mixed	65	55
Residential/Rural	55	45
Sensitive	50	40

Note-:

1. Day time shall mean from 6 a.m. to 10 p.m.

2. Night time shall mean from 10 p.m. to 6 a.m.

3. Silence Zone is an area comprising not less than 100 meters around hospitals, education institutions, courts, religious places or any other area, which is declared as such by Competent Authority.

4. Mixed categories of areas may be declared as one of the four above-mentioned categories by the Competent Authority.

**dB(A) Leq denotes the time weighted average of the level of decibels on scale A which is related to Human Beings*

A "decibel" is the unit in which noise is measured

"A" in dB(A) Leq, denotes the frequency weighted in the measurement of the noise corresponds to frequency response characteristics of the human ear.

Leq: It is an energy means of the noise level over a specified period.

ANNEXURE 9.9

WATER QUALITY STANDARD AS PER BIS (IS: 10500:1991)

S. No.	Parameters	Desirable Limit	Max. Permissible Limits in the absence of alternate source
Essential Characteristics:			
1.	Colour	5	25
2.	Odour	Unobjectionable	Unobjectionable
3.	Taste	Agreeable	Agreeable
4.	Turbidity, NTU	5	10
5.	pH Value	6.5 to 8.5	No relaxation
6.	Total Hardness (as $CaCO_3$), mg/l	300	600
7.	Iron as Fe, mg/l	0.3	1.0
8.	Chloride as Cl, mg/l	250	1000
9.	Residual free Chlorine, mg/l	0.2	-
Desirable Characteristics			
10.	Dissolved Solids, mg/l	500	2000
11.	Calcium as Ca, mg/l	75	200
12.	Copper as Cu, mg/l	0.05	1.5
13.	Manganese as Mn, mg/l	0.10	0.3
14.	Sulphate as SO_4, mg/l	200	400
15.	Nitrate as NO_3, mg/l	45	100
16.	Fluoride as F, mg/l	1.0	1.5
17.	Phenolic Compounds as C_6H_5OH, mg/l	0.001	0.002
18.	Mercury as Hg, mg/l	0.001	No relaxation
19.	Cadmium as Cd, mg/l	0.01	No relaxation
20.	Selenium as Se, mg/l	0.01	No relaxation
21.	Arsenic as As, mg/l	0.05	No relaxation
22.	Cyanide as CN, mg/l	0.05	No relaxation
23.	Lead as Pb, mg/l	0.05	No relaxation
24.	Zinc as Zn, mg/l	5.0	15.0
25.	Anionic detergent as MBAS, mg/l	0.2	1.0
26.	Chromium as Cr^{6+}, mg/l	0.05	No relaxation
27.	Polynuclear aromatic hydro carbon as PAH, g/l	-	-
28.	Mineral Oil, mg/l	0.01	0.03
29.	Pesticide, mg/l	Absent	0.001
30.	Radioactive materials: Alpha Emitters, Bq/l Beta Emitters, Bq/l	 - -	 0.1 1.0
31.	Alkalinity, mg/l	200	600
32.	Aluminum as Al, mg/l	0.03	0.2
33.	Boron, mg/l	1.0	5.0

ANNEXURE 9.10

USE BASED CLASSIFICATION OF SURFACE WATERS IN INDIA

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfections	A	i. Total Coliforms Organism MPN/100ml shall be 50 or less ii. pH between 6.5 and 8.5 iii. Dissolved Oxygen 6mg/l or more iv. Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organized)	B	i. Total Coliforms Organism MPN/100ml shall be 500 or less ii. pH between 6.5 and 8.5 iii. Dissolved Oxygen 5mg/l or more iv. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less
Drinking water source after conventional treatment and disinfections	C	i. Total Coliforms Organism MPN/100ml shall be 5000 or less ii. pH between 6 to 9 iii. Dissolved Oxygen 4mg/l or more iv. Biochemical Oxygen Demand 5 days 20oC 3mg/l or less
Propagation of Wild life and Fisheries	D	i. pH between 6.5 to 8.5 ii. Dissolved Oxygen 4mg/l or more iii. Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	i. pH between 6.0 to 8.5 ii. Electrical Conductivity at 25oC micro mhos/cm Max.2250 iii. Sodium absorption Ratio Max. 26 iv. Boron Max. 2mg/l

Source: Guidelines for Water Quality Management – CPCB 2008.

ANNEXURE 9.11

PROPOSED ENVIRONMENTAL ENHANCEMENT MEASURES

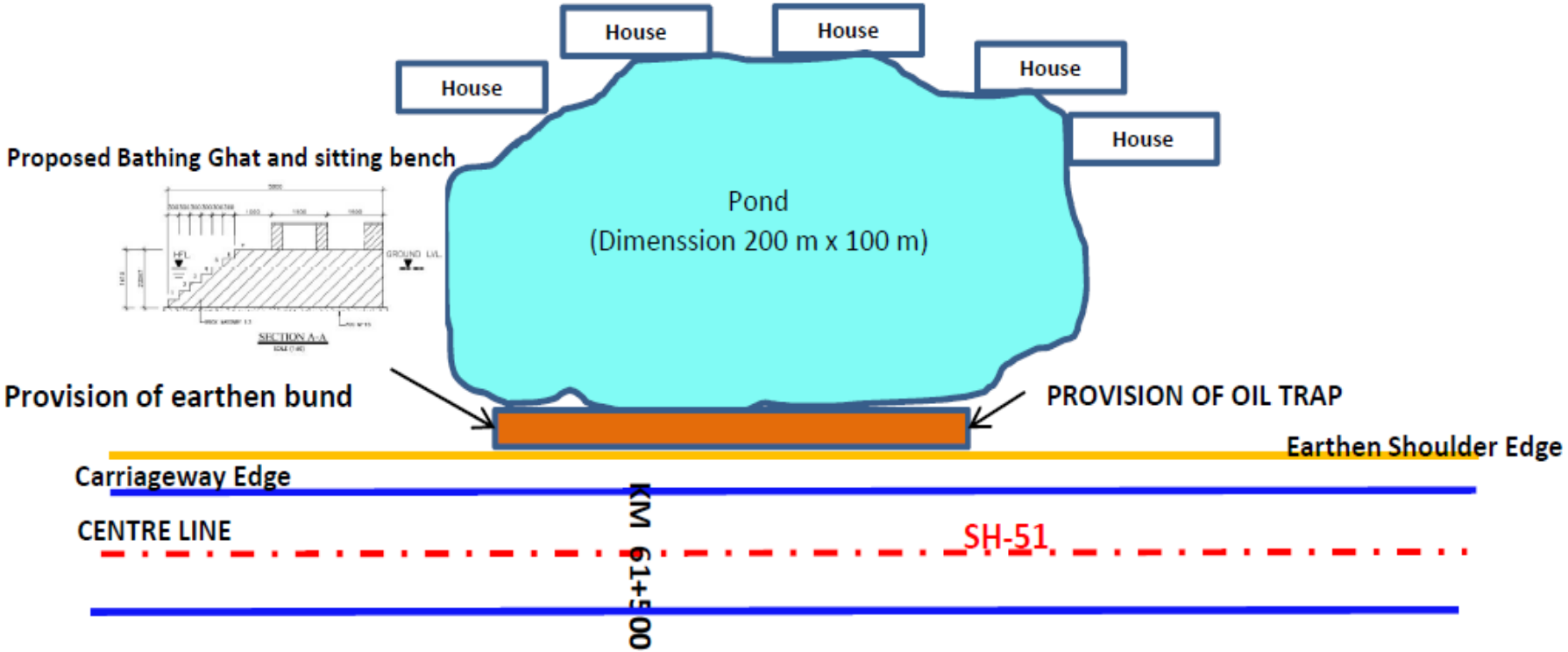
1. Pond at Wahpurpatti Village at Km 61.500

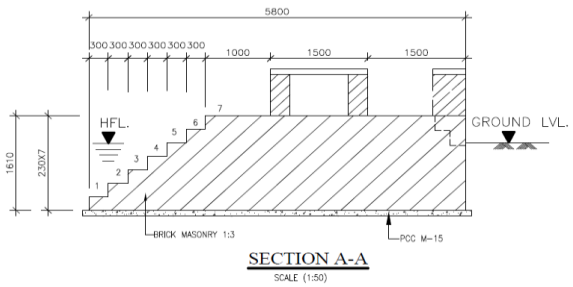
Existing status of the pond at Km 61+500 (RHS) at Wahpurpatti

Proposed Enhancement at Km 61.500 (RHS)

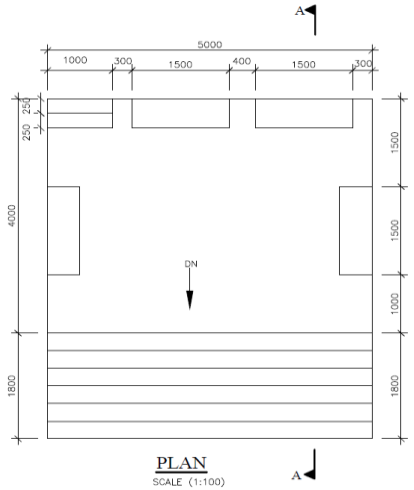
	Bathing Ghat of size 5m x 4m	**Unit**	**Estimated Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
Proposed Enhancement of Pond at Km 61.500 (RHS), Village-Wahpurpatti	(a) Excavation	Cum	37.50	56	2,100
	(b) PCC (M15)	Cum	3.00	6,299	18,897
	(c) Brick Work (1:3)	Cum	39.20	5,478	2,14,738
	(d) Tiles	Sqm	37.51	880	33,009
	Siting Bench (4 numbers) at Bathing Ghat	No.	4	4,440	17,760
				Total Proposed cost (Rupees)	**2,86,503**

Enhancement measures of Pond at Km 61.500 (RHS) at Wahpurpatti Village





SECTION A-A
SCALE (1:50)



PLAN
SCALE (1:100)

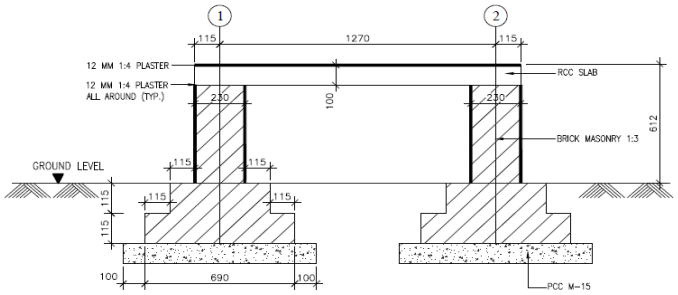
NOTES:–

(1) ALL DIMENSIONS ARE IN mm.
(2) GRADE OF CONCRETE IS M25.
(3) CLEAR COVER SLAB REINFORCEMENT–25 MM.
(4) NET SAFE BEARING CAPACITY AT FOUNDING LEVEL SHALL BE LESS THAN 8.0T/m2

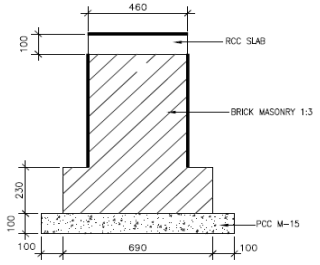
CLIENT:- Government of Uttar Pradesh Public Works Department	CONSULTANT:- egis India consulting engineers pvt. ltd.	PROJECT:- Uttar Pradesh Core Road Network Development Program (UPCRNDP) Part-A: Project Preparation (Badaun-Bilsi-Bijnaour Road (SH-51)	SCALE:- HOR 0 25 50 VER 0 2.5 5.0 1:2500 @ A2 SHEET	Prepared by: Anil Pant; Designed by: Parshant Jha; Checked by: Rajat Nag; Approved by: Rajeev Gupta; Date: Nov 2014	Revisions: Rev. R0, Date Nov 2014, Description FIRST DRAFT	TITLE: DETAIL OF BATHING GHAT AT POND AT KM 61+500 (RHS); DRG. NO.: EGIS/DPR/EIRH1UP020/GHAT-101

NOTES:–

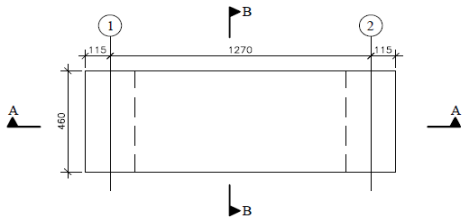
(1) ALL DIMENSIONS ARE IN mm.
(2) GRADE OF CONCRETE IS M25.
(3) CLEAR COVER SLAB REINFORCEMENT–25 MM.



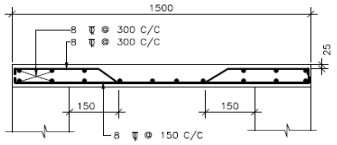
SECTION A-A
SCALE (1:15)



SECTION B-B
SCALE (1:15)



PLAN
SCALE (1:15)



REINFORCEMENT DETAIL OF SLAB

CLIENT:- Government of Uttar Pradesh Public Works Department	CONSULTANT:- egis India consulting engineers pvt. ltd.	PROJECT:- Uttar Pradesh Core Road Network Development Program (UPCRNDP) Part-A: Project Preparation (Badaun-Bilsi-Bijnaour Road (Sh-51)	SCALE:- HOR 0 25 50 VER 0 2.5 5.0 1:2500 @ A2 SHEET	Prepared by: Anil Pant; Designed by: Parshant Jha; Checked by: Rajat Nag; Approved by: Rajeev Gupta; Date: Nov 2014	Revisions: Rev. R0, Date Nov 2014, Description FIRST DRAFT	TITLE: TYPICAL DETAIL OF STRUCTURES SEATING BENCH AT POND AT KM 61+500 (RHS); DRG. NO.: EGIS/DPR/EIRH1UP020/SEATING-101

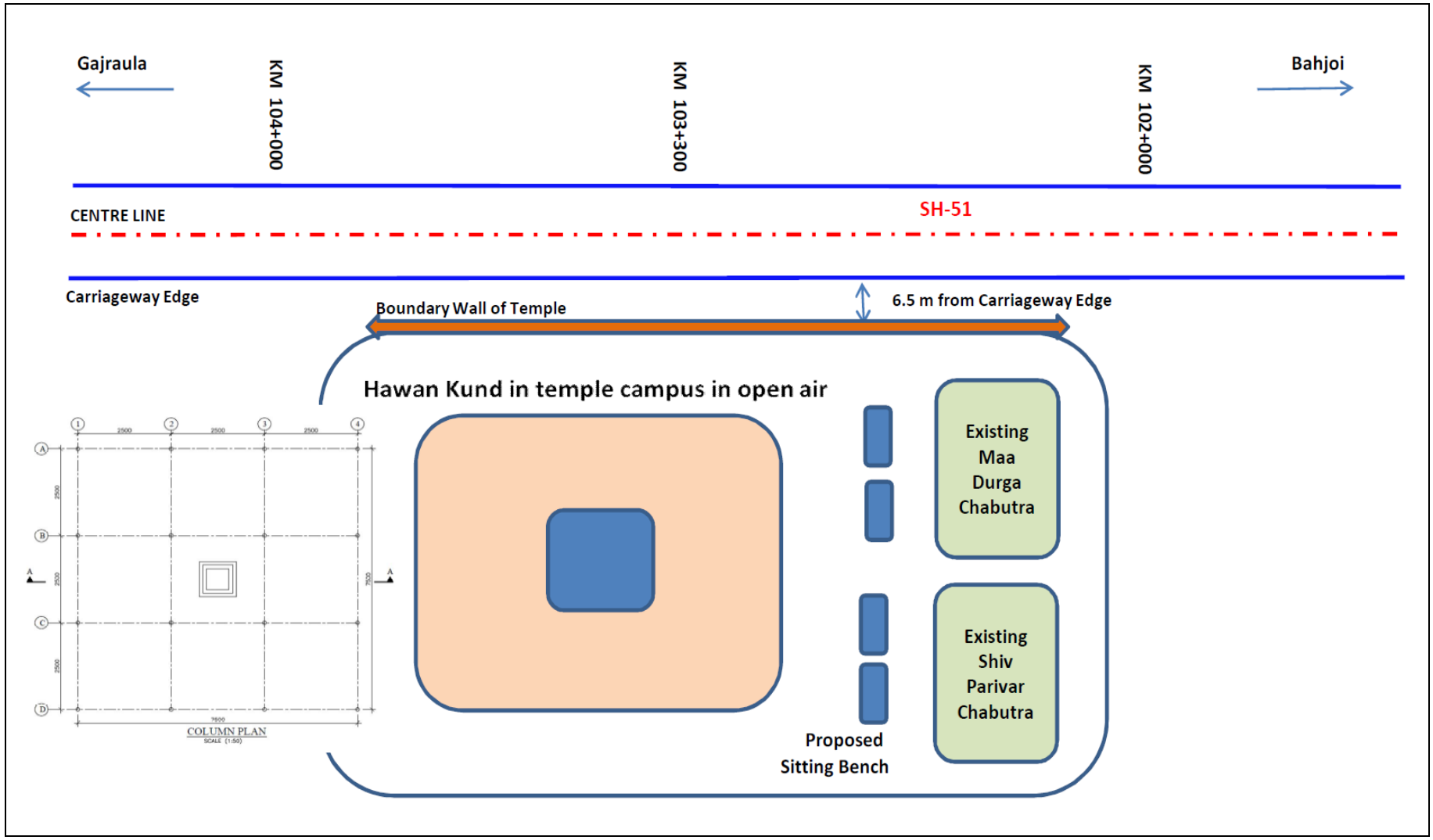
2. Enhancement of Shiv Temple at Km 103.300 (LHS) Village Dehpa

	
Temple view from road edge	Proposed Wall & Ceiling over Shiv Parivar existing Chabutra
	
Proposed Wall & Ceiling over Shiv Parivar existing Chabutra	Proposed shade over Hawan Kund

Proposed Enhancement of Shiv temple at Km 103.300 (Dehpa village)

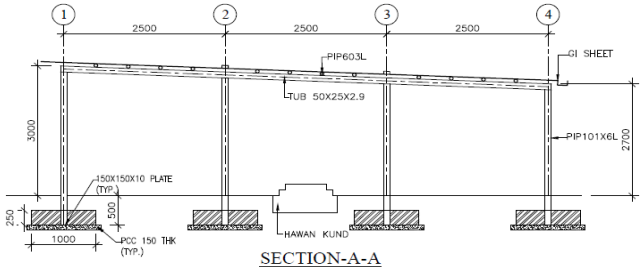
	(1) Wall and Ceiling at existing Shiv Parivar & Maa Durga Chabutra (2 Nos)	**Unit**	**Estimated Quantity**	**Rate (Rupees)**	**Amount (Rupees)**
Proposed Enhancement at Shiv Temple at Km 103.300 (LHS), Village: Dehpa	(a) Brick Work	Cum	5.76	5,478	31,553
	(b) RCC (M25)	Cum	1.14	7,754	8,840
	(c) Reinforcement (FE 500)	kgs	86.36	62	5,348
	(d) Plaster of 12 mm (1:3)	Sqm	54.6	1,233	67,322
	(e) Plaster of 6 mm (1:3)	Sqm	8	792	6,336
	(f) Enamel Painting	Sqm	62.6	65	4,069
	(2) Sitting Bench (5 numbers)	No.	5	4,440	22,200
	(3) Shade on Hawan Kund with GI sheet and Pipe				
	(a) PIP 101 x 6L	Kgs	466.65	92	42,932
	(b) TUBSOx 25x2.9	Kgs	178.98	92	16,466
	(c) PIP 603L	Kgs	389	92	35,788
	(a) PCC (M15)	Cum	2.4	6,299	15,118
	e) Brick Work (1:3)	Cum	4	5,478	21,912
	f) MS plate 150x150x10	Kgs	28.26	92	2,600
	GI Sheeting				
	(a) Area Including 30% laps	Sqm	81.133	760	61,661
				Total Proposed cost (Rupees)	**3,42,144**

Enhancement of Shiv Temple at Km 103+300 (LHS) at Dehpa Village

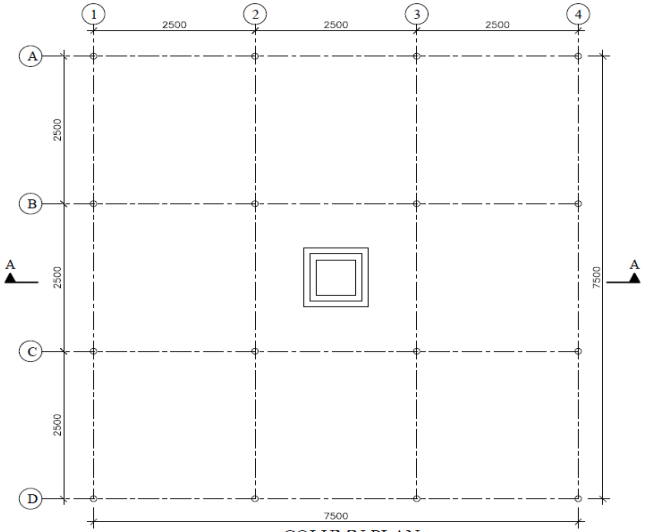


NOTES:–

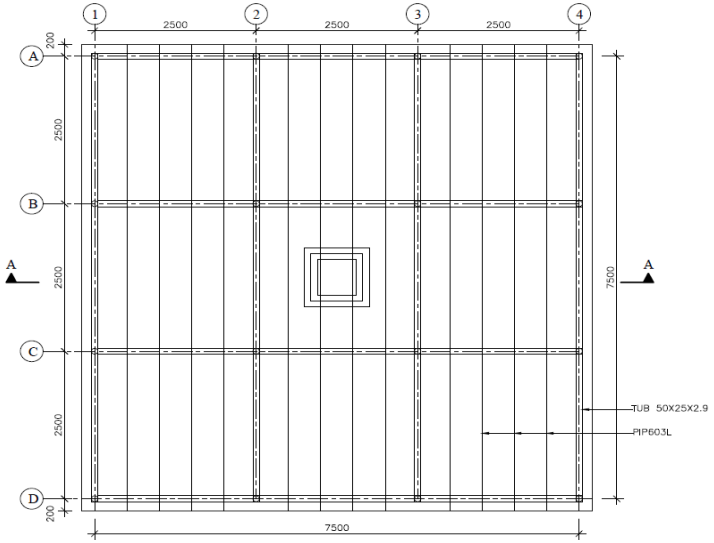
(1) ALL DIMENSIONS ARE IN mm.
(2) GRADE OF CONCRETE IS M25.
(3) CLEAR COVER SLAB REINFORCEMENT–25 MM.
(4) NET SAFE BEARING CAPACITY AT FOUNDING LEVEL SHALL BE LESS THAN 8.0T/m2



SECTION-A-A
SCALE (1:50)



COLUMN PLAN
SCALE (1:50)



ROOF PLAN
SCALE (1:50)

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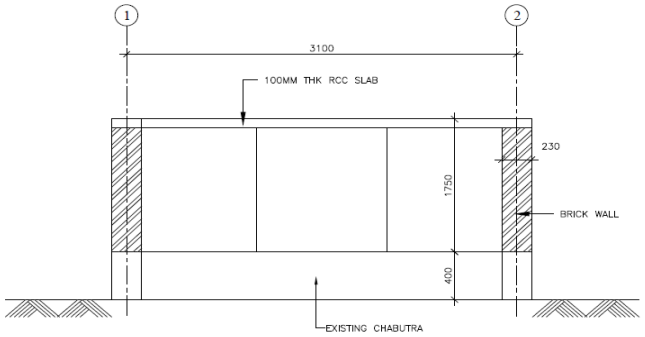
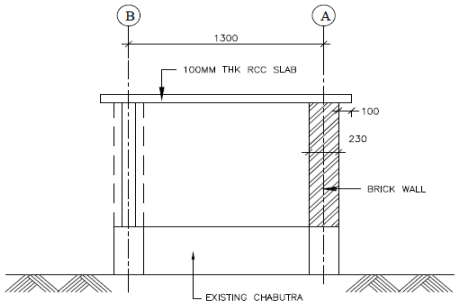


SECTION A-A

SCALE (1:25)



SECTION B-B

SCALE (1:25)

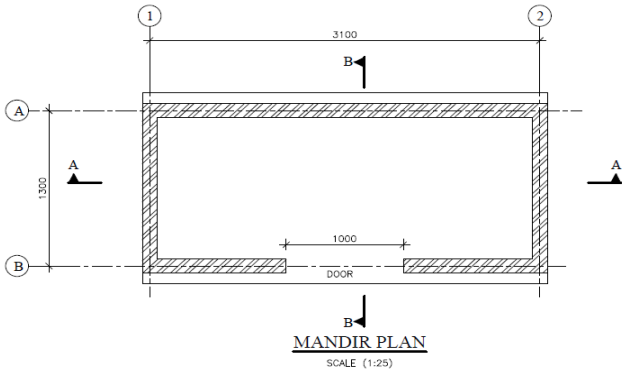
NOTES:–

(1) ALL DIMENSIONS ARE IN mm.

(2) GRADE OF CONCRETE IS M25.

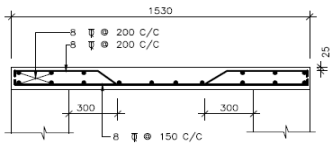
(3) CLEAR COVER SLAB REINFORCEMENT–25 MM.

(4) NET SAFE BEARING CAPACITY AT FOUNDING LEVEL SHALL BE LESS THAN 8.0T/m2



MANDIR PLAN

SCALE (1:25)

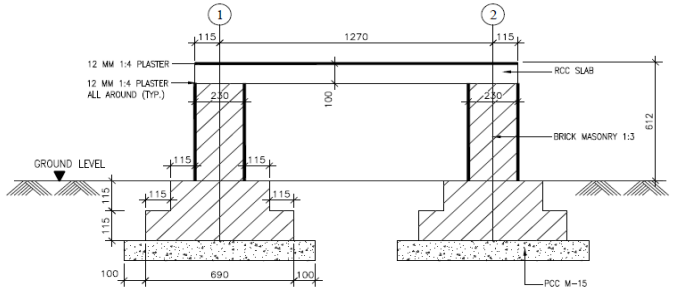


REINFORCEMENT DETAIL OF SLAB

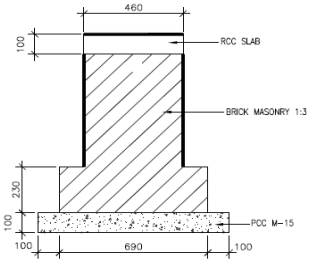
CLIENT:- Government of Uttar Pradesh, Public Works Department	CONSULTANT:- egis India, consulting engineers pvt. ltd.	PROJECT:- Uttar Pradesh Core Road Network Development Program (UPCRNDP), Part-A: Project Preparation, (Badaun-Bilsi-Bijnaour Road (SH-51)	SCALE:- HOR 0 25 50, VER 0 2.5 5.0, 1:2500 @ A2 SHEET	Prepared by: Anil Pant; Designed by: Parshant Jha; Checked by: Rajat Nag; Approved by: Rajeev Gupta; Date: Nov 2014	Revisions: Rev. R0, Date Nov 2014, Description FIRST DRAFT

TITLE : DETAILS OF WALL AND CEILING AT EXISTING CHABUTRA OF SHIV TEMPLE AT KM 103+300 (LHS)

DRG. NO. : EGIS/DPR/EIRH1UP020/KUND-101



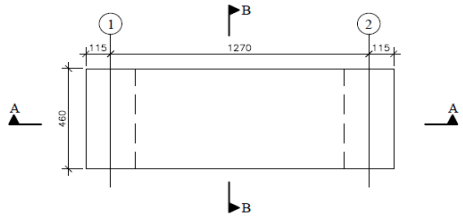
SECTION A-A
SCALE (1:15)



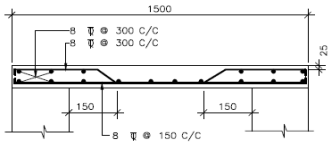
SECTION B-B
SCALE (1:15)

NOTES:-

(1) ALL DIMENSIONS ARE IN mm.
(2) GRADE OF CONCRETE IS M25.
(3) CLEAR COVER SLAB REINFORCEMENT-25 MM.



PLAN
SCALE (1:15)



REINFORCEMENT DETAIL OF SLAB

CLIENT:- Government of Uttar Pradesh, Public Works Department	CONSULTANT:- egis India, consulting engineers pvt. ltd.	PROJECT:- Uttar Pradesh Core Road Network Development Program (UPCRNDP), Part-A: Project Preparation, (Badaun-Bilsi-Bijnaour Road (Sh-51)	SCALE:- HOR 0 25 50, VER 0 2.5 5.0, 1:2500 @ A2 SHEET	Prepared by: Anil Pant; Designed by: Parshant Jha; Checked by: Rajat Nag; Approved by: Rajeev Gupta; Date: Nov 2014	Revisions: R0, Nov 2014, FIRST DRAFT	TITLE: TYPICAL DETAIL OF STRUCTURES SEATING BENCH AT SHIV TEMPLE AT KM 103+300 (LHS); DRG. NO.: EGIS/DPR/EIRH1UP020/SEATING-101